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Wetland Trends in the Greater Buffalo Area, New York: 1980-2002

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by

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INTRODUCTION

The U.S. Fish and Wildlife Service's National Wetlands Inventory Program (NWI) is responsible for mapping the nation's wetlands and for conducting assessments of wetland trends. The Greater Buffalo area was identified by the Service's New York Field Office (Cortland) as an area where wetlands may have been significantly impacted by urban development and where information on the current status and recent trends are needed. This locale likely represents western New York's top area for wetlands alteration by urban development. Consequently, the NWI initiated a local wetland trends study to evaluate the extent of these impacts and to address the status of wetlands in terms of wetland acreage.

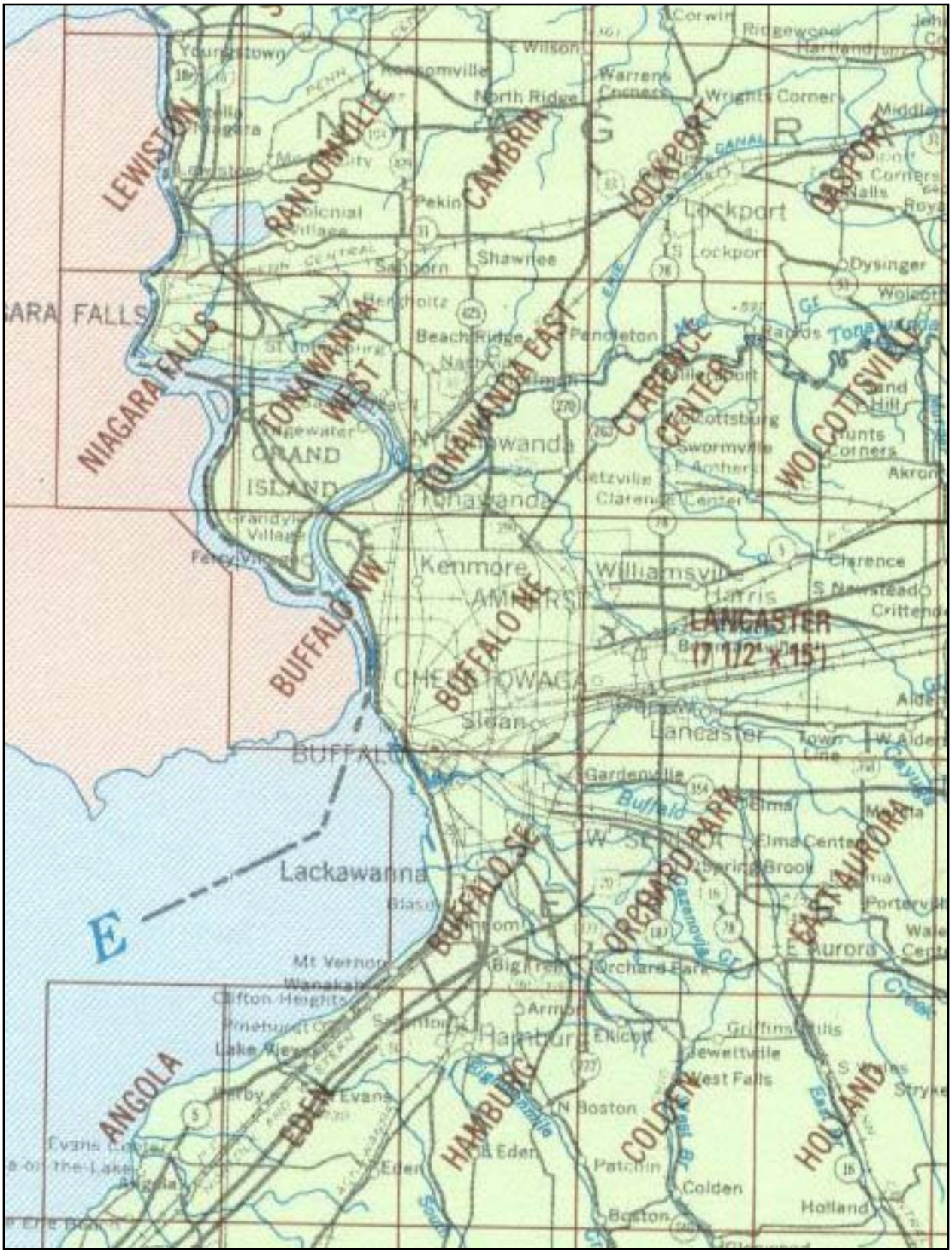
This report summarizes the study findings and makes government agencies and the public aware of the general status of and recent changes in wetlands of the Greater Buffalo area. Some changes are natural such as vegetation succession, beaver influences, and plant colonization of shallow water, while other changes are human-induced including creation of wetlands and conversion of wetlands to dry land for a variety of purposes. In addition to increasing public awareness of the status of wetlands, the findings may be used by public agencies and private nonprofit organizations to develop wetland conservation strategies that aid regional and local natural resource planning efforts.

