April 1994

Wetland Trends in Selected Areas of the Norfolk/Hampton Region of Virginia (1982 to 1989-90)

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

U.S. Environmental Protection Agency
Chesapeake Bay Program

Wetland Trends in Selected Areas of the Norfolk/Hampton Region of Virginia (1982 to 1989-90)

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

Prepared for the
U.S. Fish and Wildlife Service
Chesapeake Bay Estuary Program
and the
U.S. Environmental Protection Agency
Chesapeake Bay Program Office
Annapolis, Maryland 21401

April 1994

This report should be cited as follows:

Tiner, R.W., and D.B. Foulis. 1994. Wetland Trends in Selected Areas of the Norfolk/Hampton Region of Virginia (1982 to 1989-90). U.S. Fish and Wildlife Service, Hadley, MA. Ecological Services report R5-93/16, 18 pp.

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 partial drainage. Timber harvest of palustrine forests also causes a change in wetland type to emergent and/or scrub-shrub wetlands. Wetlands are also destroyed directly or indirectly by human activities. Most wetlands, however, are relatively stable in the short term, and subsequent changes are usually subtle and may only be detected gradually over long time periods. 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 Norfolk/Hampton region of Virginia. This report is one of many study areas selected by the EPA and FWS for detailed wetland trends analysis.

STUDY AREA

The study sites are located in the Norfolk/Hampton region in Southeastern Virginia (Figure 1) and have a combined land surface area of approximately 545 square miles. The study area encompasses twelve large-scale (1:24,000) U.S. Geological Survey topographic quadrangles: Bowers Hill, Deep Creek, Fentress, Hampton, Kempsville, Mulberry Island, Newport News North, Norfolk South, Poquoson East, Poquoson West, Princess Anne, and Yorktown.

METHODS

Wetland trends analysis involves comparing aerial photography from at least two time periods. For the present study, aerial photos from 1982 and from 1989-90 were examined and compared to determine the extent of the wetland changes (losses, gains, or changes in type) that occurred in the study area during that time period.

The 1982 photography was 1:58,000 scale color infrared (CIR) aerial photography acquired by the U.S. Geological Survey's National High-Altitude Photography Program. The 1989-90 photography was 1:40,000 scale CIR aerial photography acquired by the National

Aerial Photography Program. Wetlands and deepwater habitats were initially interpreted on the 1:40,000 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. Field work was conducted in selected areas to verify changes in classification. These results were used to improve wetland mapping, especially for seasonally saturated forested wetlands, and small wetlands that had been missed during the original interpretation. 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 about 70,000 acres of wetlands, excluding linear fringing wetlands along narrow streams. This total amounts to roughly 20 percent of the area's land surface. Table 1 summarizes the acreage of the different wetland types found in the study area.

Palustrine wetlands predominate with over 50,000 acres. This represents 73 percent of the study area's total wetland acreage. Deciduous forested wetlands alone account for approximately 70 percent of the wetlands. Over 15,000 acres of estuarine wetlands were present. They represent 23 percent of the study area's wetlands. Over three-quarters of the estuarine wetlands are emergent marshes.

Recent Wetland Trends

The results of the wetland trends analysis study are presented in Tables 2 through 10 and Figure 2. The following discussion highlights the more significant or interesting findings.

Vegetated Wetlands

Between 1982 and 1989-90, nearly 4,850 acres of vegetated wetlands were converted to upland (Table 2). Over 4,286 acres of vegetated wetland changed from one type to another, with palustrine forested and scrub-shrub wetlands being most affected. Most of the losses to upland affected palustrine forested wetland. Housing developments were the most significant cause of palustrine vegetated wetland loss, affecting over 2,000 acres and

accounting for about 43 percent of the conversion of vegetated wetlands to upland (Table 3). Conversion of wetland to cropland impacted over 1,202 acres of palustrine vegetated wetlands in the study area. This amounts to about 25 percent of the loss of palustrine vegetated wetland to upland during the study period. Sanitary landfill expansion, resort development, and ditching were also significant among the other causes of loss (Table 3). Upland conversion impacted the seasonally saturated palustrine wetland type significantly more than other types (Tables 4 and 5). Figure 2 shows losses to upland in different types of forested wetlands and their causes. Most of the gain in particular types of vegetated wetlands came from other vegetated wetland types (Table 6). This amounts to about 4,286 acres, 97 percent of which changed due to timber harvest. About 90 acres of vegetated wetland were created from upland (Table 7). Over 36 acres of estuarine vegetated wetlands were converted to upland, with housing construction being the principal cause of loss (Table 10).

