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EXECUTIVE OFFICE OF THE PRESIDENT
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May 19, 1993

LEGISLATIVE REFERRAL MEMORANDUM

LRM #M-216

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Assistant Director for Legislative Reference

OMB CONTACT: Scott CAMERON (395-6822)

SUBJECT: INTERIOR Proposed Report on Impact of Federal
Programs on Wetlands, Volume II

DEADLINE: 10:00 AM June 17, 1993

OMB requests the views of your agency on the above subject before
advising on its relationship to the program of the President, in
accordance with OMB Circular A-19.

Please advise us if this item will affect direct spending or
receipts for purposes of the the "Pay-As-You-Go" provisions of
Title XIII of the Omnibus Budget Reconciliation Act of 1990.

CC:

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Memorandum to Reviewers

Subject: Department of the Interior Report to Congress:
The Impact of Federal Programs on Wetlands, Volume II

Enclosed for your review is Volume II of the Secretary of the Interior's report to Congress on the impact of Federal programs on wetlands. This report is mandated by P.L. 99-645, the Emergency Wetlands Resources Act of 1986 (Act). Congress ordered the report because of the inconsistent approaches toward wetlands inherent in Federal programs and policies, with some Federal programs conserving wetlands and others encouraging their conversion and development.

Volume I was submitted to Congress in 1988, and covered the Lower Mississippi Alluvial Plain and the Prairie Pothole Region of the Upper Midwest. Volume II covers 17 major wetland regions of the United States: the Everglades, coastal Louisiana, Galveston Bay, Puerto Rico, California's Central Valley, four Western Riparian Areas, Southeastern and Western Alaska, the Delmarva Peninsula, the Pocosins of North Carolina, Northeastern New Jersey, Michigan coastal and forested wetlands, and Nebraska.

A comprehensive interagency review has already been conducted for Volume II. In September, 1991, Teresa Gorman, then head of the Domestic Policy Council's Wetland Task Force, circulated the August 23, 1991 draft of the report for review and comment. Comments were received from all agencies in the fall of 1991. The current draft responds to agency comments and updates obsolete material. Editing in response to agency comments was done in consultation with the staffs of the appropriate agencies. The new leadership at the Department of the Interior has reviewed the final report, believes that it is consistent with the Administration's philosophy of protecting the environment while promoting economic growth, and endorses it. Secretary Babbitt views wetlands as among his most important responsibilities, and is eager to transmit this report to Congress.

Given the thoroughness of past reviews and the significance of the report to the Administration's programs, DOI asks that this final interagency review be expedited but not cursory.

MAR -2 1993

DRAFT

THE IMPACT OF FEDERAL PROGRAMS ON WETLANDS

VOLUME II: The Everglades, Coastal Louisiana, Galveston Bay, Puerto Rico, California's Central Valley, Western Riparian Areas, Southeastern and Western Alaska, The Delmarva Peninsula, North Carolina, Northeastern New Jersey, Michigan, and Nebraska

A Report to Congress by the Secretary of the Interior

DRAFT

MAR -2 1993

PREFACE

Wetlands are a vital element in the biosphere, but they are disappearing and being degraded rapidly. Until recently, they have been regarded largely as nuisances to be drained, cleared, filled, or inundated. Now we have begun to realize that in their natural state wetlands produce numerous benefits for society, benefits which are either irreplaceable if lost or can only be replaced at great expense.

While some Federal programs are designed to protect wetlands, others encourage economic development projects which sometimes destroy wetlands. Further, these economic projects have too often turned out to be of questionable economic merit. Thus, in 1985, as a precursor to developing greater consistency in Federal policies with respect to wetlands, Congress ordered a study of Federal programs and subsidies which affect wetlands, together with a comprehensive examination of conservation options. Although more vigorous regulation or increased acquisition would preserve more wetlands, these approaches can be costly and unpopular. Both the Administration and Congress prefer to redesign Federal programs to reduce undesirable effects rather than increase expenditures for land acquisition or impose stricter regulations. Accordingly, this study identifies Federal programs which could promote the conversion or degradation of wetlands, and examines ways to revise the programs to accomplish three important goals: reduce economic inefficiencies and inequities, ease the drain on the Federal budget, and conserve environmentally significant wetlands with a minimum of Federal involvement and expenditure.

This is the second of two reports to Congress on this topic. Volume I focused on two of the most important wetland regions in the country: the bottomland hardwoods of the Lower Mississippi Alluvial Plain and the Prairie Pothole Region of the Upper Midwest. Volume II covers all other major wetland regions in the United States.

This report was developed over a number of years, and is the joint product of the Department's Office of Program Analysis and the Fish and Wildlife Service. It was produced under the direction of Jon H. Goldstein, Office of Program Analysis. For their advice and counsel throughout the preparation of this report, special recognition is due to H. Theodore Heintz, Assistant Director - Economic Analysis, Office of Program Analysis and Merritt W. Sprague, formerly Director, Office of Program Analysis.

Secretary of the Interior

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Chapter 1: EXECUTIVE SUMMARY

FOCUS OF THE REPORT

This is the second of two reports to Congress on the impact of Federal programs on wetlands.¹ Volume I was submitted to Congress in 1988, and examined how Federal programs have affected wetlands in the bottomland hardwoods of the Lower Mississippi Alluvial Plain and the prairie potholes of the Upper Midwest. Volume II focuses on 17 additional study areas, selected because they reflect the broad array of problems facing wetlands nationwide:

- o in the South, Florida's Everglades, coastal Louisiana, the Galveston Bay of Texas, and the Puerto Rican mangroves and coastal wetlands.
- o in the West, California's Central Valley, western riparian wetlands, and southeast and western Alaska.
- o in the East, the Delmarva Peninsula (comprising parts of Delaware, Maryland, and Virginia), North Carolina's pocosins and other freshwater wetlands, and northeastern New Jersey.
- o in the Midwest, Michigan's coastal and northern forested wetlands, and Nebraska's Rainwater Basin.

A map of the study areas for Volumes I and II appears in Chapter 2. (See Figure II-1.)

Volume II is divided into five parts. The four chapters in Part I describe the Federal programs affecting wetlands: agriculture; water development and management; infrastructure, local development, and housing; and resource use, extraction, and development. Parts II through V are organized regionally and examine the 17 study areas.

¹The mandate for this report appeared first in the FY85 budget for the Department of the Interior, but was repeated and revised in the Emergency Wetlands Resources Act of 1986 (P.L. 99-645, section 402).

BACKGROUND

THE FUNCTION OF WETLANDS: Wetlands are a vital element in the biosphere and produce numerous benefits for society. They provide critical nursery habitat for many species of fish and wildlife. By temporarily storing large quantities of water, wetlands play an important role in reducing flooding problems and recharging ground water. They help to maintain water quality by filtering out pollutants and sediments, and serve to control erosion by trapping soil washed from nearby uplands. In addition, wetlands are a source of recreation, timber, and other natural products for commercial use. Federal, State, and private conservation actions have slowed but not stopped their disappearance and functional degradation.

THE NATURE AND EXTENT OF WETLAND LOSSES: One hundred and four million acres (47 percent) of the original 221 million acres of wetlands remain in the contiguous 48 States, accounting for 5.0 percent of the land area. Annual losses in the period mid-1970s to mid-1980s averaged 290,000 acres. There are approximately 170 million acres of wetlands in Alaska, with less than 0.1 percent lost over the last 200 years. Lost acreage alone, however, does not depict the full extent of the problem. Few wetlands are in pristine condition. Comprehensive studies of the extent of the degradation are only now beginning, however.²

Since the mid-1980s, indications are that wetland losses are slowing. From 1987 to 1990, programs to restore wetlands under the 1985 Food Security Act have added about 90.0 thousand acres to the Nation's wetlands inventory. Other programs to protect wetlands, like the Swampbuster provision of the Food Security Act, have generated support for conserving wetlands. In addition, public education and extension efforts have helped heighten our Nation's awareness of the values of wetlands.

Approximately three-fourths of the remaining wetlands in the continental United States are privately owned. Only about 0.5 percent of these have protective covenants on them. Furthermore, some wetland conversions are not covered by Section 404 of the Clean Water Act (the principal Federal wetlands regulatory program).

²In 1988, the Environmental Monitoring and Assessment Program (EMAP) was initiated to provide improved information on the current status and long-term trends in the condition of the Nation's ecological resources. EMAP has a wetlands component. Its first interpretive report, describing the conditions of coastal wetlands, is scheduled for completion in 1996.

The most important economic sector absorbing wetlands is the agricultural sector. From the mid-1970s to the mid-1980s, wetland conversions to agricultural land uses accounted for 54.0 percent of the losses. This is an appreciable change from trends observed during the period mid-1950s to mid-1970s in which agricultural conversion represented 87.0 percent of all wetland losses. Urban land use conversions accounted for about 5.0 percent of the wetlands lost from the mid-1970s to the mid-1980s, while conversions to "other" land uses accounted for 41.0 percent of the losses. A substantial portion of conversions classified as "other" is attributable to wetlands that have been cleared and drained, but not yet put to an identifiable use.

THE ECONOMICS OF CONVERSION: That so much wetland conversion has occurred should not be surprising. The United States started with a great abundance of wetlands. With wetlands in abundance, other uses of the land were seen as more valuable. Land was considered to be more valuable when devoted to the production of market goods rather than left in its natural state, producing environmental services and amenities. Further, the initial conversions did relatively little environmental damage. Thus, even if the ecological functions of wetlands had been well understood and appreciated, it would have been deemed to be in society's interest to convert wetlands during the early years of development.

As with all non-market commodities, however, it is difficult to know even generally when enough is enough and to stop converting. The normal tendency of a private market is to encourage the conversion of wetlands to other uses. Wetlands constitute a classical example of market failure: the wetland owner generally cannot capture the benefits of his resource for his own use or sale. The flood protection benefits of wetlands accrue to others downstream. The fish and wildlife that breed in and inhabit the wetlands migrate, and are captured or enjoyed by others. The ground water recharge and sediment trapping benefits cannot be commercially exploited. For the owner of a wetland to benefit from his resource, he usually has to alter it, convert it, and develop it.

The rate of conversion and development was not left to the determination of an unfettered, private market, however. Starting with the Swamp Lands Acts in 1849 and 1850, government actions supported the conversion and development of wetlands. The Swamp Lands Acts ceded millions of acres of swamp lands to the States with the proviso that the States sell the lands and use the proceeds for reclamation. Programs for flood control, drainage, irrigation, and hydroelectric power grew throughout the 20th century. The projects effected massive changes in the nation's hydrologic regime, and made it both technically feasible and financially attractive to develop the land.

Thus, in years past, the conversion and degradation of major acreages of wetland were the result of both concerted public policy and hundreds of thousands of decisions by people attempting to enhance their economic status. It is only recently that we have realized that wetlands have sufficient value in themselves to warrant preserving most of those remaining. In the interim, many of our wetland ecosystems have been heavily depleted and are now highly stressed. Thus, although early conversions may have been viewed as a wise use of resources, most wetlands with great potential economic value have long been developed, and those remaining are both less desirable from an economic perspective and more valuable environmentally.

THE CURRENT FEDERAL ROLE

Today, there are a number of Federal programs designed to protect wetlands, but Federal policy is neither comprehensive nor consistent with respect to wetland use. Indeed, Federal programs affect wetlands in opposing ways. Some Federal programs encourage wetland conversion by reducing the cost, increasing the revenue, and/or reducing the risk of wetland development. Simultaneously, other Federal programs restrict or manage wetland use through a variety of techniques and programs: acquisition and easement; regulation; consultation among Federal agencies to identify and either avoid or mitigate the effects of agency actions; and reduction or withdrawal of Federal financial incentives to develop wetlands.

This report to Congress focuses primarily on the last of these approaches to wetland conservation. Although more vigorous regulation or increased acquisition would preserve more wetlands, these approaches could be costly. Both the Administration and Congress have shown a preference for redesigning Federal programs which produce undesired effects on wetlands before engaging in additional land acquisition or regulation. This strategy has several appealing features:

- o It discourages economically inefficient and environmentally unsound development.
- o It promotes a stronger, more competitive economy by restricting Federal programs which distort market signals and hamper initiative.
- o It fosters Federal budgetary savings at a time of large deficits.
- o It conserves environmentally significant wetlands with a minimum of Federal involvement and economic disruption.

Although restricting Federal financial support for unsound development cannot be relied on as the only conservation tool, it should be among the first approaches to the problem of wetland loss. Many Federal programs that affect wetlands are designed and financed in a way that violates the beneficiary pay principle of public finance. They distort market signals and provide subsidies that have had negative environmental effects. Optimally, these programs should be redesigned in order to confront those who benefit from the programs and projects with the full cost of their activities. Volume II takes a broad look at over 35 Federal programs implicated in wetland decline, illustrating the range of effects that Federal activities can have on wetland ecosystems.

FINDINGS AND CONCLUSIONS

The following discussion summarizes the background information, findings, and conclusions for the 17 study areas. For each area, the principal causes of wetland loss and functional degradation are identified, and recommendations for future wetland protection are listed. It should be noted that the recommendations are selective, with the purpose of giving the reader insight into the direction of the recommended approach to the problems identified. For the complete set of recommendations, the reader should refer to the end of each area chapter in Parts II through V.

FLORIDA EVERGLADES

1. Description and Importance

- o The Everglades hosts a highly diverse spectra of aquatic birds, mammals, reptiles, and amphibians.
- o The Everglades protect the Biscayne Aquifer, the primary source of drinking water for the Miami area, by recharging the ground water, filtering out pollutants, and preventing saltwater intrusion.

2. Extent and Source of Losses

- o The Everglades originally stretched about 100 miles from the southern end of Lake Okeechobee down to the tidal estuaries of the Gulf of Mexico and Florida Bay. At the turn of the century, the Everglades encompassed over 2.3 million acres of wetlands. By the mid-1970s, about 1.1 million acres (48 percent) of the original acreage remained. Much of the remaining wetlands is functionally degraded.

- o An altered water regime, initially designed to support agriculture and increasingly utilized to support residential development, has been a major cause of wetland decline.

3. Impact of Federal programs

- o Federal drainage and flood control projects which alter the natural water regime have had the greatest impact on the Everglades. The Federal Government has financed 80 percent of the cost of constructing the Central and South Florida Flood Control Project which provides drainage and flood control for agriculture.
- o Agricultural programs and incentives for residential development have led to the filling of wetlands and increased the pressure for Federal flood control and drainage efforts.
- o Federal funds for highways and airports have helped to establish the infrastructure for expanded residential development.

4. Agriculture Programs

- o Federal agricultural programs prominent in the Everglades are: construction of a system of secondary canals for farm drainage; below market rate operating and ownership loans; crop insurance at subsidized rates; price supports and import restrictions for sugarcane; and citrus and dairy marketing orders.³
- o The Swampbuster provision of the 1990 Farm Bill is almost completely ineffective in deterring the conversion of wetlands to sugarcane, because the most important subsidies for sugarcane (price supports passed through sugar processors and import quotas on sugar) are not among Swampbuster's sanctions.

5. Urban Development and Transportation Programs

- o Mortgage insurance, flood insurance, and low interest loans for expanding the supply of electricity are the key Federal programs that promote residential development in the Everglades.

³Marketing orders are federally sanctioned cooperatives which establish production and commodity standards and exert an influence on the market price. See discussion in chapter 7.

- o The Federal Government provides 90 percent of the funds for Federal highway construction and 75 percent of the funds for other roads.

6. Recommendations

- o To protect the Everglades from further conversion and impaired water quality, activities such as dredging, filling, and subsidization that safeguard existing development and foster new growth would have to be restrained, and regulation of wetland use would have to be more inclusive and vigorous.
- o Expand Swampbuster sanctions to include ineligibility to participate in marketing orders. Phase out import quotas for sugar.
- o Explore the possibility of denying Federal program benefits to industries, regions, or States found in violation of water pollution control standards.
- o Consider having all Federal agencies assess the effects of their programs on wetlands and, to the extent feasible, minimize adverse impacts.

COASTAL LOUISIANA

1. Description and Importance

- o Coastal Louisiana is heavily endowed with wetlands: 2.5 million acres of marshes (fresh, brackish, and saline) and 637,400 acres of forested wetlands. It contains about 40 percent of the coastal marshes in the coterminous United States.
- o This network of wetlands supports a fishery which accounts for 28 percent (by volume) of the total catch of U.S. fisheries. It also provides winter habitat for one-half to two-thirds of the Mississippi Flyway waterfowl population.

2. Extent of the Loss

- o Coastal Louisiana contained 4.07 million acres of wetlands at the turn of the century. From 1900 to 1978 Coastal Louisiana lost about 22 percent (901,200 acres) of its wetlands, with 3.17 million acres remaining in 1978. At least 300,000 acres are estimated to have been lost since 1978.

- o Louisiana loses approximately 35 to 37 square miles of coastal wetlands annually. This is one of the Nation's most serious wetland problems.

3. Sources of Loss

- o A combination of natural and human factors have caused the wetland decline.
- o Natural factors contributing to the loss of wetlands include: subsidence, erosion due to storms, and the rise in sea level.⁴
- o Historically, sediment deposition from the Mississippi River worked to offset any losses and replenish the wetlands. In the last century, however, dams and levees built along the Mississippi River have altered this process, preventing sediments from reaching the coastal plains.
- o Approximately three-fourths of Louisiana's recent coastal wetland loss takes the form of conversion to open water and is attributable to subsidence, erosion, and canal dredging for oil and gas pipelines. Human factors, particularly levee construction along the Mississippi River, have accelerated subsidence and erosion of wetlands. Other primary causes of wetland loss include spoil disposal and conversion to urban/industrial development. Agricultural drainage and miscellaneous factors account for a small percentage of recent coastal losses.

4. Impact of Federal Programs

- o Flood control and navigation projects have been the major cause of wetland loss in Louisiana. These projects have been almost entirely federally financed.
- o To a lesser extent, Federal hurricane protection and highway projects have had an impact.
- o A number of economic incentives offered by the Federal Government have served to increase profits and led to increased wetland conversion for: oil and gas development (tax benefits in the form of oil and gas depletion allowances and the expensing, as opposed to capitalizing, of intangible drilling costs); urban growth (flood

⁴Of course, any future sea level rise may be due in part to global warming, and hence, related to human activity.

insurance, mortgage insurance, low income housing, highway construction), and agriculture (price supports, low interest loans, disaster payments). The advent of Swampbuster has greatly diminished agricultural losses, however, and compensatory mitigation is routinely required for urban development in wetlands as a condition for State and Federal permits.

- o As a result of the Coastal Wetlands Planning, Protection, and Restoration Act of 1990, a task force of State and Federal agencies is preparing a comprehensive plan to address Louisiana's problem with coastal wetland loss. The Act provides for funding to implement wetland restoration projects approved by the task force. Without aggressive action to reverse the trend, the rate of loss of coastal wetlands in Louisiana will doubtless continue.

5. Recommendations

- o Proceed with construction of two authorized but uncompleted water diversion projects: Lake Pontchartrain and Davis Pond. These projects would restore a small percentage of the freshwater and some sediment lost as a result of the Mississippi River and Tributaries Project (MR&T). They are an essential first step in reducing the coastal losses.
- o Consider expanding the Corps' Civil Works Program to protect, create, restore, and enhance wetlands in Coastal Louisiana. The Corps now has numerous authorities to construct or modify projects to benefit wetlands.
- o Consider eliminating the Federal income tax deductions in wetland areas for oil depletion allowances granted to independent producers and for intangible costs associated with drilling.
- o Consider developing a performance-bond approach for the mitigation of wetland losses. Under this approach, environmental standards are established for permittees to meet. Simultaneously, permittees must post performance bonds sufficient to cover the cost of restoration, penalties, and the Government's administrative costs in the event the standards are not met.
- o Consider establishing stronger mitigation requirements within the regulatory programs, reflecting the quality and functional values of affected wetlands. As a first step in the implementation of the goal of no net loss of wetlands, the Corps and EPA have begun to strengthen the mitigation program.

- o Consider suspending Federal subsidization and support for urban development in environmentally significant wetlands, e.g., funds for low income housing, mortgage insurance, and National Flood Insurance.
- o Consider having all Federal agencies assess the effects of their programs on wetlands and, to the extent feasible, minimize adverse impacts.

GALVESTON BAY OF TEXAS:

1. Description and Importance

- o This region contains highly valuable marine resources and habitat for waterfowl, and supports the most productive commercial and sports fisheries on the Texas coast.
- o The Bay's wetlands buffer inland areas from storm waves and tidal surges and treat runoff waste from agricultural, urban, and industrial sources.

2. Extent and Sources of Loss and Degradation

- o From the mid-1950s through the 1970s, the Galveston Bay area lost about 1,110 acres annually to open water. The rate of loss appears constant, except when exacerbated by hurricanes or tropical storms.
- o The cumulative loss and the rate of loss are significant. However, the chief wetland problem in the region is water quality degradation. Pollutants have exceeded the assimilative capacity of the area, resulting in a decline in the quality of wetlands.
- o The key factors currently contributing to wetland decline are: industrial development, including oil and gas development and refining; urbanization; navigation channels; flood control and multipurpose water projects; and pollution due to industrial, urban, and agricultural runoff.
- o The Galveston Bay Region is home to the largest petrochemical capacity in the world and the most important supply of natural gas in the nation. The attendant pollution has seriously altered the wetlands.
- o As of the 1980 Census, the Houston-Galveston area was the fastest growing metropolitan area in the U.S. Urban runoff adds significantly to wetland loss and functional degradation in the area.

- o Agriculture based on rice and cattle accounted for most of the early loss of the region's wetlands. Although agriculture's influence has diminished, farm runoff and nonpoint discharges together with an altered hydrology due to farm drainage ditches continue to affect these wetlands.

3. Impact of Federal Programs

- o The major Federal construction activities that impair the area's wetlands stem from multipurpose flood control and navigation projects. These projects not only promote development, but also concentrate and speed contaminants to the bay system.
- o The Federal Government provides incentives for urban development that affect wetlands.
- o Federal programs for constructing and providing technical assistance for drainage ditches have destroyed wetlands in the past, but no longer seem to have a major impact.
- o Although industrial and urban development receive some impetus from Federal funds, the major Federal activity influencing the region's water quality is regulation. Protecting water quality through the regulatory process presents many problems.

4. Recommendations

- o Examine the current approach to the regulation of water quality, particularly the National Pollution Discharge Elimination System (NPDES), as it pertains to wetland impacts and develop a more effective system of pollution control. (Because of the manner in which the Clean Water Act is structured and implemented, point sources are inadequately controlled and nonpoint sources effectively escape regulation in the Galveston Bay area.)
- o The Galveston Bay National Estuary Program is preparing a comprehensive study and management plan addressing all Federal, State, and local programs affecting the biological integrity of the Galveston Bay Estuary. Consider suspending Federal funding for development in the area until the plan is completed.
- o Have Federal agencies assess the effects of their programs on wetlands. Where feasible, agencies should minimize the adverse effects of their programs on wetlands. Where this proves infeasible, agencies should

furnish Congress with an explanation of why adjustments cannot be instituted.

- o Consider suspending Federal programs which subsidize or support urban development projects that destroy wetlands, e.g., funds for mortgage insurance and national flood insurance. (A subsidy-free zone would correct market distortions by such programs. The distortions add to developmental pressures in these wetlands.)

PUERTO RICAN COAST⁵

1. Description and Importance

- o Puerto Rico has several varieties of wetlands, but mangrove forests, found along tropical and subtropical shores, are the primary wetlands at risk.
- o Mangroves serve several important functions, including: rapid formation of biomass which helps to sustain life in nearby marine environments; habitat for birds, fish and invertebrates; and protection against erosion and wave damage, particularly during tropical storms.
- o Historically, estuaries covered 60,000 acres in Puerto Rico, with about half of the area being mangroves. The most recent estimate of mangroves in 1974 put the remaining acreage at 16,029 acres, about 53 percent of the original total.

2. Impact of Development

- o In the past, mangrove and upland deforestation resulted from the demand for fuel by households and large sugarcane mills. Drainage for sugarcane and malaria control reduced wetlands in the early 20th century. By the 1940s, canals, dikes, and pumps had altered hydrological patterns.
- o Programs aimed at transforming Puerto Rico from an agrarian to an industrial economy had a significant impact on the region's wetlands during the 1950s and 1960s.
- o Economic development and housing projects, often justified as a way to relieve the chronic 15 to 20

⁵Although the text focuses on Puerto Rico, the problems and trends apply to the Virgin Islands, as well.

percent unemployment rate, are the greatest threat to coastal wetlands. Development pressure in the form of resorts, marinas, vacation homes, housing projects, and industrial facilities has sharply increased since 1985.

- o Existing regulatory programs and pre-development consultation policies have not stemmed construction in mangroves and coastal wetlands. Abandoned projects and unoccupied buildings attest to the poor planning that has occurred.

3. The Federal Role

- o Federal economic incentives play a major role in promoting development activities which affect Puerto Rico's wetlands.
- o Most significant seem to be HUD grants, flood insurance, federally insured home mortgages, and flood control projects, followed by transportation projects, grants offered by the Economic Development Administration, tax code provisions allowing the deduction of interest on second homes, and income tax exemptions for companies locating in the islands.
- o Without this Federal support many of the development projects would not have gone forward. Despite subsidies and numerous Federal programs, the unemployment rate remains relatively constant.
- o The Corps' regulatory office in San Juan appears to be understaffed to handle the case load, and penalties are insufficient to serve as meaningful deterrents to continued illegal fills. Further, the Environmental Protection Agency office responsible for Puerto Rico is located in New York, and is equally overburdened.

4. Recommendations

- o Deny flood insurance and disaster assistance to communities which do not enforce floodplain management ordinances.
- o Revise the flood insurance program in Puerto Rico to take account of the flood control capacity of wetlands and to comply with the program's own regulations requiring protection of mangroves in areas subject to high wave velocity.
- o Strengthen the enforcement program of the Corps of Engineers in response to illegal filling of wetlands.

- o Consider amending the Coastal Barrier Resources Act to provide for automatic inclusion in the Coastal Barrier Resources System (CBRS) of "otherwise protected areas" whose protective covenants are violated.

CALIFORNIA'S CENTRAL VALLEY

1. Description and Importance

- o The wetlands of the Central Valley provide wintering habitat for 19 percent of the wintering waterfowl in the continental United States. They support some of the highest densities of wintering waterfowl in the country. Nationally, they are the highest priority wetlands for preservation of wintering habitat.
- o The Central Valley contains 8 national wildlife refuges and 4 State wildlife management areas, totalling 86,700 acres, much of which is wetlands.
- o These wetlands help to maintain ecosystem productivity by detaining and slowly releasing flood waters, recharging aquifers, stabilizing shorelines, and filtering sediments and pollutants from agricultural activities.

2. Extent of Loss

- o In the mid-1800s, the Central Valley had an estimated 4.1 to 5 million acres of permanent, seasonal, and tidal wetlands, including freshwater and brackish marshes and riparian areas.
- o By 1939, Central Valley wetlands had been reduced to approximately 619,000 acres. These losses preceded the construction of the Central Valley Project. Losses were primarily the result of agricultural activities, as well as diking and levee construction in the Delta.
- o In the mid-1980s, about 379,000 acres of wetlands existed in the Central Valley, approximately six to nine percent of the original complement. Few of these wetlands remained in their natural state.

3. Source of Loss

- o The conversion of wetlands to agricultural lands accounts for the loss of over 90 percent of the original wetlands in the Central Valley. To a far lesser extent, these wetlands compete with municipal and industrial development. The Fish and Wildlife Service estimates

that less than 0.8 percent of the wetland losses in the Central Valley since 1939 were due to urban development.

- o In the Central Valley, there are 15 Federal and 25 State and private dams with capacities of 75,000 acre-feet or more. Water development and management (flood control, drainage, irrigation, and storage for a variety of purposes) has permitted the growth of an agricultural economy that accounts for an estimated six percent (by value) of the Nation's agricultural output.
- o Water development and agricultural activity have altered the remaining wetlands so that they, like agriculture, depend on managed water regimes.
- o Prior to passage of the Central Valley Project Improvement Act of 1992 (CVPIA), publicly-held wetlands had no reliable source of water of acceptable quality, delivered on a timely basis.⁶ In many areas, wetland managers have come to rely on irrigation drainwater to support wetland resources. Drainwater is often contaminated with pesticides, leached salts, and trace elements.
- o Population in the Valley is expected to grow from 4.5 to 7.5 million by the year 2010. Increasingly, the region is attracting new businesses and industries. Large numbers of people are electing to live there and commute to work in the Bay area. This growth competes with wetlands and other uses for water.

4. Impact of Federal Programs

- o The major Federal factors causing wetland decline in the Central Valley have been subsidized water development (flood control, drainage, storage, and distribution), technical assistance, and research, along with farm price and income support programs.⁷

⁶Most wetlands in the Central Valley are managed for wintering waterfowl habitat which requires a large volume of water in the late fall.

⁷Widespread conversion of wetlands occurred in the Valley long before Federal water development. Farmers diked the floodplains for cultivation, but their efforts were only partly successful. The process of reclaiming the lands and developing the area took many years and required extensive Federal assistance.

- o In the Central Valley, about 1.15 million acres which receive federally subsidized water are planted in surplus crops like rice and cotton.
- o Among agriculture programs, the income and price support programs have probably had the greatest impact on the wetlands, but the legislative reforms in the 1985 and 1990 Farm Bills virtually eliminated the influence of these programs. The distorting effects from a number of other agricultural programs (e.g., crop insurance, low interest loans, marketing orders) remain, however.
- o In the absence of water subsidies there would have been far less agricultural development in the Valley.
- o Historically, water development and agricultural programs have been among the most important factors leading to wetland decline, groundwater depletion, and degradation of the water quality in the Central Valley.
- o The CVPIA dramatically alters the way in which water and the environment are managed in the Central Valley. The Act institutes a number of water pricing reforms, establishing an increasing block rate structure and imposing user fees to pay for protection and restoration of the environment. The Act directs the Secretary to provide reliable, clean water supplies to publicly-owned wetlands and refuges, with water deliveries growing over time to meet specified wetland restoration and enhancement goals.
- o The CVPIA will not solve all the wetland problems in the Central Valley. The Act primarily addresses the water needs of publicly-owned wetlands, which account for less than one-fourth of the Valley's wetlands.
- o The CVPIA also addresses the issue of drainwater contamination by requiring that amended or renewed CVP contracts contain provisions requiring contractors to comply with State and Federal water quality standards for agricultural drainwater.

5. Ineffectiveness of Swampbuster

- o Normally, in an area where participation rates in Federal agricultural programs are high, one would expect Swampbuster to significantly reduce the attractiveness of converting wetlands to agriculture. This is not so in the Central Valley.

- o Swampbuster is likely to be almost completely ineffective in this region, because Sec. 1222(a) of the Food Security Act of 1985 provides an exemption for "artificial wetlands," and almost all the remaining wetlands in the Central Valley fall into this category.

6. Recommendations

- o On future construction, eliminate the interest subsidy for irrigation in Reclamation law, as well as the use of hydropower revenues to repay a portion of irrigation capital costs. The subsidies were designed to encourage settlement of the arid west by small family farmers. Today the goal of populating the west with small family farms is obsolete. Consideration should be given to amending the law to reflect changed social, economic, and environmental conditions.
- o Amend Swampbuster to ensure that Central Valley wetlands are not exempted from the sanctions in the Food Security Act, as amended by virtue of being classified as "artificial wetlands."
- o Consider including ineligibility to participate in marketing orders on the list of Swampbuster sanctions.
- o Consider charging persons who alter Central Valley wetlands the full cost for water from the CVP.

WESTERN RIPARIAN WETLANDS

1. Importance

- o Western riparian areas and wetlands have great significance for certain functions (such as wildlife habitat) because of the arid climates in which they are found.
- o They slow flood waters; aid in erosion control through shoreline protection and dissipation of the energy force of currents; trap sediments; and improve water quality by filtering pollutants from upland sources.

2. Extent of Loss

- o Nationwide, riparian wetlands have declined by 60 to 75 percent, whereas in the West estimates are that some riparian areas have declined by as much as 90 to 95 percent.

- o Surveys of riparian areas within western public rangelands are incomplete, but thus far the evidence indicates that most are not in healthy, fully functioning condition.

3. Sources of Loss and Degradation

- o Livestock grazing is among the leading factors responsible for riparian wetland degradation in the West.
- o Water projects (multipurpose reservoirs, small hydroelectric projects, and small diversions for irrigation) are a leading cause of riparian wetland loss. Both the construction of the projects and the way in which they are managed and maintained have significant effects on riparian areas.
- o "Vegetation management" in connection with water projects (mowing, burning, clearing, or spraying of plants in riparian and upland areas) ranks behind grazing and water projects as a factor responsible for western riparian wetland decline. Historically, the practice was much more prevalent than it is now. Vegetation management is conducted to maintain floodways, expand pasture and cropland, and help control the Rio Grande River in order to maintain a constant border between the United States and Mexico. At one time vegetation management was practiced extensively to conserve water for irrigation and municipal use. Recent studies have cast doubt on the extent of the water conservation benefits associated with vegetation removal. As a result, the Bureau of Reclamation is not currently using vegetation management to salvage water.

4. Impact of Federal Programs

- o Federal involvement accompanies each of the activities discussed above: livestock grazing; water projects, such as multipurpose dams built primarily for irrigating the arid west; agricultural programs that subsidize certain crops; small hydroelectric facilities; small diversion projects; and "vegetation management."
- o Federal land management and water resources development agencies have not adequately protected riparian areas because of conflicting developmental responsibilities, e.g., grazing, agricultural irrigation, electric power development, and resource extraction.
- o The grazing programs conducted by the Bureau of Land Management (BLM) and Forest Service have been criticized

for exceeding the carrying capacity of some parts of the range, especially in riparian wetlands.

- o The Government Accounting Office (GAO) recently reported that ranchers generally resist efforts to improve riparian areas and have effectively opposed restrictions on their livestock's access to riparian areas. GAO also noted a Federal agency bias towards ranchers and against riparian area protection at the management level.
- o BLM has acknowledged deficiencies in its program. In order to address these problems, BLM has adopted a formal riparian policy, and has completed an analysis of the resources needed to implement the new policy. The analysis provides a blueprint for future riparian wetland management; it outlines goals, strategies, and funding requirements. BLM has already begun implementation of its new policy, and has set a goal of restoring 75 percent of the riparian wetland areas under its jurisdiction to proper functioning condition by 1997.
- o The Bureau of Reclamation, the Corps of Engineers, the International Boundary and Water Commission (IBWC), and the Soil Conservation Service all construct multipurpose water projects that alter water regimes and produce major changes in water flows that affect riparian areas and the species that depend upon them. Although there has been modest improvement in recent years in the manner in which these projects are financed, they remain heavily subsidized.
- o Subsidized irrigation water is used to grow crops that are eligible for Federal agricultural subsidies, including price and income supports.
- o The Bureau of Reclamation, the Corps, the IBWC, and the Agricultural Stabilization and Conservation Service (ASCS) have all conducted extensive vegetation management programs. The Bureau no longer engages in this activity for water conservation. The ASCS continues to subsidize vegetation management on private lands; the Corps uses it to maintain the water-transport capacity of floodways; and the IBWC maintains 50,000 acres devoid of native vegetation in its efforts to control the location of the Rio Grande.
- o Because of the arid climates in which they are located, Western riparian areas frequently have a proportionately greater significance than wetlands and riparian areas elsewhere in the United States. Yet riparian areas in the West often do not qualify technically as wetlands for

purposes of regulation under section 404 of the Clean Water Act.

5. Recommendations

- o Assign responsibility for the maintenance and restoration of riparian areas to those who utilize and benefit from public rangeland.
- o Structure land-use and conservation programs so that resource users have an incentive to maintain the land.
- o Fund Federal water projects affecting wetlands in accordance with the benefit principle of public finance, i.e., each beneficiary should bear the cost (including interest costs and any wetland opportunity costs) of generating his benefits.
- o Consider eliminating Federal financial incentives for the construction of small water diversion projects. The resulting irrigation is a private activity; there are no public benefits for which taxpayers should be responsible. Further, the subsidy conflicts with other conservation goals, including protection of riparian wetlands.
- o Disallow agricultural program benefits for commodities produced as a result of irrigation from any water supply project that eliminates or degrades riparian wetlands.
- o Re-examine the use of Federal funds for "vegetation management" associated with water projects.
- o Consider having all Federal assistance programs comply with the conservation, mitigation, and reporting requirements contained in the Electric Consumers Protection Act (ECPA). ECPA requires that a project: must not have significant adverse effect on the environment; cannot adversely affect a wild or scenic river; and must comply with recommendations made by the resource protection agencies or explain why this is not possible in terms of primary agency mission.
- o Expand the procedures for identifying wetlands for purposes of regulation under section 404 of the CWA to include western riparian habitats.

SOUTHEASTERN ALASKA

1. Description and Importance

- o About 4.9 million acres (25 percent) of the 18 million acres of land in Southeastern Alaska are classified as wetlands.
- o The region is environmentally rich, containing: the Tongass National Forest; 21,000 miles of tidal shoreline; over 2500 important anadromous fish streams, which support an internationally renowned salmon fishery; and a wide variety of wildlife.

2. Extent and Source of Losses

- o Urban development and logging are the principal sources of wetland loss and functional degradation in the region. The wetland effects of logging result from clearcutting, construction of logging roads, and the building and use of transfer sites for transporting logs by waterways.
- o The losses have been small. Only about 2300 acres of Southeastern Alaska's wetlands have disappeared as a direct result of logging. However, the logging has produced some erosion and subsequent siltation of streams.

3. Impact of Federal Programs

- o Large-scale logging in the Tongass began in the 1950s, when the Forest Service attracted two companies with fifty-year timber contracts. The principal output is pulp for shipment to the Orient.
- o The major incentives to log the Tongass stemmed from mandatory harvesting provisions in the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) and the price-setting policies utilized by the Forest Service.
- o ANILCA stimulated logging by mandating that the Forest Service make 4.5 billion board feet (bbf) available for sale and harvest from the Tongass every decade. In 1990, Congress passed the Tongass Timber Reform Act (TTRA) which rescinded this mandate and ordered that competitive prices dictate the level of harvesting.
- o The TTRA ended the non-competitive nature of the pricing practices on the Tongass, terminated some timbering subsidies, and mandated that logging be conducted in a more environmentally sound manner.

4. Recommendations

- o Encourage the Forest Service to improve survey information on wetlands in the Tongass prior to authorizing developmental activity. Accurate assessment of wetland effects often does not occur until timbering plans are completed and roads laid out.
- o Consider expanding the buffer-zone requirement in the TTRA to cover all streams which can affect the water quality of anadromous fish habitat.

WESTERN ALASKA

1. Description and Importance

- o The landscape of western Alaska is very diverse. It ranges from the rugged fjords of Prince William Sound to the rolling, treeless terrain of the Bering Sea coast, from the vast taiga muskeg of the interior to the flat expanse of the tundra underlain by permafrost that constitutes the Arctic coastal plain.
- o About 47 percent of an estimated 355 million acres of lands in western Alaska is classified as wetlands.

2. Extent and Sources of Loss

- o The major causes of wetlands loss in western Alaska are from oil and gas development on the North Slope, placer mining along the rivers and streams of the interior, and urban development and development of transportation corridors.
- o Less than one percent of the wetlands in western Alaska have been lost as a direct result of oil and gas activities, mining, and urban development.

3. Impact of Federal programs

- o Two provisions of the Federal tax code specific to the oil and gas industry have helped to make development in Alaska more lucrative: the oil and gas depletion allowance and the expensing, as opposed to capitalizing, of intangible drilling costs. Since 1975, only independent producers have been eligible for the depletion allowance. There are very few independents operating in Alaska. Further, oil development has been so profitable in Alaska that neither of these tax

provisions is likely to have significantly altered the nature of the industry or its impact on wetlands.

- o To the extent that there is a subsidy to placer mining, it derives from the absence of any fee for access to hard-rock minerals on public lands. Largely through increased enforcement efforts, placer mining operations in Alaska are beginning to comply with water quality regulations.
- o The Arctic National Wildlife Refuge (ANWR) is located just east of Prudhoe Bay on the North Slope. The petroleum industry has shown considerable interest in ANWR. In 1987, the Secretary of the Interior recommended to Congress that the coastal plain of ANWR be opened to full petroleum exploration and development. Environmental organizations have made the prevention of leasing and development in ANWR a central feature of their agenda.

4. Recommendations

- o Consider having mine operators submit mining plans prior to initiating mining activities. This allows resource managers and regulatory authorities time to review plans, reduce potential effects, and increase the likelihood of post-mining reclamation.
- o Consider developing a performance-bond approach for the mitigation of wetland losses. Under this approach, environmental standards are established for permittees to meet. Simultaneously, permittees must post performance bonds sufficient to cover the cost of restoration, penalties, and the Government's administrative costs in the event the standards are not met.
- o Consider establishing stronger mitigation requirements within the regulatory programs, reflecting the quality and functional values of affected wetlands.
- o Expand the joint industry-government efforts to develop more effective methods for restoring and rehabilitating damaged and functionally degraded wetlands. Recent cooperative efforts in both the petroleum and mining industries have shown promise.

DELMARVA PENINSULA

1. Description and Importance

- o The Delmarva Peninsula is bounded by the Delaware Bay and the Atlantic Ocean on the east and the Chesapeake Bay on the west. Due to the flat topography, runoff has been slow, forming a rich network of wetlands connected by perennial or intermittent streams.
- o These wetlands intercept and filter agricultural runoff and provide food and habitat for a great diversity of species.

2. Extent and Sources of Loss

- o Between the mid-1950s and the late 1970s, the average annual wetland loss in Delaware was 1600 acres, in Maryland 1000 acres, and in Virginia 3000 acres.
- o Inland wetland losses stem primarily from agricultural activities. Drainage for agriculture and channelization of streams to carry surface water to Chesapeake Bay tributaries account for over two-thirds of the freshwater wetland losses. Creation of stock ponds and filling for urban development account for much of the rest.
- o The loss of coastal wetlands is caused primarily by draining and filling for urban development.

3. Impact of Federal Programs

- o Federal agricultural programs have had a major impact on the decline of inland wetlands and have promoted conversion of shallow wetlands to ponds for migratory waterfowl and cattle. Pond development is often conducted with State and/or Federal financial and technical assistance.
- o The Small Watershed Program (PL-566) has had the greatest effect on the Peninsula. It provides technical assistance and construction money to local watershed management groups for small watershed drainage and flood control projects. The program has been instrumental in changing the hydrologic regime and the ecology of the region.
- o Swampbuster may reduce some agricultural conversion. However, much of Delmarva's cropland is devoted to corn for the poultry industry, and these are often integrated operations which do not participate in the commodity

programs. The effectiveness of Swampbuster to restrain wetland loss is diminished by the lack of participation.

- o Federally insured mortgages, tax deductions for second homes, and flood insurance have offered indirect incentives to urban development.
- o The interaction between these Federal programs adds to the cumulative wetland losses in the Delmarva area.

4. Recommendations

- o Consider either eliminating the PL-566 drainage and Resource Conservation and Development drainage programs or legislatively modifying them to effect more environmental sensitivity and mitigation.
- o Eliminate Federal funding and technical assistance for the conversion of freshwater or tidal wetlands to ponds for waterfowl, sediment control, or cattle.

THE POCOSINS OF NORTH CAROLINA

1. Description and Importance

- o Found in the southeastern Atlantic coastal plain, pocosins are nutrient-poor, forested or shrub wetlands that evolved over the past 10,000 years due to blocked drainage and peat accumulation.
- o These wetlands serve as the last refuge for many upland and floodplain species requiring large blocks of habitat.
- o They stabilize estuaries by controlling the rate of freshwater flow, thereby regulating salinity. Much of the State's commercial fishery depends on this estuarine regime.

2. Extent and Source of Loss

- o Originally, North Carolina is estimated to have had about 2.5 million acres of natural pocosins. As of the 1940s, about 90 percent of the original acreage remained.
- o Since the 1950s, forestry and drainage for agriculture have caused a fairly steady decline. By 1980, only about 695,000 acres (31 percent) remained in its natural state. A third of the original acreage had been totally converted, and 36 percent had been partially altered or was scheduled for development by the owners.

3. Status and Prospects

- o Silviculture, peat mining, and agriculture represent the major threats to North Carolina's remaining freshwater wetlands. The severity of the threats depends largely on market conditions.
- o The area has lost two-thirds of its wetlands and has numerous government programs operating within its environs which distort incentives in favor of conversion and development. Nevertheless, the Pocosins is currently one of the least threatened areas in the country. This is due largely to: market economic conditions which make conversion (at least temporarily) unprofitable, legislative reforms in the 1985 and 1990 Farm Bills which significantly diminished the incentives in Federal agricultural law to convert wetlands to cropland, and a revitalized regulatory program.
- o The current low price of oil has dampened the interest in developing peat for methanol or for generating electricity. However, demand is likely to change under certain conditions: if prices for alternative fuels rise; air pollution regulations increase the costs associated with power generation from coal; the demand for farmland increases; or the price of land with wet soils declines.
- o The depressed agricultural economy has reduced wetland conversions. However, commodity markets are cyclical, and the eventual recovery will increase the pressure on wetlands.
- o The forestry industry is also depressed, but long-term, worldwide expectations are for a growing scarcity of wood and increasing timber prices.

4. The Federal Role

- o Federal economic incentives for forestry, agriculture, flood control, peat mining and transportation have encouraged the conversion of freshwater wetlands in North Carolina.
- o Silviculture benefits from cost sharing and tax concessions for replanting. Prior to the 1986 Tax Reform Act, 60 percent of forestry capital gains were exempt from taxation.

- o The principal agricultural benefits that affected wetlands in the region are price and income supports, crop insurance, and low interest production loans.
- o Small watershed projects (multipurpose dams, stream channelization, drainage, and flood control) directly altered the regions hydrology and made conversions feasible.
- o Incentives for peat mining include Government guarantees for some uses of the product, federally sponsored research, and special tax deductions.
- o Wetland impacts have been systematically underestimated by highway planners, and there has been less than complete mitigation for the effects of highway construction. In an effort to address the latter problem, the State has recently funded a mitigation bank.
- o The 404 program has had a turbulent history in the Pocosins during the last decade, resulting in a disrupted and poorly implemented program. Many wetlands were filled or significantly altered without permits. Following judicial action and administrative changes, the problems seem well on the way toward resolution.
- o Until recently, low participation in agricultural programs limited Swampbuster's effectiveness. The nature of farming in the Pocosins has changed dramatically in recent years, however, and as a result Swampbuster's effectiveness should increase.

5. Recommendations

- o Consider restricting Federal subsidies and tax concessions for forestry, agriculture, peat mining, and water resource projects where the development results in wetland destruction.
- o Establish a uniform Federal mitigation policy, ensuring adequate compensation for unavoidable adverse project impacts on wetlands and acknowledging the quality and functional value of the affected wetlands. The Corps and EPA issued a Memorandum of Agreement on Mitigation for the 404 program in February, 1990. The Corps/EPA guidelines serve as a starting point for a Federal policy. Consider expanding the use of performance-bonds in the wetland regulatory program.
- o Consider enacting legislation to provide incentives for private wetland conservation activities. The 1986 tax

reform substantially reduced the private benefits from conservation donations, especially for those taxpayers subject to the alternative minimum tax.

NORTHEASTERN NEW JERSEY

1. Description and Importance

- o In an area subject to severe flooding, the regions wetlands serve as natural storage areas.
- o The wetlands filter pollutants from urban runoff that might otherwise enter aquifers and surface waters which supply drinking water.
- o These wetlands offer habitat for wildlife and migratory waterfowl in a region where habitat is increasingly scarce.

2. Extent and Sources of Loss

- o The original acreage is known to be much larger than the present stock, but historic data are too incomplete for an accurate estimate. In 1976, there were 69,173 acres remaining in the six-county study area.
- o Agriculture posed the initial threat to wetlands in Northeastern New Jersey. Subsequently, it was displaced by low density housing and by highway, airport, landfill, and port facility construction which often took place in wetland areas away from population centers.
- o Today, highway construction, commercial and industrial building, higher density residential development, and flood control efforts are the major activities affecting wetlands.
- o The driving force behind current expansion is the growth of the New York metropolitan area's population and economic activity, as well as the propensity of some firms and individuals to relocate at a distance from the crowded and costly central city areas. The State of New Jersey is the most densely populated in the country.

3. Impact of Federal Programs

- o Federal financial support for highway construction and flood control have made development technically feasible and less costly and, as a result, have encouraged commercial and residential growth.

- o However, given Northeastern New Jersey's location on the outskirts of the nation's largest metropolitan area, much of the region's suburban development ultimately would have occurred in the absence of Federal incentives. The Federal incentives expedited the growth.

4. Recommendations

- o Finance new Federal flood control and Federal-aid highway projects in a manner that reflects the distribution of benefits between regional and national interests.
- o Consider requiring that a mitigation plan accompany proposals for the authorization of new projects. To the extent practicable, all Federal agencies should mitigate fully and concurrently for wetland alterations stemming from construction of Federal or federally supported facilities.
- o Acquire critically important and vulnerable wetland complexes either by direct purchase of land or easements or by cost sharing with the State of New Jersey or local municipalities. Although this region's wetlands serve a number of functions, most critical economically is the flood control benefits derived from undeveloped wetlands. A long-term wetland acquisition plan should be undertaken as a primary aspect of a coordinated flood control program.

MICHIGAN'S COASTAL WETLANDS

1. Description and Importance

- o Michigan's mainland coastal shoreline stretches for 2300 miles; coastal island shorelines add another 1000 miles. The coastal wetlands are found at river mouths, in sheltered bays, along shallow shorelines, and behind barrier beaches.
- o These wetlands offer habitat for wildlife and birds and are an important source of recreation.

2. Extent and Sources of Loss

- o The original coastal wetland acreage is unknown. Currently, the onshore coastal wetlands and the offshore vegetated wetlands each cover a little over 100,000 acres.

- o A study of five representative areas revealed an average coastal wetland loss of 59 percent between 1900 and the mid-1970s. Losses ranged from 50 percent to 77 percent in the five selected areas.
- o Early losses were due to drainage for agriculture and mosquito control. Today, a host of activities related to urban development are responsible for the loss. Residential development is the most important factor. Other factors include construction of highways, flood control structures, recreational facilities (marinas, harbors, and boat launches), navigation channels, and industrial sites. Upstream water projects also have an impact on coastal wetlands.

3. Impact of Federal Programs

- o There are numerous Federal programs which subsidize such residential and recreational development, the activities which constitute the greatest threats to Michigan's coastal wetlands. While the impact of each program is likely to be small, the combination of Federal grants, loan guarantees, insurance, tax incentives, infrastructure, and flood control programs may have significant implications for coastal wetland areas.
- o Regulatory programs are generally effective in controlling large projects which individually would impose significant environmental damage. The cumulative effects from numerous smaller projects are not well-addressed, however.

4. Recommendations

- o Have Federal agencies assess the effects of their programs on wetlands. Where feasible, agencies should minimize the wetland effects of their programs. Where this proves infeasible, agencies should furnish Congress with an explanation of why adjustments cannot be instituted.

MICHIGAN'S NORTHERN FORESTED WETLANDS

1. Description and Importance

- o Most of Michigan's forested wetlands are found in the upper peninsula and the northern lower peninsula.
- o These wetlands serve a variety of important functions, including: providing habitat for many species; reducing

flood peaks within watersheds; acting as natural filters; controlling erosion; and recharging and discharging groundwater supplies.

2. Extent and Sources of Loss

- o The original acreage of forested wetlands in northern Michigan is unknown. Currently these wetlands total 3.3 million acres.
- o Forest Service data indicate a 14 percent loss in Michigan's forested wetlands between 1960 and 1980.
- o In the late 1800s, these regions underwent heavy logging. Since that time, the forests have regenerated.
- o Attempts to clear and drain forested wetlands in the upper peninsula for row and cash crop agriculture have proved economically infeasible because of the short growing season, poor soil quality, and an inability to achieve sufficient drainage.
- o Wood products companies are conducting drainage research in the hope of making the area accessible to timber harvesting.
- o In the future, peat mining and the development of vacation homes could have an increasing impact on these wetlands.

3. Impact of Government Programs

- o The State Government promotes Michigan's forestry industry through research, planning, technical assistance, worker training, and property tax relief.
- o The Federal Government offers low interest loans and cost sharing for reforestation and a number of conservation activities. Also, several provisions of the tax code allow special expensing, rapid amortization, and investment credits for forestry activities.
- o Although the impact of these programs on the drainage of forested wetlands is unknown, none of the programs has eligibility conditioned on avoiding wetland effects.

4. Recommendations

- o Have Federal agencies assess the effects of their programs on wetlands. Where feasible, agencies should minimize the wetland effects of their programs. Where

this proves infeasible, agencies should furnish Congress with an explanation of why adjustments cannot be instituted.

RAINWATER BASIN OF NEBRASKA

1. Description and Importance

- o The Basin occupies about 4,200 square miles. An impervious, clay subsoil resulted in a perched water table and a dynamic wetland complex of temporarily, seasonally, and semi-permanently flooded wetlands.
- o The Basin's wetlands provide spring, migratory habitat for five to seven million ducks and geese, as well as breeding and nesting habitat for resident shorebirds, waterfowl, and other water-associated species.

2. Extent and Source of Loss

- o Historically, nearly 4,000 individual wetlands occupied about 95,000 acres. Approximately 34,000 wetland acres remain, but virtually all of these have been modified to some extent.
- o Between the 1960s and the 1980s, shallower, more easily drained wetlands declined by 74 percent, deep wetlands declined by about 47 percent, and the intermediate wetlands declined by 20 percent. These losses significantly altered the composition of wetlands in the Basin.
- o The loss of Rainwater Basin wetlands has forced water-associated birds to concentrate in fewer wetlands. This condition increases the incidence of disease and death. Since 1975, approximately 200,000 birds have died of avian cholera in the Rainwater Basin, due at least in part to overcrowding.
- o Most wetland conversion in the Basin has been to agriculture. In addition, these wetlands are vulnerable to siltation and to contamination by agricultural chemicals from adjacent cropland and rangeland. Chemicals applied directly in irrigation water concentrate in adjacent basins.

4. Impact of Federal Programs

- o Much of the conversion in the Basin has been conducted with Federal assistance through cost-sharing programs for water management. Although these programs are now restricted, there are some exceptions in the law. No one exception leads to a significant loss of wetlands, but collectively the exceptions degrade and diminish the stock.
- o The commodity programs (price and income supports) have distorted market signals and induced the conversion of more wetlands to agriculture than was economically efficient.
- o In recent years, the farm program participation in Nebraska has been high. Thus, if fully enforced, Swampbuster should prove successful in discouraging wetland conversions in the Basin.
- o Collectively, the Federal subsidies have kept more land in agricultural production than was efficient, and the runoff from this land continues to degrade wetlands.

5. Recommendations

- o Consider eliminating Federal cost-sharing for any soil and water conservation projects that would result in the destruction or functional degradation of wetlands.

Chapter 2: INTRODUCTION

THE FUNCTION OF WETLANDS

From colonial times until just recently, wetlands have been regarded largely as nuisances. They have been drained, cleared, filled, inundated, degraded with toxins and nutrients, and exploited for whatever resources could be extracted from them.

Recently we have begun to realize that in their natural state wetlands produce numerous benefits for society, benefits which are either irreplaceable if lost or can only be replaced at immense expense. (See Table II-1.) Broadly, wetlands regulate water flows, storing water and buffering the effects of storms; filter and help to purify water; and provide essential habitat for flora and fauna.

Wetlands provide habitat for many species of fish and wildlife, including migratory birds, endangered species, commercially and recreationally important finfish, shellfish, and furbearers, and many species of wild plants. One-third of the Nation's endangered or threatened species live in or are dependent on wetlands. Between 60% and 90% of U.S. commercial fisheries use coastal wetlands as spawning grounds and nurseries. Wetlands support a major portion of the Nation's commercial fur and hide harvest, as well as sport fishing, hunting, bird watching, and other recreational activities.

As natural regulators of water flows, wetlands provide a cost-effective means of flood control, slowing and retaining water during periods of high runoff. This buffers the impact of storms and reduces shoreline erosion, thereby protecting against the loss of life and property. By holding water and releasing it slowly, wetlands help to recharge groundwater supplies and offset the effects of drought. Moreover, through processes not fully understood, wetlands can moderate local temperature and precipitation.

By filtering out pollutants and trapping sediments, wetlands help to maintain water quality. Indeed, artificial wetlands are now being created as a means of treating sewage. When wetlands are seriously altered or destroyed, rivers, lakes, and streams are subjected to more agricultural and urban runoff. This runoff can flow into sensitive estuaries, harming fisheries, and it can also impair drinking water supplies. The ability of wetlands to assimilate wastes, however, can be exceeded. Degradation of the water quality in wetlands is becoming a serious national problem.

Thus, although wetlands are generally recognized as a vital element in the biosphere, they continue to disappear and be degraded.

TABLE II-1: Substitutes for Wetland Services

The following are a few examples of potential man made substitutes for wetland services lost due to wetland destruction.

Flood Control: dams, floodways, dikes, levees, floodwalls, diversions, zoning, relocation of property, land acquisition, flood proofing, detention depressions, reservoirs, land treatment measures.

Shoreline Anchoring: riprap, bulkheads, jetties, stream restoration, regulation of boat traffic, zoning of erosion-hazard areas, relocation of property, tax policies, land acquisition, flood proofing, flood forecasting, detention depressions, reservoirs, land treatment measures.

Sediment/Toxic Retention: sedimentation depressions, land treatment measures, dilutional flushing, buffer strip policies, zoning, tax policies, water treatment facilities, dredged removal of contaminants.

Nutrient Retention: same as Sediment/Toxic Retention, plus chemical treatment, aeration/circulation.

Fishery Habitat, Aquatic Diversity: creation of replacement habitat, diversion of fishing effort to unaffected species or non-fishing industries or recreational activities, improvement of habitat (e.g., stream restoration, placement of artificial shelters), stocking, predator management, modification of harvest restrictions, regulation of other limiting actor (e.g., pollutants).

Wildlife Habitat, General Diversity: similar to Fisheries, above.

Ground Water Recharge: artificial recharge pits, reservoir construction, induced recharge, sediment flushing to increase recharge.

Active Recreation: diversion of activities to alternate sites, construction of new sites (e.g., reservoirs, swimming pools), diversion to less water-dependent activities.

Source: The National Fish and Wildlife Foundation, Fish and Wildlife Service Five-Year Needs Assessment, Dec. 1, 1988, (revised).

THE NATURE AND EXTENT OF THE LOSSES

The Fish and Wildlife Service estimates that of the 221 million acres of wetlands which existed in the coterminous United States at the time of the Nation's settlement, only 104 million acres (47%) remained in 1985.¹ Wetlands constitute only about five percent of the surface area of the lower 48 States. Between the mid-1950s and the mid-1970s, annual wetland losses averaged 458,000 acres, an area about half the size of Rhode Island. Between the mid-1970s and the mid-1980s, this loss rate was reduced to about 290,000 acres per year.

How can it be that wetlands are so valuable in their natural state, yet they are being eliminated at such a rapid rate? The answer to the paradox is that although wetlands serve society in multiple ways, the nature of wetland benefits are such that the owners of wetlands usually cannot capture the benefits for their own use or sale. The flood protection benefits accrue to others downstream. The fish and wildlife that breed and inhabit the wetlands migrate, and are captured or enjoyed by others. The ground water recharge and sediment trapping benefits cannot be commercially exploited. Hence, for the owner of a wetland to benefit from his resource, he often has to alter it, convert it, and develop it. Since the vast majority (74%) of the wetlands in the

TABLE II-2: Wetlands Lost and Remaining, 1780s-1980s (lower 48 States)

Status	Acreage (millions)	%
Original	221	100
Lost	117	53
Remaining	104	47

Source: Dahl, T.E., 1990.

TABLE II-3: Wetland Conversion, mid-1970s to mid-1980s (lower 48 States)

Use after conversion	Acreage (millions)	%
Agriculture	1.41	54
Urban	0.13	5
Other	1.07	41
Total	2.61	100

Source: Dahl, T.E. and C.E. Johnson, 1991.

¹In Alaska, most of the original wetland acreage remains. The Fish and Wildlife Service estimates that in the last 200 years, 200,000 acres (0.1%) of the 170 million acres of wetlands in Alaska have been lost.

lower 48 States are privately owned, the system of wetlands is quite vulnerable.² (See Table II-4.)

By far the most important economic sector absorbing wetlands is the agriculture sector. Agricultural development accounted for 87% of wetland conversions between 1954 and 1974. Conversion to agricultural uses accounted for 54% of the losses from the mid-1970s to the mid-1980s. This is an appreciable change from the previous two decades. However, it should be noted that 41% of the total wetland losses from this period were classified as "other," and a substantial portion of these had been cleared and drained, but not yet put to an identifiable use (Dahl and Johnson 1991). In light of the Nation's persistent agricultural surpluses and subsidies, the continuing, annual transformation of hundreds of thousands of acres of wetlands into additional farmland is counterproductive.

Urban development and other commercial activities accounted for 46% of wetland losses in the nine year period 1974-1983, up from 13% in the period 1954-1974. These uses are likely to pose increasing threats in the years to come. As developing regions expand and land becomes more scarce, wetlands emerge as some of the least expensive sites in which to locate. Highways, airports, residential developments, industrial parks, sewage treatment facilities, and shopping centers frequently encroach upon wetlands. Wetlands are also vulnerable to water-dependent developments and activities, including harbors, marinas, and recreational housing. Wetlands contain resources like timber, peat, oil, and gas whose development and extraction can lead to loss or functional impairment of wetlands. Finally, diversion of water poses one of the greatest threats to wetlands. Water is diverted for flood control, for municipal and industrial uses, and to generate hydroelectric power, but diversion for irrigation dominates all other uses. Nearly 85% of all water consumed in the United States is for irrigation.

Much economic growth, of course, is desirable and a wise use of resources. But if a development project can only be made financially attractive by subsidizing it or ignoring its environmental costs, then the project is likely to be unwarranted and wasteful. Examining the economic efficiency aspects of development which affects wetlands has been a cardinal feature of this research project.

²Most wetlands in Alaska are in Federal or State ownership or management (85%).

THE FEDERAL ROLE

Although there are a number of Federal programs designed to protect wetlands, Federal policy is neither comprehensive nor consistent with respect to wetland use. Indeed, Federal programs affect wetlands in opposing ways. Some Federal programs encourage wetland conversion by reducing the cost, increasing the revenue, and/or reducing the risk of wetland development. Simultaneously, other Federal programs restrict or manage wetland use through a variety of techniques and programs: acquisition and easement; regulation of use; consultation among Federal agencies to identify and either avoid or mitigate the effects of agency actions; and reduction or withdrawal of Federal financial incentives to develop wetlands.

In this report, we focus primarily on the last of these approaches to conserving wetlands. Although more vigorous regulation or increased acquisition would conserve more wetlands, these approaches could be costly. Both the Executive Branch and Congress have shown a preference for attempting to redesign Federal programs which produce unwanted effects on wetlands before engaging in additional land acquisition or regulation to counter the programs in question. This approach has several appealing features:

- o It discourages economically inefficient and environmentally unsound development.
- o It promotes a stronger, more competitive economy by restricting Federal programs which distort market signals and destroy initiative.
- o It fosters Federal budgetary savings at a time of large deficits.
- o It conserves environmentally significant wetlands with a minimum of Federal involvement and economic disruption.

Restricting Federal financial support for unsound development should stand as the first line of attack on the wetland loss problem. However, this approach cannot be relied upon as the sole conservation technique. In any particular instance, its effectiveness hinges entirely upon the importance of Federal support for the financial success of the activity. In some wetland areas, Government financial support for development is insignificant and will not influence investment decisions. In others, development is so profitable that eliminating Federal subsidies will not significantly reduce the rate of wetland conversion and degradation. Thus, in order to formulate a comprehensive strategy for wetland conservation, other approaches

to conservation need to be considered, as well. We provide a brief review of these other approaches, their history, characteristics, advantages, and limitations.

LAND ACQUISITION: Government land acquisition has long formed the backbone of wetland preservation efforts. The Fish and Wildlife Service estimates that there are about 12.5 million acres of wetlands in the lower 48 States subject to Federal ownership, easement, or lease.

Wetlands have been acquired under a number of authorities³ for a variety of purposes, but historically the emphasis has been on protection of wildlife habitat.⁴ With passage of the Emergency Wetlands Resources Act of 1986 (EWRA), Congress explicitly acknowledged the full range of wetland functions and benefits, and called for and authorized a more balanced approach to wetland conservation. Under the EWRA's mandate, the Fish and Wildlife Service has recently completed a National Wetlands Priority Conservation Plan to help decisionmakers identify key wetland areas warranting possible federal protection. States purchasing wetlands

TABLE II-4: Wetland Ownership, 1985 (lower 48 States)

	Acreage (millions)	%
Private	70.3	74
Federal	12.5	13
State	10.4	11
Local	1.8	2
Total	95.0	100

Source: Heimlich and Langner, 1986b.

³The acquisition of lands (either through purchase or donation), especially wetlands, for inclusion in the National Wildlife Refuge System is authorized by legislation such as the Migratory Bird Conservation Act, Endangered Species Act, Fish and Wildlife Act of 1956 and Fish and Wildlife Coordination Act. Funding for acquisition of refuge lands (including waterfowl production areas) is authorized by the Migratory Bird Hunting and Conservation Stamp Act, Wetlands Loan Act, and Land and Water Conservation Fund Act of 1965. For a complete discussion see Volume I, Chapter 2, especially Appendix II-1 and Council on Environmental Quality, Environmental Quality, 1986.

⁴About 25 percent of the Federally owned wetlands are in the National Wildlife Refuge System. Most of the rest are administered by the National Park Service, the Forest Service, the Bureau of Land Management, the Bureau of Reclamation, the Army Corps of Engineers, the Bureau of Land Management, and the Agricultural Stabilization and Conservation Service.

with Land and Water Conservation Fund appropriations must comply with the wetlands acquisition criteria established in the National Priority Plan. States and private organizations may also use the Plan to coordinate their acquisition programs with the Federal government.

Acquisition will undoubtedly remain an important component of any Federal wetland conservation strategy. However, with the overwhelming majority of the remaining wetlands in private hands, it is unrealistic to expect fee acquisition and easement programs to solve the problem alone or perhaps even to be the major component of a comprehensive strategy.⁵ The cost is simply too high, given budgetary constraints and other priorities.

REGULATION: There are numerous Federal regulatory programs which have the effect of protecting or conserving wetlands. All but one of these, however, have this effect indirectly. Their focus is not wetlands, but regulation of an activity which has an incidental impact on wetlands (e.g., water diversion, construction of dams, discharge of pollutants) or protection of a resource which happens to be wetland dependent (e.g., plants or wildlife). Section 404 of the Clean Water Act of 1977 (CWA) is the only Federal program which addresses wetlands directly and specifically regulates their alteration (Leslie et al. 1990).

Section 404: Section 404 requires that a permit be obtained from the Corps of Engineers before dredged or fill material can be disposed of in waters of the United States (including wetlands). On its face 404 appears to provide considerable protection to wetlands. In fact, the protection is limited.

The CWA restricts only one type of wetland alteration: the placement of fill in wetlands. Wetlands can be altered in many other ways, however: excavation, drainage, clearing, flooding, or constriction of water supply, for example. This jurisdictional restriction together with exemptions in the Act for normal ranching, farming, and silviculture practices results in sizable portions of the Nation's wetland losses not being covered by the Section 404 program. Further, 404 primarily addresses the physical loss of wetlands, and does not cover degradation, such as chemical contamination.⁶ (Some degradation may be covered under another authority. See the discussion below of CWA, Section 402.)

⁵Three-fourths of the remaining wetlands in the continental U.S. are privately owned, and only 0.5 percent of these have protective covenants on them.

⁶Except where the discharge of fill or dredged material involves chemical contamination.

In addition to the legislative constraints on 404, the program's effectiveness is influenced by the magnitude of the regulatory problem relative to the Corps' resources⁷ and the manner in which some Corps districts implement the Act (e.g., low priority given to monitoring and enforcement and inability to account fully for developmental impacts, especially cumulative impacts). Problems associated with the Corps' Section 404 program have been addressed recently at hearings held by the Senate (Committee on Environment and Public Works 1985), by the General Accounting Office (GAO 1988), and by the Office of Technology Assessment (OTA 1984).⁸ Despite these problems, the rate of wetlands loss has declined since the advent of the 404 program, and the decline is due in large part to the program.

⁷To reduce the regulatory load, section 404(e) allows the Corps to issue nationwide permits (general authorizations to proceed with the proposed activities without individual review by the Corps or the resource agencies) for certain activities deemed to have minimal effects on the environment. The Corps has specified 36 types of activities under nationwide general permits. Some nationwide permits require that the Corps be notified prior to commencement of the activity, and general permittees are expected to follow certain mitigative practices in order to minimize environmental damage. These constraints may be moot, however, because monitoring for compliance is limited.

A sizable portion of the Nation's wetlands remains vulnerable to loss or degradation under the nationwide permit program. For example, nationwide permits for isolated waters and waters above the "headwaters" exempt an estimated 17 million acres of wetlands in the contiguous United States from individual permit coverage (Natural Resource Law Institute 1988). The Fish and Wildlife Service has examined wetland losses in California from projects authorized under Nationwide Permit No. 26 (Long, et al. 1992).

⁸The criticisms of the 404 process have not come just from conservationists. Developers often criticize the program for delays in processing permit applications, for jurisdiction by more than one agency, and for inconsistent interpretations of statutes. One of the frustrations most frequently voiced has been that the agencies could not even agree on what constitutes a wetland and that the resulting uncertainty has caused costly delays. This problem was addressed on Dec. 10, 1988, when EPA, the Corps, the FWS, and USDA adopted a single method for identifying and delineating jurisdictional wetlands (Federal Interagency Committee 1989). The change has proved controversial, however, and is currently under review by Federal agencies. See Appendix VI-1 for more details.

Several other Federal agencies have roles in implementing Section 404. The Environmental Protection Agency (EPA), the National Marine Fisheries Service (NMFS), and the Fish and Wildlife Service (FWS) have authority to review and comment on permit applications. In addition, EPA is responsible for developing the guidelines for issuing 404 permits, and based on specific environmental criteria, it can veto permits issued by the Corps. EPA can predesignate geographic areas as unsuitable sites for disposal of dredge and fill material. Historically, EPA has utilized these authorities very rarely. In January, 1989, in connection with the Bush Administration's no-net-loss of wetlands policy, EPA announced its intention to exercise these authorities more fully.

Section 402: One other major regulatory program affecting wetlands is the National Pollutant Discharge Elimination System (NPDES), authorized by section 402 of the CWA. Its importance stems from the fact that almost anything that enters a watershed either passes through or settles in a wetland. Under this program EPA regulates the discharge of effluents into the Nation's waterways. The program's objective was to attain fishable and swimmable waters by 1983 and zero discharge of pollutants by 1985. Failing to meet these objectives, the Act was amended in 1987 to require the adoption of more effective technologies by 1989.

Prior to the 1987 amendments to the Act, the program focused on "point source" pollution (wastes discharged from discrete and identifiable sources). Yet, "nonpoint" source pollution such as stormwater runoff from agricultural, forestry, and urban areas may contribute as much as 50% of the nation's water pollution and has become a critical factor in wetland decline (CRS 1987). The 1987 amendments directed States to develop and implement nonpoint pollution management programs and offers Federal financial assistance to support control activities.

CONSULTATION: Several statutes contain provisions requiring that an action agency sponsoring a development project which could affect the environment consult with the resource agencies (FWS, NMFS, and EPA). Consultation is required in order to assure that environmental values are considered along with the economic benefits which constitute the action agency's traditional mission. Under these consultation authorities the resource agencies have review and comment powers. Their recommendations, however, are purely advisory. An action agency is not obligated to accept the recommendations, although in some cases it must explain the rationale for not adopting them. Environmental concerns often receive perfunctory treatment when the agency that sponsors the project is also the agency that ultimately assesses the competing values associated with a project. This is perhaps

understandable given the primary mission of the agency, but it exposes an inherent flaw in the review process.

Two of the major statutes requiring consultation are The Fish and Wildlife Coordination Act and the National Environmental Policy Act (NEPA).⁹ The Coordination Act requires the agencies sponsoring federally constructed, operated or permitted water projects to consult with the FWS and the State fish and wildlife agency regarding the project's effects on fish and wildlife. NEPA requires the Federal official responsible for any "major" Federal action to consult with and obtain the comments of any Federal agency with expertise or legal jurisdiction with respect to potential environmental impacts. It also requires that an Environmental Impact Statement describing the environmental effects and project alternatives be prepared. This document makes information available for public and agency scrutiny. The requirements of the acts, however, are purely procedural, involving no regulatory authority or constraints. That is, after consulting and considering the environmental consequences of a proposed action, an agency may proceed with its project, even though there may be environmental consequences. The history of NEPA suggests that the public review process is generally effective, however.

Two executive orders, both issued in 1977 under the Carter Administration, pertain to consultation and avoidance of wetland impacts. Executive Order 11990 on the Protection of Wetlands provides opportunity for early review of Federal agency plans regarding new construction in wetland areas. It also urges all Federal agencies to avoid supporting, assisting, or financing new construction in wetlands unless there is "no practicable alternative." Executive Order 11988 on Floodplain Management directs Federal agencies to take floodplain management into account when formulating or evaluating water or land use plans. It is applicable to wetlands protection because of the strong interrelationship between wetlands and floodplains.

An executive order represents administrative policy and does not have the force of law that comes with delegation of authority by Congress. In particular, there is no right of private action (judicial recourse by non-Federal entities) under an executive order to assure compliance. These executive orders reinforce

⁹For a complete discussion of the major legislative and administrative authorities under which the FWS works to protect wetlands see Volume I, Chapter 2, Appendix II-1. Appendix II-1 includes the major authorities for wetland protection used by the FWS and most other resource agencies with the exception of the Water Resources Development Act of 1986 and Section 402 of the Clean Water Act.

legislative authorities by directing Federal agencies to exercise leadership and take action to avoid adverse impacts to wetlands and floodplains. Their force derives solely from the executive (the President) and the extent of his commitment to having them enforced. Although there is no right of private action under an executive order, usually judicial recourse is available if an agency has promulgated regulations to implement an executive order, and most Federal agencies have promulgated regulations implementing these executive orders.

RESTORATION AND CREATION: Restoring and creating wetlands has become increasingly popular as a means of mitigating and compensating for the effects of development projects. Its appeal from both an equity and efficiency point of view is apparent: development is allowed to proceed (but only after all costs...market and nonmarket...have been taken into account) and environmental amenities remain unchanged (except perhaps for being relocated). If successful, mitigation by replacement is an ideal way for those who benefit from development to bear the environmental costs of their activities. The problem arises with the conditional term "if successful."

As we have seen, wetlands have numerous functions, and replicating nature in all its variations and complexities is not just difficult, it is probably impossible. Most natural wetlands are the result of lengthy geologic and hydrologic processes, and require more or less continuous supplies of water, a balanced regime of sedimentation and erosion, and periodic events (floods, fires, droughts) to interrupt successional sequences (Kusler 1989). Although restoring disturbed wetlands is usually easier than creating new ones, success in restoration/creation depends upon how exacting we are in our demands for replacement. (For excellent overviews of this topic see Kusler 1989 and National Academy of Science 1992.)

REDUCING FEDERAL INCENTIVES FOR WETLAND DEVELOPMENT: The basic philosophy behind this approach has already been discussed above. The idea that the Federal Government should behave more consistently and avoid promoting development in environmentally sensitive areas that it was simultaneously trying to protect may not have had its origins with the Coastal Barrier Resources Act of 1982 (CBRA), but CBRA gave a great boost to wider application and adoption of the concept. CBRA made any new development projects in designated areas ineligible for most federally financed assistance programs. In the intervening years there have been several other significant pieces of legislation which have attempted to correct Federal financial incentives which distort resource allocation to the detriment of wetlands and the environment. Among these are:

- o The Food Security Act of 1985 with its Swampbuster provisions and restrictions on crop yields eligible for support payments;
- o The Food, Agriculture, Conservation, and Trade Act of 1990 amended Swampbuster, adding to the list of programs for which a violator becomes ineligible, and made it more difficult for farm operators to add to base acreage (the acreage eligible for price and income support payments);
- o The Water Resources Development Act of 1986 with its provisions for increased cost sharing and emphasis on the benefit principle for financing government programs;
- o The Tax Reform Act of 1986 which eliminated those provisions of the tax code which encouraged conversion of wetlands to farmland at a time of agricultural surplus;
- o Colorado River Floodway Protection Act of 1986 which eliminates all new federal expenditures and financial assistance which promote development within the designated floodway; and
- o The Central Valley Project Improvement Act of 1992 which requires reforms in water pricing and marketing and mandates a series of mitigative actions, financed by water and power users, to help restore the environment in the Central Valley.

In requesting this study, Congress asked for a comprehensive review of conservation alternatives. But mindful of budgetary constraints and a growing resistance to expansion of Federal programs, Congress asked that particular attention be paid to examining and developing ways to apply the CBRA concept.

ASSISTANCE FOR FEDERAL PROGRAM MANAGERS IN DETERMINING IMPACTS ON WETLANDS: Given the large number of widely dispersed Federal activities, how can program managers determine the effect which their programs are having on the nation's wetlands? Two kinds of wetland information are available to aid managers with this problem:

- o detailed wetland maps for assessing potential, site-specific impacts of projects, and
- o national estimates of the current status and trends (i.e., losses and gains) of wetlands to evaluate the effectiveness of existing Federal programs and policies and to identify national or regional problems.

Both types of information are available from the National Wetlands Inventory (NWI). See the Appendix VI-1 for detailed information.

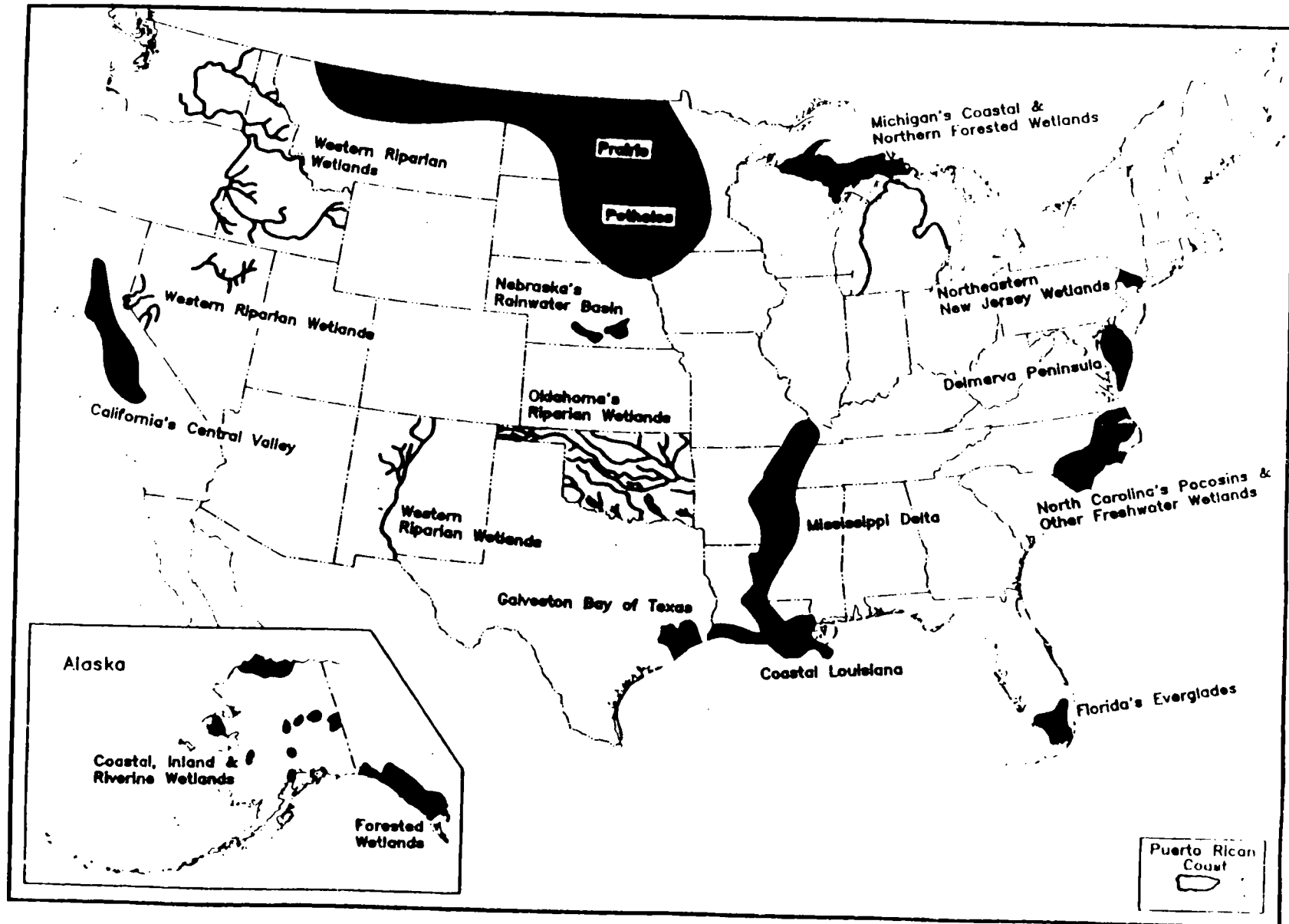
FOCUS OF THE REPORT

This is the second of two reports to Congress on the impact of Federal programs on wetlands. Volume I was submitted to Congress in 1988, and examined how Federal programs have affected wetlands in the bottomland hardwoods of the Lower Mississippi Alluvial Plain and the prairie potholes of the Upper Midwest. Volume II focuses on 17 additional study areas: in the south, Florida's Everglades, Coastal Louisiana, the Galveston Bay of Texas, and the Puerto Rican mangroves and coastal wetlands; in the west, California's Central Valley, western riparian wetlands (Idaho, Nevada, New Mexico, and Oklahoma), and Western and Southeastern Alaska; in the east, the Delmarva Peninsula (comprising parts of Delaware, Maryland, and Virginia), the North Carolina pocosins and other freshwater wetlands, and northeastern New Jersey; and in the midwest, Michigan's coastal and northern, forested wetlands, and Nebraska's Rainwater Basin.

To select the study areas, the Department surveyed Fish and Wildlife Service field personnel, asking them to identify important wetland areas which had been significantly depleted or were under stress. The 19 study areas addressed in both Volumes I and II were identified in the survey process. They reflect the broad array of problems facing wetlands nationwide.

Volume I deals with two of the most critical areas in great depth. The analysis therein is based on original research using statistical techniques to assess the impact of seven, key Federal programs. By contrast, the descriptions of the 17 study areas in Volume II are based largely on existing research, in part because comparable statistical information is unavailable. (See Figure II-1 for a map of the study areas for Volumes I and II.) Volume II takes a broad look at over 35 Federal programs implicated in wetland decline, illustrating the range of effects that Federal activities can have on wetland ecosystems.

Figure II-1: STUDY AREAS FOR VOLUMES I AND II



ORGANIZATION OF THIS VOLUME

This volume is divided into five parts. Part I describes the Federal programs affecting wetlands. It is subdivided into four chapters (chapters 3 through 6). Chapter 3 recounts the agricultural programs which have reduced the risk of farming and increased the economic feasibility of converting wetlands to croplands, e.g., such as price and income supports, disaster relief, and crop insurance.

Chapter 4 examines water resources development and water management programs, many of which supply irrigation water for agricultural use. Navigation, flood control, drainage, and hydroelectric power generation are other examples of water projects that adversely affect wetlands.

Chapter 5 discusses an interrelated set of Federal programs that stimulate the development of infrastructure facilities (such as highways, airports, sewage treatments plants), of commercial and industrial activities, and of housing. With the pressures of population growth, these programs are having a proportionately greater impact on wetland loss and degradation than in the past.

Chapter 6 examines a number of Federal programs designed to promote the development and use of specific resources such as timber, rangeland, oil and gas, or peat. Each of the Federal programs is described according to their primary purposes, the financial incentives they offer for converting or impairing wetlands, their wetlands effects, and Federal efforts to reduce those effects.

Parts II through V examine the 17 study areas located in the south, west, east, and midwest respectively. Each study area is introduced with a description of the physical location, the characteristics distinguishing the wetlands, and what is known about the original acreage, status and trends of wetlands located there. The introduction is followed by a general discussion of the factors that have contributed to the loss and degradation of wetlands in the study area. Next is a more detailed examination of the key Federal programs affecting wetlands in the area, followed by an assessment of the status and prospects for the wetlands. The question underlying the analysis is: can reducing Federal financial incentives which distort resource allocation and induce conversion significantly curb wetland loss and degradation? If not, what other strategies or mix of strategies...acquisition, regulation, consultation, restoration or creation...would serve to stem the loss? Clearly, this is an ambitious task. The report is exhaustive with respect to programs which distort resource allocation, but does not cover

all those programs which conserve wetlands.¹⁰ The recommendations section comes next, followed by a short reference section.¹¹

Table II-5 indicates which Federal programs play a role in wetland decline in each of the study areas. Because of data, time, and resource limitations, not all the programs listed in Table II-5 are discussed in depth in each of the area chapters. However, the table summarizes the basic framework for the Report to Congress and provides a ready reference for noting the scope of both the programs and the areas where they have an impact.

For a variety of reasons completion of this report has been delayed a number of times. Although the text has been carefully reviewed and updated prior to publication, revising the budgetary numbers promised to be a time-consuming task that would have further delayed issuance of the document. Thus, in a number of instances the budgetary numbers used to describe the magnitude of programs are dated.

¹⁰Conservation programs are dealt with in somewhat more detail in Volume I, but even there the discussion is limited.

¹¹Each area chapter is based on a more detailed background study available from the Office of Program Analysis in the Department of the Interior. These studies are cited along with any other sources that were specifically noted in the chapter or that supplemented the information provided in the background reports.

