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Wetland Trends for Selected Areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90)

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Region 5

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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 the Chickahominy River Watershed of 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 the Chickahominy River Watershed of Virginia (Figure 1) and have a combined land surface area of approximately 402 square miles. The study area encompasses seven large-scale (1:24,000) U.S. Geological Survey topographic quadrangles: Norge, Providence Forge, Richmond, Roxbury, Seven Pines, Walkers, and Yellow Tavern.

METHODS

Wetland trends analysis involves comparing aerial photography from at least two time periods. For the present study, aerial photos from 1982/84 and from 1989-90 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 1982/84 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 1989-90 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 or larger in size. Changes as small as 1/10th acre were detected. Field work was conducted in selected areas to verify changes in classification. These results were used to improve wetland mapping for the original time period, especially for seasonally flooded, broad-leaved deciduous forested wetlands, and small wetlands that had been missed during the original interpretation. 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 photointerpretation 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 1989-90, the study area possessed over 32,000 acres of wetlands, excluding linear fringing wetlands along narrow streams. This total amounts to roughly 13 percent of the area's land surface. Table 1 summarizes the acreage of the different wetlands types found in the study area. Nearly all the wetlands were palustrine wetlands. Deciduous forested wetlands alone account for 65 percent of the study area's palustrine wetlands. Riverine wetlands represent less than 1 percent of the study area's wetlands. Most of the riverine wetlands are freshwater tidal marshes.

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 1982/84 and 1989-90, 102 acres of vegetated wetland were converted to upland (Table 2). Most of these losses affected palustrine forested wetland. Sand and gravel pits were the most significant cause of vegetated wetland loss (Table 3), with road and highway construction and man-induced succession also significant. Nearly 284 acres of vegetated wetland changed from one type to another, with palustrine forested and emergent wetlands being most affected. Upland conversion impacted the seasonally flooded/saturated 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 17 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 62 acres of new ponds were created from upland, and nearly 130 acres were constructed in vegetated wetlands (Table 8). About 21 acres of ponds were filled in, while over 23 acres changed to vegetated wetlands. Most of the new ponds were the result of pond construction in undeveloped areas and farm pond construction (Table 9).

Summary

The study area has approximately 13 percent of its land mass covered by wetlands. Wetlands totaling 32,000 acres (in 1989-90) were identified in the study area by the Service's National Wetlands Inventory. Forested wetland is the dominant type, representing 65 percent of the wetlands in the study area.

Between 1982/84 and 1989-90, the study area lost about 284 acres of vegetated wetlands, with roughly 102 acres converted to upland. Seasonally flooded/saturated forested wetland was the type most frequently converted to upland. Beaver activity affected close to 167 acres of wetland. Pond construction added about 193 acres of palustrine nonvegetated wetlands, but this gain was reduced to about 150 acres by pond losses to upland and vegetated wetland.

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, represents known losses of valuable fish and wildlife habitats and areas providing other valued functions.

While this report documents recent wetland 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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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 Study Area - Selected Quadrangles in the Chickahominy River Watershed of Virginia, shaded below.