STUDY AREA

The study area is located in the Buffalo metropolitan area in western New York. It is represented by a 1,000 square-mile area of land encompassing parts of Erie and Niagara Counties. The study area includes a broad flat area representing part of the former lakebed of Glacial Lake Tonawanda that existed some 10,000 years ago. A series of escarpments cut across the region marking the borders of former lake shores. Lake Erie, the Niagara River, and Niagara Falls mark the western edge of the study area, while other major watercourses in the area include several creeks: Tonawanda, Ellicott, Mud, Buffalo, Cazenovia, and Cayuga. Buffalo, Tonawanda, Lockport, and Niagara Falls are the major cities within the study area.

The study area includes 21-1:24,000 NWI maps: Lewiston, Ransomville, Cambria, Lockport, Gasport, Niagara Falls, Tonawanda West, Tonawanda East, Clarence Center, Wolcottsville, Buffalo NW, Buffalo NE, Lancaster, Clarence, Buffalo SE, Orchard Park, East Aurora, Angola, Eden, Hamburg and Colden (Figure 1).

Figure 1. Location of study area in western New York. Note: Holland is not in the study area.



METHODS

Wetland trends can be analyzed a number of ways. Two common approaches to determining wetland trends are: 1) statistically based plot sampling and 2) inventory of change. The former requires evaluation of sample plots (e.g., four-square mile plots) randomly selected within a particular geographic area. This method is used for very large geographic areas like major ecoregions, entire states, or the whole country. The latter approach involves conducting an area-wide inventory of wetlands covering multiple time periods. This approach is generally used for small geographic areas where more detailed investigations can be carried out.

For this study, we chose the inventory of change approach to evaluate wetland trends. Change detection was done through conventional photointerpretation. We examined aerial imagery to determine wetland trends for two time periods: 1978/81-1994 and 1994-2002.

Data Sources

The 2002 NWI data were available for this study and served as the foundation for the project. These data were derived by a combination of aerial image analysis and interpreting collateral data sources. Aerial image interpretation was done via computer onscreen techniques. For time one (1980-era), 1978 and 1981 black and white 1:80,000 aerial photos were used; this was the imagery used to produce the original NWI maps for this part of New York state. For time two, 1994 color-infrared one-meter digital imagery was acquired from the New York Cyber Security & Critical Infrastructure Coordination Unit (NYS&C). For the contemporary period (time three - 2002), one-foot resolution true color digital imagery was obtained from NYS&C. These sources allowed an assessment of wetland changes from 1980 to 1994 to 2002. Digital soils data available from the USDA Natural Resources Conservation Service were consulted to help delineate drier-end wetlands (e.g., seasonally saturated flatwoods) that typically are hard to detect through conventional photointerpretation.

