A Biological Assessment Method to Protect and Restore Wetland Communities in the AuSable and Boquet River Watersheds of the Adirondack Park

FINAL REPORT

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS 8

SUMMARY 9

INTRODUCTION 10

GOALS AND OBJECTIVES 11

PRODUCTS 11

BACKGROUND 12

STUDY AREA 12

Adirondack Park 12

Study Watershed 12

METHODS 22

Sub-catchment Mapping 22

Wetland Mapping 23

Field Sites 23

Ecological Land Unit (ELU) Model 27
Introduction 27
GIS Data 28
ELU Model Development 28
Accuracy Assessment 33

Site Ranking 34
Introduction 34
Ranking procedure 34
Ranking criteria - restoration 34
Ranking criteria – preservation 35
Application 36

NWI-NHP Crosswalk 36

Outreach and Education 36

RESULTS 37

Sub-watershed and Sub-catchment Mapping 37

Wetland Mapping 41

The Ecological Land Unit (ELU) Model 49

Field Sites 52

Site Ranking 52

NWI-NHP Crosswalk 55

Outreach and Education 56

DISCUSSION AND RECOMMENDATIONS 57

Ecological Land Unit (ELU) Model 58

Site Ranking 64

Site Ranking 64
Interpreting results 64
Ranking results - restoration 64
Ranking results – preservation 64

NWI-NHP Crosswalk 65

FUTURE WORK 66

Analysis of Field Sites 66

Subjectivity 67

Applications 67

LITERATURE CITED 68

APPENDICES 73

Appendix 1. Bogucki wetland mapping final report. 73

Appendix 2. GIS data used in AuSable and Boquet River Watershed wetland analysis, Adirondack Park, New York, USA. 81

Appendix 3. . Legend for AuSable and Boquet River Wetlands Mapping Project 82

Appendix 4. Wetlands data table organized in order of decreasing area 83

Appendix 5. Wetlands data table organized in order of decreasing number of occurrences 89

Appendix 6. AuSable and Boquet River watershed wetland field site descriptions 95

Appendix 7. National Wetland Inventory classification code to NY Natural Heritage Program potential ecological communities crosswalk. First approximation (8-28-07) with revisions through 9-16-08. 116

Appendix 8. NY Natural Heritage Program ecological communities to National Wetland Inventory classification code crosswalk. 125

Appendix 9. Metadata for the outer watershed boundary of the AuSable and Boquet River Watershed, Adirondack Park, NY, USA (2007). 126

Appendix 10. Metadata for the Sub-catchment Basins of the AuSable and Boquet River Watershed, Adirondack Park, NY, USA (2007). 139

Appendix 11. Metadata for the digital wetland map of the AuSable and Boquet River Watershed, Adirondack Park, NY, USA (2007). 144

LIST OF FIGURES

Figure 1. Location of the Adirondack Park in New York State, USA.

Figure 2. (a) Distribution of private land, (b) county and town boundaries, (c) topography and water features, and (d) hydric soil in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Figure 3. Major Watersheds in the Adirondack Park, New York, USA and the status of digital wetlands maps.

Figure 4. USGS 7.5-minute quadrangles in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Figure 5. Adirondack Park land use classification (2003) in the AuSable and Boquet River Watershed, New York, USA.

Figure 6. Location of tax parcels of land in agricultural use (2007) by township in the AuSable and Boquet River Watershed, New York, USA.

Figure 7. Field site locations investigated during 2005 in the AuSable and Boquet River Watershed, New York, USA.

Figure 8. Visual and numeric illustration of the Ecological Land Unit (ELU) code for the AuSable and Boquet River Watershed, New York, USA, 2008.

Figure 9. Schematic of landform categories (following Anderson et al. 1998) for the AuSable and Boquet River Watershed, New York, USA, 2008.

Figure 10. Landform, an intermediate step in ELU development that precedes the addition of soil information, in the AuSable and Boquet River Watershed, New York, USA, 2008.

Figure 11. Sub-catchments in the AuSable and Boquet River Watershed, New York, USA, 2008.

Figure 12. USDA/SCS 11-digit watersheds in the AuSable and Boquet River Watershed, New York, USA, 1999.

Figure 13. Mapped wetlands in the AuSable and Boquet River Watershed, New York, USA, 2008.

Figure 14. Mapped wetlands, including Uf, Udf, and Ufq labels, in the AuSable and Boquet River Watershed, New York, USA, 2008.

Figure 15. Map of the ELU model's surface, AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Figure 16. Existing wetlands (according to EPA wetland maps) and potential wetlands (according to the ELU model) in the AuSable and Boquet River Watershed, New York, USA, 2008.

Figure 17. Existing wetlands and Uf, Udf, and Ufq mapped "wetlands" (both according to EPA wetland maps) and potential wetlands (according to the ELU model) in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Figure 18. Comparison of NRCS SSURGO soil map and ELU for a zoomed-in portion of the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

LIST OF TABLES

Table 1. Locational, topographic, and climatic data (1971-2000) for three representative NOAA monitoring stations in the AuSable and Boquet River Watershed, New York, USA.

Table 2. Adirondack Park Agency land use areas and percentages (2003) for the AuSable and Boquet River Watershed as compared to the Adirondack Park, New York, USA.

Table 3. Field sites (n = 28) investigated during 2005, their ownership, and communities identified in the AuSable and Boquet River Watershed, New York, USA.

Table 4. Information represented by each digit of the ELU code in an ecological land unit model for existing and potential wetlands in the AuSable and Boquet River Watershed, New York, USA, 2008.

Table 5. Major watersheds of the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Table 6. Sub-catchment statistics for the SCS 11-digit sub-watersheds within the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Table 7. Additional sub-watersheds mapped for this project but not included in statistics, AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Table 8. Major wetland cover types of the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Table 9. Wetland cover type distribution based on Class 1 and Class 2 labels (cover type appears anywhere in label), AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Table 10. Relationship, by area, of Class 1 and Class 2 wetland labels (1994/95) in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA.

Table 11. Relationship, by number of polygons, of Class 1 and Class 2 wetland labels (1994/95) in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA.

Table 12. Area and number of palustrine open water and wetland polygons (1994/95) with the "beaver" special modifier (“b”), organized by Class 1 label, for the AuSable and Boquet River Watershed, Adirondack Park, New York, USA.

Table 13. Area of wetland water regime modifiers by Class 1 wetland labels (1994/95), AuSable and Boquet River Watershed, Adirondack Park, New York, USA.

Table 14. Upland polygons which have evidence of farming (1994/95) in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA.

Table 15. Area and number of palustrine open water and wetland polygons (1994/95) with the "partially drained/ditched" special modifier (“d”), organized by Class 1 label, for the AuSable and Boquet River Watershed, Adirondack Park, New York, USA.

Table 16. Overall accuracy, user's accuracy, producer's accuracy, false positive rate, false negative rate, and kappa for the ELU model of existing and potential wetlands, AuSable and Boquet River Watershed, New York, USA, 2008.

Table 17. Percent correct classification for each ELU category in an ecological land unit model for existing and potential wetlands, AuSable and Boquet River Watershed, New York, USA, 2008.

Table 18. Wetland site ranking for restoration potential in the AuSable River Watershed, New York, USA, 2008.

Table 19. Wetland site ranking for restoration potential in the Boquet River Watershed, New York, USA, 2008.

Table 20. Wetland site ranking for preservation potential in the AuSable River Watershed, New York, USA, 2008.

Table 21. Wetland site ranking for preservation potential in the Boquet River Watershed, New York, USA, 2008.

Table 22. Polygons which were identified by the ELU model as potential wetlands in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

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Summary

The AuSable and Boquet River Watershed study, titled "A Biological Assessment Method to Protect and Restore Wetland Communities in the AuSable and Boquet River Watersheds of the Adirondack Park," is one of 13 United States Environmental Protection Agency (USEPA) – funded State Wetlands Protection Program projects awarded to the New York State Adirondack Park Agency (APA) since 1993. With the close of this project, detailed wetland and subwatershed mapping has been completed for approximately 79% of the Adirondack Park, or five of seven of Park watersheds.

The objectives of this study were to:

1. Inventory, map, and interpret all existing wetland communities, proximate cultural impacts, and associated catchments in the AuSable and Boquet watershed (ABW).

2. Use an Ecological Land Unit (ELU) model to predict wetland community distributions and evaluate restoration opportunities based on underlying environmental factors and cultural activities.

3. Furnish a GIS database and digital maps of wetland information and restoration/acquisition opportunities in the ABW.

4. Interpret study findings for local government officials and residents in the ABW through an integrative education and outreach campaign.

A total of 220 sub-catchments were mapped in the 229,937 ha (568,174 acres) that comprise the AuSable and Boquet river watersheds. Out of this acreage, 12,315 ha (30,431 acres) were mapped as wetland, which constitutes 5% of the total watershed area. The influence of beaver activity was seen in 19.3% of the total number of wetlands. Agricultural activities were found to have converted 750 ha (1,853 acres) of wetland to upland. 137 ha (339 acres) of wetland were found to be otherwise disturbed by agriculture.

The Agency also had the opportunity to apply an existing model to a recurring problem. The lack of suitable sites for wetlands compensatory mitigation often stymies otherwise appropriate projects. This adds time delays and increased cost to such projects. We found that the ELU model has some utility in identifying potential candidate sites for wetlands compensatory mitigation and that it compared favorably with traditional airphoto interpretation methods. More importantly, the staff efforts for this project indicated several avenues of research that might result in higher accuracy of the model.

Data collected in this project, when combined with the data layers from the Oswegatchie/Black, Upper Hudson, and St. Lawrence watersheds, provides a consistent continuous picture of the wetlands and surface hydrology of these portions of the Park and will continue to be of immense value for wetland resource protection in the future.

A Biological Assessment Method to Protect and Restore Wetland Communities in the AuSable and Boquet River Watersheds of the Adirondack Park

Introduction

Wetlands are integral to an ecologically healthy landscape, yet they have historically been viewed as an obstacle to productive use of the land and have been filled or drained. Since European settlement, more than half of all the original wetlands in the coterminous United States have been lost, or about 49 million ha (121 million acres) (Wilen and Frayer 1990, Tiner 2005b). Today, wetlands are recognized for their role in filtering and processing impurities, lowering flood peaks, decreasing drought periods, and providing crucial habitat for both flora and fauna, not to mention the recreational benefits of bird watching, boating, and fishing (Teal and Peterson 2005, Tiner 2005a, b). These benefits reach beyond the immediate area of the wetland (Ewel 1990, Gosselink et al. 1990, Teal and Peterson 2005). One landowner's intact wetland can reduce the severity of a flood for the neighbors; likewise, a drained wetland can cause stream bank erosion, sedimentation, and poorer fishing. Animals that depend on wetlands for all or part of their life cycle, and disperse or migrate as part of their life history, are also affected by the loss of surrounding wetlands. Conservation decisions need to be made on a landscape level (Gibbs 2000, Teal and Peterson 2005, Tiner 2005). For wetlands, the ideal spatial frame is the watershed.

Mitigation is generally seen as the solution to wetland loss. It is a hierarchical process applied to all regulated activities involving wetlands to protect, preserve and conserve them. Mitigation is any action that seeks to first avoid, then minimize wetland impacts, and finally compensate for any impacts that cannot be avoided. Compensation can take a variety of forms including wetland restoration, creation, or enhancement. Having the knowledge to select a good site is crucial to the success of any wetland mitigation project (Booth 2004, McCauley and Jenkins 2005, Tiner 2005b). It is difficult to create wetlands, and even more difficult to re-create many wetland functions (Tiner 2005b).

There is wide interest in mapping wetlands, and a growing interest in producing maps for the purpose of locating candidate restoration sites (Colorado: O'Neill et al. 1997, California: Russell et al. 1997, Vermont: Cedfeldt et al. 2000, Mississippi: O'Hara et al. 2000, Maine: Hertz and Sartoris 2001, generic: Lin et al. 2006). Most reported restoration mapping studies employed a Geographic Information System (GIS) in some form and used locations of current wetlands as a model parameter (i.e., land use or land cover maps, NWI maps, etc.). Viewing wetland maps in a GIS, a conservation planner or wetland regulator can examine wetland area, wetland community type, spatial distribution, proximate land uses, land ownership, and changes in wetland coverage (loss or gain) all at a watershed scale.

A principal limitation with many wetland mapping methods is that they are "snapshots" depicting the existing wetlands at the time the map was made (Tiner 1999). Compounding the problem of having static information for a changing resource, it generally takes ten years from data acquisition to map production (Wilen and Frayer 1990). To overcome these temporal constraints, we aimed to inform the selection of candidate wetland mitigation sites by identifying potential wetlands in two different ways. First, we used air photo interpretation to identify agricultural areas that were already reverting to wetland or that might revert to wetland if assisted. Second, we created an Ecological Land Unit (ELU) model of existing and potential wetlands based on enduring landscape features.

Goal and Objectives

The goal of the AuSable and Boquet River Watershed project was to provide an ecologically-based protocol to site and prioritize wetland restoration projects in the AuSable and Boquet River Watershed (ABW) of the Adirondack Park. Underlying this goal were four objectives:

1. Inventory, map, and interpret all existing wetland communities, proximate cultural impacts, and associated catchments in the ABW.
2. Use an Ecological Land Unit (ELU) model to predict wetland community distributions and evaluate restoration and acquisition opportunities based on underlying environmental factors and cultural activities.
3. Furnish a GIS database and digital maps of wetland information and restoration/acquisition opportunities in the ABW.
4. Interpret study findings for local government officials and residents in the ABW through an integrative education and outreach campaign.

Using spatially explicit information to understand wetland distribution and diversity, this project should enable managers and public stakeholders to integrate strategies for wetland protection and long-term benefits to conservation groups and state agencies working to conserve wetlands in the ABW. Methods developed for wetland mapping and prediction should also be transferable to other regions where environmental data is available in digital form.

Products

Project deliverables include:

1. A complete digital geographic database of wetlands using modified NWI mapping and naming conventions, associated watershed boundaries and water flow direction.
2. Nomenclature to link NHP and US Fish and Wildlife Service National Wetland Inventory (NWI) community classifications and modifiers to identify existing human impacts.
3. List of ELUs based on NHP reference communities and their edaphic, geologic, and topographic setting(s).
4. A GIS-based model for potential wetland community distributions and an assessment of past occurrence.

5. A CD-ROM database and summary report including a list of priority wetland communities and locations for preservation, restoration, and other forms of compensatory mitigation.

Background

The Adirondack Park Agency (APA) is a regulatory agency formed in 1971 and charged with, among other duties, administering New York State's Freshwater Wetlands Act within the Park (NYS 1975). With the help of grants from the USEPA State Wetlands Protection Program, the APA has created digital maps of watersheds and wetlands for approximately 79% of the Park since 1993 at a scale of 1:24,000, and secured grants to continue mapping the remaining 21%.

Study Area

Adirondack Park

The 2.4-million ha (6-million acre) Adirondack Park comprises the Adirondack Ecological Zone (Figure 1), encompassing the largest wilderness acreage east of the Mississippi River. Located in northern New York and predominantly forested, it is also rich in wetland and aquatic ecosystems. The Adirondack Park includes nearly 340,000 wetland ha (840,140 acres) (i.e., deep and shallow freshwater marshes, coniferous and deciduous shrub and forested swamps and peatlands) (LaPoint et al. 2004) and more than 11,000 associated lakes and ponds named on 1:24,000 United States Geological Survey (USGS) maps (4,900 of which are > 0.4 ha (1acre)) (Barge 2002). The State of New York owns approximately 43% (1 million ha, 2.5 million acres) of the Park while the remaining 57% (1.4 million ha, 3.5 million acres) is privately owned (LaPoint et al. 2004, Figure 2a). The public land is constitutionally protected as "forever wild" under the state's constitution, and the private land is primarily used for forestry, agriculture, open space recreation, homes and businesses. Because of the biological diversity in wetlands and the range of land uses, the Park is an ideal area in which to undertake a project seeking to characterize the wetland resource on a detailed watershed basis.

Study Watershed

For the purposes of this study, the adjacent watersheds of the AuSable and Boquet rivers were combined into one unit. The AuSable and Boquet River Watershed (ABW) is located in the eastern region of the Adirondack Park (Figure 3), part of the larger Lake Champlain watershed (LaPoint et al. 2004). The AuSable and Boquet watershed is bordered to the northwest by the Saranac-Chazy watershed (mapping in progress with EPA funding – grant # WL97267806), to the south by the Upper Hudson watershed (mapping completed with EPA funding - grant # CD992443-01), and to the southeast by the Lake George watershed (mapping in progress with EPA funding – grant # WL967267806). The AuSable and Boquet River watersheds are covered by all or part of 29 USGS 7.5 minute quadrangles (Figure 4).

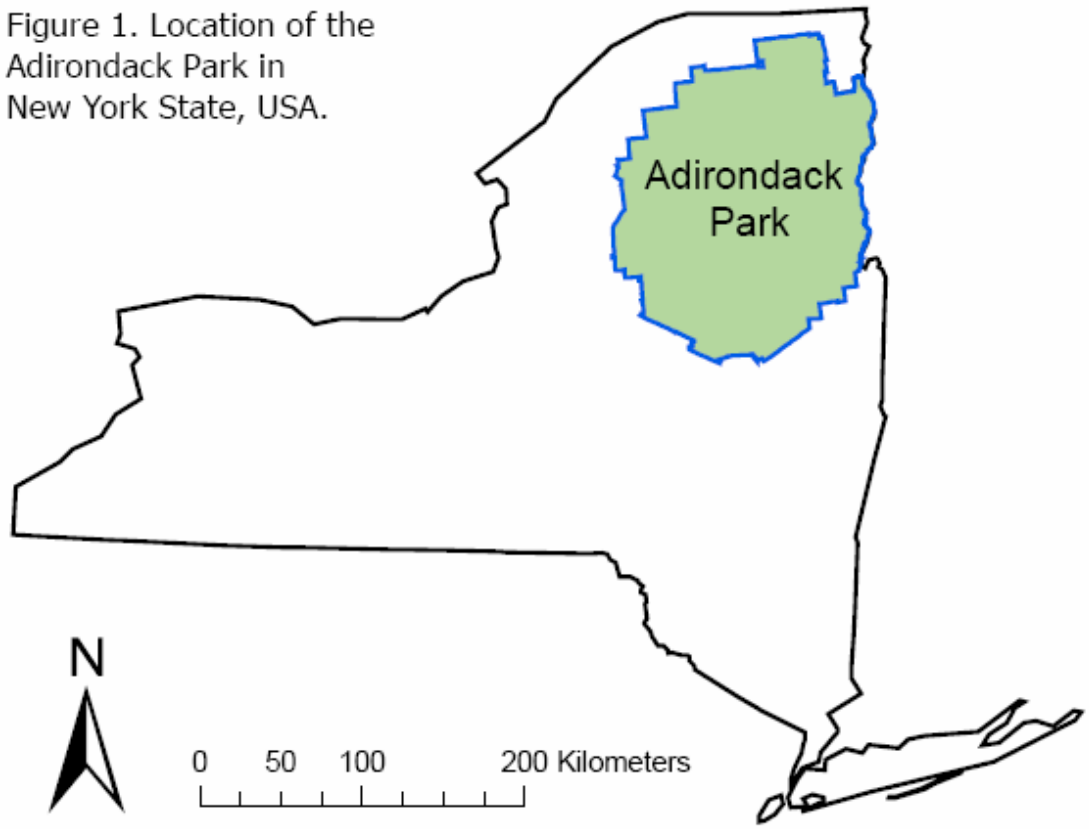


Figure 1. Location of the Adirondack Park in New York State, USA.