Nonvegetated Wetlands

Over 615 acres of new ponds were created from upland, and over 141 acres were constructed in vegetated wetlands (Table 8). About 201 acres of ponds were filled in, while only 27 acres changed to vegetated wetlands. Three-quarters of the new ponds were the result of detention basin construction and pond construction in urban areas (Table 9).

Summary

The study area has approximately 20 percent of its land mass covered by wetlands. Wetlands totaling 70,000 acres (in 1989-90) were identified in the study area by the Service's National Wetlands Inventory. Palustrine wetland is the dominant type, representing 73 percent of the wetlands in the study area.

Between 1982 and 1989-90, the study area lost about 5,064 acres of vegetated wetlands, with roughly 4,850 acres converted to upland. Seasonally saturated forested wetland was the type most frequently converted to upland. Pond construction added about 756 acres of palustrine nonvegetated wetlands, but this gain was reduced to a net gain of about 527 acres by pond losses to upland and vegetated wetlands.

The overall trend for the study area's wetlands was tremendous losses of vegetated wetlands and moderate 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 agricultural and urban development increases, the quality of wetlands can be expected to deteriorate due to runoff, increased sedimentation, groundwater withdrawals, increased water pollution, loss of natural buffer zones, and other factors, unless adequate safequards are taken to protect not only the existence of wetlands, but their quality.

ACKNOWLEDGMENTS

Funding for this project was provided by the U.S. Fish and Wildlife Service's Chesapeake Bay Estuary Program and the U.S. Environmental Protection Agency's Chesapeake Bay Program Office as part of a comprehensive study of wetland trends in the Chesapeake Bay watershed. Ed Pendleton and Carin Bisland were project coordinators for the respective programs.

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, Linda Shaffer, and John Eaton for their assistance. Photointerpretation 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.

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 Norfolk/Hampton region of Virginia, shaded below.

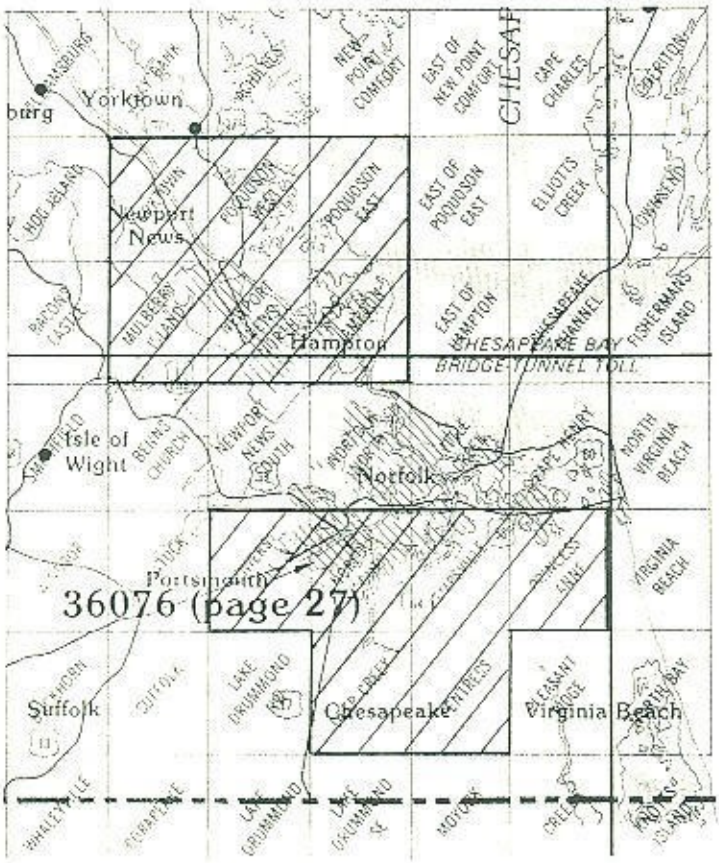


Table 1. Acreage of wetland types in selected areas of the Norfolk/Hampton region of Virginia (1989-90).

