July 1994

Wetland Trends for Selected Areas of the Gulf of Maine, from York, Maine to Rowley, Massachusetts (1977 to 1985-86)

U.S. Department of the Interior
Fish and Wildlife Service
Region 5

U.S. Department of the Interior
Fish and Wildlife Service
Gulf of Maine Project

Wetland Trends for Selected Areas of the Gulf of Maine, from York, Maine to Rowley, Massachusetts (1977 to 1985-86)

by David B. Foulis, John A. Eaton, and Ralph W. Tiner
U.S. Fish and Wildlife Service
Ecological Services
Region 5
Hadley, Massachusetts 01035

Prepared for the
U.S. Fish and Wildlife Service
Gulf of Maine Project
Falmouth, Maine 04105

July 1994

INTRODUCTION

Wetlands are subjected to multiple impacts, both natural and human-induced. They may change from one type to another, e.g., emergent wetland to scrub-shrub wetland, due to natural succession or to minor filling or drainage. Wetlands are also destroyed directly or indirectly by human activities. Most wetlands, however, change gradually over long periods of time. Knowledge of wetland losses and gains is important for evaluating the effectiveness of government programs and policies designed to protect wetlands, and for developing strategies to reverse undesirable trends.

The Gulf of Maine Council on the Marine Environment and the U.S. Fish and Wildlife Service (Service) provided funding to initiate quadrangle-based wetland trends studies for selected areas in the Gulf of Maine. These studies identify the extent and nature of wetland alterations for designated local areas.

The purpose of this report is to present the findings of the wetland trends analysis study for selected areas from York, Maine to Rowley, Massachusetts. It is one of four study areas in the Gulf of Maine chosen by the Service for detailed wetland trends analysis.

STUDY AREA

The study area is located along the coast of Maine, New Hampshire, and Massachusetts, from Argo Point in York, Maine to Plum Island in Rowley, Massachusetts. Also included are the Isles of Shoals in Maine and New Hampshire (Figure 1). It has a total (upland + wetland) land surface area of approximately 396 square miles (253,517 acres), and also includes approximately 260 square miles (166,194 acres) of deepwater habitat, most of which lies in the Gulf of Maine. The study area encompasses 10 large-scale (1:24,000) U.S. Geological Survey topographic quadrangles: Dover East, Dover West, Exeter, Hampton, Isles of Shoals, Kittery, Newburyport East, Newburyport West, Newmarket, and Portsmouth.

METHODS

Wetland trends analysis involves comparing aerial photography from at least two time periods. For the present study, aerial photos from 1977 and from 1985-86 were examined and compared to determine the extent of the wetland changes (losses, gains, or changes in type) that occurred during that time period in the study area.

The 1977 photography was 1:80,000 scale panchromatic, black and white aerial photography[1]. The 1985-86 photography was 1:58,000 scale color infrared aerial photography acquired by the National High Altitude Photography Program (NHAP). Wetlands and deepwater habitats were interpreted on the NHAP photography and classified according to the Service's official wetland classification system (Cowardin, et. al. 1979) following standard National Wetlands Inventory (NWI) mapping conventions (National Wetlands Inventory, 1990). These interpretations served as the basis for evaluating recent wetland trends.

The two sets of photographs were compared using a Bausch and Lomb SIS-95 zoom stereoscope. Changes were delineated on mylar overlays attached to the NHAP photos and transferred to an NWI map using an Ottico Meccanica Italiana stereo facet plotter. Cause of change was recorded for each polygon. The minimum mapping unit for wetlands was generally 0.5 acre, except for ponds, which were mapped when 0.1 acre or larger in size. Changes as small as 0.1 acre were detected. Quality control of all photointerpretation was performed by a second photointerpreter. Interpreted data were digitized using PC Arc/Info and acreage summaries were generated. Tables were then prepared to present the study's findings.

