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Wetland Trends for Selected Areas in Northern Virginia (1980-81 to 1988/91)

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

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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 U.S. Environmental Protection Agency (EPA) and the U.S. Fish and Wildlife Service (FWS) provided funding to initiate quadrangle-based wetland trends studies for selected areas in the Chesapeake Bay watershed. These studies identify the extent and nature of small- and large-scale wetland alterations for selected local areas.

The purpose of this report is to present the findings of the wetland trends analysis study for selected areas of Northern Virginia, one of numerous study areas selected by the EPA and FWS for detailed wetland trends analysis.

STUDY AREA

The study sites are located in Northern Virginia (Figure 1) and have a combined land surface area of approximately 347.8 square miles. The study area encompasses six large-scale (1:24,000) U.S. Geological Survey topographic quadrangles: Arcola, Fairfax, Fredericksburg, Herndon, Manassas, and Vienna.

METHODS

Wetland trends analysis involves comparing aerial photography from at least two time periods. For the present study, aerial photos from 1980-81 and from 1988/91 were examined and compared to determine the extent of the wetland changes (losses, gains, or changes in wetland type) that occurred during that time period in the study area.

The 1980-81 photography was 1:58,000 scale color infrared (CIR) aerial photography acquired by the U.S. Geological Survey's National High-Altitude Photography Program (NHAP). The 1988/91 photography was 1:40,000 scale CIR aerial photography acquired by the National Aerial Photography Program (NAPP). Wetlands and deepwater habitats were initially interpreted on the 1:58,000 photography and classified according to the Service's official wetland classification system (Cowardin, et al. 1979) following standard 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 an Ottico Meccanica Italiana stereo facet plotter. Changes and map refinements were transferred to an NWI map using this device. Cause of change was recorded for each polygon. The minimum mapping unit for wetlands was generally 1/2 acre, except for ponds, which were mapped when 1/10th of an acre in size. Changes as small as 1/10th acre were detected. Wetland boundaries were improved and previously undetected wetlands were added to the original maps because the larger scale and more apparent seasonal signs of wetland hydrology on the NAPP photos improved our ability to detect and classify wetlands. Quality control of all photo-interpretation was performed by a second photointerpreter. Interpreted data were digitized and acreage summaries generated. Tables were then prepared to present the study's findings.

RESULTS

Current Status

In 1988/91, the study area possessed about 6,000 acres of wetlands, excluding linear fringing wetlands along narrow streams. This total amounts to roughly 3 percent of the area's land surface. Table 1 summarizes the acreage of different wetland types found in the study area.

Palustrine wetlands predominate with over 5,900 acres. This represents 98 percent of the study area's total wetland acreage. Deciduous forested wetlands alone account for approximately 63 percent of the wetlands.

Recent Wetland Trends

The results of the wetland trends analysis study are presented in Tables 2 through 9. The following discussion highlights the more significant or interesting findings.

Vegetated Wetlands

Between 1980-81 and 1988/91, over 127 acres of vegetated wetland were converted to upland (Table 2). Most of these losses affected palustrine forested wetland. Commercial developments were the most significant cause of vegetated wetland loss (Table 3), with road and highway construction and housing development also significant. Nearly 81 acres of vegetated wetland changed from one type to another, with palustrine forested wetlands being most affected. Upland conversion impacted the seasonally flooded palustrine wetland type significantly more than other types (Table 4). Table 5 shows changes in different types of forested wetlands, while Tables 5a and 5b show the causes behind upland conversion. About 13 acres of vegetated wetland were created from upland (Table 6), whereas most of the gains in particular types of vegetated wetlands came from other vegetated wetland types. Beaver played an important role in wetland changes (Table 7).

Nonvegetated Wetlands

Over 125 acres of new ponds were created from upland, and 42 acres were constructed in vegetated wetlands (Table 8). About 48 acres of ponds were filled in, while over 8 acres changed to vegetated wetlands. Most of the new ponds were the result of pond construction in urban areas, construction of detention basins, and farm ponds (Table 9).

Summary

The study area has approximately 3 percent of its land mass covered by wetlands. Wetlands totaling 6,000 acres (in 1988/91) were identified in the study area by the Service's National Wetlands Inventory. Palustrine wetland is the dominant type, representing 98 percent of the wetlands in the study area.