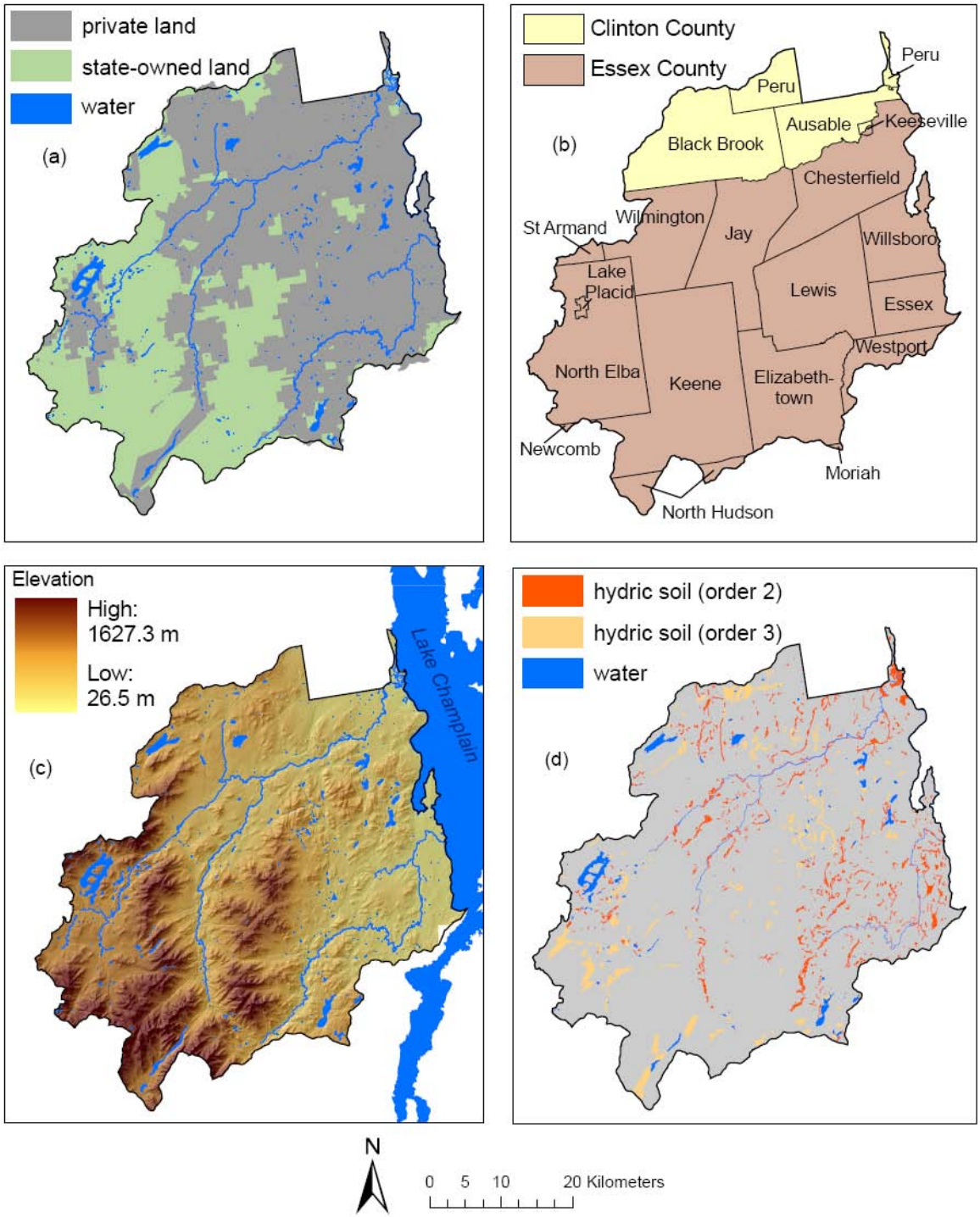


Figure 2. (a) Distribution of private land, (b) county and town boundaries, (c) topography and water features, and (d) hydric soil in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

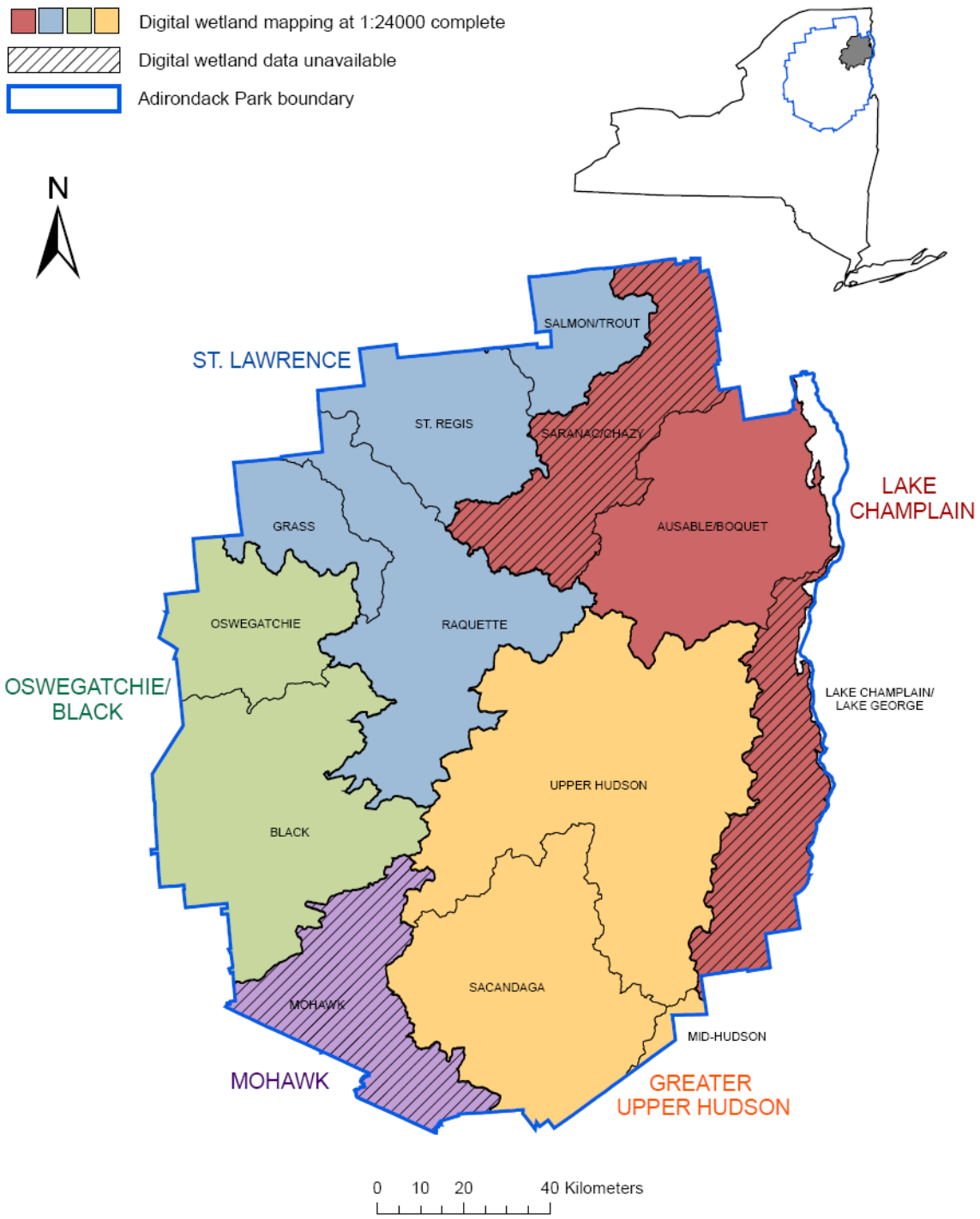


Figure 3. Major Watersheds in the Adirondack Park, New York, USA and the status of digital wetland maps.

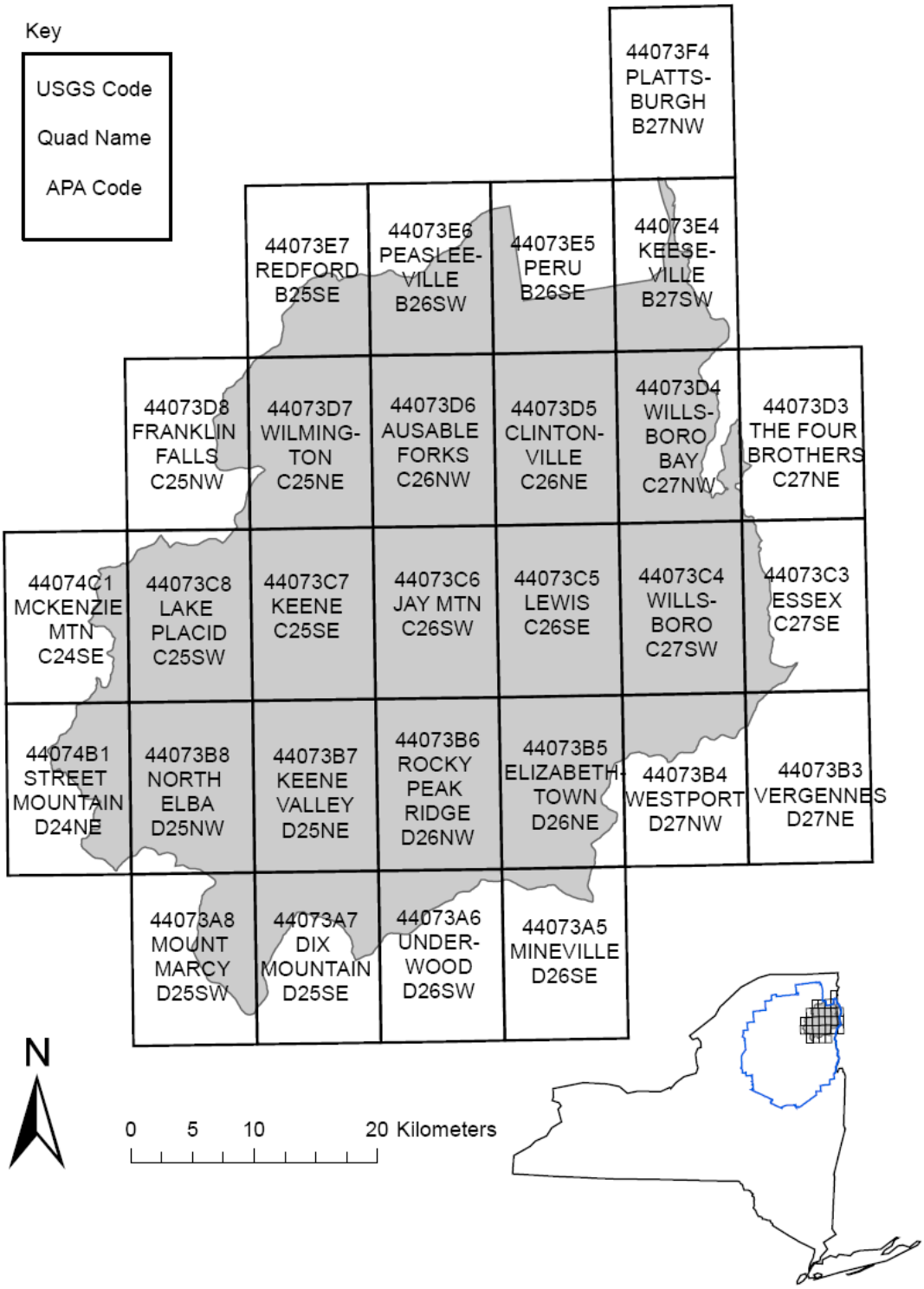


Figure 4. USGS 7.5-minute quadrangles in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

The ABW is part of the Champlain-Adirondack Biosphere Reserve, designated in 1989 by the United Nations for being a largely natural area valuable for research and conservation (United States Department of the Interior 1984, Linde et al. 1996). Both the AuSable and Boquet Rivers are designated as part of the Wild, Scenic, and Recreational Rivers System of New York State, a management designation made by the Adirondack Park Agency. Both rivers are

also on the National Park Service's Nationwide Inventory list as rivers with outstanding natural values.

The ABW encompasses approximately 229,937 ha (568,174 acres), of which approximately 12,315 ha (31,430) are wetlands (or 5%). It is intersected in the north by the Adirondack Park's northern boundary and bounded in the east by Lake Champlain. The Park contains 99% of the watershed's area. The ABW includes portions of both Essex and Clinton Counties and all or part of 20 towns and villages (Figure 2b). The region extends from 44°1'N to 44°37'N latitude and from 73°19'W to 74°5'W longitude.

The highest point in the watershed is the 1,629-m (5,344-ft) summit of Mount Marcy in the southwestern portion of the watershed. The lowest point is Lake Champlain where the water level is, on average, 29 m (99.8 ft) above sea level. The AuSable and Boquet Rivers flow generally northeast from the High Peaks region and drain into Lake Champlain (Figure 2c). These rivers are the two steepest rivers in New York State, as measured from source to mouth (United States Department of the Interior 1984, Linde et al. 1996).

By area, the ABW includes 2.8% detailed hydric soil map units (order 2), 3.0% hydric soil complexes (order 3), and 4.2% water (not including Lake Champlain, Figure 2d). The soils in the watershed are primarily spodosols, generally loamy, coarse-loamy, and sandy, with some clay in the east near Lake Champlain. The watershed's top ten soil units by area are all soil complexes described as very rocky, very bouldery, and with slopes 15 – 80% (NRCS 2006a, b). The bedrock geology underlying the watershed is primarily metanorthosite and anorthositic gneiss with a sizable section of leucogranite and granitic gneiss in the north. The surficial geology indicates a landscape dominated by till with some areas of lacustrine beach, delta, or sand.

Average climatic data (1971-2000) from three representative NOAA stations across the watershed describe the climatic differences across the ABW (NOAA 2001). Mean annual precipitation across the study area varies by 13.7 cm (Table 1). Annual mean temperature varies by 1.4ºC. The NOAA stations represent an elevation difference of 541 m (1,775 ft), while the watershed includes a 1,600 m (5,249 ft) elevation difference. Therefore, the variability of precipitation and temperature over the entire watershed is likely greater.

Table 1. Locational, topographic, and climatic data (1971-2000) for three representative NOAA monitoring stations in the AuSable and Boquet River Watershed, New York, USA.

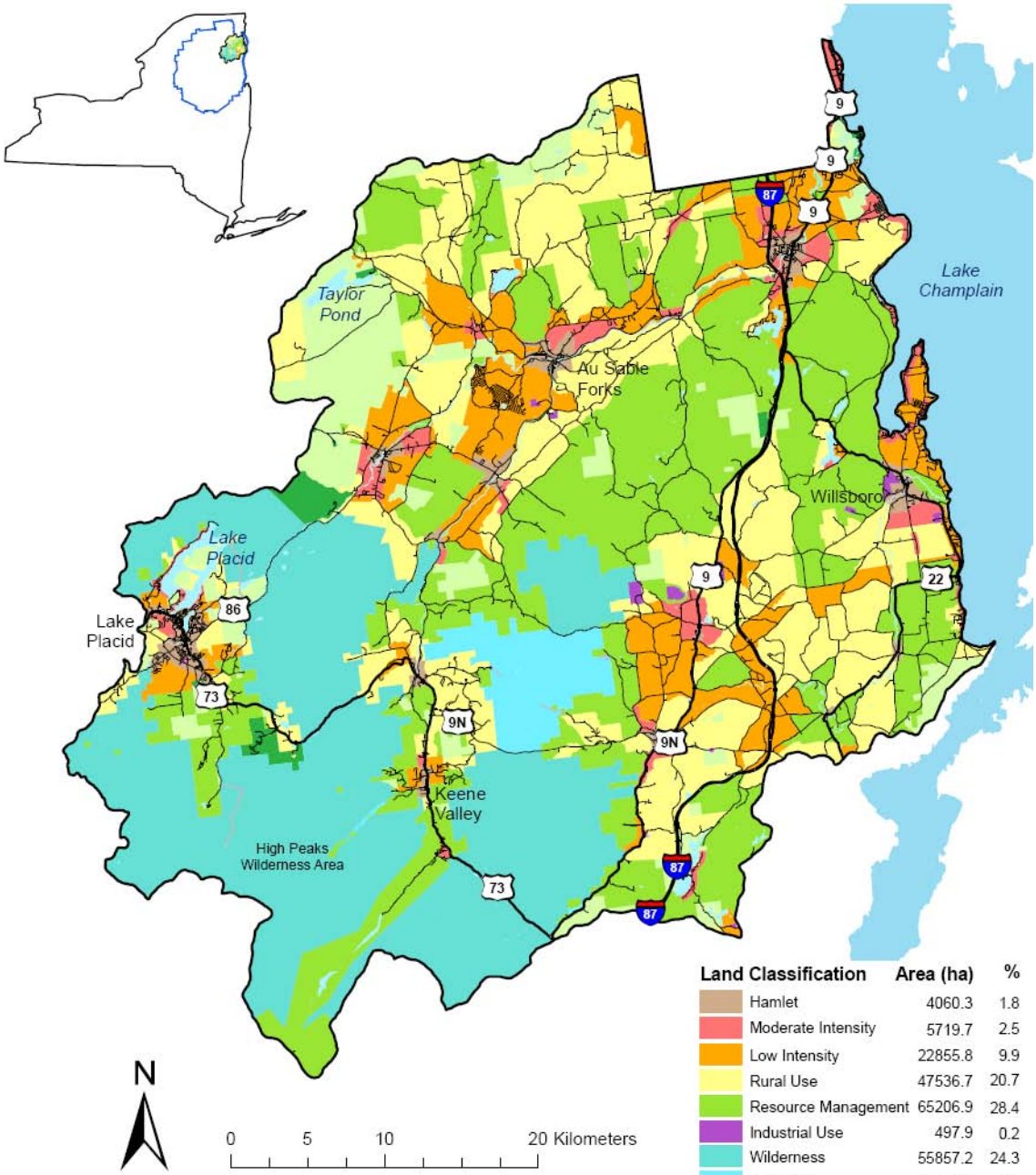
Station Name	Lake Placid 2 S	Elizabethtown	Plattsburgh AFB[a]
Station No.	102	63	158
COOP ID	304555	302554	306659
Latitude	44 15 N	44 15 N	44 39 N
Longitude	73 59 W	73 35 W	73 28 W
Elevation (m above sea level)	591.3	189.0	50.3
Annual Temp Max (ºC)	11.9	13.1	12.1
Annual Temp Mean (ºC)	5.5	6.3	6.9
Annual Temp Min (ºC)	-0.9	-0.5	1.8
Highest Mean Temp (ºC)	20.3	22.6	23.8
Median Temp (ºC)	5.4	6.2	6.9
Lowest Mean Temp (ºC)	-14.9	-15.3	-14.9
Highest Mean Year	1975	1975	1975
Lowest Mean Year	1989	1989	1994
Annual HDD[b] (base 65 ºF)	8547	8134	7817
Annual CDD[c] (base 65 ºF)	136	276	387
Mean Total Annual Precipitation (cm)	101.2	92.8	87.5

[a] Plattsburgh Air Force Base is just to the north of the AuSable and Boquet River watersheds, but the location is characteristic of others in the Lake Champlain Valley.

[b] Heating Degree Days

[c] Cooling Degree Days

The Adirondack Park Agency assigns land classifications for planning and regulatory purposes for both the public and private land in the Park (Figure 5). In the AuSable and Boquet watershed, 63.4% of the watershed is private land, 35.0% is state land, and 1.6% is water (Table 2). The only land categories comprising greater than 20% of the watershed are Wilderness (24.3%) and Resource Management (28.4%). Compared with the land classification of the entire park, the AuSable and Boquet watershed has a greater proportion of Wilderness (24.3% of the watershed and 17.6% of the Park is designated Wilderness) and a smaller proportion of Wild Forest (7.4% of the watershed and 21.2% of the Park is designated Wild Forest). Each other category is comparable, with the AuSable and Boquet watershed being representative of the Park. Also of note, the headwaters of both the AuSable and Boquet rivers are located in Wilderness areas.



Land Classification	Area (ha)	%
Hamlet	4060.3	1.8
Moderate Intensity	5719.7	2.5
Low Intensity	22855.8	9.9
Rural Use	47536.7	20.7
Resource Management	65206.9	28.4
Industrial Use	497.9	0.2
Wilderness	55857.2	24.3
Primitive	5672.0	2.5
Wild Forest	17006.1	7.4
Intensive Use	1849.2	0.8
Historic	42.3	----
State Administrative	19.7	----
Pending Classification	4.3	----
Water	3608.8	1.6

Figure 5. Adirondack Park land use classification (2003) in the AuSable and Boquet River Watershed, New York, USA.

Table 2. Adirondack Park Agency land use areas and percentages (2003) for the AuSable and Boquet River Watershed as compared to the Adirondack Park, New York, USA.