RESULTS

Current Status

In 1985-86, the study area contained about 50,190 acres of wetlands (roughly 19.8% of the study area's land surface), excluding linear fringing wetlands along narrow streams. Table 1 summarizes the acreage of the different wetland types found in the study area. About 18,251 acres of estuarine wetlands were present, with 74% of this total (13,553 acres) classified as emergent marshes. Estuarine vegetated wetlands represented 27.4% (13,753 acres) of the study area's wetlands. Palustrine wetlands predominated with about 30,287 acres, representing 60.3% of the study area's total wetland acreage. Forested wetlands accounted for 65.2% (19,760 acres) of all palustrine wetlands.

Recent Wetland Trends

Wetland trends results are presented in Tables 2 through 7. The following discussion highlights the more significant or interesting findings.

---

[1]Use of black and white photography presents certain limitations not inherent in the use of color infrared photography. Among these limitations are reduced image resolution due in part to the smaller scale of the black and white photography, and poor signature contrast. Comparing black and white photos with color infrared partially mitigates the reduced utility of the black and white photos through simultaneous stereoscopic comparison of the two images. Wetlands with subtle photo signatures, such as evergreen forested wetlands, are more difficult to identify on black and white photos; and as a result, use of black and white photos can reduce the overall accuracy of the trends analysis process. However, use of collateral data sources such as color infrared photography, soil surveys, and field work minimize this potential limitation.

Vegetated Wetlands

Between 1977 and 1985-86, over 162 acres of vegetated wetlands were converted to upland (Table 2). Most of these losses affected palustrine emergent wetland, and to a lesser extent palustrine forested wetland. Ditching and trailer park construction were the most significant causes of vegetated wetland loss, with commercial business construction also significant (Table 3). Estuarine emergent wetlands were lost to upland due to housing construction (1.15 acres) and commercial business construction (1.89 acres). About 58 acres of vegetated wetland changed from one type to another. Upland conversion impacted the seasonally flooded/saturated palustrine wetland type more than others (Table 4). Vegetated wetland gain from upland was limited to approximately 3 acres (Table 5). Most gains in particular types of vegetated wetlands came from other vegetated wetland types (Table 5).

Nonvegetated Wetlands

About 71 acres of new ponds were created from upland, and over 119 acres were constructed in vegetated wetlands (Table 6). More than 7 acres of ponds were converted to upland, while 20 acres changed to vegetated wetlands. Approximately 26% of the new ponds built in uplands were the result of detention basins constructed at new subdivisions and business developments, but the majority were attributed to other causes (Table 7).

CONCLUSION

The study area had approximately 19.8% of its land mass covered by wetlands. Wetlands totaling 50,189 acres (in 1985-86) were identified in the study area by the Service's National Wetlands Inventory. Palustrine wetland was the dominant type, representing 60.3% of the wetlands in the study area.

Between 1977 and 1985-86, the study area lost about 282 acres of vegetated wetlands, with roughly 163 acres converted to upland. Seasonally flooded/saturated wetland was the type most frequently converted to upland. Pond construction added about 190 acres of palustrine nonvegetated wetlands, but this gain was reduced to about 162 acres by pond losses to upland and vegetated wetlands.

The overall trend for the study area's wetlands was losses of vegetated wetlands and gains in nonvegetated wetlands (mostly ponds). The significance of the increase in ponds to fish and wildlife species has not been assessed and remains a point for discussion. The losses of vegetated wetlands, however, represent known losses of valuable fish and wildlife habitats and areas providing other valued functions, including flood water storage, water quality enhancement, and local water supply.

While this report documents recent trends in the study area's wetlands, it does not address changes in the quality of the remaining wetlands. As development increases, the quality of wetlands can be expected to deteriorate due to agricultural runoff, increased sedimentation, groundwater withdrawals, increased water pollution, and other factors, unless adequate safeguards are taken to protect not only the existence of wetlands, but their quality.

ACKNOWLEDGMENTS

Funding for this project was provided by the Gulf of Maine Council on the Marine Environment and the U.S. Fish and Wildlife Service's Gulf of Maine Project as part of a comprehensive study of wetland trends in the Gulf of Maine. Stewart Fefer was the project coordinator.