Table II-5: Federal Programs Affecting Wetlands in Study Areas

[illegible]

[illegible]

REFERENCES

- Committee on Environment and Public Works. 1985. Oversight Hearings on Section 404 of the Clean Water Act. May 21, June 10, July 15 and September 18, 1985. U.S. Government Printing Office, Washington, DC
- Congressional Research Service, Library of Congress. 1987. Summaries of Federal Environmental Laws Administered by the Environmental Protection Agency, Report No. 87-226 ENR, (April 15), Washington, DC, 83 pp.
- Dahl, T.E. 1990. Wetlands Losses in the United States, 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC, 13 pp.
- Dahl, T.E. and C.J. Johnson. 1991. Status and Trends of Wetlands in the Conterminous United States, mid-1970's to mid-1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC, 28pp.
- Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands. Army Corps of Engineers, Environmental Protection Agency, Fish and Wildlife Service, and Soil Conservation Service, Washington, DC
- Frayer, W.E., T.J. Monahan, D.C. Bowden, and F.A. Graybill. 1983. Status and Trends of Wetlands and Deepwater Habitats in the Conterminous United States, 1950's to 1970's. Colorado State University, Fort Collins, CO., 31pp.
- Heimlich, R.E. and L.L. Langner. 1986a. "Swampbusting in Perspective." Journal of Soil and Water Conservation, Vol. 41, (July-August), pp. 219-224.
- Heimlich, R.E. and L.L. Langner. 1986b. Swampbusting: Wetland Conversion and Farm Programs. Natural Resource Economics Division, Economic Research Service, USDA, Economic Report No. 551, Washington, DC, 34 pp.
- Kusler, Jon A. 1990. "Views on Scientific Issues Relating to the Restoration and Creation of Wetlands." Issues in Wetlands Protection: Background Papers prepared for the National Wetlands Policy Forum, Michele Leslie, Edwin H. Clark II, and Gail Bingham, eds., The Conservation Foundation, Washington, DC

- Larson, J.S. and J.A. Kusler. 1979. Preface in Wetland Functions and Values, The State of Our Understanding, P.E. Greeson, J.R. Clark, and J.E. Clark, eds., American Water Resources Association, Minneapolis, Minnesota.
- Lehr, J. 1983. "Increased Irrigation Efficiency Will Ultimately Silence the Water Short Blues of the Wasteful West." Ground Water, vol. 130, (March/April).
- Leslie, Michele, Edwin H. Clark II, and Robert B. Reed. 1990. "Overview of Existing Regulatory Programs." Issues in Wetlands Protection: Background Papers prepared for the National Wetlands Policy Forum, Michele Leslie, Edwin H. Clark II, and Gail Bingham, eds., The Conservation Foundation, Washington, DC.
- Long, Michael M., Marilyn Friley, David Densmore, and June De Weese. 1992. Wetland Losses within Northern California from Projects Authorized under Nationwide Permit No. 26. U.S. Department of the Interior, Fish and Wildlife Service, Sacramento, Calif.
- National Academy of Science. 1992. Restoration of Aquatic Ecosystems. National Academy Press, Washington, DC.
- Natural Resource Law Institute. 1988. A Guide to Federal Wetlands Protection Under Section 404 of the Clean Water Act. Anadromous Fish Law Memo; Issue 46. Lewis and Clark Law School, Portland, OR.
- Office of Technology Assessment. 1984. Wetlands: Their Use and Regulation. Congress of the United States, Washington, DC
- Tiner, R. W., Jr. 1984. Wetlands of the United States: Current Status and Recent Trends. U.S. Department of the Interior, Fish and Wildlife Service, Newton Corner, Mass.
- U.S. Department of the Interior, Fish and Wildlife Service. 1988. Wetlands Acquisition Criteria and Guidance: National Wetlands Priority Conservation Plan, Washington, DC (May), 51 pp.
- U.S. General Accounting Office. 1988. Wetlands: The Corps of Engineers' Administration of the Section 404 Program. Report to the Chairman, Subcommittee on Investigations and Oversight, Committee on Public Works and Transportation, House of Representative, Washington, DC
- Zinn, J.A. and C. Copeland. 1982. Wetland Management. A Report prepared by the Environment and Natural Resources Policy Division of the Congressional Research Service for the

Committee on Environment and Public Works, U.S. Senate, 97th Congress, 2d Session, Washington, DC (July), pp. 149.

PART I: FEDERAL PROGRAMS

Chapter 3: AGRICULTURAL PROGRAMS

In most years, U.S. farmers produce surpluses in many crops. In order to guarantee adequate levels of production while ensuring a stable economic return to growers, a complex set of Federal farm policies and programs have evolved. Major efforts to manage agricultural production and to support prices for agricultural commodities were initiated in the 1930s and continue up to the present. While various policies have been employed since the 1930s to influence agricultural conditions, in general Federal farm programs attempt to limit production of surplus crops (through acreage restrictions, allotments, set-asides, or paid diversions), while stabilizing farm income through direct payments to farmers and price supports for crops. In recent decades, agricultural policies have been set forth in a series of farm bills establishing multi-year programs for agriculture.¹

The National Wetland Status and Trends Analysis found that 54 percent of the 2.6 million acres of wetlands lost between the mid-1970s and the mid-1980s had been converted to agricultural purposes (Dahl 1991). Historically, the economic incentives embodied in agricultural statutes have influenced wetland decline by increasing the profitability while reducing the risks of agriculture. These economic incentives both magnified the gains to be derived from converting wetlands to croplands and led to increased degradation of wetlands by chemical and sediment loadings from agricultural runoff. Legislative reforms in 1985 and 1990 have made it much more difficult for new acreage to qualify for price and income supports, and have established severe penalties in many instances for converting wetlands to cropland. These changes have significantly diminished the incentives in Federal agricultural law to convert wetlands to cropland.

COMMODITY PROGRAMS

The principal tools used to effect Federal farm policy have been: (1) price supports in the form of nonrecourse loans and target prices for about a dozen surplus commodities including feed grains and wheat; (2) deficiency payments to support farm income;

¹The Food and Agriculture Act of 1965, The Agricultural Act of 1970, The Agriculture and Consumer Protection Act of 1973, The Food and Agriculture Act of 1977, The Agriculture and Food Act of 1981, and The Food Security Act of 1985, as amended by the Food, Agriculture, Conservation, and Trade Act of 1990.

and (3) acreage set-aside, acreage reduction, or paid land diversion programs to manage levels of crop production. Essentially, farmers receive price and income supports in return for agreements to restrict production on the acreage planted in program crops. Program crops are not always eligible for both price supports and deficiency payments;² the eligibility varies from year to year, generally at the discretion of the Secretary of Agriculture and within the context of existing farm legislation.

Price Supports: Crop prices are supported by loan programs. The Federal Government establishes a loan rate for a program crop that is lower than the target price. Using their crops as collateral, participating growers are able to obtain cash from Government loans at the established loan rates. The program provides an incentive for growers to place their crops in storage, and facilitates orderly marketing throughout the season. If the market price rises above the loan rate, the grower can sell the crop, repaying the loan, interest, and storage costs. However, if the market price falls below the loan rate, growers can forfeit the crop to the Government as payment for the loans. These "nonrecourse" loans place floors under the prices of which farmers receive for farm commodities.

Deficiency Payments: The key method used to support income directly involves setting target prices for some program crops. The target prices are intended to approximate the minimum price needed for growers to cover the cost of production. If the market price drops below the target price for a specified period of time, growers participating in the program are eligible to receive "deficiency" payments from the Federal Government to make up the difference between the target price and the lower selling price.³ By law, no recipient may receive more than \$50,000 annually in deficiency payments. However, through a variety of methods, some growers have successfully reorganized their businesses into multiple entities to avoid this restriction.⁴

²Crops eligible for deficiency payments are a subset of those eligible for nonrecourse loans.

³A deficiency payment is equal to the minimum of (1) the target price less the market price or (2) the target price less the loan rate.

⁴As discussed above, the farm programs are designed to guarantee adequate levels of production while ensuring a stable economic return to growers, not to support small farmers. Because a participant's benefits are based on production rather than income, larger farmers receive larger payments. In 1982,
(continued...)

Loans and payments under these programs are financed through the Commodity Credit Corporation, a corporation wholly owned by the Federal Government and operating within the Department of Agriculture (USDA). The Corporation has an authorized capital stock of \$100 million and authority to borrow up to \$25 billion from the U.S. Treasury. The Agricultural Stabilization and Conservation Service (ASCS) provides operating personnel for the Corporation and administers the commodity programs. Federal outlays for these programs increased significantly during the 1980s.

TABLE III-1: Commodity Program Outlays, 1980s

	(\$ billions)
1980	2.8
1981	4.0
1982	11.7
1983	18.9
1984	7.3
1985	17.7
1986	25.8
1987	22.4
1988	12.5

Historically, price and income supports have provided an economic incentive for the cultivation of greater acreage than the market

would have demanded in the absence of the programs. By reducing income variability and risk while increasing expected returns, farm subsidies prompted agricultural producers to convert wetlands to cropland and to cultivate marginal land that would otherwise be retired and perhaps revert to wetlands. These programs were noted in at least eight of the study areas, the areas reporting wetland losses associated with agriculture.

Supply Management, Base Acreage, and Acreage Allotments: A grower is not at liberty to enroll an unlimited amount of acreage in the commodity programs. Clearly, that would defeat the principal purpose of the programs. Based on its planting history, each farm has been assigned a "base acreage" for programmatic purposes. A farm's "base" constitutes the acreage eligible for participation in farm programs. Base is commodity specific, i.e., there is a base for corn, for wheat, etc. A grower can increase his base, but only by dropping out of the commodity programs for a period of time and developing a planting history on additional acreage.

In most years, anticipated market conditions result in USDA requiring participating growers to plant less than their base, devoting the reduction to approved conservation practices. Each

⁴(...continued)

the distribution of deficiency payments was as follows: the largest 17 percent of farms (500 or more acres) received 60.2 percent of the payments; the smallest 50 percent (farms less than 140 acres) received 10.2 percent of the payments.

year the Department of Agriculture estimates the supply of each program crop needed to satisfy demand at target prices. Based on these forecasts, USDA establishes national acreage allotments, which in turn are apportioned among States, counties, and ultimately individual farms. An individual farm's acreage allotment is partly a function of anticipated market conditions and partly a function of the farm's planting history.

As indicated above, a farm operator can increase his base, but statutory changes in 1985 and 1990 have made it much more difficult for a grower to do this. For example, prior to 1985, a grower could add to his corn base by dropping out of the corn program for a year and planting additional corn acreage. The additional corn acreage became a part of his corn base.⁵ Under the 1985 Food Security Act (FSA), however, base was calculated by averaging the acreage planted to a crop over the preceding five years. Thus, if a grower left the corn program in 1986 and planted an additional 100 acres of corn, his corn base increased by only 20 acres in 1987. It would take him an additional four years (until 1991) to qualify all 100 acres as part of his corn base, and during this 5-year period he could not participate in the corn program. The Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA) added the further constraint that an operator could not participate in any commodity program during the period when he was adding to his base. Thus, under FACTA if our hypothetical grower wants to increase his corn base by 100 acres, he must withdraw from all commodity programs for five years, a potentially significant cost.

Implications for Wetland Conversion: These changes in the statutory procedures for increasing base acreage eliminate much of the incentive in the commodity programs for developing new arable land. As a result, they have implications for wetland conversion.

Historically, a grower could drain an area and, after meeting the required cropping history in the drained area, add the new cropland to his farm's base. Once included in the base, the converted wetland could either be cropped or used to meet set-aside or diverted acreage requirements, whichever was most advantageous to the grower. The grower was permitted to keep the most productive land in production, using his least productive land to satisfy any set-aside requirements. The use of marginal cropland in this fashion has been a common practice throughout the country. Among the regions examined by the Department, it

⁵Program rules sometimes required two years of nonparticipation before the new acreage qualified as part of the base.

was cited as a frequent practice in the California Central Valley and the Nebraska Rainwater Basin.

The 1985 and 1990 farm bills made it so difficult to add to base, however, that the programmatic incentives to convert wetlands for this purpose were largely eliminated. Because of the Swampbuster provisions in the FSA, these added constraints on the incentive to convert wetlands were redundant. (Swampbuster alone makes converted wetlands ineligible to become a part of a farm's base. See below.) Nonetheless, it is interesting to note the degree to which incentives to convert wetlands have been systematically diminished and removed from the commodity programs.

Yield: A farm operator's deficiency payments are based on "program yields" per acre rather than on the yields realized by the operator. Program yields are based in part on a farm's historical performance and in part on actual production levels in the locality of the farm. In order to help control budgetary costs, program yields were frozen in the 1985 FSA at the 1986 level. This further restricted the programmatic incentives to convert wetlands to farmland.⁶

SWAMPBUSTER⁷

The Swampbuster provisions of the Food Security Act of 1985 (FSA) and the Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA) eliminate the historic, detrimental effect of the commodity programs and a number of other farm programs on wetlands. (FACTA amends the Swampbuster provisions in the FSA.) Swampbuster reduces the incentives to convert wetlands to croplands by denying eligibility for almost all farm program benefits on all acres operated by a grower who either converts a wetland or plants on a converted wetland.⁸ The ineligibility for benefits applies not only on the converted wetland but on all lands in which the operator has at least a 20 percent interest during the crop year. In addition to price and income supports, violators are also ineligible for insured or guaranteed loans,

⁶Again, from the point of view of wetlands, the restriction is redundant due to Swampbuster.

⁷The discussion here of Swampbuster is brief, and only constitutes a summary and update of chapter 5 in Volume I.

⁸The sanction is triggered either by planting an annual crop on a wetland converted after December 23, 1985, the date of enactment of the Food Security Act of 1985 (FSA) or by converting a wetland after November 28, 1990, the date of enactment of the Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA).

disaster relief, crop insurance, conservation and environmental easement payments, and participation in small watershed protection and flood prevention projects. A violator can regain eligibility for future farm program benefits by restoring the converted wetland to its original condition.

Several aspects of the original (1985) Swampbuster provisions weakened their potential effectiveness:

- o First, Swampbuster did not prohibit conversion; it only eliminated eligibility for some key Federal economic benefits.
- o Second, Swampbuster was triggered only when crops were planted on converted wetlands. Wetlands still could be converted for roads, buildings, or storage areas, and the grower remained eligible for farm program benefits.
- o Third, Swampbuster applied only to annual crops and sugarcane, but not to perennial crops. A grower could convert a wetland for alfalfa, pasture grasses, or fruit or nut trees, and still receive farm program benefits. For example, the conversion of a wetland in California into a nut orchard would not trigger Swampbuster. Further, although the Act said that Swampbuster applied to sugarcane, the particular subsidies extended to growers of sugarcane were not among the Act's sanctions. (For a thorough discussion see chapter 7 on the Florida Everglades.)
- o Fourth, the statute provided an exemption for "artificial wetlands."⁹ In most areas the proportion of artificial wetlands is small, and the statutory exemption for artificial wetlands was of no real consequence. But in the Central Valley of California, the exemption rendered Swampbuster completely ineffectual, and left almost all the remaining wetlands vulnerable to conversion without sanction. (See chapter 11, California's Central Valley.)
- o Finally, those applying for farm program benefits had to certify that they would not crop a converted wetland during the year in which they were applying for program benefits. Because the determination was made annually, it allowed growers to convert a wetland; crop it in good years when they chose not to participate in the commodity programs; and then, in years when the market was weak and the subsidy

⁹The implementing regulations define artificial wetland to include wetland which was converted prior to passage of the Act, "but now meets wetland criteria due to the actions of man." (7 CFR 12.31[c].)

programs looked more attractive, simply not plant on the wetland to qualify for benefits.

FACTA amends the FSA, and corrects almost all of the deficiencies in the original Swampbuster provisions. Under FACTA, altering a wetland triggers the Swampbuster sanctions whether or not an agricultural commodity is planted. This change removes all confusion over what constitutes a Swampbuster violation.¹⁰ If alteration of a wetland makes the production of an agricultural commodity possible or if the operator intended to make production possible, the sanctions are triggered. Of the deficiencies discussed above, only the exemption for artificial wetlands and the absence of any sanction for converting wetlands to sugarcane production remain.

As originally enacted, Swampbuster contained no provision for scaling penalties according to the severity of the violation. There was only one penalty: loss of eligibility for program benefits. FACTA corrects this, and provides for graduated penalties. Under FACTA, Swampbuster violators who convert wetlands inadvertently may receive only a partial penalty, provided they agree to restore the wetlands within one year. An operator may invoke the inadvertent-conversion/partial-penalty provision only once every 10 years, however.

Because the commodity programs constitute the major source of benefits for most farmers, Swampbuster will have its greatest impact where commodity program participation is high. Its effect will be limited where growers of program crops tend not to participate in commodity programs or where non-program crops predominate.¹¹ It is also likely that in the near future the attractiveness of participating in the commodity programs will diminish, because: statutory benefit levels are scheduled to decline; continuing budget deficits generate interest in restricting the subsidies; and discussions between the United States and the European Economic Community have focused on reducing agricultural subsidies as part of the General Agreement on Trade and Tariff negotiations. Although the effectiveness of Swampbuster would be diminished if commodity program benefits are

¹⁰It does not, of course, resolve the issue of what constitutes a wetland for jurisdictional purposes. See the discussion in Appendix VI-1.

¹¹Ralph Heimlich (1988) has found that of the 78.4 million acres of nonfederal wetlands left, only about 17 million acres (22 percent) have some probability of being converted to cropland. According to Heimlich's estimates, Swampbuster may halt conversion on about 6 million acres but is likely to be ineffective on another 6.3 million acres.

reduced, there are other program benefits which are denied to Swampbuster violators.¹² Thus, Swampbuster would continue to deter wetland conversion, though at a reduced rate.

SUGAR PRICE SUPPORTS

Subsidizing sugar through import restrictions, guaranteed prices, and nonrecourse loans has increased sugar prices and caused more land to be brought into production. Much of the additional acreage is converted wetlands, and much of it is in Florida's Everglades. Federal flood control and drainage projects make conversion of the land feasible, and protect the converted areas following agricultural development. Sugarcane production is a major cause of deterioration in water quality. Swampbuster is completely ineffective in discouraging wetland conversion to sugarcane, because price supports are paid to the processors of cane, although they must be passed on fully to the growers.

The Federal Government has been involved in the sugar industry since the 1800s. It has imposed a series of tariffs and enacted a number of statutes that, among other things, impose quotas on imports in order to protect domestic producers. In the past decade, the domestic sugar industry has been faced with declining domestic consumption, due in large part to the growing use of low-calorie sweeteners and less costly corn sweeteners. It has also faced a world surplus and widely fluctuating world prices. To counteract these downward pressures on sugar prices, the 1985 Food Security Act set the guaranteed price (to growers) for domestic sugarcane at 18 cents per pound, triple the world rate. The Act also reduced competition by restricting the amount of sugar that can be imported. To partially compensate the 39 countries whose sugar quotas were cut by the 1985 Act, the U.S. makes available surplus foods worth \$188.3 million.

Most of the subsidy to sugar is financed by U.S. consumers, who pay an estimated additional \$3 billion each year for sugar; the rest, by taxpayers. There is a duty on sugar, but most imports are exempt under the Generalized System of Preferences and Caribbean Basin Initiative.

To ensure that domestic processors will buy the costly domestic cane, sugar processors who agree to pay growers the target price (\$.18/lb.) receive low-interest, nonrecourse loans (price supports). The processed sugar serves as collateral for the

¹²The list of programs consists of price and income support payments, farm storage facility loans, grain storage payments, FMHA loans, crop insurance, disaster payments, and loans used to convert wetlands.

loan. Should sugar become available on the market at lower prices, the processors can default on the loans without penalty, and the Government acquires the more expensive sugar. This nonrecourse loan program protects the processors who can sell the sugar for a profit if prices rise, or forfeit the less valuable sugar if prices fall. The import restrictions have generally kept prices above the loan rate, thereby discouraging forfeitures and any need for additional subsidy payments by the Treasury.

Because of Government price supports and declining demand for sugar, the United States is becoming self-sufficient in sugar production for the first time in its history. Unfortunately, this is being achieved at substantial cost to taxpayers, consumers, and the environment.

DISASTER PAYMENTS AND CROP INSURANCE

One problem that farmers face when converting wetlands is the risk of crop losses due to flooding or drought. Farming on converted wetlands vulnerable to flooding or lands that no longer hold moisture due to drainage can prove hazardous. Between 1948 and 1986, flooding and excess moisture accounted for 19.6 percent of crop losses while drought accounted for 51.2 percent. Any reduction in the financial losses from such hazards will make wetland conversion more attractive. Thus, historically disaster relief and subsidized crop insurance have added to the incentives to convert wetlands. Further, insurance of this nature makes it easier for growers to obtain credit to expand operations. Although disaster relief and crop insurance have been identified as forces which contributed to wetland loss in the past, Swampbuster denies these benefits to those who plant on or convert wetlands.

From 1974-1980, the Disaster Payments Program served as a form of free Federal crop insurance to growers of program crops. The program paid 50 percent of the commodity target price for any shortfall between actual production and 60 percent of expected production, if a natural disaster destroyed or prevented planting of some portion of a grower's normal crops. This program has been gradually phased out and replaced with Federal crop insurance. Disaster assistance is now restricted to areas where crop insurance is not available or when the Secretary of Agriculture determines that such payments are needed to avert an economic emergency.

Federal crop insurance, established in 1938, operated as a pilot program for four decades, but was greatly expanded in 1980 to replace disaster payments as the key protection against crop failure. Under the crop insurance program, growers must assume a portion of the cost of insuring themselves against disaster. To

attract participants, the Federal Government pays for all administrative costs of the insurance program and will pay up to 30 percent of a grower's insurance premium. This amounts to a subsidy of almost 50 percent of the cost of the insurance program. The grower can choose among three levels of yield protection; the higher the level, the greater the premium.

Federal crop insurance is financed by the Federal Crop Insurance Corporation (FCIC), a wholly-owned Government corporation within the Department of Agriculture. The FCIC gets its funds from an initial capitalization of \$500 million and from the sale of insurance. Because of catastrophic crop losses in 1983, 1984, and 1985, the Corporation exhausted its capital and is borrowing as needed, primarily from the Commodity Credit Corporation, to pay excess indemnities.¹³ Legislative proposals that would change how the Corporation funds its operations are under consideration. In 1986, crop insurance was available in over 3000 counties with policies covering 41 different commodities. Insurance coverage was about \$4.9 billion in 1984, and rose to \$9.8 billion in 1989.

FARM CREDIT, LOW INTEREST LOANS, AND FEDERAL GUARANTEES

The Federal Government has had a history of extending credit to farm operators at below market rates through a variety of programs. Efforts have been made in recent years to curtail the Federal involvement in the provision of farm credit. Generally, these efforts have taken the form of attempting to restrict the Government to being the lender of last resort. Unfortunately, it is not clear that these efforts have been successful or that Federal credit subsidies have diminished.

As of January 1987, the Government, through the Farmers' Home Administration (FmHA), had grown to be one of the largest lenders of farm operating loans, holding more than \$26 billion (14 percent) of all U.S. farm debt, with more than \$7 billion of this debt being delinquent payments owed by more than 83,000 farm borrowers. More than a quarter of FmHA's portfolio was classified as delinquent, and over three-quarters of FmHA's delinquencies were more than 3 years past due.

The relatively low interest rates and increased availability of credit have reduced the costs to agricultural producers of

¹³The FCIC borrows from both the Treasury and the CCC, but only a small amount (\$113 million) has come from the Treasury. Further, no interest has ever been paid on the loans from the CCC, and the Secretary of Agriculture always forgives the debt, thus making the loans a transfer from the CCC to the FCIC.

expanding their operations (in some cases by draining and converting wetlands), and have sustained marginal farmers (in some cases in flood-prone and wet areas which would otherwise have reverted to wetlands). Swampbuster could halt much of the lending that affects wetlands if it were applied more effectively.

Farmers Home Administration:

The FmHA makes below market rate ownership and operating loans available directly to family farmers with limited resources. The FmHA is designed to be a lender of last resort, and borrowers are supposed to demonstrate that they cannot obtain credit elsewhere at terms and interest rates normally charged to farmers to qualify for loans. Ownership loans are made at not more than 50 percent of the prevailing market rates, but not less than 5 percent of market rates. Operating loans are made at 3 percent below market rates. In 1988, total FmHA farm borrowers numbered just under 240,000, or 11 percent of the 2.2 million farmers in the United States. FmHA's direct farm loan portfolio was over \$26 billion.

In addition to ownership and operating loans, the FmHA provides disaster emergency loans which reduce the risk of farming in flood-prone areas. These emergency loans assist victims of natural disasters in returning their farming operations to a financially sound basis, and hence, facilitate securing private sources of credit sooner. The loans may be used for expenses such as replacing damaged property, covering operating expenses, or in some cases, refinancing secured or unsecured debts incurred because of the disaster.

The 1985 Food Security Act stipulates that borrowers are not eligible for emergency loans unless they have Federal Crop Insurance. This condition is frequently waived in disaster relief bills which supplement crop insurance payments and aid farm disaster victims who were not participants in the Federal Crop Insurance Program (about 75 percent of the farm community). Such actions tend to frustrate efforts to increase the participation rate in the crop insurance program.

In 1984, FmHA issued regulations implementing the wetlands executive order (E.O. 11990). The regulations prohibit loans for activities that would directly or indirectly affect wetlands unless there is "no practicable alternative." The Swampbuster regulations also prohibit direct lending that would affect

wetlands.¹⁴ However, even if wetlands were altered in violation of loan conditions, FmHA is not empowered to recall a loan or to deny future loans. Submitting a false claim to the Government is a prosecutable offense, of course, and could be pursued through the courts or administratively under the Program Fraud Civil Remedies Act, but it takes administrative will to pursue either of these courses. Further, even if FmHA loans are not used for wetland conversion, they are used to sustain operators in flood-prone areas which might otherwise revert to wetland.

In addition to subsidized, direct lending, FmHA provides guarantees of up to 90 percent for commercial loans supplied to eligible borrowers. The guarantees are a form of subsidy since they reduce the lender's risk of default. The Disaster Assistance Act of 1988 required FmHA to provide \$200 million in loan guarantees to farm operators who experienced financial stress due to the drought. FmHA routinely subordinates its financial interests to assist borrowers in obtaining commercial credit. As a result, commercial lenders hold the senior rights to collateral and secured property, and Federal loan security is lessened.

The Farm Financial Crisis of the 1980s and the FmHA:

As of January 1987, nearly 10 percent of the Nation's farm operator households were experiencing some form of financial stress. These financially stressed households accounted for 35 to 40 percent of all farm debt, amounting to \$34.6 billion worth of loans at risk of default. About \$8 billion has been written off as bad debt with no expectation of being repaid.

FmHA's farm loan program is a revolving fund account that relies on repayment of past loans and graduation of current borrowers to commercial sources of credit to provide proceeds for new borrowers. When the farm economy deteriorated in the early and mid-1980's, it became apparent that a significant portion of FmHA's loan portfolio would not be repaid by delinquent borrowers and that increased Congressional appropriations in the future would be needed to address shortfalls. According to the General Accounting Office (GAO), FmHA farm loan programs have become a continuous source of subsidized credit for 42 percent of FmHA's

¹⁴In order to deny a loan application for wetland considerations, FmHA must make a determination that the proceeds of such a loan will contribute to the conversion of wetlands to the production of an agricultural commodity. FWS field personnel believe that given the traditional mission of FmHA, it is inadvisable for FmHA personnel to make such findings.

borrowers.¹⁵ GAO also noted the FmHA's loan losses amounted to 24 percent of its outstanding loans and 81 percent of its interest receivable (GAO 1988a and 1988b).

Congress passed the Agricultural Credit Act of 1987 (ACA) to address the deteriorating financial position of farm lending organizations across the country. Congress directed FmHA to reinstate the "continuation policy" which allows borrowers to obtain additional credit without having to show an ability to repay prior loans. FmHA's loan servicing process traditionally included rescheduling, reamortization, and deferrals. The ACA liberalized this, requiring FmHA to write-off delinquent loans, while allowing borrowers to continue operating their farms whenever possible.¹⁶ When no way can be found to restructure a loan and property is foreclosed on by FmHA or voluntarily conveyed to it, the former owner has the first opportunity to lease or repurchase the property, more often than not with Federal financing.

Wetland Conservation Restrictions and FmHA Resale Property:

The wetlands and floodplains management executive orders suggest that when Federal property is to be leased or sold, restrictions be placed in the lease or deed that will protect and enhance the wetlands and floodplains on the property. In 1984, FmHA concluded that based on the executive orders, it has a responsibility to protect and enhance wetlands in conjunction with its property disposal process. Accordingly, FmHA issued regulations requiring that prior to resale, a conservation easement be placed on land containing wetlands and the resale value of the property reduced to compensate for the easement.

On November 1, 1989, USDA submitted a proposed rule to the Office of Management and Budget, relaxing FmHA's responsibilities for establishing wetland and floodplain conservation easements on properties being leased or repurchased by prior owners. FmHA maintained that a conflict existed between a prior owner's right of first refusal to lease or repurchase property and the

¹⁵These 42 percent have participated in FmHA financing programs for more than seven years.

¹⁶In the loan servicing process, operating loans can be rescheduled for up to 15 years. Reamortization is for long term loans with reamortization of payments for up to 40 years from the date of the original loan. In addition, these loans can have interest rates reduced to "limited resource rates" which are 3 percent below the regular, discounted interest rates used by FmHA. Deferrals can be up to 5 years with no limit on the number of times a loan can be rescheduled, reamortized, and deferred.

requirements of the wetland and floodplain executive orders. Therefore, the agency concluded that they had the discretion to establish or not establish a conservation easement. Under the proposed rule, the decision of whether or not to place a conservation easement on the property would have been delegated to the prospective purchaser. In addition, FmHA determined that it could extend credit to the prior owner for the repurchase or leaseback transaction even though an easement was not established. FmHA took these actions despite the restrictions in Swampbuster and FmHA's 1984 regulations disallowing loans for activities that would affect wetlands, unless there is "no practicable alternative."¹⁷

In the Conference Report accompanying H.R. 4404, the supplemental appropriation for FY 1990, the Congress reaffirmed the need to protect wetlands. In explanatory remarks for the record, Rep. Conte, the author of the wetland language in the Report, stressed that wetlands as described in E.O. 11990 must be protected by the FmHA in conjunction with the FWS. Following these actions by Congress, FmHA's proposed rule has become dormant.¹⁸

Under the Agricultural Credit Act of 1987, after the rights of all prior owners and operators have been expired, FmHA has the authority to transfer land to any Federal or State agency for conservation purposes. Congress provided FmHA with the land transfer flexibility in order to relieve the agency of land that was difficult to sell or manage and hence to reduce further losses to the government.

The 1990 Farm Bill (FACTA) requires the establishment of permanent wetland easements and upland buffers on FmHA inventory property. However, FACTA restricts the extent of such easements on frequently cropped wetlands and wetlands that have a history of haying or grazing. In cases where farmer owners or beginning farmers or ranchers are acquiring FmHA property, an easement may not be so large as to render a property inoperable for agricultural production.

The Farm Credit System:

The Farm Credit System (FCS) is a federally chartered cooperative, owned by farmers. Established by the Government before World War I to provide agricultural credit in rural areas,

¹⁷FmHA determined that there was no feasible alternative to extending FmHA credit to prior owners for leasing or buying back their former land.

¹⁸Although FmHA has not been withdrawn the proposed rule, it has made no effort to advance it either.

it is now made up of regional banks that make farm-operating and mortgage loans through local Land-Bank Associations and Production Credit Associations. Loan funds are obtained by selling bonds on the private bond market. There are no restrictions on how the loaned funds are used. Because the FCS is not a Federal agency, its lending activities are neither conditioned by the wetlands or floodplain management executive orders nor affected by Swampbuster.

In Volume I of this report we wrote that because the FCS is a privately owned cooperative, there are no Federal subsidies used to support its lending activities. This statement is no longer correct. The financial crisis in the farm sector during the 1980s prompted Congress to pass the 1987 Agricultural Credit Act. The ACA restructured the FCS; provided an infusion of interest-free capital to the FCS through the newly created Farm Credit System Assistance Corporation; and established the Federal Agricultural Mortgage Corporation (Farmer Mac) to facilitate the development of a secondary market for agriculture real estate loans by providing Federal guarantees for securities traded in the secondary market.¹⁹

The Farm Credit System Assistance Corporation issues 15-year, uncollateralized bonds, guaranteed by the U.S. Treasury. It uses these funds to buy preferred stock in troubled System banks. The Corporation, with funds provided by the U.S. Treasury, pays all interest on these bonds for the first five years, half the interest during the second five years, and none thereafter.²⁰ After 15 years the Farm Credit Administration²¹ will determine a schedule under which the FCS will repay all interest payments made by the Corporation with Treasury funds.²² In the meantime, the public's ownership in certain FCS banks coupled with the

¹⁹These guarantees are made possible by a special reserve funded by guarantee fees and backed by a line of credit from the U.S. Treasury.

²⁰The Farm Credit System bank which received the assistance bears the burden of the rest of the interest expense.

²¹The entity which regulates the FCS.

²²Repayment of the interest will not eliminate the Federal subsidy, since the interest payments themselves serve as interest-free loans.

assistance provided by the Corporation may potentially give the government a controlling share in troubled System banks.²³

Thus, although the FCS is not formally a Federal agency, it is sustained with significant Federal support. Consequently, it does not seem inappropriate to require that its lending activities be consistent with the objectives of Swampbuster and the executive orders.

FEDERAL TAX PROGRAM

In addition to the effects of Federal programs, tax policies may have the unintended effect of increasing the incentive to drain and convert wetlands. Tax policies designed to stimulate agriculture, capital investment, recreation, and timber production may increase drainage and conversion or the modification of wetlands. By lowering the cost of development to the landowner, these tax policies may reduce costs and create incentives to develop more wetlands than would have been developed in the absence of these policies.

The income tax code played a more significant role in decisions to convert and develop wetlands in the past than it does now. Changes instituted by the Tax Reform Act of 1986 (TRA) eliminated many economic incentives affecting wetlands. Arguably the most important of these changes occurred in the agricultural section of the code, where provisions which allowed expensing (rather than capitalizing) of conversion and development costs were eliminated. The elimination of the preferential tax rate for capital gains may have had a significant effect on forestry, because most timber sales qualified for capital gains treatment under prior law. As a result, a major advantage of holding forest land was eliminated, but the implications of this for wetland conservation is different in different areas, and the net result is not at all clear. In general, tax reform eliminated a number of special provisions which were designed to promote wetland conversion and development, while leaving unaltered the tax deductibility of expenses and depreciation incurred during the ordinary conduct of business activities which happen to affect wetlands. For a more detailed discussion of past tax provisions which affected wetlands and tax reform see Volume I of this report.

²³Farm Credit Banks that have received assistance include the Louisville (OH, IN, KY, TN), Omaha (SD, IA, NE, WY), St. Paul (MN, WI, ND, MI), and Jackson (LA, MS, AL) Districts. The Jackson, Mississippi District is currently insolvent and in receivership.

In addition to those provisions of the tax code which encourage development, there are also provisions which encourage conservation. The Federal tax code allows landowners who donate land or easements to qualified conservation organizations to deduct the value of the donation as a charitable contribution. By reducing tax rates, the TRA reduced the value of tax deductions. Limited evidence to date suggests that subsequent charitable contributions have fallen.

The Alternative Minimum Tax (AMT) may have had an even greater effect on conservation donations than the TRA. Under the AMT the marginal tax rate is 21 percent, considerably less than the top bracket (28 percent) under the ordinary income tax code. More importantly, however, under the AMT the amount of a deduction is limited to the original purchase price of the property being donated. Under the ordinary income tax code the fair market value of the property constitutes the value of the donation for purposes of tax deductibility. Thus, for wealthier taxpayers subject to the AMT, the tax savings resulting from a gift is reduced. In the case of wetlands, this is important, because conservation donations tend to come from wealthier individuals.

OTHER AGRICULTURE RELATED PROGRAMS

A host of additional agricultural programs also support agricultural production (directly and indirectly), and may play a role in the decline of wetlands. These programs stabilize and improve many aspects of agriculture by helping to market perishable commodities, to develop new technologies, to disseminate new information to producers, and to promote consumption domestically and overseas. Some of these programs have been authorized, because Congress wants to support the social benefits which they provide. Examples include:

- o Marketing orders (Government-sanctioned agreements between producers and handlers to control the quantity or quality of crops) have been instituted for milk, fruits, nuts, vegetables, and specialty crops.²⁴ The orders sometimes establish a marketing arrangement bordering on monopoly, although entry into the marketing association is usually fairly easy. Marketing orders provide consumers with quality assurance, but at the expense of reduced price competition.

²⁴Seventy percent of the milk, about half of all fruits and nuts, and roughly 15 percent of all vegetables are marketed through marketing orders.

- o The Agricultural Marketing Service receives a permanent appropriation equivalent to 30 percent of customs receipts collected the previous year to promote domestic consumption and export of agricultural commodities.
- o An export credit program subsidizes purchasers of U.S. agricultural exports through credit guarantees, below-market interest rates, and sometimes interest-free lending.
- o Foreign and domestic nutrition programs (including PL-480, food stamps, the Commodity Supplemental Food Program, Supplemental Food for Women, Infants, and Children, and Temporary Food Emergency Assistance) provide outlets for surplus food production or subsidize consumer purchases expanding outlets for agricultural products.
- o Ethanol subsidies provide the incentive to convert grains into fuel-grade ethanol. Production of such fuel would be uneconomical without the Federal program.

Some of these programs provide subsidies that stimulate demand for agricultural commodities, while others are simply the mechanisms by which the Government markets or disposes of the surplus commodities it has already subsidized and stockpiled. Some may lend themselves to be conditioned with conservation restrictions,²⁵ while others may be too remote to be suitable vehicles for such constraints. Their presence indicates the degree to which Government has become involved in a purely private activity: the production and sale of food.

²⁵For example, eligibility to participate in a marketing order might be added to the sanctions under Swampbuster.

REFERENCES

- Cate, P.C. and G. S. Becker. 1984. Federal Farm Programs: A Primer, 84-232 ENR. The Library of Congress, Congressional Research Service, Washington, DC, 133pp.
- Dahl, T.E. and C.J. Johnson. 1991. Status and Trends of Wetlands in the Conterminous United States, mid-1970's to mid-1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC, 28pp.
- Heimlich, R. E. 1988. The Swampbuster Provision: Implementation and Impact. Proceedings of the National Symposium on Protection of Wetlands from Agricultural Impacts, Fish and Wildlife Service, Department of the Interior, Washington, DC, pp. 87-94.
- Heimlich, R. E. and L. L. Langner. 1986. Swampbusting in Perspective. Journal of Soil and Water Conservation, vol. 41 (July-August), pp. 221-224.
- U.S. General Accounting Office. 1988a. Farmers Home Administration; Farm Loan Programs Have Become a Continuous Source of Subsidized Credit. U.S. General Accounting Office, Washington, DC, November, 46pp.
- U.S. General Accounting Office. 1988b. Financial Audit; Farmers Home Administration's Losses Have Increased Significantly. U.S. General Accounting Office, Washington, DC, December, 47pp.

Chapter 4: WATER DEVELOPMENT AND MANAGEMENT PROGRAMS

Development of surface water resources (often to provide irrigation, flood control, navigation, hydropower, or drainage for agriculture) has been another major factor in wetland decline. Federal funds spent on developing and managing water resources often lead directly to the loss of wetlands. Typically, rivers are blocked to create reservoirs and in the process inundate wetlands; streams are dredged and channelized for flood control or shipping or for draining croplands; spoil material is used to build levees and dikes in the floodplains along the waterways; water is diverted for small scale hydroelectric or irrigation projects or conserved to aid crop production. Also important are the induced effects as development in surrounding areas becomes technically feasible or the cost of such development is lowered, e.g., by providing irrigation water at less than actual cost.

In the process of developing and managing waterways, historic flooding patterns, downstream flows, the indigenous vegetation, and the aquatic communities are altered or eliminated, and valuable wetland functions are diminished. A number of Federal agencies have water resources development and management responsibilities including: the Army Corps of Engineers, the Bureau of Reclamation, the International Boundary and Water Commission, the Soil Conservation Service and the Agricultural Stabilization and Conservation Service.

Policies governing the amount that the Federal Government pays toward developing water resources and the amount that is paid by local beneficiaries (cost sharing) vary widely and inconsistently among purposes, projects, and agencies. Cost sharing differs, for example, for purposes such as flood control (which has been financed largely by the Federal Government) and for hydropower (which is financed by local beneficiaries). Cost sharing also differs according to project. One reason for this is that Congress has included different cost-sharing provisions in the authorizations for different projects. For example, half the initial costs of the Ports of Houston and Portland were shared by local beneficiaries. When it came to deepening the channel in the Delaware River above Philadelphia, however, Congress rejected 50/50 cost sharing in favor of more liberal financing. In some cases, water-using entities have convinced Congress to reduce their share of the cost of a project or to extend the repayment schedule. In other cases, such as with the Central Valley Project in California, the Bureau of Reclamation proposed extending the repayment periods on projects whenever additional project units were added. These measures (whether initiated,

accepted, or authorized by Congress) have led to increases in the interest subsidy for some water resource projects. The absence of a consistent fiscal design makes it difficult to provide a concise summary of the subsidies involved in Federal construction and maintenance of water projects. What follows is a very general description of the policies employed by the relevant agencies.

ARMY CORPS OF ENGINEERS

The Corps was initially established over 200 years ago as an Army Engineer organization. It was later tasked to undertake internal improvement, such as building canals and improving navigable waterways. Late in the 1800s, the Corps' mission was enlarged to include flood control, and over the next 50 years a series of disastrous floods in the Mississippi Valley resulted in the Corps being given comprehensive Federal flood control responsibilities. During this same period (corresponding to the rise of the Bureau of Reclamation), Corps projects began to include irrigation and electric power benefits.

The Corps' role has expanded even more in the last 50 years as the Corps has been authorized, in conjunction with its basic navigation and flood control projects, to provide for protecting fish and wildlife, recreation facilities, water supply and quality, hydropower and shore protection. Today the Corps maintains and operates hundreds of flood control dams, over 200 major lock and dam facilities for navigation, 25,000 miles of waterways, over 100 commercial ports, and over 416 small boat harbors. These projects account for an enormous amount of infrastructure. However, they occur in or next to inland rivers, lakes, and coastal waters of the United States and their wetlands, and as a result, they have had sizable environmental effects.

The widespread impact of Corps activities is attributed, in part, to the large share of the construction and maintenance costs which was the Federal Government's responsibility under the Flood Control Act of 1936. Between 1936 and the passage of the Water Resources Development Act of 1986 (WRDA-86), cost sharing by local beneficiaries has been almost exclusively in the form of contributions of lands, easements, and rights-of-way.¹ WRDA-86 dramatically altered the way in which local areas share in the costs of Federal water projects. Water Resource Development Acts

¹Exceptions were the reimbursable purposes of recreation (50 percent), hydropower (100 percent) and water supply (100 percent).

were passed in 1988 and 1990, but they did not weaken the landmark cost-sharing and mitigation reforms of WRDA-86.

WATER RESOURCES DEVELOPMENT ACT OF 1986 and 1990

WRDA-86 established new cost-sharing requirements for the planning, construction, and operation and maintenance of projects for navigation, flood control, and other purposes, and also established national and local users fees, guaranteeing that non-Federal interests play an important role in planning, financing, and maintaining water projects.

The non-Federal share of navigation project costs increased dramatically with WRDA-86. During construction of navigation channels, local interests must pay at least 10 percent for projects with depths of less than 20 feet (often projects on the Nation's inland waterways), 25 percent for projects between 20 and 45 feet deep, and 50 percent for projects over 45 feet deep. These percentages are payable in cash, not in kind. In each case, non-Federal sponsors must pay an additional 10 percent cash over a 30 year period with interest. In addition, non-Federal sponsors are required to provide any necessary lands, easements, rights-of-way, relocations, and dredged material disposal areas required for the project. Credit is allowed for the value of these contributions against the additional 10 percent cash requirement. The Federal Government remains responsible for all costs of operation and maintenance of navigation projects maintained to a depth of 45 feet or less. Non-Federal interests are responsible for one-half of the incremental cost required to maintain depths over 45 feet. WRDA-86 also authorized funding of specific modifications to the inland waterway system with one-half of the costs from the Inland Waterways Trust Fund. WRDA-86, as modified by WRDA-90 now provides for the recovery of 100 percent of the eligible operations and maintenance costs assigned to commercial navigation of all harbors and inland harbors within the United States.

For all flood control projects...reservoirs, levees, floodwalls, and channels...local interests must contribute at least 25 percent of the project's construction costs and 100 percent of the maintenance costs. The Federal Government will no longer pay all land, construction, and maintenance costs for major reservoirs or all construction costs for local protection projects such as levees, floodwalls, and channel improvements. In-kind contributions by non-Federal sponsors, such as lands, easements, rights-of-way, and relocation costs, count as credit against the 25 percent cost share, but 5 percent of the total

project cost must be paid in cash during construction.² While the legislation did provide for reduction in the otherwise standard cost-sharing requirements for situations where a non-Federal sponsor lacked the ability to pay, instances where the non-Federal share was reduced have been few. Projects lacking a positive benefit-cost ratio may still proceed, but non-Federal sponsors must pay all costs in excess of benefits. For shoreline protection, the Act requires 35 percent local cost sharing as opposed to the 30-50 percent local cost sharing required prior to passage of the Act.

The cost-sharing provisions of the Act apply to all projects or separable elements of projects whose construction starts after April 30, 1986, except for harbor projects where the applicability date is November 17, 1986. Local interests must also pay a portion of the design studies on the same basis as construction. Moreover, the Act limits the Corps' annual obligation for civil works projects to \$1.4 billion in 1987, rising to \$1.8 billion in 1991, and placed controls on cost-overruns.

WRDA-86 also continued the deemphasis on construction of Federal water projects. Although work had continued on previously authorized projects, Congress had not authorized any new starts for Corps water resource projects in the 10 year period 1976-1986.³ With the WRDA-86, Congress went further than this and deauthorized \$11.3 billion worth of Corps projects. Although the Act called for the study or construction of 270 new projects, it subjects them to the new cost-sharing rules and to more rigorous mitigation requirements.

New project authorizations and modifications in WRDA-88 and WRDA-90 did not alter the general mitigation and cost-sharing reforms of WRDA-86. However, WRDA 90 contains new provisions that should have an overall positive effect on protection and restoration of wetlands.

²If the value of in-kind contributions should exceed 25 percent, non-Federal sponsors still owe 5 percent of project costs in cash during construction. If the total exceeds 30 percent, they owe the sum over 30 percent in cash but may pay it over a 15 year period with interest. If the value of in-kind contributions reaches 45 percent of project costs, the non-Federal contribution stops, but at least 5 percent must be contributed in cash during construction.

³In real terms, the Corps' budget has declined since 1977, and now more than half goes for operation and maintenance of existing projects rather than new construction.

WRDA-90 establishes environmental protection as a primary mission of the Corps in planning, constructing, operating and maintaining water resources projects. Further, the Act establishes an interim goal of "no overall net loss of the Nation's remaining wetlands base, as defined by acreage and function, and a long-term goal to increase the quality and quantity of the Nation's wetlands, as defined by acreage and function." In order to implement the no-net-loss goal, the Corps is directed to use all appropriate authorities to restore and create wetlands, and is directed to develop a wetlands action plan, in consultation with the Environmental Protection Agency, the Fish and Wildlife Service, and other appropriate Federal agencies. In addition, WRDA-90 authorizes a wetlands restoration demonstration program to determine the feasibility of wetlands restoration, enhancement, and creation as a means of contributing to the goal of no net loss of wetlands.

The changes mandated and authorities provided for by WRDA-86 and WRDA-90 concerning cost sharing, mitigation and the environmental mission of the Corps should help to protect and restore wetlands and constrain the demand for new projects. It should be noted, however, that the new provisions apply only to projects constructed by the Corps of Engineers, not to those built by other Federal agencies. The principles behind the changes make for good public policy. They should be adopted government-wide.

THE CENTRAL VALLEY IMPROVEMENT ACT OF 1992

The Central Valley of California encompasses 21,000 square miles, and is traversed by two great rivers, the Sacramento in the north and San Joaquin in the south. Prior to development, both rivers, inundated with the runoff from the surrounding mountains, overflowed their banks annually, sustaining 4 to 5 million acres of wetlands. To develop the Valley, a massive complex of flood control, drainage, and irrigation facilities was built (Federal, State, and private). The Federal portion, the Central Valley Project (CVP), is the Bureau of Reclamation's largest undertaking and the largest water management system in California. Its facilities include 20 dams and reservoirs, 1437 miles of canals, 51 miles of pipelines, tunnels, conduits, and aqueducts, 192 miles of drains, and 1800 megawatts of electrical generating capacity. The CVP and the ensuing development had devastating consequences for the Valley's wetlands, fisheries, wildlife habitat, and water quality. The Central Valley Project Improvement Act (CVPIA) is a belated attempt to restore the environment in the Valley and effect a more efficient use of project water.

The CVPIA establishes the "protection, restoration, and enhancement of fish, wildlife and associated habitat" as a

project purpose, and specifies a list of activities to be undertaken by the Secretary of the Interior within designated time periods to accomplish this objective. The Act dedicates 800,000 acre-feet of water annually for fish and wildlife and habitat restoration (largely fisheries⁴) and initially, 426,000 acre-feet for refuges and wildlife habitat areas (largely wetlands), the latter growing to 592,000 acre-feet over a decade. These water quantities represent a sizable proportion of project water. Although water allocations to current users will be curtailed, the severity of these reductions can be limited through more efficient management of the system, treatment and reuse of supplies, and identification of additional sources. Under conditions of water scarcity, the Act allows allocations for environmental restoration to be reduced up to 25 percent, but the percentage reduction may not exceed that for agricultural contractors.

The cost of the restoration projects and activities are to be shared by the Federal Government, the State, and the project beneficiaries (water and power users). Water and power users are assessed a series of fees, surcharges, penalties, and increased water rates, the monies to be deposited in the Restoration Fund.⁵ The Act authorizes \$50 million to be appropriated annually from the Restoration Fund,⁶ \$30 million of this to be financed by the mitigation and restoration fees.⁷

⁴The general goal for fisheries in the CVPIA is a doubling of recent naturally produced populations of anadromous fish in CVP-affected streams and rivers.

⁵All water and power users are assessed restoration and mitigation fees: \$6 per acre-foot for agriculture; \$12 for municipal and industrial users; \$25 for water sold for municipal and industrial purposes to a party not currently a CVP customer. Those served by the Friant Division are assessed surcharges over and above the restoration and mitigation fees: \$4/acre-foot until Oct. 1, 1997; \$5 from Oct. 1, 1997 to Oct. 1, 1999; and \$7 thereafter. Water rates are increased when contracts are renewed, and penalties (equal to 50 percent of the mitigation fees) are assessed for not renewing within the next 3-5 years.

⁶Annual average, in real terms, at October, 1992 prices.

⁷The Act contains a clause encouraging Congress to appropriate the full \$50 million (annual average for 1993-1997). If Congress does not appropriate \$50 million annually, the Secretary must increase the mitigation fees sufficiently to collect \$50 million annually (an increase of \$20 million).

The CVPIA requires reforms in water pricing and marketing. Long-term contracts will only be renewable for up to 25 years, as opposed to the previous 40 years. Renewed contracts will use an increasing block rate structure, with the minimum price for the first block being the cost of service and the price for the last block being at least full cost.⁸ The CVPIA encourages early renewal of contracts by penalizing users who wait until the date of expiration to renew. Finally, in keeping with the CVPIA's purpose of promoting more efficient use of water, the Act allows water users to sell their water at market value.

The CVPIA will not solve all the wetland problems in the Central Valley. The Act primarily addresses the water needs of publicly owned wetlands. These account for less than one-fourth of the wetlands in the Central Valley. The Act does direct the Secretary to investigate and report to Congress on alternative means of improving the reliability and quality of water supplies for privately owned wetlands.

WETLAND MITIGATION

Mitigation lessens the adverse environmental impacts of development projects. As defined by the Council on Environmental Quality in NEPA regulations (40 CFR 1508.20), mitigation means:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implication;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and

⁸Cost of service and full cost are terms of art in water law. When CVP contracts first came up for renewal in the mid-1980s, the Bureau of Reclamation substituted cost of service for the historical contract rate. Cost of service rates are an attempt to confront water and power users with the capital costs (exclusive of financing costs) and O&M costs associated with delivering water to them. Full cost includes financing costs, and is an attempt to confront users with the opportunity cost of serving them. Full cost is defined in the Reclamation Reform Act of 1982, §202(3).

- o compensating for the impact by replacing or providing substitute resources or environments.

Mitigation for wetland impacts from Federal water resource projects is addressed by several Federal statutes including the Fish and Wildlife Coordination Act (FWCA) and by the Water Resources Development Acts. The FWCA requires that Federal agencies consult with the U.S. Fish and Wildlife Service and State fish and wildlife agencies concerning the effects on fish and wildlife resources of a Federal water resource development project or non-Federal water development project requiring a permit or license. The FWCA specifies that fish and wildlife conservation shall receive equal consideration with other project purposes. However, action agencies may make determinations that do not result in adoption of the resource agency recommendations. Under the FWCA, the reports and recommendations of the Secretary of the Interior and the head of the State fish and wildlife agency are made a part of any report to Congress on a water resources project.

The WRDA-86 contains a number of provisions that specifically address wetland protection. Most significant are its mitigation requirements. Prior to passage of the WRDA-86, mitigation policy for wetlands losses resulting specifically from water projects had not been well articulated by Congress, and mitigation occurred irregularly. Now, when proposing a project to Congress, the Corps must develop mitigation plans for every new project or explain why the project will have negligible effects on fish and wildlife. Mitigation costs for new projects are among those to be shared by non-Federal sponsors, and mitigation will have to proceed prior to or concurrently with construction, not afterward. This should slow the loss of wetlands resulting from new Corps projects, especially losses of bottomland hardwoods which are to be mitigated in-kind to the extent possible. To repair past damages to wetlands, the Act establishes a new continuing authority funded at \$30 million annually for mitigation. The amount on a single project may not exceed \$7.5 million or 10 percent of the project cost. Despite proposals from the State of Florida, no budget request has yet been made to draw on the \$30 million authority and no funds have been appropriated by Congress.

Although the WRDA-86 established the importance of mitigation as a concept, it applies only to Corps projects. Further, it lacks specificity regarding what types of mitigation are acceptable and preferable. This lack of specificity is important, because there has been a long-standing disagreement between development-oriented and resource-oriented agencies regarding the Council on

Environmental Quality's definition of mitigation.⁹ The disagreement centers on whether the mitigation actions listed by the CEQ are listed in order of preference. Some agencies (primarily resource agencies) have favored considering the mitigation options sequentially, while others have argued for the greatest flexibility in setting mitigation requirements.

The issue of sequencing was partially resolved in February, 1990, when the Corps of Engineers and the EPA signed a Memorandum of Agreement on mitigation. The MOA establishes policies and procedures to be used by the two agencies in implementing mitigation sequencing under section 404. The issue remains controversial, however, and has attracted congressional attention. The issue is likely to be addressed during the reauthorization of the Clean Water Act in the 103rd Congress.

Despite the statutory commitment to mitigation in WRDA-86 and the 1990 MOA between the Corps and EPA, many questions remain regarding mitigation. Should the unit of mitigative compensation be defined in terms of area (i.e., acre for acre) or in terms of environmental functions? If the latter, which functional losses should be mitigated? If mitigation is conducted off-site, how far away is allowable? Should the Federal Government encourage "mitigation banking," a form of off-site mitigation where credits offsetting damage that would result from a project are accrued by restoring or protecting other areas? Who will monitor and assume responsibility for the success of mitigation efforts? How should the Government respond to failed mitigation efforts? Should project sponsors have a continuing obligation to maintain a successful mitigation site, or should their obligation cease once they have complied with the required mitigation conditions? The list is long and challenging.

EPA and the National Academy of Science have reviewed the success of wetland restoration and creation efforts (USEPA 1989 and NAS 1992), and the Corps and EPA are currently conducting a study of the feasibility of developing a mitigation banking system.¹⁰ Hopefully, these reports will help to resolve some of the troubling mitigation issues.

⁹Briefly, the CEQ's mitigation guidelines call for avoiding the wetland if the proposed project is not water dependent or if alternatives exist. If the project is water dependent and no alternatives exist, minimize the impact by modifying the project. If modification is not possible, rectify the impact by restoring the environment (40 CFR, pt. 1508.20).

¹⁰Interim reports are available from USACE, Water Resources Support Center, Ft. Belvoir, VA. Final report to Congress is anticipated in June, 1994.

BUREAU OF RECLAMATION

The Bureau of Reclamation (Bureau) was created in 1902 to assist in settling the arid west by providing water storage and delivery facilities to irrigate family farms.¹¹ Federal contributions to the development of irrigation systems in the west came largely through interest-free Federal financing of project costs, originally over 10 years, and later extended to longer repayment periods. Additional goals were added to the Bureau's mission over the years, such as providing municipal water supplies, hydroelectric power, flood control, salinity control, recreation, and maintenance of fish and wildlife habitat.

Today, the Bureau supplies about 25 million acre-feet of water for irrigation annually, about three million acre-feet for municipal and industrial uses, and about one million acre-feet for other uses. The construction of 330 dams, reservoirs, and dikes has led to the irrigation of about 4.0 million acres of "full service" lands in the 17 Western States.¹² The Bureau also provides supplemental or temporary water supplies to an additional 5.4 million acres. All of this development occurred under specific Congressional authorizations and appropriations, reflecting the desires of the Congress and society at the time.

In 1987, the Bureau of Reclamation reassessed its mission in light of current economic conditions, environmental circumstances, and changing social trends and values. The Bureau's Assessment '87 report concluded that the Bureau had largely fulfilled its original objectives and would shift its focus to more efficient management of the water resources facilities already in place (Bureau of Reclamation 1987).

The largest Federal subsidies associated with Bureau projects pertain to irrigation water. Initially, public land sales were to create a revolving fund for a self-sustaining reclamation program. Irrigation project beneficiaries were to repay project construction costs within 10 years without interest; the funds would then be used again for the next round of projects. Beginning in 1914, Congress began a series of actions extending repayment periods, granting moratoria on repayments, and forgiving payment altogether on lands classified as unproductive.

¹¹More accurately, the 1902 Act created the Reclamation Service. The name was changed to the Bureau of Reclamation in 1923.

¹²Full service lands are those whose only source of water is Bureau of Reclamation project water.

The financial assistance to irrigation was authorized by Congress and comes largely from two sources: 1) the interest-free repayment of capital costs (a subsidy from taxpayers) and 2) the use of revenues from the sale of hydropower to repay irrigation capital costs above the Bureau's estimate of the irrigators' "ability-to-pay." The level of the interest subsidy has grown over the years, primarily due to Congressional extensions of the repayment period and increases in the cost of borrowing by the Federal government.¹³ Construction costs are now amortized without interest over repayment periods of 50 years. Estimates of the magnitude of the subsidy differ, but all agree that it is substantial. The interest subsidy is borne by taxpayers in general.

The second important component of federally authorized financial assistance to irrigation, ("ability to pay" or "payment capacity") is the use of hydropower revenues for repayment of irrigation capital costs over and above irrigators' estimated ability to pay. This cross-subsidy from power users has resulted in a greater degree of irrigation development than would otherwise have taken place, and hence, greater associated impacts on wetlands, as well. The mechanics of this arrangement are as follows: The Bureau estimates the irrigators' ability to pay by developing a typical farm budget for the project. The income of a typical farm is estimated by taking the expected crop revenues less expenses for seed, equipment, land (exclusive of water costs), hired labor, and an imputed cost for family farm labor. Ability to pay is calculated as a percentage of this net income, and the calculated amount is used to establish the water rate. Past practice was to charge 75 percent of payment capacity, but current Bureau policy is to charge 100 percent of the estimated ability to pay. Much of the capital cost assignable to irrigators but not collected from them is then charged to users of hydroelectric power.¹⁴ On average, the combination of these two components of financial assistance results in irrigators paying 15 percent of capital costs associated with irrigation.

Some modifications to the repayment provisions in Reclamation law were made in the Reclamation Reform Act of 1982. This act provides that "full cost" charges be paid for water delivered to

¹³To a lesser degree, subsidies have occurred due to legislative changes granting moratoria on repayment and forgiving some charges.

¹⁴The financial aid from power users covers only a portion of the uncollected capital cost, some capital costs having been forgiven altogether and some being borne by M&I users.

that portion of landholding in excess of 960 acres.¹⁵ This measure was designed primarily to reduce the interest and ability-to-pay subsidies to large farming operations as an alternative to making them strictly ineligible to receive project water.

Subsidies have been provided for other project uses, as well, leading to more reservoir construction and regional development than would have occurred in the absence of such subsidies. Subsidies to other project uses include: (1) utilization of interest rates for repayment of hydropower and municipal and industrial water costs that are fixed by statute and are sometimes below the government long-term borrowing rates in existence at the time project facilities are constructed; (2) recreational uses provided with no local cost sharing or cost sharing only up to 50 percent of the separable costs of recreational facilities; and (3) water flows provided for fish and wildlife with no non-Federal cost sharing.

Other Federal water programs providing subsidies to irrigation may have had some effect on wetlands, as well. One example is the Federal program to pay from \$1.5 billion to \$4.0 billion to control salinity in the Lower Colorado River Basin. Project beneficiaries will cover less than 6 percent of this expense. Irrigators contribute about 37 percent of the salinity. In the absence of the program, it might have been necessary for the Federal Government to retire certain irrigation lands in the Colorado River Basin. (Alternatively, since next to households irrigation is the principal beneficiary of the salinity control program, lack of the Federal subsidies might have led farm operators to reduce the level of irrigation.) However, the extent to which a reduced level of irrigation would have reduced wetland losses is unknown.

A second example unfolding in the arid west is the issue of contaminated irrigation return flows. Depending upon Congressional action, there could be a large amount of public funds required to clean up drain water contaminated with selenium, other heavy metals, and concentrated elements leached from the soil by irrigation water.

An example of a Bureau project particularly relevant to wetlands is the Central Valley Project in California. In the CVP a number of practices evolved that extended repayment periods beyond that of other projects and increased the interest subsidy from the 58-66 percent embodied in law to over 94 percent (Wahl 1989). See

¹⁵The "full cost" formula in the Act is not actual economic cost, but a lesser amount.

the section entitled "Federal Programs and Projects" in Chapter 11 for details.

Subsidized water has allowed irrigated lands to compete with other land uses. Many projects have been located where costs were greater than benefits. Dams have been placed where rivers would otherwise have remained in their natural state, significantly modifying the landscape of the west. The loss from inundation, though substantial, is far less significant than the myriad downstream effects on wetlands, floodplains, water quality and species diversity. Now additional costs arise in efforts to deal with some of the previously ignored impacts of projects such as seismic vulnerability, salinity, facility aging, and water contamination.

Besides these environmental consequences, low-cost water has provided little incentive for careful use. In a 1988 study, USDA found that 38 percent of the land receiving federally subsidized irrigation water is devoted to crops that are in oversupply (Moore and McGuckin 1988). California, with the greatest number of acres under Federal irrigation, had the largest proportion of irrigated land (43 percent) planted in surplus crops. In 1986, \$379 million in crop support payments were paid to federally irrigated farms, and \$127 million in 1987. By statute and against the wishes of the Administration, crop subsidy payments continue to be included among the economic benefits of proposed water projects, seriously distorting the decision process.¹⁶

INTERNATIONAL BOUNDARY AND WATER COMMISSION

The International Boundary Commission, operating within the Department of State, was created by treaty between the United States and Mexico in 1889. It was renamed the International Boundary and Water Commission (IBWC) in 1944, and charged with regulating boundary waters and planning projects cooperatively with Mexico. The IBWC manages the Rio Grande River from El Paso, Texas to the mouth of the River. It carries out projects for irrigation, salinity control, sewage disposal, and flood control. To enter into an agreement with the Mexican Commissioner, the U.S. Commissioner must have specific authorization in an existing

¹⁶The Reagan Administration called for greater financial participation on the part of local beneficiaries. The WRDA established upfront financing requirements for non-Federal sponsors of Corps projects. Neither the Bureau nor the SCS were included under WRDA, but the Bureau has been negotiating upfront financing on a project-by-project basis, and the SCS has proposed legislation with financing requirements for its projects identical with the requirements in the WRDA.

treaty or an act of Congress. Costs are shared by the two countries.

IBWC projects can have significant effects on riparian wetlands. For example, the Rio Grande Channelization Project, completed by the IBWC in 1943, destroyed riparian wetlands along the 100 mile reach of the Rio Grande from Caballo Dam to the Texas State line. Maintenance now includes mowing of the river bank, levee slopes, and floodplain. Built mainly for flood control, the project destroyed between 12,000 and 20,00 acres of riparian wetlands while allowing urban development in the floodplain, development that must now be protected at Federal expense. Subsidies arise because the local beneficiaries pay nothing towards flood control and maintenance costs. The principles in the Water Resources Development Act have not yet been applied to IBWC projects.

SOIL CONSERVATION SERVICE SMALL WATERSHED PROJECTS (PL-566)

The PL-566 program administered by the Soil Conservation Service (SCS) offers technical assistance and cost-sharing funds to construct flood control and drainage structures.¹⁷ Whereas the Corps is chiefly responsible for large scale projects, SCS undertakes smaller-scale projects designed to protect, manage, improve, and develop water and land resources in watersheds of 250,000 acres or less. The program's goal has been to improve agricultural productivity on existing lands, and create incentives for agricultural expansion, mainly by building drainage channels.

As of 1985, 75 million acres of the nation's cropland had been developed by draining land (USDA 1987). Although not all this land was drained with Federal assistance, significant portions were provided with Federal funds, loans, and technical assistance. Figure IV-1 depicts land in organized drainage enterprises.

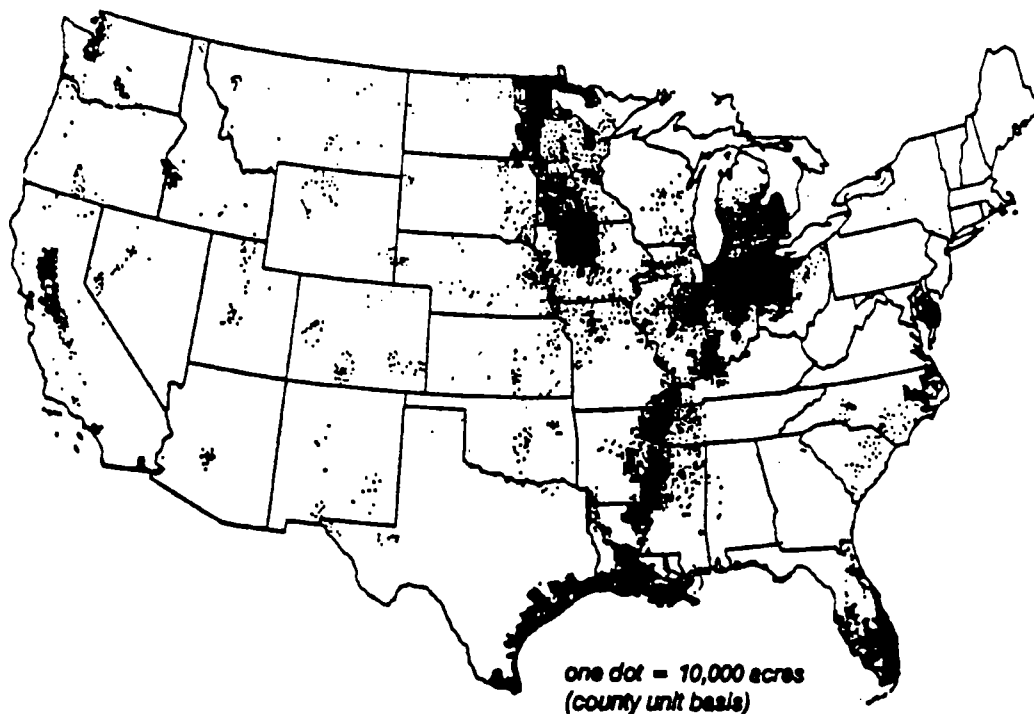
Digging channels, depositing spoil, and constructing access roads destroys riparian vegetation and reduces or eliminates beneficial filtering, flood control, and erosion control capacity. Once in place, the channels drain wetlands, increasing the rate of runoff which can cause downstream erosion, flooding, and surges of nutrient-loaded water in sensitive coastal marshes.

¹⁷The Farmers Home Administration through its Watershed and Flood Prevention Loan Program has in the past helped local sponsors provide the local share of costs (not to exceed \$10 million in any watershed) for drainage and continues to offer funds for watershed protection works, such as flood prevention and irrigation.

Due to Administration concerns about the oversupply of many agricultural commodities, the SCS Director issued a Watershed Planning Guidance Letter in June, 1987 halting new planning starts for PL-566 projects that would increase crop production. This policy grew out of a controversy about using Federal funds to drain land that would produce surplus crops eligible for Federal income and price support payments. Although the PL-566 program appears to be winding down, it is still a matter of concern in some areas. The interpretation of the term "new planning starts" in the Guidance Letter could range from new funds for previously approved projects to any new planning of additional projects. Further, since the policy in the Guidance Letter has not been codified in law, a new Secretary of Agriculture could reverse it.

Since 1977, when President Carter issued the Executive Order on Wetland Protection, direct Federal action to drain wetlands has been limited, but "incidental" drainage of wetlands has remained a problem. A channel through a wetland to drain wet cropland, for example, could go forward, and in the process alter the hydrological regime in the wetland, while providing an outlet channel for growers to drain the surrounding wetlands. Given the Guidance Letter, SCS will not fund new projects of this sort, but will render technical assistance for draining wet croplands. SCS will even offer technical assistance to drain actual wetlands, if it believes that the denial of such assistance could result in even greater harm to the wetlands. This policy lends itself to broad interpretation and without careful monitoring could be abused.

Criticisms about inadequate consultation and review of proposed projects, methods used to justify economic benefits, and mitigation policy have also surfaced in relation to PL-566 projects. One post-construction review found that 2.5 times more acres of wetlands were lost than estimated (Tiner and Finn 1986; Zinni 1986). Opportunities to avoid impacts are often missed, because the USDA Solicitor has ruled that PL-566 projects are not subject to early review called for by the Fish and Wildlife Coordination Act, and review under NEPA occurs much later in the process. Although Section 12 of PL-566 acknowledges that the Secretary of the Interior can evaluate water projects and make recommendations to minimize adverse impacts to wetlands and fish and wildlife, only those recommendations acceptable to local sponsoring agencies and the Secretary of Agriculture are

Figure IV-1: LAND IN ORGANIZED DRAINAGE ENTERPRISES

Source: USDA, Farm Drainage in the United States:
History, Status, and Prospects, Washington,
DC, 1987

implemented. By keeping the Federal share of projects approved by the SCS Administrator under \$5 million, congressional review is avoided.

Regarding benefit calculations, one post-project study by USDA/SCS found that of those projects examined, benefits ranged from 40 to 70 percent of those expected (EcolSciences 1976). And since the Federal share of flood control projects has been 100 percent, while single-purpose drainage projects receive only 50 percent Federal support, SCS regulations allow most of the identifiable project benefits to be classified as joint benefits. The Federal share would amount to 75 percent of the total project cost even though agricultural drainage was the primary purpose.¹⁸ Regarding mitigation, the SCS, using a dated system of wetlands classification, maintains a policy that does not

¹⁸For further discussion, see the section on benefit-cost analysis in the Delmarva Peninsula chapter.

require mitigation for the loss of seasonally-flooded, freshwater wetlands.

WATER CONSERVATION THROUGH VEGETATION MANAGEMENT

Phreatophyte control or "vegetation management" in the Southwest refers to the removal of vegetation along waterways to increase water yields for irrigation or municipal use, to reduce the effects of invasive saltcedar (an exotic shrub) on water resources, or in conjunction with the construction and management of flood control projects. Control of the vegetation is effected in several ways, including mowing, burning, bulldozing, cutting, spraying with herbicides, or applying chemicals designed to reduce the amount of water lost through the leaves of riparian wetland plants. With the destruction of the riparian vegetation, however, the benefits of riparian areas are lost, e.g., assimilation of wastes, control of erosion, slowing floodwaters, moderating temperatures, and providing food and habitat for fish and wildlife.

There are conflicting opinions on the merits of vegetation management. Some studies suggest that the water conservation benefits have been overstated and may be nonexistent (Welder 1988).¹⁹ Critics of these studies have suggested that ground water pumping in the area may have confounded the results and made it impossible to determine whether water conservation occurs (Weeks 1987).

Western "riparian" wetlands are typically linear, ribbon-like strips of land along freshwater streams or lakes. They occur in the transition zone between arid uplands and rivers, lakes or streams and consist of a large variety of plant communities that support many fish and wildlife species. Although often referred to as bottomlands or floodplains in the East, in the arid West they are adjacent to much drier upland.

Because of the arid climate, western wetlands are usually restricted and small compared to wetlands in less arid climates. But because of their location in an arid environment, acre for acre they are more important than wetlands in regions with greater precipitation.

The Bureau of Reclamation, the Corps, and the International Boundary and Water Commission (IBWC) have all engaged in vegetation management as part of their statutory responsibilities or as operational and maintenance activities for water programs.

¹⁹See vegetation management section of Chapter XII.

Removal of plants accompanied most major multi-purpose water and flood control projects built and/or operated by these agencies. For a number of reasons the agencies have reduced their vegetation management activities: the extent of the environmental damage, questionable water conservation benefits, little new construction and what construction there is entails mitigation. Indeed, in recent years, the Bureau's vegetation management projects have focussed on removing saltcedar in an attempt to reestablish native riparian vegetation of higher value to wildlife. The Bureau does not currently manage vegetation for water salvage, but is considering its use in the lower Colorado River region, and is planning on doing more research before deciding on a management strategy. Both the Bureau and the Corps engage in vegetation removal as a standard operating procedure in maintaining the water-transport capacity of floodways. The IBWC continues vegetation removal on a large scale to maintain the border between Mexico and the United States.

On floodways, the Federal Government covers the entire cost of vegetation removal. Cost sharing may be available for vegetation removal projects on private lands through the Agricultural Stabilization and Conservation Service. ASCS has not authorized vegetation removal as a soil and water conservation practice in all States and counties. In States and counties where vegetation removal is authorized, cost sharing varies, but approved projects receive approximately 50 percent funding.

SMALL-SCALE WATER DIVERSIONS

Small diversion structures capture and divert stream water for crop or pasture irrigation. Built mostly in the west to conserve limited water supplies, they consist of a small dam or dike constructed perpendicular to the stream, and divert water into a series of canals in the adjacent land. Small diversions lower instream water levels and reduce the flow to riparian vegetation. In Nevada, small diversions are thought to cause as much riparian wetland loss as large multipurpose projects. But because many were built over 20 years ago when no records were kept, any precise assessment of their impact is impossible. The Bureau of Land Management and the Forest Service provide easements or special use permits for small diversion projects that cross their lands. The ASCS may contribute funds on a cost-sharing basis. Building a small diversion structure for crop irrigation costs at least \$1500 and often more. The percentage paid by the Federal Government varies by county and by the amount of water a project is expected to "conserve." The Federal share can reach 70 percent in some areas. In Nevada, the Federal contribution averages about 50 percent per project, up to a maximum of \$3500 annually for a landowner. It is widely believed that the Federal

financial incentive has significantly increased the number of small diversions constructed.

USDA WATER CONSERVATION PROGRAMS

The Department of Agriculture oversees Federal soil and water conservation policy. The Soil Conservation Service (SCS) generally offers technical assistance and conservation planning to individual growers in the 3000 local SCS conservation districts, although cost sharing is available under some programs. The ASCS offers cost-sharing assistance to growers to implement structural soil and water conservation measures. Conserving water for agriculture, however, can sometimes conflict with wetlands protection. The Conservation Technical Assistance Program, the Resource Conservation and Development Program, the Agricultural Conservation Program, the Great Plains Program, and the Soil and Water Loan Program illustrate the kinds of conflicts that can arise.

Prior to 1980, the SCS Conservation Technical Assistance Program was a large-scale effort providing growers with advice on how to drain wetlands. ASCS funds were often used to implement the proposals. Regulations issued under the 1977 Executive Order on Wetland Protection limited the kinds of assistance that SCS and ASCS could offer to growers. Although the regulations have reduced the threat to wetlands, some drainage continues. For example, drainage of wetlands that occurs as a result of actions whose primary purpose is to provide adequate drainage to existing cropland is allowed, but damages must be mitigated for most wetland types. Additionally, SCS may offer assistance for projects that do not affect wetlands at the time they are constructed but may provide outlets that greatly facilitate wetland drainage in the future. This program was cited as a factor in wetland losses on the Delmarva Peninsula (chapter 15).

The SCS also administers the Resource Conservation and Development Program which offers technical assistance and funds to States, local governments, and nongovernmental bodies for the planning and installation of approved measures for flood prevention and water management, among other things. The program cost \$26.3 million in 1985, and was estimated to cost \$25 million in 1986. It is not known what proportion of the funds went to water conservation practices or what the specific wetland impacts were.

The Agricultural Conservation Program administered by ASCS shares between 60 and 75 percent of the costs (up to a maximum of \$3500) of a variety of conservation practices recommended through the SCS technical assistance program. These include measures such as land leveling, irrigation water recovery systems, and sediment

recovery ponds. The bulk of the cost-sharing assistance, however, has gone for terracing systems, waterways, ponds, permanent cover crops, and conservation tillage practices. Annual appropriations have been about \$190 million in recent years. The Great Plains Conservation Program administered by SCS similarly funds soil and water conservation activities in the 10 Great Plains States and has run about \$21 million annually.

The Farmers Home Administration guarantees and insures loans to growers and local government entities (rural cities, small towns, and water districts) to drill wells, construct ponds, dig ditches, and acquire irrigation equipment. These loans are offered on a first come, first served basis. In 1986, this program involved \$21 million in insured loans and \$5.7 in guaranteed loans.

In the past these programs have had very significant effects on the conversion of wetland to cropland. More recently the funds have been used to drain wet cropland or to conserve and manage water for irrigation and other purposes. Even these practices can significantly alter water regimes and affect wetlands, however. Historically, nine out of ten wetlands in the Nebraska Rainwater Basin were filled as a result of these conservation programs. Today in Nebraska, irrigation water recovery pits are still built in wetlands with Federal aid, and because of the lack of specificity in the governing statutes and regulations, a portion of some recovery pits can be expanded for drainage using Federal assistance and funds. In Delmarva, wetlands continue to be converted to sediment retention ponds and duck ponds with Federal assistance.

HYDROELECTRIC PROJECTS

Small hydroelectric projects²⁰ threaten riparian wetlands in mountainous States with numerous streams, as well as in other areas. Such impacts have grown with the passage of the Public Utility Regulatory Policies Act (PURPA) of 1978. PURPA was designed to increase energy self-sufficiency. It requires utilities to purchase energy from small hydroelectric operators at the utilities' avoided cost (cost of energy production). By requiring large energy companies to purchase power generated by small hydroelectric projects, PURPA guarantees a market, and thereby reduces the uncertainty and risk associated with the small venture. The guaranteed market increases expected net returns beyond those anticipated in the absence of the program, thereby stimulating project construction. Although specific

²⁰Facilities with a total installed capacity of less than five megawatts.

acreage of wetland habitat lost with small hydro development is unknown, by their very nature the projects require alteration of stream habitat and wetlands. PURPA also offered a 21 percent investment tax credit for Federal taxes, a 5 year depreciation schedule for the cost of capital investments, and loans of up to 90 percent for feasibility studies and up to 75 percent for project costs. Most of these incentives, however, have recently been eliminated.

The Federal Energy Regulatory Commission (FERC) regulates all non-Federal hydroelectric projects through a licensing program. FERC has been criticized for failing to develop adequate regulations and comprehensive plans to control the adverse environmental effects of hydroelectric power development and for ignoring the non-development values provided by waterways. Generally, the Commission has continued as a proponent of hydroelectric power despite recent court decisions requiring changes in licensing procedures that would protect other beneficial water uses. This narrow development focus is inconsistent with efforts by other Federal agencies such as the Corps, the Bureau of Reclamation, the Bonneville Power Administration, BLM, and the Fish and Wildlife Service, which spend millions of dollars each year to ensure the survival of and restore stocks of anadromous and other fish and wetland resources. Despite the Federal priority of conserving fisheries, sanctioned by the Pacific Northwest Electric Power Planning and Conservation Act of 1980 and other legislation, FERC continues to license harmful hydropower projects.

Comprehensive planning, consistent with the provisions of Section 10(a) of the Federal Power Act, could avert some of the resource conflicts and reconcile expensive and contradictory Federal programs, but such planning has not been fully undertaken. The comprehensive planning process would be improved by more active participation of State and Federal resource agencies. For example, the Fish and Wildlife Service submitted the North American Waterfowl Management Plan to FERC, which subsequently accepted it as a section 10(a)(2) comprehensive plan.

THE ELECTRIC CONSUMERS PROTECTION ACT

The Electric Consumers Protection Act of 1986 (ECPA) alleviated some of the problems associated with inequitable consideration of fish and wildlife and non-power values discussed.

- o First, it requires FERC not only to consider fish and wildlife values, recreation opportunities, and energy conservation equally with hydroelectric power development when new licenses are granted, but to incorporate resource agency recommendations received pursuant to the Fish and

Wildlife Coordination Act into its licensing conditions. To reject the recommendations, FERC must publish findings that (1) the recommendations are inconsistent with the purposes of the Federal Power Act and other applicable law and (2) the conditions it sets do comply with the Act and serve to "equitably protect, mitigate damages to, and enhance fish and wildlife."

- o Second, the Act requires FERC to assess fees to cover the cost of fish and wildlife studies and reviews.²¹ ECPA disallows PURPA benefits at new dams and diversions, unless: the project complies with specific fish and wildlife recommendations; FERC finds that the project will not have substantial, adverse effects on the environment; and the project is not located on a State or national wild and scenic river system or a river designated by a State as having important attributes which may be affected. There are few such exceptions among the proposed projects.
- o Third, ECPA amendments specifically include fish and wildlife (including related spawning grounds and habitat) in the list of non-developmental values to which FERC must give equal consideration when deciding whether to issue any license.
- o Finally, it required FERC to conduct a study of whether PURPA benefits should be extended to new small hydroelectric projects. FERC completed the study and recommended that PURPA benefits not be denied, because it believed that the environmental safeguards already in the Act were sufficient. (See second bullet above.)

The impact which ECPA has on wetlands and fish and wildlife resources depends on the manner in which FERC implements conservation recommendations. Since the Federal Power Act was passed in 1920, statutory language has escalated, requiring that greater concern be given to wetlands and fish and wildlife protection. By requiring that FERC explain why it is rejecting recommendations to protect these resources, the ECPA puts a greater burden on FERC. This reduces FERC's discretion in overriding environmental and nondevelopment water values in order to produce hydroelectric power. The Fish and Wildlife Service has noted improvements in the responsiveness of FERC to fish and wildlife conservation recommendations since enactment of ECPA. Nonetheless, resource agency recommendations are still only

²¹This requirement is clarified in the Energy Policy Act of 1992 which states that "any reasonable and necessary costs incurred by Federal and State fish and wildlife agencies" are to be included in charges paid by licensees.

advisory, and should FERC decide that specific measures to protect, mitigate, and enhance wetlands and fish and wildlife are inconsistent with the Federal Power Act, these resources are likely to suffer.

FEDERAL INCOME TAX CODE

The Tax Reform Act of 1986 repealed the investment tax credit that allowed agricultural investors to reduce their tax liabilities by 10 percent of the cost of sprinkler systems and other capital installations. The code now allows accelerated write-offs for certain "depreciable" property such as capital investments in irrigation. These investments are also subsidized by a special provision within Section 179 of the revenue code, which permits taxpayers to deduct as an ordinary business expense the first \$10,000 of any investment. Irrigators commonly use accelerated depreciation and section 179 expensing for sizable investments such as sprinkler equipment, water well drilling, and ditch excavation, all of which can have negative effects on wetlands. In addition, certain irrigators may claim a special water depletion allowance. This deduction is available where an underground source is being pumped at an unsustainable rate. It enables an irrigator to compensate for a theoretical decline in property value that is presumed to go with the exhaustion of the water supply.

Collectively, these tax code provisions encourage groundwater overdraft. This is ironic, since one of the major reasons for dam construction in the arid West was to relieve pressure on the aquifers. Development of the surface water supplies was intended to alleviate groundwater depletion.²² Indeed, cheap surface water did replace groundwater in some service areas, but as the aquifers recovered, pumping for irrigation became technically and economically feasible elsewhere.²³ Thus, in the absence of any regulation, groundwater depletion continues, although at a reduced rate.

²²See CVP purposes in House Document No. 191, 73rd Congress, 1933 and House Document No. 416, Central Valley Project Documents, Part 1, Authorizing Documents, 1956.

²³See Bertoldi, et al., 1991 for a discussion of groundwater problems in the Central Valley of California emanating from the hydrologic changes due to 1) development of groundwater for agricultural purposes and subsequent depletion of groundwater and 2) surface water development in relation to groundwater depletion.

REFERENCES

- Bertoldi, G.L., R.H. Johnston, and K.D. Evanson. 1991. Groundwater in the Central Valley, California -- A Summary Report, USGS professional paper 1401-A. U. S. Geological Survey, Washington, DC.
- EcolSciences. 1976. An Assessment of Economic and Environmental Effects of Completed PL-566 Channel Modifications Projects in Worcester and Wicomico Counties, Maryland. USDA-SCS College Park, Maryland, 433 pp.
- Moore, M. and C. McGuckin. 1988. Program Crop Production and Federal Irrigation Water in Agricultural Resources: Cropland, Water, and Conservation Situation and Outlook Report, publication no. AR-12. Economic Research Service, U.S. Department of Agriculture, Washington, DC, pp. 39-46.
- National Academy of Science. 1992. Restoration of Aquatic Ecosystems. National Academy Press, Washington, DC.
- Tiner, R.W., Jr. and J.T. Finn. 1986. Status and Recent Trends of Wetlands in Five Mid-Atlantic States: Delaware, Maryland, Pennsylvania, Virginia, West Virginia. U.S. Fish and Wildlife Service, Newton Corner, Massachusetts and U.S. Environmental Protection Agency, Philadelphia, Pennsylvania, 40 pp.
- U.S. Bureau of Reclamation. 1981. Acreage Limitation: Draft Environmental Impact Statement, including the Westwide Report Appendix. Water and Power Resources Service. Denver, Colo.
- U.S. Bureau of Reclamation. 1987. Assessment '87...A New Direction for the Bureau of Reclamation. Washington, DC.
- U.S. Department of Agriculture. 1987. Farm Drainage in the United States: History, Status, and Prospects. Edited by George A. Pavelis. Economic Research Service. Miscellaneous publication no. 1455. Washington, DC, 170pp.
- U.S. Environmental Protection Agency. 1989. Wetland Creation and Restoration: the Status of the Science. Edited by Jon A. Kusler and Mary E. Kentula. Environmental Research Laboratory, Corvallis, Oregon, 600pp.
- U.S. General Accounting Office. 1981. Federal Charges for Irrigation Projects Reviewed Do Not Cover Costs, Report No. PAD-81-07. Washington, DC.

- Wahl, R.W. 1989. Markets for Federal Water: Subsidies, Property Rights, and the Bureau of Reclamation. Resources for the Future, Washington, DC, 326pp.
- Ward, J.R., A.E. Kinsinger, and M.E. DuPraw. 1987. Dollars and Sense in Irrigated Agriculture: The Need for a Consistent Tax Policy. Natural Resources Defense Council. New York and Washington, DC, 27pp.
- Ward, J.R., F.K. Benfield, and A.E. Kinsinger. 1989. Reaping the Revenue Code: Why We Need Sensible Tax Reform for Sustainable Agriculture. Natural Resources Defense Council. New York, 142pp.
- Welder, G.E. 1988. Hydrological Effects of Phreatophyte Control, Acme-Artesia Reach of the Pecos River, New Mexico, 1967-82. U.S. Geological Survey Water Resources Investigations Report 87-4148. Prepared in cooperation with the Pecos River Commission, Albuquerque, New Mexico, December.
- Weeks, E.P., H.L. Weaver, G.S. Campbell, and D.D. Tanner. 1987. Water Use by Saltcedar and by Replacement Vegetation in the Pecos River Floodplain between Acme and Artesia, New Mexico. U.S. Geological Survey Professional Paper 491G, 33 pp.
- Zinni, W. 1986. Unpublished staff analysis. U.S. Fish and Wildlife Service, Newton Corner, Massachusetts.