APA Land Use Area	ha (acres) in watershed	% area of watershed	ha (acres) in Park	% area of Park
Hamlet	4,060.29 (10,032.98)	1.77	21,624.37 (53,433.82)	0.91
Moderate Intensity	5,719.71 (14,133.40)	2.49	41,248.21 (101,924.32)	1.74
Low Intensity	22,855.78 (56,476.63)	9.94	109,472.89 (270,507.51)	4.62
Rural Use	47,536.71 (117,463.21)	20.67	411,052.54 (1,015,710.80)	17.33
Resource Mngmt	65,206.93 (161,126.32)	28.36	628,977.68 (1,554,203.80)	26.52
Industrial Use	497.90 (1,230.31)	0.22	4,973.59 (12,289.74)	0.21
Wilderness	55,857.16 (138,023.04)	24.29	433,527.72 (1,071,246.90)	18.28
Canoe Area	0.00 (0.00)	0.00	7,129.05 (17,615.88)	0.30
Primitive	5,672.00 (14,015.51)	2.47	18,395.79 (45,455.00)	0.78
Wild Forest	17,006.13 (42,022.15)	7.40	521,728.35 (1,289,190.70)	22.00
Intensive Use	1,849.22 (4,569.42)	0.80	7,839.07 (19,370.34)	0.33
Historic	42.28 (104.47)	0.02	214.44 (529.88)	0.01
State Administrative	19.67 (48.60)	0.01	619.81 (1,531.55)	0.03
Pending Classification	4.34 (10.72)	0.00	13,568.62 (33,528.06)	0.57
Water	3,608.82 (8,917.39)	1.57	151,204.04 (373,625.18)	6.38
Totals:	229,937 (568,174)	100.00	2,371,576.18 (5,860,164)	100.00

Both the AuSable and Boquet River watersheds contain rural residential areas, forests, pastures, roads, towns, and a few industrial sites. The Boquet watershed has more agricultural land (some of the most fertile soils in the Champlain Valley) and more private land. The AuSable watershed has more state-owned land, including a full third of the watershed that is designated as Wilderness. The AuSable River's delta at Lake Champlain is publicly owned as the AuSable Marsh Wildlife Management Area and managed by the New York State Department of Environmental Conservation (NYS DEC). The south shore of the Boquet River's mouth is publicly owned by the Town of Willsboro. Both watersheds have a local river association that conducts self-studies and engages

and encourages residents concerned about water quality, flooding, erosion, and sedimentation – all problems related to the loss of wetlands.

The AuSable and Boquet watershed supports the highest proportion (approximately 8,045 ha (19,881 acres)) of agricultural land-cover in the Park, with the vast majority centered along the Lake Champlain shoreline and associated wetlands within Essex County (Figure 6).

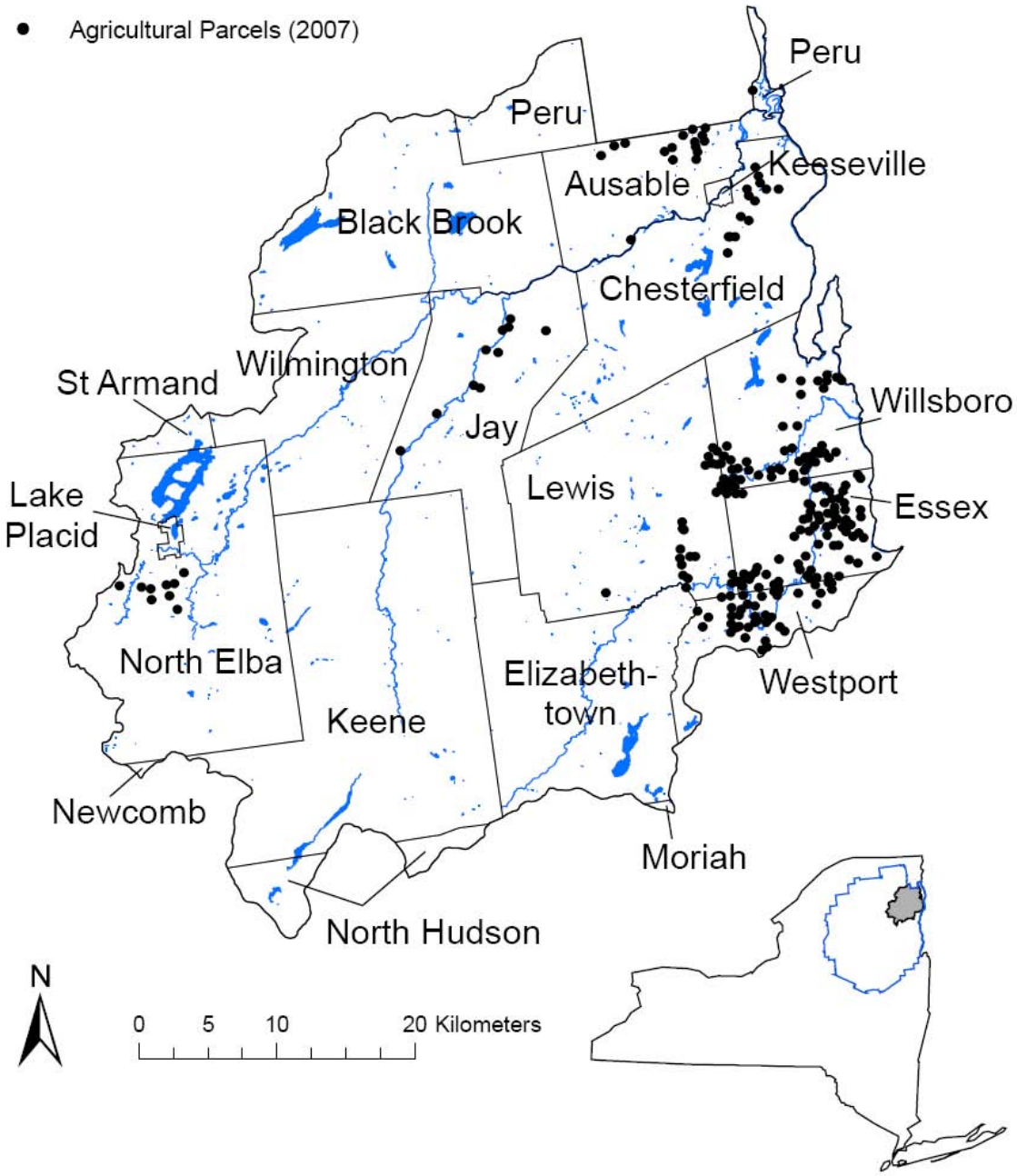


Figure 6. Location of tax parcels of land in agricultural use (2007) by township in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA.

Methods

Sub-catchment Mapping

Sub-watersheds of the study area were delineated for major rivers, their named tributaries and sub-catchments for ponds with unique pond identification numbers assigned by the Adirondack Lake Survey Corporation (ALSC) and the New York State Bureau of Fisheries (BOF). Watersheds were delineated on USGS 1:24000 or 1:25000 topographic maps using conventional methods (USDA 1977). Separate sub-catchment boundary determinations were made by two different people. A third person at the APA reconciled and verified the maps using 1:40000 NAPP or 1978 1:24000 panchromatic air photos and field checks. Final sub-catchment boundaries were digitized, edge-matched, and joined into a seamless coverage. Air photos and topographic maps were used for two independent determinations of flow pattern between sub-catchments and directional arrows were drawn on paper copies of the boundary maps. Each paper map was used to digitally assign hierarchical flow direction labels to the GIS coverage of sub-catchments using an Arc Info AML (Arc Macro Language program) created by Primack (1997). The AML assigned each sub-catchment polygon a unique I.D. number in a data field called 'THIS#' in the polygon attribute table. A second field, called 'FLOWTO#', was created that contained the I.D. number of the receiving sub-catchment polygon. In this way, the path of water from one sub-catchment polygon to another could be followed through the entire AuSable and Boquet River Watershed.

To uncover inconsistencies between flow direction assignments in the two independently produced flow-pattern maps, the polygon attribute tables were relationally joined using the 'THIS#' field. Where the 'FLOWTO#' field from one of the coverages did not match the 'FLOWTO#' field from the other coverage, the correct flow direction was ascertained by overlaying the sub-catchment polygon outlines over GeoTIFF images of 1:24000-scale USGS topographic maps (NYS GIS Clearinghouse 2000) in a GIS. If evidence of flow direction could not be determined from the topographic maps, 1:40000 NAPP air photos or 1978 1:24000 panchromatic photos were viewed in stereo. In addition, the ALSC Pond database was a useful source that gave outlet information for most of the ponds in question (ALSC 1999). Differences between the two delineation efforts primarily occurred in areas where there was little topographical variation or where the pond outlet was uncertain, especially where the watershed was isolated and internally draining. After the flow direction hierarchy was finalized, regional watersheds were generated from the sub-catchment map using an ArcInfo AML (Primack 1998) to select all watersheds flowing into a particular watershed and grouping them.

As a final step in the creation of the sub-catchments coverage, a field was added to the polygon attribute table that contained the 11-digit USDA/SCS watershed codes (USDA/SCS 1980), which allows the data set to be joined with other data sets that use the SCS codes.

Wetland Mapping

Digital wetland maps were created by the Remote Sensing Lab (RSL) at the State University of New York at Plattsburgh (SUNY Plattsburgh) from color infrared 1:40,000-scale aerial photo transparencies from the National Aerial Photography Program (NAPP) that was flown in 1994-1999. Flights and air photos for the ABW were taken in 1994 and 1995. Polygons were drawn around each wetland in the ABW and labeled according to covertype using the Cowardin classification system (Cowardin et al. 1979). The NWI labeling system takes into account the fact that a wetland may be comprised of more than one cover type. Therefore, labels are assigned to the two most abundant cover types in the wetland (each with at least 30% areal coverage) in the fields 'Class1' and 'Class2,' with 'Class1' always being the taller structure (i.e. FOx, as a forested wetland would always be listed before SSx, a scrub-shrub wetland). Class designations were further modified by codes for hydrologic regime or other special conditions ('Regime' and 'Special' fields, respectively). After RSL staff completed the initial photo interpretation, APA staff performed a quality assurance and quality control (QA/QC) assessment. Maps were then rectified and finalized. The methods used to map watersheds and wetlands in the AuSable and Boquet watershed were based on those used for previous Adirondack Park watershed projects (Roy et al. 1996, Roy et al. 1997, Primack et al. 2000, Halasz et al. 2000, LaPoint et al. 2004). A detailed treatment of the mapping methods used is found in Appendix 1.

The air photo interpretation identified wetlands that may have been impacted by agricultural practices and/or development. The impacted areas were identified by using a small case "f" after the wetland label (e.g., PEM1Ef) if the area still appeared to be functioning as a wetland but is presently being farmed. An area was identified as a Uf if the site probably functioned as a wetland in the past but is now more like a upland (through drainage) and being farmed. The modifier "d" was used where photo evidence indicated the field was drained, usually indicated by straight-line drainage courses across or along fields. It is possible that many drainage features were missed because of subsurface tile drains, ditching along roads and hedgerows. In addition, the final report for the wetland photo interpretation (Appendix 1) identifies, by quad name, photo number, and impact, 40 individual locations that were identified as impacted.

For the purposes of this report, statistics on "wetlands" refer to all polygons labeled as palustrine systems ('P'), except for palustrine open water polygon (POWx). Polygons labeled as Lacustrine ('L') or Riverine ('R') systems were not considered wetlands.

Field Sites

The intended reason for visiting field sites was to have on-the-ground data to test both the newly created 1:24000 wetland maps (see above) and the ELU model (see below).

Field site locations for the 2005 field season were chosen in the spring of 2005, before completion of wetland maps or the ELU model. Twenty-eight sites

were selected (Table 3), with many of the sites representing multiple wetland community types, or covertypes. We attempted to have our sites represent the geographic variation across the watershed, a variety of wetland covertypes, some on public and some on private land, wetlands showing different levels of human influence, and equal numbers of sites in the AuSable and Boquet River watersheds. Some sites were suggested by the local river associations with knowledge of the watershed, others because they were farmland that looked especially wet, and still others by scanning the aerial photos and picking places that looked topographically or vegetationally interesting (Figure 7).

Using the APA's GIS database, we produced field packets for each field site that included: a 2003 color-infrared aerial photo of the site, a locator map with area roads, a county level soils map, a tax map, and the names and addresses of landowners associated with the site. The corresponding river association then approached landowners by mail and phone to get written permission when necessary to travel on private land and access the wetland of interest. We were encouraged by the high proportion of obliging landowners.

At each field site we visited, we looked for and explored all potential wetland areas, making an effort to visit different covertypes where they existed. In general, we followed the New York Natural Heritage Program's (NHP) data collection methods and data sheets. We walked across an area (an informal transect) and stopped to take notes on the vegetation, within a 5-m radius, whenever the vegetative community appeared to change. In especially good community examples, we laid out a more formal plot (plot size depending on community type, usually ~100 square meters) to gather more detailed data. We took notes on species presence, species strata, percent cover, soil, and noted any exotic species. We took GPS points at each location where we took notes. If we met a landowner, we noted any historical information that he/she shared about the property. We accessed most of our sites on foot, and a few from canoe. Recurring pH meter malfunctions precluded us from recording pH. We did all of our field work between June and September of 2005 (with one outlying early October visit when we returned to a site). In most instances, we worked as a group with one river association representative, one NHP ecologist and one APA project person (the same individuals throughout).

Table 3. Field sites (n = 28) investigated during 2005, their ownership, and communities identified in the AuSable and Boquet River Watershed, New York, USA.

Watershed	Site ID#	Site Name	Ownership	(#) Community Names
Boquet	1	North Wadhams	Private	(3) shallow emergent marsh, deep emergent marsh, floodplain forest
Boquet	2	Rogers Pond at Coon Mountain	Private	(2) deep emergent marsh, flooded conifer swamp
Boquet	3	Essex Bottoms	Private	(2) sedge meadow, shrub swamp
Boquet	4	Middle Road Swamp	Private	(3) deep emergent marsh, shrub swamp, red maple-hardwood swamp
Boquet	5	Webb-Royce Swamp	NY State	(1) shallow emergent marsh
Boquet	6	Sycamore Floodplain	TNC	(1) floodplain forest
Boquet	7	Noblewood	Town	(1) silver maple - ash swamp
Boquet	9	Thrall Dam	County	(3) sedge meadow, shrub swamp, floodplain forest
Boquet	11	Crater Club	Private	(3) shallow emergent marsh, shrub swamp, silver maple-ash swamp
Boquet	12	North Branch Boquet – West Road	Private	(3) deep emergent marsh, floodplain forest, northern white cedar swamp
AuSable	15	AuSable River Delta	State	(2) deep emergent marsh, floodplain forest
AuSable	16	Beaver Brook	Private	(3) sedge meadow, shallow emergent marsh, and shrub swamp
AuSable	17	Little Cherry Patch Pond	State	(4) shallow emergent marsh, poor fen, medium fen, black spruce-tamarack bog
AuSable	18	Riverside Road	Private	(2) shallow emergent marsh, shrub swamp
AuSable	19	South Meadow	State	(5) sedge meadow, shallow emergent marsh, deep emergent marsh, shrub swamp, mixed conifer swamp
AuSable	20	Rt. 73/9N Junction	Private	(1) shallow emergent marsh
AuSable	21	Mud Pond (in Black Brook)	Private	(3) dwarf shrub bog, black spruce-tamarack bog, and spruce-fir swamp
AuSable	22	Wickham Marsh WMA	State	(3) deep emergent marsh, shrub fen, northern white cedar swamp
AuSable	24	Military Pond Outlet	Private	(1) northern white cedar swamp
AuSable	25	Blake Brook	Private	(1) sedge meadow
AuSable	26	Augur Lake/ Mud Pond	Private	(1) medium fen
AuSable	29	Behind Keene Valley School	Private	(1) shrub swamp
AuSable	30	Riverside Rd./ Rt. 86 Junction	State	(3) shallow emergent marsh, shrub swamp, red maple-hardwood swamp
AuSable	31	Beaver Brook State	State	(1) sedge meadow
Boquet	32	Essex Station	Private	(1) shallow emergent marsh
Boquet	33	Cook Road Floodplain	Private	(1) floodplain forest
Boquet	42	Boquet Mouth - North Floodplain	Private	(2) shrub swamp, floodplain forest
Boquet	46	Taylor Mountain Pond	Private	(3) dwarf shrub bog, shrub swamp, transitional sedge meadow-shallow emergent marsh

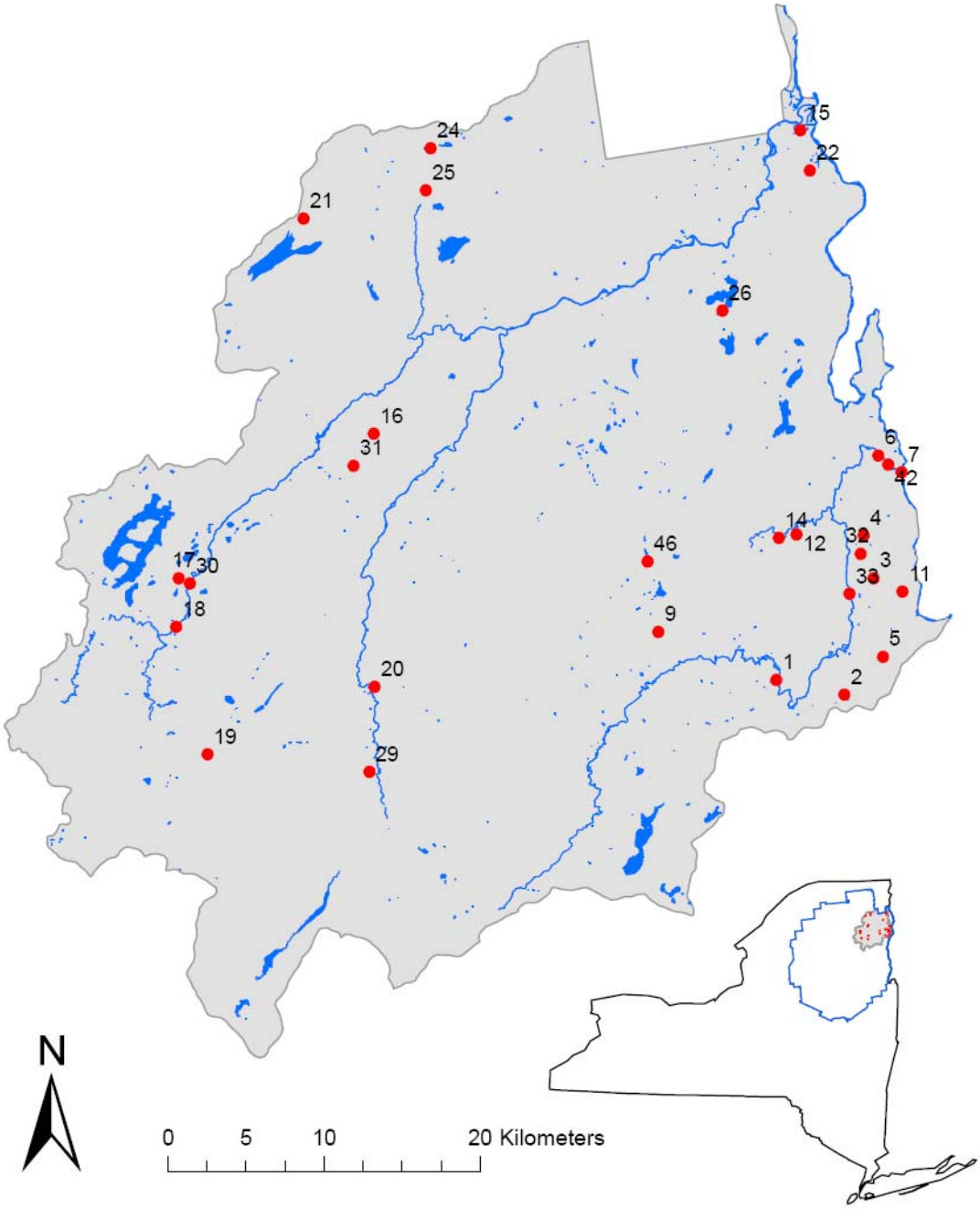


Figure 7. Field site locations investigated during 2005 in the AuSable and Boquet Watershed, Adirondack Park, New York, USA. Field sites are identified by an ID number (non-consecutive) corresponding to Table 3.

