

AGRICULTURAL IMPACTS ON  
WETLANDS IN THE NORTHEASTERN UNITED STATES<sup>1</sup>

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Abstract.--Despite its reputation as a highly industrialized region, the northeastern U.S. is mostly farmland and forests. Consequently, the agricultural impacts to wetlands are more significant than commonly thought. Available information about these impacts is presented.

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INTRODUCTION

The northeastern part of the United States is largely viewed as an industrialized, highly urbanized region. While it is true that there are many people and much industry in the region, the Northeast is largely dominated by forests and farmland, with the majority of its population and industry concentrated in several metropolitan centers. Agricultural areas are extensive throughout the region, especially in Virginia, Maryland, Delaware, Pennsylvania, New York, and New Jersey. Consequently, agricultural activities often have significant impacts on wetlands in the Northeast.

Over the past five years, the U.S. Fish and Wildlife Service has been collecting information on recent wetland trends in the Northeast. A major study based on statistical sampling techniques, has been completed for a five-state area including Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. In addition, intensive studies of recent wetland changes have been completed for two localized areas in the region where agricultural impacts are significant: (1) the Upper Choptank River watershed in Maryland and Delaware and (2) southeastern Massachusetts. Besides these data, the New

York Department of Environmental Conservation, in conducting an inventory of the state's freshwater wetlands, identified "drained mucklands" - organic soils now farmed. The purpose of this paper is to summarize existing information on recent agricultural impacts on wetlands in the northeastern United States.

AGRICULTURAL IMPACTS

In the Northeast, wetlands have been impacted in several ways by agricultural activities. These impacts can be divided into two general categories: (1) quantitative impacts and (2) qualitative impacts (Table 1). Quantitative impacts result in the wholesale destruction of wetlands, whereas qualitative impacts impair the functioning or diminish the quality of wetlands. The most obvious quantitative impact is the direct conversion of wetlands to cropland after drainage and removal of native vegetation. A less obvious impact involves wetlands that are inadvertently drained by channelization projects whose main purpose is to improve drainage on existing farmlands. In these cases (which are widespread on the Delmarva Peninsula and southeastern Virginia), large drainage ditches called "channels" are often constructed through wetlands enroute to farmlands needing drainage improvement. Many wetlands dissected by the channel are thereby completely drained. Qualitative impacts are often more insidious and subtle, such as the alteration of wetland hydrology by ground water withdrawal for irrigation or the runoff of herbicides, pesticides, fertilizers, and soil from adjacent farmlands.

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RECENT WETLAND IMPACTS IN  
THE FIVE-STATE MID-ATLANTIC AREA

*In 1986, the U.S. Fish and Wildlife Service and U.S. Environmental Protection*

Agency published a report on recent wetland trends in five states - Delaware, Maryland, Pennsylvania, Virginia, and West Virginia (Tiner and Finn 1986). The report presents the findings of a statistical sampling study which produced estimates of the wetland acreage by type for each state in the mid-1950s and late 1970s and estimates of wetland changes during this period.

Between the mid-1950s and late 1970s, about seven percent of the five-state area's palustrine vegetated wetlands were destroyed. In total, the net loss amounted to 133,000 acres. This acreage loss equates to an area three times the size of Washington, D.C. or about one-tenth the size of Delaware. On average, the annual net

loss was 58,000 acres. Agriculture and other factors (mostly channelization and related to agricultural activities) were responsible for about two-thirds of the total gross human-induced losses of palustrine vegetated wetlands. Forested wetlands and emergent wetlands were the types most adversely impacted. Direct agricultural conversion involved about 37,000 acres of forested wetland and roughly 21,000 acres of emergent wetland, while channelization projects associated with agriculture were largely responsible for an additional loss of 47,000 acres of forested wetland and 9,000 acres of emergent wetland. Conversion of bottomland hardwood forests along the Coastal Plain was the major agricultural impact to wetlands in the five-state region. Roughly 72 percent of the region's losses of palustrine vegetated wetland took place in this area.

Table 1.--Major agricultural impacts to wetlands in the northeastern United States.