Chapter 5: INFRASTRUCTURE, LOCAL DEVELOPMENT, AND HOUSING PROGRAMS

Transportation networks, including highways and airports have a significant impact on wetlands.¹ Because transportation projects frequent the landscape and because their expansion usually requires a great deal of land, wetlands often provide the most economical sites. To build highways or airport runways in wetland areas, however, means diverting water flows, filling wetlands, and often isolating a wetland area from adjoining lands, all of which can radically alter the character of the land and water and the organisms living there. Once constructed, runoff from these transportation corridors can contaminate nearby wetlands. In addition to the direct effects of construction and operation, transportation networks and other infrastructure (such as marinas, electrical power facilities, and waste treatment facilities) create the basis for additional development. The secondary impacts often far exceed the initial effects of the construction, but are rarely considered in planning for wetland protection.

A wide array of Federal programs promote local development and housing construction. To some extent the overall growth results from Federal economic policies designed to stimulate population growth and a healthy economy. Population growth is stimulated by Federal efforts such as welfare programs, programs to encourage family formation, and public education. Tax policy, trade agreements, technical assistance, grants, loans, and even recreational projects are largely justified as measures to enhance economic growth and prosperity. Many of these also lead to extensive land consumption, and in the process, wetlands are altered.

Local development programs often involve the filling of wetlands. Once built, the structures and facilities located in former wetlands frequently require costly flood control measures to protect them from storm damage. Replacing natural vegetation with concrete also exacerbates flooding. When serious flooding does occur, subsidized insurance and disaster relief offset the damages and provide incentives to rebuild in the flood prone area. This typically results in calls for more Federal flood control projects to improve protection. Wetland water quality also declines as a result of surface run-off of pollutants from residential, commercial, and industrial development. Many business centers and residential developments are situated near the water's edge for aesthetic reasons. Some locate in former

¹Navigation projects are discussed in the preceding chapter.

wetlands due to lower-priced land. Many industries select sites in or near wetlands because they require water in their industrial processes. These development activities frequently contribute to the loss and degradation of wetlands.

FEDERAL-AID HIGHWAY PROGRAM

The Federal Highway Administration (FHWA) oversees the Federal-Aid Highway Program, one of the largest and most costly Federal construction programs. FHWA awards grants to the State departments of transportation to assist in developing an integrated, interconnected network of highways. The program is financed through the Highway Trust Fund, which draws its monies from taxes on gasoline, tires, truck and trailer sales, as well as user fees from heavy vehicles. Funds may be used to construct, improve, or rehabilitate the interstate highway system, primary, secondary, and urban roads and streets. They may also be used to replace or repair deteriorating or obsolete bridges, and in some cases, fringe and corridor parking facilities, rest areas, pedestrian walkways, and bikeways. The Federal share is 90 percent for interstate projects, 80 percent for bridges, and 75 percent for most other projects. The Federal share may be increased for States with large areas of public lands. Congress authorizes spending from the Trust fund annually, and the monies are apportioned to the States according to formulas. The formulas vary depending on the types of roads and the needs of one State relative to those for all States.

To qualify for Federal highway funds, States must plan highways in accordance with Federal regulations, but are otherwise free to determine statewide priorities. After agricultural programs and multipurpose water projects, the Federal highway program was most frequently identified as a source of wetland loss in the various study areas. Federal requirements protect publicly-owned parks, recreation areas, and wildlife refuges which are classified as significant resources from new highway development, but the regulations do not apply to public lands not so classified or to privately-held lands.

A key criticism of Federal and State highway agencies has been that they fail to plan for highways in a comprehensive fashion, proceeding instead on a piecemeal basis. The absence of comprehensive planning leads to administrative inefficiency by requiring independent reviews of numerous, small segments of the same project and to a systematic underestimation of total project impacts. Of particular concern here is the inducement of subsequent growth, typically labelled indirect effects. Highway authorities often claim that as currently conducted, planning on a segment basis facilitates contracting. By subdividing a project into small parts, the level of regulatory review under

various environmental statutes, including Section 404 of the Clean Water Act² can often be reduced. In some cases, this effectively excludes resource agencies from the review process.

How to avoid and to mitigate unavoidable damages to wetlands resulting from highway projects has become a major public issue. Until recently, the FHWA's policy was to mitigate adverse impacts caused by a proposed project if the expenditure was considered reasonable given the severity of the impact. Federal funding for off-site mitigation (outside the right-of-way) was resisted strenuously and permitted only as a last resort. Some States have begun to devote their own funds to the mitigation of wetland impacts when the FHWA has refused to do so. States vary, however, in the consideration which they give to wetlands, partly because FHWA mitigation regulations allow considerable latitude.

Until recently (1990), resource agencies and the FHWA often disagreed about what constitutes a significant impact to wetlands and how much should legitimately be spent to compensate for the loss. FHWA has been mitigating on the basis of one acre for each acre destroyed, ignoring the functional values associated with the lost wetlands as well as the uncertainty of successful mitigation. Further, FHWA has been utilizing a flawed policy of subtracting wetland acreage remaining in highway rights-of-way from the total to be mitigated. (Narrow strips of land created next to a highway are of less value than the blocks of undisturbed wetlands that formerly existed, even if the acreage is identical.) Also, confusion frequently developed over who had responsibility for overseeing the mitigating contractor's work and how to finance the maintenance of the mitigation area. Moreover, there were no guarantees that the areas set aside in compensation for lost wetlands would themselves be protected.

On April 20, 1990, the Federal Highway Administrator issued an Environmental Policy Statement that may remedy some of these problems. The new policy emphasizes FHWA's commitment to the goal of no net loss of wetlands, and commits the agency "to work vigorously to preserve and, where practicable, enhance the environment." Specifically with respect to wetlands, the policy calls for "all practicable measures to avoid, minimize, mitigate, and compensate for wetland impacts." The new policy does not commit FHWA to mitigating outside highway rights-of-way or to acknowledging functional values of wetlands, but it establishes a standard of environmental sensitivity markedly different from that which the agency subscribed to in the past. Further, the recent Corps/EPA MOA on mitigation places new requirements on

²Section 404 prohibits the disposal of dredged or fill material into waters of the United States, including wetlands without a permit from the Corps of Engineers.

FHWA and State highway agencies. All of these changes may improve the consideration of wetlands in highway project planning.

On March 17, 1987 and April 8, 1991, FHWA amended its regulations (23 CFR 777) regarding mitigation of adverse environmental impacts to privately owned wetlands caused by new construction on Federal-aid highway projects. The changes include replacing the one-to-one acre wetland replacement policy with a more flexible policy based on "equivalent wetland functions." Additionally, the FHWA may now mitigate for any reasonable adverse impacts, rather than only significant impacts, and with approval of the Regional FHWA Administrator, may mitigate outside the highway right-of-way. These changes should also continue to resolve the above concerns.

Among the regions examined by the Department, highway construction was cited as an activity affecting wetlands in New Jersey, Florida, Maryland, North Carolina, Alaska, Louisiana, and Michigan.

FEDERAL AVIATION ADMINISTRATION GRANTS

All airports listed in the National Airports System are eligible for grants under the Airport Improvement Program administered by the Federal Aviation Administration (FAA). The FAA is charged with maintaining a nationwide system that meets the needs of civil aeronautics. States, counties, municipalities, Tribes, U.S. Territories, and private owners of smaller airports may receive grants for, among other things, planning, land acquisition, site preparation, terminal developments, construction and repair of runways, aprons, and roads within airport boundaries. The Federal Government will cover 90 percent of the costs of airport planning and development at all listed airports, except those primary airports serving 25 percent or more of the Nation's air travelers where it will cover 75 percent of the planning and development costs. The Federal Government will pay 50 percent of terminal development costs at all listed airports. The large percentage of airport costs borne by the Federal Government may induce more expansion than otherwise would occur.

Because of public safety considerations and lower land costs, airports often occur in areas removed from urban development. More often than not the areas where airports are sited include some wetland habitats. Airport development and expansion have been identified as threats to wetlands in Northeastern New Jersey, California, the Florida Everglades, and Puerto Rico. The extent of wetland impacts from FAA programs is largely unknown.

The FAA's mitigation policy is not as formal as that of the FHWA. Airport development funds may be used to replace lost wetlands. Because FAA has a rather small environmental review staff and no formal policy for mitigation, it tends to rely on the advice and recommendations of Federal and State resource agencies. Typically, the non-federal airport authority assumes responsibility for the quality of mitigation efforts, although FAA has no rules stipulating a responsible party or describing what should be done in cases of unsuccessful mitigation. FAA may fund maintenance of compensatory wetlands located on airport property, but the funding is less clear for off-site mitigation activities. One major difficulty that FAA encounters as a result of wetlands located near airports is protecting planes from collisions with birds.

WATER-BASED RECREATIONAL DEVELOPMENT PROGRAMS

Federal funds support water-based recreational developments occurring near or in coastal wetlands. Public marinas, harbors-of-refuge, and boat launches can receive monies from the Land and Water Conservation Fund administered by the National Park Service or from the Federal Aid in Sport Fish Restoration Fund administered by the Fish and Wildlife Service. A recent expansion of the Federal Aid program, known as Wallop-Breaux, slates at least 10 percent of the funding for boating and fisherman access facilities, so an increase in construction is expected. Private marina developments can receive funds via Coastal Zone Management Grants and Sea Grant research and extension services overseen in the Department of Commerce.

RURAL ELECTRIFICATION ADMINISTRATION LOANS

The Rural Electrification Administration (REA) within USDA provides loans and technical assistance to assure adequate and dependable electrical and telephone service to rural areas at rates that permit full and productive use of the services. To this end, REA offers long-term, insured loans and will guarantee loans to rural electric cooperatives, public utility districts, power companies, and municipalities to supply ongoing, central station electric services in rural areas. These areas usually lie outside of the boundaries of cities, villages, or boroughs with populations exceeding 1500 inhabitants. REA activities were noted specifically in the Florida Everglades, Michigan, North Carolina, and Alaska as a factor in wetland decline where the availability of electrical power at reduced rates encourages growth and more intensive use of wetland areas.

Although the REA will often finance the entire project, it sometimes requires that the project sponsor obtain a concurrent

loan for 10, 20, or 30 percent of the total. Insured loans average about \$3.3 million and guaranteed loans about \$5 million. In 1985, REA obligated \$562 million for insured loans and \$74.6 million for guaranteed loans, and expected to add another 330,000 consumers and 25,000 miles of power lines. REA also offers and guarantees loans to assure that people in eligible rural areas have access to telephone service comparable in reliability and quality to the rest of the Nation.

WASTEWATER TREATMENT CONSTRUCTION GRANTS

On balance, the treatment of sewage improves water quality and wetland health. Indeed, some artificial wetlands serve as tertiary treatment facilities for sewage. Nonetheless, sewage treatment is an essential element for development, and sewage facilities are usually located near rivers or lakes into which they release the treated water. Wetlands are often the only remaining open space near waterways, and hence serve as sites where treatment facilities are commonly built. Moreover, when the treatment site is prepared and sewer lines are dug, fill material is sometimes dumped in wetlands.

The operation of these facilities can alter hydrologic regimes and wetland communities when water is discharged continuously and also when it is flushed to create surges. Further, instead of creating artificial wetlands, existing wetlands are sometimes used for treating sewage. Also, sewage treatment plants produce a residual sludge containing pollutants from runoff and household and industrial wastes. These pollutants are generally not harmful in small quantities, but can prove dangerous when concentrated. Sludge is sometimes used as fill material for wetlands. When the sludge is deposited in landfills, the pollutants can seep into the groundwater or adjacent waterways.

Discharge of wastewater effluent is a regulated activity, however, and is unlikely to go unscrutinized. EPA regulations call for at least secondary treatment of wastewater effluent before it can be discharged into waters of the U.S., including wetlands. Municipal discharges must meet minimum technology requirements and conform with all applicable State water quality standards. EPA regional offices are supposed to review any proposals to use natural wetlands for tertiary treatment. Finally, any alteration of a wetland to facilitate tertiary treatment may require a 404 permit, a NEPA review, or consideration under a number of Federal and State statutes.

Federal law has authorized grants for planning, design, and construction of municipal sewage treatment facilities since 1956. The program was greatly expanded in 1972, and since then, Congress has authorized \$59 billion and appropriated \$48 billion

for grants to aid wastewater treatment plant construction. The EPA administers the construction grant program under the authority of the Clean Water Act. EPA allocates grants among the States according to a formula based on population and an estimate of the capital cost necessary to bring a State into compliance with the law.³ Grants generally cover 55 percent of the total project costs. For innovative technology, however, 75 percent Federal funding is allowed. Wetland problems related to the siting and construction of sewage treatment facilities were identified specifically in New Jersey and Michigan.

A 1984 estimate indicated that States need \$109 billion to construct municipal wastewater treatment plants. In response to criticism that the construction grants program had become a massive public works program rather than water quality improvement program, Congress amended the law in 1981 to limit funding to projects that would clearly meet the goals of the Act. In 1987, concerned about the budget deficit, Congress instituted a transition period through 1994, after which States would assume greater responsibility for financing sewage treatment. Traditional grants will continue through 1990. But Congress also authorized \$8 billion to be spent between 1989 and 1994 for a revolving loan fund to be matched by the States. Monies used for wastewater treatment construction are to be repaid to the State and recycled for future construction in other communities. EPA may not use construction grant money for the purchase of land, including mitigation wetlands. It can, however, require local communities to compensate for lost wetlands. The EPA does not have a clear-cut policy guiding its community mitigation requirements.

DISASTER RELIEF AND NATIONAL FLOOD INSURANCE PROGRAMS

Prior to the National Flood Insurance Act of 1968, flood insurance was virtually unavailable in the United States. (Flooding has always been more destructive of life and property in the United States than any other natural hazard.) Private insurance companies were reluctant to offer flood insurance largely because of the limited actuarial data on the frequency and magnitude of floods and because of the potential for a catastrophic event that could threaten a company's solvency

³The intention was to have the formula for allocating funds between States reflect the needs of one State relative to those for all States and to create equity and efficiency in achieving wastewater standards. The design is flawed, however, and consequently, the formula does not fulfill any of the intended goals. See Rose et al. 1977, especially chapter 6, Evaluation of Alternative Allotment Programs.

before sufficient reserves accumulated. Thus, Federal disaster relief programs, financed entirely out of the Federal treasury, were the main source of aid following a major flood. Although disaster relief was undoubtedly not the principal incentive inducing development in floodplains, it did help to offset the risk. Federal taxpayers shouldered the risk assumed by those locating in floodplains. Because of the high Federal costs and the inequitable distribution of the financial burden on taxpayers rather than property owners, Congress instituted the National Flood Insurance Program.

The National Flood Insurance Program (NFIP) is a composite of several Federal laws designed to provide flood insurance for communities threatened by flooding and to encourage comprehensive planning to minimize future flood losses. Under the program, the Federal Government provides insurance protection directly and through private insurance companies. To qualify for the insurance program, communities must adopt and enforce floodplain management regulations that meet NFIP standards. These regulations are designed to avoid economic damages resulting from floods either by elevating or floodproofing structures that are constructed in the floodplain or by discouraging development of flood-prone areas and guiding development away from areas threatened by flooding.⁴ With the NFIP Congress gave notice that: it would no longer offer a blank check in the form of disaster assistance; it wanted people to self-insure; and for properties in which the Federal Government has a financial interest, it wanted the property owner to indemnify the Federal Government against loss from flooding. Communities without flood insurance are ineligible for disaster relief in the event of floods and prospective lenders must be notified. The Department of Housing and Urban Development initially administered the program, but the responsibility has since been assumed by the Federal Emergency Management Agency (FEMA), an independent agency.

FEMA attempts to limit floodplain development by identifying flood hazard zones, assessing risk, establishing floodplain management criteria, and overseeing local management compliance. FEMA defines a floodplain broadly as any land area susceptible to

⁴The 1968 Flood Insurance Act marks a pivotal point in legislative history, not just because it established the flood insurance program, but because it constitutes one of Congress's few ventures into land-use regulation. Because of its limited authority and great reluctance to engage in direct land-use regulation, Congress chose to influence the character of floodplain development by making flood insurance available only in those communities which agreed to institute local floodplain regulations which implemented Federal standards.

being inundated by water from any source during the 100-year flood event.⁵ This includes partial or complete inundation of normally dry land by the overflow of inland or tidal waters or the rapid accumulation of runoff waters. FEMA regulations implementing the NFIP stipulate management criteria that States and localities are supposed to follow in floodplain areas. The regulations establish different levels of control for different risk areas within the floodplain. Thus, FEMA is involved in extensive mapping efforts to delineate the floodplain and the different risk areas within it. Flood Insurance Rate Maps (FIRMS) are prepared to reflect this information.

On the basis of the maps, States and localities are supposed to adopt measures to restrict development of land exposed to flood damage, guide development of proposed construction away from floodplains, flood-proof structures, and improve land management of flood-prone areas.⁶ FEMA is to work closely with the States and localities to see that such measures are adopted and enforced. In some areas, however, FEMA has been criticized for failing to enforce its standards:

- o In Puerto Rico, a study sponsored by FEMA and conducted by the Corps of Engineers revealed that the Planning Board had not followed the FIRMS in regulating floodplain development. As a result of the study, steps have been taken to bring the Commonwealth into compliance. However, FEMA readily acknowledges that problems remain.
- o On occasion FEMA maps have not accurately reflected the flood hazard, thus allowing development to proceed in floodplains without proper safeguards and without insurance rates that reflected the true risk. With approximately 65 percent of the mapping conducted by private sector engineering firms, 30 percent by other Federal agencies, and the remainder by State and local governments, variations in maps' accuracies would seem inevitable, despite the uniform study guidelines and specifications established by FEMA.
- o There is currently no requirement that the wetlands used in calculating existing flood control capacity be protected, and thus they are sometimes developed while their protective qualities are still assumed in existing FIRMS. Although changes in flood control capacities are considered when maps are redrawn, at present, budgetary constraints and

⁵One percent annual chance of occurrence.

⁶Local flood control measures such as channelization serve to decrease the area exposed to flooding, thereby causing restrictions to be lifted.

priorities allow FEMA to update only 5 percent of floodplain maps annually. This results in the use of FIRMs which are outdated and do not reflect the current flood hazards. Effective wetland and floodplain protection by the program, hinges on accurate FIRMs.

To encourage participation in the insurance program, the Federal Government initially charged subsidized rates to owners of existing properties, while owners of new or substantially improved structures were to be charged rates reflecting the risk of damage. Although Administration policy was to move toward actuarially sound rates, this proved problematic. Between 1968 and 1981 premiums covered only 46 to 47 percent of the operating expenses of the program. Since the early 1980s, however, rates have been actuarially sound for new construction,⁷ and the program has not required an appropriation since 1985.

Insofar as the National Flood Insurance Program helps to reduce development in floodplains, it serves to protect wetlands along streams, lakes, and oceans. FEMA estimates that development restrictions and building requirements discourage the encroachment and placement of fill on approximately 9,000 square miles of floodways which include many areas of wetlands. However, the NFIP remains effective only as long as (1) the program is actuarially sound and insurance rates reflect the true risks of locating in flood-prone areas, (2) mapping is accurate, and (3) development restrictions and requirements under the program are aggressively enforced.

URBAN DEVELOPMENT ACTION GRANTS

The Urban Development Action Grant (UDAG) Program, administered by the Department of Housing and Urban Development, was established in 1977 to help cities (large and small) and urban counties to relieve their economic and physical deterioration. Although still authorized, the program has not been funded since 1989. The program was designed to stimulate private investment by providing matching grants for economic development projects. UDAG awarded funds to a community (either a distressed area or a non-distressed area with pockets of poverty), which in turn granted or lent the monies to private developers. This improved the financial feasibility of otherwise marginal, private-sector

⁷Including the reconstruction of buildings which had sustained "substantial damage," defined as the cost of repair being greater than or equal to half the market value of the property. For such structures, rates were increased to make them actuarially sound, and the repaired property had to comply with the regulatory standards for new construction.

development projects. The expectation for the program was that it would have a ripple effect and stimulate additional private investment in the area, increase local tax revenues, and create jobs.

Grants were awarded for three types of projects: industrial, commercial, and neighborhood. Neighborhood projects were often a mix of housing and commercial development, but residences could qualify. From 1978 through 1983, all UDAG applications that met threshold requirements, such as a firm commitment for private financing, were funded. In 1984, HUD instituted a competitive application system based on the amount of poverty and aged housing in the area. In 1985, UDAG grants totaled \$559.3 million. This figure fell to \$249.7 million in 1986. FY88 was the last year that monies were appropriated for UDAG.

The UDAG program was mentioned as a factor in wetland decline in Alaska, Louisiana, Michigan, North Carolina, New Jersey and Puerto Rico. In 1986, Puerto Rico received 25 percent of the grants, more than any other State. The quality of environmental review occurring under the UDAG program in Puerto Rico was criticized for not providing resource agencies with sufficient opportunities to review maps of proposed project locations. UDAG allowed a number of projects to be built in marshes and near mangroves. These actions appear to have violate the Executive Orders on Wetland Protection and Floodplain Management which obligate Federal agencies to minimize development in wetlands and floodplains. The situation may have deteriorate further, because in 1986, HUD's Regional Administrator announced a new policy that would allow local officials to determine where structures are located.

In Puerto Rico, UDAG projects received subsidies averaging 25 percent of total costs. Without this level of subsidy many of these projects would not have proven economically feasible. In fact, some of the existing commercial and industrial sites are not operating to capacity and some have even been abandoned, raising questions about the need for additional development. Critics of the program maintain that in Puerto Rico, UDAG only temporarily relieved poverty, served more to aid a few influential people rather than the communities as a whole, and proceeded without adequate environmental safeguards.

COMMUNITY DEVELOPMENT BLOCK GRANTS

Block grants transfer funds from the Federal Government to the States and are often contrasted with categorical grants. Categorical grants provide funds to a State for narrowly defined purposes, such as relieving distressed areas and constructing highways or airports. Block grants are given to States along

with broad discretion over how to use the monies. With categorical grants, Congress determines the purpose of the grant and the Federal Government retains significant control over the funds. With block grants, States have much more latitude. Community Development Block Grants (CDBG) aid States in developing viable urban communities with decent housing, a suitable living environment, and expanding economic opportunities, especially for those of low and moderate income. Within this broad mandate, States develop their own programs and funding priorities.

The Department of Housing and Urban Development administers the program, and the Secretary has a discretionary fund to finance State planning efforts. In 1986, \$23 million was used to transfer skills and knowledge in planning, developing, and administering the CDBG (and UDAG) programs from those individuals and institutions which possess them to eligible block grant entities which need them. In the same year, about \$729 million was distributed among the States under the CDBG program by means of formulas that consider population, poverty, overcrowding, and age of housing. The CDBG program comprises two subprograms; the Entitlement Program applies to larger cities and the Non-entitlement Program applies to small communities.

Community Development Block Grants were noted as a factor in wetland decline in Alaska, Michigan, North Carolina, and Puerto Rico. Environmental review generally falls to the States or municipalities. In Puerto Rico where funds are often used for roads, recreational facilities, and shoreline protection, not only is the environmental review inadequate, but sometimes the engineering studies are faulty.

ECONOMIC DEVELOPMENT ADMINISTRATION PROGRAMS

The Economic Development Administration (EDA), operating in the Department of Commerce, sponsors an array of programs, including construction grants, low-interest and guaranteed loan programs, and technical assistance funds, to encourage growth in geographic areas where the economy is lagging behind the rest of the nation. The following list describes many of these programs:

- o Grants for public works and development facilities to States or their political subdivisions, as well as private or nonprofit organizations to create permanent jobs in the private sector. Federal grants may cover 50 percent of the project cost, but in severely depressed areas Federal funding can range up to 80 to 90 percent. In 1986, grants were estimated to total \$146 million.

- o Guaranteed and insured loans to private borrowers whose projects have been approved by the proper State agency. The loans provide financial assistance where funds are not available from other sources on terms and conditions furthering project goals and economic development in the area. Borrowers must obtain at least 15 percent funding from other sources, and guaranteed loan applicants must obtain at least 20 percent. Loan guarantees were estimated to total \$30.4 million in 1986.
- o Grants to counties or nonprofit organizations representing groups of adjoining counties to foster development planning and implementation capability. Non-Federal sources must contribute at least 25 percent of the funding (except for Indian Tribes) in cash or in-kind contributions. In 1986, an estimated \$18.2 million was to be spent on this program.
- o Technical assistance grants mainly to private, nonprofit groups, local governments, and educational institutions in support of demonstration projects, feasibility studies, management and operation assistance to increase and diffuse knowledge about promoting economic development in depressed areas. Grants were expected to amount to \$7.7 million in 1986.
- o Smaller grant programs exist for adjustment to sudden and severe economic dislocation and long-term deterioration and for conducting research on economic underdevelopment.

EDA programs make funds and assistance available for projects that otherwise might not proceed. They have been identified as sources of wetlands impacts in Alaska, Michigan, North Carolina, and Puerto Rico.

HOUSING PROGRAMS

The Federal income tax code along with guaranteed and direct loans offered by several different Federal agencies have played a significant role in promoting single-family home ownership and the pattern of low density housing that characterizes land use in the United States. Housing along with the support facilities they spawn, including public buildings, recreational services, and demands for more infrastructure development, compete with wetlands for space. Federal tax subsidies give preferential tax treatment to homeowners in the form of income tax deductibility of mortgage interest and property taxes. This tax treatment applies to second homes as well as primary residences.

The Veteran's Administration, HUD, and the FmHA all provide loan guarantees or direct loans with terms more favorable than those

available in the private financial market, thereby increasing the demand for housing and the pressure on wetlands. The VA provides credit assistance to eligible veterans and active duty personnel, so that they can obtain private capital on more liberal terms than is available to non-veterans. The Federal Government guarantees loans made by private lenders in return for reducing or eliminating downpayment requirements, extending repayment periods, and other requirements generally applied to conventional home mortgages. Where private capital is not available in non-urban areas, the VA may make direct loans.

HUD insures lenders against loss on mortgage loans. These guaranteed loans may be used to finance the purchase of proposed, under construction, or existing 1 to 4 unit housing, as well as to refinance indebtedness on existing housing. Maximum loan limits apply, depending on the number of single family units. The programs is geared to help moderate and middle income persons obtain housing. The terms of the loans are most liberal for veterans, then occupant mortgagors, and finally for non-occupant mortgagors.

HUD also offers mortgage insurance to enable disaster victims to obtain home loans. Under one program, loans may be given to occupant mortgagors who are victims of a disaster in a presidentially-declared disaster area. The loans are to finance the purchase of proposed, under construction, or existing single-family housing. Disaster victims are not required to meet the 3 percent minimum investment requirements that apply to other occupant mortgagors. Another program is to make home ownership more readily available to those displaced by natural disaster, urban renewal, or other Government actions and to increase home ownership opportunities for low and moderate income families. Through September, 1985, HUD mortgage insurance under these various programs applied to over 12 million mortgage units, insured for a value exceeding \$211 billion.

FmHA provides farm ownership and operating loans, as well as emergency loans to cover losses from natural disasters.⁸ It also provides direct loans to assist low-income, rural families to obtain decent housing. The loans can be used for construction, repair, or purchase of housing and for sewage disposal facilities, among other things. Under another program, the FmHA guarantees rural, rental housing loans to construct, purchase, improve, or repair rental or cooperative multi-unit housing and to provide approved recreation and service facilities.

⁸See the section on farm credit in chapter 3.

The array of programs is an indication of the degree to which the Government has become involved in augmenting the provision of shelter by the private sector. These programs operate under the umbrella of the Executive Order on wetlands, but conservation and environmental protection are not the principal mission of these programs. Accordingly, the managing authorities generally give secondary consideration to wetland issues. Many wetland impacts from housing programs should be the subject of review under the 404 program, but for a variety of reasons, they do not always receive thorough scrutiny.

THE COASTAL BARRIER RESOURCES ACT OF 1982⁹

Coastal barriers are depositional, geologic formations such as islands, spits, and peninsulas. They exist on all United States coastlines, but are most well-developed along the Atlantic and gulf coasts. These barriers are valued as the first line of defense against wind and tidal energies, especially from the normal scour of waves, winter storms, hurricanes, and northeasters. Barriers shift into a variety of shapes and sizes to absorb ocean energies and buffer the mainland, bays, and inlets. Human developments such as houses, condominiums, hotels, shopping centers and transportation networks are drawn by the aesthetic appeal of the barriers. Yet, such development destroys expansive dunes and causes barrier erosion, thus also impairing the capacity of barriers to shield inland areas. Further, barriers are dynamic systems that support a highly diverse wetland habitats, as well as wildlife and other organisms. As the barriers shift over time, human developments associated with the barriers become threatened and heroic measures are typically required to protect the investments. These are only short run measures, and must ultimately yield to the forces of nature. In the meantime, these developments are vulnerable to storms.

Recognizing the value of these barriers, Congress passed the Coastal Barrier Resources Act (CBRA) in 1982. CBRA protects areas subject to ocean damage from the effects of infrastructure, housing, and local development programs by limiting Federal expenditures and assistance for development within designated barrier units. The Act designated almost half a million acres of relatively undeveloped coastal barriers along the eastern seaboard and Gulf Coast as subsidy-free zones; it made new development activities within these designated areas ineligible for most federally financed assistance. This includes the Federal programs discussed above, such as grants for highways, bridges, ports, and airports, urban development action grants,

⁹CBRA was amended by the Coastal Barrier Improvement Act of 1990.

Veteran's Administration and Federal Housing Administration guaranteed loans, as well as Corps of Engineers assistance. Disaster relief (except for emergency assistance) and Federal flood insurance are also denied.

The program was seen as a way to minimize the loss of human life and property, to reduce wasteful Federal spending, and to protect environmental values. Supporters of the Act claimed it would save \$5.5 billion to \$11 billion in the first 20 years, and maintained that it would not require additional staff to administer. They also pointed out that the Act does not regulate private behavior, but merely proscribes subsidizing harmful development with Government funds and then using the Government to indemnify those who undertook the development. The Act was also seen as an environmental protection measure, and for that reason is administered by the Department of the Interior rather than FEMA. Preventing development on barriers protects fragile ecosystems, including associated coastal wetlands.

CBRA also required the Department to prepare a report to Congress with recommendations for additions to and deletions from the Coastal Barrier Resources System (CBRS). Based on the report,¹⁰ Congress passed the Coastal Barrier Improvement Act of 1990. The Act expanded the CBRS to over 1.25 million acres of shoreline extending more than 1200 miles and increasing the number of units from 186 to 582. Included in the expansion are new units in the Great Lakes, Florida Keys, Puerto Rico, the U.S. Virgin Islands, secondary barriers in large embayments (such as Chesapeake Bay), and wetlands associated with coastal barriers in the System.

The major limitation of CBRA from the perspective of coastal wetland protection is that it applies only to designated, largely undeveloped coastal barriers. The intent of the legislation was not to penalize existing communities but to remove Federal incentives for new development. The Act does not preclude development with private funds.

COLORADO RIVER FLOODWAY PROTECTION ACT OF 1986

The principles reflected in the Coastal Barrier Resources Act were applied to an inland area with the Colorado River Floodway Protection Act (CRFPA). Concerned about a repeat of the flood damages that occurred along the lower Colorado River in 1983, Congress passed CRFPA to protect human health, safety, and property, and to minimize damage to natural resources. The Act eliminates all new Federal expenditures and financial assistance that promote development within the designated floodway except

¹⁰Submitted to Congress on January 16, 1989.

for public health programs. The Act also established a task force to examine strategies for managing future development in the floodway including compensation for relocating and to advise the Secretary of the Interior, who is charged with administering the Act. By January, 1988, representatives of the Governors of the seven Colorado River Basin States were to advise the Secretary on the precise boundaries of the floodway from Davis Dam¹¹ to the border between Mexico and the United States. The Secretary will use their information to prepare a map to be distributed widely to each political unit within the floodway, to each Federal agency that sponsors activities in the floodway, and to each federally insured financial institution serving the floodway areas as one of its primary markets. The map will be reviewed periodically and adjusted solely to reflect changes resulting from natural forces. Although this Act just applies to a single locale, it may significantly reduce riparian wetland loss there, and could serve as an important model for other areas.

¹¹Located between Arizona and Nevada near Davis, Arizona and south of Las Vegas.

REFERENCES

- Congressional Budget Office. 1989. Reducing the Deficit: Spending and Revenue Options. Washington, DC, 400 pp.
- Kussy, E. V. A. 1982. Wetland and Floodplain Protection and the Federal-Aid Highway Program. Environmental Law, vol. 13 (Fall), pp. 161-264.
- Rose, M. and J. Goldstein. 1977. Economic Analysis of Selected Features of Municipal Wastewater Treatment Construction Grant Legislation. U.S. Environmental Protection Agency, Washington, DC, 138 pp.

Chapter 6: FEDERAL PROGRAMS TO PROMOTE RESOURCE USE, EXTRACTION, AND DEVELOPMENT

Promoting the development and use of the Nation's natural resources for the public's benefit has long been a goal of the Federal Government. Tax incentives and cost-sharing policies stimulate development on private land. On public land, the Federal Government, in its role as custodian, has facilitated access for economic use. A prime example is the Mining Law of 1872, which allows miners who discover hard rock minerals on public land to file a claim that grants them the right to extract the minerals with no payment to the Federal Government. The law also permits miners to obtain full title by taking the claim to "patent" which involves surveying and payment of a nominal fee. These terms provide a strong inducement to develop resources. Some of these resources are located in or near wetland areas, and their development can convert, modify, or degrade wetlands. This report focuses on three types of resource development and their associated wetland impacts: timber, rangeland, and energy.

Timber: The Federal Government has been in the timber business for over 85 years. Since 1899, the Forest Service and Bureau of Land Management have sold over 456 billion board feet of timber valued at about \$20 billion. Early timber sales were to encourage western settlement and economic development. In the 1930s the management emphasis shifted to maintaining stable communities. More recently environmental protection and economic efficiency have become management goals. Logging in forested wetlands can bring about drainage, changes in the vegetation, erosion (particularly from road construction), and if logs are floated downstream, the leaching of harmful organic chemicals into the water.

Rangeland: The Forest Service and the BLM administer livestock grazing on approximately 307 million acres of public range land in the west. In the 11 western States, 48 percent of the land is federally owned and about 75 percent of that is grazed by domestic livestock, so federally-permitted grazing occurs on 36 percent of the land. The BLM administers about 57 percent of the public rangeland, while the Forest Service administers about 43 percent of these lands. Because grazing is so widespread in an arid and sensitive environment, it has significant impacts on riparian wetlands. Livestock consume and trample riparian vegetation, compact the soil so that native plants cannot return, and contaminate streams with wastes and sediments. With the loss of vegetation erosion ensues.

Energy: The Mineral Management Service (MMS) oversees the leasing of oil and gas tracts in the outer continental shelf (OCS). These leasing arrangements govern a large portion of current domestic oil and gas exploration, and are major sources of revenue for the Federal Government. Unlike timber and grazing policies, oil and gas leasing is conducted through a competitive bidding system in which the Federal Government receives cash bonuses at the time of the bidding, as well as royalties when and if production begins. A portion of these revenues are deposited in the Land and Water Conservation Fund (LWCF), and a significant portion of LWCF is used to purchase wetlands.

The oil and gas industry conducts activities in coastal environments which support OCS exploration and development. These activities can convert shallow wetlands to deepwater and can contaminate wetlands with chemicals and brine, if not properly regulated. However, MMS does not have direct regulatory authority over coastal wetlands. Industry activities in support of OCS exploration and development (such as pipeline and navigation canals) that affect coastal wetlands are regulated by State and other Federal agencies.

There is some onshore oil and gas production in coastal wetland areas which is regulated by BLM. BLM incorporates safeguards in drilling permits in wetland areas which are designed to prevent environmental degradation.

Peat production, primarily for energy, may occur on Forest Service lands, but is primarily conducted on private lands. It receives favorable treatment from some Federal policies. Peat mining often requires drainage and causes oxidation of peaty soils, contaminating wetlands with nitrates.

To further the development of timber, rangeland, and energy, the Federal Government has instituted some non-neutral policies that may serve to stimulate more development and, consequently, more adverse wetlands effects than would occur otherwise.

FOREST SERVICE ROAD CONSTRUCTION AND MAINTENANCE

In the early 1980s, the Forest Service spent an average of \$417 million each year on road construction. Road related costs, including administration and maintenance, constitute 60 percent of the expenditures for the timber sales program. The road system is extensive (321,624 miles as of 1983). Roads built along riparian waterways without adequate safeguards often cause erosion and sedimentation of streams and degradation of fish habitat. Prompted by a growing environmental ethic and the combined effect of a number of environmental statutes (principally the Clean Water Act, the National Forest Management

Act, and the National Environmental Policy Act), the Forest Service has developed management practices for road construction which have greatly diminished the frequency and extent of such environmental incidents.

FOREST SERVICE AND BUREAU OF LAND MANAGEMENT TIMBER SALES POLICY

The Government sells a substantial amount of timber from national forests at less than cost. In many cases, prices do not even recover the costs of evaluating the timber and administering the sales.¹ Below-cost timber sales have long been a source of controversy. The conflict centers on two areas of disagreement: i) the extent to which economics and efficiency should define the timberland base and ii) the extent to which timber sales should be used to finance development of the national forests and community stability. That is, should land be in the timberland base if it is not economical to grow and harvest timber on that land? Are some below-cost timber sales conducted primarily to engage in road construction and provide employment and payments in lieu of taxes to local communities, and if so, should this practice continue?

The Government uses two methods for appraising timber for sale: the transaction evidence method and the residual value method. Under the transaction evidence method an appraisal price is based on an average for comparable timber sales. With the residual value method, timber in the area designated for harvesting is evaluated by working backward from the selling price of the end-products which it is anticipated will be made from the timber. All cutting, road construction, hauling, and milling costs together with an allowance for profit and risk are deducted from the market value of milled lumber. The residual constitutes the appraised or advertised price below which, by statute, the timber cannot be sold. A competitive bidding process then determines the stumpage fee to be paid by the timber contractor. Since only private, timber industry costs are considered in this process (and not the Government's costs of managing the forests and administering the sales), the process results in many sales below cost and a subsidy to the industry.

In California, Oregon, Washington, and Alaska the Forest Service uses the residual value method to appraise timber. Since 1988,

¹Recently, the Government Accounting Office analyzed 3316 USFS timber sales from FY88 (GAO 1990). Forty percent of these sales were advertised with a minimum acceptable bid less than the costs of preparing and administering the sales. The GAO found only one percent of BLM sales with minimum bids less than the costs of preparing and administering the sales.

BLM has relied primarily on the transaction evidence method. The GAO found that the transactions evidence method was a better predictor of fair market value and provided the Government with higher prices for its timber (GAO 1990).

Federal timber is sold by two methods: lump sum and scaled. Under a lump sum contract, the total amount bid is the total amount paid regardless of the actual volume of timber removed and the species distribution of the harvest. When a timber sale is scaled, the contractor is charged for the actual volume and species harvested. BLM sells its timber primarily lump sum, while Forest Service sales are mostly scaled.

Below cost sales encourage more logging than is efficient. In the absence of the Federal subsidies, the resources involved (labor and capital) would be employed elsewhere. As with all subsidies, the transition to an unsubsidized state results in dislocation costs for the communities and individuals involved. However, maintaining the subsidies imposes a fiscal burden on the rest of society.

In the course of this study, wetland impacts from logging activities on Federal lands were identified in Southeastern Alaska, in western riparian areas, and in the North Carolina pocosins.

ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT OF 1980 AND THE TONGASS TIMBER REFORM ACT OF 1990

In an effort to increase timber-related employment in Southeastern Alaska, Congress included a section in the Alaska National Interest Lands Conservation Act (ANILCA) which stimulates logging by mandating that each decade the Forest Service make 4.5 billion board feet available for sale and harvest from the Tongass National Forest. Since the passage of the Act, the market demand for pulp, the main product from Alaska's timber, has fluctuated, as has employment in Alaska's timber industry. Employment in the industry has varied from 3500 to 1800. Although markets have been improving slowly, between 1982 and 1987, the Forest Service managed to sell only 44 percent of the timber prepared for harvest. To encourage sales in a lagging market so that it could meet the congressionally mandated harvest, the Forest Service lowered prices. In 1986, Federal expenditures nationally for timber sales were estimated to exceed sales by \$621 million. From 1981 to 1989, the average cost of the Tongass timber program was \$127.54/mbf (in 1990 dollars), while average receipts were \$4.62/mbf.

With ANILCA, Congress also established a permanent appropriation, the Tongass Timber Supply Fund, which gave the Secretary of

Agriculture access to \$40 million annually to maintain the annual 450 mmbf harvest. From 1982, when the Timber Supply Fund dollars became available, through 1987, the Tongass received \$234 million to prepare timber sales, manage timber, develop harvest technology, and build roads prior to sales. Road-building, at \$150,000 per mile, was the largest expense, and the cost sometimes exceeded the value of the timber to which the road led. In addition, ANILCA authorized a \$5 million revolving low interest loan fund for harvesters of National Forests in Alaska to acquire new equipment and design new technologies for timber harvest.

The Tongass Timber Reform Act of 1990 ended the non-competitive nature of the pricing practices on the Tongass, terminated some timbering subsidies, and mandated that logging be conducted in a more environmentally sound manner. The most significant aspects of the Act relative to timber harvesting and impacts on wetlands are the elimination of both the automatic \$40 million appropriation to the Tongass Timber Supply Fund and the mandate to harvest 4.5 billion board feet of timber from Tongass every decade. The TTRA requires that the existing long-term contracts be modified so that the price for standing timber be comparable to what it would have been under competitive bidding.

About 27 percent of the 18 million acres in Southeastern Alaska are classified as wetlands. At a maximum, about 12 thousand acres would disappear as a direct result of logging activities in the Tongass. Although this is a small amount in a region which is rich in wetlands, timbering and associated activities impair streams and estuaries which are important for anadromous fish, and threaten income and employment from fisheries and tourism. The TTRA contains two important features to protect wetlands and fisheries: it prohibits commercial logging in certain key fish and wildlife habitats, and establishes a 100-foot minimum buffer zone adjacent to both sides of anadromous fish streams and their fish-bearing tributaries.

FOREST SERVICE RESEARCH, TECHNICAL, AND FINANCIAL ASSISTANCE

The Forest Service conducts research into land and resource management; the research assists the agency in managing its lands, but is readily available and often applicable to private timberland managers. Research on trees, timber management, forest products, and harvesting all assist the forest products industry.² In 1984, these programs were funded at the \$40

²In addition to assisting the forest products industry, Forest Service research has provided substantial fish and wildlife management data.

million level. The Forest Service also administers a State and Private Forestry Program which offers technical and financial assistance to States and technical assistance to private individuals to protect nonfederal lands from fire, insects, and disease, while helping State and private landowners and operators to increase timber harvests. In 1984, the program received \$61 million in Federal funds. Together these programs help to increase the harvest and profitability of nonfederal timber lands. Also, they often provide useful information on wetlands and their functions. These programs are legitimate governmental activities, but financing mechanisms are available (e.g., an earmarked excise tax) which would result in the program costs being borne by the beneficiaries rather than taxpayers in general.

The Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA) authorized the creation of the Forest Stewardship Program, funded by the U.S. Forest Service. The program's purpose is to provide technical assistance and recognition to landowners engaged in conservation activities on non-industrial, private, forest lands. A companion program also authorized by the FACTA is the Stewardship Incentive Program (SIP). This cost-sharing program is a cooperative effort among the U.S. Forest Service, the Agricultural Stabilization and Conservation Service (ASCS), and other agencies. The ASCS accepts applications from landowners and distributes the funds. Among some of the approved SIP practices are reforestation and afforestation and riparian and wetland protection and improvement.

USDA FORESTRY PROGRAMS

The Agricultural Stabilization and Conservation Service (ASCS) in conjunction with the Forest Service administers the Forest Incentives Program (FIP), a cost-sharing program available to private, non-industrial landowners for forestry practices such as planting trees. This program was funded at \$12.4 million in 1993.³ ASCS also administers the Agricultural Conservation Program which shares costs for various agricultural land conservation activities, including tree planting. The program was funded at \$194.5 million in 1993, but the extent to which these funds were applied to forestry activities is not specified. The Federal Government will generally cover from 40 percent to 75 percent of allowed expenses. Often plantation trees rather than the mix of native species are planted, thus altering the original environment.

³FACTA calls for the termination of FIP at the end of 1995, but the program could be reauthorized in the 1995 Farm Bill.

The Farmer's Home Administration (FmHA) aids the forest industry by offering: farm ownership loans to buy or develop forest land; refinancing of forest land, soil, and water loans for improving forest resources; and operating loans to help with normal costs of producing, harvesting, and processing forest products. Previously, these loans could be used to cover drainage costs, but if properly enforced, Swampbuster should preclude that. The 1985 Food Security Act included a new feature that, at the Secretary's discretion, allows delinquent farmers to reamortize loans and delay repayment if they plant at least 50 acres of soft wood timber. This feature also offers an incentive to replace native hardwoods with softwood plantations.

FEDERAL INCOME TAX CODE PROVISIONS RELATED TO FORESTRY

Several provisions in the Federal income tax code allow special expensing, rapid amortization, and investment credits for forestry activities. Reforestation expenditures up to \$10,000 for site preparation, seed or seedlings, tools, and labor are eligible for a 10 percent tax credit and may be amortized over only 7 years. It is not known how great an impact these programs have on the drainage of forested wetlands. However, if it proved significant, consideration might be given to conditioning eligibility for these provisions on avoidance of wetland conversion or degradation.

TIMBER PRODUCT EXPORT ASSISTANCE

Several export programs can be used for timber products, but no special timber export assistance programs exist. In general, timber products are included as agricultural commodities, and as such qualify for and are included in agricultural export assistance programs. Data on assistance for timber export are not reported separately from assistance for other agricultural commodity exports. It is not clear whether these programs are a significant factor in promoting the substantial exports of timber products to Japan from Northeast Alaska, but, if so, they could be implicated in some wetland loss and more importantly, some wetland degradation.

BUREAU OF LAND MANAGEMENT AND FOREST SERVICE GRAZING POLICY

In the 11 western States,⁴ 48 percent of the land is federally owned and about 75 percent of that is grazed by domestic

⁴Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

livestock. Thus, federally-permitted grazing occurs on 36 percent of the land in these States. Of the 17 million cattle raised in the 11 western States in 1983, 16 percent received Federal grazing permits. In some of these States the percentage is much higher.

Both the Forest Service and the BLM administer livestock grazing programs on the lands that they manage. Together they administer 87 percent of the Government's rangeland.

The BLM and the Forest Service regulate grazing on public lands by granting 10-year permits or leases that specify the number of animal unit months (AUMs) of grazing allowed each season on a particular tract (called an allotment). The grazing program has been criticized for exceeding the carrying capacity on some parts of the range, especially in riparian wetlands.

Grazing fees on public land are less than those for comparable private land.⁵ Ranching is a business, and ranchers would prefer to graze their animals as cheaply as possible. Thus, ranchers sometimes exert pressure on BLM and USFS field personnel to set AUMs higher or liberalize grazing constraints on their allotments. The BLM and the Forest Service maintain that stocking levels are determined entirely by resource conditions. The agencies' limited enforcement resources make it difficult to ensure that abuses do not occur.

Cattle tend to put great pressure on riparian wetlands, using them heavily for shade, access to water, and foraging. Thus, BLM and Forest Service management practices can significantly influence the condition of wetlands on the public range. The

⁵Ranchers argue that it is misleading to interpret the grazing fee differential between public and private land as a subsidy, because the lands are not equivalent. They cite numerous differences between public and private land that could legitimately lead to differential charges for grazing. The way in which the west was divided between public and private lands resulted in public lands being the less productive areas. Permittees face restrictions on predator control not encountered by private leaseholders. Public lands are more remote and less accessible, making livestock management more expensive. Environmental considerations and multiple-use management requirements constrain livestock-related decisions. Public rangeland improvement costs are shared by permittees, generally on a fifty-fifty basis. On private land, the landowner would bear these expenses, and the cost would be reflected in a higher rental fee. All these arguments have merit. Nonetheless, the grazing fee formula suffers from a downward bias and consistently results in a subsidy (USDA and DOI 1986).

Government Accounting Office (GAO) has recently concluded a study of the condition of and management practices on Federal riparian areas (GAO 1988). The GAO found that some deteriorated areas had been restored, but noting a bias towards ranchers and against riparian area protection at the management level, concluded that progress would probably continue to be slow.

Recently, BLM has adopted a formal riparian policy to protect, enhance, and restore riparian areas and to mitigate adverse impacts to these areas. Further, BLM completed an analysis of the resources needed to implement the policy (BLM 1990). The analysis provides a blueprint for future riparian wetland management, outlining goals, strategies, and funding requirements. Fencing riparian areas, limiting grazing to winter use when cottonwoods are leafless and do not tempt cows, placing water and salt away from riparian areas, assigning a ranger to key riparian areas, and promoting a riparian wetland information brochure are all strategies that BLM is exploring. BLM is accelerating its riparian area management, and is now spending \$8 million annually on this activity.

INCOME TAX CODE PROVISIONS RELATED TO THE OIL AND GAS INDUSTRY

Two special tax incentives are available to the oil and gas industry: the deduction for intangible drilling costs and the percentage depletion allowance, the latter benefit having been greatly reduced in recent years. The deduction for intangible drilling costs, allowing rapid write-offs of expenses related to oil and gas production, was introduced into the tax code through a series of administrative rulings by the Treasury Department, and then sanctioned by Congress in 1954. The deduction allows the owner to take an immediate tax deduction for "intangible" expenses...labor, fuel, power, material, supplies, and tools...associated with drilling and preparing an oil or gas well for pumping. The deduction was not available for "tangible" costs such as expenditures for pipe, tanks, and pumps used in an oil or gas rig. For most other types of construction projects, intangible costs can be deducted, but they have to be spread over the number of years that the facility will be used. For intangible drilling costs, in contrast, a full deduction can be taken in the year the expenditures are made. This tax code provision is thought to be a significant factor in offsetting the costs of canal dredging and access road construction in Louisiana and pipeline construction in Alaska.

In 1926 Congress enacted percentage depletion to establish a rule-of-thumb measure for depreciation in the value of a well as its oil or gas is pumped out. Investment in the resource was considered to be a capital investment. The depletion

allowance was arbitrarily set at 27.5 percent of production. The allowance bore no relation to actual costs and permitted tax-free recovery that in some cases vastly exceeded the amount invested in the property. Producers were allowed to deduct 27.5 percent of gross income from taxable income, with a limit on the deduction equal to 50 percent of taxable income.

In 1969, tax reform cut the oil and gas depletion allowance to 22 percent. In 1975, the depletion allowance was discontinued for all but independent producers. The reform phased in a lowered allowance for independents, leaving it at a permanent level of 15 percent by 1984 for the first 1000 barrels of oil and the first 6 million cubic feet of gas produced daily. These measures greatly reduced economic incentives to engage in marginal oil and gas exploration and production. The depletion allowance for independents may promote wetland loss in coastal Louisiana.

The Tax Reform Act of 1986 further diminished the tax incentives associated with oil and gas exploration and production by limiting both the percentage depletion allowance and the expensing of intangible drilling costs for purpose of calculating the alternative minimum tax (AMT). However, amendments to the tax code in 1992 granted relief from this provision to independent producers.

DEPARTMENT OF ENERGY PROGRAMS RELATED TO PEAT MINING

The Federal Government promotes the mining of peat for energy by guaranteeing a market and by conducting research. The Public Utilities Regulatory Policies Act of 1978 (PURPA) requires that public utilities purchase power from small producers at the utilities' own generation costs. This significantly reduces the risk associated with a new economic venture. The Government sponsored millions of dollars of research from the mid-1970s through the early 1980s on peat energy demonstration projects.

INCOME TAX CODE PROVISION RELATED TO PEAT MINING

Because peat is an alternative fuel in the pre-commercial stage, major research, development, and construction cost savings derive from special tax incentives. Of particular importance are those incentives that give peat mining a relative advantage over more traditional energy sources. Peat mining along with other alternative energy sources, for example, qualifies for accelerated depreciation of investment costs. Peat also qualifies for a five percent depletion

allowance, a deduction from taxable income related to extraction levels that more conventional energy sources no longer receive. Peat may profit, too, from research and development credits. These are available for selected basic research expenditures and, because traditional energy technology is more developed, the credits will probably benefit peat and alternative energy disproportionately.

MINING LAW GOVERNING PLACER MINING

Placer mining (mining for minerals which have been deposited by stream action, often in a stream bed) has a long history of causing adverse impacts to fish and wildlife and their habitats in Alaska. Under the Mining Law of 1872, no fee is charged to miners for access to hard-rock minerals on designated Federal lands. Originally the Act covered oil and gas as well as hard-rock minerals. Now however, coal, oil, and gas are subject to leasing arrangements that require a fair price to be paid for public resources. A mining company must stake a claim to secure a deposit against others. Although a claim may not exceed 160 acres, a mining company may stake an unlimited number of claims. A claim may be kept indefinitely so long as at least \$100 of work is conducted on it annually and the company files an annual notice of work performed. Should a mining company wish to purchase the surface rights as well (a procedure known as patenting a claim), it may do so by demonstrating to the Government the existence of a mineral deposit that can be produced with a reasonable prospect of being profitable and paying a fee of \$2.50 to \$5.00 per acre, depending on the type of claim. The expense of developing the necessary geologic, engineering, and economic data often discourages a company from patenting a claim.

REFERENCES

- Beuter, John H. 1985. Federal Timber Sales, 85-96 ENR. The Library of Congress, Congressional Research Service, Washington, D.C., 140 pp.
- Schanz, John, et. al. 1986. The Subsidization of Natural Resources in the United States, 86-588 ENR. The Library of Congress, Congressional Research Service, 45 pp.
- Report of the Secretaries of Agriculture and the Interior. 1986. Grazing Fee Review and Evaluation, Final Report, 1979-1985. Department of Agriculture, Forest Service and Department of the Interior, Bureau of Land Management, Washington, D.C., 99 pp.
- U.S. General Accounting Office. 1988. Public Rangelands: Some Riparian Areas Restored but Widespread Improvement Will Be Slow, GAO/RCED-88-105, Washington, DC, June 30, 85 pp.
- U.S. General Accounting Office. 1990. Process for Appraising Timber Offered for Sale Needs to Be Improved, GAO/RCED-90-135, Washington, DC, May 2, 50 pp.
- U.S. Department of the Interior, Bureau of Land Management. 1990. Riparian-Wetland Initiative for the 1990's, Washington, DC, 60 pp.

APPENDIX VI-1: INFORMATION AVAILABLE TO ASSIST FEDERAL MANAGERS IN DETERMINING THE IMPACTS OF PROGRAMS ON WETLANDS

Given the large number of widely dispersed Federal activities, how can program managers determine the effect their programs are having on the nation's wetlands? Three kinds of wetland information are available to aid managers with this problem:

- o Detailed wetland maps and digital wetland products for assessing site-specific impacts of projects;
- o National estimates of the current status and trends (i.e, losses and gains) of wetlands to evaluate the effectiveness of existing Federal programs and policies and to identify national or regional problems; and
- o The Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Manual).

The wetland maps, digital products, and the status and trend reports are available from the National Wetlands Inventory (NWI). The Manual is available from the U.S. Government Printing Office. The Manual proved controversial, however, and revisions have been proposed to it. The revisions have proved equally controversial, however, and at the moment the Manual is not being used for regulatory purposes. See below.

The wetland maps are used by local, State, and Federal agencies as well as by private industry and organizations for many purposes: comprehensive resource management plans, environmental impact assessments, facility and corridor siting, oil spill contingency plans, natural resource inventories, habitat surveys and other uses. The National Wetlands Inventory has produced over 32,000, 1:24,000-scale and 1:63,360-scale wetland maps covering 74% of the lower 48 States and 24% of Alaska.⁶ More than 1,450,000 copies of

⁶Mapping priorities are based principally on the needs of the Service and other Federal and State agencies. High priority is given to the coastal zone (including the coastline of the Great Lakes), prairie wetlands, playa lakes, floodplains of major rivers and other areas that support the goals of the North American Waterfowl Plan. The NWI produces wetland maps at a rate of 5% per year in the lower 48 States and at 2% annually in Alaska. The NWI will have to increase the rate of map production in Alaska to approximately 12 percent of the State annually to comply with the new mandates in the Wild Exotic Bird Conservation (continued...)

these maps have been distributed by NWI. Information on the availability of NWI maps may be obtained by calling 1-800-USA-MAPS; in area code 703 the phone number is 648-6045.

The NWI is also constructing a digitized, geographically referenced wetland database. All map data are stored in a common, ground-based, geographic reference system. These digital data are being used for such applications as resource management planning, impact assessment, wetland trend analysis and information retrieval. To date, more than 6,000 National Wetlands Inventory maps, representing 11.5 percent of the continental United States, have been digitized. Statewide databases have been built for New Jersey, Delaware, Maryland, Illinois, Indiana, and Washington, and are in progress for Minnesota, Virginia, South Carolina, South Dakota, and Florida. NWI digital databases are also available for portions of 33 other states. Copies of database files can be purchased at cost from the NWI offices in St. Petersburg, Florida. To order NWI digital wetland data, call 1-800-USA-MAPS. In area code 703, call (703) 648-6045.⁷

In addition to detailed wetland maps and databases, the Fish and Wildlife Service is directed by law to produce a series of reports on the status and trends of wetlands in the coterminous United States. The second report, Wetlands Status and Trends in the Conterminous United States, mid-1970s to mid-1980s is currently available. The report is updated at 10-year intervals. The first status and trends report described wetland gains and losses in the conterminous United States from the mid-1950s to the mid-1970s. These reports provide statistical estimates of wetland acreage for the coterminous U.S. and an indicator of overall trends (gains or losses) in wetland resources.

On January 10, 1980 the administrators of the Fish and Wildlife Service, the Department of the Army, the

⁶(...continued)

Act Amendments to the Emergency Wetlands Resources Act. By law the NWI is required to complete the mapping for the remainder of the contiguous United States by September 30, 1998 and by September 30, 2000 thereafter for Alaska and noncontiguous portions of the United States. All maps will be in digital format by September 30, 2004.

⁷The data are provided on magnetic tape in MOSS export, DLG3 optional, or GRASS format. Other products, available at cost from the database, include acreage statistics by quad, county or study area, and color-coded wetland maps.

Environmental Protection Agency, and the Soil Conservation Service adopted the Federal Manual for Identifying and Delineating Jurisdictional Wetlands. The purpose of the Manual was to provide users with mandatory technical criteria, field indicators and other sources of information, and recommended methods to:

- o Determine whether or not an area is a jurisdictional wetland under Section 404 of the Clean Water Act and the Swampbuster provision of the Food Security Act of 1985, as amended by the Food, Agriculture, Conservation, and Trade Act of 1990, and
- o Delineate the outer boundary of such wetlands.

It can also be used to identify vegetated wetlands in general for the NWI and other purposes.

With two exceptions,⁸ the wetland definitions adopted by all four agencies were identical: they all included three basic elements for identifying wetlands - hydrology, vegetation, and soils. The Manual provided a single, consistent approach to identifying and delineating wetlands from a multi-agency, Federal perspective. A uniform approach has obvious advantages to the regulated public, for if Federal agencies utilize different definitions of wetlands, the public is uncertain of its rights and obligations, and both the environment and development suffer.

The Manual proved controversial, however. Regulated groups complained that it included too much land as jurisdictional wetlands. After about a year of implementation and an elevating level of public discussion, the four agencies initiated a revision process. In August, 1991, the Administration proposed revisions to the manual. The proposed revisions tightened the (hydrologic, vegetative, and soils) criteria for identifying wetlands, and thereby significantly reduce the number of areas that qualified as jurisdictional wetlands. Criticism from the scientific and environmental community followed immediately. The controversy was never resolved, and in January, 1992, the Bush Administration withdrew the 1991 manual, terminating its efforts to change the methods for delineating regulated wetlands..

⁸The Fish and Wildlife Service includes nonvegetated areas in its definition of wetlands. The SCS excludes from its definition lands in Alaska which have a high potential for agricultural development and a predominance of permafrost soils.

The National Academy of Science is studying the wetland identification/delineation issue. The Academy estimates that the earliest date it can complete its report is June, 1994. In the interim, Congress directed the Corps, through the FY92 and FY93 appropriations bills, to revert to its 1987 wetlands delineation procedures for determining jurisdictional wetlands under Section 404. EPA has joined the Corps in using the 1987 manual, and Interior, while not formally adopting the 1987 manual, has agreed to defer to the delineation decisions of the regulatory agencies for purposes of Section 404.

PART II: THE COASTAL SOUTH AND THE EVERGLADES

Chapter 7: FLORIDA EVERGLADES

INTRODUCTION

PHYSICAL DESCRIPTION: The Everglades originally stretched about one hundred miles from the southern end of Lake Okeechobee down to the tidal estuaries of the Gulf of Mexico and Florida Bay. (See Figure VII-1.) The topography is so flat that in the wet season, sheetflows used to average 40 miles wide and 2 feet deep. In the dry season, however, only the deepest sloughs and "gator holes" remained wet. In wet years the water fed into Lake Okeechobee would spill over, flowing very slowly southward to produce the Everglades.

Today water from Lake Okeechobee is subject to flood control and irrigation efforts so canals shunt water to the east and west coasts or pumps direct it south for irrigation. Three conservation areas consisting of five pools contain the excess water and constitute the major portion of the remaining wetlands.¹ (See Figure VII-2.) Between Lake Okeechobee and the remaining everglades lies the East Everglades Agricultural Area (EAA). Everglades National Park preserves only about 7 percent of the Everglades, and has been designated as a Wetland of International Importance under the Ramsar Convention.

CHARACTERISTICS AND FUNCTIONS: The Everglades in southern Florida:

- o Represent the largest single marsh system in the United States;
- o Host a diverse spectra of aquatic birds, mammals, reptiles, and amphibians, including 6 federally listed endangered species (American crocodile, Florida panther, bald eagle, wood stork, Cape Sable seaside sparrow, and snail kite);
- o Protect the Biscayne Aquifer, the primary source of drinking water for the Miami area. The highly absorbent, "peaty muck" covers the Aquifer with a hydrostatic head, and safeguards it by recharging the ground water, filtering out pollutants, and preventing saltwater intrusion;

¹The Federal Government leases Water Conservation Area 1 from the State of Florida to serve as the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Loxahatchee Refuge).

Figure VII-1: SOUTHERN FLORIDA WITH PHYSIOGRAPHIC DIVISIONS

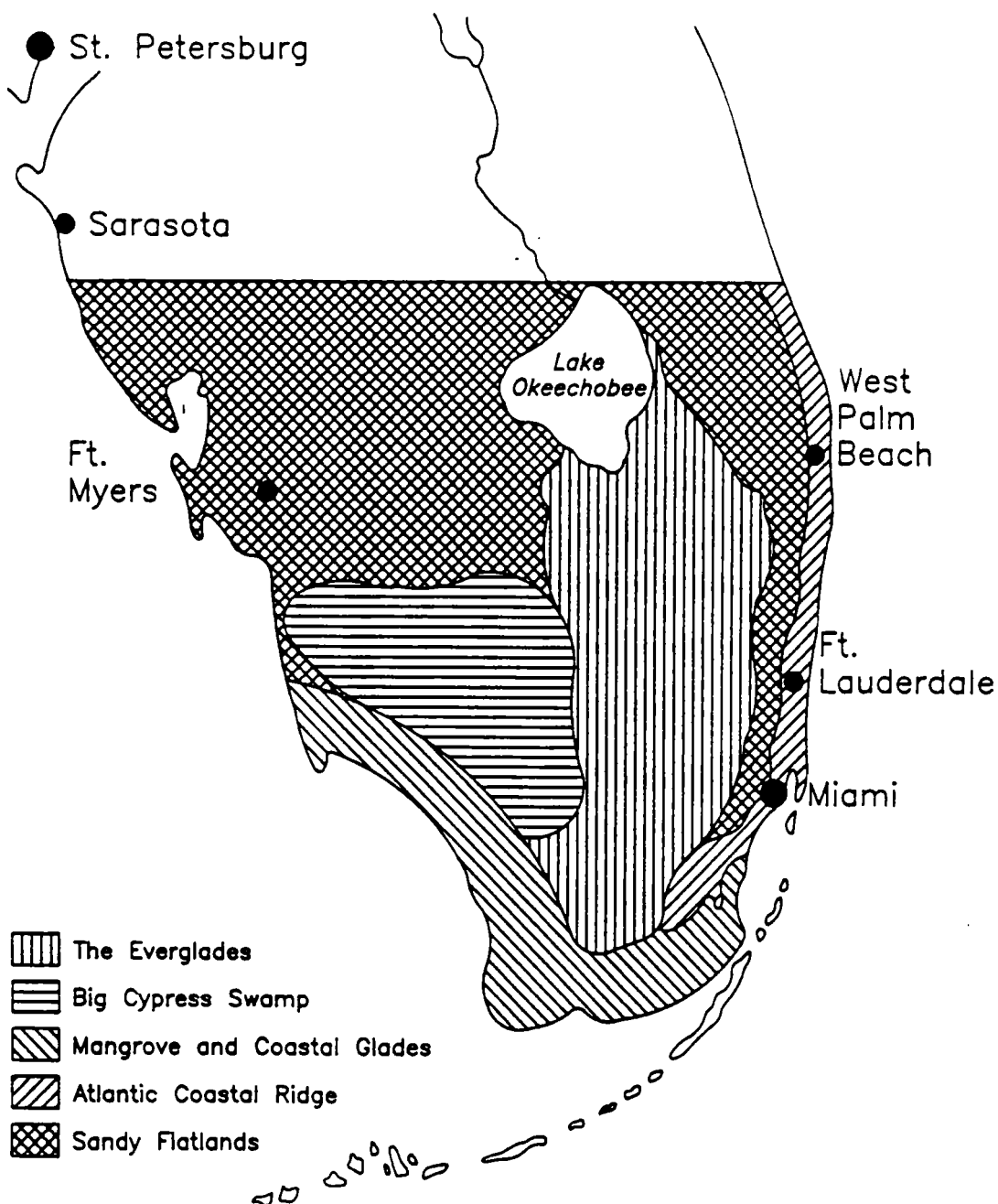
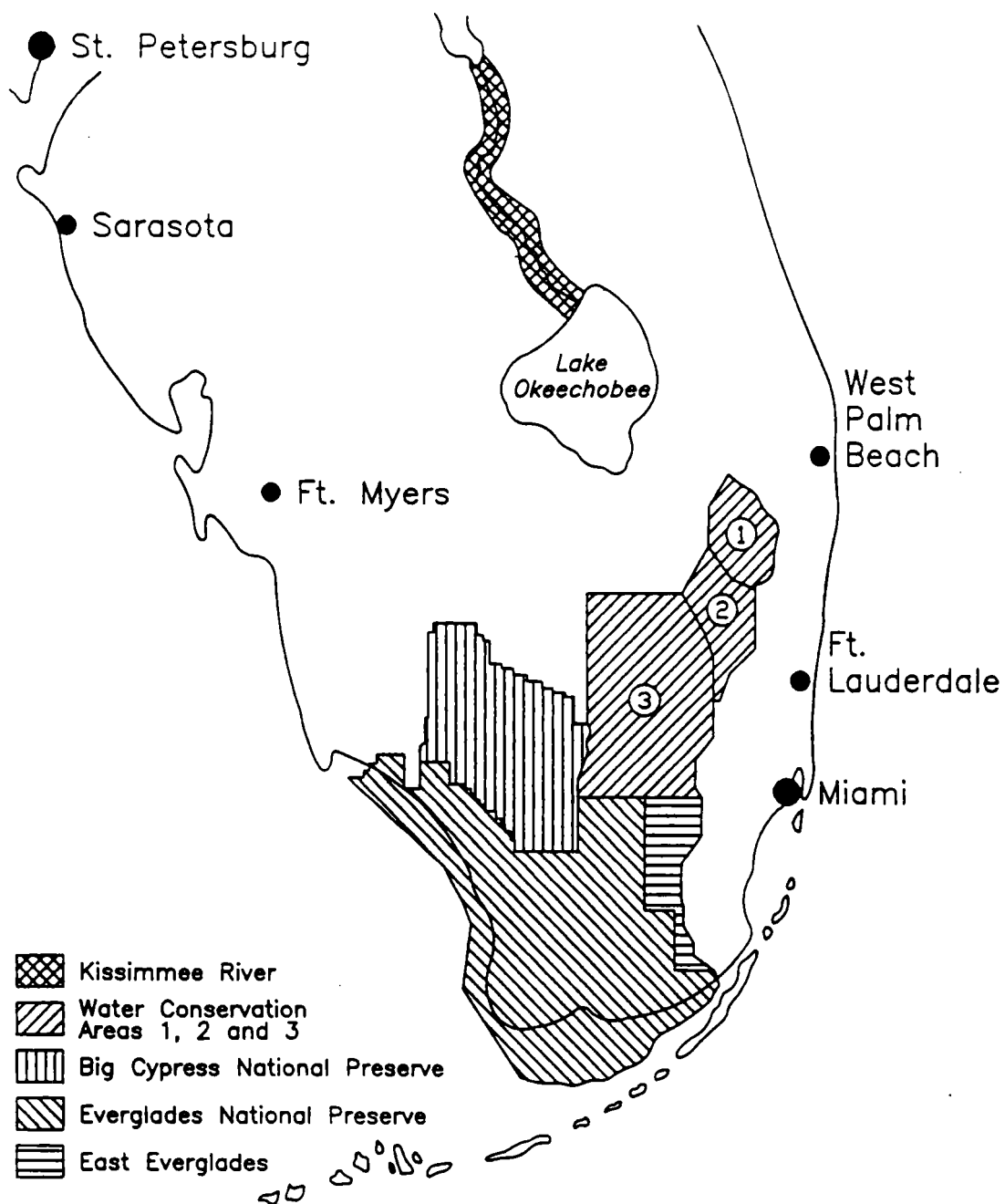


Figure VII-2: SOUTHERN FLORIDA'S WATER CONSERVATION AREAS

- Regulate water, because the "peaty muck" acts like a sponge, thereby moderating floods and buffering droughts; and
- Contain one national park, one national preserve, and one national wildlife refuge.

ORIGINAL ACREAGE: The Everglades in south Florida contained over 2.3 million acres of wetlands at the turn of the century.

CURRENT ACREAGE: About 1.1 million acres or 48 percent of the original acreage remained in the mid-1970s. Further, much of the remaining acreage is degraded.

TRENDS: Over the past 200 years the State of Florida has lost 9.3 million acres of wetlands, 46 percent of the original complement. Between 1953 and 1973 the State lost 1.44 million acres of wetlands, averaging 72,000 acres annually, with most losses occurring in the Everglades. The rate has slowed considerably since then. During 1984 through 1985, the Florida Department of Environmental Regulation granted permits for conversion of about 1000 acres in the Everglades. The FWS, however, estimates that 3000 acres were lost during that period. About 5 acres each day is degraded in the Everglades Agricultural Area as the result of pollutant runoff which transforms native sawgrass to a monoculture of cattail that cannot support the native diversity of flora and fauna.

FACTORS ADVERSELY AFFECTING WETLANDS

An altered water regime, initially to support agriculture and increasingly to support residential development, has been a major cause of wetland decline in the Everglades. The Central and South Florida Flood Control Project (C&SFP) is the primary means of flood control and drainage in the area and serves irrigation needs secondarily. The C&SFP consists of the channelized Kissimmee River, the impounded Lake Okeechobee, three water conservation areas (water impoundment areas totaling 1,345 square miles), and an intricate system of over 1500 miles of canals and levees, complete with pumping stations and flood gates. Extensive diking and draining of the Everglades Agricultural Area makes it drier. Runoff from rainfall is removed by pumping stations which force drainwater into the conservation areas.

Moreover, the South Florida Conservancy District Project was able to take advantage of the primary channels provided by the C&SFP. On-farm streams were channelized and drained into the primary

channels.² Such "secondary drainage" is now a significant factor in wetlands destruction. Thus, the C&SFP encourages additional wetland conversion by making a primary network of outflow channels available for carrying the flow from secondary channels.³

The C&SFP had four direct, adverse, hydrological impacts on wetlands:

- o First, drainage and flood control converted 700,000 acres of wetlands to dry lands.
- o Second, each year up to 1.3 million acre feet of fresh water is siphoned off to the Atlantic Ocean or the Gulf of Mexico, where it has upset the normal saline balance with major consequences for fisheries. The diversion of the water diminishes the historical contribution to the Biscayne Aquifer.
- o Third, the sheetflow of the remaining water has been contained within 5 pools which have acquired the characteristics of impoundments rather than river segments.
- o Fourth, water delivery practices have drastically altered the seasonal patterns of high and low flows to the remaining Everglades within and outside of the Park. One result of this is that the Florida Bay fisheries to the south, in contrast to those on the Gulf and Atlantic coasts, do not receive adequate freshwater inflow and suffer from hypersalinity.

Flood control has also radically altered native plant and animal life. For example, the flood control levees that surround Lake Okeechobee destroyed a band of very important native vegetation. Wading bird populations have suffered a 95 percent decline since the turn of the century (Robertson 1984). In addition, the C&SFP has had a negative impact on soils and water quality. It has helped to dry the organic soils. (This, by draining water from the land, diverting water to the Gulf of Mexico and Atlantic

²Much of this work was conducted by the Soil Conservation Service. SCS projects are built largely with Federal funds; there are only limited local contributions.

³The Army Corps of Engineers contends, however, that the distribution of water is a State function and that it only has authority to control flood waters. The State regulates private irrigation and drainage activities through consumptive use and water quality permits, respectively.

Ocean, impounding water in Lake Okeechobee and the Water Conservation Areas, and altering hydrologic patterns to the south.) The drier soils compact and subside (as much as 8 feet below the water level of canals traversing the area), and oxidize chemically or catch fire. Subsidence and oxidation destroy the peaty muck. Soil that formed at the rate of 1 foot each 400 years is vanishing at a rate of 1 foot every 10 years. By the year 2000, 85 percent of the peat existing in 1912 could be gone, and agricultural areas may have to be abandoned (Stephens 1974).

The loss of freshwater inflow also allows saltwater to intrude and contaminate drinking water. Moreover, as the peaty muck oxidizes, it releases organically bound nitrogen which combines with other elements to form nitrates. Nitrates contaminate drinking water as they seep into the aquifer or as agricultural drainwater is backpumped into Lake Okeechobee, a source of back-up drinking water for Miami. Because of water quality problems and eutrophication, backpumping from the Everglades Agricultural Area into the Lake was recently limited, and the nitrates and phosphorous from the drainwater now flow into the water conservation areas where they are likely to cause similar problems.

Agricultural pesticides and fertilizer worsen the water quality problem. Sugarcane, the predominant crop in the Everglades Agricultural Area, is chemically intensive. Dairy farms along the Kissimmee River contaminate the water with phosphorous and nitrogen.⁴ In south Dade County, tomato and vegetable farming operations start with heavy tilling to break up the deposits of sea shells and coral (limestone) covering the area, thus permitting cultivation. The hydroponic farming used in the broken limestone conditions requires greater use of fertilizer and pesticides. The Everglades National Park lies directly south of these fields and changes in the native plant community have been noted as a result of the increased levels of fertilizer and pesticides. Neither the State nor Federal Government has effectively enforced water quality standards for pumped effluents on the agricultural industry.

In 1988, the U.S. Attorney's office in Miami filed suit on behalf of the FWS and the National Park Service against the Florida Department of Environmental Regulation and the South Florida Water Management District for pumping water that exceeded nutrient water quality standards into the Everglades without a permit. These discharges cause vegetative changes, and could

⁴In the early 1950s large acreages of wetlands converted to pasturelands when the Kissimmee was ditched. Today, efforts are underway to return the Kissimmee to its original course and to restore the converted wetlands.

affect both the Loxahatchee Wildlife Refuge and Everglades National Park. The State of Florida passed the Surface Water Improvement and Management Act (SWIM) of 1986 that called for Water Management Districts to develop plans to control pollutants. The Everglades SWIM plan has been completed, but is being challenged on legal grounds by agricultural interests. Thus, as of November, 1992, plans have not been implemented which require water treatment areas, and there has been no opportunity to assess the effectiveness of the proposed regulatory measures.

Real estate development is expanding rapidly in south Florida. From 1960 to 1970, in Broward, Palm Beach, and Dade Counties, the population burgeoned by 85, 50, and 35 percent, respectively, with concomitant demands for housing. Development in former Everglades marshes often follows agricultural conversion and, in some cases, rock mining. Construction is occurring along the edges of the present Everglades, in only partially drained areas.⁵ Real estate sales in the East Everglades area are vigorous in the dry months. During the rainy season, however, the water rises, overflowing roads, flooding homes and septic systems, and polluting private wells. Predictably, this is followed by demands for protective dikes to reclaim these wetlands at public expense.

The intense population pressures on the Everglades often lead to the conversion of agricultural lands for urban and suburban purposes. Agriculture then pushes into more marginal wetlands for space. Additionally, citrus is moving southward, and constitutes a significant factor in wetland conversion. Thus, agriculture not only affects water quality, but also wetland conversion.⁶

Limestone is the only significant building material available in south Florida. Rock mining for it takes its toll on the Everglades. Surface pits of up to 1 mile square and 60 or more feet deep cover several hundred square miles of land that were once Everglades marsh. The water-filled holes have little biological productivity and expose the porous stone and water of the aquifer, providing a possible avenue for contamination of water supplies. Although suitable rock underlies the coastal

⁵For example, housing construction has recently occurred in the east Everglades along the outskirts of Miami and the eastern border of Conservation Area 3.

⁶The United States Sugar Corporation, for example, recently applied (August, 1988) to the Army Corps of Engineers for a section 404 dredge or fill permit to convert 430 acres of wetlands of Southern Division Ranch at the South end of the Lake to sugarcane and citrus.

ridge uplands of Dade and Broward Counties, the cheapest rock underlies the Everglades. The rock mining industry constantly pressures for expansion into the Everglades, including the water conservation areas.

In 1985, the Corps processed 202 applications for activities within the Everglades. Only 11 were denied. Sometimes developers convert wetlands without permits and, instead of being prosecuted, are granted after-the-fact authorization. This encourages adjacent landowners to do the same or to argue (often effectively) in their permit applications that they have a right to encroach upon and develop wetlands to the same extent as preceding projects. Although it has the authority to overrule the Corps, until recently the EPA has been reluctant to veto 404 permits in the Everglades.⁷ The FWS estimated that activities permitted between 1984 and 1985 affected at least 3000 acres in the Everglades.

FEDERAL PROGRAMS AND PROJECTS

Federal drainage and flood control projects that radically alter the natural water regime have had the greatest impact on the Everglades. Agricultural programs and incentives to residential development have led to the filling of wetlands, and greatly increased the pressure for Federal flood control and drainage efforts. Funds for highways and airports have helped to establish the infrastructure for expanded residential development.

WATER PROJECTS: The Federal Government has financed 80 percent of the cost of constructing the Central and South Florida Project,⁸ which provides drainage and flood control for agriculture. Increasingly agricultural land is converted to or encroached upon by residential development, which also benefits from the drainage and flood control.

Although the South Florida Water Management District, a regional agency, manages the C&SFP, the Federal Government is responsible for some operation and maintenance (O&M) costs. The Corps still operates the system during floods, and the Federal Government takes responsibility for clearing obstructions from the drainage canals passing through the Everglades Agricultural Area to ensure greater flows to the developing east coast. Operation and maintenance were estimated to cost about \$5.8 million in 1987.

⁷EPA recently vetoed several rock plowing permits in the East Everglades (1988).

⁸Construction totaled \$252 million between 1950 and 1985.

Local beneficiaries do not pay for drawing water from the C&SFP or use of the drainage system. Instead, the system runs on a permit basis.

About 65 percent of the benefits claimed for the project are from conversion of wetlands to agriculture and the maintenance of the converted wetlands in agriculture. Yet, over half of the acreage in the Everglades Agricultural Area is planted in sugarcane, a highly subsidized crop which is in worldwide surplus.

Future Impacts: A number of proposals could adversely affect the Everglades wetlands in the future. Deficits in the area's demands for water are likely to be made up by increasing water storage in Lake Okeechobee, which would threaten the water supply of the remaining Everglades marsh. The Corps is studying how to restore more natural water flows to the Everglades National Park. Local interests are worried about reflooding partially drained wetlands in the East Everglades, which occupy an area outside of the Park, and the Conservation Areas. Thus, in addition to purchasing existing wetlands in the flow-way of the Shark River Slough, the Corps proposes to construct levees around the residences and farmlands to protect a 95,440 acre area from the one-in-ten-year flood. Wetlands within the levees are likely to be drained. They are also likely to be filled, because the Corps will probably grant fill permits within the protected area.

One of the most controversial issues facing the Everglades is what to do with the drainwater laden with fertilizer, pesticides, and nitrates from oxidized peat. Regulatory controls have not been applied. In the past the contaminated water was backpumped into Lake Okeechobee, but serious eutrophication of the Lake and threats to the back-up water supply of Miami have given rise to alternative plans. These include restoring the Kissimmee River floodplain, diverting the runoff from some dairy areas to a 15,000 acre impoundment, creating a 40,000 acre flow-way for agricultural runoff in the Everglades Agricultural Area, and pumping the water forward to the water conservation areas. The last of these proposals has gone into effect on a trial basis, and is seriously impairing water quality in the conservation areas. In addition, the State has introduced a more stringent regulatory procedure for dealing with pollutant runoff, but the program is still in its infancy.

As indicated above, the U.S. Attorney's office in Miami filed suit against the South Florida Water Management District and the Florida Department of Environmental Regulation to prevent the discharge of degraded waters from agricultural runoff into canals on the Loxahatchee Refuge and Everglades National Park. A settlement agreement was reached in July, 1991. The settlement was affirmed as a decree in February, 1992. The settlement agreement requires the parties to engage in a strategy to clean

up the pumped effluent from the Everglades Agricultural Area (EAA) and specifies a timetable for implementation. Among the actions required are:

- o Class III water quality standards for discharges (Clean Water Act standards) must be met by July, 2002.
- o Phosphorous loads to the Everglades must be reduced by 80% by 1997.
- o Phosphorous loads to Loxahatchee Refuge must be reduced by 85% by 1997, and permits must be sought for discharges into the secondary drainage system within the EAA by July, 1993.
- o 35,000 acres of filtering marshes called stormwater treatment areas must be constructed.

The settlement agreement also requires phosphorous loads in the EAA to be reduced by 25% by February, 1996. In addition, an interagency technical oversight committee was formed to coordinate research and monitor discharges.

Until the water quality problems are resolved, fisherman are being cautioned not to eat fish caught at Loxahatchee Refuge or in the Everglades. Concentrations of mercury in fish from areas receiving agricultural runoff are above action levels specified by the Food and Drug Administration, and extremely high concentrations of mercury have been found in Florida panthers.

AGRICULTURAL PROGRAMS: Several USDA programs have affected wetlands in the Everglades.

Drainage: The Soil Conservation Service (SCS), through the South Central Florida Conservancy District Watershed Project, built a system of canals to drain on-farm water into the main channels of the C&SFP. Today the SCS's role is limited to advising farmers who plan to improve cropland drainage of Swampbuster and its consequences.

Low Interest Loans: The Farmers Home Administration (FmHA) offers low interest loans to agricultural communities for facilities ranging from water storage and delivery systems to short-term housing for laborers. It is not possible to quantify the effect of FmHA programs on wetlands. However, the subsidies provided through the FmHA tend to support agriculture on lands where it might not otherwise have been profitable.

Crop Insurance: The Federal Crop Insurance Corporation offers the only multiple peril coverage for crops, providing risk protection from hazards such as flood, fire, drought, and

insects.⁹ A variety of coverage levels are available, and premiums vary with the level of protection chosen.¹⁰

The Federal Government subsidizes the premiums and pays all administrative costs of the program.¹¹ Overall, the Federal share amounts to almost 50 percent of the cost of the insurance program. In 1985, premiums in the Everglades Counties totaled about \$1.2 million with Federal support amounting to \$500,000 annually.

The availability of this subsidized insurance clearly reduces the risk of planting in the Everglades. The program protects farmers against yield losses from a variety of natural causes, including flooding and storm damage, both of which are likely to occur in the Everglades.

If Swampbuster is fully enforced, subsidized crop insurance should no longer provide an inducement to convert additional flood-prone wetlands to crop production, including sugarcane.¹²

⁹There are private insurance companies which offer coverage, but they are reinsured by the Federal government.

¹⁰The farmer can choose among three levels of yield protection, 50, 65, or 75 percent of his normal yield. His normal yield is referred to as his Actual Production History (APH). If the farmer has at least 10 years of acceptable yield records, the APH will be determined by dropping the highest and lowest yield and averaging the remaining yields. If he has less than 10 years of data, the APH is calculated by a formula which blends the available farm data with county average data.

In addition to selecting a level of yield protection, the farmer must also choose from one of three "price elections." This will determine the price which will be used to place a monetary value on any insurable losses which occur.

The higher the yield guarantee level and the higher the price election, the higher will be the premium the farmer will pay. If at harvest time, the farm yields are below the yield guarantee level, an insurance adjuster will visit the farm and determine the indemnity which the farmer is entitled to receive.

¹¹Policies are sold at a discount of 30 percent off of the estimated premiums required to pay out all claims in a given year.

¹²Swampbuster denies farm program benefits (like crop insurance) to persons who either produce agricultural commodities
(continued...)

Those farmers who do not convert wetlands or plant on newly converted wetlands remain eligible for subsidized crop insurance, however. Even if this latter were not true, ineligibility for subsidized crop insurance probably is not much of a threat to sugarcane producers and probably will not provide much protection for wetlands. Sugarcane producers generally have a low participation rate in the crop insurance program to begin with. They tend to be large firms with capital available to self-insure. The insurance may be important for those converting to other crops, however.¹³

Dairy Price Support Program: Although there is a Federal program to support the price of milk, the program is for grade B or manufacturing-grade milk, which is not the type of milk produced in Florida due to a lack of processing plants.¹⁴ Florida producers market only grade A or fluid milk. The program assists Florida producers indirectly by absorbing some grade A milk, which might otherwise have entered Florida's market as competing supplies.

Dairy and Citrus Marketing Orders: The dairy and citrus industry benefit from marketing orders, federally sanctioned cooperatives which control the marketing of the product. Federal officials actively participate in the management of the cooperatives, sitting on the boards of directors. The system is structured so

¹²(...continued)
(including sugarcane) on wetlands converted after December 23, 1985, or alter wetlands after enactment of FACTA so that a commodity could be produced. (See discussion of Swampbuster in chapter 3.) It turns out, however, that the protections provided by Swampbuster against conversion of wetlands to sugarcane are illusory. For a full discussion see the section below entitled Swampbuster and Sugarcane.

¹³Participation in Federal crop insurance programs tends to be high for tomatoes and peppers, moderate for sweet corn, and low for citrus and sugarcane. Citrus and sugarcane tend to be produced by large companies which prefer to self-insure.