Ecological Land Unit (ELU) Model

Introduction

The concept of a land unit originated over 50 years ago within the field of landscape ecology as a "tract of land that is ecologically homogeneous at the scale level concerned" (Zonneveld 1989). The practice of combining abiotic and physiographic factors, with or without vegetation, to produce land units is now used across ecological disciplines in a variety of methods, geographic scales, and applications (Cleland et al. 1997, Kupfer and Franklin 2000, Zimmerman 2002, Franklin 2003). The ELU method used in this thesis was based upon The Nature Conservancy's (TNC) use of ecological land units to map forest habitat for neotropical migratory birds in the Connecticut River Watershed (Anderson et al. 1998). The scale of their project was larger (watershed area = ~2.5 million ha or ~6 million acres) and the resolution much coarser (74 x 74-m grid cells) than this ABW wetland application. Also employing similar methods, the State University of New York College of Environmental Science and Forestry (SUNY-ESF) Adirondack Ecological Center is working on an ELU of the potential terrestrial communities of the Adirondack Park (B. Zuckerburg, SUNY ESF, personal communication).

We used enduring landscape features, grounded in the concept of potential natural vegetation (Franklin 1995), to focus on the source of wetland expression. As explained by Anderson et al. (1998: 9), "potential natural vegetation is determined directly by environmental gradients such as nutrient variability, moisture, and temperature. These environmental gradients are driven by more broad determinants such as geology, climate, and topography. Therefore, in order to produce predictive vegetation maps the gradients thought to drive vegetation must be mapped or modeled themselves." Our plan was to refrain from using any vegetation or land cover data in the wetland mapping process. We reasoned that a model created from the same enduring landscape features associated with known and existing wetlands could be used to map potential wetlands.

Three field criteria are used to identify wetlands: dominance by hydrophytes, hydric soils, and indicators of wetland hydrology (Browne et al. 1995, Lyon 2001). We chose five enduring landscape features that were potentially relevant to wetland location: elevation, slope, land position, moisture, and soil. We reasoned that wetlands are found where more water runs into an area than drains out of it, and this occurrence depends on land position, slope, and soil. Wetlands, by definition, are found on hydric soils (Browne et al. 1995). We predicted that elevation would not be a good predictor of wetland location; wetlands can exist at any elevation. We considered, but ultimately omitted geology as a model element because the digitally available geologic data existed at a very coarse scale (1:250,000). Many others (O'Neill et al. 1997, Russell et al. 1997, Cedfeldt et al. 2000, O'Hara et al. 2000, Hertz and Sartoris 2001, Lin et al. 2006) also omitted geology from their GIS analyses for wetland restoration sites.

GIS Data

We obtained GIS data primarily from the APA's Shared Adirondack Park CD. This CD includes a variety of political, physical, and biological data for the Adirondack Park region. We also obtained a limited amount of data from the APA directly (e.g., 10-m digital elevation model) and from the Soil Data Mart on the Natural Resource Conservation Service (NRCS) website (Appendix 2).

We used ArcGIS® 9.1 software (ESRI, Redlands, California) with the Spatial Analyst extension. We performed all GIS analyses in a single datum and projection, North American Datum (NAD) 1983 Universal Transverse Mercator (UTM) Zone 18N, because this was the projection used on the APA's Shared Adirondack Park CD. We used 10 x10-m resolution for all raster analyses, because this was the resolution of the digital elevation model (DEM). We created a raster for each of these enduring landscape features by calculating elevation, slope, land position, moisture, and soil as detailed in Diggory (2008).

ELU Model Development

TNC developed the template ELU model that we used in the development of this wetland ELU model (Anderson et al. 1998). Each ELU was a four-digit code where the thousands place indicated elevation, the hundreds place indicated soil, and the tens and ones places together indicated landform, a combination of slope, land position, moisture, and aspect (Table 4, Figure 8). The ELU code itself did not have a numerical value, rather the code represented ecological features of the unit that could be translated to a likely ecological expression.

To derive the thousands place of the ELU code, we classified the continuous elevation data into five discrete classes (Table 4a). The categories follow Anderson et al. (1998) and have ecological significance as general breaks between vegetative zones on the side of a mountain. While the aspect, slope, and geology of a mountainside will affect where exactly an ecological zone changes, these represent general categories for the Adirondack region.

The soil variable was already categorical and we preserved all seven soil classes in the hundreds place of the ELU code (Table 4b).

The landform classes contributed the tens and ones places of the ELU code. To derive landform (Figure 9), we first reclassified the continuous land position data into four classes representing ridges, wide ridges, slope/flats, and toe slope/coves according to ArcGIS 9.1's Natural Breaks classification method. In the same manner, we reclassified the continuous slope data into four classes representing cliffs, steep slopes, side slopes, and flats. We crossed the four land position categories with the four slope categories to get nine new categories: cliff, steep slope, slope crest, upper slope, flat summit, side slope, cove, flat, and slope bottom. We split the flats category further into dry flats, moist flats, and wet flats according to the moisture index, resulting in a new total of 11 landform categories. We converted water features (streams and lakes) to rasters and merged them with the landform, adding two more categories. Finally, we

Table 4. Information represented by each digit of the ELU code in an ecological land unit model for existing and potential wetlands in the AuSable and Boquet River Watershed, New York, USA, 2008.

(a) Elevation categories represented by the thousands place of the ELU code.

ELU code	Elevation Range (m)			Elevation Range (ft)			Elevational category
1000	0.0	-	243.8	0	-	800	low elevations
2000	248.8	-	518.2	800	-	1700	
3000	518.2	-	762.0	1700	-	2500	mid elevations
4000	762.0	-	1219.2	2500	-	4000	
5000	1219.2	-	1628.9	4000	-	5344	alpine

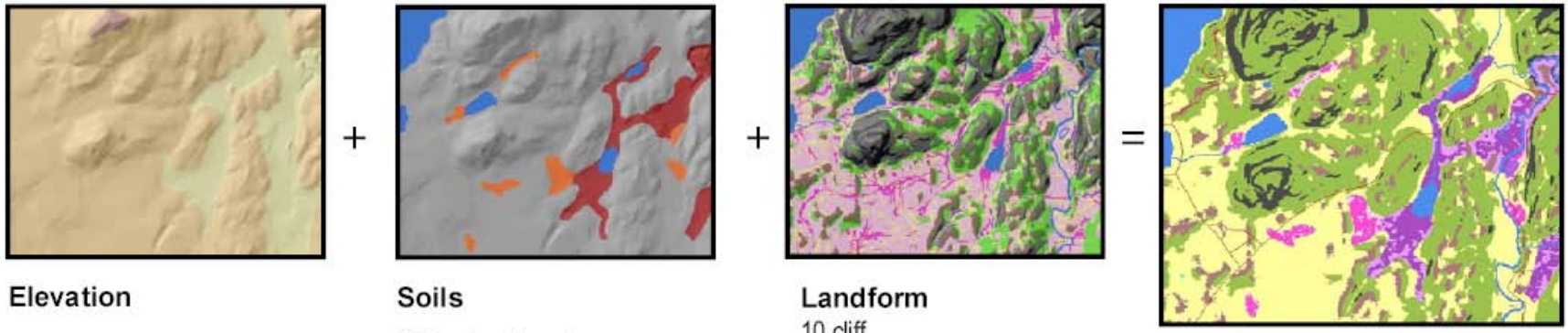
(b) Soil categories represented by the hundreds place of the ELU code.

ELU code[a]	Soil category
0	no hydric soil
100	water
200	order 2 hydric soils (detailed mapping)
300	order 3 hydric soils (soil complexes)
700	clay spot
800	wet spot
900	marsh spot

[a] ELU codes 400, 500, 600 were not assigned.

(c) Landform categories represented by the tens and ones places of the ELU code and their component parts.

ELU code	Landform Category	Land Position	Slope	Moisture	Water
10	cliff	any	cliff	any	none
11	steep slope	any	steep slope	any	none
12	slope crest	ridge	side slope	any	none
13	upper slope	wide ridge	side slope	any	none
14	flat summit	ridge/wide ridge	flat	any	none
20	side slope, N-facing	slope/flat	side slope	any	none
21	cove, N-facing	cove/toe slope	side slope	any	none
22	side slope, S-facing	slope/flat	side slope	any	none
23	cove, S-facing	cove/toe slope	side slope	any	none
30	dry flat	slope/flat	flat	dry	none
31	moist flat	slope/flat	flat	moist	none
32	wet flat	slope/flat	flat	wet	none
33	slope bottom	cove/toe slope	flat	any	none
40	streams	any	any	any	stream
42	lakes	any	any	any	lake



Elevation

1000 0 – 243.8 m

2000 243.8 – 518.2 m

3000 518.2 – 762.0 m

4000 762.0 – 1219.2 m

5000 1219.2 m +

+

Soils

000 no hydric soils

100 water

200 detailed hydric soils

300 hydric soil complexes

700 clay spots

800 wet spots

900 marsh and swamp spots

+

Landform

10 cliff
11 steep slope
12 slope crest
13 upper slope
14 flat summit
20 north face side slope
21 north face cove
22 south face side slope
23 south face cove
30 dry flat
31 moist flat
32 wet flat
33 slope bottom
40 stream

= Ecological Land Unit (ELU)

Example:

1000 (low elevation)	+	200 (detailed soils)	+	33 (slope bottom)	=	1233 (ELU code)

Figure 8. Visual and numeric illustration of the Ecological Land Unit (ELU) code for the AuSable and Boquet River Watershed, New York, USA, 2008.

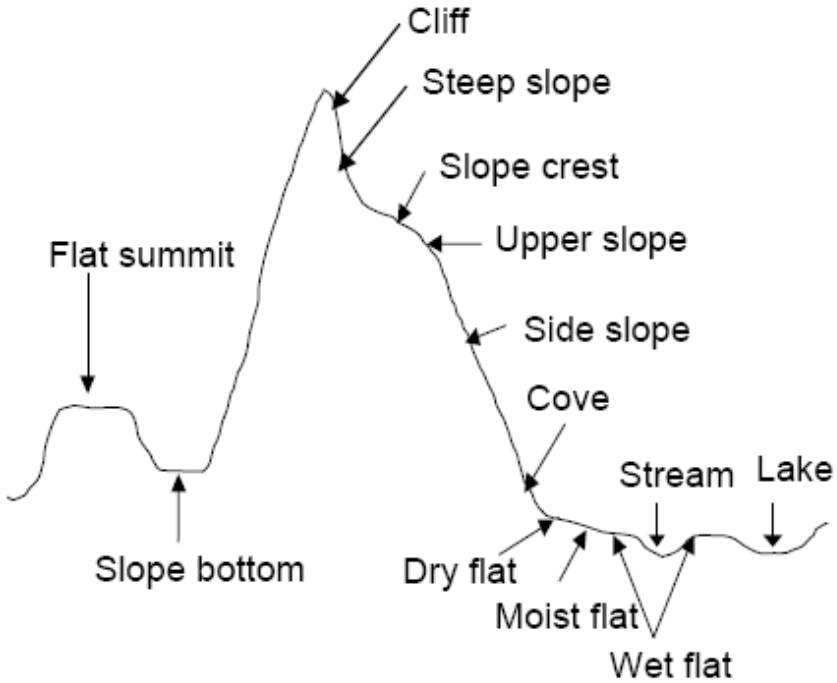


Figure 9. Schematic of landform categories (following Anderson et al. 1998) for the AuSable and Boquet River Watershed, New York, USA, 2008.

calculated aspect and split the side slopes and coves further still into north-facing and south-facing slopes and coves. While aspect does not physically influence the location of wetlands, we left it in the ELU model to be consistent with TNC's methods and in case this information proved useful at a later stage.
The resulting landform (the tens and ones digits of the ELU code) had 15 categories (Table 4c) and represented information on slope, land position, moisture, and aspect (Figure 10).

Having the thousands (elevation), hundreds (soil), and tens/ones (landform) places calculated and in raster form, we added these summary rasters together to produce the final raster surface of the ELU model. This final ELU raster had 525 different codes (5 elevation x 7 soil x 15 landform), too many to symbolize on a map. To make a readable map with more ecological meaning – than, for example, ELU code 1230 = low elevation, hydric soil complex, dry flat – we interpreted the ELU codes and their likely ecological expression.

In an Excel spreadsheet, we organized the 525 ELU values into categories based on their permanent underlying features and likely ecological expression. Since this model was made for wetlands, we focused more attention and detail on the wetland areas and lumped the non-wetland areas into larger groups. We grouped most non-wetland areas into an upland category, keeping cliffs, flat summits, dry flats, streams, and lakes separate to provide some topographic context. Based on a set of logical statements run through the use of the ArcGIS Con tool (for "conditional statement"), we re-classified and reduced the 525-

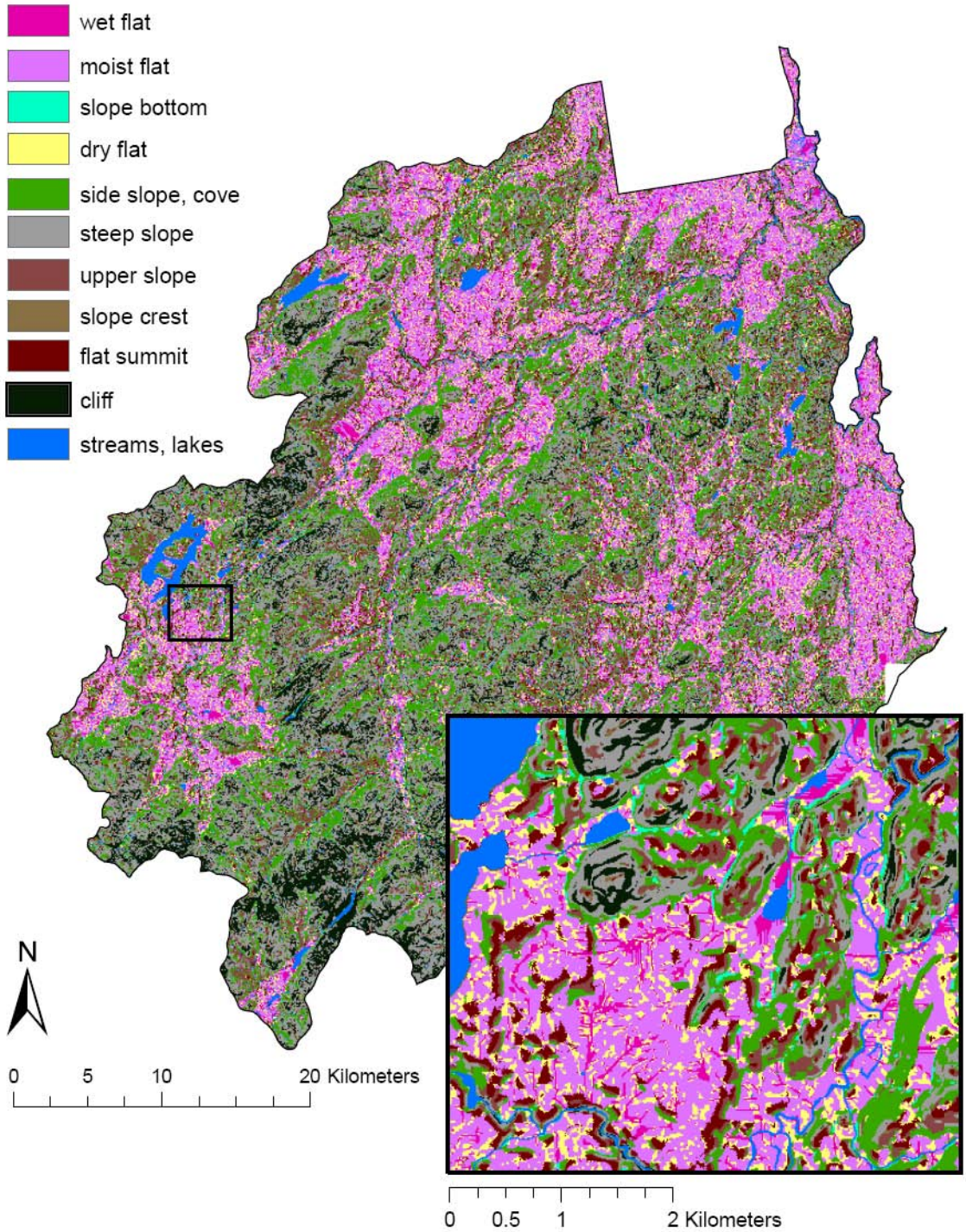


Figure 10. Landform, an intermediate step in ELU development that precedes the addition of soil information, in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

category ELU into 12 broader categories. Six of those 12 categories represented likely wetland presence. We retained the six separate categories for wetlands to reflect the different landscape information that led to each wetland classification. We placed the most confidence in wetland areas that were indicated by *both* landform and detailed soil maps. We placed less confidence in wetland areas that were indicated *only* by soil complexes containing hydric inclusions. We did not classify any wetlands on cliffs, flat summits, streams, or lakes. We did

classify some wetlands on steep slopes, slope crests, upper slopes, side slopes and coves of any aspect, flats of any moisture, and slope bottoms.

Accuracy Assessment

To quantify the accuracy of the ELU model, we compared the ELU model's predictions to reference data. We used the most current wetland maps for the region (hereafter referred to as EPA wetland maps because they were created as part of this EPA-funded project) as our reference data, indicating wetland presence or absence. See this report's section on Wetland Mapping and Appendix 1 for details on the creation of these maps. The EPA wetland maps represent existing wetlands delineated from 1994/95 color infrared aerial photography. However, the design of the ELU was to depict both those existing wetlands as well as potential wetlands, i.e., those places with the enduring landscape features to support a wetland but that did not support a wetland when the 1994/95 air photos were taken. Therefore, the ELU model should depict all existing wetlands as delineated from the photos, possibly missing man-made or beaver-made wetlands in areas that otherwise lack wetland features, and it should also indicate more wetlands than the reference wetland maps because it was designed to find not just the existing wetlands, but the potential wetlands. A 100% match between the ELU and the reference EPA wetland maps was never expected.

For purposes of comparison, note that statistics compiled on the EPA wetland maps in the Wetland Mapping section of this report did not consider palustrine open water (POWx) polygons to be wetland. However, all palustrine polygons (including POWx) were considered wetland for the accuracy assessment of the ELU and the training of the regression models.

To quantitatively compare the ELU model to the reference data, we set up a standard confusion matrix. A confusion matrix compares a produced map to a reference map and assesses where mapping units agree and disagree (Story and Congalton 1986, Congalton 1991, Sader et al. 1995, Fielding and Bell 1997, Congalton and Green 1999). In order to create the confusion matrix, we collapsed all ELU categories into just two: predicted presence or absence of wetlands. We decided that all ELU categories with hydric soil (from either detailed order 2 soil maps, less detailed order 3 soil complexes, or soil points) or hydric soil plus a moist/wet flat or slope bottom landform corresponded to wetland presence. We did not consider a moist/wet flat or a slope bottom landform alone to indicate a wetland. We decided that all other categories corresponded to wetland absence.

From the confusion matrix, we calculated overall accuracy, user's accuracy, producer's accuracy, and the kappa statistic. We also calculated percent correct classification for each collapsed ELU code (the 525 initial codes collapsed to 12 categories) in order to discover which classifications were contributing most to any predictive error.

We also compared the accuracy of the ELU model to both a logistic regression and an autologistic regression model for wetland presence in the ABW (Diggory 2008).

Site Ranking

Introduction

We wanted to provide a method for ranking wetland sites for both restoration and preservation purposes. We started by gathering methods used by groups in the area that would be thinking of these same issues, but from different scales and perspectives. We sought and received information from the New York Natural Heritage Program (NYNHP) with their statewide and preservation focus, from the Adirondack Land Trust and Nature Conservancy with their Adirondack region focus, from the Adirondack Park Agency with their Park-wide focus, from both the AuSable and Boquet Watersheds with their watershed focus, and from the Eddy Foundation with their wildlife focus within the Boquet Watershed. We assimilated the varying perspectives into the method for ranking described below and tested, altered, and re-tested our methods with our own field sites until we were satisfied. This demonstration of site ranking includes at least one community type described at each field site, but not all community types present; it is not comprehensive.

Ranking procedure

For each criteria (with one exception, explained below), we assigned a rank from 1 to 5 where 1 indicates a high candidacy for restoration or preservation and 5 indicates a low candidacy. Some criteria had no middle ground (were assigned either 1 or 5) while others could have values or 1, 2, 3, 4, *or* 5. We then summed the rankings for each criterion for each site.

We chose to make the higher ranking (higher value, higher priority) the lower number to remain consistent with the APA's assigning of wetland value. The APA system (section 578.4 to 578.7 of the APA's rules and regulations) assigns wetlands to either class 1, class 2, class 3, or class 4 where class 1 wetlands are more valuable and regulated more strictly.

Ranking criteria - restoration

For wetland restoration, we settled on the following 8 criteria after careful consideration.