Between 1980-81 and 1988/91, the study area lost about 175 acres of vegetated wetlands, with roughly 127 acres converted to upland. Seasonally flooded forested wetland was the type most frequently converted to upland. Pond construction added about 125 acres of palustrine nonvegetated wetlands, but this gain was reduced to about 69 acres by pond losses to upland and vegetated wetlands.

The overall trend for the study area's wetlands was losses of vegetated wetlands and lesser 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.

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

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Wetland maps and digital data were compiled by the U.S. Fish and Wildlife Service's National Wetlands Inventory Office at St. Petersburg, Florida and the Northeast Regional Office in Hadley, Massachusetts. Special appreciation is extended to Becky Stanley and Linda Shaffer for their assistance. Photointerpretation was performed by the junior author and quality controlled by Glenn Smith. Photointerpretation of the base maps was performed by the junior author and Irene Kenenski, and quality controlled by Glenn Smith. We also acknowledge John Eaton for his able assistance in compiling trend statistics, tables and graphics for this report, Todd Nuerminger for the tabulation of raw data, and Pam Dansereau for manuscript word processing.

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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 Study Area - Selected Quadrangles in Northern Virginia, shaded below.

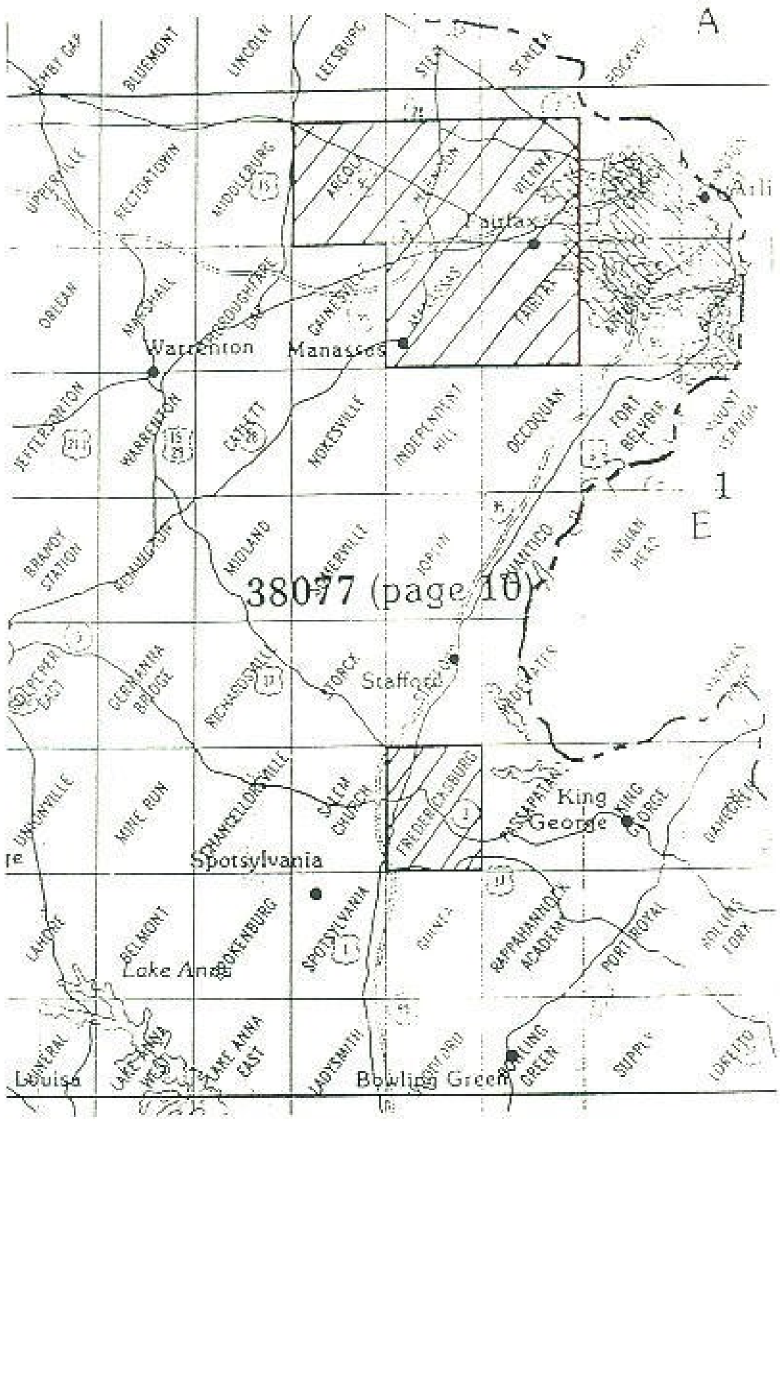

Table 1. Acreage of wetland types for selected areas of Northern Virginia (1988/91).