¹⁴The Federal Government supports the price of manufacturing-grade milk chiefly through the dairy price support program. The Government stands willing to buy carlots of butter, cheese, and nonfat dry milk from processors at pre-set prices based on a Federal support price for each hundred pounds of milk. In order to acquire dairy products, commercial distributors must offer milk processors as much or more than the Federal Government would pay. The Federal Government becomes the purchaser of all quantities of milk products produced in excess of commercial market demand at the announced prices.

that it is very difficult for nonparticipants in the marketing order to sell their output. Usually, marketing orders establish standards for a commodity and the conditions under which it is produced. Critics contend that in some case, the standards are contrived, and rather than protecting the consuming public, they serve only to restrict market entry and maintain artificially high prices.¹⁵ In Florida, the artificially high prices for milk and citrus may encourage wetland conversions to citrus orchards and dairy farms, conversions that continue to occur in the Everglades in significant amounts.

Sugarcane Price Supports and Import Restrictions: Sugarcane predominates in the EAA with over three times as much acreage devoted to it as to the four next most significant crops combined. (See Table VII-1.) About 11 million tons are harvested annually.

The sugar industry receives major Federal subsidies in the form of price supports, import restrictions, and low interest loans. The price guaranteed to sugarcane growers in 1985 was 18 cents per pound, triple the world rate. The guarantee is implemented through the combination of import quotas (which prevent competition from cheap foreign sugar) and low interest, nonrecourse loans from the Commodity Credit Corporation (CCC) to sugar processors who agree to purchase domestic cane at or above the "floor price" established by Congress.¹⁶ The processed sugar (known as raw cane sugar) serves as collateral for the loans. This program protects the processors who can sell the sugar for a profit if prices rise, or forfeit the sugar to the CCC in exchange for cancellation of their debt if prices fall. Since 1981, import restrictions

**Table VII-1: Everglades Area
Agricultural Output, 1984**

Commodity	Acres
Sugarcane	354,500
Citrus*	74,377
Corn	14,000
Potatoes	5,100
Soybeans	2,000

*Excludes lemons and limes, the primary citrus product of Dade County.

Source: Florida Statistical Abstract,
1985.

¹⁵Cooperatives have been known to destroy supplies in order to maintain prices.

¹⁶To partially compensate the 39 countries whose sugar quotas were cut in 1985, the U.S. is making available surplus foods worth \$188.3 million.

have kept the domestic price of raw cane sugar so high, however, that processors have not defaulted on their loans.¹⁷

Subsidizing sugar has guaranteed such high prices for cane that more acreage is being planted, and the U.S. is becoming self-sufficient for the first time in its history.¹⁸ In the Everglades this leads to greater pressure for drainage and flood control. Moreover, because most of the sugarcane is grown in the Everglades Agricultural Area just south of Lake Okeechobee, first made suitable for farming by the Central and South Florida Project, the expansion of sugarcane releases increasing amounts of contaminants, impairing the water quality of the Lake and the water conservation areas.

Swampbuster and Sugarcane: As indicated above, Swampbuster denies farm program benefits to persons who produce agricultural commodities (including sugarcane) on wetlands converted after December 23, 1985 or convert wetlands after enactment of the 1990 FACTA. The ineligibility is for all farm program benefits, i.e., not only on the crops which a producer grows on converted wetlands, but on all crops that a producer grows anywhere during the crop year. The intent is to reduce Federal subsidies which provide financial incentives to convert wetland to cropland.

For two reasons Swampbuster is almost completely ineffective in deterring the conversion of wetlands to sugarcane. First, Swampbuster's only sanction is the denial of program benefits to growers. But in the case of sugarcane, the growers are not the participants in the USDA program which grants the principal subsidy, the nonrecourse loan or price support program. The

¹⁷In the fall of 1990, the domestic price for raw cane sugar was \$.23/lb., compared to a world price of \$.11. In 1989, about 20 percent of the raw cane sugar crop entered the loan program, but as in the two previous years, it was all redeemed by the processors and sold in the open market.

¹⁸Sugarcane is not the sole domestic source of the Nation's sugar supplies. Half of the demand for sweeteners is now satisfied by corn syrup products, a substitute for cane or beet sugar made economically feasible by the artificially high price of sugar. Corn syrup products largely displaced sugar refined from beets. Furthermore, the high price of sugar has induced manufacturers of products using sweeteners to substitute artificial sweeteners for sugar. Following the substitution, such products were heavily advertised as "diet" or "low calorie," with the ultimate result a reduction in domestic consumption of sweeteners produced on agricultural lands.

sugar processors are the program participants.¹⁹ Since sugarcane growers who convert or plant on converted wetlands cannot be denied eligibility to a program in which they do not participate, there is no Swampbuster sanction for price supports. Secondly, even if the program were restructured, so that the growers were the program participants and received their price supports directly, the restrictive import quotas would still serve to enfeeble Swampbuster. The quotas keep the market price so high that most growers would probably continue to plant converted wetlands and forego participation in the program.²⁰

URBAN DEVELOPMENT: Mortgage insurance, flood insurance, and loans for expanding the supply of electricity are the key Federal programs that promote residential development in the Everglades.

Mortgage Insurance: Mortgage insurance provided by the Federal Housing Administration and the Veterans Administration promotes investments by financial institutions in mortgages for residential construction. Houses, mobile homes, condominiums, the purchase of land, and the development of building sites for residential subdivisions and mobile home parks benefit from mortgage insurance. By requiring less money down and lower interest rates than conventional loans, these programs increase the demand for housing, spurring construction. Despite the Wetlands Executive Order that mandates that, where practicable, Federal agencies administer their programs so as to protect wetlands, flood control and filling wetlands for housing have had a significant, adverse effect on the Everglades. Wetland protection seems to have ranked low on the list of HUD priorities, although HUD maintains that it complies with its statutory obligations.

Flood Insurance: Flood insurance and reinsurance for buildings and their contents, including homes and businesses, is provided by the Federal Emergency Management Agency. FEMA's National Flood Insurance Program offers previously unavailable flood insurance to property owners in flood prone and storm hazard areas. While the program specifies building codes and land use practices to minimize the impact of flooding, it offers insurance

¹⁹The program is structured in this way, because the CCC needs collateral which can be stored easily. Processed sugar can be stored easily; sugarcane cannot.

²⁰The benefits associated with the program are the access to financing and the risk reduction provided by the floor on the price of sugar. However, if the import restrictions tend to keep the market price well above the floor, there is not much risk to be reduced, and financing can be arranged elsewhere, although perhaps at less attractive terms.

in areas where the private insurance sector is generally not willing to provide coverage. Without this insurance, financing for such buildings would be difficult to acquire. Although the availability of Federal flood insurance is not the principal stimulus for construction within the Everglades, it appears to facilitate the process.

Electrical Supply: The availability of electrical power at reduced rates encourages development. The Glades Electric Cooperative borrows money from both the Rural Electrification Administration and non-Federal sources to extend electric service into rural areas. As of December, 1985, the Cooperative had borrowed \$17 million at below market interest rates, thus reducing the cost of electricity.

TRANSPORTATION: The Federal Highway Administration (FHWA) provides 90 percent of the funds for interstate highway construction and 75 percent of the funds for other Federal-aid roads. As such, it can be a major contributor to projects affecting wetlands. For example, the Federal Government has paid about \$268 million for a 76.3 mile conversion of SR-84 (Alligator Alley which traverses the Everglades) to Interstate Highway 75. Dredging and filling for the highway will destroy 894 acres of wetlands directly, and indirectly is likely to affect wetlands adjacent to the highway. Moreover limerock, used to fill the roadbeds, is often taken from rock mines in the Everglades. The Interstate 75 project requires 1.5 to 1.8 million cubic yards of fill material, equivalent to a 20-acre hole, 10 feet deep. These losses have not been fully mitigated, largely because of the FHWA's past reluctance to mitigate outside of the right-of-way and to use culverts more extensively to maintain sheetflow drainage patterns.²¹ Despite these deficiencies, I-75 will be a

²¹Until recently, the FHWA supported off-site mitigation (outside the right-of-way) reluctantly. On April 20, 1990, FHWA issued an Environmental Policy Statement that emphasizes the Agency's commitment to the goal of no net loss of wetlands, and commits the Agency "to work vigorously to preserve and, where practicable, enhance the environment." The new policy does not commit FHWA to mitigating outside highway rights-of-way or to acknowledging functional values of wetlands, but it establishes a standard of environmental sensitivity markedly different from that which the agency subscribed to in the past. Further, the recent Corps/EPA MOA on mitigation places new requirements on FHWA and State highway agencies. All of these changes are expected to improve the consideration of wetlands in highway project planning. For a fuller discussion of the issue of highway construction and mitigation refer to the section on the Federal-Aid Highway Program in chapter 5.

considerably better road environmentally than the existing SR-84.

STATUS AND PROSPECTS

Population growth and a booming agricultural economy will continue to exert significant pressure on the Everglades. The publicly and privately owned wetlands in South Florida, however, will experience the pressures differently. The public wetlands, such as Lake Okeechobee and the water conservation areas, are likely to suffer from additional manipulations of the natural water regime. Storage capacity, for example, will probably be increased to meet the demands of a burgeoning population for drinking water. Changes in the timing and quantity of water releases could further perturb the system...flooding nests, killing fish by changing sensitive salinity balances, and drowning plant and animal life. Both the Federal and State Governments are stepping up efforts to regulate polluters, but until these arrangements are successfully in place, significant degradation and conversion will continue. Pollution will continue to take its toll as drainwater laden with nutrients from oxidized peat and agricultural and urban runoff is pumped into the public water bodies. Road crossings and utility corridors will continue to find public wetlands less costly than alternative upland sites. And given the burgeoning population, increased demand for recreational opportunities in south Florida may lead to construction of parking lots, boat ramps, and other access facilities to allow for hunting, fishing, bird watching, and enjoyment of the remaining Everglades.

Privately held wetlands will continue to face residential development pressure. Population pressure is intense. Many financial incentives...mortgage insurance, flood insurance, and low electricity rates...spur development. The regulatory authorities are reactive at best, and seem not to be able to withstand the pressure for permits to fill. Similarly, once the structures are built, the pressure to provide flood control is intense and politically difficult to resist.

Pressure from agricultural development will also escalate in part due to the displacement of agriculture by residential development, but also due to an artificially induced market for domestic sugarcane and federally sanctioned market orders for the citrus industry. In the absence of legislative changes, Swampbuster will remain ineffective in reducing wetland conversion to cropland. The major Federal subsidy for sugarcane stems from import quotas which keep the domestic price high. Obviously, Swampbuster has no effect on the benefits to the industry from restricting imports. If the import quotas were phased out, price supports for raw cane sugar would sustain the price of sugarcane, but Swampbuster still would not have any

effect. Processors of sugarcane, not growers are the participants in the price support program. As a result, growers are exempt from Swampbuster's sanctions. Finally, there is nothing in Swampbuster to deter conversion of wetlands to citrus groves, because the Federal program from which citrus growers benefit (marketing orders) is not among Swampbuster's sanctions.

The State of Florida has adopted a "Save Our Everglades" program to try to restore and acquire wetlands. Most significantly, it began in 1984 to restore the Kissimmee River from its current channelization to its former, meandering, floodplain environment. The State has also purchased 50,000 acres and reserved another 70,000 for eventual purchase. The Federal Government is examining ways to restore natural sheetflow to a part of the Everglades National Park. In 1989, Congress passed the Everglades National Park Protection and Expansion Act authorizing the addition of nearly 107,000 acres.²² The Federal Government has also added to the publicly held wetland acreage by exchanging Federal land for Everglades, a practice that is likely to continue. Restoration and acquisition can help, but the majority of the wetlands are and will remain in private hands. To protect the Everglades from conversion and impaired water quality, activities such as dredging, filling, and subsidization that safeguards existing development and fosters new growth will have to be severely curtailed, while regulation of wetland use will have to be more inclusive and vigorous.

RECOMMENDATIONS

1. Water quality:

Explore the possibility of denying Federal program benefits to industries, regions, or States found in violation of water pollution control standards.

Water quality degradation is probably the most significant problem facing the Everglades. The Federal Government has brought suit against the South Florida Management District for failing to meet water quality standards. The Federal Government continues to subsidize industries responsible for a large portion of the pollution. The loss of program benefits unless the industries complied with stringent controls could prove an effective inducement for improving water quality. The Clean Air Act contains a provision that would allow the lifting of Clean Air Act grants, certain Federal Highway construction funds, or, at EPA's

²²The Act added only about 1 percent to the 7 percent of the Everglades included within the park boundaries.

discretion, sewage treatment construction grants to States that fail to comply with its standards. Such a provision in the Water Pollution Control Act might serve as a similar inducement to States to not only design but implement effective water quality programs.

2. Agricultural subsidies:

a. Consider phasing out the import quota and price support for raw cane sugar.

Sugarcane, the dominant crop grown in the Everglades Conservation Area, is in worldwide surplus. The industry was made possible in south Florida by the Central and South Florida Project which subsidizes drainage and irrigation costs. The project was financed largely (80 percent) by Federal taxpayers. The industry is sustained by import restrictions, which keep the domestic price for sugarcane well above the competitive world price. The U.S. partially compensates sugar exporting countries for the restrictive quotas with foreign aid in the form of surplus foods (\$188.3 million worth in 1985). If import quotas were phased out, the price support program (nonrecourse loans) would sustain the domestic price, resulting in a drain on the Treasury.²³ To avoid the budgetary cost and effect the desired social change, the import quota and the price support have to be phased out simultaneously. The destruction in wetland quantity and quality attributable to sugarcane is significant. Withdrawing import quotas and price support subsidies would have a major, positive impact on consumers, taxpayers, and the Everglades wetlands.

b. Extend Swampbuster's sanctions to sugarcane processors, thereby making processors who purchase sugarcane from growers who plant on wetlands converted after enactment of the 1985 FSA or convert wetland after enactment of the 1990 FACTA ineligible for price supports.

²³Phasing out the quotas while retaining the price supports would have a significant budgetary impact. Currently the quotas keep the domestic price high enough that processors sell all their output on the open market and redeem their loans. If the quotas were phased out, the domestic price for raw cane sugar would fall; participation in the loan program would increase; few loans would be redeemed by processors; and the Federal Government would find itself acquiring stores of raw cane sugar, something it does not do now.

Because the nonrecourse loans (price supports) go formally to the sugarcane processors, Swampbuster's effectiveness is almost completely undermined in the Everglades.

- c. Include ineligibility to participate in marketing orders on the list of Swampbuster sanctions.**

Most significant of the citrus subsidies is the system of marketing orders that requires marketing through cooperatives, artificially supporting prices and making citrus growing more profitable than it would have been under competitive conditions. This system provides consumers with quality assurance, but at the expense of reduced price competition. Eligibility to participate in the system should be contingent on good wetland conservation and environmental practices.

3. Urban development:

Consider eliminating subsidies for residential development in the Everglades.

Insured mortgages and flood insurance offer significant incentives to development in the Everglades. Although a more rigorous regulatory program would help to conserve wetlands, this approach can be costly and politically distasteful. Withholding subsidies in wetland areas fosters Federal budgetary savings, while eliminating the market distortions which encourage economically inefficient and environmentally unsound development. Pressure for additional Federal drainage and flood control projects would also subside, and funding for regulatory purposes could either be reduced or freed up for use elsewhere.

Selectively withholding Federal support for unsound development is neither a radical nor a new concept. A similar program has already been implemented on undeveloped coastal barriers under the Coastal Barrier Resources Act of 1982 (CBRA). CBRA made any new development projects in areas designated by Congress ineligible for most federally financed assistance programs.

4. Mitigation:

- a. Consider developing a system of mitigation banking that would allow for a more flexible and comprehensive mitigation program.**

Mitigation occurs largely in piecemeal fashion. Wetlands destroyed by a project in one area are often compensated for by acquiring, restoring, or creating equivalent acreage

elsewhere. Often compensation is conducted with little regard for the ecological functions of the lost wetlands or the relationship which the lost wetlands had to the larger ecosystem of which they were a part. A mitigation bank, sponsored by one or more agencies, could greatly improve the effectiveness of limited mitigation funds.

- b. Have Federal agencies assess the effects of their programs on wetlands. Where feasible, agencies should minimize the wetland effects of their programs. Where this proves infeasible, agencies should furnish Congress with an explanation of why adjustments cannot be instituted.**

As we have seen, many Federal programs that affect wetlands are designed and financed in a way that violates the most basic principles of public finance: efficiency and equity. They distort market signals and provide subsidies that are difficult to justify from the point of view of economics under any circumstances, but much more difficult to defend given their environmental impacts. Optimally, these programs should be redesigned in order to confront project sponsors with the full cost of their activities. This would reduce the Federal deficit, strengthen the economy by improving the allocation of resources, and conserve wetlands and other environmental resources. If political realities preclude elimination of these subsidies, at the very least the programs should be responsible for compensating for their impacts on wetlands and the environment.

Executive Orders 11990 and 11988, the Executive Orders on Wetland Protection and Floodplain Management, already require, where practicable, all Federal agencies to minimize wetland effects and consider floodplain impacts in conducting their programs. Although most Federal agencies instituted regulations to fulfill the requirements of the Executive Orders, some have not and some that promulgated regulations have not implemented them thoroughly. No oversight information exists on the implementation and effectiveness of the Executive Orders. The Council on Environmental Quality and the Water Resources Council were originally designated to oversee compliance with the Orders. The last Administration dissolved the Water Resources Council, and the CEQ has not had the resources to execute its responsibilities. Neither the Environmental Protection Agency nor the Fish and Wildlife Service has been able to fill the breach. Strengthening the administration and enforcement of these Executive Orders will benefit the environment, the economy, and society as a whole.

REFERENCES

- Dahl, T.E. 1990. Wetlands Losses in the United States, 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC, 13 pp.
- Florida Atlantic University-Joint Center for Environmental and Urban Problems. 1986. The Impact of Federal Programs on Everglades Wetlands. Background Report. Prepared for Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 27 pp.
- Robertson, W.B. Jr. and J. A. Kushlan. 1984. "South Florida Avifauna," in P. J. Gleason, ed. Environments of South Florida: Present and Past. Miami Geol. Soc., Miami, FL, pp. 219-257.
- Stephens, J. C. 1974. "Subsidence of Organic Soils in the Florida Everglades - Review and Update," in P. J. Gleason, ed. Environments of South Florida: Present and Past. Miami Geol. Soc. Mem. 2. Miami, FL, pp. 352-361.

Chapter 8: COASTAL LOUISIANA

INTRODUCTION

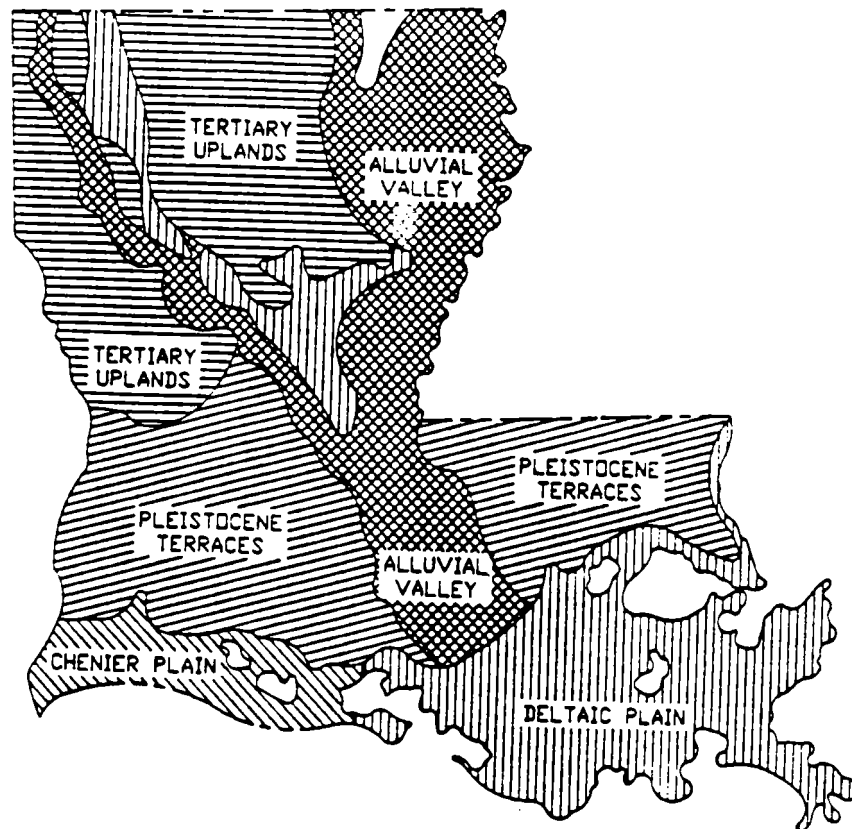
PHYSICAL DESCRIPTION: Coastal Louisiana embraces one of the most wetland-rich regions of the world, with 2.5 million acres of marshes (fresh, brackish, and saline) and 637,400 acres of forested wetlands. It contains about 40 percent of the coastal marshes in the coterminous United States. Wetlands border the entire Gulf of Mexico shoreline and extend inland more than 60 miles in some places. Coastal Louisiana's wetlands are bordered and interspersed with 1.8 million acres of ponds and lakes, 2.2 million acres of bays and sounds, and 8,200 miles of navigation, drainage, and petroleum access canals. Two physiographic units comprise the area: the Deltaic Plain on the east formed by sediments from the Mississippi and Atchafalaya Rivers and the Chenier Plain on the west formed by sediments from ocean currents. (See Figure VIII-1.)

CHARACTERISTICS AND FUNCTIONS: Coastal Louisiana influenced by its rich network of wetlands

- o Contributes 28 percent to the total volume of U.S. fisheries (\$321.5 million at dockside in 1986);
- o Leads the nation in trapping of fur-bearing animals and operates a highly regulated harvest of alligator skins;
- o Provides winter habitat for one-half to two-thirds of the Mississippi Flyway waterfowl population;
- o Contains one national park, seven national wildlife refuges, and fourteen State wildlife refuges and management areas; about 22 percent of the region is in public ownership;
- o Provides habitat for six federally-listed threatened and endangered species including the bald eagle and the brown pelican.¹

¹This excludes several listed species of sea turtles and marine mammals that may occur in Louisiana's coastal waters, but not in its coastal wetlands.

Figure VIII-1: PHYSIOGRAPHY OF LOUISIANA



- o Reduces storm and erosion damage by curtailing tidal surge and wind velocities;²
- o Maintains water quality by filtering pollutants.³

ORIGINAL ACREAGE: Coastal Louisiana contained 4.07 million acres of wetlands at the turn of the century.

²Along the coast of Terrebonne Parish wetlands were estimated in 1985 to have an estimated present value for hurricane protection of \$1,604-\$1,712 per acre.

³The loss of wetlands fringing the Lake Pontchartrain Basin and the dredging of canals in the Barataria Basin have contributed to water quality declines.

CURRENT ACREAGE: From 1900 to 1978 Louisiana lost about 22 percent (901,200 acres) of its coastal wetlands, with 3.17 million acres remaining in 1978. Conservatively, an additional 300,000 acres have been lost since then. Current loss rates are estimated to be about 0.75 percent per year.

TRENDS: From the mid-1950s through the late 1970s Louisiana averaged a loss of 48 square miles of coastal wetlands per year. Recent figures suggest that the loss may have slowed to between 35 and 37 square miles per year. These figures contrast with the 6000 years prior to 1900 when Coastal Louisiana had an overall net gain of wetlands. At current rates, half of Louisiana's and 20 percent of the coterminous United States' coastal wetlands could disappear over the next 100 years.

FACTORS ADVERSELY AFFECTING WETLANDS

A combination of natural and human factors have caused the wetland decline. Natural factors include subsidence, erosion due to storms, and a change in sea level due to recovery from the last ice age and tectonic motion. Historically, sediment deposition from the Mississippi River largely offset any losses, but in the last century human activities have altered this process. Dams and levees along the Mississippi River now trap sediments before they reach the coastal plains. Exacerbating the problem is the threat of sea level rise due to global warming. Because of the interrelationship of factors responsible for wetland loss in Coastal Louisiana, accurate estimates of losses attributable to each factor are difficult to derive. Estimates span a broad range and suggest more about relative influence of the factors than their precise impact. The most recent study (Turner and Cahoon 1988) identified the causes of between 43-73 percent of wetlands losses. Canals and spoil banks (related to activities within and outside of the outer continental shelf (OCS)) accounted for 30-59 percent of the losses and land use changes for about 13 percent.⁴ The remaining 28-57 percent of the losses "may also be caused by OCS or non-OCS economic development, agricultural and urban expansion, and canals and spoil banks, but are likely to involve the more non-manageable influences, particularly water level rise, geological factors, and the decreased sediment content of the Mississippi River" (Turner and Cahoon 1988). About three-fourths of Louisiana's coastal wetland losses are conversions to open water.

⁴OCS lands are those seaward of the territorial seas over which the States have jurisdiction. Generally, the OCS begins three nautical miles from the coast line.

The single most important factor affecting wetlands has been the construction of levees to reduce the frequency and duration of flooding throughout much of the lower Mississippi River Valley. Levees have allowed for the large-scale conversion of forested wetlands to agriculture, the growth of urban areas, and industrial expansion in areas formerly plagued by frequent flooding. The levees have benefitted navigation by confining the river's flow to a smaller area, thereby scouring the bottom of sediment buildup more efficiently and raising water levels between the levees. The net result has been a deeper navigation channel with much less channel dredging than would have been required if the levees had not been built.

The hydrologic changes that made this economic development possible took their toll on wetlands. Levees prevent the historic overbank flow that transported huge quantities of fresh water and sediment to adjacent wetlands. The 961 miles of levees associated with the Mississippi River and Tributary Project have largely halted the delta building process (except in Atchafalaya Bay). The delta building process is also affected by upstream reservoirs and flood control projects, resulting in the Mississippi River carrying about 60 percent less sediment than in the 1950s. Much of the sediment that does make it to the coast is shunted by the confined Mississippi River and dredged canals into deeper water where no delta-building takes place. In addition to restricting sediment replenishment, the flood control also deprives wetlands of freshwater, which served to keep the saltwater at bay. The cutoff of the riverine inflow allows for the intrusion of saltwater, which, in combination with the deep canals which allow for stratification and intrusion, hastens conversion of low-salinity marshes and forested wetlands to unvegetated, open water.

Whereas Mississippi River levees protect against riverine flooding, dikes protect against tidal flooding brought on by hurricanes. Dikes often enclose undeveloped wetlands; pumps are then installed to reclaim the wetlands. The increased flood protection and drainage leads to increased development of the enclosed wetlands. Three major Federal hurricane protection projects, when completed, will have enclosed over 19,000 acres and destroyed about 5800 acres of coastal wetlands directly via construction of dikes and excavation of material used in dike construction. Plans to mitigate some of these losses are underway.

Canal dredging occurs to create or deepen channels for navigation and to embed oil and gas pipelines. Canal dredging, in turn, digs up sediment that is deposited as spoil banks along the canals, thus filling existing wetlands. Canal dredging and spoil deposits accounted for between 30 and 59 percent of the coastal wetland losses in Louisiana from 1956-1978 (Turner and Cahoon

1988; Turner 1987). About 8200 miles of canals traverse the coastal wetlands.

The Corps dredges some of the navigation canals. About 550 miles of Federal navigation canals traverse Coastal Louisiana and range from 12 to 45 feet deep and 150 to 500 feet wide. The 302-mile Gulf Intracoastal Waterway is the largest of the seven main canals. Together these projects converted 17,878 acres of wetlands to open water due to excavation and another 76,676 acres due to filling with dredged material. About 274,000 additional acres disappeared in the affected drainage basins, largely as a result of the canals' indirect effects. The indirect effects are several times larger than the direct effects.

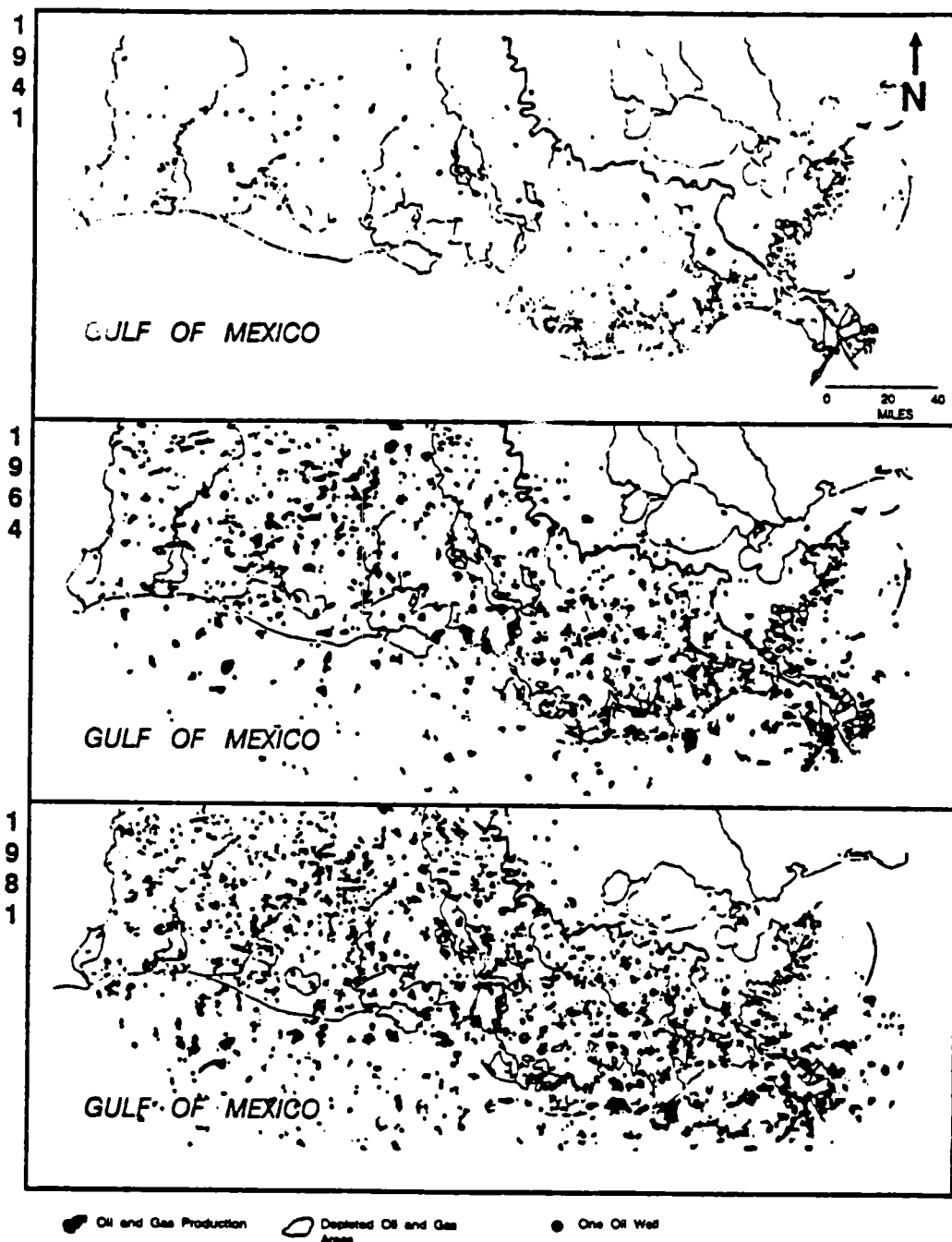
The oil and gas industry dredges other canals to transport barge-mounted oil and gas exploration and production equipment and to house pipelines. Although prior to World War II oil and gas fields were few, today more than 70 percent of the oil and 90 percent of the gas from U.S. coastal water comes from the Louisiana Coastal zone. (See Figure VIII-2.) In 1985, \$27.1 billion in crude petroleum and natural gas was extracted from the wetlands. This amounted to 16 percent of the nation's total petroleum production and 29 percent of the natural gas production.

In addition, over 152 pipelines come ashore from the outer continental shelf to the Louisiana Coast. Additional pipelines originating from State (near-shore) waters also traverse Louisiana's coastal wetlands. The Minerals Management Service recently estimated that canal dredging and the concomitant levee construction due to offshore oil and gas activity accounts for 8-17 percent of total wetland loss in Coastal Louisiana (Turner and Cahoon 1988). The placement of onshore facilities supporting offshore oil and gas activities and access roads in wetland areas causes additional losses.

While the loss from the initial construction of canals is significant, the greatest damage occurs over the longer run. Canals widen over time converting wetlands to open water. It appears that boat traffic hastens canal widening; widening occurs less frequently with pipeline canals. The doubling rate for navigation canals averages from 5 to 35 years; the annual enlargement of the older canals now approximates the area of newly constructed canals. Hence, even if no new canals were built, those in existence will exert a continuing influence.

The indirect impacts of canals are considered to be significantly more important than canal widening. These impacts result from hydrological alterations brought on by canal dredging and spoil bank creation, leading to saltwater intrusion and the subsequent conversion of vegetated wetlands to open water or to more saline

**Figure VIII-2: OIL AND GAS FIELDS IN SOUTHERN LOUISIANA IN
1941, 1964, AND 1981**



Source: Turner, 1987.

wetland types. Impoundment of wetlands deprives them of nutrients, sediments, and freshwater, thereby compacting soils and altering the flora and fauna. Pollutants from shipping and oil and gas development impair the water quality in the coastal wetlands. These impacts can occur away from the immediate area of the canal project, can manifest themselves years after canal construction, and can persist for a long period of time.

Although the Mississippi River levees, hurricane protection projects, and the canals for navigation and pipelines contribute most to wetland losses, filling for highway projects and agricultural and urban development have a significant impact in some areas. For example, between 1967 and 1984, four major Federal or federally aided highway projects in Coastal Louisiana destroyed 2640 acres of wetlands and helped create the opportunity for additional development with attendant indirect wetland losses. In the Chenier Plain agriculture has accounted for 10.8 percent of the wetland loss and urban development for 2.5 percent. Between 1952 and 1974, agricultural land increased by 14,000 acres in southwestern Louisiana and southeastern Texas mainly at the expense of coastal wetlands. Urban development remains an important factor in wetland conversion in southeastern Louisiana. Between the mid-50s and 1978, developed land increased by 59,000 acres in the Deltaic Plain largely by diking, draining, and filling wetlands. Jefferson Parish experienced the greatest increase at 14,500 acres. The Minerals Management Service estimates that together agricultural and urban development account for about 13 percent of Coastal Louisiana's wetland decline (Turner and Cahoon 1988).

Nearly all of this agricultural, urban, and highway development occurred without any action to offset wetland losses. The advent of Swampbuster has greatly diminished agricultural losses, however, and compensatory mitigation is routinely required for urban development in wetlands as a condition for State and Federal permits. The recent experience of the Fish and Wildlife Service is that the FHWA and the Corps have become more responsive to wetland mitigation recommendations.

FEDERAL PROGRAMS AND PROJECTS

Federal flood control and navigation projects have had a major impact on the loss of Louisiana wetlands. Federal hurricane protection and highway projects have had a lesser impact, but are nonetheless important. Economic incentives offered by the Federal Government for oil and gas development, urban growth, and agriculture have also served to increase profits and led to conversion of wetlands.

WATER PROJECTS: The Federal Government has assumed responsibility for the planning, construction, and maintenance of an extensive system of flood control, hurricane protection, and navigation in Coastal Louisiana. Local interests have been the chief beneficiaries of flood control and hurricane protection projects. These projects not only protect existing development, but also create the opportunity for the conversion of additional coastal wetlands. Project beneficiaries typically have contributed only land and rights-of-way to the projects, a relatively small portion of the overall costs. However, the Water Resources Development Act of 1986 (WRDA), which requires greater cost-sharing by local beneficiaries, should reduce pressure for additional projects.

Flood control: Through 1985 the Federal Government invested over \$5.9 billion on the Mississippi River and Tributaries Project throughout the Mississippi Valley.⁵ Almost 1000 miles of levees and other features comprising the Mississippi River Levees and Associated Works projects were constructed. This massive public works endeavor was constructed to prevent flooding of towns, cities, and agricultural lands, improve navigation, and facilitate commerce and trade. Almost all project benefits accrued locally, and there was very little mitigation of environmental damage.

With passage of the WRDA, Congress made substantial progress toward eliminating the subsidization of flood control, drainage, and navigation projects, as well as reducing the construction of inefficient projects. The WRDA assigns a greater share of the financial burden to those directly profiting from Corps projects.⁶ Future project beneficiaries will have to assume half the cost of development and design studies, at least 25

⁵This figure merely sums the project expenditures. It is not stated in constant dollars, and does not correct for inflation. The figure would be much higher if it were stated in the dollars of a recent year.

⁶The WRDA applies only to projects constructed by the Corps. The Reagan Administration recommended that for equity and efficiency all future water projects be financed in accordance with the benefit principle of public finance. See recommendation 1 in Volume I of this report.

percent of construction cost (including mitigation costs),⁷ and all operating and maintenance expenses.

Hurricane Protection: The Corps is conducting design studies on the "West Bank of the Mississippi River in the vicinity of New Orleans" Project, which will destroy 814 acres of wetlands and will cost \$65.8 million to build. The "Larose to Golden Meadow Hurricane Protection" Project is nearing completion, at an estimated cost of \$91.4 million.⁸ That project will result in the loss of nearly 2500 acres of wetlands through construction and drainage. Mitigation of wetland losses is underway.

Navigation: The Federal Government has spent over \$280 million⁹ for a system of over 500 miles of navigation channels and continues to spend \$40 million annually for maintenance. The WRDA will shift some of the cost of navigation projects from Federal taxpayers to the shipping industry and other project users.

The Corps has the authority to maintain existing waterways and to enlarge the Gulf Intracoastal Waterway. The Fish and Wildlife Service estimates that by the year 2026, maintenance dredging along the Gulf Intracoastal Waterway will eliminate between 500 and 2,600 more acres of wetlands in Coastal Louisiana. The total would rise substantially if authorized enlargements of that waterway are completed. As of 1992, however, the Corps does not intend to undertake these enlargements. Congress has authorized the Corps to deepen the Mississippi River Ship Channel from Baton Rouge to the Gulf at a construction cost of \$454.2 million and an annual maintenance cost of \$139.1 million. The channel was deepened to an interim depth of 45 feet in 1987; further deepening to the authorized 55-foot depth is not currently planned. Although the Corps proposes to create marsh with dredged material, the project (especially the 55-foot deep channel) could increase the intrusion of saltwater and threaten the water supplies of communities along the lower Mississippi River. Because of this threat to water supplies, resistance may develop to diverting river flow to enhance wetlands, as called for by the diversion projects described next.

⁷Under the WRDA, the cost of all lands, easements, and rights-of-way remain the responsibility of the non-Federal sponsors, but are credited against the 25 percent obligation. The WRDA requires a minimum, non-Federal cash contribution of 5 percent.

⁸Sum of total dollars spent and projected cost to complete in current dollars, not corrected for inflation.

⁹See previous footnote.

Freshwater Diversion Projects: A major Federal effort designed to help restore freshwater inflow to coastal wetlands is planned for Southern Louisiana. This effort consists of a set of three diversion projects that would install water flow gates in the levees to divert river water into adjacent wetlands. The effort would freshen water influenced by saltwater intrusion, but have little land-building impact. The three Congressionally authorized projects include the recently completed Caernarvon Freshwater Diversion (\$25.9 million), the Davis Pond Freshwater Diversion (\$70.0 million), and the Freshwater Diversion to Lake Pontchartrain Basin and Mississippi Sound (\$77.0 million). Together, these three enhancement projects would reduce marsh loss by 110,000 acres over the next 50 years, or about 2200 acres per year, and would improve the value of the remaining wetlands for fish and wildlife. Under the authority of the Coastal Wetlands Planning, Protection, and Restoration Act, the Corps will construct the West Bay Sediment Diversion project (\$8.5 million) to create 9800 acres of coastal marsh by funneling Mississippi River sediment through a diversion channel into West Bay in the active delta of the river.

Mitigation: Prior to the 1980s, mitigation of wetland losses caused by Federal navigation, flood control, and hurricane protection projects in Coastal Louisiana consisted of relatively minor project changes designed to reduce habitat losses. Such features might include building of spoil retention dikes to reduce the runoff of dredged material onto adjacent wetlands. During the past few years, however, the Corps has been including more substantial mitigation measures into its project plans. Compensation measures have included prevention of shoreline erosion on existing public lands, creation of new wetlands by careful placement of dredged material, formation of small wetlands by excavating artificial crevasses in the active Mississippi River Delta, and intensive management of existing public lands to reduce wetland loss and enhance wildlife habitat values. The improved mitigation planning approach should help to reduce future losses of wetlands associated with new proposals for Federal navigation, flood control, and hurricane protection projects. The Fish and Wildlife Service has acknowledged that newer projects are better mitigated than in the past.

OIL AND GAS DEVELOPMENT: A dense network of canals for navigation and pipelines has been dredged in Coastal Louisiana by the oil and gas industry. Two provisions of the Federal tax code, specific to the industry, have made development more lucrative: the oil and gas depletion allowance and the expensing, as opposed to capitalizing, of intangible drilling costs. Critics contend that industry oversight by the Corps and the Minerals Management Service (MMS) has not been sufficiently sensitive to wetland impacts. MMS disputes this. Moreover, MMS does not have direct regulatory authority over coastal wetlands

which are controlled by the State. Industry activities in support of OCS exploration and development (such as pipeline and navigation canals) that affect coastal wetlands are regulated by State and other Federal agencies.

Income Tax Code: From 1926 to 1975, the oil and gas industry was entitled to a tax subsidy: the depletion allowance. The allowance set an arbitrary percentage for depreciating the value of a well as its oil or gas was pumped out. The arbitrary allowance (27.5 percent of gross income through 1968 and 22 percent until 1975) was unrelated to costs, and permitted tax-free recovery, often exceeding the amount invested in the property. Producers could deduct the allowable percentage of gross income from taxable income with a limit on the deduction equal to 50 percent of taxable income. This provision encouraged the development of otherwise marginal wells with the attendant pipelines and support facilities.

In 1975, this deduction was eliminated for all but independent producers, who are now entitled to a 15 percent depletion allowance for the first 1,000 barrels of oil and the first 6 million cubic feet of gas produced daily. Louisiana's Association of Independent Producers and Royalty Owners claims 1200 members. The oil depletion allowance influences their drilling decisions about marginal areas.

A second tax code provision aids the industry by allowing deductions for intangible costs related to oil and gas exploration and production. The deduction allows producers to take an immediate tax deduction for "intangible" expenses...those without salvage value...on labor, fuel, power, materials, supplies, and tools. No rapid write off is allowed for "tangible" costs such as expenditures for pipe, tanks, and pumps used in an oil or gas rig. Whereas tangible costs are depreciated and deducted over the number of years the facility is in use, the tax code allows a full deduction for intangible costs in the year the expenditures are made.¹⁰ These deductions are a significant factor in offsetting the costs of canal dredging and access road construction. These deductions can make the

¹⁰The immediate deduction for intangibles apply to the following: transporting drilling rigs to location, including canal dredging and rig up costs; building roads for use during drilling; dredging on location; surveying and seismic studies to locate well sites; supplying water, fuel, and other resources needed for drilling; drilling on a footage or daily basis; compensating for technical services rendered by engineers, geologists, and fluid technicians; removing rigs and equipment from location.

development of marginal wells profitable, and provide the incentive for development that affects wetlands.

Regulation: Two Federal agencies (the Minerals Management Service and the Corps of Engineers) regulate oil and gas activities that can affect Louisiana's coastal wetlands.

The MMS leases Federal tracts on the outer continental shelf (OCS). However, MMS does not have the authority to regulate the activities that occur on coastal wetlands, even when those activities are conducted in support of OCS oil and gas development. Industry activities in support of OCS exploration and development that affect coastal wetlands are regulated by State and other Federal agencies. MMS does address secondary impacts of OCS activities (i.e., onshore effects) in its EISs, and it can formally notify lessees of responsibilities and procedures under other Federal and State laws in clauses included in oil and gas leases (Information to Lessee clauses). However, MMS does not have the authority to regulate activities of lessees that do not occur on the OCS.

Under section 404 of the Clean Water Act, the Army Corps of Engineers issues permits for discharge of dredged or fill material into U.S. waters, including wetlands. Such discharges can be associated with the installation of structures in navigable waters. The Corps can condition permits required to install pipelines used to transport oil or gas from the OCS through coastal wetlands.

There are two distinct approaches that could be used to modify the 404 program in Louisiana and make mitigation of wetland losses due to oil and gas activities more effective. One is market-oriented; the other involves attaching additional command-and-control provisions to permits. The economic ideal is the establishment of environmental standards for permittees to meet in whatever way they deem most efficient, while simultaneously requiring permittees to post performance bonds. The bonds must be of sufficient magnitude to cover the cost of restoration in the event the standards are not met. In situations where the performance-bond approach proves unmanageable, the alternative is the specification of procedures and techniques that must be observed in conducting the permitted activities. Some of the suggestions often offered for improving the effectiveness of mitigation for wetland losses due to oil and gas activities in Louisiana are:

- o If directional drilling is technically feasible, it could be used to reduce wetland damages caused by drilling in State waters and onshore.

- o As permit conditions, the Corps could require the use of other technologies that reduce wetland loss and degradation. Examples include using jet-spray dredges to minimize spoil buildup along channels dug in wetlands; using of board road access for drilling rigs instead of channels; re-injecting brine instead of discharging these pollutants into adjacent wetlands; using closed drilling fluid systems to minimize impacts on wetlands due to drilling fluids and associated reserve pits; and using air cushioned vehicles instead of canals and marsh buggies for marsh access.
- o The Corps could require oil companies to fully compensate for unavoidable wetland damages associated with individual proposals requiring Sections 10 and 404 permits. One way that this can be accomplished off-site is through wetland enhancement projects. Historically, the Corps rarely required off-site mitigation of damages associated with oil and gas activities in wetlands, and on occasion did not even include on-site mitigation measures recommended by resource agencies as conditions of issued permits. Recently, however, the Corps has been accepting most of the resource agencies' recommendations and has been conditioning permits with appropriate on- and off-site mitigation measures.

URBAN DEVELOPMENT: Although many factors contribute to the urban sprawl felt most intensely in Jefferson Parish in the Deltaic Plain, the Department of Housing and Urban Development (HUD) and the Federal Emergency Management Agency (FEMA) provide several key incentives. HUD sponsors low income housing and mortgage insurance for homes, even if they are built in drained wetlands. FEMA offers flood insurance for urban developments in Jefferson Parish and other Coastal Louisiana parishes under the National Flood Insurance Program for approximately 30 percent of the actual cost. The program is supposed to avoid flood damage by limiting development in flood prone areas or requiring flood-proofing of structures in such areas. As was evident in the aftermath of Hurricane Juan (1985), local governments have often done a poor job of enforcing local ordinances and codes restricting development and meeting the intended goals of the program (FEMA 1985).¹¹ This failure has led to otherwise unnecessary Federal expenditures for flood insurance claims and disaster relief payments. It has also spurred public demand for expanded Federal hurricane protection to enclose former wetlands, now converted to urban development. The West Bank project discussed above is a case in point.

¹¹Establishing and enforcing these local ordinances are a statutory requirement for eligibility in the Federal flood insurance program.

TRANSPORTATION: Between 1967 and 1976, almost 60 miles of Federal highways were built in Coastal Louisiana at a cost of \$65.8 million. The construction destroyed 1886 acres of wetlands and created greater development pressures on the remaining wetlands. New construction is underway on Interstate 310 and is proposed for Interstate 10. The State provides the Fish and Wildlife Service with an opportunity for early input on all highway projects, including those which are federally funded. The State and Federal Highway Administrations have also been fairly good at mitigating recent losses.

AGRICULTURE: Various Department of Agriculture programs and Federal tax incentives have encouraged the conversion of wetlands to croplands. USDA programs include price supports for rice, soybeans, and other crops; low interest loans issued by the Farmers Home Administration; disaster payments for crop losses; and technical assistance by the Soil Conservation Service and the Agricultural Stabilization and Conservation Service on issues such as developing drainage plans. Swampbuster should reduce the loss of wetlands to croplands.¹² Further, legislative reforms in the 1985 and 1990 Farm Bills made it much more difficult for new acreage to qualify for price and income supports, and hence, significantly diminished the incentives in Federal agricultural law to convert wetlands to cropland.

Until passage of the Tax Reform Act of 1986, the Federal income tax code contained several provisions specific to agriculture which treated expenses for land clearing, drainage, and other types of alteration liberally. Although tax reform eliminated the accelerated deductibility for these items, wetland alteration and development continue to be tax deductible, like any normal business outlay.

STATUS AND PROSPECTS

Without aggressive action to reverse the trend, the rate of loss of coastal wetlands in Louisiana is expected to continue. If the losses are not reduced, another 167,000 acres of wetlands will disappear or be converted by the year 2000. The Gulf shoreline will advance inland as much as 13 miles in some areas, jeopardizing public and private investments. State waters will become outer continental shelf lands, subject to Federal control, and private lands will become water bottoms, subject to State control. About 1200 businesses, residences, camps, schools, storage tanks, electric power substations, water control structures, and pumping stations will require protection or

¹²See chapter 3 for a discussion and critique of Swampbuster.

relocation. The Corps estimates that commercial fish and shellfish harvests will decline by 30 percent by the year 2040 without action to reverse projected wetland losses. The loss of income and assets will run into the billions of dollars.

Historically, the natural factors depleting wetlands (subsidence, compaction, erosion, hurricanes, and the rise in sea level) have been offset by delta-building sedimentation by the Mississippi River, so that prior to 1900 the deltaic land area was stable or expanding. Since then, flood control dams and levees along the Mississippi River have dramatically reduced sediment deposition and delta renewal. Moreover, flood control has facilitated private land development along the river, so now the Federal Government is committed to protecting this investment by trying to prevent the Mississippi River from shifting to its desired course where it could build delta land efficiently and by trying to prevent subsidence in sediment-depleted areas. In addition, the dredging of an extensive canal system has directly consumed coastal wetlands. And the canal widening that occurs as a result of erosion and the indirect effects from dredging (saltwater intrusion, impoundment and water logging of wetland soils as well as pollution) will exert an ongoing, negative influence on Louisiana's coastal wetlands, even if new dredging were halted. Finally, urban and agricultural development diminishes wetlands.

As a result of the Coastal Wetlands Planning, Protection, and Restoration Act of 1990, various State and Federal agencies are working together to prepare a comprehensive plan to address problem of coastal wetland loss in Louisiana. Section 303 of the Act requires establishment of a task force to i) identify a list of priority wetlands restoration projects for Coastal Louisiana (due by November 28, 1991) and ii) develop a comprehensive wetlands restoration plan for the area (due by November 18, 1993).¹³ The Act also provides for funding to implement wetland restoration projects approved by the task force. The Administration considers this Act to be a major improvement in Federal programs affecting wetlands in Louisiana.

The freshwater diversion projects (Caernarvon, Davis Pond, and the Diversion to Lake Pontchartrain basin and Mississippi Sound) could restore a modest amount of fresh water from the lower Mississippi River to adjacent marshes, swamps, and shallow estuarine waters, reducing wetland loss by an estimated 110,000 acres over a 50-year period.

¹³The task force is chaired by the District Engineer, representing the Secretary of the Army. Other task force members include the Governor of Louisiana, the Administrator of the EPA, and the Secretaries of Agriculture, Commerce, and the Interior.

Section 1135 of the WRDA authorizes the Secretary of the Army to modify water resource projects for the improvement of environmental quality. That authority was extended by the WRDA of 1988. The Fish and Wildlife Service and the Corps have identified several projects that could restore or create wetlands under that authority. The first project to make use of that funding source in Coastal Louisiana was initiated in FY 1991. Using dredged material to restore wetlands and help offset the sediment losses from levees is one of the more promising mitigation strategies.

Ongoing oil and gas development also affects wetlands. Although production has leveled off, the majority of the oil and gas produced in the coastal waters of the United States will continue to come from offshore Louisiana. This continued development could create the need for additional canals and construction of ancillary facilities. To reduce the damage, Federal regulatory oversight by the Corps in cooperation with the State could specifically encourage:

- o Minimizing additional canal construction and making greater use of existing canals;
- o Drilling directionally to several targets from one well-head location (as is now done in the Alaskan tundra and offshore Louisiana);
- o Leaving breaks in the canal spoil banks where needed to maintain hydrologic patterns;
- o Backfilling or plugging canals;
- o Using hovercraft (air-cushioned vehicles that can traverse uneven terrain with very slight impact on the ground) as is done in Alaska.

A cooperative, State/Federal program could devise a strategy to apply innovations developed in Alaska to minimize wetlands losses in Coastal Louisiana and to mitigate the effects of past activities.

The threat to wetlands from oil and gas activities might also be reduced by eliminating certain tax-expenditure subsidies for the oil and gas industry. In particular, oil depletion allowances granted to independent producers and the deductions for (rather than capitalization and depreciation of) intangible costs associated with drilling (such as canal dredging and access road construction) are difficult to justify on economic grounds. Absent such deductions, some wells that involve marginal returns might not go forward.

Urban development remains an important threat to the wetlands in Southern Louisiana. Enforcement of the Floodplain Management and Wetland Protection Executive Orders could help to alleviate urban development problems. Moreover wetland loss could also be stayed by denying Federal subsidies...low income housing funds, mortgage insurance, and National Flood Insurance...to developments in floodplains and other wetlands. This could be facilitated by routinely coordinating with FEMA and HUD on Sections 10 and 404 permit applications involving residential and industrial developments in wetland areas. Such notification would alert these agencies to proposed development plans, and forewarn developers that Federal funding cannot be provided to support such developments.

Agricultural conversion, once a serious threat to Louisiana's coastal wetlands, no longer appears as such because of the 1985 FSA and the 1990 amendments thereto in FACTA.

RECOMMENDATIONS

1. Water resource projects:

- a. Congress should continue funding the construction by the Corps of two authorized but uncompleted water diversion projects: Lake Pontchartrain (\$57.8 million Federal share) and Davis Pond (\$52.5 million Federal share).**

In conjunction with Caernarvon, which is operational, these projects would restore a small percentage of the freshwater inflows lost as a result of the MR&T Project, and may restore a portion of the sediment lost. They constitute a first step in reducing the estimated 35 to 37 square miles of Coastal Louisiana wetlands which are disappearing annually.

- b. Consider expanding the Corps' Civil Works Program to protect, create, restore, and enhance wetlands in Coastal Louisiana.**

The Corps now has numerous authorities to construct or modify projects to benefit wetlands. Examples are marsh creation with dredged material, sediment and freshwater diversion, and shoreline protection.

2. Oil and gas industry:

- a. Consider eliminating the Federal income tax deductions in wetland areas for oil depletion allowances granted to**

independent producers and for intangible costs associated with drilling.

The threat to wetlands from oil and gas activities could be reduced by making these tax subsidies unavailable in wetland areas. Both tax provisions amount to special subsidies for the industry, are difficult to justify on economic grounds, and promote drilling of marginal wells in important wetlands.

b. Consider expanding the use of performance-bonds for the mitigation of wetland losses.

Performance bonds create an incentive for developers to complete work in a timely manner. In the event of noncompliance, the Government is relieved of the need to pursue costly enforcement action, and the bond provides a ready source of funds to restore the environment quickly. BLM already utilizes performance bonds on lands which it administers. To be fully effective, the bonds must be of sufficient magnitude to cover the cost of restoration in the event the standards are not met, together with any increased governmental administrative costs and penalties. Congress should consider whether a performance-bond approach could be utilized more widely in the wetland regulatory programs.

c. Establish stronger mitigation requirements within the programs regulating oil and gas development in Coastal Louisiana.

The Army Corps of Engineers and the State regulate oil and gas development in Coastal Louisiana. The Corps could work in cooperation with State and local authorities to attach more effective wetland mitigation requirements to permits for installing pipelines and drilling equipment. Specific techniques for achieving this include: making greater use of existing canals, minimizing construction of new ones, and backfilling and plugging abandoned ones; requiring directional drilling and other extraction technologies that reduce wetland loss and degradation whenever technically feasible;¹⁴ and leaving breaks in levees where needed to maintain hydrologic patterns. Where wetland damage is

¹⁴Examples include use of jet-spray dredges to minimize spoil buildup along channels dug in wetlands; use of board road access for drilling rigs instead of channels; re-injection brine instead of discharging these pollutants into adjacent wetlands; and use of closed drilling fluid systems to minimize impacts on wetlands due to drilling fluids and associated reserve pits.

unavoidable, full compensation should be required, reflecting the quality and functional value of the affected wetlands. Off-site wetland enhancement and restoration projects could be developed as a compensatory technique.

3. Urban development:

- a. Suspend Federal subsidies such as funds for low income housing, mortgage insurance, and National Flood Insurance for urban development projects in environmentally significant wetlands.**

These expenditures offer significant incentives for development in important wetlands. They also set the stage for future Federal outlays for damages caused by storms to developments located in naturally flood-prone areas. Environmental considerations aside, strictly on economic grounds, it is sound public policy to withhold incentives for developing areas subject to high flooding risks.

- b. Enforce the Floodplain Management and Wetland Protection Executive Orders and the regulations implementing them.**

These executive orders direct Federal agencies to avoid, to the extent possible, adverse impacts associated with the occupancy and modification of wetlands and floodplains. Their purpose is to reduce the loss of life and property due to floods and to diminish environmental damage due to imprudent planning and development. Most Federal agencies have promulgated regulations implementing these executive orders.

4. Wetland restoration:

Encourage the Army Corps of Engineers and EPA to work with the State of Louisiana to identify opportunities for beneficial use of dredged material for wetlands restoration, and review the Federal standard for selecting disposal alternatives, giving greater weight to disposal alternatives that include environmental benefits.

The Corps of Engineers currently uses a least-cost criterion to select sites for disposal of dredged material. This often results in the material being dumped offshore. The State of Louisiana has expressed concerns about ocean dumping and a preference for the dredged material to be used to restore sediment-starved wetlands. Alternatives that restore wetlands are often more costly than ocean dumping, and the Corps has been reluctant to incur the additional costs. The current Federal standard calls for maintenance of waterways in the least costly manner

consistent with engineering practices and in compliance with environmental laws and regulations. The Corps, EPA, and the State should explore cost-sharing options, and develop a procedure for identifying additional opportunities for beneficial use of dredged material for wetlands restoration.

REFERENCES

- Craig, N.J., R.E. Turner, and J.W. Day, Jr. 1979. "Land Loss in Coastal Louisiana." Proceeding of the Third Coastal Marsh and Estuary Management Symposium, Day, et. al., eds., Louisiana State University, Division of Continuing Education, Baton Rouge, pp. 227-254.
- Davis, D. W. 1973. Louisiana Canals and Their Influence on Wetland Development. Ph.D. dissertation, Louisiana State University, Baton Rouge, 199 pp.
- Federal Emergency Management Agency. 1985. Interagency Hazard Mitigation Report. Prepared by Region VI, Interagency Flood Hazard Mitigation Team, Denton, Texas, 24+ pp.
- Fruge, D. W. 1986. The Impact of Federal Programs on Wetlands of the Louisiana Coastal Region. Background Report. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 32 pp.
- Gagliano, S. M. 1973. Canals, Dredging, and Land Reclamation in the Louisiana Coastal Zone. Hydrologic and Geologic Studies of Coastal Louisiana. Report No. 14. Center for Wetland Resources, Louisiana State University, Baton Rouge, 104 pp.
- Michot, T. C. 1984. Louisiana Coastal Area Study, Interim Report on Land Loss and Marsh Creation. Planning Aid Report submitted to New Orleans District, U.S. Army Corps of Engineers, New Orleans, LA. U.S. Fish and Wildlife Service, Division of Ecological Services, Lafayette, LA.
- Morgan, J. P. 1973. "Impact of Subsidence and Erosion on Louisiana Coastal Marshes and Estuaries." Proceedings of the Second Coastal Marsh and Estuary Management Symposium, Chabreck, R.H. ed. Louisiana State University, Baton Rouge, pp. 217-233.
- Turner, R. E. 1987. Relationship Between Canal and Levee Density and Coastal Land Loss in Louisiana. Fish and Wildlife Service, U.S. Department of the Interior, Washington, DC, 58 pp.
- Turner, R. E. and D. R. Cahoon, eds. 1988. Causes of Wetland Loss in the Coastal Central Gulf of Mexico, Vol. 1: Executive Summary. Minerals Management Service, U.S. Department of the Interior, New Orleans, LA, 32 pp.

U.S. Army Corps of Engineers in cooperation with the State of Louisiana. 1987. Crisis on Louisiana's Coast...America's Loss. New Orleans, LA, 14 pp.

Chapter 9: GALVESTON BAY OF TEXAS

INTRODUCTION

PHYSICAL DESCRIPTION: The Galveston Bay region encompasses approximately 600 square miles of a highly productive and diverse ecosystem on the upper Texas coast. The major components of the system include the Trinity and San Jacinto Rivers and myriad streams, bayous, and other freshwater runoffs and inflows along with four bays: Galveston, Trinity, East, and West. (See Figure XI-1.)

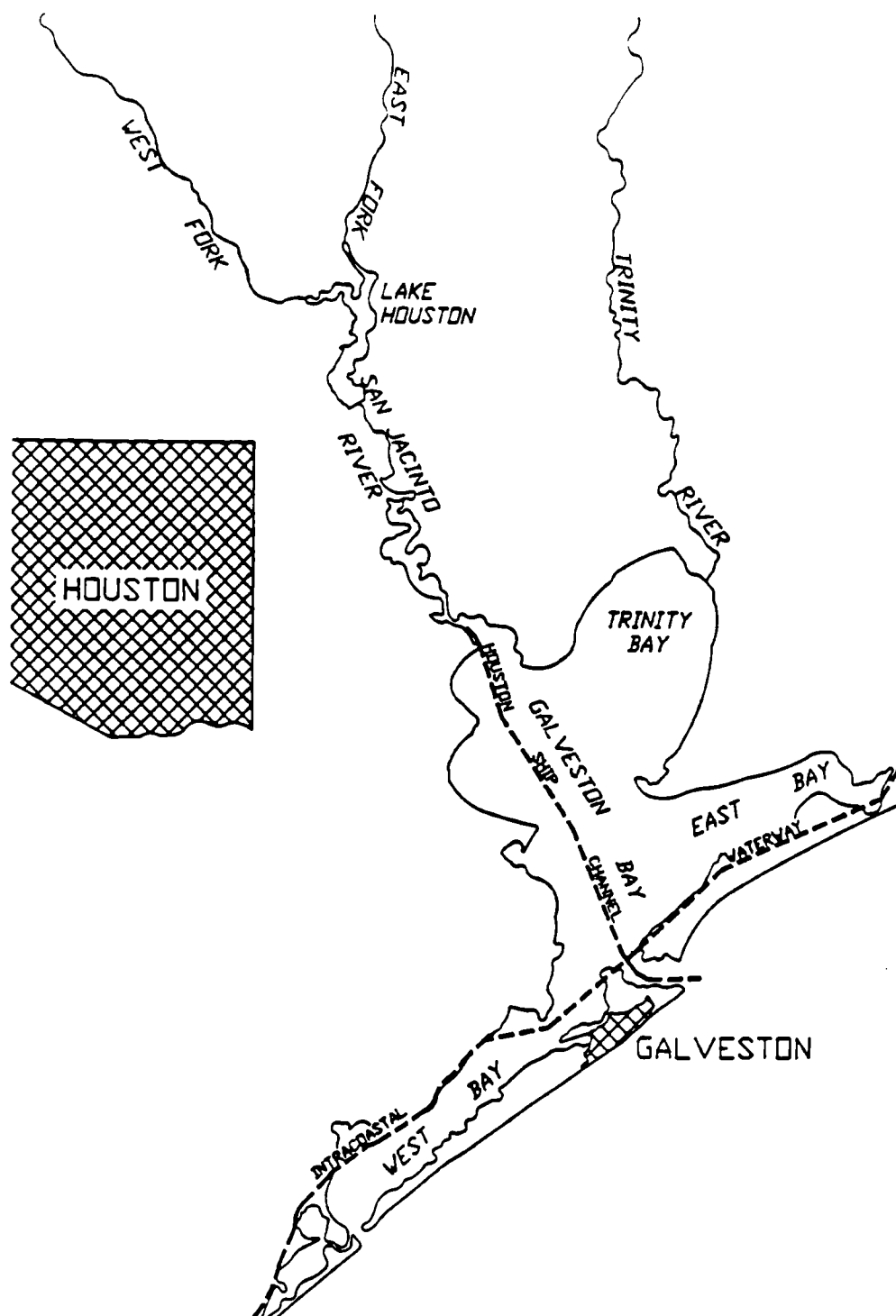
CHARACTERISTICS AND FUNCTIONS: The Galveston Bay region

- o Supports the most productive commercial and sports fisheries on the Texas coast (the fin and shellfish were valued at over \$64 million from 1977 through 1983);
- o Serves as the endpoint of congregation for the largest number of waterfowl found anywhere on the Central Flyway;
- o Sustains a number of furbearing species of economic importance including the river otter, muskrat, and nutria;
- o Includes the Menard Creek Corridor of the Big Thicket National Preserve along with the Anahuac and Brazoria National Wildlife Refuges (total acreage, 13,680);
- o Hosts eight federally-listed endangered or threatened species and five State-listed endangered species;
- o Buffers inland areas from storm waves and tidal surges and treats runoff waste from agricultural, urban, and industrial sources;
- o Contains highly valuable marine resources (e.g., food, recreation, waste assimilation, flood control, energy flow, and transport).

ORIGINAL ACREAGE: The number of wetland acres in the Galveston Bay region at the turn of the century is not known.

CURRENT ACREAGE: About 203,000 acres remained in 1979. However, this figure includes some marshes that have since eroded or subsided to become shallow unvegetated water bottoms.

Figure IX-1: THE GALVESTON BAY SYSTEM



TRENDS: From the mid-1950s through the 1970s, the Galveston Bay area lost about 1,110 acres per year to open water. The rate of loss appears constant, except when hurricanes and tropical storms blow through. In addition to the quantitative loss, pollutants have exceeded the assimilative capacity of the area, and wetlands are declining in quality.

**TABLE IX-1: Wetland Acreage in the Galveston Bay Region,
1956 & 1979**

Habitat Type	1956	1979	Percent Change
Wetland			
Fresh	73,017	67,325	-12.6
Saline	154,588	130,397	-15.6
Marine Beach Bar	3,015	1,413	-53.1
Deeper Water			
River Bottom	3,499	3,835	+9.6
Saline Open Water	363,213	388,397	+6.9

Source: U.S. Fish and Wildlife Service, National Wetland Research Center, Slidell, LA, unpublished data, 1989.

FACTORS ADVERSELY AFFECTING WETLANDS

Agriculture based on rice and cattle accounted for the early loss of wetlands. Agricultural conversions have diminished, and the key factors contributing to wetland decline today are (1) industrial development, including oil and gas development and refining; (2) urbanization; (3) navigation channels; (4) flood control and multipurpose water projects; and (5) pollution due to industrial, urban, and agricultural runoff.

An industrial "flight to the south" occurred from 1972 through 1978 largely because of substantial tax breaks to industries by certain southern States (including Texas) and relatively cheap labor. In particular, the size of petrochemical refineries

increased dramatically. In addition to the labor cost and tax incentives, the petrochemical expansion was driven by ready access to oil and gas supplies, shipping, and pipelines, the OPEC oil embargo, and a series of severe winters in the north. The Texas Gulf now has the world's largest petrochemical capacity. The area has the nation's most important supply of natural gas, refines 6 percent of the nation's gasoline, and provides the organic chemicals that serve as the feedstock for plastics, synthetic fibers, solvents, surfactants, and pharmaceuticals.

Industrial wastes abound and infiltrate channels which carry them to the bays. Crude oil processing, for example, requires an average of 18 gallons of water per gallon of oil. Ten to twenty percent of this water comes into direct contact with oil and chemicals in the refining process. The processing water is commonly contaminated with oil, grease, phenolic compounds, sulfides, cyanide, ammonia, suspended and dissolved solids, and various other chemicals. Extraction adds brine to the contaminant load. The pollutants from refining and extraction overtax the purifying capacity of wetlands and lead to fish kills.

Section 402 of the Clean Water Act is the primary method of dealing with water quality. The Act works through two sets of standards. The first, effluent standards determined by the Federal Government, are technology based¹ and limit the pollutants that may be discharged from a particular kind of industrial source. These standards are enforced by the National Pollution Discharge Elimination System (NPDES) which makes it unlawful for point sources, such as discharge pipes and conduits, to discharge designated pollutants without a permit. NPDES permits for toxic discharges from point sources must meet both effluent limitations and water quality standards. States classify waters based on uses set forth in the Clean Water Act: public water supplies; protection and propagation of fish, shellfish, and wildlife; recreation; agricultural, industrial, and other purposes including navigation. Thus allowable pollutant concentrations differ according to the designation of the particular stretch of stream. However, the regulations prohibit designations such as waste transport or waste assimilation, i.e., primarily to receive pollutants.

Several problems have been identified with current water pollution control practices as applied to the Galveston Bay system:

¹The best available technology economically achievable as established by EPA.

- o Effluent standards have been established for only a limited number of toxic water pollutants. Thus, a number of pollutants from the petrochemical industry are not now regulated under the Federal portion (the technology based portion) of the NPDES program.
- o The control technologies appear to be set with greater concern for the economic costs to industry than to the social costs to society. The standard that now applies to toxic water pollutants (the best available technology economically achievable) is at the lower end of the scale of standards established in the Act.
- o Waters flowing through the Houston Ship Channel, a stream segment designated for high pollutant concentrations, flow downstream into a designated fish spawning area, and eventually flow out into the Galveston Bay, an area of significant importance for commercial and sport fisheries. EPA regulations require that when designating uses, water quality standards shall provide for the attainment and maintenance of the water quality standards for the downstream waters outside of the mixing zone. For Galveston, this requirement applies to the downstream fish spawning area and Galveston Bay. Texas water quality standards allow for a 200-foot mixing zone (the zone within which an effluent combines with the receiving water body), but survey data have demonstrated that over time downstream sediments outside of the mixing zone are accumulating high levels of regulated contaminants.
- o Although EPA guidance requires that stress which lowers reproductive capacity be taken into account in determining water toxicity, in the field, stress test are infrequently required of permit applicants.

Urbanization is taking its toll on area wetlands. The Houston-Galveston area, about half of which is located in the Galveston Bay Region, was the fastest growing metropolitan area in the U.S in 1980.² Despite a current economic slow-down, building continues as developers follow through on projects planned and funded ten years ago. Local urban complexes sprawl outward in all directions, but development west and southwest of Houston, and also on the west end of Galveston Island, is converting riparian and marsh habitats to a high density area of housing developments, condominiums, and beach front homes. Water, power, and sewer lines along with highways crisscross the area. Besides

²In 1980 the population was about 3.1 million, and is projected to swell by 34 percent to 4.7 million by 1995. Immigration accounted for over half the growth.

depleting wetlands directly through construction activities, urban development increases flood damage by replacing the absorption capacity of the wetlands with impermeable roofs and black-top. Rushing water floods many areas around Houston after two or three-inch rains. The pollutant-laden runoff often contaminates water channels and ultimately degrades wetland areas.

Navigation projects along the Texas Gulf Coast include 720 miles of shallow draft channels, 260 miles of deep draft channels, and 12 deep water ports. Two navigation channels, the Gulf Intracoastal Waterway (GIWW) and the Houston Ship Channel (HSC), have had the greatest impact. The GIWW extends 426 miles along the Texas coast, a continuous swath, a minimum of 150-foot wide and 12-foot deep. The Houston Ship Channel is a deep draft waterway, 51 miles long, 400 feet wide, and 40 feet deep. Both channels have the same kinds of effects on wetlands, but the HSC is of greater intensity. Construction and maintenance of the GIWW produced 51 million cubic yards of spoil from 1932-1972; the HSC generated 4 times as much, 220.5 million cubic yards. Much of this was originally deposited in surrounding wetlands although there is no estimate of the numbers of acres affected. Spoil is deposited on the bay bottom where it reduces biological productivity. Project planning has had little impact on the mode of moving products (e.g., pipe vs. channels), the location or size of channels, and the location and size of disposal areas.

In addition to creating upland out of wetland and smothering various life forms, dredging alters water flow and resuspends sediment pollutants. The spoil material is contaminated with oil, grease (hydrophobic carcinogens), heavy metals, and pesticides, which are transported out of the channels and into shallow bays. The growth of urban development and industrial activities increases the contaminant level. Biologists worry about the geometric accumulation of these pollutants as they progress up the food chain, but have yet to study it carefully. Contamination from spills of oil or chemicals would be severe. Wetlands adjacent to the channels are eroded by barge wakes and altered by the wedge of heavier saltwater that intrudes up the channels. Freshwater impoundments upstream on the Trinity and San Jacinto Rivers designed to meet Houston's future water demand will aggravate the saltwater intrusions by decreasing freshwater inflow.³

³The Congressional Budget Office has suggested two changes that could shift a greater portion of the costs of navigation projects from the general public to the users. First, noting that the Federal Government recovers only about 40 percent of the costs of channel dredging for harbor maintenance, the CBO states (continued...)

Flood control and multipurpose projects have also taken a toll on wetlands in the Galveston Bay Region. For example, all but a fraction of the 1000 square mile drainage area of the Buffalo Bayou and tributary channels have been cleared, straightened, enlarged, or concrete-lined for flood control. Only 19 miles have not been altered by channel work. These projects clear vegetation (often bottomland hardwoods) from the channel rights-of-way. Urban and agricultural activities then encroach on these areas, exacerbating habitat loss and, ironically, flood damage. In the five years from 1972 through 1977, Harris County lost five percent of the floodplain forests in the 100-year floodplain. With the loss of filtering vegetation and the increase of development, the water quality degrades rapidly. The channels also create islands out of wetlands, thus restricting the movement of organisms and the support systems available to them. Both of these consequences of isolation increase the vulnerability of the wetlands.

Agriculture has destroyed and altered thousands of wetland acres, many of which were drained for rice and soybean planting. Drainage ditches collect and concentrate agricultural runoff. The contribution of upstream drainage projects adds to the pollutant load. No nonpoint source pollution controls are now in effect to control this discharge. Modifying the watershed flow with drainage ditches has also meant that water no longer spreads in sheets across wetlands, nourishing marshes and settling contaminants, but instead flows rapidly into the bay via dredged channels.

³(...continued)

that raising the harbor maintenance tax from 0.04 percent to 0.12 percent of the cargo's value would lower the deficit by \$1.5 billion from 1990-1994. Second, noting that in 1989, revenues from the Inland Waterways Fuel Tax will cover about 22 percent of waterway construction costs (about \$200 million) but no O&M costs (about \$300 million), the CBO states that imposing a user fee to cover O&M would save the Federal Treasury \$1.775 billion from 1990-1994. Implementing these recommendations would mean that shippers would press only for those projects where benefits would be expected to exceed the fees they would have to pay. Moreover, user fees on the inland waterways could encourage shippers to use existing capacity more efficiently, reducing the need for new construction to alleviate congestion. Less construction activity would reduce the amount of dredging and filling with their attendant negative wetland impacts. (CBO 1989)

FEDERAL PROGRAMS AND PROJECTS

Among the major Federal programs and activities that affect wetlands are multipurpose flood control, water supply, and navigation projects, as well as Federal programs that provide incentives for urban development. Although Federal programs to construct and advise on the construction of drainage ditches have destroyed wetlands in the past, these programs no longer seem to affect significant wetland acreage.

WATER PROJECTS:

Multipurpose: A multipurpose project...for salinity control, navigation, water supply, fish and wildlife enhancement...at Wallisville Lake is likely to have significant negative impacts on the Galveston Bay system. It will cost \$352.6 million initially and \$1.5 million each year to maintain. The project is heavily subsidized, with the Federal Government contributing about 40 percent of the construction cost and the annual O&M being shared equally.

In 1973 the district court enjoined the 75 percent completed project due to deficiencies in the Environmental Impact Statement (EIS). After the Corps redesigned the project, the district court refused to lift the ban. But on appeal in 1987, the circuit court allowed the redesigned project to go forward.

The Wallisville Lake Project will fill 75 acres of brackish marsh, and flood 588 acres of bottomland hardwoods and 3,103 acres of cypress swamp. By isolating habitat behind the dam and blocking sediment, nutrients, and freshwater input into the Galveston Bay and surrounding wetlands, the project will result in a \$700,000 to \$1 million (1974 dollars) annual loss of fisheries.⁴ Eventually, salinity increases in the bay and coastal marsh (because of the lack of freshwater inflow) will degrade nursery habitat for estuarine and downstream freshwater species. By preventing sediment flow to Galveston Bay, reservoirs contribute to marsh deterioration and conversion to open water habitat. These changes are particularly evident at the river delta of the Trinity and San Jacinto Rivers.

Navigation: Despite the problems from saltwater intrusion, the Corps is planning to enlarge the Houston Ship Channel from 400 feet wide by 40 feet deep to 600 feet wide and 50 feet deep. This will cost \$197.86 million initially and \$1.05 million each year thereafter to maintain. It would convert 892 acres of bay bottom to channel bottom. The Corps computed a favorable benefit-cost

⁴National Marine Fisheries Service estimate.

ratio based on transportation cost savings for imported crude oil and grain export. The FWS identified negative consequences for fisheries and estimated that 1900 acres would be required to mitigate oyster bed damage. The Corps' plans called for replacement of only 400 acres. As a result of the administrative appeals process, studies are underway which address hydrodynamic/salinity effects on oyster reefs, the rate of recovery of benthic communities, and possible beneficial uses of dredged material. The supplemental EIS for the HSC is due in early 1993.

Flood control: The Army Corps of Engineers is investigating the feasibility of flood control projects for ten major urban bayous and thirteen minor bayous and the feasibility of supplying water from ponds in two flood control reservoirs. These projects would destroy riparian habitat, reduce instream species diversity to forage fish, and contribute to pollution and irregular flood flows into the bays.

URBAN DEVELOPMENT: A number of Federal, urban development programs promote or fail to limit development in environmentally significant wetlands. HUD, the Farmers Home Administration, and the Veterans Administration insure loans that facilitate local development. In addition, lending institutions sell mortgages to second mortgage holding companies that are often quasi-backed by Government agencies.

In the Houston area HUD insures 5 to 10 percent of the housing developments. The Fish and Wildlife Service has registered concern about the adequacy and timing of HUD's EISs. A 1978 review of 56 different housing projects covering 58 square miles in the Houston area showed that 97 miles of stream were channelized or proposed to be channelized in conjunction with the HUD projects, resulting in a loss of 4000 acres of floodplains and degradation of 3000 acres of riparian habitat. The FWS also found that EISs are sometimes issued after land has been cleared or construction initiated. In 1978, because of heavy workload pressures, HUD decided to conduct an EIS investigation only for subdivisions over 2500 units, rather than for those over 500 units, as had been the policy. Since 1978, there has been a marked decrease in the EISs available for review and comment.

Although disagreements continue over HUD's interpretation of its NEPA responsibilities, in the last few years the agency has implemented new procedures under the wetlands executive order. Before acting on applications for loan guarantees for proposed subdivisions in the 24 surrounding counties, HUD's Houston office requests a determination of wetland effects from the Corps. Projects have either been redesigned to avoid impacts, or mitigation has been undertaken where redesign has proven impractical.

Additional support for urban development comes from the Federal Emergency Management Agency (FEMA) which offers subsidized flood insurance to homeowners outside of the designated 100 year floodplain and within it if structures are elevated above it. In the five counties included within or overlapping the Galveston Bay Region, FEMA paid \$241.6 million in claims during the first three months of 1986, a quarter of the claims statewide due to hurricanes and flooding. This subsidy reduces the risk of locating in the floodplain. As long as this program continues to underwrite urban developments that reduce wetlands and their flood attenuating capacity, insurance claims will continue to rise.

AGRICULTURE: Construction and technical assistance for drainage projects was common in the 1950s and 1960s, but no new projects are underway. Rice and soybeans dominate production. The major impact of agriculture on wetlands today is water quality degradation from drainage. Neither Federal nor State regulations adequately address "nonpoint" source water pollution.

STATUS AND PROSPECTS

Water quality degradation is the chief wetland problem facing the Galveston Bay Region. This results from having the largest petrochemical capacity in the world and the most important supply of natural gas in the nation. It also results from urban runoff in an area where population is expected to climb further and from agricultural runoff which could decline. The population pressure, however, will transform agricultural land into urban areas, exacerbating runoff problems by covering soil with blacktop. Although industrial and urban development receive some impetus from Federal funds, the major factor in the water quality problem is regulatory. Federal navigation and flood control channels, however, concentrate and speed contaminants to the bay system, and thus exacerbate the pollution problem.

Urban developments that take place in floodplains and along the coast often occur in the absence of a regional plan or local zoning. This destroys wetlands through construction, and degrades them by reducing their capacity to absorb floodwaters and purify contaminants. Flood insurance offered by FEMA serves to reduce the risks associated with such development. HUD may also encourage inappropriate development by not requiring adequate and timely environmental impact statements for projects receiving guaranteed loans.

Water projects also affect wetlands. The maintenance and expansion of existing navigation channels, the construction of additional flood control projects, and the creation of the Wallisville Lake project to offset the intrusion of saltwater up

the Trinity River⁵ all destroy and degrade wetlands. Dredging channels stirs up and spreads contaminants. Water projects also displace wetlands and generate spoil that is often dumped in marshes and bays. Moreover, the project costs have been largely underwritten by the Federal Government, while the users of navigation channels and beneficiaries of flood control have contributed very little. The federally subsidized navigation and flood control facilities provided the infrastructure which has allowed much of the present industrial development and urban growth to take place in the Galveston Bay Region. The greater cost-sharing required by the Water Resources Development Act could reduce the level of activity somewhat.

RECOMMENDATIONS

1. Interagency Land and Resources Management:

- a. Congress should not approve funding for any new or continuing action in the Galveston Bay Region until the Galveston Bay National Estuary Program completes its Comprehensive Conservation and Management Plan addressing all Federal, State, and local programs affecting the biological integrity of the Galveston Bay Estuary.**

The Galveston Bay Region suffers from the lack of local or regional plans and possibly from failure on the part of the Federal Government to use existing authorities to protect wetlands to the fullest extent. Water pollution control, floodplain development, and urban growth in wetland areas could be better addressed in a comprehensive plan designed by the relevant State agencies. Moreover, planned water projects may work at cross purposes. The expansion of the Houston Ship Channel, for example, will exacerbate the saltwater intrusion that the Wallisville Lake Project is supposed to mitigate. Comprehensive planning is a first step toward bringing coherence to regional developments.

- b. Consider creating an interagency environmental review board within the Office of Management and Budget that could serve as an impartial judge of the economic and environmental costs and benefits of a proposed project and the final arbiter of whether or not development should go forward.**

A long series of statutes (including the Federal Power Act, the Fish and Wildlife Coordination Act, and the National Environmental Policy Act) call for consultation by resource

⁵The saltwater intrusion was exacerbated by the HSC, a channel which is scheduled for expansion.

development agencies with conservation, resource management, and environmental agencies. The intent is to create a vehicle that requires consideration of the various environmental and fish and wildlife values. These values, however, must be weighed against the values that would accompany development. Environmental concerns often receive perfunctory treatment when the agency that sponsors the project is also the agency that ultimately assesses the competing values associated with a project. This is perhaps understandable given the primary mission of the agency, but it exposes an inherent flaw in the review process. Vesting authority to resolve disputes with an impartial arbiter would ensure that projects with severe environmental consequences do not go forward without design changes or concurrent mitigation.

- c. **Consider requiring all Federal assistance programs to comply with conservation, mitigation, and reporting requirements like those contained in the Electric Consumers Protection Act.**

The ECPA requires that the following conditions must be met before a new construction project is entitled to PURPA tax benefits: (1) the project must not have significant adverse effects on the environment, including recreation and water quality; (2) the project cannot be located on a State or national wild or scenic river system which would be adversely affected; and (3) the project must comply with recommendations made by the resource protection agencies or explain why this is not possible in terms of primary agency mission. If these conditions have merit with respect to hydroelectric power development, perhaps they should apply to all Federal projects. Most, but not all, agencies consult with the FWS if a project will have a major impact on wetlands. But they are not required to implement those recommendations or even to explain why the recommendations should not be implemented. This allows agencies a great deal of discretion in disregarding advice that would improve wetland quality. Requiring consultation and an explanation when the results of the consultation are not heeded could promote greater reflection and more thorough consideration of alternatives to projects with wetland impacts.

2. Urban development:

Consider eliminating Federal funding for mortgage insurance and national flood insurance for urban development projects in wetlands.

The population in the Galveston Bay Region is projected to increase by 34 percent between 1980 and 1995. This could increase contamination from urban runoff, destroy the vegetation that helps to absorb flood waters, and cause more draining and filling of wetlands. Existing mechanisms such as environmental impact statements and flood insurance rate maps have not substantially discouraged development in wetlands. A subsidy-free zone would correct market distortions which add inappropriately to developmental pressures in these wetlands.

3. Water quality regulation:

Examine the current approach to the regulation of water quality, particularly the National Pollution and Discharge Elimination System (NPDES), as it applies to wetland impacts and develop a more effective system of pollution control.

In many areas, degradation of water quality is an even more serious problem than loss of wetland acreage. In the Galveston Bay, water quality is seriously impaired by oil refining processes that require 18 gallons of water per gallon of oil and by agricultural runoff. Problems with Section 402 of the Clean Water Act as it pertains to point sources are:

- o Effluent standards for only a limited number of toxic water pollutants have been set so that a number of pollutants in the petrochemical industry are presently not required to use the best available technology economically achievable;
- o Although EPA guidance requires that stress which lowers reproductive capacity be taken into account when determining water toxicity, stress test are infrequently required of permit applicants.
- o The control technologies are set with greater concern for the economic costs to industry than to the social costs to society; and
- o The classification of stream segments according to different concentrations of pollutants relies on models that assume no impact beyond 200 feet even though such impacts are significant.

Moreover, although the Clean Water Act has a section dealing with nonpoint sources of pollution (section 1319),⁶ the program has not been implemented yet. Although some nonpoint sources must remain exempt because they would be unwieldy to regulate, the exemptions go well beyond practical limitations. Nonpoint sources represent a major factor in the decline of wetland water quality.

The Federal Government has encouraged the States to develop land use programs to deal with the problem (Section 208 of the Water Quality Act). A more direct control measure would be to regulate developed agricultural drainage systems as point sources rather than nonpoint sources, because most agricultural drainage funnels out through carefully engineered collection systems. Given the enormous impact of agricultural drainage on water quality not only in Texas, but in wetlands throughout the nation (including the Florida Everglades, the Delmarva Peninsula draining into the Chesapeake Bay, and the Central Valley in California), the Act's exemptions of agricultural "stormwater discharges" and "return flows" from point source regulation should be repealed.

⁶Nonpoint sources stem not from discharge pipes and other conduits but from agricultural runoff and more diffuse areas. Section 1319 requires States to develop nonpoint source management programs and assessment reports.

REFERENCES

- Cain, B. W. 1986. Personal communication--Fish and Wildlife Service. Re: toxic waste and NPDES system in the Galveston Bay Region. Interview, August 20, 1986.
- U.S. Congressional Budget Office. 1989. Reducing the Federal Deficit: Spending and Revenue Options, A report to the Senate and House Committees on the Budget--Part II, as required by P.L. 93-344, 1989 Annual Rept., Government Printing Office, Washington, DC, February.
- Whitehead, E. Dawn. 1987. Impacts to Wetlands of the Galveston Bay Region and the Federal Role. Background Report. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 31 pp.