- *Size* – larger sites are more worthy of restoration and so rank higher (closer to 1)
- *Need for restoration* – either there is something that could be improved (1) or there is not (10), there is no middle ground for this criterion. This criterion is the only one that stretches beyond 5, to 10. We felt that we needed to emphasize a decreased restoration priority for sites that don't appear to need restoration in the first place.
- *Ease of reversibility* – simple problems to fix rank higher (closer to 1, e.g. pull some exotic invasive species), while places with tougher problems to fix rank lower (closer to 5, e.g. site influenced by a human dam, or site with multiple issues).

- *Landscape characteristics* – places where the landform, soil, and moisture regime would naturally support a wetland rank higher (closer to 1), places where it would take huge effort and money to force in a wetland rank lower (closer to 5)
- *Connectivity* – places within large wetland complexes or nearby to many other wetlands rank higher (closer to 1), while isolated wetlands rank lower (closer to 5). This category also considers fragmentation from roads, railroads, culverts, etc.
- *Proximate land use/ External threats* – places surrounded by natural lands rank higher (closer to 1), while places surrounded by human-influenced lands (agriculture, development, etc.) rank lower (closer to 5). The rationale is that some proximate land uses threaten the wetland and make it a less sound investment for restoration.
- *Association with open water* – either a wetland is adjacent to a river, stream, lake, or pond (assigned a 1) or it is *not* adjacent to open water (assigned a 3) – there is no middle ground for this criterion. The rationale here is that wetlands adjacent to open water perform more important wetland functions (water control, sediment control, etc.) and therefore are higher restoration priorities.
- *Education potential* – the highest ranks (closer to 1) go to publicly owned lands that are easily accessible, the lowest ranks (closer to 5) go to privately owned land that is difficult to access. Intermediate ranks are also assigned (e.g. public land but difficult access, private land but highly visible).

Ranking criteria – preservation

For wetland preservation, we settled on the following 9 criteria after careful consideration. Five of these criteria are also used in the restoration ranking process. Note also that preservation ranks are assigned according to a site's current condition, not its potential.

- *Size* - larger sites are more worthy of preservation and so rank higher (closer to 1)
- *Internal condition/ Quality* – sites with an intact and healthy quality (representative of their community type) rank higher for preservation (closer to 1)
- *Connectivity* – places within large wetland complexes or nearby to many other wetlands rank higher (closer to 1), while isolated wetlands rank lower (closer to 5). This category also considers fragmentation from roads, railroads, culverts, etc.
- *Community rarity* – This criterion considers wetland community rarity in a watershed context. If there are fewer examples of a particular community, then it is more important to preserve it (because there are fewer examples/similar habitats in existence). Therefore, rarer communities are ranked higher (closer to 1). Relative values reflect those of the APA's wetland regulatory values.
- *Rare or endangered species* – if a wetland supports a rare or endangered species, then it is a preservation priority. Either a site supports a rare species (ranked 1) or it does not (ranked 5).

- *Proximate land use/ external threats* – places surrounded by natural lands rank higher (closer to 1), while places surrounded by human-influenced lands (agriculture, development, etc.) rank lower (closer to 5). The rationale is that some proximate land uses threaten the wetland and make it a less sound investment for preservation.
- *Association with open water* - either a wetland is adjacent to a river, stream, lake, or pond (assigned a 1) or it is *not* adjacent to open water (assigned a 3) – there is no middle ground for this criterion. The rationale here is that wetlands adjacent to open water perform more important wetland functions (water control, sediment control, etc.) and are therefore higher restoration priorities.
- *Education potential* - the highest ranks (closer to 1) go to publicly owned lands that are easily accessible, the lowest ranks (closer to 5) go to privately owned land that is difficult to access. Intermediate ranks are assigned (e.g. public land but difficult access, private land but highly visible).
- *Natural processes* – will natural processes continue to support this wetland? If they definitely will, this criterion receives the highest rank (1). If they definitely will not, this criterion receives the lowest rank (5).

Application

We chose field sites to be representative of the whole watershed. Others attempting to determine what a particular location's ranking might be, for restoration or preservation, can use the same criteria we have outlined here. The rank that is calculated can then be compared to the full spectrum of the field sites. Or, our criteria could be used to rank sites and compare them within their own group if interested in comparing a whole suite of sites (such as all wetlands within a township).

NWI-NHP Crosswalk

We developed a crosswalk between the National Wetland Inventory's (NWI) and the National Heritage Program's (NHP) wetland naming systems in order to facilitate shared use of maps with different classifications and enable the integration of ecological priorities. The crosswalk was developed by Elizabeth Spencer, NYNHP, through expert knowledge and reference to aerial photographs. The crosswalk was then reviewed and revised by Greg Edinger, NYNHP, and Ariel Diggory and Dan Spada, APA. In essence, the crosswalk provides a one to many correlation, with every one NWI classification being assigned to as many NHP classifications as are appropriate for this region.

Outreach and Education

We shared information about this study and the wetlands of the ABW at both the local and regional scales. We worked with individual landowners and River Associations at the local scale and presented talks and posters at conferences at the regional scale.

Results

Sub-watershed and Sub-catchment Mapping

The total watershed area calculated from mapping the wetlands and sub-watersheds of the AuSable and Boquet River Watersheds was 229,937 ha (568,174 acres). A total of 220 sub-catchments were also mapped for the project area, including 8 that were determined to be internally draining, 72 that were riverine watersheds, and 140 pond watersheds (Figure 11). The sub-catchments ranged in size from a minimum of 40.23 ha (99.41 acres) to a maximum of 138,675.81 ha (138,675.81 acres) (Table 5). The 8 internally-draining sub-catchments constitute only 4% of the total sub-catchments, in comparison with 9% of the sub-catchments of the St. Regis watershed found to drain internally. Regionalized watersheds, made up of flow path groupings of sub-catchments, were created using the ArcInfo watershed regionalization AML (Primack 1998). There were 5 SCS 11-digit watersheds (USDA/SCS 1980) contained within the AuSable and Boquet River watersheds (Table 6). Three additional sub-watersheds, Lake Champlain West Shore, Willsboro Bay and Little AuSable River, were also identified and mapped (Table 7, Figure 12). However, since they drain directly to Lake Champlain, it was decided that their statistics would be included in and reported for EPA Wetland Demonstration Program (Grant Pilot) WL97267806.

Figure 11. Sub-catchments in the AuSable and Boquet River Watersheds, New York, USA, 2008.

Table 5. Major watersheds of the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008. "Class" describes the sub-catchments outflow. I=Internally draining; P=Pond; R=Riverine.

Watershed	Class	# of Sub-catchments	Minimum area in ha (acres)	Maximum area in ha (acres)
AuSable	I	5	47.8 (118.31)	115,581.82 (285,602.67)
	P	51		
	R	83		
Boquet	I	3	40.23 (99.41)	138,675.81 (342,667.92)
	P	21		
	R	57		
		220		229,937 (568,174)

Table 6. Sub-catchment statistics for the SCS 11-digit sub-watersheds within the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Sub-watershed SCS 11-digit code	#Sub-catchments	#Draining Internally	#Riverine	#Pond	Smallest	Largest
Lower AuSable 02010004070	24	2	7	15	47.88 (118.31)	45794.30 (113,157.71)
West Branch AuSable 02010004060	79	2	20	57	50.73 (124.35)	69934.39 (172,807.87)
East Branch AuSable 02010004050	36	1	24	11	75.59 9186.78)	115581.82 (285,602.67)
Boquet 02010004030	50	3	16	31	40.23 (99.41)	138675.81 (342,667.92)
North Branch Boquet 02010004020	31	0	5	26	120.85 (298.62)	63553.73 (157,041.25)

Table 7. Additional sub-watersheds mapped for this project but not included in statistics. Adirondack Park, NY, USA. 2008.

Sub-watershed SCS 11-digit code	Sub-watershed	Area in ha (acres)
2010004010	Lake Champlain West Shore	3,274.6 (8,091.6)
2010004040	Willsboro Bay	10,184.7 (25,167.0)
2010004080	Little AuSable River	21,597.4 (53,368,3)

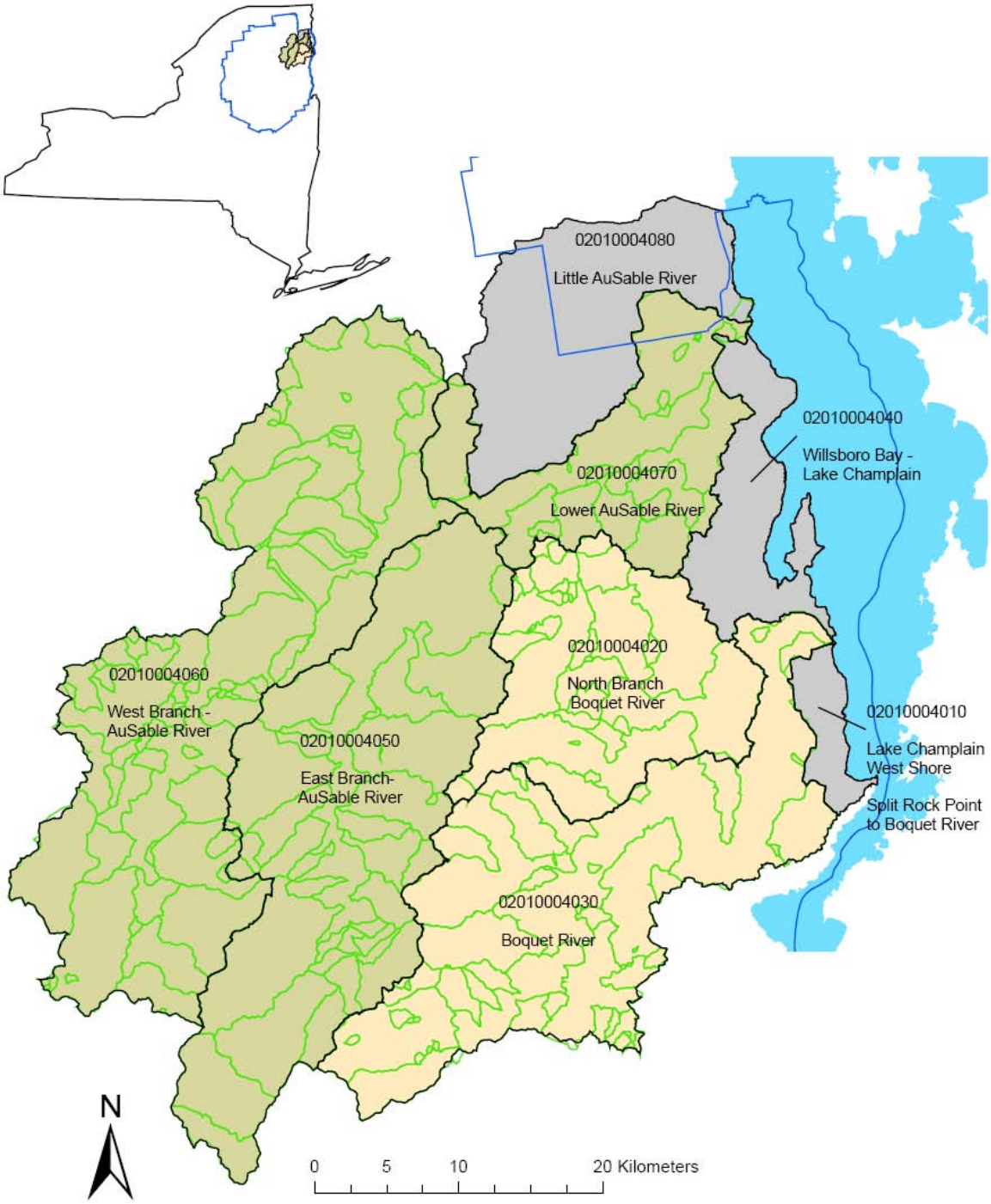


Figure 12. USDA/SCS 11-digit watersheds in the AuSable and Boquet River Watersheds, New York, USA, 1999.

Wetland Mapping

Within the project area of 229,937 ha (568,174 acres), 12,315 ha (30,431 acres) were mapped as wetlands; wetlands, therefore, constitute approximately 5% of the AuSable-Boquet watershed's surface area (Figure 13). Within the AuSable-Boquet project area, an additional 2% percent of the watershed area is lacustrine or riverine open water.

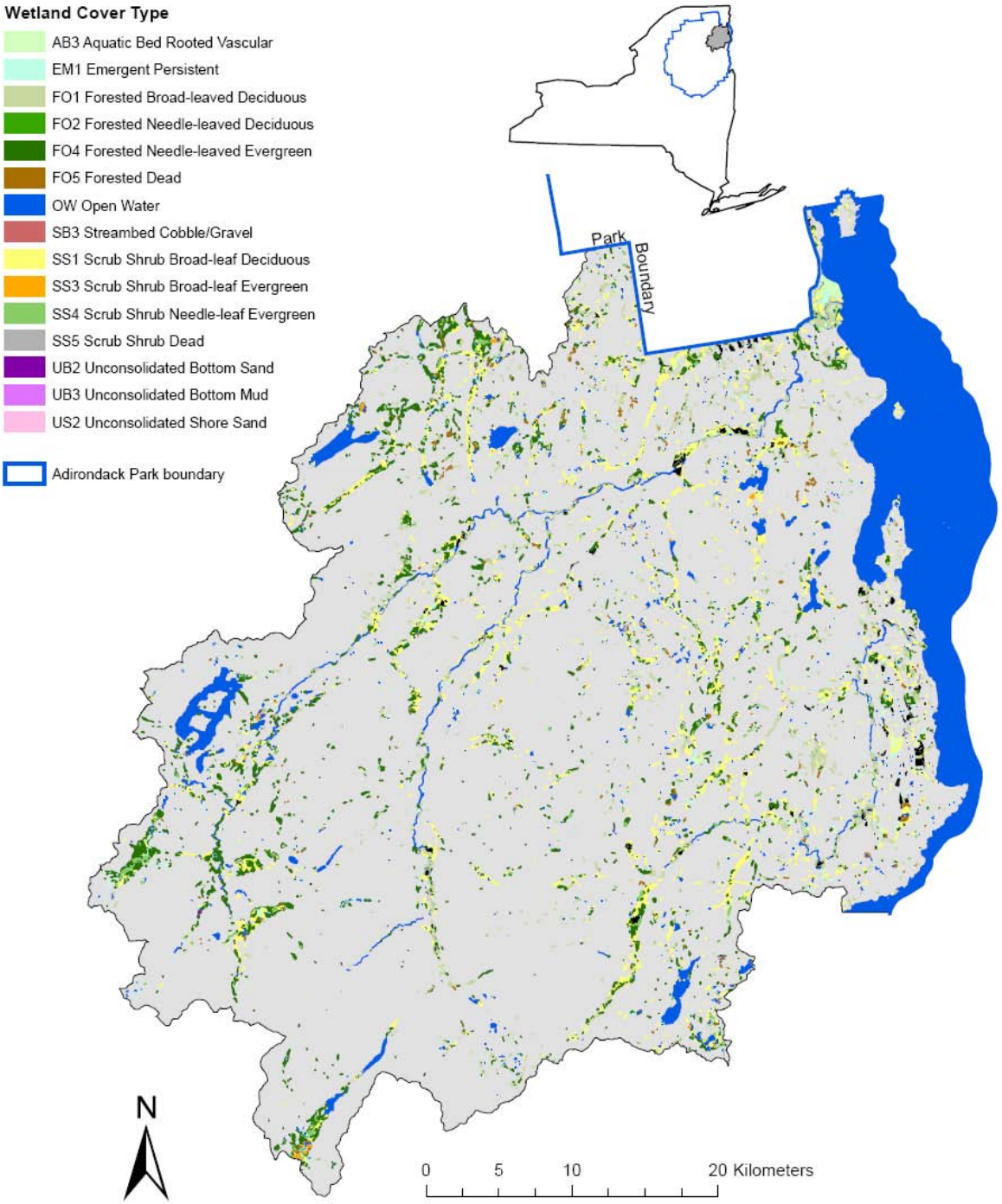


Figure 13. Mapped wetlands in the AuSable and Boquet River Watersheds, New York, USA, 2008.

Fourteen different NWI wetland cover types, including palustrine open water, were used to classify the wetland polygons for the project; each polygon was labeled with up to two cover types, which are described in Table 8.

Table 8. Major wetland cover types of the AuSable and Boquet River Watershed, Adirondack Park, NY, USA, 2008.

Wetland Classification	NWI Cover Type Label	Representative Plant Species
Open Water	OW	Pondweed, milfoil, eelgrass, or none
Persistent leaved emergent	EM1	Cattail, grasses, sedges
Broad-leaved deciduous scrub shrub	SS1	Speckled alder, willow
Needle-leaved deciduous scrub shrub	SS2	Eastern larch
Broad-leaved evergreen scrub shrub	SS3	Leatherleaf
Needle-leaved evergreen scrub shrub	SS4	Stunted or young black spruce or balsam fir
Dead scrub shrub	SS5	Dead shrubs
Broad-leaved deciduous forested	FO1	Red maple, silver maple, black/green ash
Needle-leaved deciduous forested	FO2	Eastern larch
Needle-leaved evergreen forested	FO4	Balsam fir, red and black spruce, hemlock, white cedar
Dead forested	FO5	Standing dead trees
Rooted vascular aquatic bed	AB3	Submerged aquatic vegetation
Unconsolidated shore – cobble/gravel	US1	unvegetated
Unconsolidated shore - sand	US2	unvegetated

Out of these 14 cover types, five were notable for characterizing wetland types in this watershed (Table 9): SS1, representing broad-leaved deciduous scrub shrub, was used to label 28.5% of the wetland area mapped; FO4, needle-leaved evergreen forested wetlands, was used to label 24.3% of the wetland area mapped; persistent emergent marsh, EM1, occurs in 18.6% of watershed wetlands; SS4, representing needle-leaved evergreen scrub shrub wetlands, appeared in the labels of 13.9% of the wetland area; FO1, broad-leaved deciduous swamp, accounted for 11.4%. All other cover types appeared in the labels of less than 2% of the wetland area.

Table 9. Wetland cover type distribution based on Class 1 and Class 2 labels (cover type appears anywhere in label).

Label	Ha	Acres	%
SS1	13618.6	5511.27	28.47
FO4	11620.9	4702.81	24.29
EM1	8912.21	3606.66	18.63
SS4	6638.93	2686.69	13.88
FO1	5455.69	2207.85	11.4
FO5	941.55	381.04	1.97
SS3	281.11	113.76	0.59
AB3	280.22	113.4	0.59
SS5	73.77	29.86	0.15
FO2	19.92	8.06	0.04

Class 1 and Class 2 labels and various water regime and special modifiers (NWI legend in Appendix 3) combined to make 158 different wetland labels in the project area. In addition there were ten labels designating open water and three for upland areas that may have been drained or filled for agriculture. Three labels were most common, in terms of number of occurrences (Tables 10 and 11, and Appendices 3 and 4): PSS1E, PFO4 and PSS1/EM1E. These same three labels also accounted for some of the greatest cover by area. Coverage, however, was evenly distributed over a large number of cover type labels. The label POWHb, designating beaver-modified open water, was very significant in terms of coverage and number of occurrences, accounting for a total of 346 ha (855 acres) in 491 separate ponds.

For this project, as with several preceding wetlands mapping efforts in the Park, a special modifier, “b,” was employed for wetlands influenced by beaver activity (Table 12). This modifier was appended to 19.3% of the wetland polygons in the watershed (not including open water). For cover types accounting for large coverage in the watershed, EM1 and SS1 were most influenced by beavers, with the “b” modifier appended to 40.1% and 26.2% of the respective areas. Nearly 100% of the number of polygons with FO5 or SS5 as the Class 1 label had the special beaver modifier. Conifer swamps (FO4) and deciduous swamps (FO1) were the least affected by beaver activity, with only 5.5% and 3.1% of their areas having the “b” modifier.

A high proportion of the wetlands proved to have saturated water regimes. A total of 89.5% of the wetland area in the watershed had either a saturated (B) or a seasonally flooded-saturated (E) regime modifier (Table 13). Together, these modifiers were appended to 44,356.16 ha (109,606.3 acres) of wetland in the watershed. The 89.5% of wetland area that is saturated in this project area can be compared to the 85% of Upper Hudson wetland area that is saturated (Primack *et al.* 2000), 74% of Oswegatchie-Black wetland area (Roy *et al*. 1996), and 72.4% of St. Regis wetland area (Halasz *et al.* 2000).