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Quantitative Impacts

- \* Drainage, removal of native vegetation and conversion to cropland
- \* Drainage of wetlands by channelization projects for improving drainage on farmland
- \* Construction of dikes associated with cranberry bogs and mucklands
- \* Discharge of spoil into wetlands from channelization projects
- \* Excavation of wetlands for drainage channels and ditches

Qualitative Impacts

- \* Alteration of hydrology through channelization, ditching, ground water withdrawals for irrigation (lowering local water tables affecting ground water discharge wetlands), stream diversions, or road construction
  - \* Tilling emergent wetlands during dry periods (short-term wetland destruction)
  - \* Siltation from soil erosion of agricultural lands
  - \* Discharge of fertilizers, herbicides, and insecticides
  - \* Grazing
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Virginia

From a state perspective, agricultural impacts were greatest in Virginia with about 34,000 acres of palustrine vegetated wetland converted to cropland from 1956-1977 and another 21,000 acres of these wetlands lost to other development (mostly channelization associated with farming). Of Virginia's total palustrine vegetated wetland loss, 45 percent was due to agricultural conversion and 27 percent due to other factors (chiefly channelization); urban development caused only three percent of the recent losses. Roughly 80 percent of the statewide losses of these wetlands occurred in the Lower Coastal Plain area. Forested wetlands were the prime target for agricultural conversion, with an estimated 26,000 acres converted. This figure is three times the amount of emergent wetlands converted to farmland.

Delaware

Delaware followed Virginia in agricultural impacts to wetlands, with 11,000 acres of palustrine vegetated wetland converted to farmland and an additional 22,000 acres were lost due mostly to channelization projects. Delaware lost 21 percent of its palustrine vegetated wetlands since the mid-1950s. Agriculture and other factors (mostly channelization) were responsible for 82 percent of the losses. Forested wetlands were most heavily impacted by agriculture, with 8,600 acres converted to farmland and another 20,000 acres lost mainly due to channelization projects.

## Maryland

Maryland lost about 7,000 acres of palustrine vegetated wetlands to agriculture and another 7,000 acres to other factors (chiefly channelization); this amounts to roughly 66 percent of the state's recent losses. Most (91 percent) of the losses of palustrine vegetated wetlands took place on the Coastal Plain (the Eastern Shore). Emergent wetlands were the prime object for agricultural conversion. About 4,000 acres of emergent wetlands became farmland compared to 2,000 acres of forested wetlands converted.

## Pennsylvania

In Pennsylvania, agricultural conversion of wetlands involved about 8,000 acres of palustrine vegetated wetlands, accounting for about 17 percent of the recent statewide losses. Channelization and drainage projects, often related to agriculture, destroyed nearly 11,000 acres, representing 23 percent of the state's losses. Urban development was the cause of 14 percent of the recent losses; whereas pond and lake construction represented 45 percent of the losses. Emergent wetlands were most adversely affected by agriculture, with 7,000 acres converted to farmland.

## West Virginia

In marked contrast to the other states, West Virginia lost only 569 acres of palustrine vegetated wetlands to agriculture from 1957-1980, while an estimated 870 acres of abandoned farmland reverted back to wetland. So, the state experienced an estimated net gain of 301 wetland acres due to agriculture. Forested and emergent wetlands were converted to farmland, whereas most of the reestablished wetlands on former farmland were scrub-shrub and emergent wetlands. Two areas where detailed wetland trends analyses were performed showed contrasting results regarding the impacts of agriculture on wetlands. The Canaan Valley area showed only modest losses to agriculture (only nine percent of the total losses, with channelization projects and impoundment construction being the major loss factors - 42 percent and 35 percent, respectively). In contrast, agricultural conversion of wetlands in the Meadow River area accounted for 79 percent of the recent wetland losses, with emergent wetlands being most affected.

## SPECIFIC WETLAND IMPACTS

Fairly detailed information on the agricultural impacts on wetlands is available for four areas: (1) Upper Choptank watershed, (2) southeastern Massachusetts, (3) New Jersey (cranberry bogs and blueberry fields), and (4) New York (mucklands only). Figure 1 shows the locations of key areas of discussion. The following section summarizes the pertinent data.