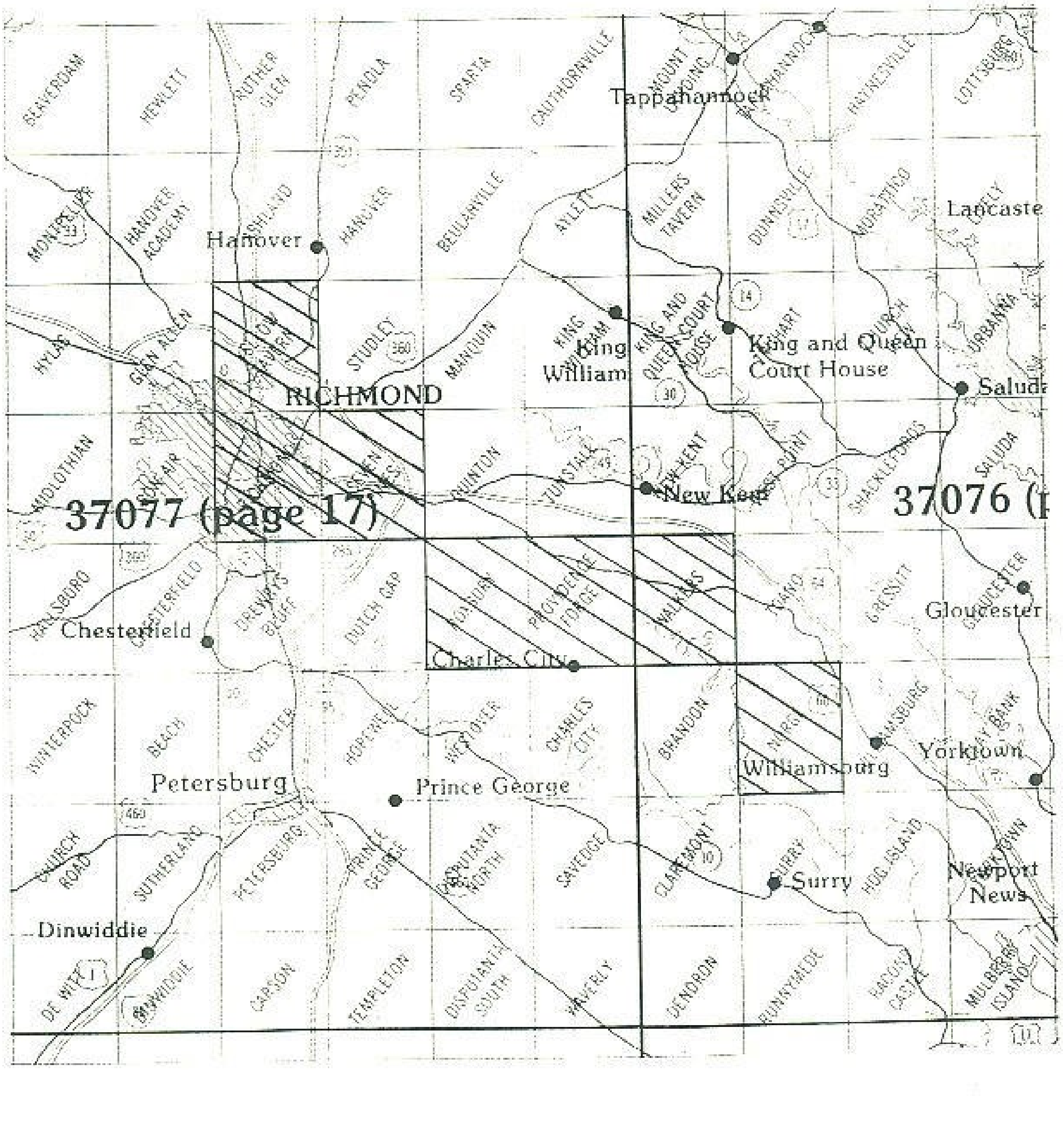

Table 1. Acreage of wetland types for selected areas of the Chickahominy River Watershed of Virginia (1989-90).

Wetland Types	Acres
PALUSTRINE WETLANDS	
Tidal Emergent	
Seasonally Flooded - Tidal	3,286.89
Semipermanently Flooded - Tidal	10.53
Regularly Flooded	412.37
(Subtotal Tidal)	*(3,709.79)*
Nontidal Emergent	
Seasonally Flooded/Saturated	296.14
Seasonally Flooded	535.70
Temporarily Flooded	145.91
Semipermanently Flooded	1,267.84
Permanently Flooded	11.31
(Subtotal Nontidal)	*(2,256.90)*
Total Palustrine Emergent Wetlands	**5,966.69**
Tidal Forested	
Deciduous, Broad-leaved	
Seasonally Flooded - Tidal	1,213.21
Temporarily Flooded - Tidal	42.50
Deciduous, Needle-leaved	
Seasonally Flooded - Tidal	90.25
Semipermanently Flooded - Tidal	8.63
Evergreen, Needle-leaved	
Seasonally Flooded - Tidal	1.16
Temporarily Flooded - Tidal	13.77
Dead	0.71
(Subtotal Tidal)	*(1,370.23)*
Nontidal Forested	
Deciduous, Broad-leaved	
Seasonally Flooded/Saturated	7,018.94
Seasonally Flooded	5,789.60
Temporarily Flooded	2,675.74
Semipermanently Flooded	3,039.38
Permanently Flooded	3.66
Deciduous, Needle-leaved	
Seasonally Flooded/Saturated	161.07

Table 1 *(Continued)*

Semipermanently Flooded	964.98
Permanently Flooded	10.04
Evergreen, Needle-leaved	
Seasonally Flooded/Saturated	133.29
Temporarily Flooded	356.39
Seasonally Flooded	134.90
Saturated	67.36
Dead	364.60
(Subtotal Nontidal)	*(20,719.95)*
Total Palustrine Forested Wetlands	**22,090.18**
Tidal Scrub-Shrub	
Deciduous	
Seasonally Flooded - Tidal	91.75
(Subtotal Tidal)	*(91.75)*
Nontidal Scrub-Shrub	
Deciduous	
Seasonally Flooded/Saturated	1,048.52
Seasonally Flooded	533.87
Temporarily Flooded	231.40
Saturated	10.99
Semipermanently Flooded	938.29
Evergreen	
Seasonally Flooded/Saturated	2.93
Seasonally Flooded	32.14
Saturated	11.59
Dead	2.41
(Subtotal Nontidal)	*(2,812.14)*
Total Palustrine Scrub-Shrub Wetlands	**2,903.89**
Aquatic Bed	26.61
Farmed Wetlands	2.14
Total Palustrine Vegetated Wetlands	**30,989.51**
Unconsolidated Bottom (Ponds)	1,189.03
Unconsolidated Shore	27.21
Total Palustrine Nonvegetated Wetlands	**1,216.24**
GRAND TOTAL PALUSTRINE WETLANDS	**32,205.75**