Chapter 10: PUERTO RICAN COAST¹

INTRODUCTION

PHYSICAL DESCRIPTION: Saline flats, freshwater marshes, and freshwater swamp forests all face development pressure in Puerto Rico. Mangrove forests and freshwater wetlands are the primary wetland types at risk. Mangroves are found in brackish and salt water along tropical and subtropical shores. (See shaded areas in Figure X-1.) In northern Puerto Rico, mangroves grow on broad coastal plains near river mouths or adjacent to the Atlantic Ocean behind protective sand dunes. In southern Puerto Rico, the islands of Vieques and Culebra, and the Virgin Islands are semi-arid with wave-sheltered shorelines and embayments. Offshore mangrove cays (known as overwash islands), fringing mangrove, dwarf mangrove, salt ponds, and vegetated saline flats are typical of the southern coasts.

CHARACTERISTICS AND FUNCTIONS: Mangroves

- o Form biomass at rates equal to most intensively cultivated tropical agricultural lands, with only marine grass beds, coral reefs, and tropical rain forests exceeding mangroves in productivity;
- o Export organic matter to adjacent coastal food chains, thereby playing a critical role in sustaining life in environments such as coral reefs and seagrass beds;
- o Provide habitat for many birds, fish and invertebrates in their maze of trunks, prop roots, and muddy substrates. (Several endangered, threatened, and candidate species of birds depend on Puerto Rican mangroves. Resident, commercially important shellfish include the mangrove oyster, juvenile spiny lobster, and land crab.);
- o Protect shorelines, boats, and land-based structures from erosion and wave damage, particularly during tropical storms and hurricanes;
- o Serve as physical and chemical filters for upland runoff and enhance marine water quality;

¹Although this chapter focuses on Puerto Rico, the trends identified apply to the Virgin Islands, as well.

Figure X-1: PUERTO RICO'S MANGROVES



- o Comprise a significant portion of Puerto Rico's public forests, with recreational and educational value.²

ORIGINAL ACREAGE: Historically in Puerto Rico, estuaries covered 60,000 acres, of which about 30,000 were mangroves.

CURRENT ACREAGE: The most recent estimate of mangroves in 1974 put the remaining acreage at 16,029 acres or about 53 percent of the original acreage.

TRENDS: Mangrove forests and freshwater wetlands are the primary wetland types at risk. By 1918, mangroves had been reduced to 20,000 acres, falling to 16,000 by 1938. By 1959, mangroves recovered to about 18,000 acres due to: the absence of major hurricanes; the electrification of the island which reduced the demand for charcoal and firewood; a depressed economy; and emigration of a half million residents. But between 1959 and 1968, mangroves disappeared at a rate of 160 acres per year. This jumped to a rate of 500 acres per year between 1972 and 1974 because of the development of heavy industry, housing, and tourism complexes. If sustained, this loss rate would have destroyed all the mangroves in 20 years. Between 1975 and 1987, the rate slowed to what is roughly estimated as 100 acres per year. An improved investment climate from 1985 to 1988 has greatly increased the number and size of proposed development

²Protected areas include Piñones, Aguirre, Boquerón, and Ceiba Commonwealth forests.

projects in wetlands (particularly marinas and resorts) along the remaining, undeveloped portions of the coast.

Freshwater wetlands have been increasing as previously farmed fields are abandoned and allowed to revert. These newly re-established wetlands are at risk as urban coastal development replaces agriculture.

Given the relatively small size of Puerto Rico and the Virgin Islands, wetland losses here cannot be compared to those in the mainland United States. Wetlands in the Virgin Islands are confined to narrow coastal fringes and "salt ponds." Although small, these wetlands are vital to migratory birds and native wildlife. The elimination of a 5-acre salt pond can be devastating in the Virgin Islands.

FACTORS ADVERSELY AFFECTING WETLANDS

In the past, mangrove and upland deforestation resulted from the demand for fuel by households and large sugarcane mills. Drainage of fresh and brackish wetlands for sugarcane and malaria control also took its toll on wetlands, and by the 1940s, canals, dikes, and pumps had altered hydrological patterns. Economic development programs aimed at transforming Puerto Rico from an agrarian to an industrial economy had a significant impact on Puerto Rican wetlands during the 1950s and 1960s. The petrochemical industry, in particular, spurred the development of refineries, factories, navigation channels, cooling and waste ponds, and peripheral industries. For a number of major firms, expansion proved unsustainable,³ and abandoned sites now occupy former mangroves. Sugarcane farming also became uneconomical in the 1980s. As drainage systems deteriorated, freshwater wetlands and lagoons began to re-emerge. For example, the Humacao Wildlife Refuge is comprised of abandoned sugarcane fields and cattle pasture.⁴

The unemployment rate in Puerto Rico hovers between 15 and 20 percent and, thus, efforts to provide jobs for residents account for the major activities now affecting mangroves. The tourist industry--with its attendant hotels, resort housing, marinas, and golf courses--is one key factor threatening mangroves. Another is business ventures such as office buildings and industrial

³Commonwealth Oil Refining Company, Puerto Rico Olefins, PPG, Union Carbide, Hess Virgin Islands Corporation, and Harvey Alumina.

⁴The refuge is composed of over 3,000 acres of recently re-established wetlands and lagoons.

parks. In the rush to get projects underway, planning has sometimes suffered, and although mangrove sites have been cleared, the projects have not always materialized as planned. Some former mangroves host abandoned resorts and industrial parks. Agriculture is no longer a factor in wetland conversion and decline, but proposed copper and gold mining in several mountainous areas could pose a threat by degrading water quality and requiring additional port facilities.

Unauthorized filling of wetlands is a substantial and continuing problem. Although the Corps of Engineers issues many cease and desist orders, and several cases have been tried in Federal court, only a few of the illegal fills have been restored. The Corps' regulatory office in San Juan is inadequately staffed to handle the case load,⁵ and penalties are insufficient to serve as meaningful deterrents to continued illegal fills.

Manpower constraints also hamper the Corps' ability to inspect for and enforce compliance with permit conditions. All too often required mitigation is not performed by project sponsors. A case in point is a project undertaken by Caribbean Airlines Services in 1987. As a condition of its permit, Caribbean agreed to create 22 acres of wetlands in the Luis Muñoz Marín International Airport. Caribbean never did the required mitigation work. The Fish and Wildlife Service notified the Corps of this violation in August, 1992. As of January, 1993, the Corps had not issued a notice of noncompliance. Further, despite this violation, the Corps is processing a new permit for Caribbean without requiring compliance with the 1987 permit. Several other major projects have not complied with mitigation requirements. Although the Corps is aware of the violations, little action has been taken.

EPA has wetland enforcement authority, as well, but the sole wetlands biologist in the EPA's San Juan office is responsible for all wetland issues in Puerto Rico and the Virgin Islands. Wetlands program management and legal counsel are located in EPA's New York regional office, however. The lack of field personnel and extended lines of communication have limited EPA's effectiveness in wetlands enforcement activities in Puerto Rico and the Virgin Islands.

⁵The Corps' Jacksonville District has recently transferred full regulatory functions to the San Juan Office. The combination of limited staff and increased workload makes it difficult to handle enforcement, mitigation, and compliance cases.

FEDERAL PROGRAMS AND PROJECTS

A diverse group of Federal programs promote the tourist industry and urban development. Environmental safeguards are inadequate, and this development affects coastal wetlands, especially mangroves. The Federal programs include grants for economic development, mortgage and flood insurance, provisions of the income tax code specific to Puerto Rico and the Virgin Islands, and flood control and navigation projects. Highway and airport projects, which provide the infrastructure for further development, also affect wetlands. The intent of the Coastal Barrier Resources Act can be circumvented on areas ostensibly dedicated to conservation.

URBAN DEVELOPMENT:

Urban Development Action Grants: The Urban Development Action Grants Program (UDAG) was last funded in FY88. It awarded matching funds to attract private investment to distressed areas. Puerto Rico received a disproportionate share of UDAG funds. From 1980 through 1986, HUD awarded over \$191 million for 168 projects in Puerto Rico. In July, 1986,⁶ Puerto Rico received a larger number of grants than any mainland state, amounting to 25 percent of the funding available for small cities. Between January and July, 1986, the Federal government awarded \$23.4 million in UDAG funds, attracting \$72 million in private investment. This amounted to a 25 percent Federal subsidy without which most projects would not have been constructed.

The Executive Orders on Wetlands Protection and Floodplain Management require that HUD review projects for environmental impacts. Several examples of UDAG projects for which the executive order reviews appear to have been deficient are:

- o The Corales de Hatillo housing development is located behind residual dunes which are regularly overtopped by winter swells. The project seems to violate EO 11988 floodplain management policies. UDAG contributed \$740,000 toward the project's cost of \$2.94 million.
- o The El Coquí Housing Project eliminated 19.5 acres of freshwater marsh bordering mangroves in the Las Cucharillas Swamp. UDAG contributed \$1.2 million with additional funding coming from HUD's public housing program.

⁶The latest awards at the time this research was conducted.

- o The expansion of the Rio Mar resort included a second golf course which destroyed freshwater marsh acreage. UDAG awarded \$5.5 million for the project.

If UDAG had identified potential wetland impacts prior to approving projects, wetlands would have been better protected. Municipal personnel handling these programs were not trained in wetland identification and values.⁷ The FWS could have assisted in the early identification of potential wetland problems if it had been given maps for all proposed UDAG projects.

In 1986, HUD's regional administrator instituted new policies designed to accelerate project approval. These policies probably led to even more limited environmental reviews.

Community Development Block Grants: Under the Community Development Block Grant Program (CDBG), HUD often funds projects like roads, recreational facilities, and shoreline protection. In 1986, Puerto Rico received \$64 million in CDBG funds for its 13 larger cities and \$48 million for 60 smaller communities. Environmental review falls to the cities and the Municipal Services Administration. Environmental concerns tend to be low on their list of priorities. Under current staffing levels the various resource agencies cannot review or monitor all the numerous CDBG proposals.

Many projects go forward without adequate engineering studies. In one case, the Municipality of Mayagüez built a road across a deep marsh, isolating a section of marsh from its water source. Fill had to be deposited across an area four times the width of the road. The underlying soft peat was so unstable that light poles are leaning, and fill obstructs culverts intended to allow some water exchange. The road serves to encourage the filling of adjacent marsh for commercial use, thus indirectly destroying an important receptor of flood waters which protects the water quality of downstream mangrove forests.

The large number of projects dispersed over so many communities makes it difficult to determine the magnitude of CDBG's effect on wetlands, but the cumulative impact could be significant. Wetland conservation would improve if municipal personnel responsible for CDBG programs were trained to better identify potential wetland impacts of proposed projects. Further, providing relevant maps to the CDBG office, the large Puerto Rico cities, and the Municipal Services Administration would be an

⁷UDAG grant environmental reviews usually consisted of a checklist filled out by the applicant. Not applicable (N/A) was the most common response.

inexpensive first step toward reducing the environmental impacts of the CDBG Program.

Economic Development Administration: The Economic Development Administration (Department of Commerce) provides funds to the Puerto Rico Industrial Development Company (PRIDCO) which are designed to stimulate the economy. The FWS believes that the program poses a significant, potential threat to wetlands.

In one instance, PRIDCO applied for funds to upgrade a water supply pipeline to an existing, industrial zone and adjacent residential area in Ponce. PRIDCO officials were told that to compete effectively with other EDA funding proposals they had to link the project to plans for additional factory construction. Even though several industrial parks in Ponce stand empty, PRIDCO drew up plans for a large new industrial park. After EDA requested environmental review by the FWS, the plans were modified so as to avert damage to wetlands. This successful outcome is not the rule for the environmental review process. Impacts to wetlands were avoided in this instance due to the unusual conscientiousness of the EDA official managing the grant. Going forward with such projects in the absence of need is a poor use of the land and of Federal monies. The EDA should encourage the rehabilitation of abandoned facilities zoned for industrial use before developing new industrial areas.

National Flood Insurance Program: The National Flood Insurance Program (NFIP) and the Disaster Assistance Program administered by the Federal Emergency Management Agency (FEMA) are not fulfilling their potential to prevent poor floodplain management and the resulting wetland destruction in Puerto Rico. To participate in the NFIP, communities must adopt local ordinances regulating development in floodplains. The ordinances must conform to minimum Federal standards. Under a FEMA contract, the Corps of Engineers found that the Puerto Rico Planning Board had not enforced the standards. In regulating floodplain development, the Planning Board had not followed the Flood Insurance Rate Maps (FIRMS) that indicate various hazard zones.

The Planning Board recently promulgated a new regulation (Regulation 13) to bring the program into compliance. FEMA has recommended additional changes in the regulation, but these changes will neither resolve all the problems inherent in the existing regulation nor eliminate all the abuses of the program. For instance, Regulation 13 does not account for cumulative impacts to flood storage capacity from fill.⁸ New construction within floodplains is being elevated by fill so as to locate it above designated flood heights. Although this may technically

⁸Not all of this filling is in wetlands.

comply with NFIP standards, it is certainly at variance with the purposes of the floodplain protection program, and where such filling is in wetlands, it violates the wetlands executive order. Finally, although FEMA regulations prohibit construction in floodways,⁹ floodway maps have not been distributed to all permitting and planning agencies, and thus, it seems likely that at least some construction is occurring in floodways.

Another feature of the flood insurance program which frustrates wetland protection emanates from the way FEMA draws the flood insurance maps. FEMA regulations ostensibly protect mangroves by prohibiting any alteration of mangroves in the V-Zone (a coastal high hazard area subject to high velocity waters). However, the maps for Puerto Rico include only a few fringing, mangrove forests along the south coast. The FIRMS should be redrawn to include additional mangrove and beach areas, because (1) they appear to be part of the V-Zone, and (2) wave energy and flooding potential are exacerbated when mangroves or dunes are destroyed by construction activities or sand extraction.¹⁰

The FWS recommends that all wetlands within the reach of storm surge from a major hurricane be protected from future development or, at least, that the FIRMS be redrawn to take into consideration continuing wetland losses and the increased intensity of flooding elsewhere resulting from these losses. FIRMS are drawn in order to identify the different risk areas within a floodplain, and thus must take into account the existing flood control capacity of the areas of concern. There is currently no requirement that the wetlands used in calculating the existing flood control capacity be protected, and thus they are sometimes developed, while their protective qualities are still assumed in the existing FIRMS. These areas should be protected or, if not, the FIRMS should be redrawn to reflect their loss, insurance premiums adjusted, and construction standards enforced. The lack of accurate FIRMS and of effective enforcement of existing FIRMS undermines wetland and floodplain protection by offering insurance for inappropriate development.

Mortgage Insurance: The Federal Housing Administration insures home mortgages in order to promote investment in residential housing by financial institutions. Inclusion in this program can make a difference in a project's marketability. Environmental review is required before a subdivision can qualify. The extent

⁹A floodway is an area dedicated for conveyance of waters from the 100-year flood.

¹⁰FEMA recently revised the FIRMS to incorporate newly designated units of the Coastal Barrier Resources System, but failed to correct inaccuracies in the maps for any other areas.

to which housing developments that should have been ineligible for program benefits because of their effects on wetlands qualified for insurance is largely unknown. Although the FHA does have regulations implementing the Wetlands Protection Executive Order, the extent to which they are enforced is largely unknown. This matter merits further study, because housing developments continue to be constructed in vulnerable areas. If mortgage insurance were unavailable to developments proposed for wetland areas, the increased financial risk would reduce this source of wetland loss.

Tax Code: Two features of the Federal tax code may play a role in the future of Puerto Rico's wetlands. Section 936 of the Internal Revenue Code is a tax exemption program designed to attract corporations to establish factories in Puerto Rico and the Virgin Islands. The success of this program depends on whether manufacturing plants can be constructed in stages, with final assembly occurring in U.S. territories under the Section 936 tax incentives. The deduction of mortgage interest on second homes may affect wetlands in the islands, because a large number of vacation homes are constructed in sensitive wetland areas. The interest deduction subsidizes this activity.

WATER PROJECTS: Flood control, water supply, and to a lesser degree, navigation projects sponsored by the Army Corps of Engineers could have a significant impact on wetlands in the future. The Corps is now constructing only one major project in the islands: the Potugués and Bucaná Rivers Project in Ponce. This project channelizes a river and creates a reservoir, but has minimal impact on coastal wetlands. A thorough review of the effects of past Corps projects was not possible, but one proposed flood control project (the Río Puerto Nuevo Flood Control Project) could harm coastal wetlands in Puerto Rico. Located in the center of the San Juan metropolitan area, the project would cost \$253 million and eliminate 20.5 acres of mature mangrove wetlands. The affected area includes the Constitution Bridge mudflats and mangroves, a Commonwealth designated Critical Coastal Wildlife Habitat. A 30-acre mitigation plan will be implemented to partially compensate for wetland loss.

Lack of coordination with FWS during the reconnaissance phase of flood control projects continues to result in wetland impacts not being recognized until later phases of the Corps' project evaluation process. The Corps' method of calculating benefits for flood control projects has been criticized on the grounds that it tends to justify development in wetlands, compromising the Floodplain Management and Wetland Protection Executive Orders. A review of the methods used by the Corps for calculating flood control benefits would help to dispel any doubts about the validity of the techniques utilized.

TRANSPORTATION: As a result of negotiations by the natural resource agencies and a growing awareness about wetlands by the construction community, a major highway project to alleviate traffic jams around the international airport has been redesigned. As originally conceived, the Baldorioty de Castro Expressway would have eliminated 50 acres of wetlands, more than half of those remaining along the entire San Jose Lagoon perimeter. It is now estimated that only 6 acres of mangroves and 12 acres of herbaceous wetlands will be lost.

The direct effects of the San Juan Urban Core Transportation System were successfully mitigated, but the system could have significant indirect effects. The Commonwealth admitted that to make the \$20 million channel to provide ferry service appear economically viable, the projected level of commuter use was inflated in the Environmental Impact Statement. The Commonwealth now wants additional development of the remaining wetlands in this already crowded area to promote patronage of the Transportation System.

Expansion at the Luis Muñoz Marín International Airport, typically involving equal cost sharing between the Commonwealth and the Federal Aviation Administration, regularly destroys surrounding wetlands. At the urging of the Corps and FWS, the Ports Authority has developed a long-term mitigation plan for the airport to address all wetland impacts. As proposed, the mitigation plan calls for acquiring and placing protective covenants on high-value, privately owned wetlands, rather than creating or restoring wetlands. The mitigation plan eliminates the risk of conversion for some wetlands, but it does not offset the loss of wetlands due to planned expansion of the airport. Although it is possible to create mangroves, the communities in the vicinity of the airport strongly objected to the Ports Authority using uplands for wetland mitigation. Land for expansion for these communities is very limited, and over 100 acres would have been needed to fully offset the losses from planned development at the airport. Nonetheless, a mitigation plan which focussed on restoration of degraded or previously converted wetlands would have been preferable to the one which was proposed.

AGRICULTURE: While agriculture, per se, no longer has a major impact on wetlands in Puerto Rico, some SCS watershed projects which are justified for agricultural purposes may pose a threat to wetlands, and portions of them seem to violate SCS operating procedures.¹¹ Many coastal sugarcane fields were originally

¹¹Since 1987, the Executive Order on Wetlands Protection has restricted direct Federal action to drain wetlands. Further, in (continued...)

developed for agriculture by draining wetlands and floodplains. Large tracts of former sugarcane fields have long been abandoned due to market conditions, sufficiently long that some fields have either acquired wetland characteristics or reverted to wetlands. Under SCS regulations, an area which has not been cropped for over 5 years does not qualify as a prior converted wetland, and is not eligible for SCS assistance as part of a watershed project. SCS should review watershed projects planned for Puerto Rico to determine whether they comply with SCS procedures and regulations.

COASTAL BARRIER IMPROVEMENT ACT: Congress accepted the principal of withdrawing Federal support for activities that disrupt fragile coastal and floodplain environments when it passed the Coastal Barrier Resources Act of 1982 (CBRA). With enactment of the Coastal Barrier Improvement Act of 1990 (CBIA), Congress amended CBRA and extended this principal to the coastal environments of Puerto Rico and the Virgin Islands. The CBIA reduces the incentive to develop designated coastal wetlands in Puerto Rico and the Virgin Islands, but as enacted the intent of the statute can be circumvented on areas ostensibly dedicated to conservation.

Under CBRA, areas that are "otherwise protected" are generally not included in the Coastal Barrier Resources System (CBRS). Congress apparently thought that including these areas in the CBRS would be redundant and did not want to preempt legitimate State, local, and private conservation decisions. CBRA regulations define an otherwise protected area (OPA) as one which "has been withdrawn from the normal cycle of private development and dedicated for conservation, wildlife management, public recreation, or scientific purposes." The CBIA prohibits the provision of new flood insurance coverage on OPAs. However, no additional penalties are triggered if the protective covenants on an OPA are ignored and the area is made available for development. NFIP coverage remains unavailable for projects in an OPA that is proposed for development, but there are no restrictions on the availability of development assistance from other Federal programs. Development proposals are pending for numerous OPAs in Puerto Rico. If withdrawal of flood insurance proves insufficient to discourage the disregard of protective covenants and development of OPAs, then Congress may want to consider stronger sanctions.

¹¹(...continued)

June, 1987, the SCS Director issued guidance halting all new planning starts for watershed projects that would increase crop production.

STATUS AND PROSPECTS

Agriculture no longer has a major impact on wetlands. Economic development and housing projects, often justified as a way to relieve the 15 to 20 percent unemployment rate, pose the greatest threats to coastal wetlands. The economy of Puerto Rico appears to be emerging from a period of sluggish activity; development pressure in the form of resorts, marinas, vacation homes, housing projects, and industrial facilities has sharply increased since 1985. Existing regulatory programs and pre-development consultation policies have failed to stem construction in mangroves and coastal wetlands. The devastation from Hurricane Hugo in 1989 raised serious questions concerning coastal development. However, development continues, and in many areas such as Culebra, structures were rebuilt in the same locations.

Federal economic incentives play a major role in promoting these activities. Most significant seem to be flood insurance, federally insured home mortgages, and flood control projects, followed by Community Development Block Grants, transportation projects, grants offered by the Economic Development Administration, tax code provisions allowing the deduction of interest on second homes, and income tax exemptions for companies locating in the islands. The Urban Development Action Grant Program had a significant effect on wetlands, but it is no longer funded. Without this heavy Federal investment many of the development projects would not have gone forward. Despite the subsidies and the heavy investment, the unemployment rate remains relatively constant. Current laws and regulations may not be strong enough to withstand this mounting economic pressure, and mitigation opportunities for mangrove losses are limited because of the relatively confined area they now occupy.

RECOMMENDATIONS

1. Urban Development:

- a. FEMA should deny flood insurance and disaster assistance to communities which do not enforce floodplain management ordinances.**

To participate in the National Flood Insurance Program and the Disaster Assistance Program, communities must adopt local ordinances regulating development in floodplains. These ordinances are regularly violated in Puerto Rico, often resulting in the destruction of wetlands having important flood prevention and ecological characteristics. FEMA has the authority to deny flood insurance and disaster assistance if the ordinances are not enforced. In a region

with such severe developmental pressures, if the ordinances can be ignored with impunity, they likely will be.

- b. If withdrawal of flood insurance proves insufficient to discourage development of "otherwise protected areas" (OPA), Congress should amend the Coastal Barrier Resources Act to provide for automatic inclusion in the Coastal Barrier Resources System (CBRS) of OPAs whose protective covenants are violated.**

The CBIA greatly reduces the incentive to develop designated coastal wetlands in Puerto Rico, but as enacted the intent of the Act can be circumvented on OPAs. New flood insurance coverage is unavailable on OPAs, but if the protective covenants are violated and an OPA is made available for development, no additional sanctions are triggered. NFIP coverage continues to be unavailable for projects in a former OPA, but there are no restrictions on the availability of development assistance from other Federal programs. Automatic inclusion in the CBRS and denial of all Federal benefits supporting development would seem the appropriate response for such a breach of faith.

- c. Flood insurance rate maps (FIRMS) should be drawn to include more mangrove and beach areas.**

FEMA regulations ostensibly protect mangroves by prohibiting their alteration in the V-Zone (a coastal high hazard area subject to high velocity waters). However, the maps for Puerto Rico include only a few fringing, mangrove forests along the south coast. FIRMS should be drawn to include additional mangrove areas, because construction activities alter the mangrove stands and sand dunes, and in turn these alterations alter wave energy and increase the intensity of storm waves. The Planning Board takes account of Federal flood-zone designations when designing ordinances which regulate development in floodplains. Clearly, if the maps are not inclusive, wetlands can be converted for ill-advised development.

- d. In recognition of their flood control benefits, all wetlands subject to storm surge from a major hurricane should be protected from future development. Further, the FIRMS should be redrawn to take into consideration past wetland losses and the resulting increased intensity of wave action and river flows elsewhere.**

FIRMS are drawn in order to identify the different risk areas within a floodplain. As such, they should account for the flood control benefits of existing wetlands. There is currently no requirement that the wetlands used in

calculating the existing flood control capacity be protected. Consequently, these wetlands sometimes get developed, while their protective qualities continue to be assumed in the existing FIRMS. Either these wetlands should be protected or, following their loss, the FIRMS should be redrawn to reflect the elimination of their flood control benefits.

- e. The Municipal Services Administration and the larger municipalities should develop wetland identification expertise for use in reviewing Community Development Block Grant proposals. National Wetland Inventory maps should be used as a basis for environmental review of the Community Development Block Grant (CDBG) proposals.**

There are a large number of projects approved under the CDBG program. The cumulative impact of these programs on wetlands may be significant. Frequently, threats to wetlands are identified only after the fact. The wetland effects of the program could be reduced if HUD management issued guidance placing a high priority on wetland conservation and if HUD and municipalities trained their personnel in identifying potential wetland impacts. CDBG proposals are too numerous to allow resource agencies to review each proposal thoroughly. However, if HUD and municipal personnel were provided with wetland identification training and NWI maps, the number of referrals to resource agencies could be reduced to a manageable level.

- f. Federal agencies (mainly HUD and the Department of Commerce) involved in promoting industrial development should modify policies, whenever possible, to encourage the rehabilitation of abandoned facilities that are already zoned for industrial use, rather than promoting the development of new industrial areas.**

In order to transform Puerto Rico from an agrarian to an industrial economy and to relieve unemployment problems, Federal agencies have sometimes promoted new development which was harmful to wetlands. New development was encouraged even though abandoned sites were available. Before new projects are approved and supported with Federal funds, sponsoring agencies should be required to demonstrate that existing capacity cannot be rehabilitated more cheaply or cannot serve the desired function.

2. Regulation:

Strengthen the enforcement program of the Army Corps of Engineers and EPA to respond to illegal filling of wetlands and noncompliance with mitigation conditions in permits.

Unauthorized filling of wetlands and nonfulfillment of mitigation conditions in permits are substantial and continuing problems in Puerto Rico. Although the Corps issues many cease and desist orders, and several cases have been tried in Federal court, only a few of the illegal fills have been restored. The Corps' and EPA's enforcement efforts are inadequately staffed to handle the case load, and penalties are insufficient to serve as meaningful deterrents to continued illegal fills and developers' disregard of mitigation requirements in permits.

REFERENCES

- Fridman, H. L. 1986. Building Starts Soar as Barriers Go Down. The San Juan Star (August 10), pp 1+.
- Pace, R. 1986. The Impact of Federal Programs on Wetlands in Puerto Rico. Background Report. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 36 pp.

PART III: ALASKA AND THE WEST

Chapter 11: CALIFORNIA'S CENTRAL VALLEY

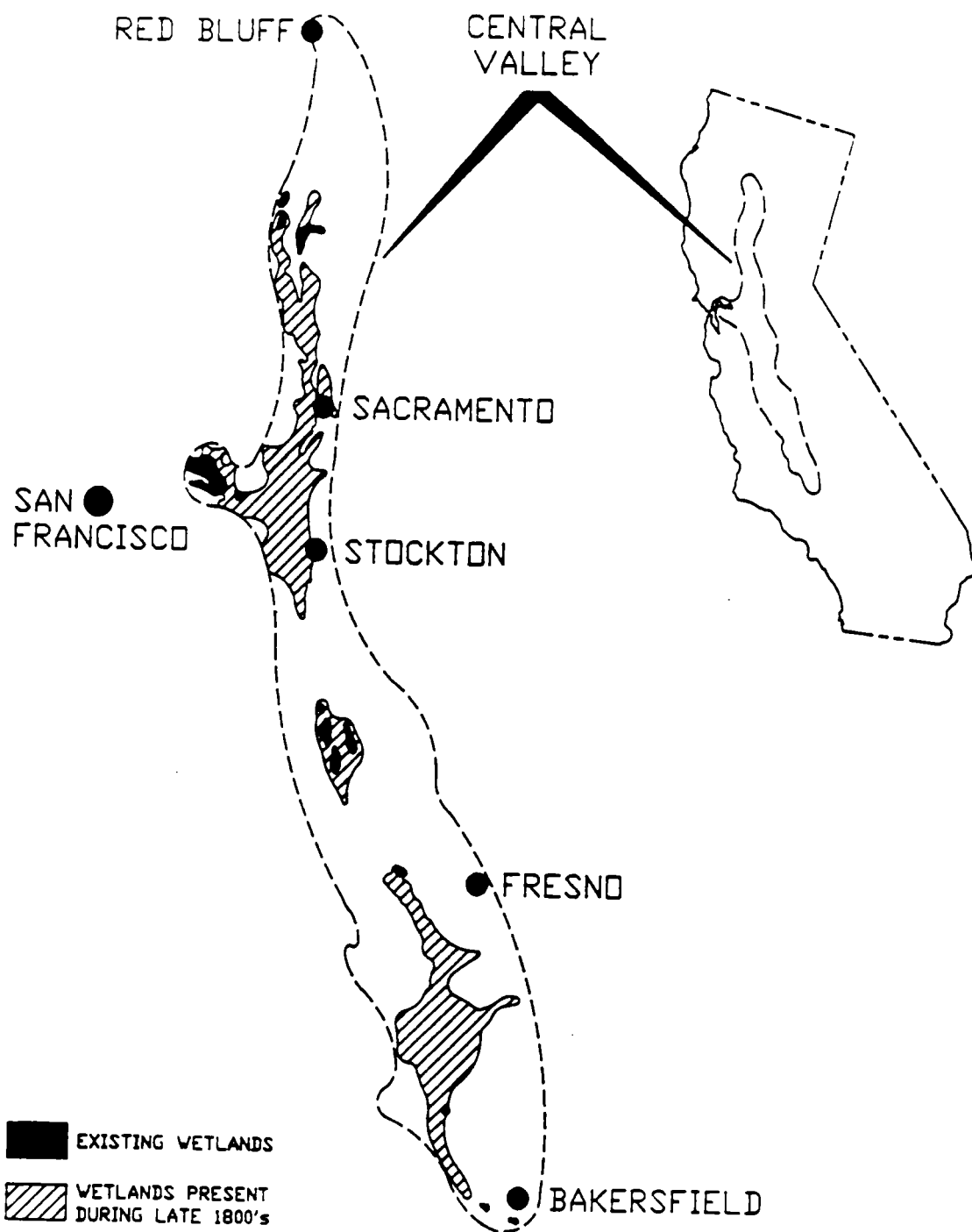
INTRODUCTION

PHYSICAL DESCRIPTION: California's Central Valley extends approximately 400 miles from Red Bluff in the north to the mountains below Bakersfield in the south, encompassing 16,000 square miles. (See Figure XI-1.) Seventeen drainages traverse the Valley ridged by the Sierra Nevadas on the east and the Coast Ranges on the West. The Valley is best envisioned as two lesser valleys, the northern Sacramento and the southern San Joaquin, each with a major river flowing through it. The Sacramento and San Joaquin Rivers converge in a 1000 square mile delta seeking an outlet to the Pacific Ocean at San Francisco Bay. Agriculture dominates land use in the Valley. Cotton is the crop generating the largest revenues in the State. In the Central Valley, it is grown mainly in the southern San Joaquin Valley. Rice grows mainly in the south and central Sacramento Valley. Sugar beets, fruits, nuts, and vegetables are found throughout the Valley, while grain and livestock are produced in peripheral regions in conjunction with other agricultural endeavors.

CHARACTERISTICS AND FUNCTIONS: The Central Valley wetlands:

- o Provide wintering habitat for 19 percent of the wintering waterfowl in the continental United States. Support some of the highest densities of wintering waterfowl in the country, and are the highest priority wetlands nationally for wintering habitat preservation;
- o Support chinook salmon resources, which are important commercially and recreationally, and a striped bass sport fishery;
- o Provide habitat for 5 federally-listed endangered species and three threatened species;
- o Contain portions of 8 national wildlife refuges and 4 State wildlife management areas totalling 86,700 acres;
- o Help to maintain ecosystem productivity by detaining and slowly releasing flood waters, recharging aquifers, stabilizing shorelines, and filtering many sediments and pollutants from agricultural activities.

Figure XI-1: CALIFORNIA'S CENTRAL VALLEY WETLANDS



ORIGINAL ACREAGE: The Central Valley originally had between 4 and 5 million acres of permanent, seasonal, and tidal wetlands, including freshwater and brackish marshes and riparian areas.

CURRENT ACREAGE: In the mid-1980s, about 379,000 acres of wetlands existed in the Central Valley, approximately nine percent of the original complement, and few of these remained in their natural state (Frayer et al. 1989). Of the remaining wetlands, 319,000 acres are freshwater. (See Figure XI-2.) About 59 percent of the remaining wetlands in the Central Valley are protected through either public ownership or perpetual conservation easements. The remaining 41 percent are in private ownership and are not protected.

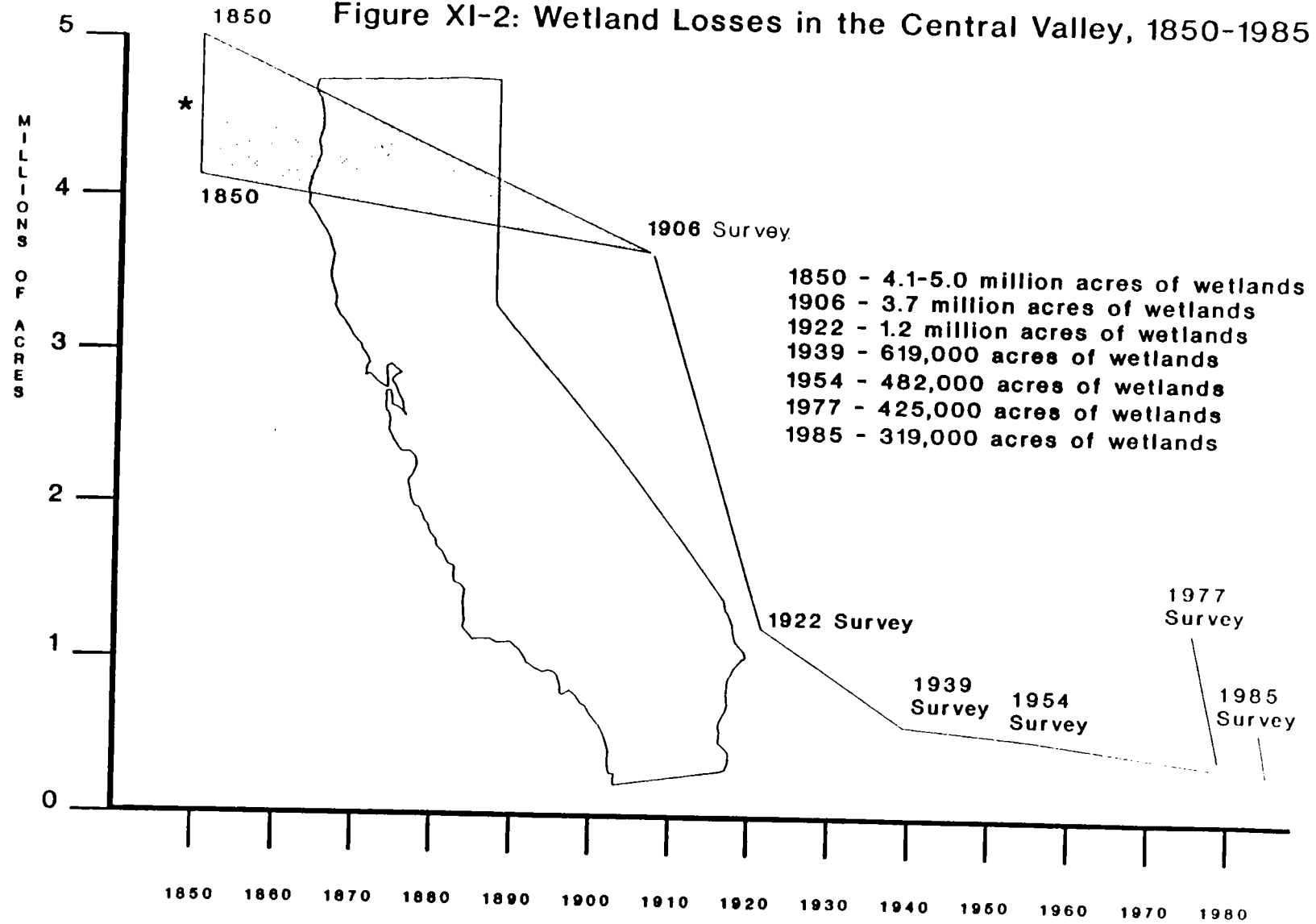
TRENDS: Figure XI-2 graphically displays the trend in California's wetlands over the last century. The trend for the Central Valley parallels that for the State as a whole. Up through the mid-1800s, a small proportion of wetlands were affected by man's activities, e.g., burning by native peoples and grazing by the Spanish. Between 1850 and the 1910s, alteration began in earnest as a result of hydraulic mining, piecemeal flood control, and early irrigation efforts. More coordinated flood control efforts were initiated around 1910, and by the early 1920s, 70 percent of the original wetland complement had been converted. From 1922 through the present, an additional 21 percent of the original wetlands was lost due to the combination of large dams and downstream levee and channelization works. The levees transformed permanent wetlands into seasonal wetlands. The large dams provided the flood control needed to encourage settlement and make conversion of the wetlands to croplands technically feasible. And the water needed to irrigate crops came from the same dams which provided the flood control. A more detailed description of the changes effected in the Valley in the last 150 years follows.

THE TRANSFORMATION OF THE CENTRAL VALLEY

Much of the Central Valley's complement of wetlands at the time of settlement was swamp and overflowed lands flanking the Sacramento and San Joaquin Rivers. These rivers are fed by drainages that originate in the surrounding mountains, flowing through the valley from the north and south, respectively, to San Francisco Bay. Both rivers overflowed their banks annually, because their channels could not contain the enormous volumes of runoff generated by winter rains followed in the spring by snowmelt from the Sierra Nevada.

With passage of the Swamp Lands Act of 1850, Congress gave public lands that were swamp and overflowed to the States, with the

Figure XI-2: Wetland Losses in the Central Valley, 1850-1985



* Estimates prior to 1900 range from 4.1 - 5.0 million acres

proviso that they be reclaimed for agriculture. The State of California responded by establishing local reclamation districts and by selling the lands at \$1 per acre to individuals interested in converting them. The districts set about the task of constructing many miles of levees to confine the rivers to their channels, thereby allowing the conversion of wetlands to farmlands. Widespread conversion of seasonal wetlands occurred in the Sacramento Valley as farmers diked the floodplains for cultivation. These efforts were only partly successful, however. The land reflooded each winter and restricted the growing season. The process of reclaiming the lands ceded under the Swamp Lands Act was to take many years and require extensive Federal assistance.

That assistance came about initially in an indirect way when in 1893 Congress established the California Debris Commission. The practice of hydraulic mining had generated a tremendous amount of sediment, hence the term "Debris Commission". The sediment silted in the Yuba and Feather river channels so severely that navigation had become impaired and flooding exacerbated. The Commission constructed dams in the Yuba River watershed to trap the sediment. The Commission operated with funds appropriated equally by Congress and the State, and three of its five members were officers of the Corps of Engineers.

More direct involvement of the Federal Government in California's flood control planning (and continued wetland loss) came in 1905, when the Corps helped devise a flood control plan for the Valley. Twelve years later, as part of the nation's first Flood Control Act, Congress authorized the Corps to plan and construct the Sacramento Flood Control Project. This system of levees and ancillary facilities was cost shared with the State, and had the effect of facilitating the conversion of the swamp and overflowed lands of the valley floor that had not already been converted by the decades-long efforts of the State-authorized local reclamation districts. By the 1940s, an extensive Federal system of levees and overflow bypasses afforded Valley residents a high degree of protection from annual flooding events. By then, 85 percent of the wetlands in the Central Valley had disappeared.

While the Valley was being leveed and ditched, private and municipal interests constructed numerous dams and storage reservoirs on rivers draining the west slope of the Sierra Nevada.¹ These reservoirs captured a portion of the Sierra

¹Among the larger ones built during the 1920s were Hetch Hetchy (built by the City of San Francisco with authorization from Congress); Don Pedro, Exchequer, and Almanor (all built by irrigation districts); and Pardee (a municipal facility serving Oakland).

snowmelt and reduced the flood flows that had sustained Valley wetlands.

Since 1939, the Bureau of Reclamation and the Corps have constructed much larger, multipurpose reservoirs in the Central Valley.² Another 16 reservoirs were placed in operation by the State, municipalities, and irrigation districts. The loss of an additional 6-9 percent of the Valley's original complement of wetlands followed. Although this percentage may seem small in comparison to the magnitude of earlier losses, it represented approximately half of the wetlands remaining as of 1939.

Currently, there are about 6.9 million acres irrigated in the Central Valley. The total population in the Valley is about 4.5 million. Central Valley facilities supply water to 1.7 million of these. The Valley population is expected to total 7.5 million by the year 2010, with a large number of people who work in the Bay area electing to live in the Valley and commute long distances to work. The growing population and increased economic activity will actively compete with wetlands for a water supply.

In 1992, Congress enacted the Central Valley Project Improvement Act. The main purposes of the Act are to reform the pricing and management of CVP water and to attempt to mitigate for the fish, wildlife, and associated habitat impacts of the project. The protection and restoration of the Valley's wetlands are among the Act's principal concerns.

FACTORS CURRENTLY AFFECTING WETLANDS

Central Valley wetlands and the functions which they serve compete directly for water and space with agriculture and, to a lesser extent, with municipal and industrial uses. Half of California's and five percent of the nation's agricultural output comes from the Valley. Central Valley agriculture depends on managed water, and the distribution system has radically changed the face of the entire valley.

California has more large dams (over 1240), with greater total storage capacity than any other State. In the water-rich northern Central Valley, flood control was the driving force for construction of the dams, while the desire to irrigate and cultivate the San Joaquin Valley was the motivation in the south. Massive water development and manipulation has been required, including reversing the direction of river flows and trans-basin diversions. The Central Valley Project, planned by the State,

²Fifteen reservoirs, each with capacity greater than 75,000 acre-feet.

and built and operated by the Bureau of Reclamation, is the largest of the water management systems in California. The Valley also has an extensive levee system, built and maintained by the Corps, which confines the rivers and streams, allowing trees and vegetation to be cleared for crops and urban development. Water development and the agricultural activity promoted by it account for the loss of 91 percent of the original Central Valley wetlands, and have altered the remaining wetlands so that they, like agriculture, depend on managed water regimes. Water development has also contributed to significant urban development. These agricultural and urban developments are protected by the dams and levee system, and provided with water by the projects.³

Managed water can take the form of surface water, pumped groundwater, drainwater, and conserved water. Each type has been available to wetlands in limited quantities, varying with the available supply. Although the Bureau currently provides CVP water for purposes of fish and wildlife conservation, the amounts provided have been quite limited and largely determined annually (as opposed to dedicated, contractual volumes).⁴ The Bureau has had statutory authority to issue long-term contracts for fish and wildlife purposes for some time, and has done so on occasion.⁵ But the Bureau has always considered fish and wildlife conservation as a secondary purpose of the CVP. Further, the issue of who would bear the cost of providing such water supplies has always been a contentious one.

With passage of the Central Valley Project Improvement Act of 1992 (CVPIA),⁶ Congress took an important step toward restoring the environment in the Valley and effecting a more efficient use

³The FWS estimates that a minor percentage (.8 percent) of the wetland loss in the Central Valley since 1939 is due to urban growth (U.S. Department of the Interior 1989b).

⁴For example, in the San Joaquin Valley less than one percent of project water is devoted to wildlife areas, and much of that is agricultural drainage water. The CVPIA mandates a substantial change in the allocation of project water, and requires agricultural drainwater to meet water quality standards.

⁵The Bureau has long-term contracts with the California Department of Fish and Game to provide water to two waterfowl management areas as well as a long-term contract for 50,000 acre-feet with the Grasslands Water District. The latter was required as part of the settlement of a lawsuit against the San Luis Unit.

⁶The CVPIA is Title 34 of the Reclamation Projects Authorization and Adjustment Act of 1992 (PL 102-575).

of project water. The CVPIA asserts that the protection and restoration of fish and wildlife and associated habitat is a purpose of the project, assigning it a priority equivalent to that for irrigation. The Act specifies activities to be undertaken by the Secretary within designated time periods, to accomplish this objective. Section 3406(d) of the Act directs the Secretary to provide firm water supplies of suitable quality to maintain and improve wetland habitat on Federal refuges, State wildlife management areas, and the Grassland Resource Conservation District in the Central Valley. Initially, the firm supplies to be delivered to these wetland areas are to equal their current average annual supplies (comprised of some firm, but mostly non-firm, supplies). By 2002, however, firm water supplies to these areas are to be sufficient to enable "full habitat development."⁷ The cost of the restoration projects are to be shared by the Federal Government, the State, and the project beneficiaries, but a significant amount of the cost (\$30 million annually) is to be borne by the water and power users through a series of water-use charges. In addition, the CVPIA requires reforms in water pricing and marketing, increasing the water rates and reducing the length of contracts. (For a full discussion of the provisions of the Act, see chapter 4.)

The CVPIA will not solve all the wetland problems in the Central Valley. The Act primarily addresses the water needs of publicly-owned wetlands. These account for less than one-fourth of the wetlands in the Central Valley. The Act does direct the Secretary to investigate and report to Congress on alternative means of improving the reliability and quality of water supplies for privately-owned wetlands.⁸

Historically, wetland managers have used groundwater on occasion to sustain wetlands, but during the current drought (1986-1983) they have come to rely on it more heavily. Groundwater is increasingly more expensive to pump, and supplies are being depleted largely due to agricultural use. (Agriculture is depleting groundwater reserves in the San Joaquin Valley at an average overdraft of 1.5 million acre-feet per year.) Even in the absence of rising energy costs, groundwater could not serve as a complete solution for wetland water supplies: pumping capacities are just too small. Further, groundwater supplies are showing more and more frequent signs of contamination.

Historically, irrigation drainwater has been viewed as a resource to be reused to support wetlands, and, in many areas, wetland

⁷Roughly, the biological carrying capacity of the area in the absence of water scarcity.

⁸Section 3406(d)(6)(A).

managers have come to rely on irrigation drainwater to support wetland resources. It has become increasingly recognized, however, that drainwater contains contaminants from agricultural runoff including pesticides, leached salts, and trace elements. Indiscriminant use of drainwater on wetlands has resulted in adverse effects on the flora and fauna found in or associated with wetlands. Potentially powerful provisions in the CVPIA address the water quality issue. The Act requires that when CVP contracts are amended or renewed, provisions be added requiring contractors to comply with State and Federal water quality standards for agricultural drainwater. (The issues of irrigation drainwater and agricultural practices and their environmental consequences are addressed in more detail below.)

Water conservation by the agricultural sector has not resulted in more water for wetlands. Conserved water has almost always been allocated for purposes other than wetlands. Indeed, some water conservation practices have proved detrimental to wetlands. For example, the lining of canals to prevent water seepage affects wetlands because the seepage served as a source of moisture to adjacent wetlands. The CVPIA addresses this problem, authorizing the Secretary to undertake water conservation measures in conjunction with CVP contractors. Any conserved water is to be shared in the same ratio as the costs are shared, with the Secretary's share to be used for restoration of wildlife habitat and populations.

The upstream diversion of water (for agricultural, municipal, and industrial uses), the dredging of Delta channels (for navigation), and the extensive levee system have had a significant impact on the hydrology and plant community of the Sacramento-San Joaquin Delta. Under predevelopment conditions, the Delta was characterized by high winter and spring flows and extremely low summer and fall flows, with salt water intrusion frequently occurring well into the upstream channels of the Sacramento and San Joaquin Rivers during periods of low flow. After the major flood control and water supply projects were completed, summer and fall flows into the Delta increased significantly and winter and spring flows decreased, resulting in a much different Delta than had occurred naturally. The Delta's water quality and vegetation characteristics changed markedly.

Since the major State and Federal water storage facilities were constructed in the 1940s, 1950s and early 1960s, diversion for consumptive use has greatly increased, reducing the streamflow into the Delta and the outflow from the Delta into the Bay.⁹

⁹Water exports from the Delta from State and Federal pumps in the South Delta presently average over 6 million acre-feet annually.

Deepening of navigation channels have further allowed seawater intrusion. The resulting change in water quality and flow regimes has adversely affected wetlands in the Bay and Delta, particularly in Suisun Marsh, which is being converted from a brackish to a salt marsh.

To correct for problems created by the water management operations, the California Departments of Fish and Game and Water Resources, the Bureau of Reclamation, and the Suisun Resource Conservation District are proceeding with the development and construction of facilities to protect the managed portions of the marsh from increased salinity and vegetative changes that result from continued export of water.¹⁰ These facilities are designed to comply with water quality standards for the Delta and Suisun Marsh prescribed by the California State Water Resources Control Board (Board) in its 1978 Delta Water Quality Plan (1978 Plan). However, the adequacy of the standards are in doubt. In 1987, EPA rejected the 1978 Plan on water quality grounds, and again in 1991, EPA rejected the Board's revised (1991) water quality standards.

While the Board was struggling to develop a long-term plan for the Delta, Governor Wilson called for adoption of an interim plan of protection by the end of 1992. On December 9, 1992, the Board released draft Decision 1630, which imposes terms and conditions on the operation of the Central Valley Project (Bureau of Reclamation), State Water Project (Department of Water Resources), and the facilities of many of the largest water rights holders. The terms and conditions are designed to provide improved interim protection (5 years) for public trust resources in the estuary. Decision 1630 would increase the instream flows in the Sacramento-San Joaquin River system,¹¹ and would benefit wetlands of the estuary that are situated "instream" or tidally and the managed (non-tidal) units of Suisun Marsh (due to improved water quality), but would not benefit the freshwater, inland wetlands of the Central Valley.¹² In January, 1993, EPA

¹⁰The principal component of this project, the Montezuma Slough Control Structure, is presently in place and operating.

¹¹In particular, Decision 1630 would require bypassing diversion to storage, releasing "pulse" flows, reductions in the amount of deep percolation occurring on lands prone to drainage problems (i.e., a reduction in the amount of irrigation water applied), curtailment of exports, curtailments of upstream diversions during "pulse" flows, and various other measures.

¹²Indeed, the increased instream flows mandated by Decision 1630 will make it more difficult to satisfy the demands for water
(continued...)

informed the Board that Decision 1630 would not be sufficient to correct the water quality deficiencies in the Delta and that it would promulgate a rule to satisfy the water quality requirements of the Clean Water Act. EPA expects that only minor revisions of Decision 1630 will be necessary to comply with its rule.

Virtually the entire duck population of the Pacific Flyway winters in California. Based on mid-winter indices of the Fish and Wildlife Service, about 3.0 million ducks wintered annually in California during the period 1981-89. This is a significant decrease from 1971-80, when the average annual wintering population was 5.3 million ducks. During each of these periods, between 40 and 50 percent of the wintering population was in the Central Valley.

In May 1986, the United States and Canada became signatories to the North American Waterfowl Management Plan (NAWMP). The NAWMP established a national goal for each country to rebuild waterfowl populations to levels that existed during the 1970s. Although much of the recent waterfowl population decreases are attributed to the persistent drought in the northern breeding areas of Canada and the United States, adequate wintering habitat is essential to meeting the goals of the NAWMP. As programs to improve conditions in major breeding areas increase fall flights, it is essential that adequate wintering habitats be available to prevent overcrowding and stress that make birds more susceptible to disease and contaminants. Biologists believe that because many native and perennial wetlands have been replaced with domestic crops and seasonal wetlands, they provide lower quality food and few, if any, invertebrates. As a result, birds may not be getting the nutrition necessary to carry them through the winter and prepare them for spring migrations to northern breeding areas. The populations appear to be suffering from increased mortality.

High levels of pesticides, salts, and trace elements degrade water quality and may adversely affect species dependent on the water. The national average of pesticide use in 1981 was 2.3 pounds per acre; California growers applied over 11 pounds per acre. The Suisun Marsh, the Grasslands, San Joaquin River, Tulare Basin, South Delta, and the Sacramento River have all been particularly hard hit by the application of chemicals. The actual magnitude of the pesticide problem is not known. However, lawsuits have been filed, and at some locations pesticides found in fish tissues are substantially above public health standards for human consumption. Where impervious clay layers underlie an

¹²(...continued)
by agriculture, municipalities and industries, and inland wetlands.

agricultural field,¹³ tile drains or drainage ditches are placed to remove water from the root zone. In the absence of the drainage, applied irrigation water builds up, and saturated soils and salt accumulation reduce crop yields, ultimately rendering the soil unsuitable for crops. The problem of salt buildup is costly to Valley agriculture, causing a 10 percent annual crop loss valued at \$31.2 million and, where possible, a shift to more salt-tolerant crops.

When irrigation water percolates through the soils, it mobilizes salts and trace elements such as selenium, arsenic, and boron that may be present. Where the levels of salts and trace elements are high, the drainage water becomes not only unsuitable for use on wetlands, but creates problems of disposal. This situation became apparent at Kesterson Reservoir in the early 1980s. When the San Luis Drain was not completed as authorized, Kesterson Reservoir became an evaporation facility for agricultural drainwater. Waterfowl deaths and deformities were discovered at the reservoir, which were associated with high selenium levels found in the concentrated drainwater.¹⁴ Problems associated with drainwater have subsequently been found at other Valley wetlands and elsewhere in the arid West. Evaporation ponds on private lands attract water-associated birds and, in some ponds, frequencies of death and deformity greater than those found at Kesterson have been documented, particularly in the Tulare Basin in the San Joaquin Valley.

Private duck clubs control about 347,000 acres in the Central Valley. Half are wetlands; the other half are rice, corn, and pasture lands flooded after harvest to attract ducks and hunters. Most of these lands do not produce the moist-soil plants and abundant invertebrates that waterfowl need; they are designed as hunting not feeding areas, although some do provide waste grain and weed seeds. The development value of the land for both agricultural and urban purposes is rising, as are the property taxes and water costs. Few duck clubs want to pay for the year-round water management needed to sustain natural vegetation. Between 1970 and 1986, the number of hunters in the Valley dropped precipitously. This is not surprising given the increased costs of operating the duck clubs, the shortened seasons, the reduced bag limits, deterioration in the quality and

¹³Primarily in the San Joaquin Valley Drainage.

¹⁴Because of the extent of the contamination, Kesterson Reservoir was closed, filled in, and returned to the Bureau of Reclamation. The Bureau agreed to mitigate for the lost wetlands, and is now attempting to do so. The reservoir had been part of the Kesterson National Wildlife Refuge.

quantity of the birds,¹⁵ and reduced numbers of birds due to drought conditions in the northern breeding areas. Reduced duck club revenues result in fewer duck clubs and reduced political and economic support for protecting waterfowl habitat. As the revenues generated from hunting fees go down, while the costs of maintaining wetlands go up, wetlands are drained earlier in the season, further diminishing their habitat value for waterfowl. More acreage is being converted to crops which have little or no food or cover value for waterfowl, and industrial parks and other urban developments are replacing some former wetlands. The CVPIA makes a start at addressing these problems, directing the Secretary to develop incentive programs to encourage farmers to keep fields flooded for waterfowl during appropriate times of the year.

There are major efforts underway to offset some of the wetland losses in the Central Valley. (These efforts are in addition to those mandated by the CVPIA.) The State has contributed substantial funds to acquire wetlands in recent years. As of mid-1990, the Fish and Wildlife Service had purchased easements on 41,000 acres of duck habitat. Under the North American Waterfowl Management Plan, the State, the Federal Government, and several private, non-profit conservation organizations are engaged in a joint venture to protect Central Valley wetlands.¹⁶ The objective is to acquire and put easements on a total of 147,000 wetland acres in the Central Valley, including existing wetlands and agricultural lands to be restored to wetland status.¹⁷

¹⁵Some have been poisoned and are unfit for human consumption.

¹⁶The North American Waterfowl Management Plan is designed to assure the continued survival of abundant waterfowl populations in Canada and the United States. It was signed in 1986, and implementation is through joint, private-sector/public-sector ventures. The Central Valley Joint Venture establishes habitat needs and strategies to accomplish the objectives. The agreement specifies the conservation activities to be conducted (easements, acquisition, cooperative agreements with landowners allowing restoration on private land), the responsibilities of each party, and target dates for accomplishing the objectives. In addition to the State and Federal Governments, Ducks Unlimited, The National Audubon Society, and the California Waterfowl Association have contributed significantly to the restoration and enhancement of wetlands for water-oriented birds.

¹⁷State and Federal refuges total 37,406 and 54,645 acres respectively. Most of the acreage is maintained as seasonal wetlands, with 10-20 percent as permanent marsh.

The Bureau of Reclamation is actively pursuing two environmental initiatives that could have a major, beneficial impact on wetlands in the Central Valley. The first is the San Joaquin Basin Action Plan, a cooperative project among the California Department of Fish and Game, the U.S. Fish and Wildlife Service, and the Bureau of Reclamation. This plan is a major habitat acquisition and wetland enhancement program. It is designed to meet the long-term mitigation requirements for Kesterson Reservoir and to contribute significantly to the North American Waterfowl Management Plan for the Central Valley Habitat Joint Venture. The plan calls for the creation of 4,464 acres of new wetlands and provides protection for an additional 6,239 acres of existing wetlands. Taken together, these actions would mitigate for losses associated with closure of Kesterson, while satisfying 12 percent of the Central Valley Habitat Joint Venture's San Joaquin Basin objective for wetland preservation (53,000 acres) and 22 percent of the objective for wetland creation (20,000 acres). The Bureau will also execute long-term agreements to supply 52,000 acre-feet of Central Valley Project water annually to sustain these wetlands.

The second major initiative, the San Joaquin River Basin Resource Management Initiative, could have a substantial, beneficial effect on wetlands. The Secretary of the Interior announced this undertaking on November 29, 1989; it will be carried out in cooperation with the State. The express purpose of the initiative is to improve the water and related environs of the San Joaquin River Basin with particular emphasis on fisheries, wetlands, and water quality. The scope of the initiative and related environmental studies will be determined through the NEPA scoping process, and will address operational aspects of projects in the San Joaquin Basin, including, but not limited to price, conservation, time, manner, and efficiency of delivery.

The CVPIA addresses these logistical items. Section 3406(d)(5) authorizes the Secretary of the Interior to construct (or acquire from non-Federal entities) the facilities needed to convey water to Federal refuges and State wildlife management areas in the Central Valley. Construction of such facilities will be necessary, because refuges generally do not have their own delivery system, and rely on the irrigation canals to convey water to them. Irrigation districts often close their canals in the winter for maintenance, however. Thus, delivery of water can be and often is reduced or cut off when wintering birds are in residence.

FEDERAL PROGRAMS AND PROJECTS

Federally subsidized water development, technical assistance, and research, along with farm price and income support programs have

been major factors causing wetland loss and degradation in the Central Valley.

WATER PROJECTS: The Bureau of Reclamation, the Army Corps of Engineers, and the Soil Conservation Service are all active in water projects in the Valley, but the Bureau is the principal Federal water agency there.

Bureau of Reclamation: The Central Valley Project consists of 20 dams and reservoirs, 8 hydroelectric plants, 2 pumping/generating plants, and 54 pumping plants along with 1437 miles of canals, 51 miles of pipelines, tunnels, conduits, and aqueducts, and 192 miles of drains. The CVP is the largest undertaking in the Bureau's history. The Bureau has 13 million acre-feet of storage in the CVP, and received about 20 million acre-feet of water rights from the State for the CVP. It also has been granted about 2.3 million acre-feet of water rights at completed projects in the Valley other than the CVP, and claims rights to all return flows from the water it delivers.¹⁸ Water from the CVP fully irrigates 115,000 acres, partially irrigates 2.5 million acres, supplies about 320,000 acre-feet for municipal and industrial use, and generates about 6.8 million megawatt hours of hydroelectric power.

All project beneficiaries are subsidized. Consumers of hydropower and municipal and industrial water users pay below market interest rates. Recreational and fish and wildlife uses receive capital subsidies. Irrigation, which is the principal use of water from the project, enjoys financial assistance primarily from two sources: 1) the interest-free repayment of capital costs (a subsidy from taxpayers) and 2) the use of revenues from the sale of hydropower to repay irrigation capital costs above the Bureau's estimate of the irrigators' "ability-to-pay."¹⁹

The interest subsidy was authorized by the Reclamation Act of 1902 and 1939. The Act authorized the repayment of irrigation costs without interest for the portion of the investment cost of the project which is allocated to irrigation.²⁰ These costs are

¹⁸The Bureau's rights to this water may not be secure. The State maintains that it has authority to amend the rights.

¹⁹See chapter 4 for more details.

²⁰The financial assistance to irrigation extends to the cost of providing project power for pumping irrigation. By law, no interest accrues on the portion of a project's investment allocated to irrigation pumping. This subsidy can be calculated
(continued...)

amortized without interest over repayment periods of up to 50 years. However, four practices (some no longer extant) extended the repayment period even further (and thus further increased the interest subsidy).

- o First, Bureau policy delays the start of the fifty-year clock by requiring that a project or a part of a project be in service (i.e., delivering water) before the repayment period commences. (This policy benefits all users, not just irrigators.)
- o Until recently the Bureau engaged in a practice called "rolling repayment." This practice extended the repayment period for capital investment to 50 years after the completion of the most recent unit, effectively rewinding the repayment clock when each new unit was added to the system. Water users began paying for service when their original contracts went into effect, but as new facilities were added, they could reduce annual payments by spreading out the repayment period.²¹ Because the CVP is the largest project and was constructed over such a long period of time, the rolling repayment policy provided a particularly large subsidy to CVP users.

The Bureau now requires that all construction costs for the CVP have to be repaid by the year 2030. This is 50 years after completion of the newest facility (New Melones Dam), but some 80 years after the first features were built. Rolling repayment has been discontinued. Any major, new facilities added to the CVP will be under a separate repayment schedule.

- o Third, long-term, fixed-rate contracts also increased repayment periods. The Bureau executed contracts in the early 1950s to 1960s which contained fixed water rates. These water rates were intended to be sufficient to recover the construction costs over the 50-year period and repay annual operation and maintenance (O&M) costs, provided costs remained stable. However, because of inflation,

²⁰(...continued)

in two ways: what it costs the Government to generate power or what the Government could get for this power on the open market. If water users had to purchase power from private sources, they would have to pay more than double the full cost Government prices.

²¹Of course, because the cost of the new facilities had to be repaid, water users were subsequently responsible for paying a larger amount of principal.

particularly the high inflation rates of the 1970s, O&M costs rose sharply. By 1986, O&M costs exceeded the annual contract repayments, leaving deficits, not the surpluses needed to repay capital.²²

Contracts executed since the 1970s contain water rates which are adjustable at certain intervals; those executed after 1982 contain annual adjustable water rates. The majority of the Central Valley Project contracts will be renewed between the period 1995-2007, and the renewal contracts will contain annual adjustable water rates that are sufficient to recover the costs of O&M, capital, pumping costs, and water marketing. In addition, any deficit not repaid by the water users will be included in their water rate and will bear interest as of October 1, 1985. This latter requirement is imposed by Public Law 99-546 (discussed below). The CVPIA also requires reforms in water pricing and marketing, increasing the water rates and reducing the length of contracts.

- o Fourth, average cost pricing stretches out the repayment period and distorts the demand for constructing additional facilities. By averaging together costs for the entire facility before any user is assigned a share (the higher costs of new additions are added in with the lower costs of older facilities), those benefitting from a new facility do not have to pay its true additional cost of delivering water to them. Conversely, those being serviced by older facilities do not have to pay the new higher average price until their long-term, fixed-rate contracts expire, thus further delaying repayment.

The second form of financial assistance provided by Federal law to irrigation is the use of revenues from the sale of hydropower to repay a portion of irrigation capital costs (a cross-subsidy from hydropower users to users of irrigation water). If Bureau officials estimate that project irrigators cannot pay the assigned share of the CVP project's capital costs, they will require hydropower users to make up the difference. It is not currently known what degree of assistance from power revenues will be needed for repaying CVP costs by the year 2030.

²²This practice occurred even though Reclamation law states that O&M costs are to be paid annually in advance. It might seem from this that the contracts should have been voided for not being in compliance with the law. The situation is not nearly that simple. The law calls for the Secretary to set rates to recover the construction costs and all O&M costs. The Secretary complied with the law, but the rates were established under the assumption that O&M costs would remain stable over time.

The above subsidies for capital and interest do not account for all the subsidies to irrigators. These are only the subsidies for private resources...the resources which irrigators have to purchase in order to conduct their activities. These are not the full social costs resulting from the CVP; omitted are the costs of preventing or mitigating losses or damages to fish and wildlife and the environment. These environmental costs are legitimate costs of providing the project output, and both efficiency and equity require that they be borne by the project beneficiaries. The CVP has not been financed in this way. Indeed, only a small portion of the public and private resource costs of the project have been allocated to the CVP, and a smaller portion still billed to the beneficiaries. These subsidies have resulted in economically inefficient use of water and land in the Central Valley.²³ The CVPIA partially corrects these inequities and inefficiencies by raising water rates and imposing charges for correcting environmental damage.

No precise estimate exists for the cost of mitigating the environmental damage associated with the CVP. The cost of studying and dealing with the contamination caused by drainwater alone is proving substantial. The Federal Government has spent over \$23 million to study the problem at Kesterson and cleanup the site. The Bureau estimated that another \$3 million would be spent in 1990, and has agreed to pay \$22 million to mitigate environmental problems at Kesterson. Another \$23-25 million of Federal funds and an equal amount of State monies have been spent for a study of the overall drainage problems resulting from the San Joaquin Valley Drainage Program. Problems were identified at Federal, State, and private wildlife areas throughout the San Joaquin Valley. In addition, the FWS has identified problems at the San Luis Refuge and the Grasslands Wildlife Management Area, and suspects problems at Butte Sink, Colusa, Delevan, Sacramento and Sutter Refuges (essentially the entire length of the Central Valley). The Soil Conservation Service is searching for ways to solve the severe salinity problems created on private lands by irrigation. The State along with the irrigation water users is likely to contribute, but the Federal costs are likely to be significant.

²³Of the total \$931 million spent on farm irrigation facilities in the Central Valley Project over the last 40 years, only \$50 million (less than 5 percent) has been repaid. By one estimate, since the Project's inception it has received a \$2 billion subsidy authorized by Congress and another \$1.5 billion subsidy proffered by administrative decisions (LaVeen and King 1985). Irrigation water users pay an average of \$6.15 per acre foot; the cost to the Federal Government is \$72.99, resulting in a 91 percent subsidy.

Federal policy makers have taken several steps in an attempt to reduce the level of subsidy to CVP irrigation water users:

- o First, Congress passed the Reclamation Reform Act of 1982 recognizing and legitimizing land holdings beyond the 160 acre homestead limit.²⁴ In return for increasing the acreage limitation from 160 to 960 acres, the Act imposed higher water prices on leased lands in excess of 960 acres.²⁵ To be legally entitled to subsidized water on the 960 acres, however, users must amend their contracts, agreeing to pay the full O&M costs. Districts seeking to increase their water supply must similarly amend their contracts, and pay construction costs (excluding interest) as well as full O&M costs. Second, as noted above, the Bureau has adopted a new rate setting policy that fixes a payout date. When current contracts expire, the Bureau will set annually adjustable water rates to eliminate the problems stemming from fixed-rate contracts.
- o P.L. 99-546 (which adopted the Coordinated Operation Agreement between the Federal Government and the State for managing the water system in the Central Valley) stipulates that for new and amended contracts, rates are to be set to recover the appropriate share of existing Federal investments by 2030 and that O&M deficits (including those since October 1, 1985) are to be financed and repaid at market interest rates. These stipulations are in addition to those requiring State and Federal water projects to be managed to protect Delta water quality.
- o In 1984, the Reagan Administration issued a policy statement that allows the cost-sharing arrangements for old Bureau

²⁴The CVP was initially put forth as an operation to benefit small farmers suffering in the Great Depression. Thus, the acreage provisions of the Reclamation Act were to apply: the landowner had to live in the neighborhood of the irrigated land and no individual landowner was eligible for water on more than 160 acres. These restrictions have been thoroughly circumvented. As early as 1945, one study found that three percent of the Project beneficiaries in the southern San Joaquin controlled 41 percent of the cropland and 52 percent of all land (Worster 1985). A policy of "technical compliance" to evade the acreage limitation developed, allowing corporate farmers to deed land to relatives and employees, and then lease it back to qualify for subsidized water.

²⁵Although current law contains this requirement, it is vague concerning the definition of a "farm," and therefore, the intent of Congress is often circumvented.

projects to remain, but requires that all proposed projects receive commitments for "up front" financing from non-Federal interests. No specific rate was set, and cost sharing is negotiated on a project by project basis.

- o Finally, in 1992, Congress enacted the CVPIA which reforms water pricing (raising rates and shortening the length of contracts) and imposes user charges to fund environmental restoration.

Thus, Congress and the Bureau have taken steps to reduce the subsidies to irrigation in the Central Valley. Irrigators will pay for O&M expenses, including any O&M deficits back to 1985 and interest on these deficits, and all user will pay for environmental restoration and protection. The basic interest subsidies remain, however.

Two major Bureau projects in the planning stage would exacerbate losses of Central Valley wetlands:

- o The first, the Auburn-Folsom South Unit, was authorized in 1965 to provide increased water supply, power, and flood protection to the Sacramento area. Construction was halted after the Oroville earthquake in 1975. About 27 miles of the Folsom South Canal has been constructed. In December, 1980, the Secretary of the Interior determined that a redesigned dam could meet safety requirements, but that non-Federal cost sharing and Congressional reauthorization would be necessary for the project to move forward.

In July, 1987, the Bureau completed analysis of 5 alternative sizes for an Auburn Dam to assist local non-Federal cost-sharing entities. The present estimated cost of the project is \$1.4 billion of which \$0.3 billion has already been spent. The project designed by the Bureau is estimated to provide as much as 300,000 acre-feet of additional water for the Central Valley project, supplemental flood control for urban areas downstream of the dam, and an estimated 600 GWh of electrical power at a cost roughly comparable to developing new power sources (Bureau of Reclamation 1987). In 1988 and 1989 several water entities put forth proposals to cost share in the project (or a smaller, multipurpose Auburn Dam). However, as of November, 1992, none of these proposals had been found adequate. The Department is currently studying the matter.

Critics of the Bureau's design contend that for such a large project it would supply a relatively small amount of water, provide little flood control, and be an expensive source of power. The reservoir would inundate about 10,000 acres of the American River Canyon, and potentially reduce stream

flows in the lower American River. About 1,000 acres of wetlands in and downstream of the reservoir would be lost to direct and secondary impacts. The FWS argues that the project would have significant adverse impacts on fish and wildlife behind the dam, in the service area, on the lower American River, and in the Sacramento-San Joaquin Delta.

In the absence of any cost-sharing agreement for a multipurpose project and in light of Sacramento's desire for increased flood control on American River, the Army Corps of Engineers has developed designs for a flood control only project or for a "stageable" dam (one that would initially provide flood control, but that could be expanded to include additional purposes at some later date).

- o The second major project consists of a distribution and wastewater drainage system for the San Luis Unit. The San Luis Unit of the CVP provides supplemental irrigation water to 583,000 acres, 26,000 acre-feet for municipal and industrial use, and some flood control and recreational benefits. Construction of the drain to the Sacramento-San Joaquin Delta was halted due to cost and environmental and political concerns. Without drainage facilities San Luis Unit agricultural lands become unproductive. The "interim" impounding and evaporation of the agricultural drainage water at the Kesterson Reservoir led to selenium accumulation and the poisoning of wildlife. Kesterson was subsequently closed as a site for receiving agricultural drainage water. Federal and State agencies are still trying to find ways to manage the drainwater and deal with drainwater contamination problems from San Luis Unit agricultural lands. Under the CVPIA the Secretary can use restoration funds to retire agricultural lands which are producing contaminated drainwater. This is one of the options the Department has under consideration.

Army Corps of Engineers: The Corps first became involved in the Central Valley in the middle to late 1800s to protect and promote navigation and to guard against flooding. It was instrumental in planning and constructing the debris dams in the Yuba River watershed, and it designed and built the Sacramento Flood Control Project (SFCP), the system of levees and ancillary facilities that effectively protected the valley floor from flooding and resulted in the loss of much of the remaining wetlands in the Sacramento Valley. (See the section earlier in this chapter discussing the history of the transformation of the Central

Valley.) The cost of the debris facilities were shared equally with the State, but the SFCP was more heavily subsidized.²⁶

Today the Corps operates 26 dams (12 of these in partnership) for flood control on the Sacramento and San Joaquin Rivers and their tributaries. Dredging, excessive clearing, snag removal, and various levee projects continue. For example, the Corps is to deepen the Sacramento Deep Water Ship Channel (\$107 million) and the Stockton Ship Channel (\$36 million), and continues to work on the Sacramento River Bank Protection Project. These activities often destroy near-shore aquatic habitats, riparian vegetation, and benthic organisms. Life up the food chain is affected. Depositing of fill material often smothers wetlands. A number of related flood control projects are either being planned or are under construction which would involve wetlands losses by reducing the chances for flooding in overflow basins and allowing riparian areas to be converted to other uses. Cumulatively, these projects affect virtually all of the riverine and floodplain lands and associated wetland habitats in the Central Valley.

As mentioned above under the section on the Bureau of Reclamation, the Corps is also considering a flood control alternative for Sacramento, a modified Auburn Dam to be constructed at the site of the original Bureau of Reclamation project, but with flood control as the principal purpose.

AGRICULTURAL PROGRAMS: In the Central Valley, about 1.15 million acres receiving federally subsidized water are planted in surplus crops like rice and cotton.²⁷ In return for complying with supply controls,²⁸ growers of surplus crops can receive income supports (including deficiency payments, disaster payments, and subsidized crop insurance) and price supports (including non-

²⁶Historically, there were no cash cost-sharing contributions by non-Federal sponsors of flood control and navigation projects constructed by the Corps. The cost sharing that occurred was almost exclusively in the form of contributions of lands, easements, and rights-of-way. See Volume I, chapter 2.

²⁷California's agricultural production is distributed as follows: Field crops, 20 percent (cotton, hay, corn, sugar beets, wheat); fruit and nuts, 20 percent (grapes, oranges, almonds and strawberries); vegetables, 20 percent (tomatoes, lettuce, potatoes); dairy and beef products, 30 percent; greenhouse plants, 10 percent. Together these crops amount to only 2.8 percent of the gross State income.

²⁸Such as acreage set-asides, marketing quotas, croplands diversion, payments-in-kind, and farmer-owned grain reserves.

recourse loans and Government purchases).²⁹ Federal export programs, including subsidized export sales and export production incentives, are also important for rice and cotton.³⁰ In 1984, direct Federal subsidy payments to growers in 19 Central Valley counties totalled \$253.5 million.³¹ Total net income for Valley growers was only \$66.5 million, however. With Federal agricultural subsidy payments to these growers almost four times greater than their net farm income, the Government was not only covering these growers' net incomes, but making a significant contribution towards operating and maintenance expenses, as well.

Normally, in an area where participation rates in agricultural programs are high, one would expect Swampbuster to significantly reduce the attractiveness of converting wetlands to agriculture. This is not so in the Central Valley. Swampbuster is likely to be almost completely ineffective in the Central Valley, because Sec. 1222(a) of the Food Security Act of 1985 provides an exemption for "artificial wetlands." The implementing regulations define artificial wetland to include wetland which was converted prior to passage of the Act, "but now meets wetland criteria due to the actions of man." (7 CFR Part 12.31[c].) Most of the remaining wetlands in the Central Valley fall into this category because: the Valley was once largely wetland associated with riverine overflow areas; over the years, with the intensive damming and flood control programs, most of these wetlands were converted to cropland; now, where managed water is available, some land has been reconverted to wetland. In most areas other than the Central Valley, the proportion of artificial wetlands is small, and the statutory exemption for artificial

²⁹Crop insurance and disaster payments do not appear to be significant factors in the Central Valley due to the relatively controlled agricultural irrigation environment.

³⁰A sizeable amount of acreage in California is devoted to producing crops for export. Without subsidies, few California growers could compete internationally. In 1986, for example, the world price for cotton was about 31 cents per pound, while it cost 60 to 65 cents per pound to produce in California. These costs for growing cotton in California are the private costs of the grower only, and do not reflect irrigation or other cost subsidies. Deficiency payments are supposed to be limited to \$50,000 per farm, but this limit is waived if the commodity is exported.

³¹Portions of these counties lie outside of the Central Valley.

wetlands is of no real consequence. In the Central Valley, the exemption renders Swampbuster completely ineffectual.³²

This does not mean, however, that all the wetlands in the Central Valley are unprotected and vulnerable to conversion. It simply means that they are not protected by Swampbuster. In many instances, Central Valley wetlands are subject to the Corps' permitting program under section 404 of the Clean Water Act. Furthermore, legislative reforms in the 1985 and 1990 Farm Bills made it much more difficult for new acreage to qualify for price and income supports, and hence, significantly diminished the incentives in Federal agricultural law to convert wetlands to cropland. (See chapter 3.)

Historically, the economic incentives embodied in agricultural statutes magnified the gains to be derived from converting wetlands to croplands and led to increased degradation of wetlands by chemical and sediment loadings from agricultural runoff. The legislative reforms in 1985 and 1990 significantly diminished the statutory incentives encouraging conversion. These reforms do not mean the end of market incentives to convert wetlands to agriculture. They simply mean that the Federal Government is no longer exacerbating these incentives through two of the most important agricultural programs: the commodity loan program and the deficiency payment program.

High-value crops such as fruits, nuts, and vegetables are not protected by direct Federal support programs, but they are aided through the use of marketing orders, Government-sanctioned and enforced agreements between producers and handlers to control the quantity or quality of crops. The orders sometimes establish a marketing arrangement bordering on monopoly, although entry into the marketing association is usually fairly easy. Marketing orders provide consumers with quality assurance, but at the expense of reduced price competition. Federal officials sit on the boards of directors for the cooperatives, and the system is structured so that it is virtually impossible for sellers to market their products outside of the cooperative system.

Through market orders the Federal Government supports about 50 percent of all fruit and nut crops and about 15 percent of all vegetables. These crops have higher than average revenue returns because of the greater risk associated with their production. From 1950 to 1982, California fruit, nut, and vegetable crops

³²Refuges and other wetlands which were created as mitigation for project effects are not considered artificial under the Swampbuster regulations. Such mitigation lands are a small proportion of the wetlands in the Central Valley, because very little of the CVP's effects have been mitigated.

rose from 23 to 29 percent of the State's total agricultural production. Ricelands with some value to waterfowl, for example, are being converted to almonds with no such habitat values. Marketing orders increase the rate of return and reduce the risk associated with growing fruits, nuts, and vegetables, and could contribute to a grower's decision to convert wetlands to specialty crops.

Historically, the great variety of agricultural subsidies offered significant incentives to convert wetlands. Among agricultural programs, the income and price support programs probably had the greatest impact, but with the legislative reforms of 1985 and 1990 the influence of these programs was virtually eliminated. The distorting effects from a number of other agricultural programs (e.g., crop insurance, low interest loans, marketing orders) remain. In the absence of water subsidies there would have been far less agricultural development in the Valley. The combination of agricultural and water subsidies has been the single most important factor leading to wetland decline, groundwater depletion, and degradation of the water quality in the Central Valley.

STATUS AND PROSPECTS

Until recently, loss and degradation posed a largely unabated and severe threat to the wetlands remaining in the Central Valley (nine percent of the original complement). There was no provision for a reliable supply of water to sustain these wetlands; water for publicly-owned wetlands was supplied almost exclusively through annual agreements. Agricultural demand for water remained strong, while the rapidly growing State population continued to seek a greater share of the water. This situation changed dramatically with passage of the Central Valley Project Improvement Act of 1992.

With passage of the CVPIA, Congress took an important step toward restoring the environment in the Central Valley and effecting a more efficient use of project water. The CVPIA institutes a number of water pricing reforms, establishing an increasing block rate structure and imposing user fees to pay for protection and restoration of the environment. The Act provides reliable, clean water supplies to publicly-owned wetlands and refuges, with water deliveries growing over time to meet specified wetland restoration and enhancement goals. The Act also addresses the issue of drainwater contamination by requiring that amended or renewed CVP contracts contain provisions requiring contractors to comply with State and Federal water quality standards for agricultural drainwater. The CVPIA will not solve all the wetland problems in the Central Valley. The Act primarily

addresses the water needs of publicly-owned wetlands, which account for less than one-fourth of the Valley's wetlands.

Despite the CVPIA and a number of other administrative and statutory reforms in the pricing of CVP water in the past few years, the basic interest subsidies to water users remain intact. Unless potential users are confronted with the full cost of providing them with water, the demand for new water projects will continue to be artificially high. Without the proper incentives, subsidized water will continue to be used to grow surplus, heavily subsidized crops. Water is currently going to less productive cropland, requiring greater fertilization and application of water to support surplus crops. This allocation will produce more land-use and water-quality problems, and result in significant economic inefficiencies.

Swampbuster is likely to be ineffective in discouraging wetland conversion in the Central Valley, because the statute exempts "artificial wetlands" from any sanctions. The majority of the remaining Central Valley wetlands rely on modified water regimes, and thus are classified as artificial. Consequently, conversions can occur with no loss of farm program eligibility. However, the incentives to convert wetlands to agriculture inherent in Federal price and income support programs were virtually eliminated by the legislative reforms in the 1985 and 1990 Farm Bills. These reforms made it much more difficult for new acreage to qualify for price and income supports. The reforms did not, however, eliminate all market incentives to convert wetlands or all agricultural subsidies inducing conversion.

Privately-owned wetlands, some held by duck clubs, are increasingly expensive to own and maintain. Simultaneously, declines in migratory birds prompting restricted bag limits and season lengths have reduced duck club memberships and revenues. Like the public refuges, these private wetlands have depended heavily on drainwater as a water supply, and contamination is reducing the supplies from that source. Although the CVPIA only provides for water for publicly-held wetlands, the Act does direct the Secretary to investigate alternative means of improving the quality, quantity, and reliability of water for privately-owned wetlands in the Central Valley.

RECOMMENDATIONS

1. Water Management:

- a. On future construction, eliminate the interest subsidy for irrigation in Reclamation law, as well as the use of hydropower revenues to repay a portion of irrigation capital costs.

The subsidies were designed to encourage settlement of the arid west by small family farmers. Today the goal of populating the west with small family farms is obsolete. The law should be amended to reflect changed social, economic, and environmental conditions. The CVPIA makes major strides in this direction, but the basic interest subsidies and cross-subsidization of irrigators by other project users remain.

The Department recognizes that major institutional changes can be very disruptive and that transitions are important in order to minimize this disruption. People make major investments based on the market distortions introduced by subsidies. Eliminating subsidies on existing projects is disruptive, and equity requires that beneficiaries be given an opportunity to adjust to the correction of these distortions. However, not eliminating subsidies on new construction imposes an unfair burden on the rest of society. Agriculture is a business, and should be competitive with other activities. If agriculture cannot pay for the full cost of the resources which it uses, including water resources, it is inefficient to allocate the resources to it by subsidization and inequitable to ask taxpayers and users of hydropower to finance the costs.³³

b. Consider charging persons who alter Central Valley wetlands the full cost for water from the CVP.

Wetlands in the Central Valley have been reduced to approximately nine percent of the original complement, and many of the remaining wetlands are severely degraded. The remaining wetlands in this region serve critical functions; their continued loss and degradation will produce major ecological changes. Amending water contracts to charge full cost to persons altering wetlands is not an action to be taken lightly. However, Congress has already taken an analogous step with the Swampbuster provision of the Food Security Act of 1985. Given the dimensions of the problem in the Central Valley, a similar provision for water subsidies may be warranted.

³³The Congressional Budget Office estimated that nationwide implementing two modest reforms would save \$85 million between 1990 and 1994: (1) enforcing statutory requirements that farms of more than 960 acres be charged the full cost for Federal irrigation water and (2) charging full costs to those using Federal water to grow surplus crops (CBO 1989).

2. Agricultural Subsidies:

- a. Amend Section 1222(a) of the Food Security Act to ensure that Central Valley wetlands are not exempted from Swampbuster sanctions by virtue of being classified as "artificial wetlands."**

Swampbuster is likely to be ineffective in discouraging wetland conversion in the Central Valley because the statute exempts "artificial wetlands" from any sanctions. The majority of the remaining Central Valley wetlands rely on modified water regimes, and as such will be classified as artificial. Thus, conversions can occur with no loss of eligibility for farm program subsidies. Although the legislative reforms in the 1985 and 1990 Farm Bills made it much more difficult for new acreage to qualify for price and income supports, the reforms did not eliminate all agricultural subsidies to convert wetlands to agriculture. Given the extent to which the Central Valley's wetland ecosystem has been depleted and degraded, consideration should be given to making the Swampbuster sanctions available to help protect the artificial wetlands.

- b. Include ineligibility to participate in marketing orders on the list of Swampbuster sanctions.**

Much of California's produce such as fruits, nuts, and vegetables are not protected by direct Federal support programs, but through the use of marketing orders. This system provides consumers with quality assurance, but at the expense of reduced price competition. Eligibility to participate in the system should be contingent on good wetland conservation and environmental practices.

REFERENCES

- Creighton, J. 1986. If There Were a New Bureau of Reclamation, What Role Would Social and Institutional Factors Play? Address to the Federal Interagency Symposium on Social Analysis and Natural Resource Agencies, Salt Lake City, Utah, August 27.
- Framer, W. E., D. D. Peters, and H. R. Pywell. 1989. Wetlands of the California Central Valley: Status and Trends - 1939 to mid-1980s. U.S. Fish and Wildlife Service, Region 1, Portland, Oregon, 28 pp.
- Hartmann, R. and D. Pierce with assistance by F. Smith. 1987. The Impact of Federal Programs on Wetlands of the California Central Valley. Background Report. U.S. Department of the Interior, Office of Policy Analysis, Washington, DC, 38 pp.
- LaVeen, E. P. and L. King. 1985. Turning Off the Tap on Federal Water Subsidies: the Central Valley Projects. Natural Resources Defense Council and California Rural Legal Assistance, San Francisco, CA.
- Steinhart, P. 1987. Empty the Skies. Audubon, November, pp. 70-95.
- U.S. Congressional Budget Office. 1989. Reducing the Federal Deficit: Spending and Revenue Options, A Report to the Senate and House Committees on the Budget--Part II, as required by P.L. 93-344, 1989 Annual Rept., Government Printing Office, Washington, DC, February.
- U.S. Department of the Interior, Bureau of Reclamation. 1987. Auburn Dam Report, Auburn Dam Alternative Study, Sacramento, California.
- U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region. 1989a. Report on Refuge Water Supply Investigation: Central Valley Hydrologic Basin, California. Sacramento, California, March.
- U.S. Department of the Interior, Fish and Wildlife Service. 1989b. Wetlands of the California Central Valley: Status and Trends - 1939 to Mid-1980's. Portland, Oregon, June.
- Wahl, R. W. 1989. Markets for Federal Water: Subsidies, Property Rights, and the Bureau of Reclamation. Resources for the Future, Washington, DC, 326 pp.