Interpretation of Trends

Changes in wetlands due to both natural and human-induced actions were detected on the imagery by directly comparing the status of wetlands on each set of imagery. An on-screen, "heads up" process was used for detection and delineation. This method required working back in time comparing the 2002 NWI wetlands to the 1994 imagery and the 1994 wetlands to the 1980-era photos. The most current NWI data and the 2002 imagery (from which it was derived) were used as the foundation for the trends assessment.[1] The 1980-era imagery was scanned and geo-rectified for computer applications. Wetlands were added, deleted, or their boundaries were reconfigured to more accurately represent their status at the applicable time period. Wetlands and deepwater habitats were classified according to the Service's official wetland classification system (Cowardin et al. 1979) which is the U.S. national standard for wetland classification (Federal Geographic Data Committee 1996).

Wetland changes between 2002 and 1994 were identified by overlaying the 2002 NWI data on the 1994 imagery. The causes of the changes were determined by consulting the 2002 images. The same procedure was used, but with different imagery to assess wetland changes from 1980 to 1994. Each change was digitized, with the cause recorded, creating a trends data layer for each time interval (i.e., 2002-1994 and 1994-1980). Conversions of wetlands to nonwetlands were labeled by their respective land use or land cover classification following Anderson et al. (1976). The minimum area of change detected was approximately 0.5 acre.

Data Analysis and Tabulation

Geospatial data were analyzed through geographic information system technology, using ArcGIS 9.1 (Environmental Systems Research Institute, Inc., ESRI). Statistics addressing wetland status and trends for the study were generated using this program.

[1] For the 2002 NWI data, the target mapping unit (tmu) was approximately 1 acre, recognizing the inherent limitations of photointerpretation for mapping wetlands (Tiner 1990). Such targets are for general guidance only, and many conspicuous, smaller wetlands are often mapped, with ponds being the most common wetland type mapped below the tmu.

RESULTS

Wetland and Deepwater Habitat Status: 2002

Wetlands occupied nearly 114 square miles of the study area. This amounts to 11 percent of the land area. Forested wetlands were the dominant type, representing 70 percent of the area's wetlands (Table 1). Nearly all of these forested wetlands were dominated by broad-leaved deciduous trees. Sixty-eight percent of the forested wetlands were seasonally saturated flatwoods.[2] Scrub-shrub wetlands were next in abundance, accounting for 13 percent of the wetlands, followed by emergent wetlands with nearly 6,600 acres inventoried (9% of the wetlands). Ponds (e.g., palustrine unconsolidated bottoms and shores) totaled nearly 3,500 acres, comprising about 5 percent of the area's wetlands.

The waters of Lake Erie dominated the deepwater portion of the study area, with over 35,000 acres inventoried (Table 1). Riverine waters accounted for nearly 11,000 acres.

Wetland Trends

The general trends for the region were losses of vegetated wetlands (forested, scrub-shrub, and emergent types) and gains in nonvegetated wetlands (ponds and shallow lakes/impoundments) (Table 2). Vegetated wetland losses were greater during the 14-year period from 1980-1994 than from 1994-2002 and the rate of change was higher as well: net annual losses of 109 acres vs. 67 acres.

Vegetated Wetlands

Losses and Changes in Wetland Type

From 1980-1994, a total of 1,560 acres of vegetated wetlands were converted to nonwetland or nonvegetated wetlands (ponds and unconsolidated shores) (Table 3). Forty-three percent of the losses were attributed to residential development, while nearly 13 percent was due to commercial development, almost 11 percent to pond construction, and over 9 percent to gravel mining operations. The average annual loss of these wetlands during this period was 111 acres. Forested wetlands received the brunt of the impacts, declining by more than 1,200 acres from 1980-1994. This amounts to a two percent loss of forested wetland and comprised over three-quarters of the vegetated wetland losses. Scrub-shrub wetlands absorbed the second heaviest losses during this period with 186 acres lost (13 acres average annual loss), representing nearly two percent of these wetlands. Nearly 90 acres of emergent wetlands were lost which amounts to 1.3% of the 1980 extent of these wetlands.