Wetland Types	Acres
PALUSTRINE WETLANDS	
Tidal Emergent	
Temporarily Flooded-Tidal	45.41
Seasonally Flooded-Tidal	104.34
Semipermanently Flooded-Tidal	3.86
(Subtotal Tidal)	*(153.61)*
Nontidal Emergent	
Seasonally Flooded/Saturated	376.54
Seasonally Flooded	679.60
Temporarily Flooded	426.47
Semipermanently Flooded	56.05
Permanently Flooded	.43
Seasonally Saturated	86.38
(Subtotal Nontidal)	*(1,625.47)*
Total Palustrine Emergent Wetlands	**1,779.08**
Tidal Forested	
Deciduous	
Temporarily Flooded-Tidal	280.26
Seasonally Flooded-Tidal	1,943.35
Evergreen	
Temporarily Flooded-Tidal	337.27
Seasonally Flooded-Tidal	1,196.11
Dead	1.66
(Subtotal Tidal)	*(3,758.65)*
Nontidal Forested	
Deciduous	
Seasonally Flooded/Saturated	8,157.14
Seasonally Flooded	7,221.90
Temporarily Flooded	8,492.92
Seasonally Saturated	9,291.00
Semipermanently Flooded	188.23
Permanently Flooded	14.32
Evergreen	
Seasonally Flooded/Saturated	99.38
Seasonally Flooded	1,063.19

Table 1 *(Continued)*

Temporarily Flooded	1,253.45
Seasonally Saturated	3,939.81
Dead	63.43
(Subtotal Nontidal)	*(39,784.77)*
Total Palustrine Forested Wetlands	**43,543.42**
Tidal Scrub-Shrub	
Deciduous	
Temporarily Flooded-Tidal	32.98
Seasonally Flooded-Tidal	181.94
Evergreen	
Temporarily Flooded-Tidal	3.73
Seasonally Flooded-Tidal	223.25
(Subtotal Tidal)	*(441.90)*
Nontidal Scrub-Shrub	
Deciduous	
Seasonally Flooded/Saturated	275.76
Seasonally Flooded	426.72
Temporarily Flooded	779.27
Seasonally Saturated	1,019.01
Semipermanently Flooded	61.72
Evergreen	
Seasonally Flooded	99.85
Temporarily Flooded	89.54
Seasonally Saturated	150.78
(Subtotal Nontidal)	*(2,902.65)*
Total Palustrine Scrub-Shrub Wetlands	**3,344.55**
Farmed Wetlands	2.84
Aquatic Bed	14.88
Total Palustrine Vegetated Wetlands	**48,684.77**
Unconsolidated Bottom (Ponds)	2,448.43
Unconsolidated Shore	25.87
Total Palustrine Nonvegetated Wetlands	**2,474.30**
GRAND TOTAL PALUSTRINE WETLANDS	**51,159.07**

Table 1 ***(Continued)***

ESTUARINE WETLANDS	
Emergent	
Irregularly Flooded	11,307.71
Regularly Flooded	307.12
Unknown	2,988.22
Total Estuarine Emergent Wetlands	**14,603.05**
Scrub-Shrub	
Irregularly Flooded	543.47
Total Estuarine Scrub-Shrub Wetlands	**543.47**
Forested	
Irregularly Flooded	359.11
Total Estuarine Forested Wetlands	**359.11**
Total Estuarine Vegetated Wetlands	**15,505.63**
Unconsolidated Shore	3,357.11
Rocky Shore	3.68
Total Estuarine Nonvegetated Wetlands	**3,360.79**
GRAND TOTAL ESTUARINE WETLANDS	**18,866.42**
TOTAL WETLANDS	**70,025.49**

Table 2. Changes of vegetated wetlands in selected areas of the Norfolk/Hampton region of Virginia (1982 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	382.62	568.10	16.42	2.42
Palustrine Forested	3,934.02	2,050.22	113.88	61.27
Palustrine Scrub-Shrub	493.76	1,666.33	9.43	---
Palustrine Farmed	2.99	---	---	---
Estuarine Emergent	34.13	2.02	1.43	8.73
Estuarine Scrub-Shrub	2.29	---	---	0.51
Total	**4,849.81**	**4,286.47**	**141.16**	**72.93**

*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 palustrine vegetated wetland* loss to upland in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

Cause of Loss	Acres
Housing	2,050.85
Agriculture	1,202.21
Sanitary Landfill Expansion	397.03
Resort Community Development	266.77
Ditching	243.04
Unknown	89.78
Canal Construction	72.79
Highway Construction	70.26
Sand & Gravel Pits	67.62
Road Construction	61.18
Commercial (Business)	58.11
Industrial	45.12
Commercial (General)	40.31
Junkyard Expansion	40.31
Recreation	38.75
Commercial (Shopping)	28.13
Transmission Line Corridors	13.12
Airport	11.25
Public	7.17
Silviculture	4.08
Federal Installation	3.06
Timber Harvest, Silviculture	1.82
Marina	0.62
Total	**4,813.38**

*Includes 2.99 acres of farmed wetlands.