Wetland Types	Acres
PALUSTRINE WETLANDS	
Tidal Emergent	
Artificially Flooded	4.30
(Subtotal Tidal)	*(4.30)*
Nontidal Emergent	
Seasonally Flooded/Saturated	73.13
Seasonally Flooded	303.44
Temporarily Flooded	126.30
Saturated	10.66
Semipermanently Flooded	27.77
(Subtotal Nontidal)	*(541.30)*
Total Palustrine Emergent Wetlands	**545.60**
Tidal Forested	
Deciduous	
Seasonally Flooded-Tidal	152.11
Temporarily Flooded-Tidal	7.22
(Subtotal Tidal)	*(159.33)*
Nontidal Forested	
Deciduous	
Seasonally Flooded/Saturated	158.44
Seasonally Flooded	1,056.03
Temporarily Flooded	2,392.01
Semipermanently Flooded	5.37
Evergreen	
Seasonally Flooded	1.78
Temporarily Flooded	73.10
Saturated	2.25
Dead	14.57
(Subtotal Nontidal)	*(3,703.55)*
Total Palustrine Forested Wetlands	**3,862.88**
Tidal Scrub-Shrub	
Seasonally Flooded-Tidal	8.87
(Subtotal Tidal)	*(8.87)*

Table 1 *(Continued)*

Nontidal Scrub-Shrub	
Seasonally Flooded/Saturated	131.57
Seasonally Flooded	199.39
Temporarily Flooded	189.72
Saturated	0.66
Semipermanently Flooded	9.35
Dead	4.28
(Subtotal Nontidal)	*(534.97)*
Total Palustrine Scrub-Shrub Wetlands	**543.84**
Aquatic Bed	2.64
Total Palustrine Vegetated Wetlands	**4,954.96**
Unconsolidated Bottom (Ponds)	968.28
Unconsolidated Shore	37.99
Total Palustrine Nonvegetated Wetlands	**1,006.27**
GRAND TOTAL PALUSTRINE WETLANDS	**5,961.23**
ESTUARINE WETLANDS	
Emergent	2.28
GRAND TOTAL ESTUARINE WETLANDS	**2.28**
LACUSTRINE WETLANDS	
Unconsolidated Shore	1.01
GRAND TOTAL LACUSTRINE WETLANDS	**1.01**
RIVERINE WETLANDS	
Rock Bottom	80.29
Rocky Shore	5.15
Unconsolidated Shore	17.38
GRAND TOTAL RIVERINE WETLANDS	**102.82**
TOTAL WETLANDS	**6,067.34**

Table 2. Changes of vegetated wetlands in selected areas of Northern Virginia (1980-81 to 1988/91).

Wetland Type	Converted to Upland (acres)	Changed to Other Vegetated Wetlands* (acres)	Changed to Nonvegetated Wetlands (acres)	Changed to Deepwater Habitat (acres)
Palustrine Emergent	29.51	13.72	15.30	6.12
Palustrine Forested	80.24	52.37	16.83	---
Palustrine Scrub-Shrub	16.05	14.82	10.04	---
Palustrine Aquatic Bed	1.22	---	---	---
Total	**127.02**	**80.91**	**42.17**	**6.12**

*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 Northern Virginia (1980-81 to 1988/91).

Cause of Loss	Acres
Commercial Development	41.54
Housing	27.77
Roads/Highways	27.33
Airports	6.23
Industrial Development	5.66
Agriculture	4.56
Ditching	3.24
Unknown	2.74
Transmission Line Corridors	2.65
Sand & Gravel Pits	2.14
Public Facilities	2.12
Recreation Facilities	0.86
Public Sewer Facilities	0.18
Total	**127.02**

Table 4. Conversion of hydrologically similar palustrine vegetated wetlands to upland in selected areas of Northern Virginia (1980-81 to 1988/91).