From 1994-2002, 545 acres of vegetated wetlands were destroyed. Residential development remained the major cause of wetland loss, being responsible for nearly 38 percent of the losses. Conversion of vegetated wetland to "transitional land" (land going to some type of development that could not be determined as the work was in progress) was the second leading cause of vegetated wetland loss, accounting for 22 percent of the total losses. Pond construction and commercial development accounted for 26 percent of the losses, with each responsible for about 13 percent of the losses. Almost 390 acres of forested wetlands were lost including 24 acres that were excavated to create emergent wetland. Average annual loss of forested wetland amounted to about 49 acres (less than half of what it was during the 1980-1994 period). Nearly one percent (0.8%) of the forested wetlands that existed in 1994 was destroyed during this eight-year period. About one percent of the other vegetated wetlands were also lost by 2002. Nearly 84 acres of scrub-shrub wetlands and roughly 64 acres of emergent wetlands were lost.

Gains

Seventy-three acres of vegetated wetlands became established from 1980-1994. Most of this increase (51 acres) came from abandonment of agriculture in a farmed wetland that became vegetated with shrub and emergent wetland species. Most of the remaining gain in vegetated wetlands was created by excavating depressions in upland which were then colonized by aquatic bed vegetation or wetland emergent plants. Nearly seven acres of "dead" forested wetland were the result of beaver activity which converted an upland forest to a shallow water depressional wetland with standing dead trees.

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[2] These wetlands were largely identified by the presence of hydric soil areas map units in undeveloped areas; hydric soil locations were derived from digital soil data of USDA county soil surveys, while aerial imagery was consulted to determine the current status of the land as either developed or undeveloped hydric soil.

From 1994-2002, only nine acres of vegetated wetland were created from upland. In addition, 24 acres of forested wetlands were excavated to create emergent wetland habitat.

Nonvegetated Wetlands

Losses

Nonvegetated wetlands are mostly ponds. Only 25 acres of these habitats were altered from 1980-1994, and only 14 from 1994-2002 (Table 4). Most of them were filled in for upland development or destroyed during sand and gravel pit mining operations.

Gains

Increases in nonvegetated wetlands mainly through pond construction occurred throughout the study period (1980-2002). Palustrine unconsolidated bottom acreage rose by 38 percent from 1980-1994 and by nearly 10 percent from 1994 to 2002. Overall, pond acreage (palustrine unconsolidated shore and bottom) increased by nearly 1,220 acres during the 22-year period (Table 4). From 1980 to 1994, 81 percent (715 acres) of the gain came from upland (45% from cropland), with the remainder (164 acres) coming from wetland (mostly forested wetland: 64%). From 1994 to 2002, a slightly greater percentage of the gain came from wetlands: 22 percent vs. 19 percent from 1980 to 1994. Most of the increase in pond acreage still came from agricultural lands, yet 126 acres of shallow water lacustrine habitat were created by excavating upland fields/thickets along the Erie Canal at the boat ramp near Carlisle Gardens and in building a large impoundment next to the New York Thruway toll plaza at Bowmansville

Table 1. Extent of wetlands and deepwater habitats in the Greater Buffalo area, 2002

	NWI Classification		*Acreage*
Habitat	System	Class	
Wetland	Lacustrine	Unconsolidated Bottom	1, 479.9
		Unconsolidated Shore	197.9
		Aquatic Bed	5.8
		---	---
		Total Lacustrine Wetlands	1,683.6
	Palustrine	Aquatic Bed	25.4
		Emergent	6,558.4
		Farmed	219.6
		Forested	51,186.9
		Scrub-Shrub	9,589.0
		Unconsolidated Bottom	3,318.9
		Unconsolidated Shore	160.2
		---	---
		Total Palustrine Wetlands	71,058.4
	Riverine	Unconsolidated Shore	90.2
	GRAND TOTAL - WETLAND		72,832.2
Deepwater Habitat			
	Lacustrine	Unconsolidated Bottom	35,078.8
	Riverine	Rock Bottom	266.2
		Unconsolidated Bottom	10,447.0
		---	---
		Total Riverine DW Habitat	10,713.2
	GRAND TOTAL - DEEPWATER HABITAT		45,792.0

Table 2. General wetland trends in the Greater Buffalo Metro area 1980 to 2002.