Table 10. Relationship, by area, of Class 1 and Class 2 wetland labels (1994/95) in the AuSable and Boquet River Watershed, Adirondack Park, NY, USA.

	Class 2 ha (acres)											
Class 1	/EM1	/FO1	/FO2	/FO4	/FO5	/OW	/SS1	/SS3	/SS4	/SS5	(blank)	Grand Total
AB3						113.4 (280.2)						113.4 (280.2)
EM1						288.2 (712.1)					855.8 (2114.7)	1144.0 (2826.8)
FO1	53.0 (130.8)			322.3 (796.5)		6.6 (16.2)	761.3 (1881.2)		10.0 (24.7)		763.3 (1886.1)	1916.4 (4735.6)
FO2	2.1 (5.1)						0.5 (1.3)		1.5 (3.8)			4.1 (10.2)
FO4	81.6 (201.7)	291.4 (720.1)	3.9 (9.7)		0.9 (2.2)	31.4 (77.6)	789.9 (1951.8)		1813.9 (4482.4)		1367.4 (3378.9)	4380.5 (10824.4)
FO5	10.1 (25.1)					363.4 (897.9)	0.4 (1.1)			1.9 (4.6)	4.3 (10.7)	380.1 (939.4)
OW											24554.9 (60676.6)	24554.9 (60676.6)
SB3											1.6 (4.1)	1.6 (4.1)
SS1	2160.3 (5338.3)					63.8 (157.7)		9.9 (24.5)	342.1 (845.2)	3.8 (9.3)	1177.3 (2909.1)	3757.1 (9284.1)
SS3	42.4 (104.8)					4.0 (9.8)	3.6 (8.8)		6.9 (17.2)		26.8 (66.1)	83.6 (206.6)
SS4	113.2 (279.7)					3.6 (8.8)	198.5 (490.4)	20.2 (50.0)			176.0 (434.9)	511.5 (1263.8)
SS5						20.6 (50.9)			0.7 (1.8)		2.9 (7.1)	24.2 (59.9)
UB2											2.7 (6.6)	2.7 (6.6)
UB3											0.6 (1.6)	0.6 (1.6)
US2											4.7 (11.5)	4.7 (11.5)
Grand Total	2462.7 (6085.4)	291.4 (720.1)	3.9 (9.7)	322.3 (796.5)	0.9 (2.2)	894.9 (2211.2)	1754.1 (4334.5)	30.1 (74.5)	2175.2 (5375.1)	5.6 (13.9)	28938.3 (71508.1)	36879.5 (91131.3)

Table 11. Relationship, by number of polygons, of Class 1 and Class 2 wetland labels (1994/95) in the AuSable and Boquet River Watershed, Adirondack Park, NY, USA.

	CLASS2											
CLASS 1	/EM1	/FO1	/FO2	/FO4	/FO5	/OW	/SS1	/SS3	/SS4	/SS5	blank	Grand Total
AB3						4						4
EM1						216					795	1011
FO1	40			235		18	583		15		703	1594
FO2	3						1		1			5
FO4	72	171	1		3	34	526		597		955	2359
FO5	4					400	1			1	5	411
OW											1199	1199
SB3											6	6
SS1	1179					66		9	327	1	1486	3068
SS3	30					5	2		3		33	73
SS4	94					8	181	10			204	497
SS5						17			1		1	19
UB2											4	4
UB3											2	2
US2											10	10
Grand Total	1422	171	1	235	3	768	1294	19	944	2	5403	10262

Table 12. Area and number of palustrine open water and wetland polygons (1994/95) with the "beaver" special modifier (“b”), organized by Class1 label, for the AuSable and Boquet River Watershed, Adirondack Park, NY, USA.

	Area					Number		
CLASS1	"b" (ha)	"b" (acres)	Total class area (ha)	Total class area (acres)	% total class area	"b"	Total polygon # in class	% total class #
AB3	15.9	39.2	17.6	43.4	90.2	2	3	66.7
EM1	459.1	1134.5	1144.0	2826.8	40.1	413	1011	40.9
FO1	58.8	145.2	1916.4	4735.6	3.1	64	1594	4.0
FO2			4.1	10.2			5	
FO4	242.0	597.9	4380.5	10824.4	5.5	177	2359	7.5
FO5	379.9	938.8	380.1	939.4	99.9	409	411	99.5
OW	346.4	856.1	551.9	1363.7	62.8	492	1068	46.1
SS1	984.6	2433.0	3757.1	9284.1	26.2	566	3068	
SS3	22.0	54.3	83.6	206.6	26.3	21	73	28.8
SS4	112.1	277.0	511.5	1263.8	21.9	76	497	15.3
SS5	24.2	59.9	24.2	59.9	100.0	19	19	100.0
UB2			2.7	6.6			4	
UB3			0.1	0.2			1	
US2			4.7	11.5			10	
TOTAL	2644.9	6535.7	12778.4	31576.2	20.7	2239	10123	22.1

Table 13. Area of wetland water regime modifiers by wetland Class 1. Codes for water regime modifiers are: B=saturated, D=seasonally flooded-well drained, E=seasonally flooded-saturated, F=semi-permanently flooded, H=permanently flooded.

	WATER REGIME ha (acres)						
CLASS1	B	D	E	F	H	(blank)	Grand Total
AB3					113.4 (280.2)		113.4 (280.2)
EM1	39.3 (97.1)	10.7 (26.4)	806.3 (1992.3)		287.7 (711.0)		1144.0 (2826.8)
FO1	617.6 (1526.2)	29.2 (72.2)	1262.2 (3119.1)	0.8 (1.9)	6.6 (16.2)		1916.4 (4735.6)
FO2	3.6 (8.9)		0.5 (1.3)				4.1 (10.2)
FO4	2994.5 (7399.6)	21.2 (52.5)	1335.9 (3301.0)		27.8 (68.8)	1.0 (2.5)	4380.5 (10824.4)
FO5	0.4 (1.1)		9.0 (22.4)		370.7 (915.9)		380.1 (939.4)
OW					24554.9 (60676.6)		24554.9 (60676.6)
SB3			1.6 (4.1)				1.6 (4.1)
SS1	600.2 (1483.1)	3.3 (8.1)	3021.6 (7466.5)	69.8 (172.6)	62.2 (153.8)		3757.1 (9284.1)
SS3	60.0 (148.4)		19.6 (48.5)		4.0 (9.8)		83.6 (206.6)
SS4	217.5 (537.4)		290.4 (717.6)		3.6 (8.8)		511.5 (1263.8)
SS5			3.6 (9.0)		20.6 (50.9)		24.2 (59.9)
UB2		2.7 (6.6)					2.7 (6.6)
UB3		0.1 (0.2)			0.6 (1.4)		0.6 (1.6)
US2		4.7 (11.5)					4.7 (11.5)
Grand Total	4533.2 (11201.8)	71.8 (177.4)	6750.8 (16681.7)	70.6 (174.5)	25452.1 (62893.5)	1.0 (2.5)	36879.5 (91131.3)
% of Total	12.29	0.19	18.31	0.19	69.01	0.00	100

An inventory and delineation of wetlands that may have been impacted by agricultural practices and/or development was also conducted during the initial interpretation (Tables 14 & 15 and Figure 14). A total of 332 polygons, accounting for 750.0 ha (1853.2 acres), are locations that probably functioned as a wetland in the past, but due to farming and/or ditching are now more similar to upland areas (Table 14, Figure 14). Most of these locations are in the Champlain Valley or proximate to the AuSable River. A total of 25 polygons, accounting for 137.3 ha (339.2 acres), showed evidence of ditching or draining and therefore had the special modifier “d” (Table 15). The only class labels with

the modifier “d” were emergent persistent (EM1), broad-leaved deciduous scrub/shrub (SS1), and broad-leaved deciduous forested (FO1).

Table 14. Upland polygons which have evidence of farming (1994/95) in the AuSable and Boquet River Watershed, Adirondack Park, NY, USA. Uf = Upland farmed; Udf = Upland, partially drained/ditched, farmed; Ufq = Upland farmed questionable.

NWI label	# polygons	area (ha)	area (acres)
Uf	301	656.4	1622.1
Ufd	26	86.5	213.7
Ufq	5	7.0	17.4
Totals	332	750.0	1853.2

Table 15. Area and number of palustrine open water and wetland polygons (1994/95) with the "partially drained/ditched" special modifier (“d”), organized by Class1 label, for the AuSable and Boquet River Watershed, Adirondack Park, NY, USA.

	Area					Number		
CLASS1	"d" (ha)	"d" (acres)	Total class area (ha)	Total class area (acres)	% total class area	"d"	Total polygon # in class	% total class #
AB3			17.6	43.4			3	
EM1	12.9	31.8	1144.0	2826.8	1.1	12	1011	1.2
FO1	0.2	0.5	1916.4	4735.6	----	1	1594	0.1
FO2			4.1	10.2			5	
FO4			4380.5	10824.4			2359	
FO5			380.1	939.4			411	
OW			551.9	1363.7			1068	
SS1	124.2	307.0	3757.1	9284.1	3.3	12	3068	0.4
SS3			83.6	206.6			73	
SS4			511.5	1263.8			497	
SS5			24.2	59.9			19	
UB2			2.7	6.6			4	
UB3			0.1	0.2			1	
US2			4.7	11.5			10	
TOTAL	137.3	339.2	12778.4	31576.2	1.1	25	10123	0.2

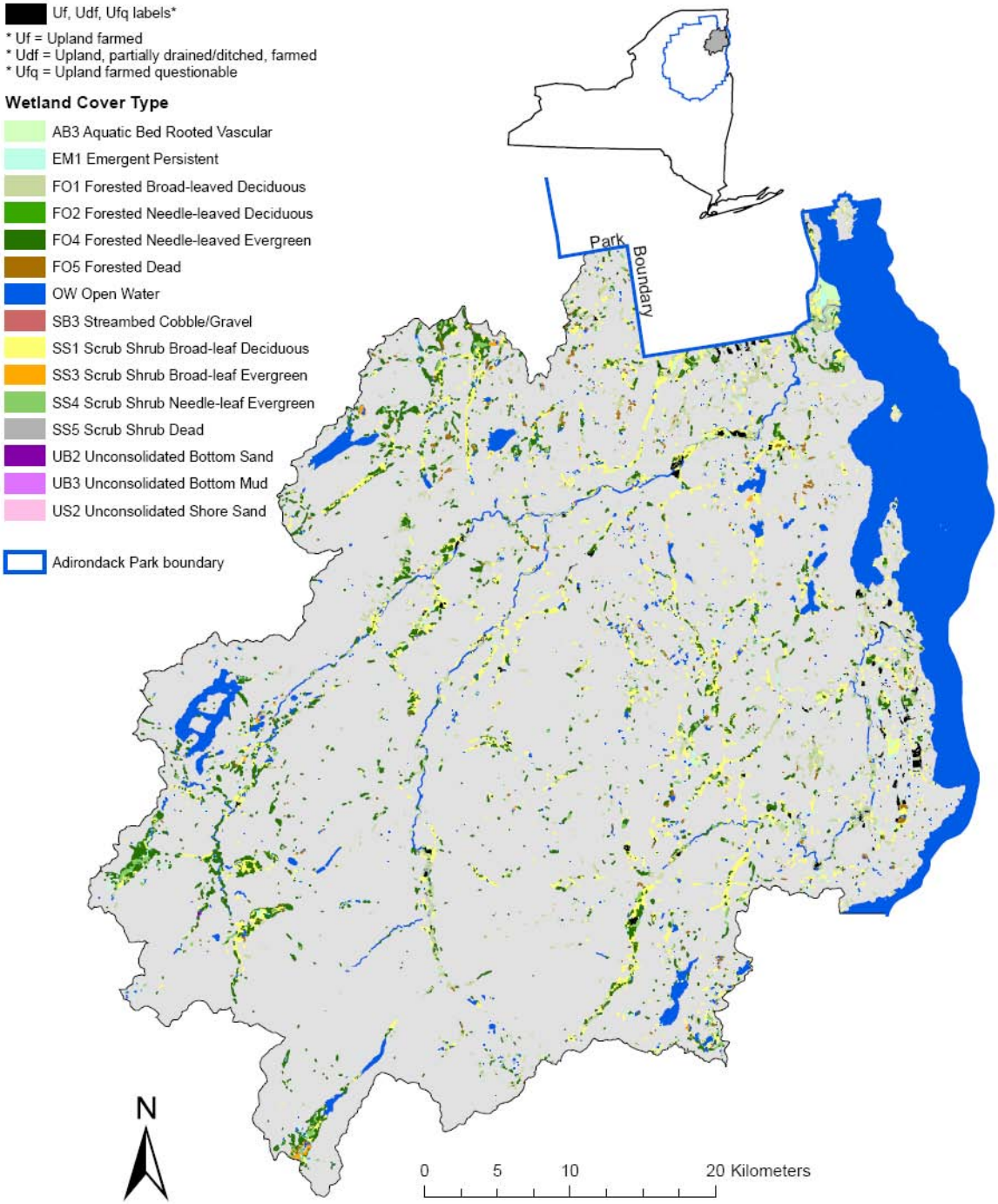


Figure 14. Mapped wetlands, including Uf, Udf, and Ufq labels, in the AuSable and Boquet River Watersheds, New York, USA, 2008.

The Ecological Land Unit (ELU) Model

The confusion matrix indicated an overall accuracy of 70.4% (Table 16) for the ELU model (Figure 15). The user's accuracy for wetland absence was 96.3% and for wetland presence was 42.8%. Producer's accuracy for wetland absence was 62.4% and for wetland presence was 91.6%. These accuracy percentages indicated that the ELU method often misclassified non-wetlands as wetland, but the ELU method rarely classified a location as non-wetland when it was a true wetland. The ELU model's kappa statistic was 0.397. The false positive rate was 58.3% while the false negative rate was 3.2%.

Table 16. Overall accuracy, user's accuracy, producer's accuracy, false positive rate, false negative rate, and kappa for the ELU model of existing and potential wetlands, AuSable and Boquet River Watershed, New York, USA, 2008.

Accuracy measurement		Percent
Overall Accuracy[a]		70.4
User's Accuracy	Wetland Presence	42.8
	Wetland Absence	96.3
Producer's Accuracy	Wetland Presence	91.6
	Wetland Absence	64.2
False Positive[b]		58.3
False Negative[b]		3.2
Kappa		0.3974[c]

[a] Overall Accuracy = percent correct classification

[b] False positive and negative rates were corrected for the actual prevalence of wetlands on the landscape (5.2% wetland presence by area).

[c] Kappa is a metric from 0 to 1 with values closer to 1 corresponding to greater accuracy.

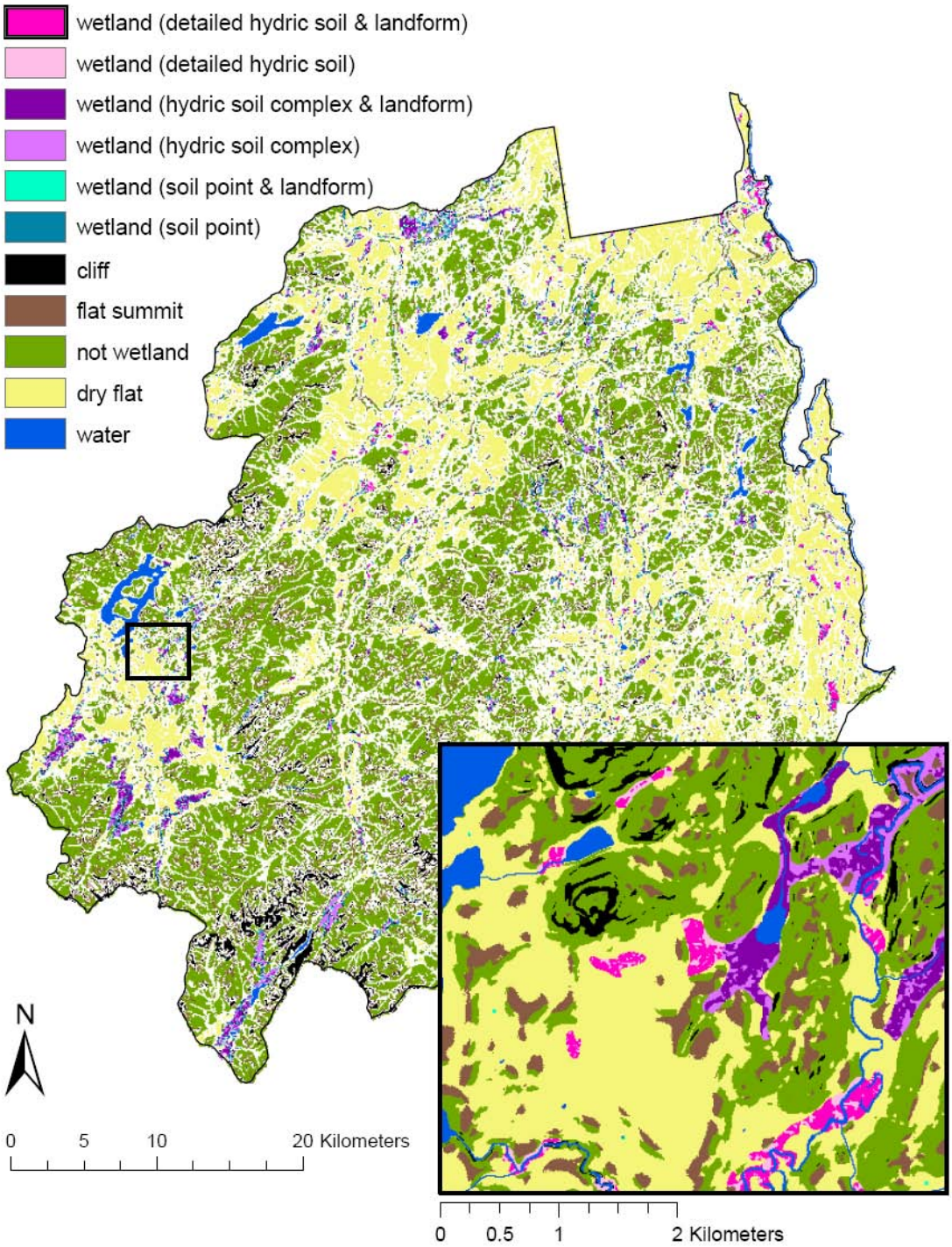


Figure 15. Map of the ELU model's surface, AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

A closer examination of which ELU categories contributed to the misclassifications revealed clear strengths and weaknesses (Table 17). Of the 2,000 sample points in the validation data set, ≥ 90.1% of locations the ELU classified as wetland because of detailed hydric soil, with or without a moist/wet flat landform, correctly indicated the presence of wetlands. Similarly, 90.2% of locations the ELU classified as wetland because of hydric soil complex and a moist/wet flat landform also correctly indicated the presence of wetlands. However, only 76.9% of locations the ELU classified as wetland because of a hydric soil complex alone were indeed wetlands.

Examining predictions of wetland absence, ≥ 90.7% of locations classified as cliff, flat summit, or "not wetland" (a broad "other" category) correctly indicated the absence of wetlands (Table 17). The categories of dry flat, streams, and lakes performed poorly. Only 44.6% of locations labeled dry flat by the ELU agreed with the non-wetland status on the EPA maps. It seemed that even without a hydric soil map unit or a moist/wet flat landform, these dry flats contained a fair amount of wetlands. Only 13.4% of locations labeled streams by the ELU and 33.8% of locations labeled lakes by the ELU agreed with the non-wetland status on the EPA wetland maps. Instead, a majority of locations labeled stream or lake by the ELU corresponded to wetland presence on the EPA maps.

Table 17. Percent correct classification for each ELU category in an ecological land unit model for existing and potential wetlands, AuSable and Boquet River Watershed, New York, USA, 2008.

Label[a]	Wetland[b]	% correct classification	n
wetland (by soil point and landform)	yes	100.0	1
cliff	no	97.6	42
wetland (by detailed soil and landform)	yes	94.8	249
flat summit	no	92.4	66
not wetland	no	90.7	603
wetland (by soil complex and landform)	yes	90.2	92
wetland (by detailed soil)	yes	90.1	71
wetland (by soil complex)	yes	76.9	39
dry flat	no	44.6	702
lake	no	33.8	68
stream	no	13.4	67
wetland (by soil point)	yes	- - -	0
			2000 Total

[a] We grouped the 525 ELU codes into these 12 broader categories. There are 6 categories for wetland distinguished by the landscape features that led us to classify those ELUs as wetland.
[b] This column designates whether a particular ELU category indicates wetland presence or not, as defined for this analysis.