Worster, D. 1985. Rivers of Empire: Water, Aridity, and the Growth of the American West. Pantheon Books, New York, 402 pp.

Chapter 12: WESTERN RIPARIAN WETLANDS

INTRODUCTION

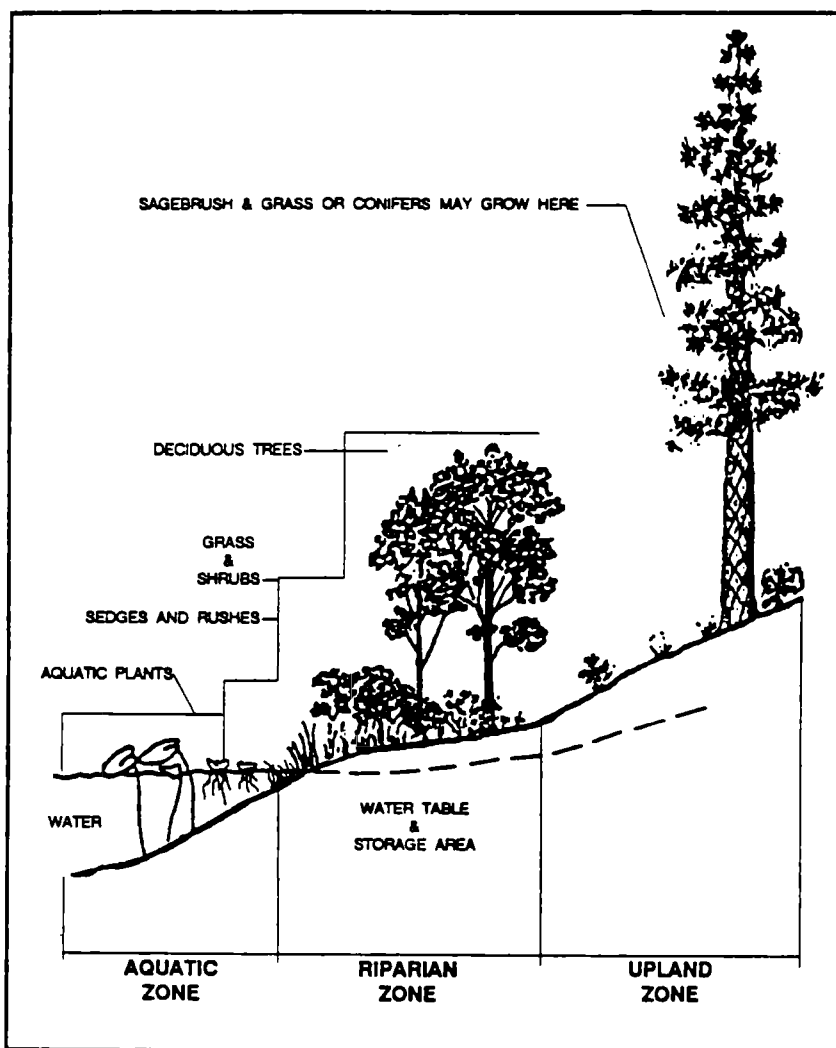
PHYSICAL DESCRIPTION: Western, riparian areas are linear, ribbon-like strips of vegetation along rivers, streams, or lakes that are dependent upon perennial, intermittent, or ephemeral surface or subsurface water. Habitats in these areas are often divided into two zones: riparian (which includes the often narrow, aquatic portion of the stream or river) and upland. In the southwestern United States, the non-aquatic portion of the riparian zone may consist of emergent marsh directly adjacent to the stream or river, low terrace forest (cottonwood and willow), and upper terrace forest or scrub shrub. Riparian wetlands function as the transition zone between the drier uplands and the water. (See Figure XII-1.) Two types of riparian areas are commonly distinguished:

- o relatively narrow headwater wetlands in steep valleys with fast-flowing rivers, and
- o broader floodplain wetlands in broad valleys with meandering rivers.

This chapter focuses on the riparian areas of the Great Basin, the Southwest, the southcentral prairie, and the intermontane west which are vegetated by trees, shrubs, grasses, forbs, and sedges. (See Figure XII-2.) Here upland areas are more arid and water sources more intermittent than those in the eastern United States or the coastal western areas. Although the areal extent is proportionately less than in other parts of the country, western riparian areas and other wetlands have a proportionately greater significance for some functional values (such as fish and wildlife habitat, flood control, aquifer recharge, and water quality functions), because of the arid climates in which they occur.

The Corps of Engineers, EPA, and the Fish and Wildlife Service are discussing whether some riparian areas in the West should be considered wetlands for section 404 jurisdictional purposes. In this region riparian areas vegetated with wetland plants (hydrophytes) often are not identified as wetlands under the current wetland identification procedures, because they do not satisfy the established criteria for hydric soils and wetland hydrology. Nevertheless, western riparian habitats clearly serve the objective of the Clean Water Act to restore and maintain the integrity of the Nation's waters by providing for groundwater recharge and discharge, flood storage, sediment retention, and fish and wildlife habitat. Thus, while these riparian areas

Figure XII-1: SCHEMATIC OF A RIPARIAN AREA



Source: Oregon Watershed Improvement Coalition.

Figure XII-2: SELECTED WESTERN RIPARIAN WETLANDS



perform the functions of wetlands, there is some disagreement as to whether they qualify as wetlands for 404 regulatory purposes.

CHARACTERISTICS AND FUNCTIONS: Western riparian areas including the wetlands comprising them provide several important functions, including:

- o Slowing flood waters and helping to recharge groundwater;
- o Aiding in erosion control through shoreline protection, dissipating the energy force of currents and trapping sediments
- o Improving water quality by filtering pollutants from upland sources and by regulating water temperature through vegetation shading; (Both functions protect trout and salmon fisheries.)
- o Providing crucial habitat for 50 to 75 percent of vertebrate species found in the western intermontane region, including many designated as endangered or threatened; (This is especially important for neotropical migratory birds where riparian areas are scattered amidst great expanses of arid land.)
- o Serving as important recreational areas.

ORIGINAL ACREAGE: Unknown for western riparian areas or riparian wetlands.

CURRENT ACREAGE: Unknown for western riparian areas or wetlands as a whole, because data are fragmented, localized, or nonexistent. Of the 250 million acres of federally owned rangeland, only one percent is classified as riparian areas. Neither the Bureau of Land Management (BLM) nor the Forest Service (USFS), the agencies responsible for administering public rangelands, have complete inventories of the amount and condition of riparian habitat on their lands yet (GAO 1988).

TRENDS: Nationwide riparian wetlands have declined by 60 to 75 percent, whereas in the West estimates are that some riparian areas (e.g., Rocky Mountain Region and Arizona) have declined by as much as 90 to 95 percent (Swift 1984; Johnson and Carothers 1982). Surveys that have been conducted of the quality of selected riparian areas within public rangelands seem to indicate that the overwhelming majority are in poor to fair condition. Tens of thousands of stream miles are in need of restoration (GAO 1988).

FACTORS ADVERSELY AFFECTING WETLANDS

Due to the intensity of land use and the wide expanse of territory subject to grazing, livestock grazing has been an important factor in the loss and deterioration of riparian wetlands in the West. Water projects (multipurpose reservoirs, small hydroelectric projects, and small diversions for irrigation) also contribute to wetland loss in the region. "Vegetation management" is a third factor discussed. Additionally, timber harvesting and associated road building as well as mining and sand and gravel extraction affect wetland acreage and water quality in the region.¹

Livestock were introduced into the West in the 1500s when the Spanish established missions. Livestock numbers increased dramatically in the late 1800s, peaking in 1886. Since 1941, the BLM has reduced livestock grazing on public rangelands by 50 percent. In 1983, western lands supported 17 million cattle. Today, federally permitted livestock grazing occurs on 36 percent of the land in the 11 western States.²

Livestock often favor riparian areas because of the availability and abundance of shade, lush vegetation, and water.³ Overgrazing can inflict severe and long lasting damage. Under heavy grazing pressure much of the riparian vegetation is removed and regeneration impaired. Loss of stabilizing riparian vegetation increases erosion, widens channels, reduces channel depth, and causes siltation of spawning grounds and invertebrate food producing areas. In addition, without vegetative cover the shorelines along waterways no longer provide food and cover for fish and wildlife, shade to help regulate water temperature, or the capacity to filter runoff pollution or dissipate flood waters. In disturbed areas, invasive and nuisance plant species often take root.

Federal multipurpose water projects in the West support irrigation, flood control, hydroelectric power, navigation, and recreation. These projects are sponsored, constructed, and/or managed by the Bureau of Reclamation, the Army Corps of

¹Although Federal programs support these activities, the Department did not have enough resources to investigate the impact of timber harvesting and mining on wetlands in the West.

²Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

³In northern California mountain meadows, riparian vegetation, which comprises only 5 to 10 percent of the meadowlands, provides about 90 percent of the usable livestock forage.

Engineers, the International Boundary and Water Commission, and the Soil Conservation Service (SCS). They often inundate riparian areas to form reservoirs. Riparian vegetation does not readily establish itself along reservoir shorelines because of water level fluctuations associated with project operations or poor soils surrounding the reservoirs. Reservoirs also trap instream sediments that would otherwise nourish downstream riparian areas. Dredging of sediment to deepen or straighten channels for flood protection, navigation or water management disturbs bottom-dwelling organisms, changes the channel and flow conditions, and produces spoil that has often been deposited in riparian areas. The construction, operation, and maintenance of multipurpose water projects introduces physical barriers in streams and alters the timing and level of water flows. As a result, these activities change water velocity, depth, and temperature, and affect the biota sensitive to these conditions, including anadromous fish. Water withdrawal for irrigation, highly saline irrigation return flows, and groundwater pumping (particularly in California and the High Plains of western Oklahoma) also are factors contributing to a change in the quality, extent, and composition of riparian vegetation. Indirectly, multipurpose water projects have led to agricultural encroachment, urban development, and navigational and recreational facilities in areas which historically were riparian wetlands.⁴

Small hydroelectric projects threaten riparian areas in mountainous States and other areas. Around 1980 the number of license applications increased. The number of applications are

⁴On the Humboldt River in northwest Nevada, 75 percent of riparian wetlands have been lost as a direct result of multipurpose water projects. On the Snake River in Idaho, 50 percent (508 miles and over 50,000 acres) of the riparian communities have been inundated due to such projects. The changes are similar along other western rivers. The Columbia and Rio Grande have been developed to a greater extent than the Snake, while others such as the Payette, Boise, and Missouri (in Montana) are also heavily developed.

Over 500,000 acres of riparian wetlands were inundated by Corps and Bureau reservoir projects in eastern Oklahoma between 1940 and 1982. Additional, unquantified wetland losses also occurred from over 140 miles of Corps and SCS stream channelization projects. Construction of some multipurpose dams in western Oklahoma has had a profound effect on downstream wetlands through reduced instream flows. For example, average annual flows were reduced 83 percent by construction of the Sanford Dam on the Canadian River in the Texas panhandle portion of Oklahoma.

decreasing again due to energy economics and the reduction and elimination of Federal benefits. In Idaho, for example, prior to 1981 the Fish and Wildlife Service (FWS) had never reviewed any such projects, but from 1981 to 1986, 350 license applications were on file. The sudden increase followed the energy crisis of the 1970s and Federal legislation that encouraged the development of alternative energy sources.

Small hydroelectric projects divert water from a stream for short distances,⁵ and reduce instream flow in the diverted reach. The dams can interfere with the migration of fish, including important anadromous species. In addition, significant mortality occurs as fish, especially fry, are drawn into power plant turbines. This has become a significant concern to fish and wildlife resource agencies. Riparian vegetation is lost during construction and also as a result of the reduced water levels in the diverted reach. Even periodic flushing requirements fail to fully compensate for the loss of moisture and sediment movement. With the loss or reduced vigor of the vegetation comes the same kind of problems mentioned above with grazing and multipurpose projects, although to a lesser degree.

A full accounting of the wetland effects of small hydroelectric projects in the West is unavailable. However, a review of 17 projects in Idaho by the FWS found that seven had removed over 50 percent of surrounding riparian vegetation during construction, two had a somewhat lesser effect, and eight had a minimal effect. Three projects in Idaho resulted in major violations of section 404 of the Clean Water Act, because large quantities of fill material were dumped into riparian wetlands and aquatic environs to construct road access.

Many small diversion or dam structures adversely affect downstream wetlands by diverting the entire flow of streams for irrigation during the growing season. Moisture needed to maintain riparian wetland vegetation is removed from the stream during the critical spring and summer months. In Nevada, small diversions are thought to cause as much riparian wetland loss as large multipurpose projects.

"Vegetation management" in connection with water projects refers to the mowing, burning, clearing, or spraying of plants in riparian and upland areas.⁶ Historically, the practice was much

⁵On average about a mile and a half, although the distance varies.

⁶The BLM uses the term "vegetation management" to mean something different. BLM uses it to refer to efforts to achieve or maintain a plant community that most nearly meets the multiple
(continued...)

more prevalent than it is now.⁷ Nevertheless, it ranks only behind grazing and water projects as a factor in western riparian wetland decline, especially in the Great Basin and the southwest. Riparian and other wetland vegetation in this region is managed for four major objectives:

- o To maintain the water-transport capacity of floodways.
- o To expand agricultural land. Critics of the practice suggest that the small gain in cropland is not worth the in-stream problems caused by sedimentation.
- o To help maintain a constant border between the United States and Mexico. Detractors of the policy suggest that the investment of energy in trying to hold a river steady as a means of marking a political border is futile, because it works against the natural forces that cause rivers to meander.⁸
- o To increase downstream water yields for irrigation or municipal use. Vegetation management often accompanied the construction and operation of major multipurpose water projects. The view that removing the adjacent vegetation can increase streamflow by reducing water uptake is no longer widely accepted, and is not currently being practiced by Federal agencies.⁹

⁶(...continued)
use objectives identified in land use plans. Burning, plowing, chaining, and spraying are termed "land treatment" by the BLM, and BLM sometimes uses these practices to improve riparian areas.

⁷See the discussion of vegetation management in the next section or in chapter IV.

⁸Trees and shrubs armor river banks and reduce erosion, while unvegetated banks erode and begin to meander. The International Boundary and Water Commission is committed to eradicating vegetation along the border with Mexico in hopes of preventing any alteration in course. Rivers, however, naturally shift courses over time and are not likely to be held fast even with major human intervention.

⁹Recent studies along the Pecos River found that water salvage either does not occur at all or is significantly less than predicted (e.g., Welder 1988). Critics have suggested that ground water pumping in the area may have confounded the results, however, and made it impossible to determine whether water conservation occurs (Weeks 1987).

Although the practice is now largely curbed and some areas are regenerating, the damage to wetlands has been extensive. In New Mexico alone over 3000 miles of streamside vegetation was lost by 1985. Lands next to the streams can suffer severe erosion during wet periods, and vegetation removal prevents riparian wetlands from carrying out valuable hydrologic, water quality, food chain, habitat, and recreational functions.

An additional problem, due in part to vegetation management, has been the displacement of native riparian wetland plants, such as cottonwood and willow, with exotic saltcedar vegetation. Saltcedar was first introduced into the U.S. from Eurasia during the late eighteenth century as an ornamental plant. By the early 1900s, it had escaped from cultivation and become naturalized in several stream valleys in the southwestern U.S. Since then saltcedar has spread rapidly, probably due to reservoir construction and the alteration of natural river flows and due to the establishment of suitable seed beds. Also, some State agencies used this plant for stream bank stabilization purposes. Saltcedar, however, introduces a host of new problems. It has little habitat value because of its tendencies to form monocultures, to produce tiny seeds of little food value, and to dry up water holes.¹⁰

The net effect of saltcedar invasion is the reduction in biological diversity of riparian ecosystems. Indeed, a number of Federal agencies are now engaged in concerted but often frustrating efforts to control saltcedar. As mitigation for structural activities undertaken in operating its water projects, the Bureau of Reclamation removes saltcedar and attempts to reestablish native riparian vegetation of higher value to wildlife. SCS and the FWS have instituted similar programs.¹¹ These programs are still in their nascent stage and it is too early to determine their success, but there is guarded optimism that native riparian species can be reintroduced and replace saltcedar in less saline areas.

Road construction and clear cutting for timber harvesting can also adversely affect riparian wetlands. In rugged, mountainous terrain, roads are often located along streams. Riparian wetlands are adversely affected during construction and later

¹⁰The exception to this is in the border area of the far southwest where birds tend to utilize saltcedar habitat.

¹¹The Fish and Wildlife Service has instituted a program of saltcedar removal and native riparian habitat replacement at the Bosque del Apache National Wildlife Refuge in New Mexico. Saltcedar shrubs have been removed and cottonwood trees planted on 150 acres, as the first increment of a several thousand-acre riparian habitat replacement project.

when high stream flows erode exposed soil. Federal land management agencies issue permits and set construction standards for roads on public lands. Future management plans for much of the Federal land base in the West call for the construction of thousands of miles of roads for timber harvesting. Clearcutting similarly strips the soil of the vegetation that holds it in place and leads to erosion. These activities reduce topsoil and the regenerative potential of the land and silt up streams, many of which support valuable commercial and sport fish. Mining for various minerals is also common throughout the West and, depending on the method, can have an impact on the land and lead to sedimentation and pollution of riparian waters.

As noted earlier, western riparian wetlands have not received adequate protection from Federal regulatory programs, in part because of jurisdictional limitations in the statutes and in part because Federal agencies disagreed on the definition and delineation of wetlands. In January, 1989, the FWS, EPA, the Corps, and the SCS agreed to accept a uniform method of identifying and delineating jurisdictional wetlands. The change proved controversial, however, as did proposed revisions. The controversy has not been resolved,¹² but its resolution probably will not bring regulatory relief to western riparian wetlands. To qualify as a wetland under the procedures adopted by the four agencies, three basic elements must be evident: wetland hydrology, hydrophytic vegetation, and hydric soils. Many western riparian areas which function similarly to wetlands do not meet this standard.

The Clean Water Act also limits riparian wetland protection due to the absence of a requirement for a 404 permit for removal of vegetation by individuals, even though the activity may result in erosion of streambanks and hence, indirect discharge of "fill" material into wetlands. This statutory limitation has proved a significant factor in facilitating riparian habitat destruction on private lands in rural and urban areas in some parts of the West. Such vegetation removal is often associated with conversion of wetlands for agricultural purposes and, in urban areas, for reasons such as clearing for development projects, weed control, and intentional elimination of potential habitat for rare and endangered species.

FEDERAL PROGRAMS AND PROJECTS

Federal involvement accompanies each of the activities discussed above: livestock grazing, water projects such as multipurpose dams built primarily for irrigating the arid West, agricultural programs that subsidize certain crops, small hydroelectric

¹²See Appendix VI-1.

facilities, small diversion projects, as well as vegetation management, logging, and mining.

LIVESTOCK GRAZING: In the 11 western States (excluding the western North Dakota - Texas tier), 48 percent of the land is federally owned and about 75 percent of that is grazed by domestic livestock. Thus, federally permitted grazing occurs on 36 percent of the land; this percentage is much higher, however, if coastal areas and the Central Valley, where Federal rangeland is scarce, are excluded. Of the 17 million cattle raised in the 11 western States in 1983, 16 percent received Federal grazing permits. In some States the percentage is much higher. In Idaho, for example, 88 percent of the cattle graze for at least part of the year on public lands.

Both the Forest Service (USFS) and the Bureau of Land Management (BLM) administer livestock grazing programs on the lands that they manage. Together they administer 87 percent of the Government's rangeland. Figures for Idaho, New Mexico, and Nevada, show that 80 percent of the permitted cattle graze on BLM lands and 20 percent on Forest Service lands. The following discussion focuses on BLM policy and illustrates some of the problems faced in protecting riparian areas. The Forest Service's program is quite similar, however.

The BLM regulates grazing on its lands by granting 10-year permits that specify the number of animal unit months of grazing (AUMs) allowed each season on a particular tract (called an allotment).¹³ The program has been criticized for exceeding the carrying capacity on some parts of the range, especially in riparian lands. The GAO reported in 1988 that 20 percent of BLM and Forest Service allotments were being overgrazed and that for 75 percent of these areas, the rangeland managers had scheduled no change in grazing practices (GAO 1988a). Although the GAO found that only a relative small proportion of public rangeland was currently being overgrazed, it reported that the damage to riparian areas was extensive, running into tens of thousands of miles on BLM and Forest Service lands (GAO 1988b). There are several possible reasons why overgrazing and excessive pressure on riparian areas can occur.

Grazing fees on public land are less than those for comparable private land.¹⁴ Ranching is a business, and ranchers would

¹³The Forest Service uses the same procedure.

¹⁴Ranchers argue that it is misleading to interpret the grazing fee differential between public and private land as a subsidy, because the lands are not equivalent. They cite numerous differences between public and private land that could
(continued...)

prefer to graze their animals as cheaply as possible. Thus, ranchers sometimes exert pressure on BLM and USFS field personnel to set AUMs higher or liberalize grazing constraints on their allotments. The BLM and the USFS maintain that stocking levels are determined entirely by resource conditions.

Permittees are allowed to graze cattle that do not belong to them on their allotments, provided they control the cattle directly and continue to abide by any grazing prescriptions (e.g., number of cattle and seasonal use levels). Critics of public rangeland policy have argued that the grazing fee differential encourages permittees to graze cattle owned by others and creates an incentive to engage in overgrazing. BLM responds that if overgrazing occurs, it is unrelated to the grazing fee subsidy, that it is a staffing problem. With the limited personnel available to inspect allotments, BLM cannot always ensure that abuses do not occur and that permit conditions are being observed. The critics acknowledge that BLM's enforcement resources are strained, but point out that there is a standard strategy for such situations: impose strict sanctions on a few known violators. BLM contends that it maintains a stern penalty structure,¹⁵ and given its limited resources, enforces diligently, processing approximately 500 trespassing cases per year and levying about \$150,000 in fines.

Under the current permit system, land tracts are allotted to ranchers for 10-year periods. Agency critics have contended that such long-term leasing arrangements afford BLM little management flexibility and that if overuse of a riparian area were to be

¹⁴(...continued)

legitimately lead to differential charges for grazing. The way in which the west was divided between public and private lands resulted in public lands being the less productive areas. Permittees face restrictions on predator control not encountered by private leaseholders. Public lands are more remote and less accessible, making livestock management more expensive. Environmental considerations and multiple-use management requirements constrain livestock-related decisions. Public rangeland improvement costs are shared by permittees, generally on a fifty-fifty basis. On private land, the landowner would bear these expenses, and the cost would be reflected in a higher rental fee. All these arguments have merit. Nonetheless, as designed, the grazing fee formula suffers from a downward bias and consistently results in a subsidy (USDA and DOI 1986).

¹⁵The penalty for nonwillful, unauthorized use is \$8.75 per AUM; willful trespassing, \$17.50 per AUM plus administrative costs; and repeated willful trespassing, \$26.25 per AUM plus administrative costs. BLM has the authority to suspend, modify, or cancel a permit.

discovered, very little could be done until the permit period had expired. The contention is puzzling. BLM has ample authority at any time to modify permit terms and conditions or delay or discontinue grazing in order to protect the range. In order to exercise these authorities, however, field personnel have to monitor an allotment and build an evidentiary case. BLM has insufficient staff to do a thorough job of monitoring the public range.

Even when the number of animals permitted for an allotment is reduced, pressure on riparian wetlands can continue unabated. This is because wetlands are not managed separately by BLM even though cattle use them heavily for shade, access to water, and foraging. BLM acknowledges this deficiency, and is developing grazing management systems to correct it.

Until recently, BLM did not classify riparian wetlands as distinct units for the purpose of evaluating allotments, so generally it did not conduct riparian-specific monitoring and management. Thus, the number of cows permitted for an allotment was based on upland forage, even if the allotment included riparian wetlands. Riparian areas serve as a biological magnet for livestock and other native wildlife.¹⁶ Good management requires that riparian areas be classified as distinct range sites whose rate of use is based only on the availability and condition of the riparian plants. As part of its recently adopted riparian management policy, BLM has initiated an inventory effort to classify riparian areas as distinct ecological sites and to establish riparian-area grazing prescriptions and practices, including season of use, duration of grazing, and utilization levels. BLM has established certain areas as Riparian National Conservation Areas, such as the very valuable cottonwood bosque along the upper San Pedro River in Arizona.

The GAO recently concluded that the principal technique for restoring riparian areas was a change in the management of livestock to give the native vegetation a chance to grow. This means requiring ranchers holding permits to improve livestock control. Yet, GAO noted that many of these ranchers "question the value of riparian area improvement efforts and effectively oppose any restrictions on their livestock's access to riparian areas" (GAO 1988). Further, ranchers exert considerable influence on public rangeland management decisions. Although BLM district managers make the final decisions, they receive advice from District Grazing Advisory Boards. The Boards are composed

¹⁶For example, riparian vegetation from low elevations (cottonwood/willow) to upper elevations (alder/willow) provide habitats of high value to neotropical migratory birds, including flycatchers, vireos, warblers, orioles, tanagers, and buntings.

exclusively of stockmen, and offer advice about allotment management plans and the use of range improvement funds. Each BLM district also has a Multiple Use Advisory Council whose members represent various public land interests. The Councils generally are not asked for advice about the use of range improvement funds.

GAO also noted a bias towards ranching interests and against riparian area protection at the management level:

Many staff, largely but not exclusively in BLM, believe that agency management does not support them when actions to improve management of riparian areas are opposed by permittees. The perception that top agency management is not serious about implementing riparian improvement policies is a barrier that can inhibit or discourage field staff from taking the actions essential to restoring riparian areas. (GAO 1988)

To discourage this perception and to induce action, GAO recommended that the following specific measures be taken:

- (1) The Secretaries of the Interior and Agriculture should direct the Director of BLM and the Chief, U.S. Forest Service, respectively, to review the staffing support provided to riparian improvement efforts in the context of all program activities, and determine whether appropriate staffing levels are being provided.
- (2) The Secretaries should, as part of their annual budget submissions, report on the extent of riparian improvement that can be expected with the level of staffing they recommend.
- (3) The Secretaries of the Interior and Agriculture should direct the Director of BLM and the Chief, U.S. Forest Service, respectively, to reemphasize and reiterate the agencies' commitment. As part of this effort, the Director and Chief should:
 - o establish finite, measurable goals in terms of miles of riparian areas to be targeted for restoration;
 - o annually measure and document the specific progress being made to achieve those goals; and
 - o document and justify instances where restoration steps needed to achieve established goals are seriously thwarted or rejected.

In response to the problems identified by the GAO, BLM adopted a formal riparian policy to "maintain, restore, or improve"

riparian areas and to mitigate adverse impacts to these areas. Further, BLM requested a 5-year needs analysis from its field offices. That analysis is complete, and provides a blueprint for future riparian wetland management, outlining goals, strategies, and funding requirements (BLM 1990). Each BLM State office has instituted a riparian strategy plan that includes establishing a showcase demonstration project. Fencing riparian areas, limiting grazing to winter use when cottonwoods are leafless and do not tempt cows, placing water and salt away from riparian areas, assigning a ranger to key riparian areas, and promoting a riparian wetland information brochure are all strategies that BLM is exploring. Much of this is still at the policy/guidance/planning stage, but the change in emphasis and direction is promising, and BLM has set a goal of restoring 75 percent of the riparian wetland areas under its jurisdiction to proper functioning condition by 1997.

None of these changes will come cheaply. BLM estimates that it will take \$60.8 million and 300 new positions to implement the riparian wetland management strategies. Initial funding has been requested by BLM and has been appropriated by Congress. Although much of the land in question is public grazing land, and lessees of public rangeland have stewardship requirements in their leases, the restoration and maintenance strategy relies largely on cooperative efforts and Federal funding.

MULTIPURPOSE WATER PROJECTS: The Bureau of Reclamation, the Army Corps of Engineers, the International Boundary and Water Commission, and the Soil Conservation Service all construct multipurpose water projects that alter water regimes and produce major changes in water flows that affect riparian areas and the species that depend upon them. Under the authority of the Reclamation Acts of 1902 and 1939, the Bureau constructs, operates, and maintains projects for the storage, diversion, and development of waters for the reclamation of arid and semi-arid lands in the western States. The Corps participates in those reclamation projects where flood control is identified as a project purpose. Under the authority of the Rivers and Harbors Act of 1945 the Corps constructs navigation projects whose benefits may also include flood control, power, and recreation. Under treaty authority, the International Boundary and Water Commission assumes joint responsibility with its Mexican counterpart for regulating waters that border both nations. Under the authority of the Watershed Protection and Flood Prevention Act (P.L. 566), the Soil Conservation Service constructs small projects for watershed protection, flood prevention, agricultural water management and non-agricultural water management such as recreation.

Bureau multipurpose projects provide water for about three percent of the nation's harvested cropland and about six percent of the 1982 gross crop value. These modest percentages disguise

the impact which Bureau projects have had on the West. Since its inception, the Bureau has built \$7-8 billion worth of projects,¹⁷ affecting 11 million acres and including 327 storage reservoirs, 345 diversion dams, 15,300 miles of canals and 51 hydroelectric projects.

The Federal subsidies involved for Bureau projects differ depending on purposes, scope, and size. The most significant subsidy (the irrigation subsidy) is the difference between the cost of water from the reclamation projects and the amount repaid by irrigators. The main elements of the irrigation subsidy are (1) providing interest-free, long-term loans, (2) reducing the irrigators' liability by assigning to other project features...usually power...the difference between what the irrigators owe and what the Bureau concludes they are able to pay, (3) allocation of joint project costs to non-irrigation features such as flood control which the Federal Government assumes in full, (4) moratoria on repayment of capital, and (5) forgiving portions of loans and charges altogether. In a 1981 study examining 18 irrigation districts, the Department found that the irrigation subsidy ranged from 56.9 to 96.7 percent, up from 14 percent in 1902 (Department of the Interior 1981).¹⁸

The Corps participates in Bureau projects that include flood control as a purpose. It also constructs multipurpose projects on its own for flood control and navigation, many of which have irrigation and recreational benefits associated with them. Before passage of the Water Resources Development Act of 1986 (WRDA), the Federal Government assumed the full costs of flood control. It also paid for constructing and maintaining navigational waterways for commercial use except for land, rights-of-way, dredge disposal areas, and the maintenance of port facilities which were supplied by non-Federal interests. Under the WRDA, however, cost sharing by beneficiaries was increased significantly.¹⁹ Because the WRDA applies only to Corps and not

¹⁷This is the sum of expenditures, and is not in constant dollars.

¹⁸Estimates of the magnitude of the irrigation subsidy differ, but all agree that it is substantial. The U.S. Water Resources Council estimated (1975) that the Bureau provided irrigation water at 18 cents on the dollar. Shanz et. al (1986) conclude that in 1982, Bureau of Reclamation water subsidies totaled about \$1 billion, 14 percent of the gross value of crops irrigated with Bureau water, averaging about a \$30 subsidy per acre foot.

¹⁹Non-Federal sponsors of flood control must contribute at least 25 percent of the project costs with a minimum of 5 percent (continued...)

to Bureau projects, however, an inequity arises: beneficiaries of Bureau projects have a lower cost sharing rate (higher subsidy) for the same type of project.

The International Boundary and Water Commission (IBWC) in the Department of State was created to regulate boundary waters and plan projects cooperatively with Mexico. It controls the Rio Grande from Caballo Reservoir, New Mexico to the river's mouth, assuming administrative responsibility for flood control, irrigation, salinity management and sewage disposal projects, all of which can affect the water quantity and quality in riparian areas. To enter into an agreement with the Mexican Commissioner, the U.S. Commissioner must have specific authorization in an existing treaty or an act of Congress. Although the treaty authorizes three multipurpose dams, only two have been built, each country paying for half the construction and maintenance costs.²⁰ Subsidies arise because the Federal Government recoups none of its costs from local beneficiaries for flood control and irrigation services. The principles of the Water Resources Development Act have not been applied to water projects constructed and managed by the IBWC. As with Bureau of Reclamation projects, beneficiaries of IBWC projects pay less for the same project output than if it were provided by the Corps. Additionally, the IBWC does not believe that it has the same obligations as other development agencies to consult with the FWS about the consequences of its activities to fish and wildlife or other environmental values. It does confer with the FWS on occasion, but regards the FWS's recommendations as advisory, not mandatory.

SCS small watershed protection projects have had considerable impact on riparian wetlands in portions of the West. In Oklahoma, for example, about 2000 SCS watershed lakes have been constructed since passage of the 1944 Flood Control Act. The mostly complete Washita River Watershed Project in western Oklahoma (a 7,800-square-mile watershed containing 64 subwatersheds) caused considerable riparian wetland losses from

¹⁹(...continued)

in cash. The sponsor of every future harbor project must make a cash contribution of 10 percent for projects with depths of less than 20 feet, 25 percent between 20 and 45 feet, and 50 percent for projects over 45 feet. Sponsors must pay an additional 10 percent over a 30-year period with interest. And sponsors of irrigation projects built by the Corps must pay 35 percent of the construction costs.

²⁰The two projects that have been constructed are the Falcon Reservoir and the Amistad Reservoir. Discussions about building the third dam authorized by the treaty continue, but have not proceeded to a formal planning stage.

about 1250 detention dams, 180 land stabilization structures, and 90 miles of channelization.

SCS projects are heavily subsidized, being developed largely with Federal funds and limited local financial contributions. The program has a highly uncertain future, however. On direction from the Secretary of Agriculture, the Director of the SCS issued a Watershed Planning Guidance Letter on June 18, 1987 halting new starts for PL-566 drainage projects designed to increase crop production. SCS construction activities have declined since the letter. Given the conservation provisions of the Food Security Act of 1985 as amended, persistent crop surpluses, and the President's pledge of a no-net-loss of wetlands policy, SCS should find it difficult to justify most small watershed projects in the future. Nonetheless, Section 622 of the House Appropriation Bill (H.R. 2882) states that in fiscal year 1990 the Secretary of Agriculture "shall initiate construction of not less than 20 new projects" under PL-566.

In addition to the subsidies related to the development of water, many individual agricultural producers receive price and income supports for growing certain crops, such as wheat, corn, sorghum, barley, rice, and cotton. Recent data showing the acreage of crops produced with subsidized irrigation water that are also eligible for agricultural price and income supports are not available, but in 1969 37 percent of the acreage irrigated with Bureau of Reclamation water was devoted to such crops. Subsidized irrigation water is thus used to grow crops that are eligible for a host of USDA subsidies. One way of dealing with this problem is through a counterpart to Swampbuster: make crops irrigated from a water project that affects riparian wetlands ineligible for Federal agricultural programs, e.g., price and income supports, crop insurance, and low interest loans.

HYDROELECTRIC PROJECTS: Some Government programs promote the development of small hydroelectric projects. These programs grew out of the Public Utilities Regulation Policies Act of 1978 (PURPA), a statute designed to increase national energy self-sufficiency. PURPA required energy companies to purchase energy from small hydroelectric operators at prevailing energy rates. It also offered these projects a 21 percent investment tax credit, a 5 year depreciation schedule for the cost of capital investments, and loans of up to 90 percent for feasibility studies and up to 75 percent for project costs. Requiring large energy companies to purchase power generated by small hydroelectric projects guaranteed a market, reducing the uncertainty and risk associated with the venture. It therefore increased expected net returns beyond those expected in the absence of the program, stimulating project construction and wetland loss. Other than the buy-back requirement most of these incentives have recently been eliminated, however.

The Federal Energy Regulatory Commission (FERC) licenses all non-Federal hydroelectric projects. It has been criticized for authorizing development without giving adequate consideration to comprehensive plans, non-development uses, and waterway values. Yet, Section 10(a) of the Federal Power Act (FPA) allows adoption of projects only when all beneficial uses of water (including fish and wildlife uses) have been fully considered. The FWS contends that the Commission has continued to be a proponent of hydroelectric power development despite recent court decisions requiring changes in licensing procedures that would protect other water uses. As of summer 1988, no hydroelectric project in Idaho had been denied by the Commission for environmental or other beneficial use reasons. Nationwide, few projects have been denied for environmental reasons. Although the FPA requires acceptance of the FWS's terms and conditions for exemptions from licensing (Section 30(c)) and the Secretary's terms for protecting Federal reservations (Section 4(e)) and fishway prescriptions (Section 18)²¹, the FWS estimates that these consultations represent less than one-third of their workload with FERC. The large majority of the work involves purely advisory consultations with hydropower license applicants and FERC.

Promoting hydroelectric power without fully considering other beneficial uses of the water results in an inefficient use of resources. Several Federal agencies including the Bonneville Power Administration, the Army Corps of Engineers, the Bureau of Reclamation, and the FWS spend millions of dollars each year to ensure the survival of anadromous fish stocks and to restore these stocks. Despite this Federal priority (sanctioned in the Pacific Northwest Electric Power Planning and Conservation Act of 1980 and other legislation) the Commission continues to issue licenses for harmful hydroelectric power development; the FWS contends that FERC does this without adequate mitigation. Consideration of comprehensive plans in accordance with Section 10(a) of the Federal Power Act could avert some of the current, case-by-case, resource conflicts and reconcile expensive and contradictory Federal programs. Instead of accepting all applications, the Commission could save money, effort, and riparian resources by developing comprehensive basin plans and excluding hydroelectric development in basins or portions of basins where it is not compatible with other water uses and requiring appropriate mitigation in basins or portions of basin where it is compatible. Promoting improvements such as

²¹FERC generally includes the Service's fishway prescriptions either as mandatory Section 18 prescriptions or as conditions under Section 10(j) of the FPA. FERC and the Service have had some disagreements regarding what measures fall under Section 18 and therefore are mandatory and what measures fall under Section 10(j) and therefore are discretionary.

cogeneration and conservation at existing dams and canals could also relieve pressure on riparian wetlands from small hydroelectric projects.²²

The Electric Consumers Protection Act of 1986 alleviated some of the problems associated with inequitable consideration of fish and wildlife and non-power values discussed above.

- o First, it requires the Commission not only to consider fish and wildlife values, recreation opportunities, and energy conservation equally with hydroelectric power development when new licenses are granted, but to incorporate resource agency recommendations received pursuant to the Fish and Wildlife Coordination Act into its licensing conditions. To reject the recommendations, the Commission must publish findings that (1) the recommendations are inconsistent with the purposes of the Federal Power Act and other applicable law and (2) the conditions it sets do comply with the Act and serve to "equitably protect, mitigate damages to, and enhance fish and wildlife."
- o Second, the Act requires the Commission to assess fees to cover the cost of fish and wildlife studies and reviews and to transfer the revenue to the resource agency conducting the studies and reviews.²³ The law disallows PURPA benefits at new dams and diversions unless: the project complies with specific fish and wildlife recommendations; FERC finds that the project will not have substantial, adverse effects on the environment; and the project is not located on a State or national wild and scenic river system or a river designated by a State as having important attributes which may be affected. There are few such exceptions among the proposed projects.
- o Finally, it requires the Commission to examine whether PURPA benefits should be extended to new small hydroelectric projects and establishes a moratorium on PURPA benefits during the study period.

SMALL DIVERSION PROJECTS: Small diversion projects have a considerable impact on western riparian wetlands. In Nevada they destroy as many riparian wetlands as large water projects. The BLM and USFS provide easements or special use permits for small diversion projects. The Agricultural Stabilization and Conservation Service (ASCS) contributes funds. Building and

²²Cogeneration can cause environmental problems if not designed carefully.

²³This requirement is endorsed and clarified in the Energy Policy Act of 1992.

maintaining small diversion structures that capture the flow of a stream for crop irrigation costs at least \$1500. The percentage paid by the Federal Government varies by county and depends on how much water a project is expected to "conserve." The subsidy can reach 70 percent, but in Nevada the Federal contribution averages about 50 percent per project, subject to an annual maximum of \$3500 for a landowner. The FWS contends that the Federal financial incentive has significantly influenced the number of small diversions constructed. Congress should consider eliminating this subsidy because:

- o Irrigation is a private activity, and there are no public benefits for which taxpayers in general should be billed.
- o The subsidy conflicts with other conservation goals, including protection of riparian wetlands.

VEGETATION MANAGEMENT: Vegetation removal from riparian areas has been a standard practice by the Bureau of Reclamation, the Corps, and the IBWC in conjunction with the construction and management of their facilities. For several reasons the practice is not nearly as prevalent as it was in the past. There is little new construction of water projects. What construction there is entails mitigation. And recent studies have cast doubt on the extent of the water conservation benefits associated with vegetation removal. As a result, the Bureau is not currently using vegetation management to salvage water.²⁴

Although the Bureau is not currently engage in vegetation removal for water conservation, it has not entirely abandoned the idea, either. The Bureau is still giving some consideration to its application in the lower Colorado River region, and is planning on doing more research before deciding on a management strategy.

Federal agencies continue to engage in vegetation management in order to:

- o Remove woody vegetation that is unsuitable for cattle forage and interferes with crop cultivation, and thus expand pasture or agricultural land. Through the ASCS the Federal Government subsidizes this practice on private lands,

²⁴Past damages were extensive, however. For example, in 1964, Congress gave the Bureau responsibility for maintaining a continuing program to decrease water losses along the Pecos River, from its headwaters near Las Vegas, New Mexico to Girvin, Texas (PL 88-594). The Bureau's program was devoted to clearing and controlling saltcedars on an area of about 21,000 acres. Some of this area has revegetated, but much of it is still degraded.

covering 50 percent of the cost on an annual basis and 55 percent on a multi-year basis.

- o Maintain the waterway between Mexico and the United States in a constant position so as to mark the border between the countries. Under contract to the IBWC, the Bureau destroyed at least 50,000 acres of riparian habitat within a 70 mile reach of the Rio Grande between Hatch, New Mexico and the American Dam near El Paso, Texas. The IBWC now maintains the area devoid of native vegetation.²⁵ The IBWC destroys vegetation on other portions of the Rio Grande as well to keep the boundary clear.²⁶ The FWS contends that border maintenance can be accomplished without eradicating all vegetation. It seems quite likely that there are less costly and less environmentally disruptive methods of marking the border.
- o To maintain the water-transport capacity of floodways. Federal agencies engaged in vegetation removal for maintaining floodways are not required to obtain dredge and fill permits under section 404 of the Clean Water Act. Thus, the manner in which they control the vegetation escapes regulatory scrutiny. This is particularly unfortunate, because the spoil is often dumped in riparian wetlands.

FOREST PRODUCTS AND MINING INDUSTRIES: While the subsidies to the forest products and mining industries have not received detailed attention, several types of subsidies can be identified. The timber on Federal lands is sold at below market prices. Moreover, private landowners may claim special expensing, rapid amortization, and investment credits for forestry activities. For example, expenditures for site preparation, seedlings, tools, and labor up to \$10,000 are eligible for a 10 percent tax credit and may be amortized over 7 years. While not affecting riparian wetlands directly, these subsidies make timber more lucrative and result in increased demands for logging roads which, as discussed earlier, do affect riparian wetlands.

The mining industry also receives a number of income tax advantages that increase after-tax income. Examples include the depletion allowance, expensing of exploration and development costs, and preferential treatment when mines close and land is

²⁵The Bureau is responsible for vegetation management on 600 acres. The IBWC manages the rest.

²⁶By destroying habitat, the IBWC may be affecting the endangered ocelot and jaguarundi. The Audubon Society and the Sportsman's Club of Texas recently filed suit against the IBWC for brush clearing.

reclaimed. Geologic, statistical, and survey information compiled by the U.S. Geological Survey and the Bureau of Mines is also available free of charge.

STATUS AND PROSPECTS

Western riparian areas are under intense pressure. Small in comparative area, they are disproportionately important environmentally and economically. The Federal land management and water resources development agencies have not adequately protected riparian areas because of conflicting developmental responsibilities, e.g., grazing, agricultural irrigation, electric power development, and resource extraction. These activities play a major role in wetland loss and degradation.

The activity and program with the greatest impact is livestock grazing. Grazing occurs on 36 percent of the land area in 11 western States. Overgrazing in allotments that include riparian areas severely degrades riparian ecosystems. According to the GAO, riparian decline results from a program with disproportionate concern for livestock production relative to conservation and environmental impacts. Program features that evoke this concern include:

- o A grazing fee which may create an incentive for abuse, making the already difficult task of enforcing grazing restrictions more onerous;
- o Allotment evaluations that fail to consider the impact on riparian vegetation when determining allowable use; and
- o Statutory restrictions limiting representation on the District Advisory Boards exclusively to stockmen, so that recommendations on grazing allotments and range improvements give scant attention to safeguarding wetlands.

BLM has made strides in developing a wetlands protection policy. As part of its recently adopted riparian management policy, BLM has initiated an inventory effort to classify riparian areas as distinct ecological sites and to determine the current ecological status and condition of these areas. BLM will use the information gathered to establish riparian-area grazing prescriptions and practices, including season of use, duration of grazing, and utilization levels. If this new policy is vigorously endorsed by top management and Congress, there should be marked improvement in the rate of restoration of riparian areas.

Water development projects sponsored by the Federal Government have also had an impact on riparian wetlands in the West. Adjudicating water claims will be one of the great challenges in

the future of the West. Competition among alternative uses is intense, and Indian claims to water must be addressed. Ensuring that riparian areas receive adequate water supplies will present major policy dilemmas. Calls for additional multipurpose water projects are expected to increase with population growth, and the Federal Government is exploring sites for new storage reservoirs. Although the Water Resources Development Act of 1986 represents a groundbreaking effort to pass a greater share of the costs of projects constructed by the Corps on to the beneficiaries, the Bureau of Reclamation and the IBWC have no firm cost-sharing policy that would serve to limit economically inefficient multipurpose projects. The Bureau and IBWC negotiate cost sharing rates on a project by project basis, but historically projects have been heavily subsidized, especially irrigation projects.

While small-scale hydroelectric development depends largely on the prices of oil, the problems of the nuclear power industry have also prompted investigations into potential sites for hydro projects by private and State organizations. Currently, we have the specter of some Federal agencies spending large sums to protect fisheries, while private sector entities seek to divert water for hydroelectric power production. This is wasteful. By developing basin-wide plans, the Federal Energy Regulatory Commission could reduce the costs of both conservation and hydro development.

The Electric Consumers Protection Act (ECPA) attempts to make sure that fish and wildlife values are not ignored in favor of hydroelectric development. The ECPA sets a precedent by requiring that the recommendations of resource management agencies must be included as licensing conditions unless it is inconsistent with the purposes of the Federal Power Act or certain exceptions apply. Thus, the FWS's recommendations are often still advisory under ECPA, and riparian areas may still suffer adverse impacts should FERC decide that a conservation recommendation is inconsistent with the purposes of the Federal Power Act or if the project qualifies for one of the many exceptions. Generally, if the water is needed for hydropower generation and use of that water to protect wetlands would financially preclude development of a site, the Commission favors development and wetlands are lost.

Small diversion projects for irrigation receive substantial Federal funding. These projects have a significant impact on western wetlands. Since the irrigation benefits are entirely private, public funding for the diversion projects seems questionable. Half the cost of destroying woody vegetation on private lands to increase pasture and cropland is paid by the Federal Government. There is no economic justification for such a subsidy. Eliminating vegetation along floodways as a means of increasing water supplies is financed entirely with Federal

funds. The water conservation benefits of this practice have been challenged; the program conflicts with efforts to conserve riparian wetlands; and again, Federal financing of an activity which generates purely private benefits seems inappropriate.

RECOMMENDATIONS

1. Interagency land and resource management processes:

- a. Expand the procedures for identifying wetlands for purposes of regulation under section 404 of the CWA to include western riparian habitats.**

Western riparian areas frequently have a proportionately greater significance than wetlands and riparian areas elsewhere in the United States because of the arid climates in which they are located. Yet riparian areas in the West often do not qualify as wetlands for purposes of regulation under 404. To qualify as a wetland under the procedures adopted by the Corps, EPA, FWS, and SCS, three basic elements must be evident: wetland hydrology, hydrophytic vegetation, and hydric soils. Many western riparian areas which function similarly to wetlands do not meet this standard because of the absence of hydric soils or hydrologic conditions. It seems appropriate to modify the Federal procedures for identifying wetlands to encompass all areas which function as wetlands and contribute to maintaining the integrity of the Nation's waters.

- b. Federal and State land and resource management agencies should develop a joint plan for reducing impacts to riparian wetland and for rectifying past effects.**

A host of activities from livestock grazing, multi-purpose water projects, small-scale hydroelectric power and water diversions, vegetation management, logging, and mining contribute significantly to the loss and degradation of riparian wetlands. Defining and delineating wetlands, including wetland effects in project assessments, coordinating activities, and mitigating damages are all issues which need to be addressed in the planning processes of the relevant agencies, if the impacts to riparian wetlands are to be reduced.

- c. Consider requiring that all Federal assistance programs comply with the conservation, mitigation, and reporting requirements contained in the Electric Consumers Protection Act.**

The ECPA requires that the following conditions must be met before a new construction project is entitled to PURPA tax

benefits: (1) the project must not have significant adverse effects on the environment, including recreation and water quality; (2) the project cannot be located on a State or national wild or scenic river system which would be adversely affected; and (3) the project must comply with recommendations made by the resource protection agencies or explain why this is not possible in terms of primary agency mission. These conditions should apply not just to hydroelectric power development but to Federal projects across the board. Most, but not all, agencies consult with the FWS if a project will have a major impact on wetlands. However, they are not required to implement those recommendations or even to explain why the recommendations should not be implemented. This allows agencies a great deal of discretion in disregarding advice that would improve wetland quality. Requiring consultation and an explanation when the results of the consultation are not heeded could promote greater reflection and more thorough consideration of alternatives to projects with wetland impacts.

2. Land management agencies:

- a. As a part of their responsibility to advise BLM on allotment management planning, Grazing Advisory Boards should be required to consider riparian issues and to recommend measures to improve and maintain riparian areas.**

Although BLM district managers make the final management decisions about allotments and the allocation of range improvement funds, they receive advice from District Grazing Advisory Boards. The Boards are influential, and since they are composed exclusively of stockmen, their recommendations focus on livestock industry concerns, generally to the exclusion of wetland and environmental matters. Each BLM district also has a Multiple Use Advisory Council whose membership is broader, representing various public land interests. The BLM would probably receive more balanced advice regarding the management of riparian wetlands if the Boards and the Councils were to meet jointly on occasion to discuss such issues as riparian management.

- b. Increase the level of supervision to detect unauthorized grazing, and impose appropriate penalties on violators.**

Increasing regulatory constraints would help to alleviate overgrazing problems and control any profiteering. It is an expensive, labor intensive approach, but imposing strict sanctions on a few known violators might result in an approximation of a self-enforcing system.

- c. **Require those who utilize and benefit from public rangeland to be responsible for the maintenance and restoration of riparian areas.**

BLM has estimated that it will require \$60.8 million and 300 new employees to implement its strategy for restoring riparian wetlands in the West to proper functioning condition. The restoration plan calls for a cooperative effort between the Federal Government, private landowners, resource users, the concerned public, and other government entities. The spirit of voluntarism is admirable, but given the magnitude of the task, a voluntary program is likely to fall short of the goal, with the lion's share of the burden having to be borne by taxpayers.

Much of the land in question is public grazing land. Lessees of public rangeland have stewardship requirements in their leases. These requirements constitute important, appropriate incentives for the maintenance of the land. Where riparian areas are currently in need of restoration, the BLM proposes a traditional cost-sharing arrangement, with the Federal Government supplying any required funding and materials and the lessee providing the labor. Once the area is restored, the lessee should assume full responsibility for its maintenance.

3. Water resource development:

- a. **Require that Federal water projects affecting wetlands be financed in accordance with the benefit principle of public finance, i.e., each beneficiary should bear the cost (including interest costs and any wetland opportunity costs) of generating his benefits.²⁷**

The Water Resources Development Act of 1986 (WRDA) constitutes an important step toward equitably allocating responsibility for financing water projects. The WRDA establishes a minimum cost-sharing contribution of 25 percent for non-Federal sponsors of flood control and drainage projects and 35 percent for irrigation projects constructed by the Corps of Engineers. It initiates cash contributions by non-Federal sponsors, and requires that this contribution be at least equal to five percent of the construction cost. Although many of the benefits of past

²⁷The Congressional Budget Office estimates that \$85 million would be saved from 1990-1994 if only two reforms were made: enforcing requirements that farms of more than 960 acres be charged the full cost for Federal irrigation water and charging full costs to those using Federal water to grow surplus crops (CBO 1989).

projects have accrued locally, historically there have been no cash [only in-kind] contributions by the non-Federal sponsors. The Act makes the non-Federal sponsors responsible for all operations and maintenance costs and half the cost of development and design studies. Further, by prohibiting the use of certain calculation techniques which have been used previously to artificially inflate benefit-cost ratios, the WRDA lends support to the efforts for standardized, objective evaluation criteria for public projects.

With passage of the WRDA, Congress has made substantial progress toward eliminating the subsidization of flood control, drainage, irrigation, and navigation projects as well as reducing the construction of inefficient projects. However, the WRDA applies only to projects constructed by the Army Corps of Engineers. The concepts of efficiency and equitable cost sharing based on allocation of benefits are well-established. They should be extended to all water projects affecting wetlands. Both equity and efficiency will be served better if only those activities which reflect legitimate national objectives receive Federal financing, and non-Federal benefits are paid for by non-Federal sponsors.

b. Eliminate Federal financial incentives for the construction of small water diversion projects.

Small diversion projects have a considerable impact on western riparian wetlands. The BLM and USFS provide easements or special use permits for small diversion projects, and Federal funds are contributed through the Agricultural Stabilization and Conservation Service. Building and maintaining small diversion structures that capture the flow of a stream for crop irrigation costs at least \$1500. The percentage paid by the Federal Government varies by county and depends on how much water a project is expected to "conserve". The subsidy can reach 70 percent, subject to an annual maximum of \$3500 for a landowner. The Federal financial incentive has significantly influenced the number of small diversions constructed. The subsidy should be eliminated, because irrigation is a private activity, there are no public benefits for which taxpayers in general should be billed, and the subsidy conflicts with other conservation goals, including protection of riparian wetlands.

c. Include mitigation costs and funds for periodic evaluation of mitigation activities among project costs reimbursable to the Federal Government.

Mitigation aims to reduce the negative environmental effects associated with a project, and the parties reaping the benefit should pay the costs, including environmental costs that have often in the past been ignored. If a public benefit arises from the project, the Federal Government should bear its share of mitigation expenses. The Federal agency sponsoring the project should be assigned the responsibility for seeing that mitigation is appropriately financed, evaluated, and enforced, and agency budgeting should reflect this responsibility.

4. Agriculture:

Disallow agricultural program benefits for commodities produced as a result of irrigation from any water supply project that destroys or degrades riparian wetlands.²⁸

Many individual agricultural producers receive price and income supports for growing certain crops, such as wheat, corn, sorghum, barley, rice, and cotton. In 1969, 37 percent of the acreage of crops receiving Bureau of Reclamation water was also eligible for agricultural price supports. Thus, subsidized irrigation water is used to grow crops that are eligible for a host of Federal agricultural subsidies. One way of dealing with this problem is through a counterpart to Swampbuster: make crops irrigated from a water project that detrimentally affects riparian wetlands ineligible for Federal agricultural programs, e.g., price and income supports, crop insurance, and disaster relief.

5. Vegetation protection and management:

- a. Prohibit Federal cost sharing for "vegetation management" conducted to expand pasture and agricultural lands.**

Through the Agricultural Stabilization and Conservation Service, the Federal Government sponsors a cost-sharing program of vegetation management to increase pasture and agricultural lands. The program funds half the cost of this practice on an annual basis and 55 percent on a multi-year basis. The problems that result from stream bank erosion alone may not be worth the minimal pasture expansion. Environmental consequences aside, using Federal funds for vegetation removal to benefit livestock owners is difficult to justify.

²⁸Alternatively, the Congressional Budget Office has suggested that the Bureau of Reclamation should charge the full cost of Federal water used to grow crops subject to agricultural price support programs.

- b. Expand Section 404 of the Clean Water Act to require permits for "vegetation management" that affects water quality.**

Under Section 404 of the Clean Water Act, a permit is not required for vegetation removal alone if it does not involve discharge of dredged or fill material into U.S. waters, even though the activity may result in erosion of streambanks (and hence, indirect discharge of "fill" material into such waters). This statutory limitation has been a significant factor in facilitating riparian habitat destruction on private lands in rural and urban areas in some parts of the West. Such vegetation removal is often associated with conversion of wetlands for agricultural purposes. In urban areas, it is done in order to clear for development projects, for weed control, and sometimes maliciously in order to eliminate potential habitat for rare and endangered species.

Federal agencies engaged in vegetation removal for maintaining floodways are exempt from 404. Thus, the manner in which they control vegetation escapes scrutiny by regulatory authorities. This is particularly unfortunate, because the spoil is often dumped in riparian wetlands. Removing the exemption from 404 for these Federal agencies may require more than amending 404, since their authority to engage in vegetation management emanates either from specific statutory language or general organic legislation.

- c. Explore alternative ways of maintaining the border between Mexico and the United States.**

For ease in marking the Mexican/United States border, the International Boundary and Water Commission had at least 50,000 acres of riparian habitat within a 70 mile reach of the Rio Grande cleared and now maintains it devoid of native vegetation. It seems quite likely that there are less costly and less environmentally disruptive methods of marking the border.

REFERENCES

- Ault, C. The Effects of Federal Programs on Wetlands Resources in the Rio Grande Valley in New Mexico. Draft Background Document. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 7 pp.
- Brabander, J. 1985. Bottomland Hardwood Wetlands of Eastern Oklahoma. Draft Background Document. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 147 pp.
- Danielson, L., C. Ault, D. Sada, and S. Sather-Blair. 1987. Impacts of Federal Programs on the Degradation of Western Riparian Wetlands. Background Report synthesized from draft documents. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 61 pp.
- Rodman, J. 1989. Reflections on Tamarisk Bashing. Paper presented at the Society for Ecological Restoration and Management Annual Meeting, Oakland, CA, January 16-20.
- Sada, D. 1986. The Effects of Federal Programs on Wetlands in Nevada. Draft Background Document. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 46 pp.
- Sather-Blair, S. 1986. Western Riparian Wetland Losses and Degradation: Status and Trends of the Influence of Federal Water and Private Hydroelectric Projects. Draft Background Document. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 56 pp.
- Schanz, J., A. Backiel, E. Buck, R. Gorte, K. Hendrixson, L. Kumins, M. Martel, J. Moore, M. Segal, D. Thompson and J. Zinn. 1986. The Subsidization of Natural Resources in the United States. Congressional Research Service, Library of Congress, Washington, DC
- Stinnett, D. 1988. Riparian Areas of Western Oklahoma. Draft Background Document. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 15 pp.
- Swift, B.L. 1984. "Status Riparian Ecosystems in the United States", Water Res. Bull. 20(2): 223-228.
- U.S. Congressional Budget Office. 1989. Reducing the Federal Deficit: Spending and Revenue Options, A report to the Senate and House Committees on the Budget--Part II, as required by

- P.L. 93-344, 1989 Annual Rept. Government Printing Office, Washington, DC, February.
- U.S. Department of Agriculture, Forest Service and U.S. Department of the Interior. 1986. Grazing Fee Review and Evaluation: Final Report, 1979-1985, Report of The Secretaries of Agriculture and The Interior, Washington, DC, February, 99 pp.
- U.S. Department of the Interior, Bureau of Reclamation. 1981. Acreage Limitation EIS, Westwide Report, Appendix.
- U.S. Department of the Interior, Bureau of Land Management. 1990. Riparian-Wetland Initiative for the 1990's. Washington, DC, 60 pp.
- U.S. General Accounting Office. 1988b. Public Rangelands: Some Riparian Areas Restored but Widespread Improvement Will Be Slow, GAO/RCED-88-105, Washington, DC, June 30, 85 pp.
- U.S. General Accounting Office. 1988a. Public Rangelands: More Emphasis Needed on Declining and Overstocked Grazing Allotments, GAO/RCED-88-80, Washington, DC
- U.S. Water Resources Council. 1975. Options for Cost-Sharing, Part 5a: Implementation and OM&R Cost-Sharing for Federal and Federally Assisted Water and Related Land Programs. Washington, DC
- Welder, G. E. 1988. Hydrological Effects of Phreatophyte Control, Acme-Artesia Reach of the Pecos River, New Mexico, 1967-82. U.S. Geological Survey Water Resources Investigations Report 87-4148. Prepared in cooperation with the Pecos River Commission, Albuquerque, New Mexico, December.
- Weeks, E.P., H. L. Weaver, G. S. Campbell, and D. D. Tanner. 1987. Water Use by Saltcedar and by Replacement Vegetation in the Pecos River Floodplain between Acme and Artesia, New Mexico. U.S. Geological Survey Professional Paper 491G, 33 pp.

Chapter 13: SOUTHEASTERN ALASKA

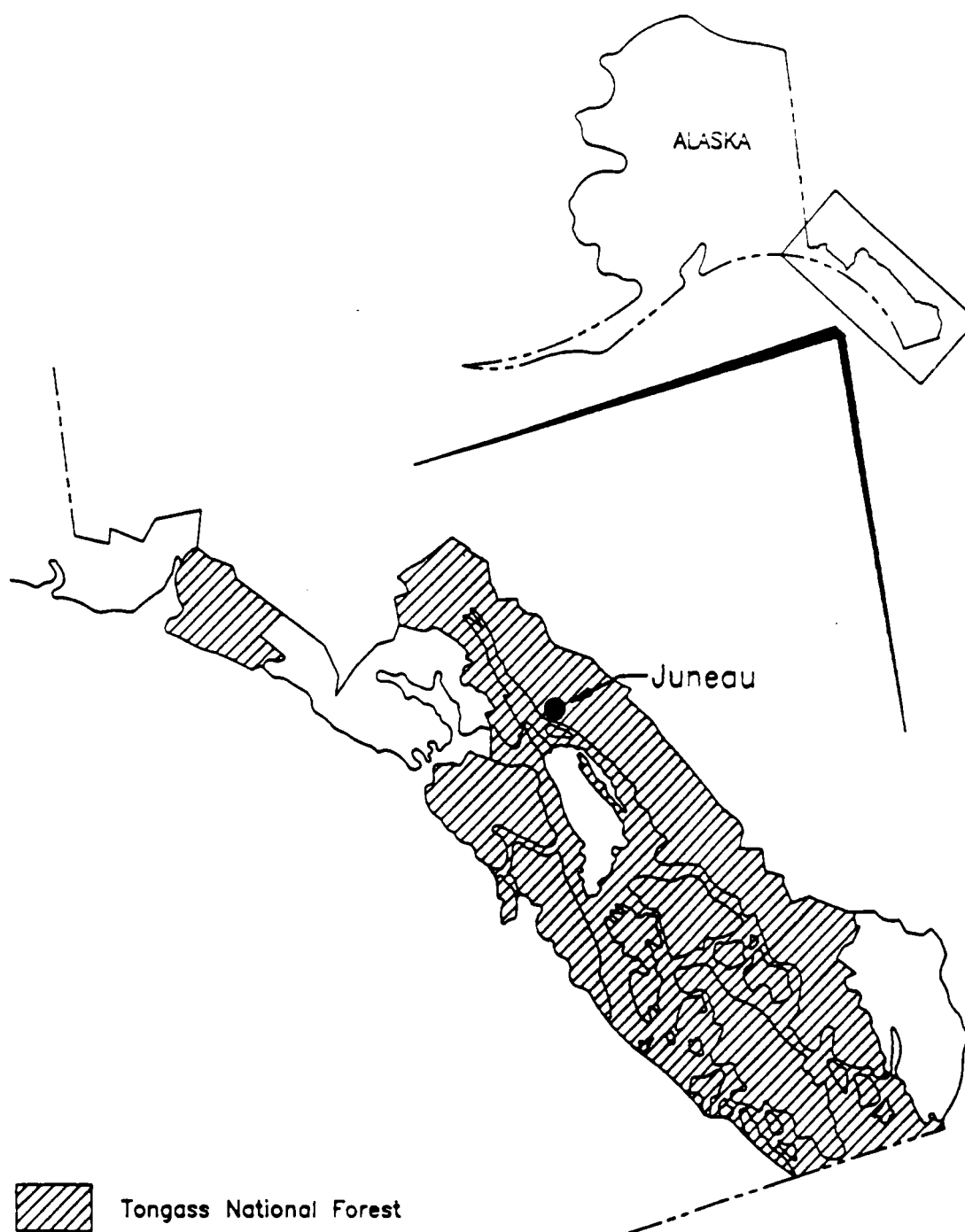
INTRODUCTION

PHYSICAL DESCRIPTION: Southeastern Alaska extends from Dixon Entrance on the south to Yakutat Bay on the north. (See Figure XIII-1.) Known as the Alaska Panhandle, this area forms a distinctive physiographic unit about 525 miles long and 120 miles wide. Of the 18 million acres, 27 percent is wetland. Half of this wetland acreage is forested, and most of the rest is bogs or muskegs. Coastal, riparian, and seasonally flooded marshes together comprise less than 5 percent of Southeastern Alaska's wetlands. With its wet and mild climate and mountainous terrain, it is representative of the Pacific rain forest ecosystem, exhibiting a maritime character with numerous islands, tidewater glaciers, fjords, estuaries, and a rugged coastline. Despite the mountains, wetlands are a conspicuous feature of the landscape because of the extremely high precipitation, shallow depths to bedrock, and extensive, impermeable soil layers. Wetlands commonly occur on hillsides and on rolling terrain. The dense forests of Southeastern Alaska are mixed with marshes, bogs, and muskegs. Thousands of small coastal marshes occur along the 21,000 mile convoluted shoreline. Larger estuarine wetlands are situated at river mouths and deltas.

CHARACTERISTICS AND FUNCTIONS: Southeastern Alaska

- o Contains the 17 million-acre Tongass National Forest, the nation's largest national forest, covering 85 percent of the Panhandle;
- o Includes about 21,000 miles of tidal shoreline, accounting for 61 percent of Alaska's total and 30 percent of the entire shoreline of the United States;
- o Has over 2500 important anadromous fish streams; the salmon found there support an internationally renowned sport fishery and an enormous commercial fishery and ancillary processing industry, involving domestic and foreign interests; Southeastern Alaskan salmon bring in almost \$100 million annually to the State's economy;
- o Supports a wide variety of wildlife of national and regional significance, including 10,000 bald eagles, many thousands of migratory waterfowl, and abundant deer, bears, and furbearers;

Figure XIII-1: ALASKA'S TONGASS NATIONAL FOREST



- o Provides primary subsistence resources used by Southeastern Alaska's Natives.¹

ORIGINAL ACREAGE: About 4.9 million acres (27 percent) of the 18 million acres of land in Southeastern Alaska are classified as wetlands.

CURRENT ACREAGE: Only about 2300 acres of Southeastern Alaska's wetlands (less than five one-hundredths of a percent) have been lost as a direct result of logging activities.² In addition, about 19,000 acres of forested wetlands have been logged and converted to shrub wetland. Once vegetation reestablishes itself in the logged area, there may not be any reduction in wetland values, but in the interim there can be some environmental effects from erosion.

TRENDS: Prior to passage of the Tongass Timber Reform Act of 1990 (TTRA), the Fish and Wildlife Service estimated that an additional 10,000 acres of wetlands would be lost if the full 1.75 million acre harvest proposed by the USFS for the Tongass were actually completed. However, the TTRA removes some of the subsidies supporting timbering in the Tongass, and hence, the full 1.75 million acres may not be harvested. Further, the TTRA mandates certain changes in logging practices which are likely to reduce wetland losses and other environmental effects in the Tongass.

FACTORS ADVERSELY AFFECTING WETLANDS

Wetland losses throughout Alaska result from development in five major sectors: (1) transportation systems, including roads, pipelines, airports and harbors, (2) urban development near major population centers, (3) oil and gas development on the North Slope,³ (4) placer mining in Interior Alaska, and (5) forestry in Southeastern Alaska. This report addresses the latter three

¹Although the importance of Southeastern Alaska's wetlands to fish and wildlife species has been documented, little information exists on other functions for these wetlands. From limited investigations, the functions and values of the Panhandle's vegetated wetlands are similar to those of their counterparts in the Lower 48 (Adamus 1987).

²Road construction and the development and operation of log transfer and storage facilities.

³If petroleum development occurs on the Arctic National Wildlife Refuge, there will be wetland effects there, too.

items. Forestry is addressed in this chapter; oil and gas development and placer mining are treated in the next.

In Southeastern Alaska, urban development and logging have been the principal causes of wetland loss. Wetland effects of logging result from clear-cutting, construction of logging roads, and the building and use of transfer sites for transporting logs by waterways.

The actual harvest of trees converts needle-leaved, evergreen, forested wetlands to deciduous shrub wetland types. However, at the present time only about five percent of the land harvested for timber in Southeastern Alaska is wetland.⁴ The conversion from forested to shrub wetlands may not result in a long-term loss of any wetland values, only a conversion from one set of wetland functions to another. However, before trees and shrubs re-establish themselves, erosion can occur, clogging waterways frequented by salmon and other anadromous fish. Logging in upland areas can also result in sediment eroding into watercourses.

Road construction can cause loss and degradation of freshwater wetlands. To date, 3500 miles of roads have been built in the Tongass. Since 1980, construction has averaged about 100 miles of new roads per year and 34 miles of reconstruction.⁵ About 1050 miles of roadways occur in wetland areas. The FWS estimates that roads account for about 2000 acres of direct wetland loss. In addition to the direct losses, roads often alter the hydrologic regime. Culvert placement, for example, usually alters waterflows on both the uphill and downhill sides of a road. Roads also isolate wetland areas, and activities during construction can cause erosion and the silting of streams.

The construction and use of log transfer sites result in loss of wetlands. Much of the harvested timber is stored onshore and then transported on waterways to various destinations for processing. Wetlands are lost to the construction of onshore storage areas, loading platforms, and docks. Transferring logs from land to water or boats requires a facility that extends from

⁴The existing Tongass Land Management Plan calls for an increase in timbering on poorly drained soils.

⁵These unpaved logging roads are designed specifically for moving vehicles and equipment for timber harvesting.

the shore out to the water. The FWS estimates that the 90 sites active in 1985 had directly destroyed about 300 acres.⁶

Secondary environmental impacts associated with log transfer sites include the accumulation of bark debris and concentration of organic compounds in estuaries. Bark strips away as logs are dumped into the water and rafted for temporary storage. The FWS estimates that the bark has degraded about 176 acres of substrates, reducing the biota along with the food and cover used by other water-dependent species. This constitutes a small but ecologically significant portion of the estuarine area in Southeastern Alaska. Organic compounds leaching from the logs also serve to degrade water quality. High concentrations of organic compounds have been measured at the transfer sites and dissolved oxygen concentrations measured in coastal waters have been below Alaska's minimum standard. Concern that the bark accumulation and log leachates reduce estuary and fishery productivity is leading to stricter regulations related to the siting and operation of transfer facilities.

FEDERAL PROGRAM

The major incentives to log the Tongass stemmed from provisions in the Alaska National Interest Lands Conservation Act and the price-setting policies utilized by the Forest Service for timber harvesters. In 1990, Congress passed the Tongass Timber Reform Act which amends the relevant provision in ANILCA and requires that the level of harvesting be dictated by market demand. Although the TTRA will not remove all of the subsidies to logging on the Tongass, it is likely to result in significant changes in the way the Tongass is managed and reduce the environmental effects from logging.

SILVICULTURE: The Forest Service manages most of Southeastern Alaska's wetlands, because about 85 percent of the Southeastern Alaska is included in the Tongass National Forest. About 2.3 million of the 16.9 million acres of the Tongass are suitable for harvest; in 1986, the Forest Service developed plans to ultimately harvest 1.75 million of these acres. At that time, 333,000 acres had already been logged. High volume, old growth timber stands generally are the most productive and valuable for wildlife. These areas have been logged most heavily, far out of proportion to their frequency of occurrence in the Tongass. The

⁶The Service assumes that 58 abandoned sites have recovered. Prior to passage of the TTRA, there were another 228 sites identified for possible development over the next 50 years, with an additional, expected wetland loss of 456 acres. As a result of the provisions in the TTRA, these losses may be smaller.

Forest Service has not studied the Tongass to locate the environmentally most valuable wetlands. In the absence of this information, no effort can be made to avoid wetlands when designing timber sale areas.

Large-scale logging did not begin on the Tongass until the 1950s. At that time the Forest Service awarded fifty-year timber contracts to two companies, Ketchikan Pulp Company (KPC) and Alaska Pulp Company (APC).⁷ The USFS had never before entered into contracts of such long duration.⁸ In an effort to increase timber-related employment in Southeastern Alaska, Congress included a section in the Alaska National Interest Lands Conservation Act (ANILCA) of 1980,⁹ which further stimulated logging by mandating that the Forest Service make 4.5 billion board feet (bbf) available for sale and harvest from the Tongass every ten years.

Since enactment of ANILCA, the market demand for pulp, the main product from Alaska's timber, has fluctuated, as has employment in Alaska's timber industry. Employment in the industry has varied from 3500 to 1800. In one recent year, Alaska paid more than \$4 million in unemployment benefits to out-of-work loggers and one-third of this went to nonresidents. Although markets are slowly improving, between 1982 and 1987, only 44 percent of the timber prepared for harvest by the USFS was sold. Nonetheless, ANILCA required the USFS to try to process the full 450 million board feet (mmbf) every year.

The tourist industry in Southeastern Alaska employs more people than fishing or logging. The area's fisheries account for \$100 million in revenue annually. Prior to passage of the TTRA, timber harvesting designed to meet the statutory quota posed a threat to these long-term revenue-generating activities.

The manner in which the Government determines stumpage fees (the price paid by logging companies for timber to be harvested) and

⁷KPC is owned by the Louisiana Pacific Corporation and APC is owned by the Japanese Alaska Pulp Corporation. In the early 1980s, Federal courts found these two timber companies guilty of conspiracy to manipulate timber prices and to force smaller companies out of the logging business on the Tongass, a violation of the Sherman Antitrust Act.

⁸The USFS entered into some long-term contracts in the contiguous United States in the period prior to World War II. The contracts on the Tongass were the last and longest of the long-term contracts.

⁹Sections 705(a) and 705(b)(1).

sells timber tracts results in a subsidy to the timber industry. First, areas to be harvested are designated and the timber is appraised. In Alaska the Forest Service uses the residual value appraisal method for estimating the value of standing timber. Logging industry production costs (cutting, road construction, hauling, milling and an allowance for profit and risk) are subtracted from the anticipated price for the industries' final products (milled lumber and pulp) to arrive at the appraised value for the standing timber. The Forest Service advertises the appraised price, solicits bids, and awards a contract to the highest bidder. The appraised price is the minimum acceptable bid. Because this method for determining stumpage fees does not take account of the Government's costs for managing the forests and administering the sales, many sales occur below cost and a subsidy is granted to the timber industry. The TTRA reduces, but does not eliminate this subsidy.

Until recently an additional subsidy was available to timber companies through "emergency rate redeterminations" (ERR). If market prices for timber products fell sufficiently to eliminate the contractor's allowed margin for profit and risk, the Forest Service could retroactively lower the stumpage fee to ensure a profit. The system was asymmetric, because no adjustment was made if the selling prices for finished lumber or pulp products rose during the period of a contract. Consequently, while timber contractors could benefit from rising market conditions, the Government lost revenue retroactively from past timber sales when markets declined. An ERR has only been triggered once and only on the Tongass, but the reduction in the stumpage fee was sizeable and the rebate to APC and KPC was in excess of \$71 million.¹⁰ In 1990, the Forest Service revised the procedure so that 1) it is no longer retroactive and now applies only to unharvested timber, and 2) it is symmetric for long-term

¹⁰In June, 1982, the Forest Service granted KPC an ERR covering the period 1979-1984. The rate for spruce, which made up most of the harvest, was reduced from \$114.96/mbf to \$2.87/mbf. Based on Forest Service data, the Department estimated that KPC received a rebate on 352 mmbf which it had cut prior to the ERR. Assuming that all 352 mmbf were spruce, KPC's rebate would have been \$39.5 million. Between June, 1982 and 1984, KPC cut an additional 175 mmbf at the reduced rate. Similarly, in March, 1983, the Forest Service granted APC an ERR covering the period 1981 to 1986. APC's stumpage fee for spruce was reduced from \$215.96/mbf to \$2.26/mbf. Using the same procedure as above, the Department estimated that APC received a rebate of \$31.9 million on 149.1 mmbf harvested prior to the ERR and a rate reduction on 196 mmbf which it harvested between March, 1983 and 1986.

contractors, i.e., the Federal Government shares in both rising and falling markets.¹¹

With ANILCA, Congress also established a permanent appropriation, the Tongass Timber Supply Fund, which gave the Secretary of Agriculture access to \$40 million annually to maintain the annual 450 mmbf harvest. From 1982 (when the Timber Supply Fund was initiated) through 1987, the Tongass received \$234 million to prepare timber sales, manage timber, develop harvest technology, and build roads prior to sales. Road building, at \$150,000 per mile, was the largest expense. Road construction costs alone sometimes exceeded the value of the timber to which the road led. Critics of this policy contended that roads were built to prevent further wilderness designations and to reduce objections when logging contracts were let in these areas.¹² The TTRA eliminates the automatic, annual, \$40-million appropriation to the Tongass Timber Supply Fund, and returns the Tongass timber program to the normal Congressional appropriations process.

ANILCA also authorized a \$5 million revolving low interest loan fund for harvesters of national forests in Alaska to acquire new equipment and design new technologies for timber harvest. The TTRA did not address this provision.

Although almost half the national forests lose money on their timber sales, the loss in the Tongass has been the greatest of all. Between 1970 and 1982 the Federal Government spent over \$375 million to make Tongass timber available, while charging the timber industry less than \$63 million. From 1981 to 1989, the average cost of the Tongass timber program was \$127.54/mbf (in 1990 dollars), while average receipts were \$4.62/mbf. In addition to discouraging the wise use of timber, this substantial subsidy led to the loss and degradation of some of Southeastern Alaska's wetlands and fishery resources.

The Tongass Timber Reform Act of 1990 ended the non-competitive nature of the pricing practices on the Tongass, terminated some timbering subsidies, and mandated that logging be conducted in a

¹¹For smaller, independent contractors the process remains asymmetric with rate redeterminations occurring only in declining markets.

¹²In one case, after the court issued an injunction on building a road on the uninhabited island of Kuiu, south of Admiralty, the Forest Service granted the Alaska Pulp Corporation a permit to build the road itself. The case is now in the courts. In another case, the Forest Service spent \$7 million to prepare for a timber sale in the Couverdon District, but failed to attract a single bid.

more environmentally sound manner. The most significant aspects of the Act relative to timber harvesting and impacts on wetlands are the elimination of both the automatic \$40 million appropriation to the Tongass Timber Supply Fund and the mandate to harvest 4.5 billion board feet of timber from Tongass every decade. The TTRA requires that the existing long-term contracts with the two pulp companies (KPC and APC) be modified so that the price for standing timber be comparable to what it would have been under competitive bidding. The TTRA contains two important features to protect wetlands and fishery resources: it prohibits commercial logging in certain key fish and wildlife habitats, and establishes a 100-foot minimum buffer zone adjacent to both sides of anadromous fish streams and their fish-bearing tributaries.¹³

The General Accounting Office has reported that one requirement in the TTRA has not been implemented properly (GAO 1991). As timber contractors build roads in national forests, they earn "purchaser road credits" which can be used to pay for harvested timber.¹⁴ These credits can be applied during the term of the contract or transferred to another of the purchaser's timber contracts in the same national forest. Typically, timber contracts run 3 to 7 years, and any road credits not exercised during that period are lost. Because the two long-term contracts in Alaska apply to very large areas and extend over 50 years, APC and KPC have been able to accumulate all their road credits and apply them against their stumpage fees. The TTRA directs the Forest Service to modify APC's and KPC's contracts so that road credits are determined in the same manner as they are under standard, short-term contracts. The GAO contends that the contracts should have been modified so that road credits could not be carried forward from one harvest area to another. The Forest Service interprets the TTRA differently and maintains that it has complied with the Act.

STATUS AND PROSPECTS

The Tongass National Forest comprises 85 percent of Southeastern Alaska. Thus far, the loss of wetlands due to logging, road

¹³No buffer zone existed previously.

¹⁴This is not a subsidy. Timber contractors bear the cost of constructing access roads to harvesting sites. However, under the Forest Service's system for billing contractors, the estimated road construction costs are initially added to the stumpage fee to determine the "gross price" for timber. As roads are constructed, the estimated road construction costs are credited to the contractor's account and can be used to pay for timber.

construction, and the construction and operation of log-transfer facilities has been small (considerably less than one percent of the stock of wetlands). There have been some indirect losses and secondary environmental effects, however, and these have been in areas of particular biological productivity. Degradation of estuaries and of waterways important for anadromous fish has occurred from erosion (due to timbering and construction of logging roads and transfer facilities) and from accumulated bark and leachate from the logs (which lowers dissolved oxygen levels in the water and smothers benthic organisms). The State has initiated some efforts to regulate the pollutants generated by logging and associated activities, and the TTRA mandates significant changes in timbering practices to avoid environmental damages.

Mandatory harvesting provisions in the Alaska National Interest Lands Conservation Act and the price-setting policy utilized by the Forest Service have been the major incentives promoting logging in the Tongass. These subsidies artificially bolstered the region's troubled logging industry. Even with the subsidies, however, fluctuating market demand produced wide variations in employment and output.

The Tongass Timber Reform Act of 1990 ended the non-competitive nature of the pricing practices on the Tongass, terminated some timbering subsidies, and mandated that logging be conducted in a more environmentally sound manner. The most significant aspects of the Act relative to timber harvesting and impacts on wetlands are the elimination of both the automatic \$40 million appropriation to the Tongass Timber Supply Fund and the mandate to harvest 4.5 billion board feet of timber from Tongass every decade. The TTRA is likely to result in significant changes in the way the Tongass is managed.

Concurrently with passage of the TTRA, the Forest Service has been revising the Tongass Land Management Plan (Plan). The draft Plan and Environmental Impact Statement were published in June, 1990. The Plan provides several management scenarios, involving a variety of land set-asides, levels of timber harvest, degrees of protection of fish and wildlife resources, etc. The deadline for commenting on this document was January, 1991. The FWS hopes that the final Plan will improve the protection of the Tongass and its wetlands.

Although the excesses on the Tongass associated with timbering are being addressed, there is a potential threat to Southeastern Alaska's wetlands from mining. The Panhandle is a highly mineralized zone. Large deposits of gold, silver, copper, molybdenum, and other ores have been found. Some are in production, while others are in the exploratory or developmental stages. River-borne pollution from mining in Canada also has the

potential to affect Alaskan waters. The degree of impact to the Tongass ecosystem will depend upon the protection provided by the Forest Service while it facilitates mineral development.

RECOMMENDATIONS

1. Federal Timber Program

- a. Encourage the Forest Service to develop better survey information on wetlands in the Tongass prior to authorizing developmental activity.**

Most wetland survey information in the Tongass is based on interpretations of aerial photographs. Field verification is rarely conducted. Although many types of wetlands are easily identified from aerial photographs, some wetlands in the palustrine and riverine systems are difficult to distinguish. As a result, accurate assessment of wetland effects often does not occur until timbering plans are completed and roads laid out.

- b. Consider expanding the buffer-zone requirement in the Tongass Timber Reform Act to cover all streams which can affect the water quality of anadromous fish habitat.**

The TTRA establishes a 100-foot minimum buffer zone adjacent to both sides of anadromous fish streams and their fish-bearing tributaries. Limiting buffer strips to fish-bearing streams may not adequately protect the resource. Non-fish bearing streams can contribute significant silt loads to downstream fish habitat.

REFERENCES

- Adamus, P., et al. 1987. Juneau Wetlands: Functions and Values. Adamus Resource Assessment, Inc.
- Bayha, K. 1987. Loss of Wetlands in Southeast Alaska. Background Report. U.S. Department of the Interior, Office of Policy Analysis, Washington, D. C., 12 pp.
- Emerson, P., et. al. 1984. The Feds Can't See Their Losses for the Trees. The Wall Street Journal. November 14.
- U.S. General Accounting Office. 1991. Contractual Modification Requirements of the Tongass Timber Reform Act, GAO/RCED-91-133, Washington, DC, March 20, 29 pp.
- U.S. General Accounting Office. 1990. Process for Appraising Timber Offered for Sale Needs to Be Improved, GAO/RCED-90-135, Washington, DC, May 2, 50 pp.

Chapter 14: WESTERN ALASKA

INTRODUCTION

PHYSICAL DESCRIPTION: Western Alaska is bounded by Yakutat Bay on the south, the Beaufort Sea on the north, the Bering Sea on the west, and the Canadian border on the east. The landscapes of western Alaska are very diverse, ranging from: the rugged fjords of Prince William Sound; to the rolling, treeless terrain of the Bering Sea coast; to the vast taiga muskeg of the interior; to the flat expanse of the Arctic coastal plain.

From the coast of the Beaufort Sea south to the foothills of the Brooks Range lies the Arctic or North Slope, which is a broad, flat, coastal plain dotted with innumerable lakes and characterized by treeless tundra underlain by a continuous layer of permafrost. The Arctic coastal plain is separated from the Yukon River basin to the south by the Brooks Range, a rugged mountain chain with peaks exceeding 6,000 feet and passes as high as 2,500 feet.

The interior region of western Alaska is a plateau that is cleft by three, major river valleys. This plateau reaches southward to the Alaska Range with summits varying from 10-20 thousand feet. West of the Alaska Range is the Aleutian Island chain, a wind-swept series of treeless volcanic islands that extends to the international dateline. The southern coast of western Alaska is a rugged mosaic of mountains, glaciers, ice fields, and fjords.

DISTINCTIVE CHARACTERISTICS: Western Alaska

- o Contains the 19,624,348-acre Yukon Delta National Wildlife Refuge, one of the most significant waterfowl breeding areas in North America;
- o Contains the Nation's largest National Park: Wrangell-St. Elias National Park and Preserve, which is almost six times larger than Yellowstone National Park;
- o Has 17 of the Nation's 20 tallest mountain peaks, including Denali (Mt. McKinley), North America's tallest mountain;
- o Has a coastline longer than that of the conterminous United States;
- o Has enough glaciers to cover an area about half the size of New England;

- o Includes Izembek Lagoon, which contains 84,000 acres of eelgrass beds, one of the largest eelgrass beds in the world.

ORIGINAL ACREAGE: About 47 percent of an estimated 355 million acres of lands in western Alaska is classified as wetlands.

CURRENT ACREAGE: Less than one percent of the wetlands in western Alaska have been lost as a direct result of oil and gas activities and mining.