### Upper Choptank River Watershed

The U.S. Fish and Wildlife Service's National Wetlands Inventory Project, Northeast Region, identified wetland changes between 1952/54 and 1981/82 in the Upper Choptank River watershed. This 92-square mile watershed is located in three counties (Caroline and Queen Anne's, MD; Kent, DE) along the Delaware-Maryland border.

In the early 1950s, the watershed possessed 13,814 acres of wetlands. By 1981/82, a total of 2,778 acres of palustrine vegetated wetlands had been destroyed; this amounts to a 20 percent loss. Direct conversion of wetlands to farmland accounted for nine percent (or 260 acres) of the total loss, whereas incidental drainage of wetlands from channelization projects (supporting agricultural activities) led to the destruction of 2,027 acres (73 percent of the total losses). Excavation of the channels and disposal of spoil material caused 16 percent (or 445 acres) of the losses. Urban development was responsible for less than one percent of the losses.

It is interesting to note that the percent of wetland loss in this area (20 percent) is very close to the estimated loss of wetlands in Delaware (21 percent) and that agriculture and other development (mostly channelization) were responsible for over 80 percent of the losses in both areas.

### Southeastern Massachusetts

In March 1988, the U.S. Fish and Wildlife Service completed a study of wetland changes in a 641-square mile area in southeastern Massachusetts (Tiner and Zinni 1988). The study period was from 1977 to 1985/86, thus most changes observed took place after the effective starting date of federal wetland permitting under Section 404 of the Clean Water Act.

During the study period, about 2.5 percent (or 1,245 acres) of the area's palustrine vegetated wetlands were destroyed. This included 647 acres of

forested wetlands, 365 acres of scrub-shrub wetlands, and 233 acres of emergent wetlands. On average, the annual loss rate of palustrine vegetated wetlands approached 150 acres. Agricultural activities caused 63 percent of the recent wetland losses, with conversion of wetland to cranberry bogs affecting 429 acres and conversion to other cropland impacting 392 acres (Table 2). An interesting observation from the study was that cranberry bogs were being constructed on upland soils. In fact, 62 percent (or 695 acres) of the new bogs were built on uplands, mostly from evergreen forests.

The wetlands converted to cropland in the study area were the subject of recent litigation in the federal courts, since much of this work was done without the required federal permit. In an August 18, 1987 court decision (U.S. v. Cumberland Farms of Connecticut, Inc.), the U.S. Court of Appeals judges upheld a district court decision that, among other things, requires Cumberland Farms to pay a penalty of \$540,000 (\$150,000 upfront) and to restore approximately 150-200 acres of wetlands that had been converted to farmland without federal permit. This opinion was upheld by the U.S. Supreme Court in February 1988. Recently, the district court ordered that Cumberland Farms restore the wetlands by August 31, 1988. If they fail to perform restoration by this date, they must pay the remaining \$390,000 penalty plus complete restoration (Brian Valiton, U.S. Army Corps of Engineers, pers. comm.). If restoration is completed by the time limit, the \$390,000 would be remitted. Thus, it appears that some of the agricultural impacts to wetlands in the study area will be reversed.

Table 2.--Causes of wetland loss in southeastern Massachusetts (1977-1985/86). (Tiner and Zinni 1988). The wetland acreage lost figures include palustrine vegetated wetlands, other wetlands, and cranberry bogs.

Cause	Wetland Acreage Lost
Cranberry Bogs	429
Other Agriculture	392
Ponds & Lakes	228
Urban Development	258
	<u>1,307</u>

#### New Jersey Cranberry Bogs and Blueberry Fields

New Jersey ranks third in the nation in cranberry production behind Massachusetts and Wisconsin and second in blueberry production. Both activities have significant impacts on wetlands. Cranberry bogs have been created mostly from wetlands, while blueberry culture utilizes both wetlands and uplands with seasonal high water tables. Data on cranberry industry impacts on wetlands is available, but similar data for blueberry agriculture is not available.