"Data-driven" regression models created by Diggory (2008) achieved greater overall accuracy than the "expert-driven" ELU model. Compared to the ELU model's 70.4% overall accuracy, an autologistic regression model had 85.3% overall accuracy while a simpler logistic regression model had 80.9% overall accuracy.

Field Sites

We visited 28 field sites in the summer of 2005, for a total of 60 wetland communities (Table 3). Ecological descriptions are presented in Appendix 6. Of the 28 field sites, the NYNHP found nine communities of high enough quality to be considered an Ecological Occurrence. Contact the NYNHP directly for Ecological Occurrence reports, since their dissemination is controlled to protect sensitive and rare communities

Site Ranking

Results of the site ranking are presented in Tables 18 through 21 and interpreted in the corresponding discussion section.

Table 18. Wetland site ranking for restoration potential in the AuSable River Watershed, New York, USA, 2008. Smaller ranking numbers indicate better candidate restoration sites.

Site ID#	Site Name	Community Type	Site Rank	
19	South Meadow	sedge meadow	9	better ---->
15	AuSable River Delta	deep emergent marsh	12	
17	Little Cherry Patch Pond	poor fen/medium fen	12	
22	Wickham Marsh WMA	deep emergent marsh	12	
15	AuSable River Delta	floodplain forest	13	
20	Rt 73/9N Jct	shallow emergent marsh	14	
31	Beaver Brk State	sedge meadow	14	
21	Mud Pond (in Black Brook)	dwarf shrub bog	16	restoration candidate
21	Mud Pond (in Black Brook)	black spruce-tamarack bog	16	
18	Riverside Rd	shrub swamp/shallow emergent marsh matrix	21	
16	Beaver Brook	shrub swamp	22	
16	Beaver Brook	sedge meadow	22	
19	South Meadow	mixed conifer swamp	22	
24	Military Pond outlet	northern white cedar swamp	22	
26	Augur Lake / Mud Pond	medium fen	22	
30	Riverside/Rt86 Jct	shrub swamp	23	<---- worse
29	behind Keene Valley School	shrub swamp	25	
25	Blake Brook	sedge meadow	26	

Table 19. Wetland site ranking for restoration potential in the Boquet River Watershed, New York, USA, 2008. Smaller ranking numbers indicate better candidate restoration sites.

Site ID#	Site Name	Community Type	Site Rank
9	Thrall Dam	sedge meadow	14
9	Thrall Dam	shrub swamp	14
33	Cook Road Floodplain	floodplain forest	14
6	Sycamore Flood Plain	floodplain forest	15
42	Boquet Mouth - North Floodplain	shrub swamp	16
1	North Wadhams	floodplain forest	20
1	North Wadhams	shallow emergent marsh	20
4	Middle Road Swamp	red maple-hardwood swamp	21
5	Webb-Royce Swamp	shallow emergent marsh	22
11	Crater Club	wet clayplain forest	22
9	Thrall Dam	floodplain forest	23
32	Essex Station	shallow emergent marsh	23
46	Taylor Mt Pond	dwarf shrub bog/shrub swamp matrix	23
7	Noblewood Flood Plain & Delta	silver maple-ash swamp	25
12	North Branch Boquet - West Road	floodplain forest	25
12	North Branch Boquet - West Road	deep emergent marsh	25
42	Boquet Mouth - North Floodplain	floodplain forest	25
2	Rogers Pond at Coon Mountain	flooded conifer swamp	27
12	North Branch Boquet - West Road	northern white cedar swamp	27
3	Essex Bottoms	shrub swamp	28
3	Essex Bottoms	sedge meadow	28
4	Middle Road Swamp	deep emergent marsh	28
4	Middle Road Swamp	shrub swamp	28
11	Crater Club	cattail marsh	29

<---- worse restoration candidate better ---->

Table 20. Wetland site ranking for preservation potential in the AuSable River Watershed, New York, USA, 2008. Smaller ranking numbers indicate better candidates for preservation.

Site ID#	Site Name	Community Type	Site Rank
19	South Meadow	sedge meadow	16
15	AuSable River Delta	floodplain forest	18
26	Augur Lake / Mud Pond	medium fen	18
15	AuSable River Delta	deep emergent marsh	19
30	Riverside/Rt86 Jct	shrub swamp	20
17	Little Cherry Patch P	poor fen/medium fen	21
19	South Meadow	mixed conifer swamp	21
22	Wickham Marsh WMA	deep emergent marsh	21
24	Military Pond outlet	shrub swamp	21
16	Beaver Brook	sedge meadow	22
21	Mud Pond (in Black Brook)	dwarf shrub bog	22
21	Mud Pond (in Black Brook)	black spruce-tamarack bog	22
16	Beaver Brook	shrub swamp	23
31	Beaver Brk State	sedge meadow	23
25	Blake Brook	sedge meadow	24
29	behind Keene Valley School	shrub swamp	25
20	Rt 73/9N Jct	shallow emergent marsh	27
18	Riverside Rd	shrub swamp/shallow emergent marsh matrix	29

better ---> preservation candidate <--- worse

Table 21. Wetland site ranking for preservation potential in the Boquet River Watershed, New York, USA, 2008. Smaller ranking numbers indicate better candidates for preservation.

Site ID#	Site Name	Community Type	Site Rank
12	North Branch Boquet - West Road	northern white cedar swamp	19
9	Thrall Dam	floodplain forest	20
7	Noblewood Flood Plain & Delta	silver maple-ash swamp	21
9	Thrall Dam	sedge meadow	21
9	Thrall Dam	shrub swamp	21
33	Cook Road Floodplain	floodplain forest	21
46	Taylor Mt Pond	dwarf shrub bog/shrub swamp matrix	21
5	Webb-Royce Swamp	shallow emergent marsh	22
6	Sycamore Flood Plain	floodplain forest	22
42	Boquet Mouth - North Floodplain	floodplain forest	22
12	North Branch Boquet - West Road	old oxbow/floodplain forest	23
12	North Branch Boquet - West Road	deep emergent marsh	23
42	Boquet Mouth - North Floodplain	shrub swamp	24
1	North Wadhams	floodplain forest	27
2	Rogers Pond at Coon Mountain	flooded conifer swamp	27
4	Middle Road Swamp	deep emergent marsh	28
4	Middle Road Swamp	red maple-hardwood swamp	28
11	Crater Club	shallow emergent marsh	28
1	North Wadhams	shallow emergent marsh	29
4	Middle Road Swamp	shrub swamp	29
11	Crater Club	silver maple-ash swamp	30
32	Essex Station	shallow emergent marsh	31
3	Essex Bottoms	sedge meadow	35
3	Essex Bottoms	shrub swamp	36

better ---->

preservation candidate

<---- worse

NWI-NHP Crosswalk

We created a “first approximation” of the NWI-NHP Crosswalk because it should not be considered definitive or comprehensive without further ground-truthing at additional locations. The 2005 field surveys provided a good base reference to facilitate working remotely, but only 7 of the 24 sites overlapped with NWI delineated wetlands on a sample of reviewed quadrangles. This incomplete overlap lead to both the omission of a number of wetland types

surveyed, and the inclusion of additional types not encountered during these field visits.

Outreach and Education

At the local level, we had at least three contacts with each landowner that gave us permission to access their wetland. (1) We wrote an initial permission-seeking letter with a follow-up phone call that explained the value of the watershed's wetlands and their participation in this study. (2) The landowner(s) often accompanied us on our field visit. And (3), we wrote thank you letters to each landowner after our visit that identified the community type and most abundant species in the wetland on their property. The thank-you letter also provided them with an aerial photograph of their wetland and property.

In addition, we worked as project partners with the local river association for each watershed. Our experience with this study has helped to inform further studies that the river associations are pursuing.

We also presented the ELU model's methods and results throughout the study period at various regional conferences, one high school and one college:

- "GIS and Field Partnerships to Identify and Prioritize Wetland Restoration Sites on a Watershed Scale in the Adirondack Park." Presentation given at Association for State Wetland Managers workshop on "Integrated restoration of riverine wetlands, streams, riparian areas, and floodplains in watershed contexts," Amherst, MA. November 16, 2005.
- "Mapping potential wetlands in a Geographic Information System: implications for restoration and conservation." Poster presentation at the Northeast Natural History Conference IX, New York State Museum, Albany, NY. April 20-21, 2006.
- "Elements of wetland research" presented to high school environmental studies class, Westport, NY. April 14, 2008.
- "Mapping potential wetlands in a Geographic Information System: implications for restoration and conservation." Poster presentation at the Adirondack Research Consortium's 13th Annual Conference on the Adirondacks. Lake Placid, NY. May 2006.
- "Mapping potential wetlands in a GIS: implications for mitigation." Presentation given at New York State Wetlands Forum conference. Lake Placid, NY. April 25-26, 2007.
- "Mapping potential wetlands in a GIS; model development and validation." Presentation given at New York State Geographic Information System conference, Albany, NY. October 2, 2007.
- "Mapping potential wetlands in the AuSable and Boquet Watersheds." Presentation given at the Lake Champlain: Our Lake, Our Future conference, Burlington, VT. January 8, 2008.
- "Using enduring landscape features and a Geographic Information System to map potential wetlands." Capstone presentation for Master of Science degree at the State University of New York, Syracuse, NY. April 22, 2008.

Discussion and Recommendations

Sub-watershed and Sub-catchment Mapping

Sub-watershed and sub-catchment mapping has been conducted for each of the other watersheds in this series of EPA wetland protection grants (Oswegatchie-Black, Upper Hudson, St. Lawrence, Mohawk and Saranac-Lake George). The purpose for going through the tedious watershed mapping process is to develop a highly accurate database of sub-catchments and the direction of water flow through them from headwaters to final receiving waters. These data are to be used in cumulative impact assessment during the Agency's project review process. Typically, low productivity pristine lakes and ponds can be expected to be located as headwaters with little or no development within their watersheds and little contribution from other developed waters. Lakes and ponds lower in the watershed typically show higher levels of development and a longer "string" of contributing waters. Such an assessment might help guide development away from pristine waterbodies, and from those more productive lakes and ponds that are at risk of trophic status change.

Wetland Mapping

The ability to delineate and classify wetlands from aerial photography depends upon many factors including image quality, emulsion type, photo scale, date of photography interpretive equipment, uniqueness of wetland signature, photo interpreter ability and experience, and QA/QC protocol. For this project, the imagery was generally quite good. The QA/QC standards that were adopted for the project dictate that all wetlands with identifiable signatures should have been delineated and classified. It is possible that some wetlands may have been missed (e.g., human error), but the interpretation of natural, non-impacted wetlands is considered accurate.

Air photo interpretation for the ABW encountered two principal difficulties, highlighting the disadvantage of relying solely on air photo interpretation for locating candidate mitigation sites. First, palustrine coniferous evergreen forest (PFO4) is inherently difficult to distinguish from adjacent upland coniferous trees. The boundary usually has to be determined by a gentle break in slope, subtle changes in canopy height/crown size, and/or a slight change in vegetation signature. Secondly, wetlands, especially in the Champlain Valley, have been modified extensively by agriculture and development. Significant drainage and some filling of wetlands have occurred in this area. Adding to the interpretation problem, many areas in the Valley are underlain with dense marine and lacustrine clay soils that make it difficult to delineate wetlands even with undisturbed conditions. (In Appendix 1, Bogucki provides 17 different and more detailed examples of mapping difficulties encountered in the ABW). However, even if identifying all modified areas is not possible, those that were identified were spot checked on the ground as part of this project. Incorrect interpretations were revised and the information derived from the field check was used to inform subsequent interpretations.

For the purpose of identifying candidate mitigation sites, air photo interpretation has its advantages and disadvantages. Attention to visible clues enabled the photo interpretation to identify wetlands that have been farmed ("f") or ditched ("d") and uplands that likely once had wetland characteristics before they were farmed and/or ditched (Uf, Udf, and Ufq). These locations may be good candidates for wetland mitigation. Bogucki (Appendix 1) identifies 40 wetland areas that were identified as impacted by town, quadrangle name, photo number, and impact. These 40 sites would be a good starting point for choosing a candidate mitigation site.

The ability to delineate and classify wetlands which have been modified by agriculture or development is much more difficult than recognizing non-impacted wetlands. A task that is ordinarily even difficult in the field, identifying wetlands altered by farming practices from aerial photography can only be a first step in examining wetland impacts. Further consideration must be given to a site's particular suitability for wetland mitigation (e.g., landscape context, ownership, feasibility, etc.), including a field visit to ground-truth the remote findings.

Ecological Land Unit (ELU) Model

ELU accuracy

The 70.4% overall accuracy achieved by the ELU model is commendable. From a user's perspective, the ELU model reliably (with 96.3% accuracy) located sites in which wetlands were absent, but had lower accuracy (42.8%) locating sites of wetland presence (Table 16). This difference likely resulted because the ELU model tends to err on the side of omission rather than commission and so it missed some existing wetlands. Recall, however, that all of these accuracy statistics refer to the comparison between the ELU model for both existing and potential wetlands and the EPA reference maps of only existing wetlands. To what extent any mismatches between the two should be attributed to error, on the part of the ELU model or the reference maps, is unknown. Since the overall accuracy is so high, it appears that the ELU model did succeed in locating existing wetlands based on their enduring landscape features. By extension, we believe, and the design of the model supports, that the ELU model's false positive errors are the very potential wetlands that we were seeking as candidate mitigation sites; the false positives are likely locations with the same enduring landscape features as existing wetlands that do not currently support a wetland.

The ELU model produced very low classification accuracies for water (< 34%, Table 17), likely due in part to our decision to place water in the non-wetland group when we created wetland presence/absence categories from the ELU combined with our decision to place POWx polygons in the wetland group when we created wetland presence/absence categories from the EPA reference maps. Some wetlands contain open water or appear to from aerial photography (e.g., deep water marshes). Wetlands are often closely associated with water, so there may also be an issue of geographic precision.

For purposes of comparison statistics compiled on the EPA wetland maps in the Wetland Mapping section of this report did not consider palustrine open

water (POWx) polygons to be wetland. However, all palustrine polygons (including POWx) were considered wetland for the accuracy assessment of the ELU and the training of the regression models. These two segments of the project were conducted independently and different definitions of "wetland" were used. We speculate that if the POWx polygons were considered non-wetland for the purposes of training the regression models, the accuracy of the regression models may increase. We also speculate that if the POWx polygons were considered non-wetland for the purposes of the ELU accuracy assessment that the ELU's accuracy would also increase.

ELU vs regression models

The "expert-driven" ELU model and the "data-driven" logistic and autologistic regression models, to which the ELU was compared, each performed well. There are advantages and disadvantages to using either approach to model locations for candidate wetland mitigation sites.

While the ELU model was expert-driven and perhaps more ecologically intuitive and transparent than the regression models, it was also more complicated and time consuming to create. However, the ELU had fewer false positives (58.3%) than the regression models (78.3% – 93.2%) and so it could reduce time spent investigating false positives in the field (Table 16). The best use of the ELU model would be for regions where no reference data, i.e., maps of existing wetlands, exist to train any regression models. It would also serve well if a modeler wanted to search only for a certain enduring landscape feature suitable for a certain type of wetland.

The building of a regression model may be more difficult to explain than the ELU model, which is seemingly a "black box" construct. But the automation of the regression models means that less time is needed to program and run them. Some would argue that the regression models have more scientific merit because there is less "subjective" modeler input involved. They also achieved greater overall accuracy (80.9% and 85.3%) when compared to reference data on existing wetlands than the ELU model (70.4%). This greater accuracy was achieved, however, at a sacrifice to false positives.

ELU vs air photo interpretation

Visually examining the potential wetlands identified by the ELU in relation to the existing wetlands mapped via air photo interpretation helps to relate the two methods. Overlaying the existing wetlands identified via air photo interpretation on a map of wetlands identified by the ELU reveals where the ELU identifies potential wetlands, those that were not mapped and those that are not currently existing (Figure 16). There are 11,514.9 ha (28,453.9 acres) identified by the ELU as potential wetlands (Table 22), mostly in close proximity to existing wetlands (Figure 16). To enhance the comparison, we added the potential wetlands identified by the air photo interpretation (Uf, Udf, and Ufq polygons) to the visual overlay (Figure 17). By area, 17.8% of the Uf/Udf/Ufq locations overlapped ELU-identified wetlands with a majority of the overlap occurring with

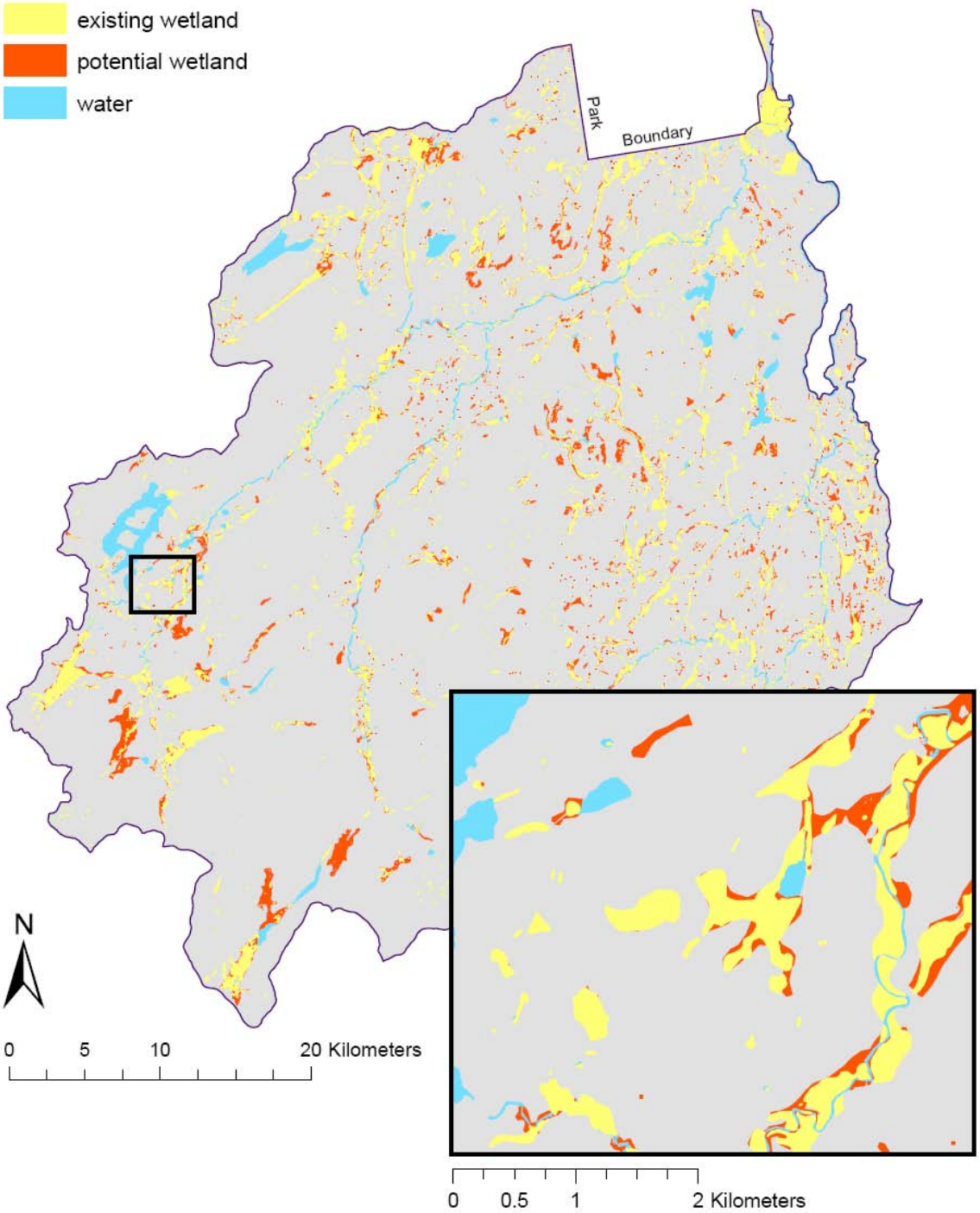


Figure 16. Existing wetlands (according to EPA wetland maps) and potential wetlands (according to the ELU model) in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Table 22. Polygons which were identified by the ELU model as potential wetlands in the AuSable and Boquet River Watershed, Adirondack Park, NY, USA, 2008. Potential wetlands are locations which have the landscape features to potentially support a wetland, but which do not have an existing wetland.