TRENDS: About 30,000 acres of wetlands in western Alaska have been converted by oil and gas activities (18 percent of the total losses in the region). Approximately two-thirds of these losses have occurred on the Arctic coastal plain. In addition, oil and gas activities on the Arctic coastal plain have degraded wetland quality through a variety of secondary effects, such as flooding and thermal erosion of permafrost. In some areas of the Arctic coastal plain, secondary effects of oil and gas activities cover more than twice the acreage directly affected by fill material. Additional and similar impacts to the Arctic coastal plain can be expected if oil and gas exploration and development occurs in the Arctic National Wildlife Refuge.

Mining activities have converted about 14,500 acres of wetlands in western Alaska (8 percent of the losses). Placer mining accounts for a majority of these losses. About 75 percent of these conversions have occurred in the interior region of western Alaska. In addition to direct effects on wetlands, mining activity in western Alaska degrades wetlands through secondary effects on hydrology and water quality.

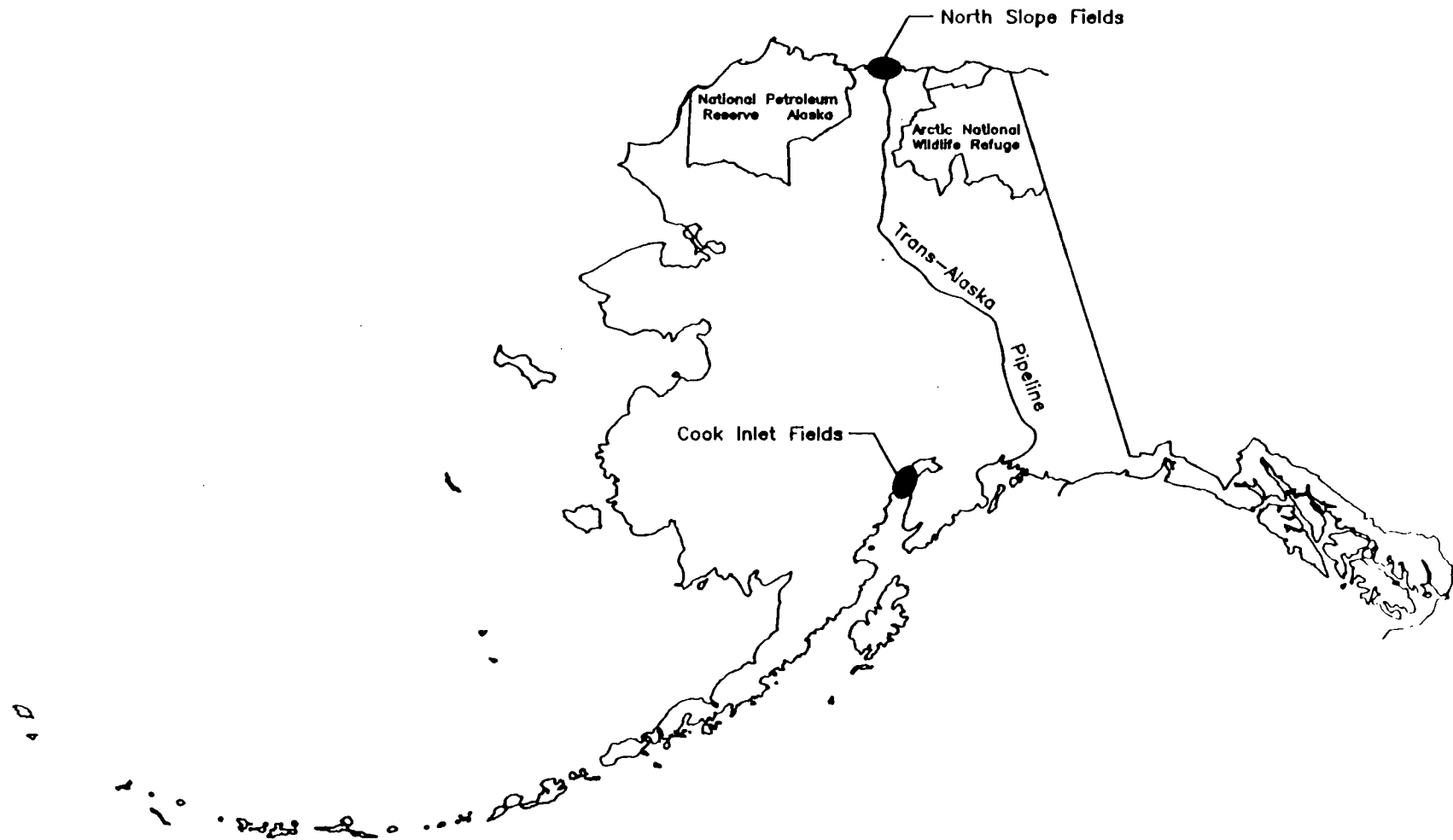
FACTORS ADVERSELY AFFECTING WETLANDS

Wetlands losses throughout Alaska result from development in five major sectors: (1) transportation systems, including roads, pipelines, airports and harbors, (2) urban development near major population centers, (3) oil and gas development on the North Slope,¹ (4) placer mining in Interior Alaska, and (5) forestry in Southeastern Alaska. This report addresses the latter three items. Forestry is addressed in the previous chapter; oil and gas development and placer mining are treated here.

More than 750 exploratory oil and gas wells have been drilled in Alaska. The only commercially recoverable finds currently operating are on the North Slope and the Cook Inlet-Kenai

¹If petroleum development occurs on the Arctic National Wildlife Refuge, there will be wetland effects there, too.

Figure XIV-1: PETROLEUM DEVELOPMENT IN WESTERN ALASKA



Peninsula areas. (See Figure XIV-1.) Both of these areas have substantial wetland acreage associated with the oil and gas activity.

Oil and gas exploration and development in wetland areas have significant impacts, particularly in Arctic regions where vegetative recovery is slow. The effects of oil and gas activities on wetlands differ between the exploration and development phases of oil and gas operations.

The exploration phase of oil and gas operations usually results in little surface disturbance. Initial stages of geophysical reconnaissance are supported by helicopter personnel and only require small, temporary camps. Subsequent seismic surveying causes greater disturbance from overland transportation of equipment and personnel. Tundra wetlands can be affected by seismic survey or transportation corridors, particularly if activities occur when the tundra is not completely frozen.

Exploratory drilling, the final stage of exploration, can involve considerable surface disturbance, including: construction of drilling sites, camp sites, and airstrips; overland transport of equipment and personnel to drilling sites; and gravel mining. Transporting heavy equipment to drill sites can cause removal or compaction of tundra, which in turn can cause thawing of permafrost and subsidence of the terrain. The combination of thermal erosion (thermokarst) and hydraulic erosion over longer periods of time can create further slumping or, worse, gullies and ravines. Using ice to construct exploratory drill pads and roads, although less damaging than using gravel, can require up to 15 million gallons of water and can drain tundra ponds and streams.

Petroleum development on the Arctic coastal plain results in much more extensive disturbance of wetlands, because it requires fill material (usually gravel) to construct an infrastructure. This infrastructure, which consists of drill pads, storage areas, transportation facilities, gravel mines and other developments, alters terrain, disrupts natural drainage patterns, and changes or eliminates fish and wildlife habitat. The existing infrastructure for oil and gas operations in the Prudhoe Bay-Kuparuk complex is spread over more than 800 square miles of tundra. Nevertheless, the amount of wetland acreage affected is relatively small.

On Federal lands, BLM attaches mitigation requirements to leases and conditions drilling permits with environmental safeguards. These requirements take into account regional and site-specific environmental factors worthy of protection. Wetlands are prominent among the resources receiving protection. Although all damage to wetlands from petroleum development on Federal lands

cannot be avoided, BLM actively attempts to protect these resources.

In addition to the direct impacts associated with placing gravel on tundra, petroleum development on the Arctic coastal plain has resulted in significant indirect impacts. In the wettest parts of the Prudhoe Bay oil field, flooding and thermokarst covered more than twice the area directly affected by roads and other construction activities. As with other types of developmental activities, stream crossings (e.g., for pipelines or access roads) can affect water quality through changes to stable stream banks, erosion, siltation, and stream bottom disturbance.

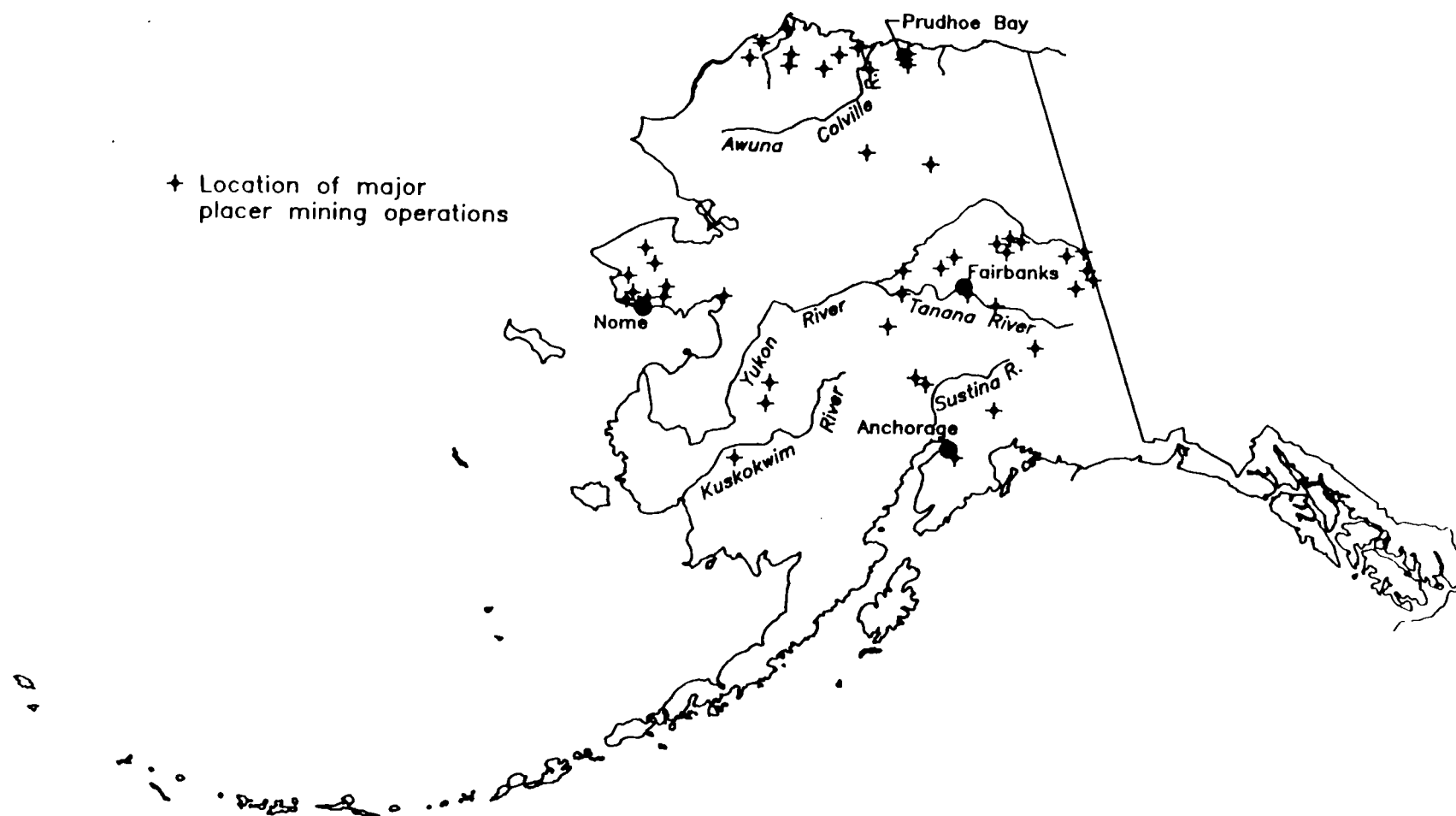
Other secondary effects such as release of contaminants, sewage dumping, oil spills, and dust have damaged or degraded wide areas of tundra wetlands adjacent to oil and gas facilities. Contaminants released from reserve pits by overflows, leaching, or breaching has released diesel fuel, heavy metals, ethylene glycol, and soluble salts onto the tundra, and has killed vegetation surrounding reserve pits. According to figures from the Alaska Department of Environmental Conservation, in 1985 alone there were 521 oil spills on the Arctic coastal plain, amounting to about 82,000 gallons of oil. Diesel and crude oil, which can cause severe damage to tundra vegetation and can remain toxic for more than 4 years after the spill, accounted for almost half of the spills.

Placer mining is the other activity in western Alaska that significantly affects wetlands. Placer is a mineral deposit usually located in gravel associated with a stream bed. Mining operations involve retrieval of placer deposits by hand, hydraulic, mechanical, dredging, or drifting methods. A mining operation can be divided into stripping, sluicing, and disposing of tailings.

Small scale placer mining operations can be found throughout the State, with concentrations in the southcentral, southwest, and interior regions. As of the late 1980s, about 450 miners actively work an undetermined number of the approximately 84,000 placer mining claims that exist in Alaska, most on Federal lands. A Bureau of Land Management map of nearly all claims shows that they follow the stream network of Alaska. (See Figure XIV-2.)

The Corps estimates that up to 2250 acres of wetlands per year are lost to placer mining activities (i.e., placement of fill). The Corps only has information on placer mining activities over which it has jurisdiction, however, so this is a conservative estimate. Placer mining activities have receded recently, primarily because of depressed gold prices and increased regulation of water quality and effluent discharge by State agencies and EPA.

Figure XIV-2: MAJOR PLACER MINES IN WESTERN ALASKA



Placer mining in Alaska has a long history of causing adverse impacts on fish and wildlife and their habitats. Siltation, filling of wetlands, and severe alteration of stream channels have often eliminated anadromous and resident fish habitat, impeded or totally blocked fish passage, and in some large scale placer mining areas, totally extirpated local fish stocks. Although the extent of the degradation has not been fully quantified (e.g., number of streams affected, stream miles), it is clear that the loss of biological productivity in streams and adjacent wetlands due to placer mining activity is a major problem. Indeed, some streams are completely dead biologically.

Wetlands and riparian habitats adjacent to placer mined streams are destroyed by excavation of gravel and placer deposits, deposition of overburden and tailings, and construction of berms, ditches, settling ponds, camps, airstrips, and roads associated with mining. Wetland impacts involve direct and indirect losses, as well as functional alteration. Indirect impacts include blockage of natural drainage patterns and displacement of waterfowl, shorebirds, and other terrestrial wildlife species that use wetland areas.

FEDERAL PROGRAMS AND PROJECTS

OIL AND GAS EXPLORATION AND DEVELOPMENT: Two provisions of the Federal tax code specific to the oil and gas industry have made development in Alaska more lucrative: the oil and gas depletion allowance and the expensing, as opposed to capitalizing, of intangible drilling costs. Also, industry exploration and development activities are regulated by State and other Federal agencies.

Income Tax Code: From 1926-1975, the oil and gas industry enjoyed a significant tax break: the depletion allowance. The allowance set an arbitrary percentage for depreciating the value of a well as its oil or gas was pumped out. The arbitrary allowance (27.5 percent of gross income through 1968 and 22 percent until 1975) bore no relation to costs, and permitted tax-free recovery, often exceeding the amount invested in the property. Producers could deduct the allowable percentage of gross income from taxable income with a limit on the deduction equal to 50 percent of taxable income. In 1975, this deduction was eliminated for all but independent producers, who now enjoy a 15 percent depletion allowance for the first 1,000 barrels of oil and the first 6 million cubic feet of gas produced daily.

There are a few independent producers operating on the Arctic coastal plain. Their operations became commercially exploitable once the infrastructure was installed to service Prudhoe Bay. These independent producers have had a very small impact on

wetlands, and restricting the depletion allowance would not have been an effective way of addressing this impact. Although, nationally the depletion allowance encouraged the development of otherwise marginal wells, it probably had minimal effect on development on the North Slope.

The second tax code provision aids the industry by allowing deductions for intangible costs related to oil and gas exploration and production. The deduction allows producers to take an immediate tax deduction for "intangible" expenses (i.e., those without salvage value) on labor, fuel, power, materials, supplies, and tools. No rapid write-off is allowed for "tangible" costs, such as expenditures for pipe, tanks, and pumps used in an oil or gas rig. These deductions are a significant factor in offsetting the costs of exploration and development, and undoubtedly increased the rate of return on the North Slope field. However, the North Slope oil field is very valuable in its own right, and elimination of the deduction for intangible costs probably would not have significantly altered the nature of the development or its impact on wetlands.

Regulation: The State and two Federal agencies (the Minerals Management Service and the Corps of Engineers) regulate oil and gas activities that may affect Alaska's wetlands.

The MMS leases Federal tracts on the outer continental shelf (OCS). However, MMS does not have the authority to regulate the activities that occur on coastal wetlands, even when those activities are conducted in support of OCS oil and gas development. Industry activities in support of OCS exploration and development that affect coastal wetlands are regulated by State and other Federal agencies. MMS does address secondary impacts of OCS activities (i.e., onshore effects) in its EISSs, and it can formally notify lessees of responsibilities and procedures under other Federal and State laws in clauses included in oil and gas leases (Information to Lessee clauses).

Under section 404 of the Clean Water Act, the Army Corps of Engineers issues permits for discharge of dredged or fill material into waters of the U.S. (including wetlands); such discharges may be associated with installing structures in navigable waters.² In 1979, two years after oil production

²Oil and gas development in Alaska is also regulated under two other sections of the Clean Water Act. Section 401 requires a 404 permit applicant to get a certification that any discharge will comply with State effluent limitations and water quality standards. Section 402 addresses the chemical quality of the Nation's water and associated wetlands, and establishes a program that requires a
(continued...)

began in the Prudhoe Bay region, the Corps exerted regulatory jurisdiction over North Slope wetlands. The Corps (with oversight by EPA and the assistance of the Fish and Wildlife Service, National Marine Fisheries Service, and State agencies) regulates most construction activities on State and private lands on the Arctic coastal plain. The Corps can condition permits required to construct support facilities for exploration on the OCS through coastal wetlands.

The 404 regulatory program has resulted in relatively thorough review of proposals, increasing the likelihood that project designers will include state-of-the-art mitigation measures. However, in many cases, the Corps exercises its discretionary authority and omits stipulations and conditions recommended by cooperating agencies to mitigate wetland impacts. In addition, there are still many projects which, for a variety of reasons, receive expedited or inadequate review.

There are procedures and techniques which could lessen wetland losses and environmental harm due to oil and gas activities in Alaska. Some of the suggestions often offered are:

- o If directional drilling is technically and economically feasible, it could be used to reduce damages in highly valuable wetlands.
- o The Corps could require off-site mitigation of damages associated with oil and gas activities in wetlands. Currently, it does this rarely. This is more difficult to do in Alaska than in Louisiana, but some opportunities do present themselves.
- o The Corps could be more sensitive to the on-site mitigation measures recommended by the FWS as permit conditions.
- o Greater use might be made of performance bonds to ensure compliance with mitigation requirements.³ Performance bonds create an incentive for developers to complete work in

²(...continued)

permit for most discharges into surface waters and can require discharge limits for various pollutants.

³BLM already has such a program (43 CFR 3103.1). On Federal lands administered by it, BLM holds minimum bonds to cover lease activities. Among other things, these bonds help to ensure proper protection of the environment during drilling and production activities on lease sites and proper reclamation of sites prior to abandonment. Funds for restoration of any unauthorized damage to wetlands would come out of these secured bonds.

a timely manner, because the bonds cannot be released until permit provisions are fulfilled. Since the regulatory authority must approve release of the bond, monitoring of mitigation projects is assured. In the event of noncompliance, the Government is relieved of the need to pursue costly enforcement action, and the bond provides a ready source of funding to restore the environment quickly. To be fully effective, bonds must be of sufficient magnitude to cover the cost of restoration in the event the standards are not met, together with any increased governmental administrative costs and penalties.

Leasing: Section 1008 of the Alaska National Interest Lands Act calls for the establishment of a program for oil and gas leasing on non-North Slope Federal lands.⁴ The Act provides for oil and gas studies on national wildlife refuges in Alaska to provide information for use in future land management decisions. Any leasing, exploration, and production would be subject to permits and stipulations designed to protect fish, wildlife and subsistence activities. 1.7 million acres of national wildlife refuge lands in Alaska (excluding the Arctic National Wildlife Refuge) could eventually be subject to leasing, if it is judged compatible with refuge purposes.⁵ It should be noted, however, that the Arctic National Wildlife Refuge (ANWR) is the only refuge currently receiving national attention for exploration and development.⁶

To the east of Prudhoe Bay is the coastal plain of the Arctic National Wildlife Refuge. When the refuge was established in 1980, the eastern portion of the plain was designated wilderness, but Congress left unresolved the issue of whether or not the remaining 1.5 million acres of the coastal plain (known as the "1002 lands") should be made available for oil and gas leasing and development. Congress directed the Department of the Interior to weigh that area's oil potential against its value as wilderness and wildlife habitat. In 1987, the Department

⁴This excludes the Arctic National Wildlife Refuge and is all lands south of the Brooks Range.

⁵No leasing would occur on refuge lands where the Secretary determines that oil and gas exploration or development would be incompatible with the purposes of the refuge.

⁶Native landowners have pursued seismic and surface geological exploration on their lands within the Yukon Flats National Wildlife Refuge. Should economically recoverable oil reserves be located on Native lands, development of adjacent refuge land would be likely. Also, oil and gas production on the Kenai National Wildlife Refuge has been going on since 1957.

recommended opening the 1002 lands to full petroleum exploration and development. The issue now rests with Congress, which has considered legislation on the subject in 1987, 1988 and 1989. Following the Exxon Valdez oil spill in March, 1989, Congress deferred consideration of coastal plain oil and gas leasing, while the intricacies of oil spill liability legislation were being addressed. The invasion of Kuwait heightened the public discussion of leasing in ANWR.

Environmental organizations have argued that petroleum development in the 1002 area of the coastal plain is not compatible with the wilderness setting of ANWR. Twenty-two of these organizations⁷ have made protection of the 1002 area of ANWR a central feature of their national agendas, combining their efforts to promote wilderness designation for the 1002 area. Any leasing, exploration, or production in ANWR would be subject to permits and stipulations designed to protect environmental resources.

In addition to the onshore leasing program, there is an offshore program. The first sale for OCS leases in offshore Alaska was held in 1976. Since that time, 15 sales have been held offering leases for more than 98 million acres on the Alaska OCS Region. The Department has leased 1,477 tracts (8.2 million acres). As of August 1990, there were 917 active leases owned by 32 lessees, covering over 2 million acres. Thus far, only drilling on leases in the Beaufort Sea has produced significant oil and gas discoveries. In the event that the coastal plain on ANWR were opened to leasing, the onshore infrastructure constructed to serve ANWR would stimulate additional exploration in the Beaufort Sea area.

PLACER MINING: The Federal land holding agencies in Alaska (Forest Service, BLM, National Park Service, and FWS) manage mining under the General Mining Law of 1872 and their individual mandates and regulations. The Law provides for the exploration, development, and production of mineral resources on public lands, and the right of access to mining claims. In addition, under their organic statutes, each Federal agency has broad authority to regulate activities on their lands.

To the extent that there is a subsidy to placer mining, it derives from the cost-free access to hard-rock minerals on public lands. Under the 1872 Law, no fee is charged to miners for extracting the resource. Originally the Law covered oil and gas as well as hard-rock minerals. Now however, coal, oil, and gas

⁷Including such diverse interests as the Wilderness Society, Natural Resources Defense Council, Sierra Club, Trustees for Alaska, Defenders of Wildlife, and the Garden Club of America.

are subject to leasing arrangements that require a fair price to be paid for public resources; only hard-rock minerals remain free for the taking. A mining company must only stake a claim to secure a deposit against others. Although a claim may not exceed 160 acres, a mining company may stake an unlimited number of claims. A claim may be kept indefinitely so long as at least \$100 of work is conducted on it annually. Should a mining company wish to purchase surface rights as well (a procedure known as patenting a claim), it may do so for \$2.50 to \$5.00 per acre, depending on the type of claim.

STATUS AND PROSPECTS

Alaska presently produces about 25 percent of the nation's petroleum reserves, almost all of it from oil fields located on the Arctic coastal plain. Most of this production comes from the Prudhoe Bay oil field, with lower levels of production coming from younger fields like Kuparuk and Milne Point. In 1989, production from wells in these oil fields began to decline. Significant facility expansion is not expected in these areas.

In the past five years, there has been a marked increase in oil and gas production from reservoirs located in the shallow coastal waters adjacent to Prudhoe Bay. This had a corresponding increase in effects on coastal wetlands. Facilities have been constructed for the Lisburne and Endicott production units, both of which required extensive onshore infrastructures. Additional construction on the eastern edge of Prudhoe Bay will be required for the Niakuk production unit, if increases in the price of oil make the project feasible.

Most prospects for future oil and gas development in Alaska are on the Arctic coastal plain, in State coastal waters, or on the OCS. Interest in exploration and development is focused primarily on the 1.5 million-acre coastal plain of the Arctic National Wildlife Refuge. The Department has analyzed the environmental consequences of oil and gas development in ANWR. As a result, it is anticipated that regulatory mechanisms and controls similar to those at Prudhoe Bay would be in place for any development on the refuge. It has not yet been determined which Federal agencies will be responsible for regulating any development on ANWR, but responsibility is likely to be shared by EPA, the Corps, MMS, FWS, and the National Marine Fisheries Service.

There are a few new petroleum prospects west of Prudhoe Bay. Development of the shallow West Sak field⁸ will require closer

⁸West Sak is located near the Kuparuk and Milne Point fields.

well spacing, and therefore, more pads, roads, and pipelines. Expansion into adjacent Gwydyr Bay, Point Thompson, Seal Island (offshore), and the Colville River delta is likely, since the State has created units for these fields. Drilling on the western edge of the Arctic coastal plain, in the National Petroleum Reserve - Alaska, has not yielded commercially-recoverable petroleum reserves.

In the 5-year period from 1992 to 1997, the Department has scheduled 10 additional lease sales for the Alaska OCS Region. Two sales each are scheduled for the Beaufort and Chukchi Sea. Additional sales are planned for several other OCS areas in Alaska, although the industry's interest is most intense in the Beaufort and Chukchi Seas.

Until recently, oil and gas activities on the OCS or in Alaskan coastal waters have not significantly affected wetlands. There have been no producing wells in these areas, and thus no onshore infrastructure has been needed. With the increased industry activity on the OCS and in the coastal waters, wetlands will become more vulnerable. If the experience with the Endicott project is any indication of the environmental impacts associated with petroleum development in Alaskan coastal waters, significant wetland losses can be expected. Endicott required about 8 million cubic yards of gravel and other fill material to construct its infrastructure (a gravel causeway, drilling islands, roads, and gravel pits).

Currently, the price of gold has fallen below \$400/oz. The depressed market is reflected in the reduced number of permits issued for placer mining activities in 1989. When gold prices are down, the majority of placer operations are run by small scale and recreational miners. These small operations typically involve suction dredges working the substrate of streams and rivers or stripping relatively small riparian areas. Small placer operators tend to have more impact on instream habitats and fish. Although there may be less surface disturbance associated with these operators, because of their narrow profit margins regulators have been reluctant to impose much in the way of mitigation or rehabilitation requirements on them. Recently, however, small operators have shown a willingness to acknowledge the impact of their activities and discuss mitigation. They are receiving more pressure from regulatory agencies, land managers, and environmental groups to comply with regulatory standards.

There are only three or four major mining companies currently operating in Alaska, but for those placer operations with enough capital to discuss mitigation, progress has been made toward improving effluent discharges, increasing the number of settling ponds, recontouring of tailings, revegetation and restocking of riparian and stream habitats, and initiating studies of the time

period required for natural revegetation of mined areas (as opposed to active rehabilitation and revegetation). Again, there appears to be evidence that resource and regulatory agencies have tempered their approach based on their assessment of a company's financial status.

Largely through the increased enforcement efforts of the EPA and the Alaska Departments of Fish and Game, Environmental Conservation, and Natural Resources, both small and large scale placer gold operations are beginning to comply with water quality regulations.

RECOMMENDATIONS

1. Oil and gas industry:

a. Consider expanding the use of performance-bonds for the mitigation of wetland losses.

Performance bonds create an incentive for developers to complete work in a timely manner. In the event of noncompliance, the Government is relieved of the need to pursue costly enforcement action, and the bond provides a ready source of funding to restore the environment quickly. BLM already utilizes performance bonds on lands which it administers. To be fully effective, the bonds must be of sufficient magnitude to cover the cost of restoration in the event the standards are not met, together with any increased governmental administrative costs and penalties. Congress should consider whether a performance-bond approach could be utilized more widely in the wetland regulatory programs.

b. Strengthen the mitigation requirements in the regulatory programs to ensure adequate compensation for project impacts.

In granting 404 permits in Alaska, the Corps often exercises its discretionary authority and omits stipulations and conditions recommended by cooperating agencies to mitigate wetland impacts. There are procedures and techniques which could lessen wetland losses and environmental harm due to oil and gas activities in Alaska. Conducting the exploration phases of petroleum operations during the winter months, when the tundra is frozen and snow cover protects vegetation and other features of the terrain, will reduce wetland effects. Also, using ice instead of gravel for exploratory drilling pads and road construction is also less disruptive environmentally. To avoid cumulative impacts on tundra vegetation from ice road

construction, these facilities should not be allowed in the same location for two consecutive years.

Specific measures that would help to mitigate the effects of petroleum development on the Arctic coastal plain include: making greater use of existing onshore facilities to support offshore oil and gas exploration and development; making more extensive use of alternatives to gravel roads and pads that make tundra restoration more effective, e.g., gravel-timber-insulation; limiting the construction of new facilities and reusing gravel from abandoned facilities; accelerating the restoration of abandoned pads and roads; eliminating reserve pits by disposing of drilling muds through reinjection; more careful monitoring of culvert placement and retrofitting problem culverts to prevent flooding caused by poor placement of culverts; consolidation of facilities to limit the extent of construction on tundra; and requiring directional drilling and other extraction technologies that reduce wetland loss and degradation whenever technically feasible.

- c. Expand the joint industry-government efforts to develop more effective methods for restoring and rehabilitating damaged and degraded wetlands.**

In recent years, cooperative efforts between petroleum companies and State and Federal resource agencies have developed more effective methods for restoring wetlands through site reclamation and restoration. Recent efforts have successfully restored native vegetation to overburden material associated with gravel mining, e.g., Mine Site F in the Kuparuk oil field. Similarly, mine sites near the Dalton Highway (the Haul Road), have been restored to shallow ponds supporting pendent grasses. These successes suggest that increased cooperative efforts could lead to more effective methods for restoring damaged wetlands on the Arctic coastal plain.

2. Placer mining:

- a. Reduce the adverse effects of placer mining and increase the likelihood of post-mining reclamation through advanced planning.**

The adverse effects of placer mining on wetlands could be reduced by requiring mine operators to submit mining plans prior to initiating mining activities. At a minimum, plans should contain information on how operators intend to locate and extract mineral deposits. Wetland and other environmental effects could be greatly reduced, if mining

operations were confined to the mineral deposit sites and stream mining were prohibited for purposes of exploration. Increased use of settling ponds to maintain water quality would help to control environmental effects during mining, and make post-mining stream reclamation (including wetland restoration) easier and more effective.

b. Expand cooperative efforts to identify and reclaim wetlands that have been affected by mining activity.

Recently, local governments, State and Federal agencies, and the mining industry have begun a cooperative planning effort on the Nome River to restore the River and adjacent wetlands. Although only in the initial planning stages, this effort provides a framework for mitigating the adverse effects of placer mining activity.

REFERENCES

- Gould, Rowan. 1990. Oil and Gas Operations in Alaska. Background Report. Office of Program Analysis, U.S. Department of the Interior, Washington, DC, 6 pp.
- Rogers, John. 1990. Placer Mining in Alaska. Background Report. Office of Program Analysis, U.S. Department of the Interior, Washington, DC, 4 pp.

PART IV: THE EAST

Chapter 15: DELMARVA PENINSULA

INTRODUCTION

PHYSICAL DESCRIPTION: The Delmarva Peninsula is bounded by the Delaware Bay and the Atlantic Ocean on the east and the Chesapeake Bay on the west. (See Figure XV-1.) Three States...Delaware, Maryland, and Virginia...divide the peninsula politically. Due to the flat topography, especially between the Delaware Bay and the Chesapeake Bay drainages, runoff has been slow, forming a rich network of wetlands connected by perennial or intermittent streams. Fresh, brackish, and saltwater wetlands are threatened on Delmarva, but freshwater wetlands currently face the greatest pressure for development.

CHARACTERISTICS AND FUNCTIONS: Delmarva inland wetlands

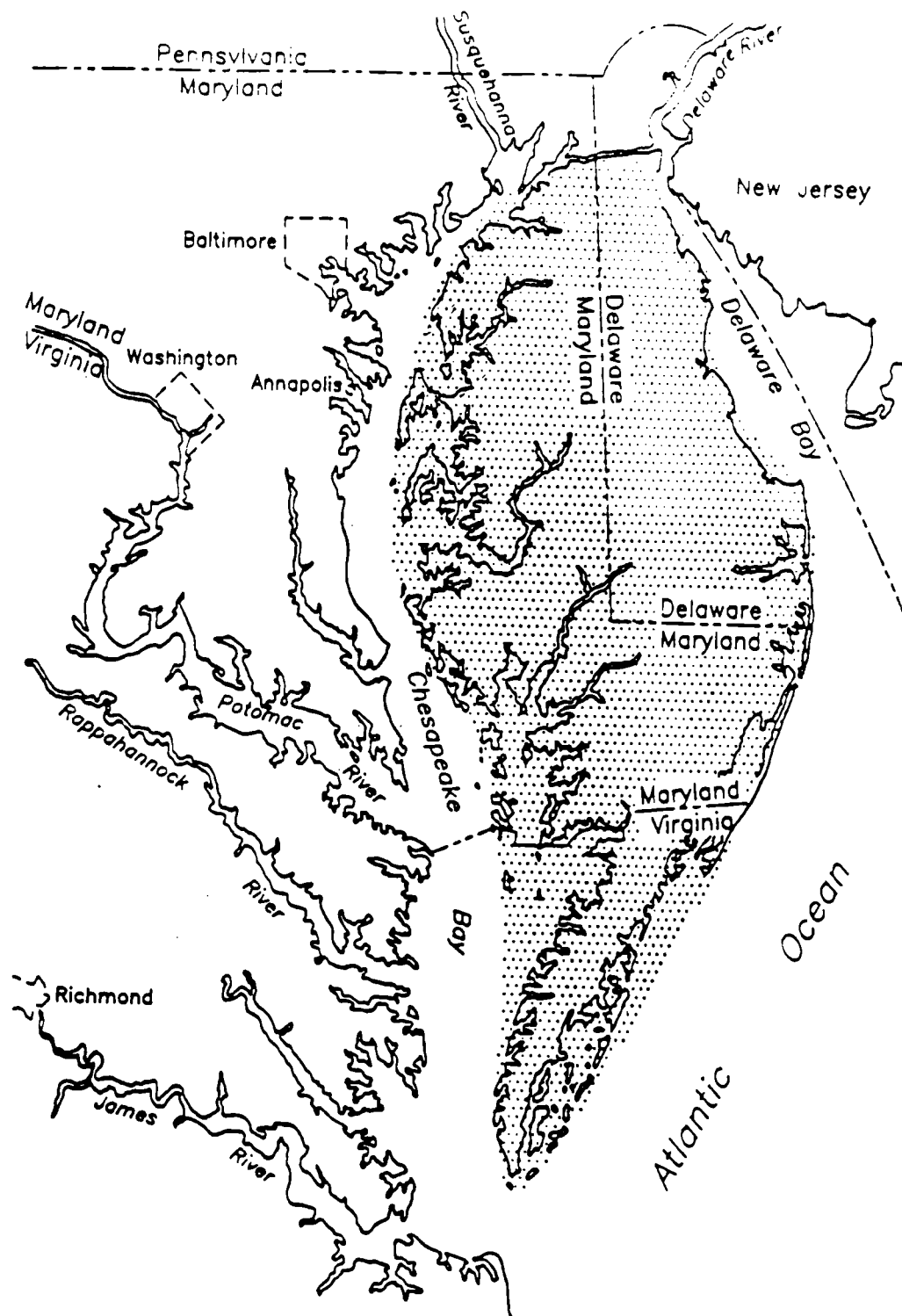
- o Intercept and filter sediments, fertilizer, and chemicals that otherwise runoff from agricultural land to the Chesapeake Bay causing eutrophication;
- o Detain and store flood waters, thereby reducing flooding in neighboring and downstream areas;
- o Serve as discharge areas from groundwater aquifers to maintain more regular baseflows, to supply downstream aquatic areas, and to offset the effects of drought on neighboring cropland;
- o Provide food and habitat, supporting the greatest diversity of species found on the Peninsula, including the endangered Delmarva fox squirrel.

ORIGINAL ACREAGE: Unknown.

CURRENT ACREAGE: Although figures are not available for the Delmarva Peninsula per se, Table XV-1 describes acreages in the three States and losses suffered between the mid-1950s and late 1970s.

TRENDS: Over the past 200 years, Delaware has lost approximately 257,000 acres of wetlands, 46 percent of its original complement; Maryland has lost over 1.21 million acres, 73 percent of its original wetlands; and Virginia has lost approximately 774,000 acres, 43 percent of the original acreage (Dahl 1990). Between the mid-1950s and the late 1970s, the average annual wetland loss

Figure XV-1: THE DELMARVA PENINSULA



in Delaware was 1600 acres, in Maryland 1000 acres, and in Virginia 3000 acres (Tiner and Finn 1986). The current rate of loss is unknown.

TABLE XV-1: Wetland Acreage and Losses in Three-State Area, mid-1950s to late 1970s

	Current Acreage	Inland Loss (percentage)	Coastal Loss
Delaware	216,000	18	2
Maryland	440,000	3	2
Virginia	1,000,000+	6	1

Source: Tiner and Finn, 1986.

FACTORS ADVERSELY AFFECTING WETLANDS

Although inland and coastal wetlands suffer from most of the same causes of loss, their relative importance differs. The loss of inland wetlands on the Delmarva Peninsula results primarily from agricultural activities. Drainage for agriculture and channelization of streams to carry surface water to Bay tributaries accounted for over two-thirds of the freshwater wetland losses. (See Table XV-2.) Next in importance is the creation of ponds and lakes for use by migratory waterfowl and cattle. Draining and filling for urban development is also a factor in inland wetland loss. The loss of coastal wetlands is caused primarily by draining and filling for urban development. The creation of impoundments is also an important factor responsible for the loss of coastal wetlands.

Drainage and channelization of streams often follows a common pattern. Forested freshwater wetlands are often cleared for timber sales, then ditched, drained, and converted to croplands. Streams are widened, deepened, and straightened to provide outlet channels to accommodate the increased water from drainage activities. Typically, conversion involves constructing a 16 to 20 foot maintenance road next to the channel. The construction destroys emergent and forested wetland vegetation along the edges of the waterways. After vegetation removal, spoil is placed on one or both sides of the channel on top of the previously wooded area, and grass is planted on the leveled spoil. Often the land is plowed for crops right up to the edge of the waterways. The loss of riparian vegetation eliminates the erosion control and water retention and filtering capacities once provided by the

wetlands. This impairs water quality in the Chesapeake Bay and its tributaries, degrading fish spawning grounds and nurseries. A policy of clearing and depositing spoil on just one side of a stream, establishing a minimal width for vegetative clearing, and replanting shrubs and trees instead of crops and grass would reduce some of the impacts of channel building.

**TABLE XV-2: Conversions of Freshwater Wetlands
in Three States**

	Delaware	Maryland	Virginia
	(percentage loss to)		
Agriculture	28	31	45
Channelization	54	33	27
Ponds & Lakes	5	27	25
Urban Development	12	8	3

Source: Tiner and Finn, 1986.

Ironically, channelization programs that serve to increase the flow of chemicals and nutrients into the Bay and its tributaries continue in the face of a \$390 million effort to clean up Chesapeake Bay, an effort designed primarily to reduce nonpoint runoff. The Federal Government along with the States of Maryland, Virginia, Pennsylvania, and the District of Columbia are attempting to stem the pollution by adopting rather expensive or hard-to-implement measures such as upgrading sewage treatment plants, reducing urban and agricultural runoff, and requiring practices to control soil erosion. However, the effort to restore the Bay does not address channelization, a well-documented source of the problem. The continuing channelization and drainage removes much water that, if held in reserve, could lessen the impacts of drought, a serious problem of late on the Delmarva Peninsula.

Once in place, the channels serve as convenient outlet ditches and promote additional farm drainage. These channels and ditches draw down the ground water and deplete the water in neighboring wetlands. Thus, the effect of the original channel construction extends well beyond the acreage originally intended.

After drainage and channelization, the construction of lakes, reservoirs, and ponds ranks as a factor in wetland demise. This occurs to provide habitat for waterfowl or a source of water for cattle or for sediment control. In the process, a broad expanse of shallow, slowly flowing water becomes a smaller, standing, deeper pool. These hydrological changes modify the flora and

fauna and further impair the pollution and flood control functions of the wetlands. Some coastal wetlands, too, are lost to the construction of freshwater ponds for migratory waterfowl.

Filling and dredging for urban development and creation of open water account for a substantial loss of estuarine wetlands. Filling occurs in order to build houses, business sites, industrial facilities, and highways, while dredging of shallow fresh and salt waters occurs to create access for private boats. In estuarine areas, bulkheading and filling accompany the dredging for boat access, adding to the shallow water losses. Dredging of ditches for mosquito control also eliminates estuarine wetlands, but this technique is rarely used now.

Section 404 of the Clean Water Act is designed to protect wetlands from environmentally unacceptable discharges of dredge or fill material (33 U.S.C. Section 1344(e))¹. As administered, Section 404 does not adequately achieve this goal. The Corps is unable to supervise its areas of jurisdiction with the resources at its disposal, and has been reluctant to assume the full scope of its protective responsibilities. In the past, the FWS and Corps have frequently disagreed about what constitutes a wetland. This problem was addressed on January 10, 1989, when EPA, the Corps, the FWS, and the Soil Conservation Service adopted a single method for identifying and delineating jurisdictional wetlands.² The change proved controversial, however, and in August, 1991, the Administration proposed changes to the Manual. Those changes proved equally controversial, and have not been finalized. In the interim, Congress directed the Corps, through the FY92 and FY93 appropriations bills, to revert to its 1987 wetlands delineation procedures for determining jurisdictional wetlands under section 404.

Section 404 was never intended to stop all wetland conversions. It allows for certain exemptions to the permit process.³ It also

¹The history of the Corps' role in wetland regulation is long and complex. The 1977 Amendments to the Clean Water Act, however, supplied extensive legislative history confirming the 404 program's role in wetlands protection. See Myhrum 1979 and Natural Resources Law Institute 1988.

²Federal Manual for Identifying and Delineating Jurisdictional Wetlands, January, 1989.

³Exemptions from permit requirements include some federal projects and activities with minor effects. Exempted minor activities are rather complex and have been rather narrowly construed. Some exempted activities include "normal" farming,
(continued...)

authorizes the Corps to issue general permits on a State, regional, or nationwide basis.⁴ For activities that require an individual permit, the Section 404(b)(1) Guidelines set a high standard when a "non-water dependent" activity is proposed for a "special aquatic site."⁵ The guidelines create two rebuttable presumptions for non-water dependent activities: i) that practicable alternative sites which do not involve discharges to wetlands are available, and ii) that such alternatives are less environmentally damaging than the proposed project.⁶ The Corps also engages in a more general public interest review in which it weighs the benefits that would reasonably accrue from a discharge against the reasonably foreseeable environmental effects. The Corps includes over 20 factors in its public interest review.⁷ The limits imposed on the Corps' public interest balancing by the 404(b)(1) Guidelines' presumption against wetland fills are not clear. The trend has been for the Corps to go along with the

³(...continued)

ranching, and forestry activities (but not establishing a new agricultural use), constructing and maintaining stock ponds or irrigation ditches (but not converting or significantly modifying wetlands or other aquatic areas), and constructing or maintaining farm, forest or mining roads.

⁴Categories of activities eligible for general permits include fish harvesting, bank stabilization, bridge building and minor road crossings. Classes of waters to which general permits apply include discharges in wetlands under 10 acres located above the headwaters of nontidal waters where streamflow is less than five cubic feet per second or in "isolated waters" not part of a surface tributary system. The authorizations for individual permits in isolated waters apply to some 17 million acres of wetlands, permitting about 40,000 discharges annually. They have proved quite controversial.

⁵Under the guidelines an activity is considered non-water dependent if it does not require access to, proximity to, or siting within a special aquatic site to fulfill its basic purpose. The guidelines list the following areas as special aquatic sites: wetlands, mud flats, vegetated shallows, riffle and pool complexes, sanctuaries and refuges, and coral reefs.

⁶The Corps will often limit its consideration of alternatives to granting or not granting a permit rather than exploring alternative projects. This may skew the public interest balancing towards the applicant's version of the purpose and need for the project (Natural Resources Law Institute 1988).

⁷These range from environmental concerns to energy needs to considerations of property ownership.

permitting decisions of State and local agencies, so if a State or local agency grants or denies a permit to a proposed project, the Corps tends to do the same with the 404 permit (Natural Resources Law Institute 1988). The FWS would like to see the criteria contained in the 404(b)(1) guidelines (especially the criterion having to do with nonwater dependent uses) be given greater weight in this highly flexible public interest balancing process.

FEDERAL PROGRAMS AND PROJECTS

Federal agricultural programs have had a major impact on the decline of inland wetlands and have promoted conversion of shallow wetlands to ponds for migratory waterfowl and cattle. Three Soil Conservation Service programs have had an effect on draining and channelizing activities that destroy wetlands directly through conversion to cropland. The PL-566 Program has had the greatest impact. The extent to which the Conservation and Operation Program and the Resource Conservation and Development Program induce conversion to cropland is not known. The Conservation and Operation Program also aids in conversion of wetlands to ponds. Agricultural price and income support programs, along with crop insurance, have also induced wetland conversion indirectly. Finally, federally insured mortgages, tax deductions for second homes, and flood insurance have offered indirect incentives to urban development. Urban development ranks after agriculture and pond construction as a contributing factor in the decline of freshwater wetlands, and is the most important factor in coastal wetland loss.

AGRICULTURAL PROGRAMS:

PL-566: The PL-566 Program provides technical assistance and construction money to local watershed management groups for small watershed drainage and flood control projects. This heavily subsidized program has been instrumental in changing the hydrologic regime and the ecology of the Delmarva Peninsula. Since its inception on Delmarva, over 1100 miles of PL-566 channels have been constructed in the Chesapeake Bay watershed alone. Over 341.4 additional miles have been authorized, but not yet constructed. In 1978 the SCS completed the Delmarva River Basin Survey which outlines a plan for promoting economic growth on the Peninsula and calls for drainage of about 411,000 more acres of wet cropland to maximize yields. Although wetland conversion is not a program goal, it is technically possible for the wet cropland drained under the program to revert to wetlands, and in the absence of the subsidized drainage, farm operators might ultimately find it financially unattractive to continue working the land and allow the reversion. The 1978 SCS plan for the Peninsula recommended building 5281 miles of outlet channels

that would provide drainage for 10,000 to 15,000 miles of on-farm ditches and tiles. Every mile of PL-566 channel constructed spawns several more miles of on-farm drainage ditches.

Incidental Drainage: SCS regulations implementing the Executive Orders on Wetland Protection and Flood Plain Management allow drainage of existing cropland, but not of wetlands. Wetland drainage that occurs "incidental" to draining cropland, however, is allowed and potentially introduces a way around the restrictions of Swampbuster, because "incidental" drainage can be significant. A channel through a wetland, for example, is permitted in order to drain existing wet cropland.

The proposed Upper Chester River Project illustrates the magnitude of wetland losses that can occur from "incidental" drainage associated with a PL-566 project. Under this project, the SCS and the State of Delaware would each channelize about 100 miles of stream. The on-farm ditching which would result from this project is estimated at 150 miles. Although these 350 miles of channels and ditches are designed to drain existing cropland only, the FWS estimates that more than 3100 acres of wetlands could disappear as a result of incidental drainage. The Federal Government has decided to withhold funds for this project, not because of the "incidental" impact on wetlands, but because it would increase grain production which the Administration seeks to reduce. Nonetheless, SCS will provide technical assistance for design and engineering of the drainage ditches, thus allowing the project sponsors to construct a somewhat smaller project.

Technical Assistance: Although SCS is not supposed to provide technical assistance for wetland drainage, assistance can be extended to landowners who intend to drain anyway, especially when denial of assistance could result in even greater environmental harm. The Fish and Wildlife Service has expressed concern about abuses of this policy and about personnel who disregard the regulations and continue to render technical assistance.

Consultation, Review, and Mitigation: From the point of view of the FWS, consultation and review under the PL-566 program is inadequate and has exacerbated the effects on wetlands:

- o Wetlands effects have been consistently underestimated. For example, an FWS study of the Upper Choptank River Project found that instead of destroying 1050 acres of wetlands as predicted in the EIS, 2778 acres disappeared, 2.5 times the prediction (Tiner and Finn 1986; Zinni 1986).
- o The SCS maintains that seasonally-flooded, freshwater wetlands are not high value wetlands, and does not mitigate for damages done to them. Such wetlands are valuable for

retaining flood waters for gradual release during drought periods and for reducing nitrogen loads into the streams and ultimately the Chesapeake Bay. The current mitigation policy provides an incentive to avoid other kinds of wetlands, but none to avoid seasonally flooded, freshwater wetlands.

- o The USDA Solicitor ruled (April 15, 1970) that PL-566 projects are not subject to the constraints of the Fish and Wildlife Coordination Act.⁸ Consequently, the FWS's review falls under National Environmental Policy Act authority, and occurs much later in the process when the alternative courses of action remaining are limited.
- o Section 12 of PL-566 acknowledges that the Secretary of the Interior can evaluate water projects and make recommendations to minimize adverse impacts to fish and wildlife. However, only those recommendations acceptable to local sponsoring agencies and the Secretary of Agriculture are implemented. Changes that would cost the local sponsors more money or decrease project efficiency are often not accepted. The Department would prefer to have PL-566 review occur under the authority of the Fish and Wildlife Coordination Act (FWCA). This would entail modifying the FWCA to require consultation for all projects receiving Federal financial or technical assistance. It would also be helpful to amend section 12 of PL-566, striking reference to recommendations agreed to by local sponsors and the Secretary of Agriculture.
- o During early project planning a range of options for water management problems are supposed to be considered by SCS and the project sponsors. Since 1975, for every PL-566 project proposed for Delmarva on which the FWS consulted, channelization was the only option given serious consideration. Adopting non-structural measures would reduce erosion and impacts on fish and wildlife. However, non-structural measures tend to be more expensive and not as efficient at removing water.
- o Scrutiny of SCS projects by Congressional subcommittees can be avoided if the Federal share of projects is kept under \$5 million. The SCS Administrator can approve projects up to \$5 million, while the SCS State conservationist can approve projects up to \$2 million.

⁸The FWCA applies to activities authorized or undertaken by a Federal agency. PL-566 projects are funded by SCS but not directly undertaken or authorized by it. Hence the ruling by the USDA Solicitor.

Benefit-Cost Analysis: The FWS is quite critical of the methods used to justify the economic benefits of proposed projects. The analyses exaggerate project benefits and manipulate calculations. Estimates for pre-and post-project yields are often not substantiated. It appears that unjustifiably low estimates of average pre-project yields account for the increased benefits. One USDA/SCS analysis of five PL-566 projects found that actual benefits ranged from 40 to 70 percent of the estimated values used to justify project funding (EcolSciences 1976). Moreover, because the Federal share of flood control projects has been 100 percent, while single purpose drainage projects receive only 50 percent, the classification of benefits has major financial implications for project sponsors. Most of the identifiable project benefits for SCS projects in the Delmarva area have been classified as joint benefits. This results in a Federal cost share of 75 percent, even though economic analyses indicate that flood reduction benefits usually cannot be justified economically and overall project benefits stem primarily from improved crop yields. This accounting procedure creates an attractive financial proposition for local beneficiaries who pay only 25 percent of the construction costs.

Future of PL-566: On direction from the Secretary of Agriculture, the Director of the SCS issued a Watershed Planning Guidance Letter on June 18, 1987 halting new starts for PL-566 drainage projects designed to increase crop production. This policy, to be incorporated into the National Watershed Manual, was adopted following the controversy surrounding the Upper Chester River Project. That project would have used Federal funds to drain land for surplus crops, crops that would have been eligible for Federal price and income supports. Some believe that this letter heralds the gradual demise of the PL-566 drainage program. Indeed, SCS construction activities have declined since the letter. Nonetheless, Section 622 of the House Appropriation Bill (H.R. 2882) states that in fiscal year 1990 the Secretary of Agriculture "shall initiate construction of not less than 20 new projects" under PL-566.⁹ The Senate and the President may take a different approach to PL-566 funding, but the House action indicates that interest in the program is still keen.

Even in the absence of Federal construction, a considerable Federal investment can still occur in the form of technical assistance as demonstrated by the Upper Chester River Project.

⁹The House bill would appropriate \$12.5 million for river basin surveys and investigations (research), \$8.9 million for watershed planning (technical assistance), and \$182 million for flood prevention (cost-sharing construction activities). The potential impact on wetlands, however, is unknown.

Technical assistance is being proffered in Delaware, for example, where localities are paying construction costs and where State regulations restricting drainage are lax. It is less common in Maryland where regulations do not prohibit drainage, but do require a great deal more documentation as to the effects. The guidance letter may not be the final word on the PL-566 program, because the meaning of "new starts" is ambiguous. It could be interpreted to mean only new planning starts or new funds for previously approved projects. Furthermore, even if technical assistance and new starts, broadly construed, were curbed, the change in PL-566 stems not from statutory law, but merely from a guidance letter written by the Director of the Soil Conservation Service. Without a change in Departmental regulations, a new Secretary of Agriculture could quickly reverse policy.

Conservation and Operation Program: Under this program, by far SCS's largest, individual farmers receive technical assistance on maintaining soil productivity through conservation measures, "wetland improvement" for waterfowl, and drainage for cropland.¹⁰ On Delmarva where the level of program activity is significant, farmers generally believe poor natural drainage limits productivity. Hence, technical assistance aims to lower the groundwater tables and increase channel outlet capacity. Occasionally this type of assistance includes not only existing cropland but small isolated wetland areas. The aggregate wetland acreage lost from all of these isolated occurrences remains undocumented, but the FWS believes it to be significant.

Agricultural Cost-Share Program: The Agricultural Cost-Share Program, administered by the Agricultural Stabilization and Conservation Service, allocates funds to farmers for the installation of conservation measures suggested through the SCS technical assistance program. A State committee decides on the eligibility of measures for State cost sharing, and county committees select measures from the State list. The State list includes on-farm drainage ditches or tile drainage as legitimate cost sharing items. These are entirely private activities, and their subsidization is difficult to justify. Currently only drainage of existing cropland is approved, but incidental drainage of wetlands occurs. Moreover, by reducing drainage costs on existing cropland, a farmer can better afford small drainage measures on wetland areas.

¹⁰Although agriculture is the primary target of assistance, any individual may request assistance for any problem within SCS's range of expertise. In some urban areas, for example, SCS expends much effort reviewing stormwater management plans for new subdivisions.

Resources Conservation and Development Program: This program offers technical and financial assistance to local sponsors in designated project areas. The activities funded under this program are typically smaller than under PL-566 and include recreational development, erosion control, and drainage projects. The Federal cost-share ranges from 50 to 80 percent. The budget for new projects has declined sharply in recent years.

Commodity Programs: Price and income supports have made it more attractive to convert wetlands to cropland, but in general the level of program participation on Delmarva has been low. Because Swampbuster's effectiveness depends on the withholding of programmatic benefits, the low participation rates in the commodity programs on the Delmarva Peninsula means that Swampbuster's forcefulness is diminished here.

As discussed in chapter 3, legislative reforms in the 1985 and 1990 Farm Bills have made it much more difficult for new acreage to qualify for price and income supports, and hence, have significantly diminished the incentives in Federal agricultural law to convert wetlands to cropland. As with Swampbuster, however, the traditionally low participation rates in the commodity programs on the Delmarva Peninsula means that the diminished incentives in the law will not significantly reduce the threat of conversion for wetlands on the Peninsula.

Crop Insurance: The Federal Crop Insurance Corporation (FCIC) or private insurance companies that the Federal Government reinsures offer crop insurance that protects farmers from the risk of drought, flood, fire, and insects. Farmers are supposed to buy the insurance to be eligible for disaster relief. Figures for the Maryland portion of Delmarva indicate a 20 to 25 percent participation rate in the crop insurance program which is about the national average.¹¹ FCIC data for Delaware for 1987 show only a 5.4 percent participation rate (GAO 1988). Premiums paid by farmers do not cover the cost of the insurance offered. The Government subsidizes this insurance by paying all administrative costs and up to 30 percent of a grower's insurance premiums. One possible explanation for the relatively low level of participation is the expectation by farmers that the Government will provide disaster relief even though crop insurance is supposed to be a prerequisite to receiving disaster relief.¹² Phasing out the premium subsidy and holding firm on the policy to

¹¹Telephone communication with the Maryland office of the FCIC.

¹²One suggestion for increasing participation rates is to require crop insurance coverage by participants in the price and income support programs.

deny disaster relief to those not covered by crop insurance would provide a strong incentive for farmers to find other ways to control risks. These could include wetland enhancing measures such as not planting in floodplains and other wetland areas and retaining and restoring riparian vegetation to slow and gradually release floodwaters.

Programs Promoting Conversion to Water Impoundments: As noted above, conversion of inland and coastal wetlands to ponds is a significant source of wetland loss. Several programs are involved. The Conservation and Operation Program offers technical assistance for "wetland improvement" for waterfowl, while the Agricultural Cost-Share Program provides funds for activities approved by State and county committees. Funds for ponds are approved by the State and by some counties as a means to retain sediments. The ASCS will pay for 50 percent of construction costs for sediment control ponds.¹³ The Resources Conservation and Development Program offers funds for recreational development. Thus, Federal funds contribute not only to wetland conversion to agriculture, but also conversion to ponds.

URBAN DEVELOPMENT: Mortgage insurance provided by the Federal Housing Administration and the Veterans Administration promotes investments by financial institutions in mortgages for residential construction. By requiring less money down and lower interest rates than conventional loans, these programs increase the demand for housing, intensify the pressure for dredge and fill permits, further construction activities, and lead to greater flood control activities. Flood insurance and reinsurance for buildings and their contents, including homes and businesses, is available through the Federal Emergency Management Agency, offering coverage the private sector is generally not willing to underwrite. Although the precise impact of these programs in promoting urban development on Delmarva is not known, population pressure in the area is great. Between 1990 and 1994, population is estimated to increase by 19 percent in the Bay watershed; estimates for Delmarva are even higher, with increases ranging from 20 to 25 percent.

Federal highway funds also pose a threat to wetlands directly and indirectly by the development they promote. Maryland has initiated extensive highway redevelopment plans to enhance access to coastal areas. The "Reach the Beach" program includes major upgradings of Route 50/301 on Kent Island, a new Kent Narrows high bridge, upgrading Route 50 to Route 404, the new Choptank River Bridge, the Vienna Bypass, the Salisbury Bypass, upgrading

¹³ASCS contribution limited to \$3,500.

Route 404 and numerous improvements to major roadways leading from the western shore to the Bay Bridge.

STATUS AND PROSPECTS

Stream channelization and agricultural conversion (much of it prompted by the channelization) have had the greatest impact on wetland loss and water quality on Delmarva. Swampbuster may reduce some agricultural conversion. Yet, much of the Delmarva cropland is devoted to corn for the poultry industry. Many of their operations are integrated. Perdue Farms, for example, will raise some of its own corn, feed it directly to the chickens, and not participate in the commodity programs. The company might also enter into agreements with area corn growers, who would then not find the commodity programs attractive. In both cases, the effectiveness of Swampbuster to restrain wetland loss is diminished by the lack of commodity program participation. Similarly, the low participation rate in the commodity programs renders ineffective (from the point of wetland conservation) the increased difficulty in the 1985 and 1990 Farm Bills of adding to acreage eligible for program benefits.

The Guidance Letter issued by the Director of the SCS has prohibited new planning starts for PL-566 drainage projects designed to increase crop production. This may portend the demise of the PL-566 drainage program. The House, however, continues to appropriate funds for the program and USDA regulations remain unchanged by the letter. Pressure to drain wet croplands remains strong on Delmarva, and so the tendency may be to construe the letter narrowly. Moreover, a guidance letter is easily rescinded. In addition, technical assistance for locally funded drainage activities continues unabated, checked only by the stringency of State regulations. The budget for the smaller scale Resource Conservation and Development Program has also declined in recent years, but as with PL-566, a resurgence cannot be ruled out.

The construction of ponds for waterfowl and cattle can be expected to increase. The States of Maryland, Delaware, and Virginia all have programs to assist private landowners in developing waterfowl ponds. Maryland offers tax breaks for those who enter their program. The Soil Conservation Service is also very active through their Conservation and Operation Program in providing technical assistance to landowners for waterfowl ponds, usually located in freshwater wetlands. The Department believes that Federal funds and technical assistance should not be available to convert freshwater or tidal wetlands to waterfowl or sediment control ponds.

Urban and recreational development are likely to increase on Delmarva, and lead to further pressures on coastal wetlands in particular. Federal funds for highways will promote these developments. The Coastal Barrier Resources Act has slowed development on undeveloped barrier islands on the Atlantic and Gulf Coasts.¹⁴ The Coastal Barrier Improvement Act of 1990 significantly expanded the Coastal Barrier Resources System (System), including 36 secondary barriers in Maryland and 47 in Virginia in the Chesapeake Bay. The expansion of the System included associated aquatic habitats¹⁵ and secondary barriers, i.e., barriers not directly on the ocean such as those within major embayments like the Chesapeake. These additions should further reduce development affecting Delmarva's coastal wetlands.

RECOMMENDATIONS

1. Water Management:

- a. Eliminate, by statute, the PL-566 drainage and Resource Conservation and Development drainage programs.**

Channelization aided by these programs is the single greatest cause of wetland loss on Delmarva. But by destroying the streamside vegetation and straightening streams, channelization also increases downstream flooding, generating calls for more channels. The loss of vegetation and temporary, isolated wetlands also increases the impact of drought. Moreover, without the filtering vegetation, agricultural runoff and eroded soil flow into the waterways, impairing the water quality of the Chesapeake Bay and Eastern Shore tributaries and leading to declines in fisheries and waterfowl habitat.

- b. If the above recommendation is not implemented, the PL-566 program should be legislatively modified so that recommendations by the FWS are accorded greater weight in the planning and mitigation processes.**

¹⁴The CBRA requires that to be included in the system, coastal barriers be a minimum of one quarter mile of shoreline in length and that they be largely undeveloped from the beach to the inland side.

¹⁵The original units of the Coastal Barrier Resources System included only a minimum number of associated aquatic habitats (adjacent wetlands, marshes, estuaries, inlets, and near-shore waters).

As currently structured, the PL-566 program allows for Service review under the National Environmental Policy Act, which comes late in the planning process, but not for review under the Fish and Wildlife Coordination Act, which would come much earlier. Moreover, only recommendations acceptable to the Secretary of Agriculture and the local sponsoring agencies are implemented. Alternative forms of water management to channelization are rarely considered seriously. Finally, damage to seasonally flooded wetlands that have important flood control and pollution control benefits are not mitigated under SCS policy.

- c. Develop a wetland restoration and development program to reestablish wetlands altered or destroyed as a result of PL-566 drainage projects.**

The Water Resources Development Act of 1986 has set a precedent for wetland restoration and mitigation of losses and degradation due to past Federal activities. Thus far, monies have not been appropriated, although they have been requested to aid in the restoration of the channelized Kissimmee River in Florida to its original riverbed. Selective restoration could prove a cost-effective method of dealing with flooding, drought, and water quality problems.

- d. Eliminate Federal funding and technical assistance for the conversion of freshwater or tidal wetlands to ponds for waterfowl, sediment control, or cattle.**

The construction of ponds ranks high as a factor causing the loss of freshwater and coastal wetlands on Delmarva. The States and Federal Government are promoting this practice. Maryland, Delaware, and Virginia all have programs to assist private landowners in developing waterfowl ponds. Maryland offers tax breaks for those who enter their program. The Soil Conservation Service is also active through the Conservation and Operation Program by providing technical assistance to landowners for waterfowl ponds. The increase in waterfowl habitat is coming at the expense of pollution and flood control benefits offered by naturally occurring wetlands.

2. Agricultural Programs:

Phase out the premium subsidy for crop insurance and insist on compliance with the policy requiring a farmer to have crop insurance in order to receive disaster relief.¹⁶

The Federal Crop Insurance Corporation or private insurance companies that the Federal Government reinsures offer crop insurance that protects farmers from the risk of drought, flood, fire, and insects. Farmers are supposed to buy the insurance to be eligible for disaster relief. Figures for the Maryland portion of Delmarva indicate a 20 to 25 percent participation rate in the crop insurance program, which is about the national average. Premiums paid by farmers do not cover the cost of the insurance offered. The Government subsidizes this insurance by paying all administrative costs and up to 30 percent of a grower's insurance premiums. One possible reason for the relatively low level of participation is the expectation by farmers that the Government will provide disaster relief even though crop insurance is supposed to be a prerequisite to receiving disaster relief. This expectation has been reinforced frequently. Withholding disaster relief unless crop insurance was acquired could provide a strong incentive for a farmer to find more environmentally sound ways of controlling risks, such as not planting in floodplains and other wetland areas and retaining and restoring riparian vegetation to slow and gradually release floodwaters.

3. Regulation:

Develop more explicit and stringent guidelines to limit the discretion of the Army Corps of Engineers in permitting activities that are not water dependent and have negative wetland impacts.

When reviewing those activities that require an individual permit, the section 404(b)(1) guidelines contain a presumption against wetland alterations for, among other activities, nonwater dependent uses (40 CFR Sections 230.10 and 230.3). The Corps, however, engages in a more general public interest review involving weighing the benefits that

¹⁶The Congressional Budget Office estimates that eliminating the premium and administrative subsidy for crop insurance from 1990 through 1994 would save \$1.2 billion. The probable savings resulting from a reduction in expenditures for disaster relief are not included in these estimates.

would reasonably accrue from a discharge against the reasonably foreseeable environmental insults. The Corps includes over 20 factors in its public interest review. The limits imposed by the 404(b)(1) guidelines' presumption against wetland fills on the Corps' public interest balancing are not yet clear. Interpretation and implementation of 404 vary widely among Corps districts. The trend has been for the Corps to concur with the permitting decisions of State and local agencies, so if a State or local agency grants or denies a permit to a proposed project, the Corps tends to do the same with the 404 permit. Wetland losses could be significantly reduced if the criteria contained in the guidelines, especially the criterion having to do with nonwater dependent uses, were given greater weight in the public interest balancing that takes place.

REFERENCES

- Dahl, T.E. 1990. Wetlands Losses in the United States, 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC, 13 pp.
- EcolSciences. 1976. An Assessment of Economic and Environmental Effects of Completed PL-566 Channel Modifications Projects in Worcester and Wicomico Counties, Maryland. USDA-SCS College Park, Maryland, 433 pp.
- Hall, T. N. 1985. Impact of Agricultural Drainage Activities in Coastal Flats Region of the Chesapeake Bay. Wetlands of the Chesapeake--Proceedings, 389 pp.
- Jones, M. Claudia, Timothy N. Hall, and Robert L. Zepp, Jr. 1986. Agricultural Drainage and Wetland Loss on Delmarva. Background Report. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 20pp.
- Myhrum, 1979. "Federal Protection of Wetlands Through the Legislative Process," 7 B.C. Env'tl. Affairs 567, 620-625.
- Natural Resources Law Institute. 1988. "A Guide to Federal Wetlands Protection under Section 404 of the Clean Water Act," Anadromous Fish Law Memo, Issue 46. Lewis and Clark Law School, Portland, Oregon, August.
- Tiner, R. W., Jr. and J. T. Finn. 1986. Status and Recent Trends of Wetlands in Five Mid-Atlantic States: Delaware, Maryland, Pennsylvania, Virginia, West Virginia. U.S. Fish and Wildlife Service, Newton Corner, Massachusetts and U.S. Environmental Protection Agency, Philadelphia, Pennsylvania, 40 pp.
- U.S. Congressional Budget Office. 1989. Reducing the Federal Deficit: Spending and Revenue Options, A report to the Senate and House Committees on the Budget--Part II, as required by P.L. 93-344, 1989 Annual Rept. Government Printing Office, Washington, DC, February.
- U.S. General Accounting Office. 1988. Crop Insurance; Participation in and Costs Associated with the Federal Program. U.S. General Accounting Office, Washington, DC, July.
- Zinni, W. 1986. Unpublished staff analysis. U.S. Fish and Wildlife Service, Newton Corner, Massachusetts.

Chapter 16: NORTH CAROLINA...THE POCOSINS AND OTHER FRESHWATER WETLANDS

INTRODUCTION

PHYSICAL DESCRIPTION: North Carolina's freshwater wetlands consist of pocosins, non-alluvial swamp forests, white cedar swamps, Carolina Bays,¹ bottomland hardwoods, and wooded swamps. The name "pocosins" means "swamp-on-a-hill" in the Algonquin Indian language. Seventy percent of the nation's pocosins are found in North Carolina, and they comprise approximately 50 percent of the State's freshwater wetlands. Found in the southeastern Atlantic coastal plain, pocosins are nutrient-poor, forested or shrub wetlands that evolved over the past 10,000 years due to blocked drainage and peat accumulation. The depth of the organic material ranges from 8 inches to more than 51 inches. The water table is near the surface from 6 to 12 months each year, and in winter sometimes rises above ground. Water moves slowly as sheetflow across the surface towards the fragile estuary.

CHARACTERISTICS AND FUNCTIONS: North Carolina pocosins

- o Serve as the last refuge for many upland and floodplain species requiring large blocks of habitat, especially area-sensitive, forest-interior birds and the black bear;
- o Provide important habitat for four federally-listed endangered species and one federally-listed threatened species. Two other State-listed endangered are also found there;
- o Stabilize estuaries by controlling the rate of freshwater flow thereby regulating salinity. Much of the State's \$63 million commercial fishery depends on this estuarine regime;
- o Contain 6 National Wildlife Refuges, 1 national and 2 State forests, 7 State parks, 5 State game lands, and 2 State natural areas. About 18 percent is owned by Federal and State forestry agencies.

ORIGINAL ACREAGE: North Carolina is estimated to have had about 2.5 million acres of natural pocosins.

¹Elliptical depressions from 200 feet to 5 miles long which are generally oriented northwest to southeast.

CURRENT ACREAGE: By 1980, only about 695,000 acres (31 percent) remained in its natural state. A third of the original acreage had been totally converted, and 36 percent had been partially altered or was scheduled for development by the owners. (See Figure XVI-1.) Some of the pocosins that were threatened with development in 1980, however, were ultimately purchased by or donated to the FWS to become part of the Alligator River National Wildlife Refuge and Pocosin Lakes National Wildlife Refuge. In addition to those pocosins in these two refuges, approximately 363,000 acres of pocosins currently receive some level of protection as natural areas, although some of these have been partially altered.

TRENDS: By the late 1940s, about 90 percent of the original acreage remained. Since the 1950s, forestry and drainage for agriculture have caused a steady decline, interrupted by some small gains due to reforestation.

FACTORS ADVERSELY AFFECTING WETLANDS

To date conversions for forestry and agriculture have had the greatest impact on the area's wetlands. Under current (1988) economic conditions, however, the opportunities for profitable conversion and development of these wetlands for silviculture or agriculture are limited. Using simulation models the Department examined the investment decision to clear and drain undeveloped pocosin wetlands in North Carolina for agriculture or silviculture. The simulations allowed for analyses of the influence of Federal incentives, policies, and programs on the rate of return and riskiness of conversion. The analysis for both forestry and agriculture indicated that the returns to developing pocosin wetlands for these purposes were low even in the presence of sizable Federal incentives and subsidies (Danielson 1988 and Noffsinger et al. 1987).

Mining the Pocosins for peat, however, poses a serious threat. Although shallow peatlands are suitable for silviculture and agriculture, deep peatlands are not. After clearing, however, the peat can be mined, and the land used subsequently for either tree farms or agricultural crops.

Development has had a number of environmental effects. Wildlife habitat has been seriously fragmented. The remaining "islands" support less species diversity in fewer numbers. Thousands of contiguous acres are required for forest interior bird species and the black bear to survive. Drainage systems interrupt the sheetflow that moves slowly across the wetland surface. Under natural conditions the runoff rises slowly after storms, often peaking several days after the rain. This process modulates the flow of water and controls the salinity of receiving waters.

Figure XVI-1: POCOSIN WETLANDS OF NORTH CAROLINA, 1980



XVI-3

Nutrients, pollutants, and silt from agricultural runoff are filtered, as well. Once drainage is installed, peak and annual flows increase, and pulses of freshwater containing increased loads of chemicals and sediments are discharged into streams, marshes, and shallow estuarine nursery areas.

Over 90 percent of North Carolina's commercial fish harvest depends on the estuaries. Comparisons show that unaltered areas maintained stable salinity, while areas which received drainage from ditched pocosins and non-alluvial swamp forests had salinity which varied by 100 percent over short periods of time. The altered areas produced fewer shrimp, finfish, and oysters. Other studies have linked agricultural drainage to excessive algal blooms and food chain disruptions. Studies of the Chowan River, which flows into Albemarle Sound, have linked increased nutrient loads from agricultural drainage and point source discharges to excessive algae blooms, subsequent food chain disruptions, and red sore disease problems. In 1976, about 95 percent of the white perch and half of the commercial fish caught in Albemarle Sound was discarded due to lesions.

Forestry: The Southern United States has become the wood basket of the nation and is expected to remain so for the next quarter century. North Carolina, situated near the largest United States and European markets, has a transportation advantage over other southern areas. Moreover, the flat, expansive pocosins are conducive to site preparation, plantings, and harvesting. Timber companies own about 44 percent of the remaining undisturbed pocosin lands in North Carolina. Obviously these companies will play a key role in determining the future of these lands. Presently (1988), the forestry industry is depressed, but long-term, worldwide expectations are for growing wood scarcity and increasing timber prices.

Agriculture: Agriculture has been the major factor in wetland conversion in the past, particularly during the mid-1970s, when high farm product prices and increasing cropland values offered large incentives to clear and drain pocosins for corn, soybeans, and wheat. A renewal of large-scale agricultural conversions is unlikely until the agricultural economy improves. In 1981, about 21 percent of remaining pocosins were in the hands of large, corporate, often absentee landowners (Richardson et al. 1981). The concentration of ownership has decreased recently due to the dissolution of First Colony Farms which had large pocosin landholdings. Although the market has momentarily slowed the rate of conversion, runoff from past conversions continues to degrade wetland quality.

Peat Mining: Peat mining is likely to pose a significant threat to pocosin wetlands in the future. Lands that may be considered vulnerable include the 100 square miles of peatland in the Dismal

Swamp area, the 40 square miles of peatland in the Croatan Forest, privately owned peatlands on the Albemarle-Pamlico area, and the 350 square miles in the Carolina Bays scattered throughout the coastal region. The ditching and draining of peatlands would contribute to unstable salinity conditions, and the lowered levels of ground and surface water could increase fire frequency.² Peat oxidation could release nutrients and heavy metals normally bound in the soil, thereby degrading water quality and aquatic habitats. Clearing and harvesting will increase peat erosion causing increased turbidity in surface waters. Reclaiming peat-mined lands for agriculture would further degrade water quality, and permanently destroy wildlife habitat benefits.

Environmental protection for the Pocosins was strengthened with passage in 1986 of fairly restrictive peat mining regulations by the State. Most notably, the regulations require that any peat mining project must include controls that produce runoff which closely approximates that which would have occurred had the site developed naturally to vegetative maturity. While these regulations are forceful in their treatment of discharges and in reducing adverse impacts to water quality, they fail to address mitigation for wetland losses or degradation due to peat mining.

Peat can be mined to produce methanol, electric power, briquettes, and a horticultural soil. If peat is to be a viable source of energy, it must compete favorably with coal, hydropower, wood, and other biomass products. Peat competes well in areas in the U.S. and other countries where the cost of traditional energy sources is high, where high quality peat is available at a relatively low price, and where government has provided subsidies for research, development, and production. The Federal Government sponsored millions of dollars of research on peat and other biomass products for energy between the mid-1970s and early 1980s.

Feasibility studies by the Electric Power Research Institute and by consulting research firms have generally found that North Carolina peat could compete favorably in the production of methanol and electricity. In 1981, peat methanol was found to be competitive at a price of 75 cents per gallon of methanol. Since then, natural gas prices have fluctuated. Between 1981 and 1985, wellhead prices rose nearly 27 percent making peat methanol even more competitive. Natural gas prices have declined since 1985 to just below 1981 levels. In 1983, the cost of producing electricity from coal was found to be 5 to 14 percent higher than from peat at a coastal North Carolina site. Although peat mining

²Dry peat ignites easily, and once burning, the fire is difficult to extinguish.

for methanol and electric power have not proceeded beyond test stages in North Carolina, State permitting agencies have received several formal proposals.³

Small Water Projects: Small watershed projects to aid agriculture through flood control destroy bottomland hardwood wetlands. Reservoirs are built and channels are dredged, enclosed in levees, snagged, and cleared to prevent flooding and to improve drainage on wet croplands. Channelization, in particular, reduces the functional values of adjacent wetlands by interrupting the water interchange between the stream and the floodplain. Alluvial wooded swamps and bottomland hardwoods suffer from lack of water, and direct wetland loss occurs from spoil placed along the channel. Once a channel is in place, it provides a ready outlet for additional drainage.

The effects of channels are often underestimated. When Joyce Creek in Camden County was deepened by about 2.5 feet, the Army Corps of Engineers projected no significant negative impacts. The project was completed in 1983. Following heavy rains in February, 1984, the area did not flood, while surrounding swamps did. Essentially all of the hydrological interaction between the channel and the 750 acres of adjacent wetlands were eliminated by the project.

Transportation: Between 1984 and 1987, an average of 82 acres per year of mostly bottomland hardwoods disappeared as a direct result of transportation projects. This figure does not include secondary and indirect losses due to the additional development fostered by roadways, e.g., subdivisions. Similarly, it does not include wetland losses that have occurred because the proposed project met the conditions of various nationwide general permits authorized under the Clean Water Act.⁴ Two transportation-related, nationwide permits which affect wetlands in the Pocosins are Nationwide Permit Number 14 - Minor Road Crossing and

³For example, White Tail Farms applied for permits to mine peat on approximately 5,918 acres in Hyde County to fuel a gasification and cogeneration facility. First Colony Farms proposed mining 15,000 acres in a three-county area south of Lake Phelps for electric power generation. Although in these cases environmental concerns and/or financial problems have delayed or led to termination of the proposed projects, other prospective developers have remained interested.

⁴In an effort to manage its workload, the Corps of Engineers has issued several "nationwide" permits...general authorizations to proceed with proposed activities without full review by the Corps or the resource agencies. This action is in accordance with section 404(e) of the CWA.

Nationwide Permit Number 26 - Headwaters and Isolated Wetlands. Thus far, planning and mitigation have not adequately stemmed the rate of loss.

Regulation: The 404 regulatory program had a turbulent administrative and judicial history in North Carolina during the past few years. The Corps's jurisdictional decisions⁵ became controversial, eliciting objections from the FWS and ultimately resulting in two lawsuits being filed by environmental groups against both the Corps and EPA...the Corps for finding that the wetlands in question were nonjurisdictional and EPA for not exercising its power to overrule the Corps. The courts found against both agencies; for a period of time, EPA took over the responsibility for making pocosin jurisdictional calls; and in January, 1989 the regulatory and resource agencies agreed to a single methodology for identifying wetlands. The program that has emerged from this turmoil appears transformed, and the FWS is optimistic that EPA's and the Corps's current diligence will preclude a recurrence of past problems with jurisdictional decisionmaking. (For a fuller discussion of this history see the subsection entitled "Enforcement of 404" in the next section.)

Concerns remain with other aspects of the 404 program, however:

- o In 1987, the FWS reported a number of apparent wetland fill violations to the Corps. These were never investigated, and the lack of enforcement may have encouraged greater disregard for the law.
- o Frequently, FWS recommendations to the Corps to condition permits, to consider the secondary and cumulative impacts of projects, or to require sufficient mitigation are not adopted.
- o Although agricultural conversions in the Pocosins have decreased in recent years, there has been a countervailing increase in proposals for nonagricultural development. The 404(b)(1) guidelines, which emphasize water dependency as an important criterion for granting a permit, may have been violated. Housing developments, parking lots, and mobile home courts constructed in wetlands attest to the manner in which the Guidelines have been applied.
- o Finally, the cumulative loss of wetlands under nationwide permits, particularly permits for isolated and limited-flow

⁵Findings as to whether proposed development sites are wetlands which fall under the purview of the Clean Water Act, and hence should be subject to agency scrutiny under the 404 process.

(headwater) wetlands remains troubling. Headwater wetlands serve important water-quality functions for fish and wildlife. The proportion of wetlands represented by headwater and isolated wetlands in North Carolina is significant, and thus continued losses could have a profound effect on fish and wildlife resources.

FEDERAL PROGRAMS AND PROJECTS

Several Federal programs provide economic incentives that encourage the loss of freshwater wetlands in North Carolina. These programs relate to silviculture, agriculture, flood control, peat mining and transportation.

FOREST PRODUCTS INDUSTRY: The Forest Service (USFS) manages national forest lands that contain wetlands, and in the past has proposed draining 5,370 acres of the Croatan National Forest, including 2,867 acres of pocosins, for conversion to a loblolly pine plantation. The plans also considered peat mining. In response to negative public comments, the Final Management Plan for the Croatan omitted drainage proposals and banned peat mining. The Fish and Wildlife Service has expressed concern that drainage may be occurring on other National Forests in North Carolina and that proposals for drainage in the Croatan may resurface.

Three Federal incentive programs have increased the profitability of forestry on private lands:

- o First, the Federal Government shares the costs of replanting after harvest. In 1986 the Federal Government paid 40 percent of the qualifying reforestation expenses up to a maximum of \$10,000 per non-corporate private landowner per year. The Department estimates that in the Pocosins this provision reduces the reforestation costs of an average forest landowner by about \$100 for each reforested acre, and increases the rate of return from clearing and draining wetlands for forestry by about 18 percent. In 1987, this subsidy was increased: the percentage of qualifying reforestation expenses paid by the Federal Government climbed from 40 to 50 percent.
- o Second, a percentage of replanting costs for corporate and non-corporate landowners (up to a \$10,000 limit) can be used as a deduction against current taxable income to encourage replanting. This tax code provision is contrary to the general requirement that such costs be capitalized. Thus, the replanting costs can be deducted from current income many years before the revenues are earned from harvesting and selling the trees. The Department estimates that this

provision shields about \$135 of income from taxes for each reforested acre in North Carolina.

- o Third, prior to passage of the 1986 Tax Reform Act (TRA), 60 percent of net income derived from the sale of long-term assets (capital gains) could be exempted from taxable income. The TRA eliminated this provision, but Congress is considering reinstating the differential taxation of capital gains.

Subsidies and tax concession are often a two-edged sword, and these for silviculture are no exception. In the Pocosins and a number of other natural areas, these programs and provisions induce forestry and timbering, and alter and degrade the environment. In other areas, however, they induce reforestation which improves the environment.⁶ Since 1986, a number of conservation groups have argued for reinstatement of the excised tax provisions which made silviculture financially more attractive (Ward et al. 1989). Theoretically, statutes can be fine-tuned and carefully written to target provisions appropriately. In practice, this is often difficult to effect.⁷

The Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA) authorized two new programs to encourage forest management for environmental benefits, as well as social and economic benefits. The Forest Stewardship Program, funded by the U.S. Forest Service, provides technical assistance and recognition to landowners engaged in conservation activities on non-industrial, private, forest lands. A companion program also authorized by FACTA is the Stewardship Incentive Program (SIP). This cost-sharing program is a cooperative effort among the U.S. Forest Service, the Agricultural Stabilization and Conservation Service (ASCS), and other agencies. The ASCS accepts applications from landowners and distributes the funds. In North Carolina, the N.C. Forest Service provides the lead on technical assistance. The SIP practices approved for North Carolina

⁶While reforestation is preferable ecologically to urban development or an unregenerated, timbered-over expanse, commercial pine plantations replace native ecosystems with a greatly simplified biological system, one which is unable to provide the same ecological functions and values as pocosins and wetlands.

⁷In the example at hand, tax reform was extremely difficult to achieve, and took its toll in Congress. Reopening the Act presents every interest group with the opportunity to press its particular case. For that reason, Congress has resisted reconsideration strenuously. Now that resistance is showing signs of weakening.

include reforestation and afforestation, and riparian and wetland protection and improvement.

AGRICULTURAL PROGRAMS: Federal agricultural programs are designed to stabilize agricultural commodity prices and to increase the incomes of growers. In the process these programs reduce the risk and increase the profitability of farming, and historically have provided inducements for wetland conversion. However, legislative reforms in the 1985 and 1990 Farm Bills made it much more difficult for new acreage to qualify for price and income supports, and hence, significantly diminished the incentives in Federal agricultural law to convert wetlands to cropland. (See chapter 3.)

Nonrecourse loans (price supports) are available for corn, wheat, and soybeans, the principal crops grown on newly-converted land in North Carolina. Corn and wheat are also eligible for deficiency payments (income supports).⁸ Other programs such as subsidized crop insurance and agricultural production loans offer additional subsidies to agriculture.

The Department estimates that in North Carolina, under the economic conditions prevailing during the period 1975-1984, the price and income support programs had only a moderate impact on the profitability of clearing and draining pocosin wetlands, but they significantly reduced the risk and uncertainty of agriculture operations (Danielson 1988). By 1986, as a result of changes in commodity market prices and the farm programs embodied in the Food Security Act of 1985 (FSA), program participation became much more profitable than non-participation. Qualifying newly converted acreage, however, had become more difficult.⁹ By 1988, the difference in profitability between participation and non-participation had almost disappeared because of market price recovery and phased reductions in price supports and deficiency payments (FAPRI Review 1988).

Effectiveness of Swampbuster: The Swampbuster provision of the Farm Security Act of 1985, as amended denies eligibility for almost all farm program benefits on all acres operated by a grower who either converts a wetland or plants on a converted wetland. Moreover, under USDA's implementing regulations, wetlands converted after enactment to either peat mining or

⁸Deficiency payments are based on a target price set by Congress. Producers are paid the difference between the target price and the higher of the loan rate (price support) or a 5-month average U.S. market price. For a more detailed discussion, see chapter 3.

⁹See discussion in chapter 3 under Commodity Programs.

silviculture and then subsequently used for agriculture would be subject to the Swampbuster provisions. Even if the land were sold, the new owner would be ineligible for agricultural program benefits. Thus, it would appear that Swampbuster would reduce wetland conversions to agriculture in North Carolina's pocosins.

Central to Swampbuster's effectiveness, however, is participation in the farm programs. Swampbuster denies farm program benefits to operators who either convert or plant on converted wetlands. Ineligibility for program benefits is the law's only sanction.¹⁰ Hence, Swampbuster will not provide much protection for wetlands in areas where program participation is low. Until recently, the Pocosins was such an area. Some large farms in the Pocosins were integrated livestock operations which grew their own grain. As self-feeders who rarely marketed their grain, they had nothing to gain from participating in the farm programs. Under such circumstances, Swampbuster's effectiveness is diluted.