Wetland Type	1980 Acreage	1994 Acreage	Change 1980 - 1994	2002 Acreage	Change 1994 - 2002
Lacustrine	1,610.6	1,610.6	0	1,683.6	+73.0
Palustrine					
Aquatic Bed	18.3	22.9	+4.6 acres	25.4	+2.5 acres
Emergent	6,709.5	6,621.9	-87.6 acres	6,558.4	-63.5 acres
Farmed	270.0	219.6	-50.4 acres	219.6	0
Forested	52,782.7	51,575.5	-1,207.7 acres	51,186.9	-388.6 acres
Scrub-Shrub	9,859.3	9,672.9	-186.4 acres	9,589.0	-83.9 acres
Unconsolidated Bottom	2,197.3	3,022.3	+825.0 acres	3,318.9	+296.6 acres
Unconsolidated Shore	63.0	90.5	+27.5 acres	160.2	+69.7 acres
Total Palustrine	71,900.1	71,225.6	-674.5 acres	71,058.4	-167.2 acres
Riverine					
Unconsolidated Shore	90.2	90.2	0	90.2	0

Table 3. Causes of vegetated wetland trends. Wetland codes: EM – Emergent, SS – Scrub-Shrub, FO – Forested, PUB – palustrine unconsolidated bottom (= pond), and PUS (palustrine unconsolidated shore = typically, a dry pond or seasonally wet depression).

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed 1980-1994*	*Acres Changed 1994-2002*
LOSS to	Agriculture	Emergent	29.5	0.0
		Forested	25.1	2.0
		Scrub-Shrun	8.3	0.0
		(Subtotal)	*(62.9)*	*(2.0)*
	Excavation (to River)	Forested	4.8	0.0
		Scrub-Shrub	3.5	0.0
		(Subtotal)	*(8.3)*	*(0.0)*
	Excavation (to Lake)	Forested	36.1	0.0
		Scrub-Shrub	14.4	0.0
		(Subtotal)	*(50.5)*	*(0.0)*
	Commercial Development	Emergent	3.8	7.0
		EM/Scrub-Shrub	1.7	3.2
		Forested	134.3	39.6
		FO/SS	0.0	10.9
		Scrub-Shrub	56.4	4.6
		SS/EM	0.0	2.8
		(Subtotal)	*(196.2)*	*(68.1)*
	Industrial Development	Emergent	3.1	5.0
		Forested	19.6	18.7
		Scrub-Shrun	1.4	7.1
		(Subtotal)	*(24.1)*	*(30.8)*
	Recreational Development	Emergent	0.0	8.7
		Forested	8.7	0.0
		(Subtotal)	*(8.7)*	*(8.7)*
	Residential Development	Emergent	19.7	5.7
		EM/Scrub-Shrub	3.7	5.7
		Forested	555.3	112.0
		FO/SS	29.3	18.8
		Scrub-Shrub	56.0	6.2
		SS/EM	7.8	41.6
		SS/FO	4.3	15.4
		(Subtotal)	*(676.1)*	*(205.4)*

Table 3. Causes of vegetated wetland trends. Wetland codes: EM – Emergent, SS – Scrub-Shrub, FO – Forested, PUB – palustrine unconsolidated bottom (= pond), and PUS (palustrine unconsolidated shore = typically, a dry pond or seasonally wet depression). Continued