The National Wetlands Inventory found 6,590 acres of cranberry bogs ("farmed wetland") in New Jersey in 1976/77 (Tiner 1985). They represent only one percent of the state's palustrine vegetated wetlands. Nearly three-quarters of the bogs are located in Burlington County. According to the N.J. Pinelands Commission, there are about 3,000 acres harvested annually, with the remaining bogs being inactive and in various stages of succession (Robert Zampella, pers. comm.).

The N.J. Pinelands Commission reports 7,399 acres of blueberry fields for 1982 (Robert Zampella, pers. comm.). Roughly 90 percent of the blueberry acreage is in two counties: Atlantic (4,195 acres) and Burlington (2,552 acres). The wetland impact of blueberry culture is not known at this point, although Atsion sandy soils (Keric Haplaquods) are cultivated (Johnson 1978; Markley 1971).

#### New York Mucklands

Mucklands are farmed wetlands with organic soils and/or mineral soils high in organic content. These wetlands are artificially drained in a number of ways, including subsurface tile drains, open ditches, and dike and pump drainage systems (Higgins and Neeley 1978). They produce crops, such as onions, carrots, celery, lettuce, spinach, potatoes, corn, and sod for lawns. In the Northeast, farmed mucklands are most common in New York.

According to N.Y. Department of Environmental Conservation (NYDEC) figures, New York possessed 35,002 acres of drained mucklands in 1968 (Sharon O'Connor, pers. comm.). Five counties had nearly 80 percent of the state's drained mucklands: Orange (11,332 acres or 40 percent of its wetlands), Wayne (4,900 acres or 10 percent of its wetlands), Orleans (4,352 acres or 26 percent of its wetlands), Madison (3,856 acres or 24 percent of its wetlands), and Oswego (3,359 acres or six percent of its

wetlands). NYDEC also inventoried 4,594 acres of "reverted drained mucklands" where farming has been abandoned and wetland plants are reestablishing. Despite this abandoned acreage, natural wetlands are still under pressure for muckland drainage (Russell Cole, pers. comm.).

#### REGIONAL OVERVIEW

Specific information on the agricultural impacts has been presented for five Mid-Atlantic states and for certain areas or types of agriculture (e.g., cranberry bogs and mucklands). Other data on the impacts of farming on northeastern wetlands can be obtained by consulting available U.S.D.A. Soil Conservation Service county soil surveys. Upon so doing, one finds that agricultural impacts are widespread in floodplain wetlands in river valleys throughout the region. Many acres of corn and other vegetables are now grown on former wetlands. In some areas, however, the abandonment of agriculture has permitted wetland reestablishment. Throughout the region, farmers have created numerous ponds, many of which support wetland vegetation, at least along their edges. In the five-state area of the Mid-Atlantic region alone, roughly 35,000 acres of ponds were established on agricultural lands between the mid-1950s and late 1970s (Tiner and Finn 1986); this accounts for about a third of the recent net increase (100,000 acres) in ponds in that area. Another third of the new ponds in this five-state region came from vegetated wetlands, in part associated with agriculture. The importance of the gain in pond acreage to fish and wildlife species and in providing other wetland values has not been assessed and remains a subject for discussion.

The future trend of agricultural impacts on northeastern wetlands is uncertain, but we know that increased demand for agricultural products will increase pressure to utilize remaining wetlands in the Northeast and elsewhere. A recent U.S. Department of Agriculture publication entitled, Farm Drainage in the United States: History, Status, and Prospects (1987) reported that 68 percent (5.6 million acres) of the wetlands on non-Federal lands in 12 northeastern states are convertible to crops. It was also estimated that between 262,000 and 1.7 million acres of wetlands may be converted, with the low estimate including only wetlands with medium or high potential for conversion to cropland. While agricultural impacts to wetlands are projected to be more significant in other regions, especially in the Prairie Pothole

region of the upper Midwest and in the southeastern U.S. (National Research Council 1982), agriculture will likely continue to have significant wetland impacts in the Northeast.

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