Table 1 *(Continued)*

LACUSTRINE WETLANDS	
Unconsolidated Bottom	7.88
Unconsolidated Shore	18.36
GRAND TOTAL LACUSTRINE WETLANDS	**26.24**
RIVERINE WETLANDS	
Tidal Emergent	
Regularly Flooded	67.60
Unconsolidated Shore	92.44
GRAND TOTAL RIVERINE WETLANDS	**160.04**
TOTAL WETLANDS	**32,392.03**

Table 2. Changes of vegetated wetlands in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Wetland Type	Converted to Upland (acres)	Changed to Other Vegetated Wetlands* (acres)	Changed to Nonvegetated Wetlands (acres)	Changed to Deepwater Habitat (acres)
Palustrine Emergent	2.52	25.04	19.26	18.14
Palustrine Forested	86.59	240.25	73.05	11.10
Palustrine Scrub-Shrub	12.90	18.89	38.15	22.13
Total	**102.01**	**284.18**	**130.46**	**51.37**

*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 Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Cause of Loss	Acres
Sand & Gravel Pits	35.92
Road Construction	20.71
Man-induced Succession	13.04
Ditching	12.08
Housing	8.22
Resort Development	5.55
Airport	2.78
Commercial Development	2.52
Agriculture	1.19
Total	**102.01**

Table 4. Conversion of hydrologically similar palustrine vegetated wetlands to upland in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Palustrine Wetland Type	Acres
Temporarily Flooded	9.70
Seasonally Flooded	17.82
Seasonally Flooded/Saturated	59.77
Semipermanently Flooded	14.69
Total	**101.98**

Table 5. Changes in palustrine forested wetlands in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Forested Wetland Type	Converted to Upland (acres)	Changed to Other Wetland Types* (acres)	Total Loss (acres)
Temporarily Flooded	9.39	37.12	46.51
Seasonally Flooded	15.28	81.04	96.32
Seasonally Flooded/Saturated	55.31	209.77	265.08
Semipermanently Flooded	6.61	44.68	51.29
Total	**86.59**	**372.61**	**459.20**

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

Table 5a. Causes of upland conversion in different types of palustrine forested wetlands in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Palustrine Forested Wetland Type	Converted to Upland (acres)	Cause of Loss
Temporarily Flooded	7.37	Road Construction
	1.05	Ditching
	0.52	Agriculture
	0.45	Commercial
Seasonally Flooded	8.22	Housing Construction
	3.33	Road Construction
	2.78	Airport
	0.95	Sand & Gravel Pits
Seasonally Flooded/Saturated	31.81	Sand & Gravel Pits
	10.01	Road Construction
	9.16	Ditching
	2.86	Man-induced Succession
	1.47	Resort Development
Semipermanently Flooded	5.11	Man-induced Succession
	1.50	Resort Development
Total Palustrine Forested Wetland Loss	**86.59**	

Table 5b. Causes of upland conversion in palustrine forested wetlands in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Cause of Loss	Converted to Upland (acres)
Sand & Gravel Pits	32.76
Road Construction	20.71
Ditching	10.21
Housing Development	8.22
Man-induced Succession	7.97
Resort Development	2.97
Airport	2.78
Agriculture	0.52
Commercial	0.45
Total Palustrine Forested Wetland Loss	**86.59**

Table 6. Gains in vegetated wetlands in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Wetland Type	Gain from Nonvegetated Wetlands (acres)	Gain from Other Vegetated Wetlands* (acres)	Gain from Upland (acres)
Palustrine Emergent	17.63	101.20	6.35
Palustrine Scrub-Shrub	5.35	147.73**	10.61
Palustrine Forested	---	35.23†	---
Total	**22.98**	**284.16**	**16.96**

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

**58.58 acres due to timber harvest; 33.86 acres due to sand and gravel pit operation; 41.78 acres due to beaver activity; 13.51 acres due to natural succession.

†All due to natural succession.

Table 7. Changes in palustrine wetlands in selected areas of the Chickahominy River Watershed of Virginia due to beaver activity (1982/84 to 1989-90).

Palustrine Wetland Type	Change in Water Regime Only (acres)	Change in (or to) Vegetated Class (acres)	Change to Nonvegetated Wetland (acres)
Palustrine Emergent	0.87	---	13.74
Palustrine Scrub-Shrub	7.69	4.76	26.54
Palustrine Forested	29.10	54.20	24.92
Palustrine Unconsolidated Bottom	---	4.95	---
Total	**37.66**	**63.91**	**65.20**

Table 8. Gains and losses in palustrine nonvegetated wetlands in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

	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	62.85	120.78	20.95	22.98
Palustrine Unconsolidated Shore	---	9.68	---	---
Total	**62.85**	**130.46**	**20.95**	**22.98**

Table 9. Causes of recently constructed ponds on upland sites in selected areas of the Chickahominy River Watershed of Virginia (1982/84 to 1989-90).

Causes	Pond Acreage Created
Ponds in Undeveloped Areas	22.16
Farm Ponds	16.80
Urban Ponds	8.54
Detention Basins	8.31
Unknown Cause	2.24
Ponds in Commercial Areas	1.54
Sand & Gravel Pits	1.33
Reservoirs	1.29
Ponds in Recreational Areas	0.64
Total	**62.85**