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed 1980-1994*	*Acres Changed 1994-2002*
	Transitional Land	Emergent	2.5	14.2
		EM/Scrub-Shrub	0.0	0.6
		Forested	36.6	76.6
		FO/SS	6.2	0.0
		FO/EM	15.4	25.2
		Scrub-Shrub	22.0	2.4
		SS/EM	0.0	2.3
		SS/FO	30.6	0.0
		(Subtotal)	*(113.3)*	*(121.3)*
	Transportation	Emergent	5.7	0.0
		EM/Scrub-Shrub	0.0	1.7
		Forested	64.6	3.0
		FO/SS	1.2	0.0
		SS/FO	8.3	0.0
		(Subtotal)	*(79.8)*	*(4.7)*
	Golf Course	Forested	1.7	0.0
		(Subtotal)	*(1.7)*	*(0.0)*
	Gravel Pit	Forested	143.2	0.0
		Scrub-Shrub	4.9	0.0
		(Subtotal)	*(148.1)*	*(0.0)*
	Pond Creation	Emergent Wetland	37.0	40.8
		EM/SS	3.0	3.5
		Forested	100.3	22.1
		FO/SS	4.0	3.3
		Scrub-Shrun	17.9	0.7
		SS/EM	1.3	0.0
		(Subtotal)	*(163.5)*	*(70.4)*
	Unconsolidated Shore	Emergent	0.0	1.5
		Forested	0.0	32.4
		(Subtotal)	*(0.0)*	*(33.9)*
	Upland Field/Thicket	Forested	1.0	0.0
		(Subtotal)	*(1.0)*	*(0.0)*
	Rangeland	Forested	25.1	0.0
		Scrub-Shrub	0.7	0.0
		(Subtotal)	*(25.8)*	*(0.0)*
	TOTAL LOSSES		**1,560.0**	**545.3**

Table 3. Causes of vegetated wetland trends. Wetland codes: EM – Emergent, SS – Scrub-Shrub, FO – Forested, PUB – palustrine unconsolidated bottom (= pond), and PUS (palustrine unconsolidated shore = typically, a dry pond or seasonally wet depression). Continued

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed 1980-1994*	*Acres Changed 1994-2002*
GAIN from	Upland Field/Thicket	Aquatic Bed	2.3	0.7
		Emergent	3.3	0.0
		EM/Pond	3.1	0.0
		(Subtotal)	*(8.7)*	*(0.7)*
	Shrub Thicket	Aquatic Bed	0.0	1.8
		Emergent	1.9	0.0
		(Subtotal)	*(1.9)*	*(1.8)*
	Agriculture	Emergent	0.7	1.8
		Scrub-Shrub	0.2	0.0
		(Subtotal)	*(0.9)*	*(1.8)*
	Rangeland	Emergent	0.6	0.0
		EM/Pond	1.1	0.0
		(Subtotal)	*(1.7)*	*(0.0)*
	Beaver-conversion of Upland Forest	Forested (dead)	6.5	0.0
		(Subtotal)	*(6.5)*	*(0.0)*
	Pond Creation	Scrub-Shrub	2.7	0.0
		Emergent	0.0	4.5
		(Subtotal)	*(2.7)*	*(4.5)*
	Palustrine Farmed	SS/EM	50.5	0.0
		(Subtotal)	*(50.5)*	*(0.0)*
	TOTAL GAINS		**72.9**	**8.8**

Table 3. Causes of vegetated wetland trends. Wetland codes: EM – Emergent, SS – Scrub-Shrub, FO – Forested, PUB – palustrine unconsolidated bottom (= pond), and PUS (palustrine unconsolidated shore = typically, a dry pond or seasonally wet depression). Continued

Nature of Change	*Cause of Change*	*Wetland Type Affected*	*Acres Changed 1980-1994*	*Acres Changed 1994-2002*
CHANGE IN TYPE	Emergent	Aquatic Bed	0.5	0.0
	Forested	Emergent	12.6	23.9 (23.1 = excavated)
	Forested/Emergent	Emergent	2.2	0.0
	Scrub-Shrub	Aquatic Bed	1.8	0.0
		Emergent	0.4	0.0
	TOTAL CHANGES IN TYPE*		**17.5**	**23.9**

*Conservative figure since emphasis was on detecting losses and gains in wetlands.

Table 4. Causes of nonvegetated wetland trends. PUB = palustrine unconsolidated bottom = pond; PUS = palustrine unconsolidated shore = seasonally dry pond (typically).