The nature of farming in the Pocosins has changed dramatically in the last few years, however, with some of the largest farms being subdivided and sold. Some pocosins that were previously part of large farming operations have been incorporated into the National Wildlife Refuge System. The large, integrated livestock operations have declined, and recent ASCS data indicate that the participation rate in the farm programs in the Pocosins is now fairly high.¹¹ Thus, with the change in the structure of farming in this region, Swampbuster's effectiveness here should increase. Indeed, in a recent review of Swampbuster's implementation in one county,¹² the FWS Raleigh Field Office found Swampbuster was generally functioning well on farms participating in the farm programs.

Commencement of Conversion: The effectiveness which Swampbuster might have had in the Pocosins was dependent in part on the way in which "commenced" determinations were made.

¹⁰There are additional constraints on wetland conversion under other statutes, notably Section 404 of the Clean Water Act. Recent problems with enforcement of 404 in the Pocosins are discussed below.

¹¹In three major pocosin counties the participation rate was 55 percent for corn and wheat acreage, slightly higher than participation rates for these crops statewide (50 percent for corn and 40-45 percent for wheat).

¹²Bladen County, a county which contains a high number of Carolina Bays.

In an effort to make the application of Swampbuster as equitable as possible, Congress provided for some exemptions from the Swampbuster sanctions. Notable among these is the exemption for converted wetlands whose conversion was begun before the date of enactment of the statute (Dec. 23, 1985). Congress intended to permit farmers who had invested "substantial funds" in ongoing or imminent projects to complete the projects and thereby recoup their investments. The final rule reflects this intent.

Under the final rule the ASCS is responsible for making commencement determinations, and must consult with the Fish and Wildlife Service on each determination. The ASCS delegated this authority to the county committees. County committees are composed of local residents, usually farmers, who may find it difficult to make decisions which will adversely affect their neighbors. Consequently, the objectivity of the exemption process may have been compromised by allowing the county committees to make the commencement determinations.

The ASCS reports that in North Carolina, as of October 20, 1992, 359 applications for exemption under the commenced clause, involving 29,030 acres were approved. Upon further review of commenced decisions, 41 approvals were reversed, amounting to 3634 acres. The net outcome was that 318 applications were approved for 25,396 acres in North Carolina. The FWS did not have the resources to adequately monitor and participate in the exemption hearings.

PEAT MINING: The Federal Government promotes the mining of peat for energy by guaranteeing a market, conducting research, and allowing generous tax deductions.

- o The Public Utilities Regulatory Policies Act of 1978 (PURPA) requires that public utilities purchase power from small producers at the utilities' avoided cost.¹³ This guarantee significantly reduces the risk associated with a new economic venture. In 1986, the North Carolina Public Utilities Commission knew of no regulations or administrative policy restrictions that denied PURPA benefits when wetlands were adversely affected.
- o The Federal Government sponsored millions of dollars of research from the mid-1970s through the early 1980s on peat energy demonstration projects.
- o Because peat is an alternative fuel in the pre-commercial stage, major research, development, and construction cost

¹³The price that the utility would have had to pay for alternative power.

savings derive from special tax incentives. Of particular importance are those incentives that give peat mining a relative advantage over more traditional energy sources. Peat mining along with other alternative energy sources, for example, qualifies for an accelerated depreciation of investment costs from taxable income.¹⁴ The market for peat is also supported by this tax provision, because equipment that generates energy by burning peat is eligible for the rapid write-off. Peat qualifies for a five percent depletion allowance...a deduction from taxable income related to extraction levels that more conventional energy sources no longer receive. Until recently, research and development tax credits were available for selected basic research expenditures.¹⁵ Because traditional energy technology is more developed, the credits probably benefitted peat disproportionately to alternative energy sources.

ENFORCEMENT OF 404: With peat mining and forestry posing important threats to the pocosins, and subsidies available for the development of both peat and forestry, much reliance is placed on the efficacy of the 404 regulatory process for protecting the pocosin wetlands. The 404 program has had a turbulent history in the Pocosins during the last decade. Although some recent problems with the program seem largely resolved, a review of the recent history is revealing.

Section 404 of the Clean Water Act addresses the need for Federal permits for the placement of fill material in wetlands. While the Corps administers the 404 program, EPA has oversight authority. In the early 1980s, the Corps made some jurisdictional calls which were controversial. The calls involved large areas: 34,000 acres on First Colony Farms and 5,918 acres on White Tail Farms. Both First Colony and White Tail intended to engage in peat mining. The Corps offered EPA the opportunity to make the jurisdictional decisions. The Corps does not normally extend this courtesy, but given the magnitude of the proposed projects, it did so in these cases. EPA decided against making the decisions.

In both cases the Corps found that the proposed sites were not jurisdictional and that no permit was needed. Both cases

¹⁴Only equipment used to mine peat for energy purposes is eligible for rapid depreciation.

¹⁵The credits expired in 1987.

resulted in lawsuits.¹⁶ In December, 1985, the Federal District Court for the Eastern District found that the Corps' finding in First Colony was arbitrary and capricious, and remanded the case to the Corps for reconsideration. The First Colony situation ultimately was resolved when EPA determined that much of the site constituted wetland subject to Section 404. The White Tail case was resolved by a court-approved settlement, whereby the Government's previous decision that the area was not a wetland was vacated, and EPA agreed to make the wetland jurisdictional call on the property.

In December, 1986, EPA notified the Corps that it was assuming responsibility for jurisdictional calls for pocosin wetlands in 19 coastal counties of North Carolina. EPA retained this jurisdictional authority in the region until January, 1989, when the Corps, EPA, the FWS, and the SCS published a manual and agreed to accept a uniform method of identifying and delineating jurisdictional wetlands.¹⁷ Following publication of the manual, EPA and the Corps agreed that the Corps would resume pocosin wetland jurisdictional decision-making, that EPA would do some advanced identification of wetlands in the area, and that the Corps would submit a sampling of its jurisdictional decisions to EPA for review for compliance with the manual. EPA has found the Corps' decisions to be generally within the manual's guidelines.

At the risk of belaboring the obvious, laws and regulations are not self-evident. They are subject to interpretation, and the protections which they provide depend upon who is doing the interpreting and enforcement. The Department found that under current economic conditions, the opportunities for profitable conversion and development of pocosin wetlands are limited. The prospective uses for these lands (agriculture, forestry, and peat mining) are also limited, however, and the landowners are unlikely to hold them as wetlands indefinitely. Speculation (both for agriculture and nonfarm purposes) drove farmland prices up during the 1970s. Farmland prices declined in the early 1980s, but have now begun to rise again. Prices of land with wet soils are depressed. If farmland prices rise enough, or prices

¹⁶The National Wildlife Federation sued both the Corps and the EPA over the jurisdictional issue in First Colony, and the Southern Environmental Law Center filed similarly against both agencies in White Tail.

¹⁷The 1989 manual (entitled Federal Manual for Identifying and Delineating Jurisdictional Wetlands) proved controversial, and the controversy has not been resolved. In the interim, Congress has directed the Corps to use its 1987 manual. See Appendix VI-1 for details.

of wet soils fall enough, development for one or more of the above purposes will again become attractive, and an effective regulatory program will be essential.

WATER RESOURCES DEVELOPMENT: In North Carolina both the Corps and the SCS build small watershed projects. Both agencies have justified projects to a large extent by increased agricultural production. While both programs still exist, current SCS policy prohibits new PL-566 drainage projects which are designed to increase crop production.

Under the Continuing Authorities Program, Congress authorized the Corps to plan, design, and construct certain water development projects without Congressional approval in order to respond efficiently to local needs. Activities undertaken range from small beach erosion control to small navigation projects. The Federal Government has paid 100 percent of the costs of the reconnaissance, has usually paid 50 percent of the feasibility studies, and has frequently provided the majority of construction costs. The program authorizes small flood control projects (up to \$5 million for the Federal construction share) and snagging and clearing for flood control (up to \$500,000). The passage of the Water Resources Development Act of 1986, which shifts a greater portion of the financial burden onto local project beneficiaries, has reduced the number of projects in the Southeast, including North Carolina.

The PL-566 program focuses on managing water along streams in watersheds of 250,000 acres or less. PL-566 has brought about 80 multi-purpose dams and over 1,100 miles of channelization to North Carolina. The Federal Government paid for up to 50 percent of the costs allocated to drainage and recreation, while local sponsors provided all land rights for flood control and paid all water supply costs.

In general, the Federal benefits of PL-566 projects are primarily local and private and, as such should not be federally financed. Federal financing distorts the demand for small watershed projects, many of which affect wetlands directly and subsequently induce conversion of additional wetlands. The Department believes, and so recommended in Volume I (USDOI 1988), that water projects should be financed in accordance with the benefit principle of public finance, i.e., local sponsors should bear the costs required to generate local benefits, including any environmental costs, and the Federal Government should pay for legitimate Federal benefits.

SCS regulations implementing the Wetland Protection Executive Order prohibit technical assistance that would result in wetland conversion for most types of wetlands, allowing it for others only after an environmental evaluation and after the land has

produced a cultivated crop for at least 3 of the past 5 years. The SCS may assist with structural measures designed for other purposes that harm wetlands only if the project sponsor accepts an alternative that avoids or mitigates the wetland loss.

While SCS consults with the FWS on larger projects, on smaller projects the two agencies do not interact. The FWS has expressed concern about the magnitude of losses resulting from these smaller projects where the Corps has not exerted 404 wetland jurisdiction and no third party review ensures adequate mitigation. One solution to this is to have SCS consult with the FWS regarding mitigation whenever SCS offers technical or financial assistance that could result in wetland alteration.

TRANSPORTATION: Three key problems have led to high annual wetland losses due to highway construction projects. First, for planning purposes the North Carolina Department of Transportation (NCDOT) subdivides large projects into numerous, smaller segments. While the NCDOT claims this facilitates contracting, the FWS claims that it results in systematic underestimation of the wetland impacts for entire projects, and decreases administrative efficiency by requiring independent reviews of numerous small segments of the same project. To improve this, Environmental Impact Statements required by the National Environmental Policy Act (NEPA) should not be developed until wetland impacts for entire projects can be quantified and addressed in a single NEPA document.¹⁸

Second, partitioning a project into smaller units tends to undermine the intent of the 404 process. Partitioning can result in the small segments of a proposed roadway qualifying for approval under the nationwide permits for minor road crossings or headwaters and isolated wetlands. Alternatively, if the project is sufficiently subdivided, each segment will not have a significant effect on the environment, and can qualify for a "categorical exclusion" under the Council on Environmental Quality's regulations for implementing NEPA. Partitioning subverts the rules which were intended to apply to projects which truly have no significant impact on the environment. Although for nationwide permits the Corps must review each highway project to determine that it meets the criteria, in North Carolina the Corps has seldom ruled against a highway project due to wetland losses. During the 10-year planning cycle of the NCDOT's Transportation Improvement Program, the FWS estimates that over 400 acres of bottomland hardwoods were lost to projects that the FWS could not comment on because of inappropriate categorical

¹⁸This would be consistent with the CEQ's NEPA regulations requiring a full analysis of "connected" actions (40 CFR 1508.25).

exclusions.¹⁹ The Federal Highway Administration (FHWA) and the NCDOT have refused to include the FWS field office on the mailing list notifying of categorical exclusions.

Mitigation is the third problem area, and it is replete with difficulties:

- o The FHWA mitigates on an acre for acre basis only, seemingly without consideration to the environmental functions of the affected wetland and the uncertainties of obtaining successful mitigation. Further, the FHWA subtracts wetland acreage in a highway right-of-way from the total to be mitigated. This is a faulty practice: narrow strips of land next to a highway are usually of less environmental value than the lost blocks of undisturbed wetlands.
- o The NCDOT refuses to assume responsibility for overseeing the mitigation contractor's work. This problem could be resolved if the FHWA would amend its regulations to clarify which agency, the State or the FHWA, has responsibility for supervising mitigation activities.
- o Following mitigation the transportation agencies offer no assurances that the mitigated wetlands will be properly managed and protected from future development.
- o Often mitigation does not occur because funds are not available.
- o Mitigation is further complicated by the NCDOT's contention that it has no legal mechanism to mitigate outside of existing rights-of-way. This problem was partially alleviated in 1985 when the State legislature established the NCDOT Wetland Mitigation Bank. The legislature appropriated \$500,000 to acquire 1,031 acres of imminently threatened prime bottomland hardwoods in the Roanoke River floodplain for use as a mitigation bank. The NCDOT Bank is one of the two largest in the country (along with the Tenneco Bank in Louisiana), but it has not been operating long enough to allow for a full assessment of its

¹⁹The manner in which proposals for replacement of highway bridges are handled demonstrates the difficulties with categorical exclusions. Current language defining bridge replacements or categorical exclusions is so broad that a bridge may be moved a considerable distance up or down stream and still qualify for an exclusion. The Service argues that building or modifying highway bridges should qualify for a categorical exclusion only if the proposed construction is on the existing bridge alignment.

effectiveness. The NCDOT Bank is designed to provide upfront mitigation, is large enough to accommodate sound fish and wildlife management activities, and serves as a mechanism to offset truly unavoidable adverse wetland impacts and to reduce delays in permit processing.

In April, 1990, the FHWA issued an environmental policy statement, committing itself to fully funding mitigation measures necessary to satisfy Federal law, even where such mitigation requirements exceed those of established FHWA policy. This policy statement may lead to the resolution of the above concerns. FHWA has promulgated regulations to implement this policy change. (See chapter 5.)

STATUS AND PROSPECTS

Silviculture, peat mining, and agriculture represent the major threats to North Carolina's remaining freshwater wetlands. The severity of the threats depends largely on market conditions. The current low price of oil has dampened the interest in developing peat for methanol or for generating electricity. Demand will change, however, if prices for alternative fuels rise, air pollution regulations increase the costs associated with power generation from coal, the demand for farmland rises, or the price of land with wet soils declines. The depressed agricultural economy has reduced wetland conversions, but commodity markets are cyclical, and the eventual recovery will increase the pressure on wetlands. Legislative reforms in the 1985 and 1990 Farm Bills, however, have made it much more difficult for new acreage to qualify for price and income supports, and hence, have significantly diminished the incentives in Federal agricultural law to convert wetlands to cropland. The forestry industry is also depressed at the moment, but long-term, worldwide expectations are for a growing scarcity of wood and increasing timber prices.

Although the Department found that under current economic conditions, the opportunities for profitable conversion and development of pocosin wetlands are limited, the prospective uses for these lands (agriculture, forestry, and peat mining) are also limited. High farm and nonfarm demand drove farmland prices up during the 1970s. Farmland prices were down in the early 1980s but have begun to rise again. If the difference between farmland prices and wetland prices becomes great enough, development for one or more of these purposes will again become attractive.

In the recent past there have been numerous instances where neither the Corps nor EPA exerted their 404 jurisdictional authority, and as a result, many pocosin wetlands were filled or significantly altered without permits. Further, throughout the

early 1980s the Corps did not respond to FWS reports of 404 violations. The absence of corrective enforcement action on large scale projects served to condone infringements. Use of the new wetland methodology for making jurisdictional decisions for the 404 regulatory program should preclude a recurrence of past problems with this aspect of the program, but concerns remain regarding the administration and enforcement of several other aspects of 404 in North Carolina.

Swampbuster's effectiveness in forestalling agricultural conversions depends directly upon the rate of farmer participation in the Federal farm programs. Participation rates have increased recently in the Pocosins with a change in the structure of farming in the area. However, Swampbuster applies only to agricultural conversions and not to activities of the forest products industry which owns 44 percent of remaining pocosins.

With the recent (1986) passage of fairly restrictive peat mining regulations by the State, protection for the Pocosins from mining impacts was strengthened. Most notably, the regulations require that any peat mining project must include controls that produce runoff which closely approximates that which would have occurred had the site developed naturally to vegetative maturity. While these regulations are forceful in their treatment of discharges and in reducing adverse impacts to water quality, they do not address mitigation for wetland losses or degradation due to peat mining.

RECOMMENDATIONS

1. Private incentives:

Congress should consider enacting legislation which provides incentives for private wetland conservation activities.

There are a limited number of avenues available to Congress for establishing positive incentives for private conservation, and all of them entail revenue considerations to one degree or another: institute tax concessions; engage in some form of direct payment or cost sharing for conservation practices; and help develop and promote ways for private landowners to capture and market the benefits of wetlands in their natural state. The Federal budgetary problems of recent years have imposed severe limitations on appropriations for non-entitlement programs, conservation included, and resulted in intense competition for the limited funds. Proposals for tax concession (which necessarily reduce revenues) have met with understandable

wariness by legislators in part because of the unusual deficit problems and in part because of Congress's reluctance to revisit the tax code so soon after the arduous political struggle to produce the major tax reform of 1986. There are no free lunches and no miracle solutions, however. If incentives are to be effective, they must be funded. Although the generic mechanisms for funding are few, the implementing options are numerous, including:

- o Revising the tax code for donations of wetlands. The 1986 tax reform substantially reduced the private benefits from conservation donations, especially for those taxpayers subject to the alternative minimum tax;
- o Providing inducements for States or localities to base property taxation of wetlands on economic returns in their natural state;
- o Allowing a credit or deduction for wetland property taxes under the Federal income tax code;
- o Developing and promoting markets for hunting leases or other recreational uses, perhaps using State game departments as clearing houses for willing buyers and sellers.

2. Forestry:

- a. Eliminate Federal cost sharing for reforestation on lands ditched or drained for silviculture.**

Congress enacted the "Swampbuster" provision of the Food Security Act of 1985 to reduce agricultural conversions. That precedent, if applied to silviculture, could significantly reduce the loss of forested wetlands that are drained and converted to pine plantations.

- b. Federal reforestation tax incentives (a 10 percent Investment Tax Credit for reforestation expenses and an 84-month write-off of these expenses) should not be available to any owner who ditches or drains wetlands.**

While these programs serve the purpose of increasing tree plantings, they also encourage the conversion of wetlands. Elimination of these programs would reduce the profit from clearing and draining wetlands for growing trees.

3. Tax code provisions related to agriculture:

- a. Expensing for tax purposes of clearing and draining costs, whether classified as land conservation and improvement or land development, should not be allowed for any developer/landowner who drains or alters wetlands for any purpose. Such expenses should be added to the cost basis for the property.**

The level of clearing and draining costs has a moderate impact upon economic feasibility of drainage. Until this recommendation is implemented, the Internal Revenue Service should scrutinize expensing closely to ensure that development costs are not being misclassified and expensed as land improvement costs.

- b. Depreciation on equipment, or other normally depreciable items, should not be allowed for tax purposes for that portion of the equipment used for conversion of wetlands.**

The Federal income tax code provides an incentive for pocosin wetland conversion through accelerated depreciation for equipment which landowners or contractors use to clear and drain wetlands. This is an additional influence on the economic feasibility of wetland conversion.

4. Peat mining:

- a. Amend the Public Utilities Regulatory Policy Act (PURPA) to make small power producers ineligible to sell power at the utility's avoided costs, as presently required, if the energy resulted from wetlands destruction.**

Peat mining represents a significant future threat to pocosin wetlands in North Carolina. PURPA's requirement that utilities buy power from alternative sources at the utility's avoided cost guarantees a market and a price to the producers. This reduction in uncertainty could spur the development of peat mining unless wetlands are protected.

- b. Business energy tax credits, depletion allowances, and accelerated depreciation provisions for alternative energy property should not be allowed for projects which will adversely affect wetlands.**

Federal incentives which lower the cost of peat as an alternative energy source can increase the competitiveness of peat and precipitate the loss of thousands of acres of pocosin wetlands.

5. Wetland permit issues:

Establish a uniform Federal mitigation policy to be adopted and implemented by all Federal agencies. Such policy should ensure adequate compensation for unavoidable adverse project impacts on wetlands, acknowledge the quality and functional value of the affected wetlands, and incorporate the goal of "no net loss" of wetlands.

Mitigation means many different things to many different people. To effectively compensate for unavoidable wetland losses, mitigation should preserve comparable wetland values and ensure long-term protection. Implementation of this recommendation should address the transportation and Section 404 problems discussed in this chapter.

6. Water Resources Development:

- a. When drainage benefits are included among the justifications for a Federal water project and the project will alter existing wetlands, project sponsors should be required to pay 100 percent of the costs incurred to provide the drainage benefits and to provide mitigation necessary to offset the direct and indirect loss of the wetlands.**

In general, the Federal benefits of PL-566 water projects are local and private and, as such, should not be federally financed. Federal financing associated with PL-566 and the Corps' Continuing Authority projects heightens the demand for small watershed projects, many of which affect wetlands directly and induce additional wetland conversion. Secondary wetland conversion is of particular concern in pocosin areas, where small watershed projects may provide the outlets required for private drainage of non-alluvial wetlands.

- b. Whenever Federal technical/financial assistance is provided that will result in wetland alteration, require both consultation with the Fish and Wildlife Service and mitigation for the impacts.**

Consultation with the FWS will help to determine how to avoid wetland losses, minimize the amount and degree of alteration, and compensate for unavoidable losses. Requiring adequate mitigation would replace losses or discourage the landowner from wetland destruction. When only token mitigation is required, the technical assistance program provides a significant Federal incentive for alteration and conversion of wetlands. Disagreements over

adequate mitigation at the field level should be forwarded to higher levels for review and resolution.

7. Transportation:

Require pre-development consultation between the States and the Fish and Wildlife Service on all federally funded highway projects to facilitate better implementation of NEPA procedures and to minimize adverse impacts to wetlands.

Despite the existence of a framework for early coordination, the FWS sometimes has been unable (due to resource limitations) to participate fully in the planning for federally aided highways. In such cases, the FWS may not get involved until after State agencies have applied to the Corps for 404 permits. Thus, opportunities have been foregone to alert State highway planners and local entities to the presence of wetlands and other environmentally sensitive resources and to advise them about avoiding adverse project effects. With participation by the FWS coming late in the planning period, options for changing the design of projects have been foreclosed or limited.

In 1988, the FHWA issued a report (prepared jointly with the Corps, EPA, FWS, and NMFS), identifying a variety of practices and techniques for making the early coordination process for federally aided highway projects more effective. Adoption of the procedures identified in the report will go a long way toward solving many of the inadequacies in the consultation process. Congress should encourage the States to implement the proposed procedures, and the FWS will make every effort to utilize these procedures to resolve early on any differences with Federal and State highway agencies.

REFERENCES

- Danielson, L. E. 1988. Impacts of Federal Programs on the Degradation of Pocosin Wetlands. Background Report. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 60 pp.
- FAPRI Review. 1988. Preliminary Analysis for the FAPRI U.S. and World Agricultural Outlook. FAPRI Staff Report #1-89. Univ. of Missouri, Columbia and Iowa State University, Ames (Presented in Kansas City, December).
- Laney, R. Wilson. 1988. The Elimination of Isolated and Limited-Flow Wetland in North Carolina. In Proceedings of the Symposium on Coastal Water Resources, American Water Resources Association. Wilmington, NC (May), pp. 243-253.
- Noffsinger, R. E., L. K. Gantt and L. E. Danielson. 1987. The Impact of Federal Programs on Freshwater Wetlands in North Carolina with an Emphasis on Pocosins. U.S. Department of the Interior, Fish and Wildlife Service, Raleigh Field Office, Raleigh, NC, 76 pp.
- Reed, R. M., L. D. Voorhees and P. J. Mulholland. 1981. Environmental Impacts Associated with Using Peat for Energy. Reprints of the 1981 International Gas Research Conference, U.S. Dept. of Energy, pp. 1048-1057.
- Richardson, C. J., ed. 1981. Pocosin Wetlands. Hutchinson Ross Publishing Co., Stroudsburg, PA, 364 pp.
- Richardson, C. J., R. Evans, and D. Carr. 1981. Pocosins: An Ecosystem in Transition. pp. 3-19 In C. J. Richardson, ed. Pocosin Wetlands. Hutchinson Ross Publishing Co., Stroudsburg, PA, 364 pp.
- Richardson, C. J., R. Evans, and D. Carr. 1982. Status of pocosin wetlands (freshwater evergreen shrub bogs) in coastal North Carolina as of 1980. Map. Integrated Case Studies Program in Natural Resources Analysis, School of Forestry and Environmental Studies, Duke University, Durham, NC.
- Richardson, C. J. 1983. Pocosins: Vanishing Wastelands or Valuable Wetlands? Bioscience 33(10): 626-633.
- U.S. Department of the Interior. 1988. The Impact of Federal Programs on Wetlands, Vol. I: The Lower Mississippi Alluvial

Plain and the Prairie Pothole Region. A Report to Congress by the Secretary of the Interior, Washington, DC.

Ward, Justin R., F. Kaid Benfield, and Anne E. Kinsinger. 1989. Reaping the Revenue Code. Natural Resources Defense Council, New York, NY, 142 pp.

Chapter 17: NORTHEASTERN NEW JERSEY WETLANDS

INTRODUCTION

PHYSICAL DESCRIPTION: Northeastern New Jersey consists of a six-county area that coincides with the Passaic River Basin and parts of the Rahway, Raritan, and Hackensack River Basins. Because of the region's geologic history and resultant landscape diversity, a wide variety of well preserved wetland types occur, ranging from the highlands to the Hudson-Raritan Rivers estuary. (See Figure XVII-1.) Densely populated, Northeastern New Jersey is strongly influenced by its close proximity to the New York City metropolitan area and its location on the major north-south corridor of transportation on the East Coast.

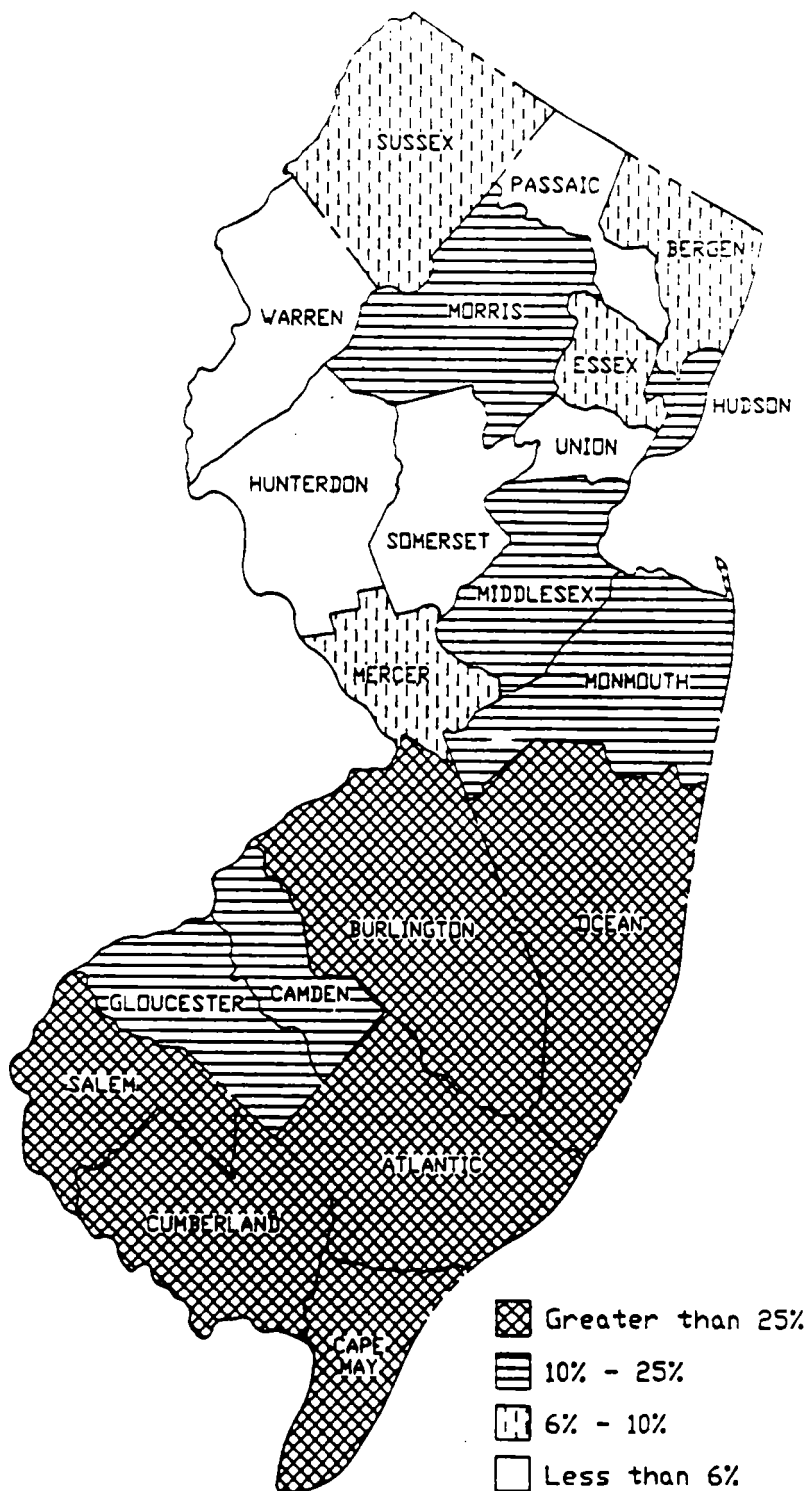
CHARACTERISTICS AND FUNCTIONS: Northeastern New Jersey wetlands

- o Serve as natural storage areas for flood waters, thereby reducing flood peaks, slowing water velocity, and regulating flow to downstream areas;
- o Filter pollutants from urban runoff that could otherwise enter aquifers and surface waters that supply drinking water;
- o Prevent erosion and filter silt from the water;
- o Host 9 endangered and 4 threatened State species and occasionally host bald eagles and peregrine falcons (both listed federally as endangered);
- o Provide habitat for hundreds of resident and migratory wildlife species;
- o Provide extensive sporting and recreational opportunities, including consumptive and non-consumptive activities involving fish and wildlife;
- o Are largely privately owned and are protected, in part, through recent State regulatory controls, the effectiveness of which is uncertain.

ORIGINAL ACREAGE: Known to be much larger than the present stock, but historic data are too incomplete for an accurate estimate.

CURRENT ACREAGE: In 1976, 69,173 acres remained in the six-county Passaic River Basin.

Figure XVII-1: NEW JERSEY COUNTIES BY PERCENTAGE OF WETLAND



XVII-2

TRENDS: Only disparate information exists. Early wetland inventories were partial in nature focusing on a particular area or type of wetland. Between 1953 and 1973, for example, two coastal counties (Union and Essex) lost 100 percent of their tidal marshes and the two others (Bergen and Hudson) lost over 50 percent. Morris County which contains 58 percent of Northeastern New Jersey's remaining wetlands is subject to the greatest development pressure.

FACTORS ADVERSELY AFFECTING WETLANDS

The purposes for which wetlands have been converted have changed over time in Northeastern New Jersey. The region's agricultural sector was displaced by low density housing and by highway, airport, landfill, and port facility construction that often took place in wetland areas away from population centers. Today highway construction, commercial and industrial building, higher density residential development, and flood control efforts are the major activities affecting wetlands.

The driving force behind current expansion is the growth of the New York metropolitan area's population and economic activity, and the desire of some firms and employees to relocate away from the high-density, high tax-rate, high cost central city areas. The State of New Jersey is the most densely populated of the United States averaging 986 people per square mile. Eastern New Jersey averages 5089 people per square mile, over five times the State average. The resulting strong demand for land in the region has pushed wetland prices to between \$90,000 and \$200,000 per acre in some areas.

From all indications, growth will continue and even accelerate.¹ The area's proximity to major transportation arteries fosters development. Developers are building on tracts of land, including wetland, that were considered marginal for development in past years, but in many areas are now the only available open space.

Highways, buildings, and flood control separately and in combination adversely affect wetlands. Highways were often built

¹Surprisingly, from 1970 to 1980, population growth slowed significantly in New Jersey. Indeed, for all of the northeastern counties except Morris it was actually negative. This proved a temporary phenomenon except for Essex County. Essex is experiencing a decline in population as people emigrate to the more undeveloped counties, such as Morris. As one might expect, the less developed counties contain the most valuable wetlands.

in wetlands to minimize land acquisition costs and disruption to existing development. Today highways crisscross the area and are being extended and widened. This expansion destroys wetlands through filling, by isolating wetland areas, and by disturbing hydrological regimes.

Highways also induce additional growth. A substantial amount of induced development and concomitant wetland loss may take place even before construction starts, as developments locate along proposed routes in anticipation of a new highway project. Once built, the highway attracts more intensive growth. The development of the region could not have taken place without the superhighway network that has evolved. The elaboration of that network to reduce travel time and costs continues to threaten the remaining wetlands.

The filling of wetlands for urban development--residential and commercial projects as well as infrastructure such as public buildings, sewage treatment plants, and airport expansion--can destroy wetlands directly. Replacing wetlands with structures reduces water absorption, increases flooding, and alters hydrological flows. Storm runoff, with little vegetation to filter it, becomes laden with urban pollutants as it eventually wends its way to the ocean. The area drains into the Hudson-Raritan Rivers estuary, one of the three most polluted estuaries in the United States. To exacerbate this threat, more than half of the 109 Superfund sites in New Jersey are adjacent to wetlands.

Calls for greater flood control arise once structures are built in floodplains and converted wetlands. Construction of levees and channels for flood control destroy additional wetlands directly. Once provided, the flood protection induces more development, prompting more wetland conversion.

Urbanization in Northeastern New Jersey has aggravated the flooding problems in an already flood-prone region. The high population density, a wet climate, and substantial reduction in the uplands and wetlands available to hold moisture combine to produce recurring disasters. According to the Army Corps of Engineers, one of the most serious flood control problems on the East Coast occurs along the Passaic River. Federal disasters were declared in 1968, 1971, 1972, 1973, twice in 1975, and again in 1984. Average annual damages throughout the Passaic River Basin amount to \$77.8 million. The New Jersey Division of Water Resources estimates that a flood equal to the worst on record, occurring in 1903, would cost about \$1.5 billion due both to losses in water retention capabilities and the increase in building and property values within the floodplain.

To protect property, the Corps has proposed the \$1.306 billion Dual Inlet Tunnel Diversion Plan. The plan proposes acquisition by the Corps of 5,200 acres of wetlands for flood water storage. The State, which is the local sponsor, has an agreement with the Corps to continue to protect 6,300 acres of floodplain wetlands from development. An additional 9,500 acres of wetlands are currently protected as parkland within the central basin.

Dissatisfied with the protections provided by 404, then New Jersey Governor Kean requested and obtained State legislation, the New Jersey Freshwater Wetlands Protection Act of 1987, that exceeds the stringency of the Federal provisions by broadening regulatory controls to cover nearly all activities affecting wetlands and by providing upland buffer zones. The Act became effective in July, 1988. Whether the State legislation can be administered effectively and in time to conserve a significant amount of New Jersey's remaining wetlands remains to be seen. Many development proposals have been grandfathered under the new State legislation, and several proposals which have not met Federal standards under the 404(b)(1) Guidelines have been permitted by the State. In addition, the State's appeals process allows and additional (and political) avenue for developers to seek permitting of wetland fills. Currently, the State and EPA are drafting an agreement for State assumption of the 404 program. The draft assumption proposal contains no provision for endangered species review by the Fish and Wildlife Service. With three federally listed species dependent on wetlands in New Jersey, the Fish and Wildlife Service asked EPA to initiate consultation under section 7 of the Endangered Species Act to ensure that federally listed species continue to receive protection under a State-assumed 404 program.

FEDERAL PROGRAMS AND PROJECTS

The particular pattern of suburban development in Northeastern New Jersey, situated as it is on the outskirts of the nation's largest metropolitan area, would probably have occurred to a lesser degree in the absence of Federal incentives. The rapidity and extent of westward expansion in the region, however, was influenced by direct Federal grants for highways, tax incentives for commercial and residential developments, and Federal flood control efforts.

TRANSPORTATION: Highways constructed with financial assistance from the Federal government have had a major impact on the region's wetlands. The future spread of development in Northeastern New Jersey depends on the continued extension and widening of the highway network, so that commuting time from residential to commercial locations remains reasonable. The east-west Interstate Highways 80, 280, and 78 and the north-south

Interstate Highways 287 and 295 together with the State-funded New Jersey Turnpike and Garden State Parkway are the backbone of the network. The Federal Government pays 90 percent of the cost of interstate highway construction and 75 percent of the cost of other Federal-aid roads.

The Federal Highway Administration (FHWA) has different policies for reviewing and mitigating projects depending on whether the affected wetlands are publicly or privately owned. The Department of Transportation Act of 1966 restricts the FHWA from approving any project which utilizes publicly owned park, recreation, and wildlife refuge lands unless there is no feasible or prudent alternative and unless the FHWA takes all practicable measures to minimize harm. The FHWA must consult with the Department of the Interior in making this determination, and mitigation, including wetland replacement, generally must be acceptable to the Department before a "no objection" is given to the FHWA. Most remaining wetlands in Northeastern New Jersey, however, are privately held and receive a lesser degree of protection under FHWA policies.

Mitigation for privately held wetlands suffers from several major weaknesses:

- o Before State highway authorities can make commitments and decisions about the design and location of a proposed project, the FHWA must issue an Environmental Impact Statement (EIS). Although the FWS comments on and makes recommendations regarding proposed projects during the EIS process, the FWS and the FHWA often disagree about what constitutes a significant impact to wetlands and what mitigation measures should be taken. Following issuance of an EIS, State authorities make resource commitments and decisions which often severely limit the opportunities to avoid or minimize wetland losses during any subsequent Federal review, e.g., the 404 regulatory process.
- o In its numerical simplicity, the FHWA's acre-for-acre policy does not adequately take into account the qualitative differences between wetlands. Because all wetlands are not identical and are difficult to create, wetland functions are seldom fully replaced under this policy. The FHWA has a preference for mitigating losses by enhancing or creating wetlands within the highway right-of-way. Wetlands counted toward mitigation within the highway right-of-way are often less valuable than wetlands away from roadways. The narrow ribbons rarely conform to the shape of the original wetlands and severely limit opportunities for construction of flood water retention basins. The traffic causes direct loss of wildlife as well as indirect effects from noise and pollutants such as lead, cadmium, and copper. Even when

States qualify for Federal-aid highway funding to mitigate wetland losses outside the highway right-of way, the regulations provide no assurance that the mitigation wetlands are comparable to those lost. FHWA regulations are frequently interpreted by State highway authorities to allow certain uplands to be counted as replacement habitat for wetland losses, further reducing wetland replacement.

- o The FHWA allows 1:1 mitigation only for wetlands directly affected by a project, even though the indirect effects of highway development often exceed the direct effects.

In April, 1990, the FHWA issued an environmental policy statement, committing itself to fully funding mitigation measures necessary to satisfy Federal law, even where such mitigation requirements exceed those of established FHWA policy. This policy statement may lead to the resolution of the above concerns.

URBAN DEVELOPMENT: The Federal Government encourages residential developments (irrespective of the type of land) by tax provisions such as the deductibility of mortgage interest payments and the exclusion of imputed rental income in the Federal individual income tax code. At the same time, owners of wetlands who refrain from development receive no tax benefits, and local governments that restrict wetland development forego an increased tax base. The tax benefits for development combined with the absence of benefits for conservation skews the incentives towards development.

National tax policy also promotes commercial development. Corporations receive accelerated depreciation and investment tax credits. The construction of new office buildings, for example, follows a cyclical pattern over time, but in the early 1980s changes in the Federal tax code significantly stimulated such construction. Changes in the taxes on real estate, already considered to be subject to favorable treatment, led to one of the biggest office development booms in the Nation's history. Average annual office completions jumped from a stable 20-year level of 12 million square feet prior to 1981 to over 30 million square feet thereafter. Of primary importance were changes that significantly reduced the number of years over which commercial real estate could be depreciated. The "paper" loss generated by these depreciation policies can be used as offsets against taxable income from other sources. New ownership devices also permit passive investors to take advantage of the tax shelter that office construction provide.

In addition, flood insurance and disaster relief lessen the risk of development in flood-prone areas, and in conjunction with

Federal loan guarantees and interest subsidies promote development in these areas.

FLOOD CONTROL: For the most part, flood control in New Jersey consists of poorly coordinated, inadequate measures sponsored by local government. The measures taken are primarily construction of levees and channelizing or deepening existing river beds. The flooding problem in Northeastern New Jersey, particularly in the Passaic River Basin, is severe and growing worse.

As part of the Passaic River Flood Control Program, the Corps has proposed building the Dual Inlet Tunnel Diversion Project. The proposal includes both structural and non-structural flood control measures. Structural elements would consist of (1) a 20.1 mile long, 39 foot wide tunnel with two inlets from the Pompton River to Newark Bay; (2) several new or improved segments of levees and floodwalls along the Pompton, Rockaway, and Passaic Rivers to direct flood flows; (3) channel modifications; and (4) locating new levees at the fringe of development but back from the stream to help reduce some of the effects on wetlands. Simultaneous nonstructural measures such as acquiring 5350 acres for natural flood storage areas have been proposed but no commitment to such measures has been made.

This project would dramatically alter the hydrologic regime of the region, and would affect or destroy 750 acres of wetland and stream habitat. These effects would occur during construction, but improper operation of the tunnel (leading to either permanent flooding or insufficient seasonal inundation) could affect many additional acres of wetlands. Although the Final Environmental Impact Statement (FEIS) was released in April, 1988, impact assessment has not been completed. Assessment will continue during Phase II of the project design, during which the FWS will review the proposed mitigation.

As with all Federal flood control projects, the Tunnel would be heavily subsidized. As of 1990, the Federal share of the construction cost was estimated to be \$969 million and the non-Federal share, \$337 million.

STATUS AND PROSPECTS

It is difficult to distinguish the wetland losses in New Jersey that resulted from Federal programs from those that would have occurred anyway. Direct Federal payments for highways and flood control have undoubtedly spurred the commercial and residential development of the region. They made the development technically feasible and they substantially lowered its cost. In the absence of these two programs, development in the region certainly would have been slowed substantially.

It is clear that some of the benefits associated with highways in Northeastern New Jersey extend beyond the region, and hence, the projects legitimately should receive some Federal funding. The cost sharing is such, however, that considerable subsidization is involved. Unlike highways, the non-regional benefits from flood control are more difficult to identify. Since, on average, Federal taxpayers bear 75 percent of the cost of constructing flood control projects, the projects are heavily subsidized and the financing is quite distorting.

Correcting the cost-sharing ratios for flood control and highway projects to reflect the distribution of benefits would have an important, beneficial effect on both development and the environment in Northeastern New Jersey. It would improve both equity and efficiency.

The same effect probably cannot be obtained by restricting the other Federal programs which affect wetlands in Northeastern New Jersey. The demand for space is too strong and the high price of dry land too high for development to be deterred much by marginal changes in economic incentives. All privately-held wetlands in Northeastern New Jersey face severe threats from development and are likely to disappear within the next 50 years under the current regulatory climate and acquisition efforts. A much more rigorous enforcement of the Section 404 permitting process by the Corps or EPA or a strong State regulatory program would be required to slow the process.

The New Jersey Freshwater Wetlands Protection Act of 1987 establishes two new permit programs, one to strictly curtail activities in freshwater wetlands (i.e., filling, drainage, tree cutting, placement of obstructions, etc.) and one for the regulation of the discharge of dredged or fill material into the open waters of the State. In addition, the Act establishes "transition areas" (buffers) for freshwater wetlands of exceptional or intermediate resource value. The Act became effective on July 1, 1988, too recent to assess its effectiveness. The effects of a State-assumed 404 program are unknown. The FWS has statewide concerns regarding compliance with the Endangered Species Act and protection of endangered species, particularly threatened plant species in southern New Jersey wetlands. Consequently, the FWS has asked EPA to initiate consultation under Section 7 of the Endangered Species Act to ensure that federally listed species continue to receive protection under a State-assumed 404 program.

Because of the significant flood control benefits wetlands provide, it might be cost-effective to acquire or to purchase easements to maintain a sizable portion of the remaining stock in

Northeastern New Jersey, most of which is privately held.² The region continues to develop and the flood problem becomes ever more serious as the water retention capacity of the land is lost. At the same time more construction is occurring within the floodplains of the region's rivers escalating the damage likely to result from flooding. The development pressure is so intense that a comprehensive strategy will be required if Northeastern New Jersey's remaining wetlands are to be conserved.

RECOMMENDATIONS

1. Public Works Subsidies:

Require that cost-sharing ratios for new Federal flood control and Federal-aid highway projects reflect the distribution of benefits between regional and national interests.

By correcting a serious distortion in economic signals and incentives, this change in project financing would have an important, beneficial effect on both development and the environment in Northeastern New Jersey. The change would be an improvement in both equity and efficiency.

2. Regulation:

In conjunction with State and local jurisdictions, develop an integrated regulatory program to ensure that no types of wetlands conversions are exempted because of peculiarities in the wetland protection laws and regulations.

Wetlands continue to be lost under Section 404 which covers only about 20 percent of the Nation's wetland losses. Although the New Jersey Freshwater Wetlands Protection Act addresses a number of gaps in the Federal program, grandfathering under the Act will result in further losses. Moreover, vigorous enforcement efforts under the new Act have yet to be demonstrated.

3. Mitigation:

Require that a mitigation plan accompany any proposal for authorization of any new project and that all Federal agencies mitigate fully and concurrently for wetland

²The two largest remaining wetland complexes in the Passaic River Basin are the 4275 acre Great Piece Meadow owned by various private parties and the 3100 acre Troy Meadows owned by Wildlife Preserves Inc. The latter has indicated the need to sell soon.

alterations stemming from construction of Federal or federally supported facilities.

The systematic application of the CEQ's mitigation principles³ would yield considerable progress toward the goal of no net loss of wetlands. The principles call for mitigation to proceed in the following sequence: (1) avoid adverse impacts, (2) minimize unavoidable adverse impacts, and (3) compensate for unavoidable impacts through replacement. Mitigation should occur prior to or concurrent with other project features and should be routinely monitored for effectiveness. Congress already requires concurrent mitigation for all Corps' projects (Water Resources Development Act of 1986).⁴

4. Acquisition:

Consider acquiring critically important and vulnerable wetland complexes either by direct purchase of land or easements or through cost sharing with the State of New Jersey or local municipalities.

Although Northeastern New Jersey wetlands serve a host of values, most critical economically is the flood control derived from undeveloped wetlands. Floods along the Passaic River are among the most costly in the nation. Structural flood control efforts have proceeded incrementally. Structural measures have a tendency to pass flooding problems along to unprotected areas. Further, the illusion of protection often leads to additional floodplain development. All this suggests the logic in nonstructural measures. A long-term wetland acquisition plan should be undertaken as a primary aspect of a coordinated flood control program.

³Defined in NEPA regulations (40 CFR 1508.20).

⁴Although it is a Corps project, proposals for the Dual Inlet Tunnel Diversion Project do not now include firm commitments for prior or concurrent mitigation.

REFERENCES

- Congressional Budget Office. 1989. Reducing the Deficit: Spending and Revenue Options. Washington, DC, 400 pp.
- Chezik, Michael. 1989. Update on the New Jersey Freshwater Wetlands Protection Act. Memorandum from Bureau of Freshwater Wetlands, Division of Coastal Resources, Department of Environmental Protection, State of New Jersey to Fish and Wildlife Service, U.S. Department of the Interior. Trenton, NJ, May 4, 4 pp.
- Peterson, Don. 1989. Federal Highway Administration's Consideration of Wetlands in the Planning of Federal-Aid Highways. Memorandum from Fish and Wildlife Service to Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, April 14, 4 pp.
- Rosenberg, Richard. 1987. The Impact of Federal Programs on Wetlands in Northeastern New Jersey. Background Report. U.S. Department of the Interior, Office of Policy Analysis, Washington, DC, 39 pp.

PART V: THE MIDWEST AND THE PLAINS

Chapter 18: MICHIGAN'S COASTAL AND NORTHERN FORESTED WETLANDS

INTRODUCTION

PHYSICAL DESCRIPTION: Michigan borders on four Great Lakes (Michigan, Superior, Huron and Erie) and two international, connecting channel systems (St. Marys River and St. Clair-Detroit River Ecosystem). (See Figure XVIII-1.) The State's mainland coastal shoreline stretches for 2300 miles; coastal island shorelines add another 1000 miles. The coastal wetlands are found at river mouths, in sheltered bays, along shallow shorelines, and behind barrier beaches. Most of Michigan's forested wetlands are found in the upper peninsula and the northern lower peninsula. In areas seasonally inundated by rivers, hardwoods such as red maple and black ash occur, while in depression-type wetlands, conifer species dominate.

CHARACTERISTICS AND FUNCTIONS: Michigan's coastal wetlands

- o Host three endangered and five threatened species, including the bald eagle, peregrine falcon, and 5 plants;
- o Include two National Lakeshores, one National Park, three National Forests, and six National Wildlife Refuges.¹ About 21 percent of the mainland shoreline is in public ownership; 30 percent, if island shorelines are added to the total.

Michigan's northern forested wetlands

- o Offer food and cover to many species of birds and wildlife due to multiple vegetative strata, the presence of water, and riparian corridors that allow for movement between habitats;
- o Reduce flood peaks within watersheds, serve as natural filters, control erosion, and recharge and discharge groundwater;
- o Are contained within private forest lands and 3 national forests. Over 400,000 acres (12 percent) of these forested wetlands are in public ownership;
- o Host one endangered and two threatened species.

¹These are partially or wholly in the coastal zone.

Michigan's coastal wetlands have been estimated to be worth between \$216 million and \$425 million annually, with each acre providing over \$2000 in services. Estimates of annual values for the various services are given in Table XVIII-1.²

Table XVIII-1: Economic Value of Michigan's Coastal Wetlands, 1980

<u>Economic Service</u>	<u>Annual Value per acre</u>
Runoff nutrient control	\$679
Sport fishing	426
Fish production	420
Waterfowl breeding/feeding	291
Nonconsumptive recreation	148
Waterfowl hunting	42
Trapping of furbearers	30
Water supply	6
Commercial fishing	<u>5</u>
TOTAL	\$2047

Source: Herdendorf et. al. 1986 based on data from Jaworski, 1981.

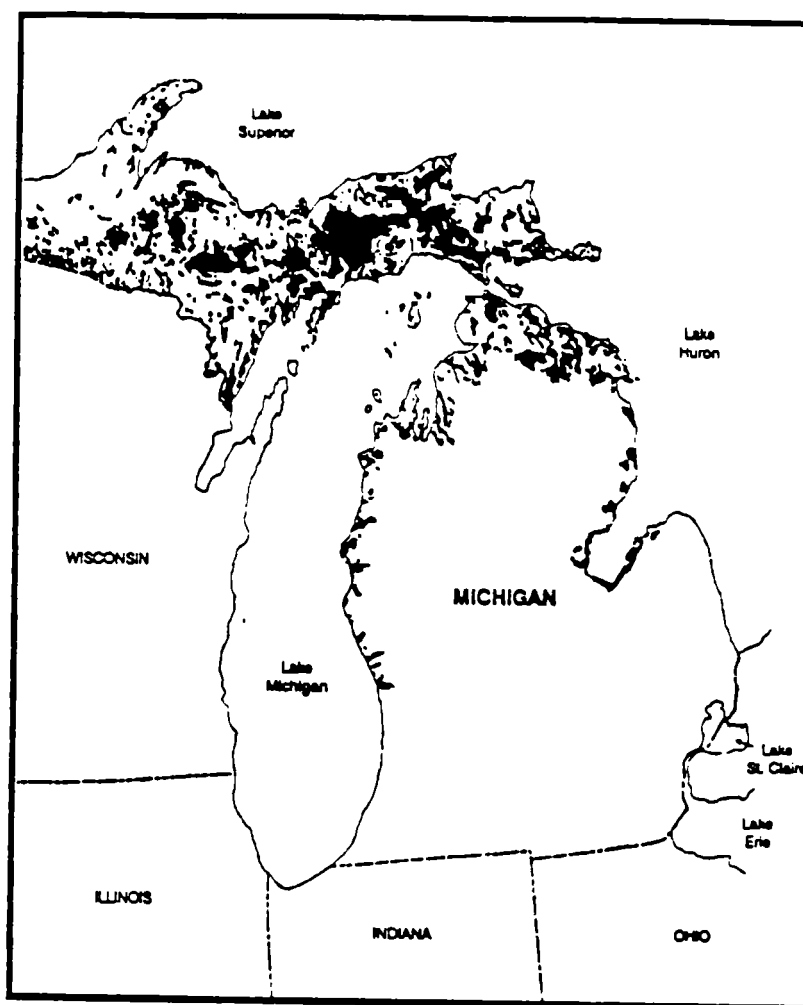
ORIGINAL ACREAGE: The original acreage of wetlands is unknown for both coastal and northern forested wetlands in Michigan.

CURRENT ACREAGE: Michigan's onshore coastal wetlands cover about 105,855 acres. If offshore vegetated wetlands are included, the wetlands cover 207,898 acres. Michigan's northern forested wetlands total 3.3 million acres in the upper peninsula and the northern lower peninsula.

TRENDS: Comparing coastal wetlands on historical topographic maps with modern maps for five representative areas on Michigan's shoreline reveals an average loss of 59 percent (41,608 out of 70,130 acres) between the turn of the century and the mid-1970s. Losses ranged from 50 percent to 77 percent in the five selected areas. Forest Service data for Michigan show a 14 percent loss

²A gross annual economic return methodology was used to determine wetland values for consumptive and nonconsumptive uses of wetlands and replacement values were used to determine economic values of fish and waterfowl production.

Figure XVIII-1: MICHIGAN'S NORTHERN FORESTED AND COASTAL WETLANDS



in forest types likely to be wetlands between 1966 and 1980. More recent data on the rate of loss are not available.

FACTORS ADVERSELY AFFECTING COASTAL WETLANDS

In the past, drainage for agriculture and for mosquito control, largely aided by the Federal government, was the primary factor leading to the demise of coastal wetlands in Michigan. Today, however, a host of activities related to urban development are responsible for the loss. These include construction of residences, highways, flood control structures, recreational facilities, navigation channels, and industrial sites. Upstream water projects also have an impact on coastal wetlands.

Residential development is the most important factor presently affecting wetlands along all of the Great Lakes. In 1975, the Great Lakes Basin Commission predicted a 26 percent increase in the amount of U.S. shoreland along the upper four Great Lakes which would be devoted to residential uses by the year 2020. This represents a 279-mile increase in developed Great Lakes shoreline. The forecasted residential development includes not only suburban expansion from larger cities such as Detroit, but vacation and second home development, as well. The latter are envisioned as including single dwellings, trailer parks, and condominium complexes. Sewage treatment facilities and highways provide the infrastructure to accommodate existing dwellings and encourage additional development.

Partially drained agricultural land or wetlands requiring draining, filling, and diking are likely candidate sites for this development. Major pumping and/or dike maintenance efforts may be needed to keep the areas from reverting to wetland, particularly during periodic high lake levels. Between 1985 and 1986 Federal expenditures on flood control and shoreline protection increased five-fold. Under natural conditions of ebb and flow, coastal wetlands can regenerate, but once dikes, bulkheads, and berms are built, vegetation no longer moves shoreward during high lake levels, and thus revegetation does not occur when the lake recedes.

Demands for recreational facilities such as marinas, harbors, and boat launches accompany the growth in vacation home development, converting biologically productive shallow water habitat to deep water. The construction and maintenance of navigation channels, important transit routes for midwestern States, has also played a key role in the disappearance of coastal wetlands. Direct losses attributable to these activities result from dredging channels and constructing turning basins and harbors. Historically, dumping dredge material into wetland areas also contributed to losses, but dumping has decreased sharply in recent years. Traffic in narrow channels can increase erosion, a problem which is exacerbated if vessels speeds are not carefully monitored. Movement of large vessels in the St. Mary's River, especially during winter ice conditions, is believed to cause erosion of adjacent wetlands. Vessel passage may also result in accelerated bulkhead construction by shoreline property owners to prevent further erosion. Bulkheads prevent the re-establishment of wetland vegetation.

Industrial development has been a locally important factor in wetland losses. The Great Lakes Basin Commission predicted a 40 percent increase in industrial use along the entire shoreline of the upper four Great Lakes between 1970 and 2020, involving 85 miles of shoreline. The construction of manufacturing plants and limestone mining operations, for example, is expected to

increase. Disposal of industrial waste materials has had adverse effects on wetlands. Coal-fired power plants have used hundreds of wetland acres along the Lake Erie and Saginaw Bay shorelines for disposal of fly ash, and the automotive industry has used wetlands for disposal of foundry sand-castings.

Disposal of wastes not only fills in wetland areas, but reduces water quality. Although some "grandfathered" disposal activities still occur, such as Detroit Edison's fly ash disposal at Monroe, present regulatory programs no longer permit the filling of coastal wetlands for waste disposal. Nonetheless, the water contamination from past activities will continue to affect wetlands well into the future. The sites are so polluted that the wetlands cannot be restored safely and thus they continue to be filled. The Resource Conservation and Recovery Act, administered by the EPA and the States, regulates solid waste disposal sites such as this. However, few comprehensive monitoring studies have been conducted on or adjacent to fly ash sites to establish the extent of degradation and legal liability. EPA has the authority both to conduct studies and to pursue responsible parties to mitigate wetland damages. Why it has not done so is not clear.

Upstream uses also affect Great Lakes wetlands. When impoundments upstream trap sediment, the sediment-dependent (deltaic) wetlands formed at the river mouth begin to shrink. Since 1913, eleven dams have been built within a 100-mile stretch of the Huron River above Pt. Mouillee. High water levels accelerate land loss: in 1940, for example, with the breach of a large protective barrier beach, erosion escalated sharply. Almost 90 percent of the 2600 acre deltaic wetland at the mouth of the Huron River at Pt. Mouillee has since been transformed to open water. The Army Corps of Engineers and the Michigan Department of Natural Resources are cooperating to build a structure to replace the barrier beach and restore the wetlands. The project has had ongoing problems with high water levels, leaky dikes, and potential exposure of contaminated sediments.

Present Federal and State regulatory programs have reduced much dredging and filling of emergent coastal marshes, in part because of a general appreciation of the value of these areas. Forested and shrub wetlands, however, remain quite vulnerable to alteration by developers who often do not realize that permits are required. Additional research and education on values of forested and shrub wetlands as well as more stringent penalties would help to alleviate this problem.

FACTORS ADVERSELY AFFECTING NORTHERN FORESTED WETLANDS

In the late 1800s, northern forested areas underwent heavy logging. Since then the forests have regenerated. Of the 15 million acres of commercial forest land now in northern Michigan, 53 percent is in private, nonindustrial holdings, 36 percent in public ownership, and 11 percent is owned by industrial forest corporations. Attempts to clear and drain forested wetlands in the upper peninsula for row and cash crop agriculture have proved economically infeasible because of the short growing season, poor soil quality, and an inability to achieve sufficient drainage. Through a program designed to aid wood products companies, the State Government is promoting Michigan's forestry industry, which accounts for \$2 - \$4 billion of output annually (2 percent of the State's gross product). The program involves conducting research, help in planning, offering technical assistance and worker training, and granting property tax relief. While silviculture is the major threat to northern forested wetlands, the impacts from peat mining and vacation home development could increase over time.

In the late 1970s and early 1980s, wood products companies initiated three drainage demonstration projects which successfully and economically reduced water levels. Four additional drainage projects were proposed. Of the four proposals, the State, which has assumed responsibility for administering the 404 regulatory program, allowed only one and denied permits for the rest. But whether pressure to permit drainage projects increases in northern Michigan depends on market conditions and on the results of the demonstration projects. If drainage compares favorably with intensifying management on upland sites as a way to increase timber harvests, a policy of permitting drainage activities could evolve. Drainage makes the areas accessible to timber harvesting machinery, and enhances the rate of tree growth. Often native trees are replaced with red pine plantations, which support a relatively low diversity of plant and animal species. Draining the land also contributes to soil erosion, downstream flooding during spring peak flows, and reduced base flow for the remainder of the summer. These changes could affect the trout fisheries found in many northern Michigan streams.

Peat mining could also increase the drainage of forested wetlands. Michigan, with an estimated 4.5 million acres of peat lands, supplies 30 percent of U.S. demand. If demand for peat for horticultural use or as an energy source increases, these lands could come under increasing pressure. The removal of peat can degrade wetlands by releasing toxic metals from the peat, releasing organic pollutants and causing eutrophication of surface waters, increasing runoff, changing groundwater

conditions, and destroying soils through fire. Michigan does have a program to oversee further development of peat mining.

The increased construction of first and second homes in the northern lower peninsula is increasing. Of the 15 Michigan counties projected to experience population growth in excess of 50 percent in the next 30 years, 14 are in the northern lower peninsula. A comparable increase in second home development is expected.

FEDERAL PROGRAMS AND PROJECTS IN COASTAL MICHIGAN

URBAN DEVELOPMENT: Residential and recreational development constitutes the greatest threat to Michigan's coastal wetlands, and there are several Federal programs which subsidize such development. The Department of Housing and Urban Development (HUD) provides funds for residences and infrastructure through its Small Cities Program, Community Development Block Grants, and Urban Development Action Grants. In 1986, HUD spent \$138.8 million in Michigan. How much was spent for projects in coastal areas or how these programs affected coastal wetlands is not known. The Federal Housing Administration and Veteran's Administration guarantee loans for home construction from private lenders, while the Farmer's Home Administration makes loans for rural, low-income housing. The National Flood Insurance Program administered by the Federal Emergency Management Agency serves in practice to secure the loans. If Federal flood insurance were unavailable, private funds for coastal development would shrink considerably. Income tax deductions of property taxes and interest for primary and second homes promotes development, with much of the pressure in coastal Michigan being in coastal wetlands. Sewage treatment facilities financed by the Environmental Protection Agency³ and utility connections sponsored in part by the Rural Electric Administration destroy wetlands directly during construction and provide the infrastructure necessary for residential and commercial development, which also often affects wetlands. All these programs constitute subsidies of private activities, subsidies from general taxpayers to local residents.

Regulatory programs are generally effective in controlling large projects which would have significant environmental effects. But smaller projects, which individually do incremental damage but collectively do significant cumulative damage, are often permitted, because the cumulative effects are not adequately considered by the regulatory authorities.

³In 1986, Michigan received \$77.8 million for construction of treatment facilities.

Federal Highway Administration (FHWA) grants, totaling \$335 million in Michigan in 1986, lead directly to wetland destruction. Often routes and engineering alternatives to minimize wetland losses are not selected due to higher construction costs. Until recently, FHWA policy prevented most mitigation outside of the highway right-of-way and established an acre-for-acre limit to the amount of compensation (as opposed to in-kind, function-for-function mitigation). This mitigation policy reduced the probability of creating high quality wetlands.

On April 20, 1990, the Federal Highway Administrator issued an Environmental Policy Statement that may remedy some of these problems. The new policy emphasizes FHWA's commitment to the goal of no net loss of wetlands, and commits the agency "to work vigorously to preserve and, where practicable, enhance the environment." Specifically with respect to wetlands, the policy calls for "all practicable measures to avoid, minimize, mitigate, and compensate for wetland impacts." The new policy does not commit FHWA to mitigating outside highway rights-of-way or to acknowledging functional values of wetlands, but it does establish a standard of environmental sensitivity markedly different from that which the agency subscribed to in the past.

EPA regulations prohibit the use of Federal wastewater treatment grant funds for buying lands needed to mitigate wetland losses caused by the siting of sewage treatment facilities in wetland areas. These regulations may limit the extent of mitigation projects associated with the siting of such facilities.

Even if direct wetland effects were minimized or compensated for, few planning decisions take secondary impacts on wetlands into account. In rural areas, for example, new sewage treatment facilities are built to serve residences which stand on converted wetlands. Construction often provides for excess capacity, thereby promoting additional development in wetlands. Limiting the funds for excess capacity in undeveloped and rural areas could curb demand. New and expanded highways similarly facilitate additional urban development. Moreover, once planning is completed, grants made, and construction underway, follow-up on construction practices is weak. Contractors sometimes dispose of construction materials in wetlands in ignorance or defiance of the legal restrictions. Disposal problems have emerged during both highway and sewer projects near Detroit and along U.S. Route 2 in the Upper Peninsula.

Federal funds also underwrite water-based, recreational projects, which frequently occur near or in coastal wetlands. Public marinas, harbors-of-refuge, and boat launches can receive funds from the Land and Water Conservation Fund (LWCF) administered by the National Park Service or from the Federal Aid in Fish

Restoration Fund administered by the Fish and Wildlife Service.⁴ A recent expansion of the Federal Aid program for sport fishing, known as Wallop-Breaux, slates at least 10 percent of the funding for boating and fisherman access facilities, so an increase in construction is expected. Private marina developments may receive funds via Coastal Zone Management grants and Sea Grant research and extension services.

Federal incentives for industrial development include the various business tax incentives remaining under the Tax Reform legislation, Economic Development Administration grants amounting to \$2.6 million statewide in 1986, and Small Business Administration loans. These have a lesser and more localized impact on coastal wetlands than residential and recreational developments.

WATER PROJECTS: Flood control and shore protection projects, such as the construction or repair of dikes and levees, are conducted by the Army Corps of Engineers, the Soil Conservation Service, and the Agricultural Stabilization and Conservation Service. In Michigan, spending on flood control and shore protection projects by these agencies rose from \$1.9 million in 1985 to \$10.8 million in 1986. Many of the projects occur in the western basin of Lake Erie and Saginaw Bay. Increased cost sharing by non-Federal sponsors (like that mandated by the Water Resources Development Act of 1986) should reduce requests for Corps assistance.⁵

Navigation is enhanced by dredging, lock construction and operations, and harbor improvements conducted by the Corps. All of these can have negative consequences for coastal wetlands. Ice-breaking by the U. S. Coast Guard near coastal wetlands can increase erosion and result in losses of emergent and submerged vegetation.

⁴The FWS receives some monies from the LWCF but these must be spent for land acquisition only. The NPS, however, allocates monies from the LWCF to use for water-based, recreational projects.

⁵Increased cost-sharing may bring with it the need for increased regulatory vigilance, however. For example, one community along Lake Erie turned down Corps shore protection proposals as too expensive. Instead, they invited the contractors from a large sewage treatment and sewer line project to illegally dump excess materials along their property, including wetlands. This resulted in a major enforcement action by Michigan Department of Natural Resources, Corps, and EPA with several years passing before the fill was removed.

Dam construction and rehabilitation for hydroelectric power development is also underway in Michigan. Many of the Huron River dams are being revamped to produce power by private companies and local communities. The Federal Energy Regulatory Commission licenses these facilities, and the 1978 Public Utility Regulatory Policies Act (PURPA) offers a direct economic stimulus for the construction of small hydroelectric projects in the form of a guaranteed market for the output of small hydroelectric projects.⁶

FEDERAL PROGRAMS AND PROJECTS IN NORTHERN FORESTED MICHIGAN

SILVICULTURE: Several Federal programs and tax code provisions which promote forestry may induce drainage of wetlands in northern Michigan.

Forest landowners can avail themselves of two cost-sharing programs, which generally cover from 50 to 75 percent of allowed expenses. The Agricultural Conservation Program, administered by the ASCS, offers funds to plant trees and shrubs for timber production as well as for windbreaks, shelterbelts, erosion control, and wildlife. The Forestry Incentive Program, administered jointly by the Forest Service and the ASCS, permits cost sharing with owners of tracts under 1000 acres for timber production, including site preparation, planting, tree removal and precommercial thinning.

The Farmer's Home Administration (FmHA) aids the forest industry by offering farm ownership loans to buy or develop forest land or refinance debts against forest land, soil and water loans to improve forest resources, and operating loans to help with normal costs of producing, harvesting, and processing forest products. Some of these loans can be used to finance drainage. All of these loans are at below market rate interest. The 1985 Food Security Act allows (at the Secretary's discretion) delinquent farmers to reamortize FmHA loans and delay repayment if they plant at least 50 acres of softwood timber. This feature offers an incentive to replace native hardwoods (often forested wetlands) with softwood plantations lacking in some of the functions and values of native hardwood forests.

Several provisions in the Federal income tax code allow special expensing, rapid amortization, and investment credits for forestry activities. Reforestation expenditures up to \$10,000

⁶PURPA requires that utilities purchase the power from projects under five megawatts at favorable rates. PURPA used to include tax and loan incentives, but these have been eliminated recently.

for site preparation, seed or seedlings, tools, and labor are eligible for a 10 percent tax credit and may be amortized over only 7 years. It is not known how great an impact these programs have on the drainage of forested wetlands. However, if it proved significant, consideration might be given to conditioning eligibility for these provisions on avoidance of wetland conversion or degradation.

Although it is not known how great an impact these programs have on the drainage of forested wetlands, none of the programs has eligibility conditioned on avoiding wetland effects. Indeed, the Forest Service itself conducts a limited amount of research on techniques for draining wetlands.

STATUS AND PROSPECTS

A host of Federal incentives to urban development may promote the loss of coastal wetlands in Michigan and elsewhere. While the impact of each program is likely to be small, in combination grants, loan guarantees, insurance, tax incentives, infrastructure, and flood control programs may have a significant impact in coastal wetland areas. Over the next 30 years development pressure along these coasts is projected to escalate due to expected growth in Michigan's non-metropolitan areas. The population in counties bordering northern Lake Michigan and Grand Traverse Bay are expected to grow by 50 percent during this period. Significant growth is also anticipated in counties bordering southern Lake Michigan and Lake St. Clair.

Present State and Federal regulatory programs will likely reduce the level of dredging and filling in the emergent marshes (except for water-dependent recreation facilities such as marinas and harbors). Without restrictions on their use, however, Federal funds will continue to abet the loss of wetlands through these types of recreational development. Regulatory programs have been less effective in controlling development in coastal forested and shrub wetlands.

It is difficult to estimate the extent to which restricting the Federal economic incentives for residential and recreational development will conserve coastal wetlands. It is clear, however, that many of these Federal programs are not properly designed based on principles of efficiency and equity. The subsidies are difficult to justify under any circumstances, but they are more difficult to defend given the programs' environmental impacts. If political realities preclude elimination of the subsidies, the programs should be conducted so as to minimize impacts on wetlands and the environment.

An improvement in the wood products market in conjunction with findings that drainage for silviculture may be economically feasible and cheaper than intensified forest management of upland areas would increase development pressures in the forested wetlands of northern Michigan. The various cost-sharing and loan programs, income tax provisions, and Federal research efforts for forestry serve to reduce the cost of drainage and development of wetlands for silviculture. Although the Federal government has eliminated many incentives for agricultural conversion, the historical incentives for silviculture remain intact.

Subsidies and tax concession are often a two edged sword, and those for silviculture are no exception. In Michigan and a number of other natural areas these programs and provisions induce forestry and timbering, and in the process may alter and degrade wetland environments. But in other areas, they induce reforestation which improves the environment. Optimally, the statutes and programs should be carefully conditioned in order to target provisions appropriately and induce forestry only where it is desirable.

Peat mining poses a potential to Michigan's forested wetlands should energy prices rise. In this case, a well enforced regulatory program will be necessary to protect environmentally significant sites.

RECOMMENDATIONS

1. **Have Federal agencies assess the effects of their programs on wetlands. Where feasible, agencies should minimize the wetland effects of their programs. Where this proves infeasible, agencies should furnish Congress with an explanation of why adjustments cannot be instituted.**

Many Federal programs that affect wetlands are designed and financed in a way that violates the most basic principles of public finance: efficiency and equity. They distort market signals and provide subsidies that are difficult to justify under any circumstances, but much more difficult to defend given their environmental impacts. Optimally, these programs should be redesigned in order to confront project sponsors with the full cost of their activities. This would reduce the Federal deficit, strengthen the economy by improving the allocation of resources, and conserve wetlands and other environmental resources. If political realities preclude elimination of these subsidies, the programs should be conducted so as to minimize their impacts on wetlands and the environment and mitigate wetland losses in-kind and function-for-function rather than in a limited acre-for-acre manner.

Executive Orders 11990 and 11988, the Executive Orders on Wetland Protection and Floodplain Management, already require all Federal agencies to minimize wetland and consider floodplain impacts in conducting their programs. Although most Federal agencies instituted regulations to fulfill the requirements of the Executive Orders, some have not and some that promulgated regulations have not implemented them thoroughly. No oversight information exists on the implementation and effectiveness of the Executive Orders. Strengthening the administration and enforcement of these Executive Orders will benefit the environment, the economy, and society as a whole.

REFERENCES

- Herdendorf, C. E., C. N. Rafael and E. Jaworski. 1986. The Ecology of Lake St. Claire Wetlands: A Community Profile. Biological Report, 85 (7.7), Fish and Wildlife Service, U.S. Department of the Interior, Washington, DC, 187pp.
- Kolar, M. 1986. Impacts of Federal Programs on Michigan's Coastal Wetlands. Background Report. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 32pp.
- Simon, B. 1986. Forested Wetlands in Northern Michigan. Background Document. Office of Policy Analysis, U.S. Department of the Interior, Washington, DC, 32pp.

Chapter 19: THE RAINWATER BASIN OF NEBRASKA

INTRODUCTION

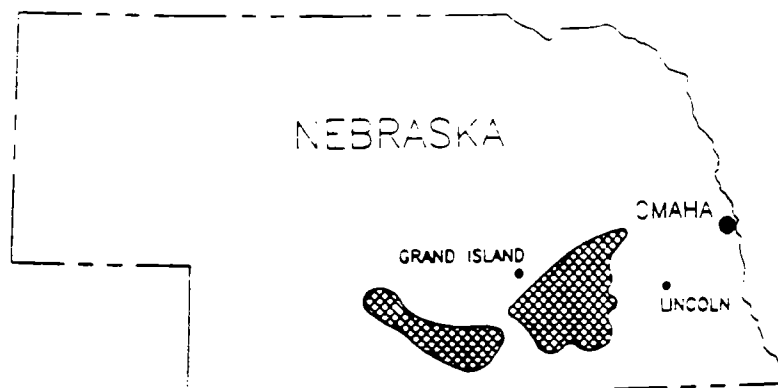
PHYSICAL DESCRIPTION: The Rainwater Basin area of Nebraska occupies about 4,200 square miles in 17 counties in the south central portion of the State. (See Figure XIX-1.) Within that area are scattered wetland basins formed when clay particles created a layer in the subsoil impervious to water movement. The impervious layer resulted in a perched water table. The sink-like basins receive water from rainfall, and vary in size and depth, producing a dynamic wetland complex. Temporarily, seasonally, and semi-permanently flooded wetlands occur in the Rainwater Basin. Each of these wetland types has distinctive soils, hydrology, and vegetation. Agricultural land use dominates the area, with grain (corn, wheat, milo, and sorghum), soybeans, and alfalfa being the main crops produced.

CHARACTERISTICS AND FUNCTIONS: The Rainwater Basin wetlands

- o Provide spring, migratory habitat for 5 to 7 million ducks and geese, including about 1 million snow geese, 90 percent of the mid-continental greater white-fronted goose population, 50 percent of the mid-continental mallard breeding population, and 30 percent of the continental northern pintail breeding population;
- o Furnish breeding and nesting habitat for shorebirds, waterfowl, and other water-associated species;
- o Support 2 federally-listed endangered species (bald eagle and whooping crane); and
- o Contain about 15,400 acres protected by either State or Federal ownership or contract programs. This represents 45 percent of the area's remaining wetlands.

ORIGINAL ACREAGE: Historically, nearly 4,000 individual wetlands occupied about 95,000 acres in the Rainwater Basin.

Figure XIX-1: RAINWATER BASIN OF NEBRASKA



CURRENT ACREAGE: Approximately 34,000 wetland acres remain in the Rainwater Basin.¹ Virtually all of the remaining wetlands have been modified to some extent.

TRENDS: Trends vary by wetland type. Between the 1960s and the 1980s, shallower, more easily drained wetlands declined by 74 percent, deep wetlands declined by about 47 percent, and the intermediate wetlands declined by 20 percent, significantly changing the composition of wetlands in the Basin. A majority of the seasonally and temporarily flooded wetlands, those more easily drained, are privately owned. Thus, although Swampbuster and recent shifts in public policy have slowed conversion, the remaining wetlands continue to be vulnerable to conversion should economic conditions in the agricultural sector warrant. Further, even if conversion is not profitable, run-off from farms and roadways threatens the wetlands with siltation and chemical contamination.

FACTORS ADVERSELY AFFECTING WETLANDS

Most wetland loss in the Basin has been to agriculture, although some loss has occurred as sections of roads and ditches were constructed and improved. Today drainage of wetlands to make the land more suitable for crop production is the major factor accounting for loss in the Rainwater Basin. While some of the

¹This is the acreage for palustrine or depressional wetlands, which are the focus of this chapter. There are an additional 17,000 acres of riverine and lacustrine wetlands in the Basin.

smaller and shallower wetlands in the area may be effectively drained through leveling and grading, drainage of Rainwater Basin wetlands usually requires the excavation of large pits to store the drained water. The excavated material provides fill for the drained wetland.

Landowners drain wetlands by excavating pits in the floor of a wetland basin so that water that once spread shallowly, for days, weeks, or months at a time, over a relatively large, low-lying area is contained in a pit up to 20 feet deep. To drain one wetland acre can require a pit from 1000 to 2000 cubic yards in size, depending on whether the wetland is temporarily, seasonally, or semi-permanently flooded. Although rarely possible, pits are sometimes used in combination with drainage ditches. Whatever the method, complete drainage is seldom achieved. Partial flooding and some crop loss occurs on converted lands in at least one out of every five to seven years.

During the last 10-15 years, corn produced on irrigated land has been the most profitable crop in the region; this status is expected to continue. Grain, sorghum, or wheat are usually grown on non-irrigated wetland areas during a dry year or with only partial drainage.

Nebraska State law requires that persons using groundwater for crop irrigation purposes must prevent or control the irrigation runoff water. Consequently, agricultural reuse pits, constructed to trap irrigation wastewater, are often placed in natural drainages. As a result, wetland effects are frequent. Reuse pits within closed watersheds trap natural run-off, reducing water permanence in the wetlands, causing shifts in plant species composition and abundance, and changing semi-permanently flooded wetlands to seasonally or temporarily flooded wetlands. Sometimes a reuse pit is located directly in a wetland basin, with excavated material used to fill part of the wetland.

The profitability of a converted wetland is significantly affected by soil type and conversion costs. Drainage tends to be profitable in temporarily flooded areas with more productive soils and pit excavation limited to several hundred cubic yards. Drainage tends to be unprofitable in semi-permanently flooded areas with less productive wet soils and excavation exceeding 2000 cubic yards. For seasonally flooded wetlands, if soil is fairly productive and only moderate excavation is required, conversion can be profitable.² Excavation costs have been rising at a rate of about 9 percent per year (faster than cash

²Soil productivity at least 80 percent of that for upland soils and excavation less than 1000 cubic yards.

receipts), and thus conversion is becoming a less attractive proposition.

Most Rainwater Basin wetlands, including those in public ownership, are being degraded by siltation from adjacent farms and roads and contaminated by agricultural chemicals. Siltation gradually fills in the wetlands, altering aquatic, vegetative communities and reducing water retention by the wetlands. The wetlands are exposed to herbicides that can disrupt the composition of the plant community and reduce species diversity. Also, the wetlands are contaminated by insecticides that can alter the species composition and decrease the numbers of aquatic and terrestrial, invertebrate species.

The loss of Rainwater Basin wetlands has forced water-associated birds to concentrate in fewer wetlands. This condition increases the incidence of disease and death. Since 1975, approximately 200,000 birds have died of avian cholera in the Rainwater Basin, due at least in part to overcrowding. Avian cholera affects not only waterfowl, but crows, raptors, sandhill cranes, and other bird species. Overcrowding and disease in the Rainwater Basin is particularly troubling, because the area serves as migratory habitat for the endangered whooping crane.

FEDERAL PROGRAMS AND PROJECTS

Much of the conversion in the Basin has been conducted with Federal assistance through cost-sharing programs for water management. In addition, agricultural subsidies (largely in the form of price and income supports) have encouraged landowners to drain wetlands. These programs offered incentives and funding for converting wetlands in an economic environment where private conversion was often unprofitable or, at best, only marginally profitable. Swampbuster eliminated the conversion incentive due to price and income supports. Although Swampbuster also made Federal cost-sharing assistance unavailable for projects which convert wetlands to agriculture, there are some exceptions in the law. These exceptions are particularly relevant to the Rainwater Basin, and Federal cost-sharing for water management in this region continues to affect wetlands.

WATER PROJECTS: Two Federal cost-sharing programs assist in a wide range of soil and water conservation practices, and can lead to wetland drainage: the Agricultural Conservation Program (ACP) administered by the Agricultural Stabilization and Conservation Service (ASCS) and the Great Plains Program (GPP) administered by the Soil Conservation Service (SCS). In recent years the ACP has spent \$4-5 million annually in the area. The program covers 60 to 75 percent of the costs (up to \$3500) of selected conservation measures, such as land leveling and the construction of

irrigation water recovery systems. GPP expenditures have averaged \$1-1.5 million annually in the area, decreasing a bit in recent years. This program covers up to 60 percent of land leveling costs and up to 75 percent of the costs of irrigation water recovery systems.

Construction of irrigation water recovery pits has the greatest impact on wetlands. If a wetland lies at the end of a field irrigated by gravity-flow, a recovery pit may be excavated within the wetland to capture the spent water. In center pivot systems, recovery pits may be excavated in the corners of the field just outside the reach of the pivot. In both types of irrigation systems, captured water is reused for irrigation which can remove or reduce the supply of irrigation water or natural runoff that would normally be available to adjacent wetlands. Recovery pits can also be enlarged three to four times for drainwater storage.

Assistance for "irrigation water conservation" is available for gravity-flow but not center pivot systems. The program is not supposed to bring new land under irrigation, so assistance is only available for projects on land which has been irrigated 4 out of the last 5 years. Despite this programmatic constraint and despite additional constraints introduced with Swampbuster, there are exceptions which allow continued subsidization of activities which affect wetlands. Some exceptions are provided for in the statutes and some stem from enterprising interpretations of the statutes and regulations. No one exception leads to a significant loss of wetlands, but collectively the exceptions degrade and diminish the stock. For example:

- o If a wetland adjacent to an irrigated field is the most logical and feasible site for a recovery pit, the pit may be located in the wetland and still qualify for cost-sharing assistance. Since wetlands are almost always low-lying areas into which water drains, it is always going to be cheaper to locate recovery pits there than elsewhere. The technical exception makes the formal conservation constraints seem a bit disingenuous.
- o Because of what are considered "overriding technical factors" (usually cost considerations), cost-sharing for construction and price supports and deficiency payments for crops may be extended even in cases where some additional wetland is brought under cultivation. In most such cases, however, mitigation would be required by SCS and the design approved by the FWS.
- o The ACP and GPP programs require that recovery pits be designed with only enough capacity to capture irrigation flows. The programmatic requirements exclude capacity for

rainfall runoff. However, SCS personnel indicate that cost-sharing is not automatically denied for oversized pits. Rather, assistance is simply limited to that portion of the work necessary to construct a pit of the required capacity. Partitioning projects in this contrived way circumvents the intent of the conservation provisions of the statutes.

COMMODITY PROGRAMS: The commodity programs are designed to limit the production of certain crops while stabilizing or increasing farm income through crop price supports and direct payments to farmers. The basic tools have been nonrecourse commodity loans to support prices; deficiency payments to support income; and acreage set-aside, reduction, or diversion programs to restrict production.

Here as elsewhere, these subsidies have distorted market signals and induced the conversion of more wetlands to agriculture than was economically efficient. With the advent of Swampbuster, however, these incentives were eliminated. Swampbuster denies farm program benefits to persons who either convert wetlands after the date of enactment of the 1990 FACTA or plant on wetlands converted after December 23, 1985. Given the high rate of farm program participation in the Rainwater Basin, Swampbuster should pose a significant constraint on wetland conversion for agriculture.³

Although Swampbuster eliminated the incentive to convert wetlands in order to gain access to farm program benefits, there is a residual impact from the commodity programs. The crop subsidies in conjunction with low interest loans from FmHA keep more land in agriculture (especially marginal land) than would otherwise be the case. In the absence of the subsidies some of this land would revert to wetlands. Further, while the land remains in the agriculture sector, the runoff continues to degrade existing wetlands.

STATUS AND PROSPECTS

The Rainwater Basin's wetlands remain vulnerable to siltation and contamination from agricultural chemicals from adjacent cropland and rangeland. Irrigation wastewater containing herbicides from chemicals applied directly in irrigation water potentially poses an additional threat to the aquatic environment by concentrating herbicides and altering vegetal communities in the adjacent

³Feed grain and wheat program participation has grown from 70 percent to over 80 percent in Nebraska in recent years.

basins.⁴ Although the incentives have been much reduced, privately owned wetlands are still subject to draining and filling.

The high level of farm program participation in Nebraska in recent years suggests that if fully enforced, Swampbuster should prove successful in discouraging wetland conversions in the Basin. However, if support levels continue to decline and the programs become more restrictive, participation is likely to wane.

Cost-sharing for water conservation practices such as building irrigation water recovery pits is expected to continue causing wetland losses. In some cases these pits can be built in wetlands, and the excavated material can be used to fill wetlands. These pits can also be expanded to store rainwater runoff, depriving wetlands of moisture and adding to water available for irrigation. Although apparently prohibited, Federal funds continue to contribute to pit expansion projects which affect wetlands, because the projects are formally subdivided into segments that qualify for aid (and hence, ostensibly do not affect wetlands) and segments that must be privately funded.

RECOMMENDATIONS

1. Water management projects:

Eliminate Federal cost-sharing participation by the ASCS and SCS in any soil and water conservation projects that would destroy or degrade wetlands.

The ASCS's Agricultural Conservation Program and the SCS's Great Plains Program provide cost-sharing and technical assistance for soil and water conservation measures, such as land leveling and irrigation water recovery systems, that may directly or indirectly contribute to wetland losses or degradation. Such financial and technical assistance encourages landowners to undertake inefficient and environmentally damaging projects. Such assistance is inconsistent with other Federal activities to protect wetlands, such as the Swampbuster provision of the Food Security Act and Executive Order 11990 which directs Federal agencies to avoid adverse impacts to wetlands. Finally, Federal assistance for developing irrigation water

⁴Although Nebraska law requires that wastewater from irrigation be kept on the operator's land, this law is rarely enforced.

resources promotes further agricultural productivity of surplus commodity crops.

REFERENCES

- Swanson, Larry D. 1986. The Profitability of Wetland Drainage in the Rainwater Basin of Nebraska. Prepared for the U.S. Environmental Protection Agency, Region VII, Kansas City, Kansas, 102 pp.
- Gersib, Richard A., B. Elder, K.F. Dinan, and T.H. Hupf. 1989. Waterfowl Values By Wetland Type Within Rainwater Basin Wetlands With Special Emphasis on Activity Time Budget and Census Data. Nebraska Game and Parks Commission, Lincoln, Nebraska, and U.S. Fish and Wildlife Service, Grand Island, Nebraska, 105 pp.
- Raines, Richard R., M.C. Gilbert, R.A. Gersib, W.S. Rosier, and K.F. Dinan. 1990. Regulatory Planning for Nebraska's Rainwater Basin Wetlands (Advanced Identification of Disposal Areas). Prepared for the Rainwater Basin Advanced Identification Study. U.S. Environmental Protection Agency, Kansas City, Kansas, and U.S. Army Corps of Engineers, Omaha, Nebraska, 46 pp.