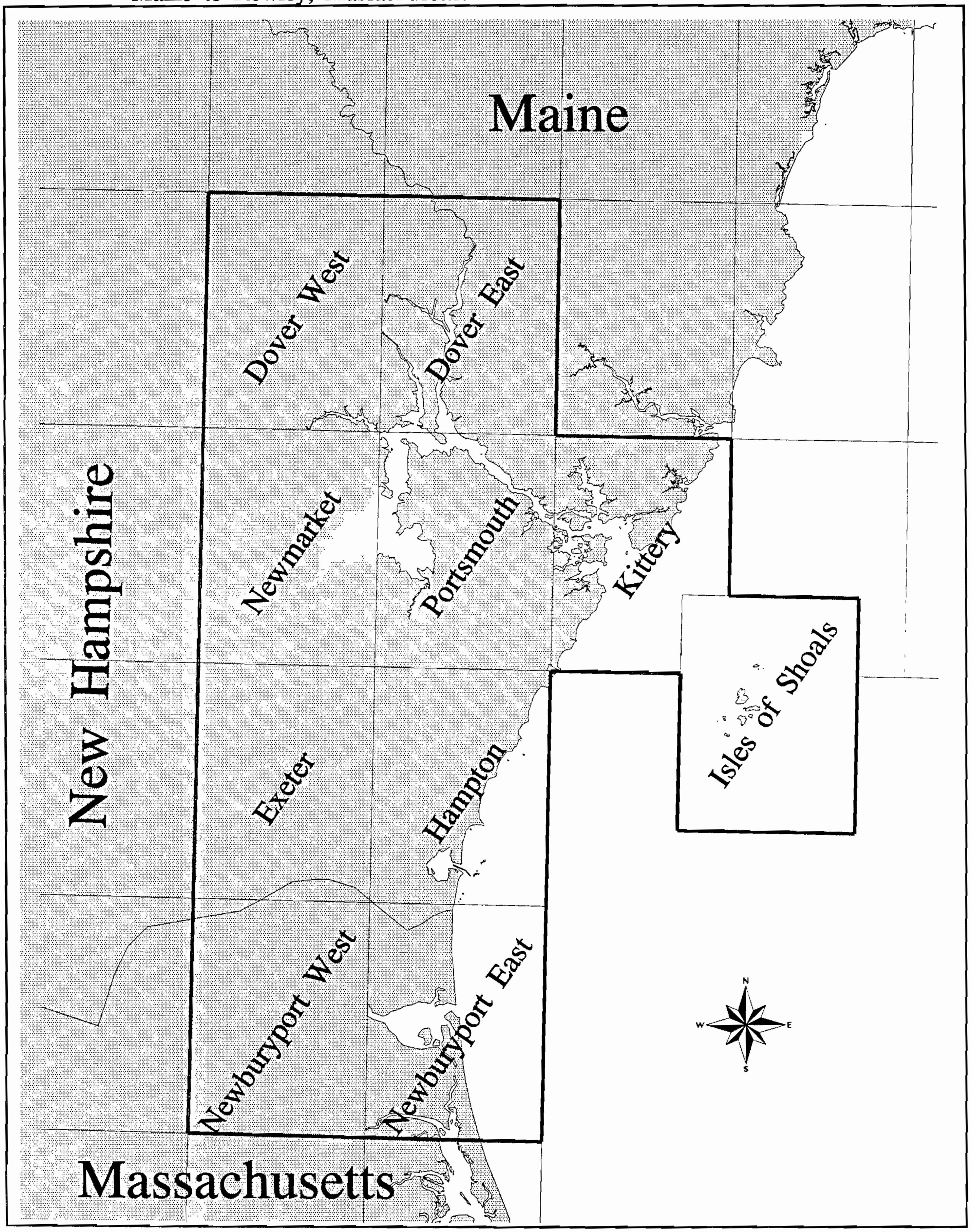
Wetland maps and digital data were compiled by the U.S. Fish and Wildlife Service's National Wetlands Inventory Office at St. Petersburg, Florida. Special appreciation is extended to Becky Stanley and Linda Shaffer for their assistance. Photointerpretation was performed by the authors and quality controlled by Glenn Smith. John Eaton also digitized trend polygons, and compiled trend statistics, and raw data for this report. Bob Houston prepared the graphics.