Nature of Change	*Cause of Change*	*Nonvegetated Wetland Type*	*Acres Changed 1980-1994*	*Acres Changed 1994-2002*
LOSS to	Commercial Development	PUB	0.4	0.2
	Residential Development	PUB	0.7	0.4
	Transitional Land	PUS	0.0	1.6
		PUB	10.4	3.6
		(Subtotal)	*(10.4)*	*(5.2)*
	Gravel Pit	PUB	7.4	1.2
		PUS	3.8	2.5
		(Subtotal)	*(11.2)*	*(3.7)*
	Rangeland	PUB	*0.0*	*4.5*
	Subtotal Loss to Upland		**22.7**	**9.9**
	Vegetated Wetland by Plant Colonization			
	Emergent	PUB	0.0	4.5
	Scrub-Shrub Wetland	PUB	2.7	0.0
	Subtotal Loss to Wetland		**2.7**	**4.5**
	TOTAL LOSSES		**25.4**	**14.4**

Table 4. Causes of nonvegetated wetland trends. PUB = palustrine unconsolidated bottom = pond; PUS = palustrine unconsolidated shore = seasonally dry pond (typically). Continued

Nature of Change	*Cause of Change*	*Nonvegetated Wetland Type*	*Acres Changed 1980-1994*	*Acres Changed 1994-2002*
GAIN from	Agriculture	PUB	315.9	77.1
		PUS	5.2	5.3
		(Subtotal)	*(321.1)*	*(82.4)*
	Upland Forest	PUB	89.3	13.6
		PUS	1.6	0.0
		(Subtotal)	*(90.9)*	*(13.6)*
	Golf Course	PUB	1.6	0.0
	Upland Field/Thicket	PUB	110.5	40.2
		PUS	6.5	0.9
		Lacustrine Shore	0.0	125.9
		(Subtotal)	*(117.0)*	*(167.0)*
	Gravel Pit	PUB	31.2	18.1
		PUS	23.8	3.6
		(Subtotal)	*(55.0)*	*(21.7)*
	Industrial Development	PUB	2.5	0.0
	Rangeland	PUB	45.5	31.7
		PUS	0.9	0.0
		(Subtotal)	*(46.4)*	*(31.7)*
	Upland Shrub Thicket	PUB	63.6	5.5
		PUS	3.6	0.6
		(Subtotal)	*(67.2)*	*(6.1)*
	Transitional Upland	PUB	12.7	38.4
	Transportation	PUB	0.5	0.0
	Subtotal Gain from Upland		**714.9**	**360.9**

Table 4. Causes of nonvegetated wetland trends. PUB = palustrine unconsolidated bottom = pond; PUS = palustrine unconsolidated shore = seasonally dry pond (typically). Continued

Nature of Change	*Cause of Change*	*Nonvegetated Wetland Type*	*Acres Changed 1980-1994*	*Acres Changed 1994-2002*
GAIN from	Emergent Wetland	PUB	37.0	40.8
		PUS	0.0	1.5
		(Subtotal)	*(37.0)*	*(42.3)*
	EM/SS Wetland	PUB	3.0	3.5
	Forested Wetland	PUB	100.3	22.1
	FO/SS Wetland	PUB	4.0	3.3
	Scrub-Shrub Wetland	PUB	17.9	0.7
	SS/EM Wetland	PUB	1.3	0.0
	Forested Wetland	PUS	0.0	32.4
	Subtotal Gain from Wetland		**163.5**	**104.3**
	TOTAL GAINS		**878.4**	**465.2**
CHANGE IN NONVEGETATED WETLAND TYPE				
	PUS	PUB	10.1	3.0
	PUB	PUS	0.0	0.5
	TOTAL CHANGES IN TYPE		**10.1**	**3.5**