Palustrine Wetland Type	Acres
Temporarily Flooded	40.94
Seasonally Flooded	76.86
Seasonally Flooded/Saturated	5.90
Semipermanently Flooded	2.57
Permanently Flooded	0.18
Saturated	0.57
Total	**127.02**

Table 5. Changes in palustrine forested wetlands in selected areas of Northern Virginia (1980-81 to 1988/91).

Forested Wetland Type	Converted to Upland (acres)	Changed to Other Wetland Types* (acres)	Total Loss (acres)
Temporarily Flooded	26.70	23.83	48.21
Seasonally Flooded	49.20	33.27	82.47
Seasonally Flooded/Saturated	3.04	11.53	14.57
Semipermanently Flooded**	1.30	7.88	9.18
Total	**80.24**	**76.51**	**154.43**

*Includes both changes in class (e.g., forested to emergent) and changes in water regime within a given class.

**Largely represents dead forested wetlands.

Table 5a. Causes of loss in palustrine forested wetlands in selected areas of Northern Virginia (1980-81 to 1988/91).

Palustrine Forested Wetland Type	Converted to Upland (acres)	Cause of Loss for PFO
Temporarily Flooded	2.14	Sand & Gravel Pits
	0.86	Recreation Facility
	0.79	Unknown
	5.09	Commercial Business
	3.10	Housing Construction
	13.59	Road/Highway Construction/Improvement
	0.83	Ditching
	0.30	Public Sewer Facility
	0.22	Airports
Seasonally Flooded	22.42	Commercial Business
	12.63	Housing Construction
	8.27	Road Construction/Improvement
	5.66	Industry
Seasonally Flooded/Saturated	2.15	Housing Construction
	0.89	Road/Highway Construction/Improvement
Semipermanently Flooded	1.30	Housing Construction
Total Palustrine Forested Wetland Loss	**80.24**	

Table 5b. Causes of loss in palustrine forested wetlands in selected areas of Northern Virginia (1980-81 to 1988/91).

Cause of Loss	Acres Lost
Commercial Business	27.51
Road/Highway Construction/Improvement	22.75
Housing Construction	19.18
Industry	5.66
Sand & Gravel Pits	2.14
Recreation Facility	0.86
Ditching	0.83
Unknown	0.79
Public Sewer Facility	0.30
Airports	0.22
Total Palustrine Forested Wetland Loss	**80.24**

Table 6. Gains in vegetated wetlands in selected areas of Northern Virginia (1980-81 to 1988/91).

Wetland Type	Gain from Nonvegetated Wetlands (acres)	Gain from Other Vegetated Wetlands* (acres)	Gain from Upland (acres)
Palustrine Emergent	8.69	47.67	3.84
Palustrine Scrub-Shrub	---	20.79	5.49
Palustrine Forested	---	12.45	3.20
Total	**8.69**	**80.91**	**12.53**

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

Table 7. Changes in palustrine wetlands in selected areas of Northern Virginia due to beaver activity (1980-81 to 1988/91).

Wetland Type	Change in Water Regime only (acres)	Change in Vegetated Class (acres)	Gain from Upland (acres)	Change to Nonvegetated Wetland (acres)
Palustrine Emergent	---	---	---	0.21
Palustrine Forested	3.65	9.84	---	0.62
Palustrine Scrub-Shrub	0.75	---	1.21	---
Palustrine Unconsolidated Bottom	---	---	4.11	---
Total	**4.40**	**9.84**	**5.32**	**0.83**

Table 8. **Gains and losses in palustrine nonvegetated wetlands in selected areas of Northern Virginia (1980-81 to 1988/91).**

	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	124.02	23.06	46.72	8.69
Palustrine Unconsolidated Shore	1.49	19.11	1.30	---
Total	**125.51**	**42.17**	**48.02**	**8.69**

Table 9. **Causes of recently constructed ponds on upland sites in selected areas of Northern Virginia (1980-81 to 1988/91).**

Causes	Pond Acreage Created
Urban Ponds	44.34
Stormwater Detention Basins	21.97
Farm Ponds	16.70
Sand & Gravel Pits	12.28
Ponds in Undeveloped Areas	8.29
Airport Ponds	4.89
Ponds Created by Rising Water Levels	4.59
Recreational Facilities	4.13
Beaver Ponds	4.11
Impoundments	1.96
Ponds of Unknown Purpose	1.50
Industrial Ponds	0.75
Total	**125.51**