REFERENCES

Cowardin, L.M., V. Carter, F.C. Golet, and T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31. 103 pp.

National Wetlands Inventory. 1990. Photointerpretation Conventions for the National Wetlands Inventory. U.S. Fish and Wildlife Service, St. Petersburg, FL. 45 pp. plus appendices.

Figure 1. Location of U.S. Geological Survey quadrangles for the wetland trends analysis (1977 to 1985-86) covering the coastal area from York, Maine to Rowley, Massachusetts.



... of wetland types for selected areas of the Gulf of Maine, from York, ... to Rowley, Massachusetts (1985-86).

	Acres	% of Total
...ETLANDS		
...nergent		
Seasonally Flooded-Tidal	163.64	
Temporarily Flooded-Tidal	1.44	
(Subtotal Tidal)	*(165.08)*	0.33
...ntidal Emergent		
Semipermanently Flooded	155.19	
Seasonally Flooded/Saturated	2,163.85	
Seasonally Flooded	123.72	
Saturated	17.75	
Temporarily Flooded	80.15	
(Subtotal Nontidal)	*(2,540.66)*	5.06
Total Palustrine Emergent Wetlands	**2,705.74**	5.39
Tidal Forested		
Evergreen, Needle-leaved		
Seasonally Flooded-Tidal	10.85	
Temporarily Flooded-Tidal	25.81	
Deciduous, Broad-leaved		
Seasonally Flooded-Tidal	349.17	
Temporarily Flooded-Tidal	6.23	
(Subtotal Tidal)	*(392.06)*	0.78
Nontidal Forested		
Evergreen, Needle-leaved		
Seasonally Flooded/Saturated	3,448.17	
Seasonally Flooded	199.09	
Temporarily Flooded	15.38	
Saturated	6.32	
Deciduous, Broad-leaved		
Seasonally Flooded/Saturated	14,452.43	
Seasonally Flooded	554.92	
Temporarily Flooded	308.26	
Saturated	7.17	
Dead	375.66	
(Subtotal Nontidal)	*(19,367.40)*	38.59
...ine Forested Wetlands	**19,759.46**	39.37

Table 1, continued

Wetland Type	Acres	% of Total
Tidal Scrub-Shrub		
Deciduous, Broad-leaved		
Seasonally Flooded-Tidal	357.51	
Temporarily Flooded-Tidal	4.68	
(Subtotal Tidal)	*(362.19)*	0.72
Nontidal Scrub-Shrub		
Evergreen, Needle-leaved		
Seasonally Flooded/Saturated	30.75	
Evergreen, Broad-leaved		
Seasonally Flooded/Saturated	20.18	
Saturated	22.98	
Deciduous, Broad-leaved		
Seasonally Flooded	168.28	
Saturated	5.97	
Temporarily Flooded	47.27	
Semipermanently Flooded	146.49	
Seasonally Flooded/Saturated	5,702.19	
Dead	6.21	
(Subtotal Nontidal)	*(6,150.32)*	12.25
Total Palustrine Scrub-Shrub Wetlands	**6,512.51**	12.98
Total Palustrine Vegetated Wetlands	**28,977.71**	57.74
Unconsolidated Bottom (Ponds)	1,306.04	
Unconsolidated Shore	3.46	
Total Palustrine Nonvegetated Wetlands	**1,309.50**	2.61
GRAND TOTAL PALUSTRINE WETLANDS	**30,287.21**	60.35
ESTUARINE WETLANDS		
Emergent		
Regularly Flooded	445.76	
Irregularly Flooded	13,107.66	
Total Estuarine Emergent Wetlands	**13,553.42**	27.00
Aquatic Bed		
Regularly Flooded	199.79	