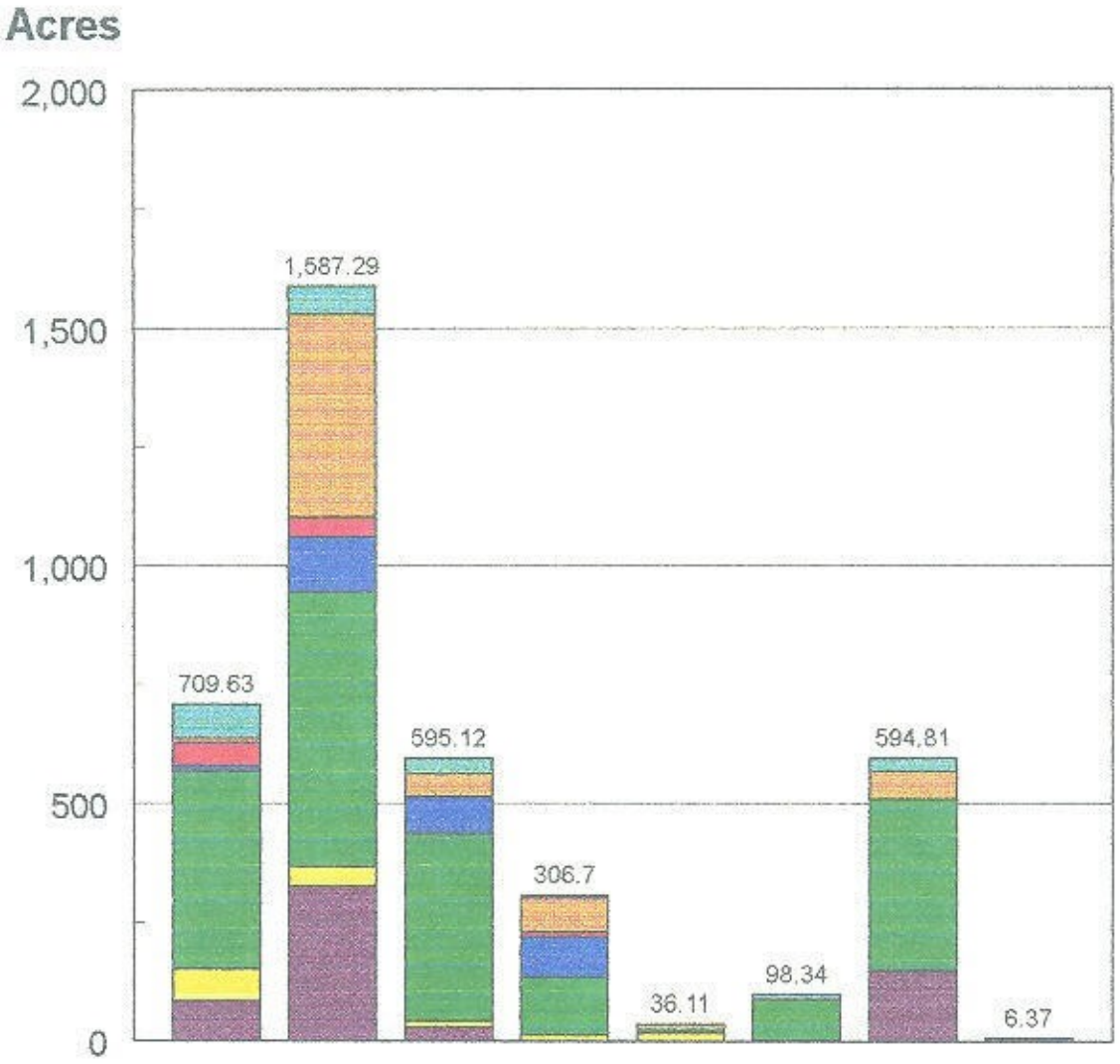
Table 4. Conversion of hydrologically similar palustrine vegetated wetlands to upland in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

Palustrine Wetland Type	Acres
Temporarily Flooded	1,146.21
Seasonally Saturated	2,563.34
Seasonally Flooded	669.22
Seasonally Flooded/Saturated	359.52
Semipermanently Flooded	10.66
Temporarily Flooded - Tidal	6.35
Seasonally Flooded - Tidal	55.09
Farmed	2.99
Total	**4,813.61**

Table 5. Conversion of hydrologically similar palustrine vegetated wetlands, presented by class, to upland in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