STUDY LIMITATIONS

Wetlands identified with the wetter water regimes such as permanently flooded, semipermanently flooded, and seasonally flooded are usually the most easily recognized types through photointerpretation and are therefore the most accurately mapped. In contrast, seasonally saturated and temporarily flooded wetlands are quite challenging to detect through remotely sensed techniques. These wetlands typically lack standing water except in few shallow depressions that may contain water (or ice) for extended periods from winter through early spring and for brief periods after heavy summer rains. They have high water tables during these seasons that have supported the establishment of wetland vegetation and formation of hydric soils. The lack of surface wetness makes them particularly difficult to photointerpret as well as to recognize in the field. Both seasonally saturated and temporarily flooded wetlands tend to lack surface water in early spring when most aerial photographs are captured. Examination of soil properties is usually required to verify the existence of these wetlands. Soil surveys conducted by the U.S. Department of Agriculture, Natural Resources Conservation Service provide a useful source of information to aid photointerpreters in mapping these difficult types. This information is now available in digital form to facilitate this process. Limited field checking in the general area by NWI personnel found that there was a good correlation between hydric soils and these drier-end wetlands. Nonetheless, the interpretation of these types should be considered conservative and field verification is recommended to evaluate the potential uses of these types.

Habitat fragmentation by roads and residential/commercial development has also played a significant role in adversely affecting wetlands. This type of development has often reduced the connectivity among wetlands, especially for those wetlands not intersected by streams. In addition, such development has most likely adversely impacted the hydrology of wetlands across the region as local drainage patterns have been disrupted.

SUMMARY

In 2002, wetlands represented eleven percent of the Greater Buffalo area. Forested wetlands remained the dominant type, occupying nearly 51,200 acres and accounting for 70 percent of the region's wetlands. Over two-thirds of these forested wetlands were seasonally saturated flatwoods (i.e., low-lying seasonally wet forests with water tables at or near the surface from winter through spring).

The region lost nearly three percent of its vegetated wetlands from 1980 to 2002 (69,640 to 67,579 acres), while nonvegetated wetland acreage (e.g., ponds) rose by a third (3,961 to 5,253 acres). Residential development was the main cause of the vegetated wetland loss, being responsible for 43 percent of the losses from 1980 to 1994 and for 38 percent of the losses from 1994 to 2002. During the former period, commercial development and pond construction each accounted for 13 percent of the losses. From 1980 to 2002, pond acreage continued to increase, first by 853 acres (1980-1994) and then by 366 acres (1994-2002). Most of the new ponds were built on upland, primarily on cropland.

ACKNOWLEDGMENTS

The 2002 NWI data used as the foundation for this study was compiled by photointerpreters in the Department of Plant, Soil, and Insect Sciences at the University of Massachusetts, mainly Irene Huber and Todd Nuerminger. The trends study was performed by the U.S. Fish and Wildlife Service, Northeast Region, National Wetlands Inventory Program. John Swords analyzed the imagery and recorded wetland changes in a digital database. Herbert Bergquist used GIS technology to compile the results in a format for use in this report. Ralph Tiner was responsible for general project design and for summarizing the findings in this report. Funds for this project were provided by the Service's National Wetlands Inventory Program (Washington Office).

Several individuals reviewed the draft report: Jim Dick, Bill Kirschner, and Bill Wilen. I thank them for their help in finalizing this publication.

A special thanks to Christine Sevilla for letting us use her flatwood wetland photograph for the cover. This type of wetland is typical of many of the remaining forested wetlands in the study area. Also thanks to Andrew Cruz for preparing the image for Figure 1.

REFERENCES

Anderson, J.R., E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. A Land Use and Land Cover Classification for Use with Remote Sensor Data. U.S. Geological Survey, Reston, VA. Geol. Survey Prof. Paper 964.

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

Federal Geographic Data Committee. 1996. Wetland classification standard: FGDC-STD-004. http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands/index_html

Tiner, R.W., Jr. 1990. Use of high-altitude aerial photography for inventorying forested wetlands in the United States. Forest Ecology and Management 33/34: 593-604.

U.S. Fish & Wildlife Service
http://www.fws.gov

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