Table 1, continued

Wetland Type	Acres	% of Total
Total Estuarine Aquatic Bed Wetlands	**199.79**	0.40
Total Estuarine Vegetated Wetlands	**13,753.21**	27.40
Unconsolidated Shore	4,497.44	
Total Estuarine Nonvegetated Wetlands	**4,497.44**	8.96
GRAND TOTAL ESTUARINE WETLANDS	**18,250.65**	36.36
LACUSTRINE WETLANDS		
Aquatic Bed	53.88	
Emergent, Non-persistent	33.09	
Total Lacustrine Vegetated Wetlands	**86.97**	0.17
GRAND TOTAL LACUSTRINE WETLANDS	**86.97**	0.17
MARINE WETLANDS		
Aquatic Bed	611.03	
Total Marine Vegetated Wetlands	**611.03**	1.22
Unconsolidated Shore	890.66	
Rocky Shore	62.66	
Total Marine Nonvegetated Wetlands	**953.32**	1.90
GRAND TOTAL MARINE WETLANDS	**1,564.35**	3.12
TOTAL WETLANDS	**50,189.18**	**100.00**

Table 2. Changes of vegetated wetlands in selected areas of the Gulf of Maine, from York, Maine to Rowley, Massachusetts (1977 to 1985-86).

Wetland Type	Converted to Upland (acres)	Changed to Other Vegetated Wetlands* (acres)	Changed to Nonvegetated Wetlands (acres)
Palustrine Emergent	70.57	5.91	13.34
Palustrine Forested	50.33	47.79	58.89
Palustrine Scrub-Shrub	38.90	4.35	46.98
Estuarine Emergent	3.04	0.00	0.00
Total	**162.84**	**58.05**	**119.21**

*Represents changes in class (e.g., emergent to scrub-shrub) but not changes in water regime within a given wetland class.

Table 3. Causes of vegetated wetland loss to upland in selected areas of the Gulf of Maine, from York, Maine to Rowley, Massachusetts (1977 to 1985-86).

Cause of Loss	Acreage
Ditching	42.65
Trailer Park Construction	29.64
Commercial Business	24.53
Cemetery Expansion	10.55
Agriculture	10.15
Commercial Shopping Construction	10.06
Housing Construction	9.79
Road Construction	7.36
Sanitary Landfill Expansion	3.47
Dam Construction	3.43
Commercial, General	3.42
Industrial Construction	2.85
Unknown Cause	2.27
Recreational Facility	1.46
Sand and Gravel Pits	1.21
Total	**162.84**

Table 4. **Conversion of hydrologically similar palustrine vegetated wetlands to upland in selected areas of the Gulf of Maine, from York, Maine to Rowley, Massachusetts (1977 to 1985-86).**

Palustrine Wetland Type	Acres	% Total Loss
Temporarily Flooded	27.89	17.5
Seasonally Flooded	25.96	16.2
Seasonally Flooded/Saturated	105.12	65.8
Seasonally Flooded-Tidal	0.83	0.5
Total	**159.80**	**100.0%**

Table 5. Gains in vegetated wetlands in selected areas of the Gulf of Maine, from York, Maine to Rowley, Massachusetts (1977 to 1985-86).

Wetland Type	Gain from Nonvegetated Wetlands (acres)	Gain from Upland (acres)	Gain from Other Vegetated Wetlands (acres)*
Palustrine Emergent	14.64	0.00	4.40
Palustrine Forested	0.00	2.69	5.54
Palustrine Scrub-Shrub**	5.71	0.40	48.11
Total	**20.35**	**3.09**	**58.05**

*Represents changes in class (e.g., emergent to scrub-shrub) but not changes in water regime within a given class.

Also, **12.68 acres of palustrine scrub-shrub wetland were created from deepwater habitat.

Table 6. Gains and losses in palustrine nonvegetated wetlands in selected areas of the Gulf of Maine, from York, Maine to Rowley, Massachusetts (1977 to 1985-86).

	GAINS		LOSSES	
Wetland Type	Created from Upland (acres)	Created in Vegetated Wetlands (acres)	Converted to Upland (acres)	Changed to Vegetated Wetlands (acres)
Palustrine Unconsolidated Bottom	70.83	119.21	7.79	20.35