Palustrine Wetland Class	Acres
Palustrine Emergent	
Temporarily Flooded	165.48
Seasonally Saturated	80.43
Seasonally Flooded	59.58
Seasonally Flooded/Saturated	49.94
Semipermanently Flooded	7.95
Seasonally Flooded - Tidal	19.23
Palustrine Emergent Subtotal	**382.61**
Palustrine Forested	
Temporarily Flooded	807.97
Seasonally Saturated	2,182.09
Seasonally Flooded	595.66
Seasonally Flooded/Saturated	309.58
Seasonally Flooded -Tidal	33.15
Temporarily Flooded - Tidal	5.57
Palustrine Forested Subtotal	**3,934.02**
Palustrine Scrub-Shrub	
Temporarily Flooded	172.76
Seasonally Saturated	300.82
Seasonally Flooded	13.98
Semipermanently Flooded	2.71
Seasonally Flooded - Tidal	2.71
Temporarily Flooded - Tidal	0.78
Palustrine Scrub-Shrub Subtotal	**493.76**
GRAND TOTAL	**4,813.61**

Figure 2. Causes of loss to upland in palustrine forested wetlands in selected regions of the Norfolk/Hampton area of Virginia (1982 to 1989/90).



	PFO1A	PFO1B	PFO1C	PFO1E	PFO1R/S	PFO4A	PFO4B	PFO4 other
Agriculture	84.65	325.25	28.60	0.00	1.36	0.00	148.11	0.00
Comm./Indus.	66.62	42.18	13.08	12.97	17.63	3.09	0.91	0.00
Housing	415.34	577.77	392.96	120.97	5.43	85.40	360.69	1.99
Recreation	13.94	116.23	78.99	86.33	0.00	0.00	0.00	3.76
Roads/Hghy	47.60	41.36	3.21	10.98	0.13	0.00	0.00	0.62
Other	8.73	426.65	46.47	70.25	11.56	0.00	58.17	0.00
Ditching	72.75	57.85	31.81	5.20	0.00	9.85	26.93	0.00
Total	709.63	1,587.29	595.12	306.70	36.11	98.34	594.81	6.37

Table 6. Gains in vegetated wetlands in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

Wetland Type	Gain from Nonvegetated Wetlands (acres)	Gain from Other Vegetated Wetlands* (acres)	Gain from Upland (acres)
Palustrine Emergent	12.22	490.23	60.43
Palustrine Forested	---	1,838.76	5.61
Palustrine Scrub-Shrub	0.69	1,954.76	20.83
Palustrine Aquatic Bed	3.18	0.26	---
Estuarine Emergent	11.02	0.44	3.15
Estuarine Scrub-Shrub	---	2.02	---
Total	**27.11**	**4,286.47**	**90.02**

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

Table 7. Causes of gains from upland in palustrine vegetated wetlands in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

Cause of Gain	Acres
Agriculture	34.86
Unknown	10.43
Sand & Gravel Pits	9.76
Man-induced Successional Change	7.67
Potential Mitigation	4.67
Industrial Development	4.26
Detention Basin Construction	3.60
Commercial Development	3.17
Federal Installation	2.38
Road Construction	2.20
Highway Construction	1.35
Excavated	1.02
Pond Construction	0.88
Ditch Construction	0.62
Total	**86.87**

Table 8. Gains and losses in palustrine nonvegetated wetlands in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

	GAINS		LOSSES			
Wetland Type	Created From Upland (acres)	Created in Vegetated Wetlands (acres)	Converted to Upland (acres)	Changed to Palustrine Vegetated Wetlands (acres)	Changed to Estuarine Vegetated Wetlands (acres)	Changed to Deepwater Habitat (acres)
Palustrine Unconsolidated Bottom	613.81	139.88	189.90	13.78	11.02	0.73
Palustrine Unconsolidated Shore	1.34	1.28	11.07	2.31	---	---
Total	**615.15**	**141.16**	**200.97**	**16.09**	**11.02**	**0.73**

Table 9. Causes of recently constructed ponds on upland sites in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

Causes	Pond Acreage Created
Detention Basins	292.32
Urban Ponds	174.47
Sand & Gravel Pit Ponds	74.49
Ponds at Recreational Areas	31.03
Farm Ponds	12.71
Ponds in Undeveloped Areas	10.52
Ponds near Sanitary Landfills	6.28
Ponds in Highway Cloverleaves	2.37
Excavated Ponds	2.92
Industrial Ponds	2.10
Ponds in Resort Communities	1.63
Unknown	1.65
Impoundments	0.44
Ponds in Logged Areas	0.75
Total	**615.15**

Table 10. Causes of estuarine vegetated wetland loss to upland in selected areas of the Norfolk/Hampton region of Virginia (1982 to 1989-90).

Cause of Loss	Acres
Housing	12.91
Public Facility	9.03
Highway Construction	6.92
Industrial Development	3.37
Commercial Development	1.72
Ditching	1.60
Marina	0.87
Total	**36.42**