	# polygons	area (ha)	area (acres)
ELU potential wetlands	3885	11514.9	28453.9

ELU wetlands indicated by both a hydric soil (detailed order 2) and a wetland landform (e.g., moist/wet flat or slope bottom) (Table 23). Conversely, 82.2% of the Uf/Udf/Ufq locations overlapped ELU-identified uplands with a majority of the overlap being the broad ELU category “dry flat” (Table 23). These dry flats are areas without any hydric soil, on the drier end of the moisture index, and less than ~11% slope. Water ELU categories equal only 1.26% of the Ufx area and contribute only minimally to any mismatch.

As with anything identified remotely (by the ELU model or air photo interpretation), a site’s particular suitability as a candidate for wetland mitigation should be examined further (e.g., landscape context, ownership, feasibility, etc.), including a field visit to ground-truth the remote findings.

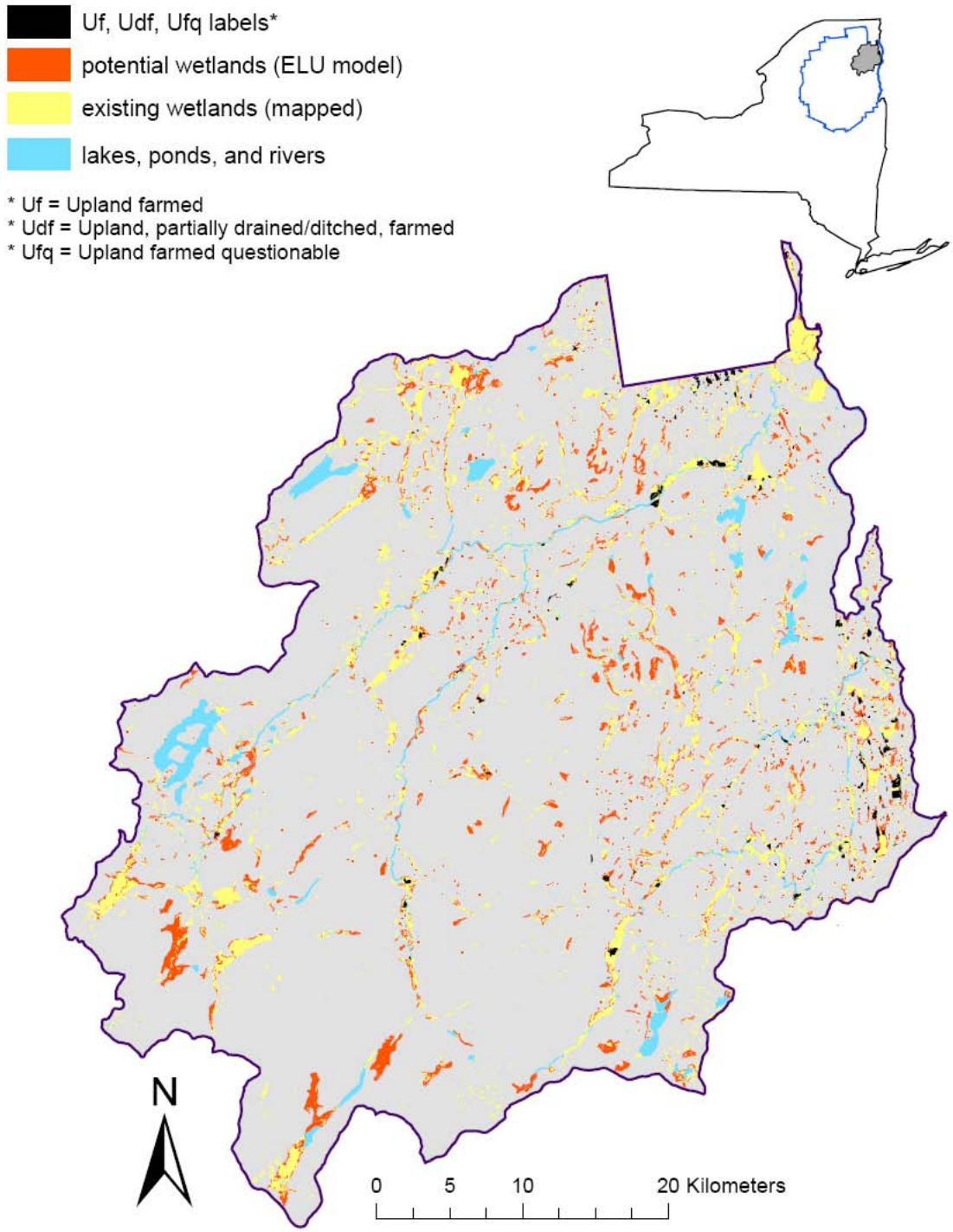


Figure 17. Existing wetlands and Uf, Udf, and Ufq mapped "wetlands" (both according to EPA wetland maps) and potential wetlands (according to the ELU model) in the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Table 23. ELU categories beneath Uf, Udf, and Ufq polygons as mapped by air photo interpretation in the AuSable and Boquet River watershed, Adirondack Park, NY, USA (2008).

ELU	category	Count[a]	Percent	Combined Percent
1	wetland (by detailed soil & landform)	9845	13.14	
2	wetland (by detailed soil)	3009	4.01	
3	wetland (by soil complex & landform)	284	0.38	
4	wetland (by soil complex)	61	0.08	17.82
6	wetland (by soil point & landform)	100	0.13	
7	clay spot	26	0.03	
8	wet spot	30	0.04	
10	cliff	19	0.03	
14	flat summit	902	1.20	
15	not wetland	1261	1.68	
34	dry flat	56869	75.88	82.18
40	stream	1595	2.13	
42	lake	770	1.03	
43	water (by soil survey)	174	0.23	
	Sum	74945	100.00	100.00

[a] Count = number of 10m x 10m gridcells categorized by that particular ELU category

ELU vs soil maps

The ELU model appeared to mirror the maps of hydric soil (Figure 18), but the extra information incorporated into the ELU model adds value to an unmodified SSURGO county soil map. A soil map unit may include up to 40% of its area that is not of the labeled soil series (Tiner 1999). Consequently, up to 40% of a hydric soil unit may in fact be non-hydric soil, and vice versa. Additionally, the series level of soil classification was never intended to separate hydric from non-hydric soils. “Facultative hydric soils” may or may not be hydric, depending on landscape position. Therefore, the ELU adds valuable information by identifying which parts of the hydric soil map units also have probable wetland landforms, thereby also identifying which do not and are potentially non-hydric inclusions.

Hydric soil is a critical element of the ELU model and should not be omitted because of its strong influence on the results. Hydric soil is often used as ancillary data to improve remote-sensing of wetlands (Sader et al. 1995, Cedfeldt et al. 2000, Ozesmi and Bauer 2002, Baker et al. 2006). Because wetland identification relies on proper hydrology, hydric soil, and hydrophytic vegetation, and the ELU model already ignores vegetation, ignoring soil information would result in a model of the only remaining characteristic: hydrology. In the process of making the ELU for the ABW, we examined a map of all areas where potential wetland land positions (i.e., flats, coves, slope

bottoms, side slopes) overlapped with moist or wet moisture indices, without the constraint of any soil information (Figure 10). The resulting map included far too great an area – practically the entire Champlain Valley – and did not realistically identify wetland locations. Soil information was necessary to further refine the hydrology information in the ELU model.

Site Ranking

Interpreting results

It is important to note that many of the sites are closely ranked (within a few numbers) and what this means. For instance, a site ranked 14 is not necessarily a higher priority than a site ranked 15, though it is most likely a better candidate than a site ranked 20. The more different 2 ranks are, the more likely that one site is truly a better candidate for either restoration or preservation. Personal knowledge should be incorporated when making final decisions on restoration or preservation. Important aspects to consider are a project's feasibility from a technical standpoint as well as available funding and landowner cooperation.

Ranking results - restoration

The results from summing the assigned restoration ranks for each site in each watershed are shown in Tables 18 and 19. The top results (the top 6 or 7) for both watersheds are all publicly owned sites with "easily" fixable problems (usually exotic invasive species). It is surprising, however, that South Meadow appeared as the highest ranked candidate for restoration in the AuSable watershed. This ranking is due to the fact that it is such a large, publicly-owned, and easily accessible site with an "easily reversible" problem with the exotic invasive plant, cow vetch. The site also had some scots pine and blue spruce near its edges. Subjectivity arises here, because someone who feels that these species are not a problem would rank this site quite differently.

Ranking results – preservation

The results from summing the assigned preservation ranks for each site in each watershed are shown in Tables 20 and 21. We considered exempting sites from the ranking process that are already protected though ownership (either state-owned or privately owned with a conservation easement), but decided not to; we want to show where preservation efforts should be commenced or continued if they are already in place, or attempted, if they are not.

Note that the presence of an S1 ranked species, indicating its rarity in New York State, elevates the cedar swamp community at the North Branch Boquet – West Road site to the top of the preservation list. This rank indicates that it is a good candidate for preservation. Also realize that there are seven other sites ranked within two of the cedar swamp site. It is not the only preservation priority, just one of the sensible ones. Examining the bottom of the list we find, as expected, that the sites are highly altered.

In the AuSable Watershed, one anomaly seems to be that the poor fen and tamarack-spruce bog at the Mud Pond site (in Black Brook) rank near the

middle of the list. The site is a great example of these communities, of small to medium size, and in good health. One reason these sites may not have ranked higher is that they are located on private land and are therefore not the best for educational purposes and that they are being affected by the neighboring road and culvert, which is currently plugged from beaver activity.

In the Boquet Watershed, it is also worth pointing out that the Crater Club's clayplain forest community ranked only 1 above Essex Station's cattail marsh community in preservation priority. Many would argue that a clayplain forest is much more rare and therefore worth preserving than a cattail marsh. The problem is that both of these sites are small and highly altered, which affects their ranking, as well.

In a few instances, sites near the top of the preservation list also received top ranks on the restoration list. This circumstance does not indicate a problem with the ranking system, just that these sites have small and easily fixable problems which make them strong candidates for both purposes. The South Meadow site's sedge meadow actually ranked at the top of both the restoration and preservation lists in the AuSable Watershed. In the Boquet Watershed, the Thrall Dam wet meadow and shrub swamp and the Cook Road Floodplain's floodplain forest ranked high on both the restoration and preservation lists, as well.

NWI-NHP Crosswalk

The mapping and classification standards employed during the wetland mapping of the AuSable and Boquet quadrangles differ in a few important ways from those used by NYNHP, which made cross-walking between the two occasionally difficult and imprecise. First, the wetland maps are made at the 1:40,000 scale on 1994-1999 color infrared aerial photographs while NYNHP typically uses scales between 1:3,000 and 1:10,000 and digital orthophoto imagery from 2003. These differences in imagery affected the crosswalk interpretation of delineated polygons, both due to the time lag between photos and the "shifting" of boundaries when viewed at the significantly larger scales required to classify the polygons onscreen using GIS. Secondly, NYNHP maps only one community type per polygon unless the types form an inseparable mosaic or have embedded inclusions of other types that are too small to be removed. The NWI labels applied to the wetland maps use both one community to one polygon, and one polygon to many communities, some of which include discrete areas of different structural classes (e.g., conifer swamps and herbaceous dominated marshes). These procedural differences led at times to incongruent typing such that a particular polygon, especially those containing multiple structural classes (e.g PSS4/EM1Eb), may crosswalk to a number of relatively unrelated community types (Appendix 7) or individual community types might be represented by several seemingly unrelated structural classes (Appendix 8).

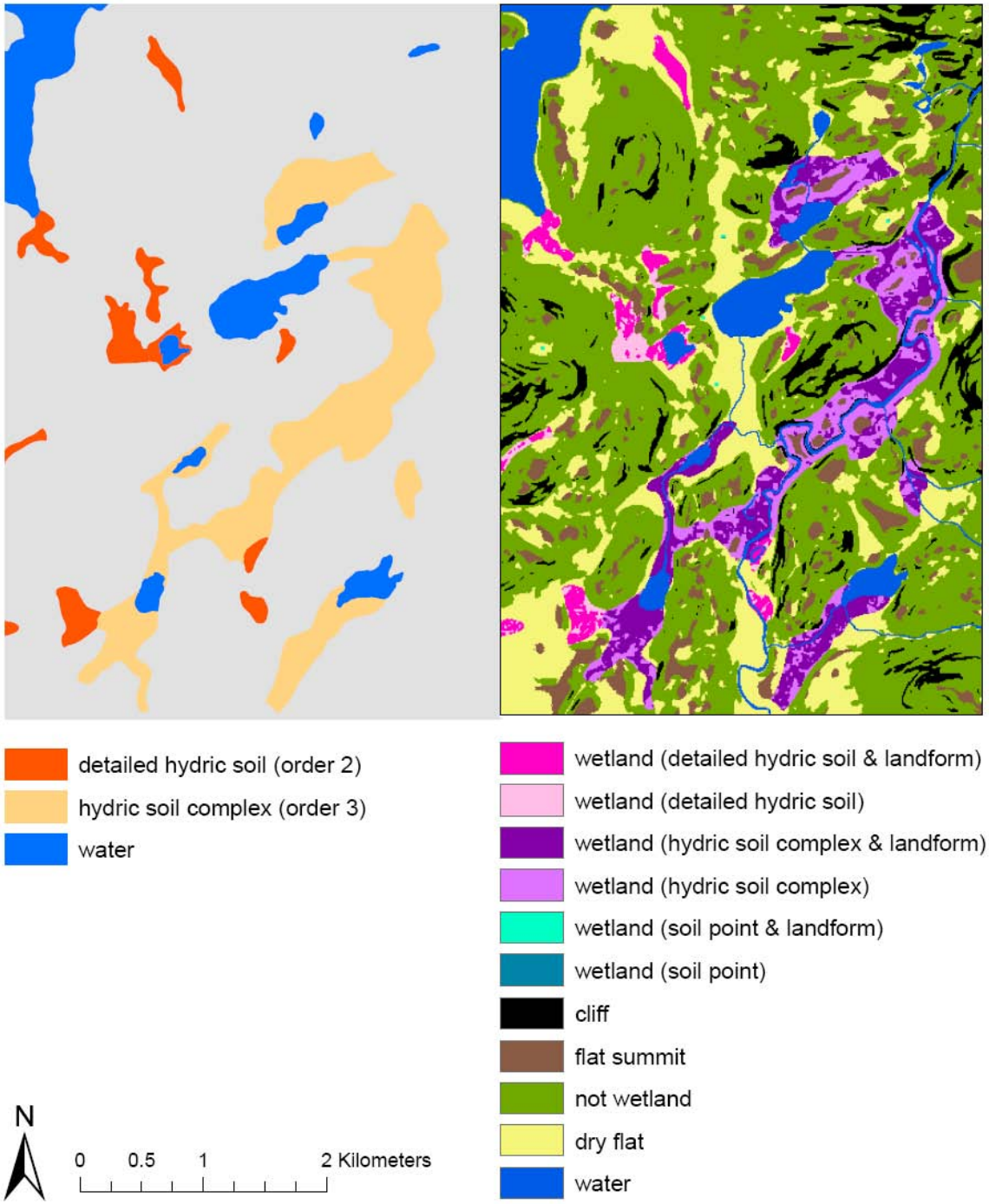


Figure 18. Comparison of NRCS SSURGO soil map and ELU for a zoomed-in portion of the AuSable and Boquet River Watershed, Adirondack Park, New York, USA, 2008.

Future Work

Analysis of Field Sites

The original intent of the air photo interpretation was to inform the 2005 field sites, and the intent of the field sites was to provide an accuracy assessment of the ELU model. As with many projects laid out in advance, reality set a different course. The field sites were chosen when the air photo

interpretation existed only on the aerial photograph transparencies, and not digitally. Twenty-eight different field sites were ultimately examined that included 60 wetland communities, but they were not chosen in a manner or number which allowed them to provide a statistically sound accuracy assessment of the ELU model. The accuracy assessment was, instead, done separately from a stratified random sample of 2000 points (1000 in wetlands, 1000 in non-wetlands) of the digital wetland maps.

We recommend some future analysis of the field site data, which includes species presence by strata and percent cover. Comparisons of the field notes to the wetland label assigned by air photo interpretation and to the ELU model would both be valuable.

Subjectivity

The only way to know how much subjectivity enters into a process is to have an independent party repeat it. The QA/QC protocol for the air photo interpretation should have eliminated most subjectivity from that procedure. It would be interesting to have the ELU model re-built for the same or a different watershed in order to compare methods and results. There are two main areas of subjectivity in the ELU model building process. First, whenever continuous data is divided into categorical data (e.g., separating dry, moist, and wet categories from a moisture index), the decisions on where to separate the continuous data are based on ecological understanding, but are somewhat subjective nonetheless. Second, when translating ELU codes (e.g., 1330 = low-elevation + hydric soil + dry flat) to an ecological expression (e.g., wetland or not?), the decision is informed by the modeler's knowledge and experiences and is also somewhat subjective.

Applications

The purpose of this project, other than creating a digital library of sub-catchment boundaries and wetland polygons, should not be forgotten. The potential wetlands identified by special modifiers on the wetland polygons and by the ELU model should be shared with anyone looking for a candidate wetland mitigation site in the AuSable and Boquet River watershed. Those looking to repeat or improve on these methods in other watersheds (recommended only for areas in the Northeast with similar topography and ecology) should have full access to the details needed to proceed. The creation, testing, and sharing of an automated ELU (e.g., using ArcGIS model builder) would be a good way to promote the use of the ELU model, and has utility for identification of potential wetland restoration sites.

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Appendices

Appendix 1. Final report on AuSable-Boquet river basins wetland aerial photography interpretation by Donald Bogucki.

AU SABLE-BOQUET RIVER BASINS WETLAND AERIAL PHOTOGRAPHY INTERPRETATION

FINAL REPORT

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AUGUST 31, 2004

AU SABLE-BOQUET RIVER BASINS WETLAND AERIAL PHOTOGRAPHY INTERPRETATION

INTRODUCTION

This project was undertaken to obtain a current inventory of wetlands in the Au Sable-Boquet river basins (Figure 1) in the Adirondack Park for the purpose of wetlands protection. In addition, special attention was given to those wetlands that may have been impacted or modified by agriculture or other land use changes. The area of study encompasses approximately 568,000 acres and includes all or portions of 29 7.5-minute USGS quadrangle sheets (Table 1).

METHODS

Phase I - The Adirondack Park Agency supplied all the 1:40000 NAPP (National Aerial Photography Program) color infrared transparency aerial photographs required for the project (222 photos). Each aerial photograph was sorted by flight line and identified with a self-stick label on the upper right hand corner of the transparency and placed in manila folders according to flight line. The location of all photo principal points was marked on the Ogdensburg 1:250000 quad sheet for easy geographic reference. A 9”x 9” clear acetate sheet was secured with drafting tape to each transparency to be delineated, and the quad corners and borders for the 7 ½ minute topographic quads were drawn on the appropriate photo overlay (four photos per quad). In areas of high relief care was taken to compensate for excessive radial image displacement in locating quad borders.

Phase II - The wetlands mapping on the color infrared transparency overlays was completed according to a modified National Wetlands Inventory (NWI) classification system (Cowardin et al. 1979) developed by the Adirondack Park Agency in previous mapping projects. Because even very small wetlands may have significant ecological value and function, all wetlands visible on the photography were delineated and classified. Based upon past work in the Adirondacks, wetlands areas as small as 0.1 acre (depending on signature) often can be identified on the imagery. In order to achieve the smallest line width, the wetland boundaries, always drawn on the upland area around the wetland, were delineated with a 5x0 Staedtler Marsmatic pen with acetate ink. All wetland delineations and classifications, both polygon and linear, were done stereoscopically using a B&L SIS 95 zoom stereoscope. The wetland cover types were classified to system, subsystem, class, subclass, water regime modifier, and special modifiers when appropriate. Some additional nomenclature/ special modifiers were adopted for this project in areas impacted by agriculture and will be defined under the Modified Wetlands section of the report.

Each overlay was edge matched to all adjacent photos. This was done stereoscopically for both the overlays within the study area and to neighboring watersheds (Upper Hudson and Raquette-Grasse). Generally this is not a difficult operation except where the adjacent flight line photography is significantly different from the photo being delineated. Some problems were encountered in edge matching for this project and will be discussed in the problems section.

QUALITY ASSURRANCE/QUALITY CONTROL

In order to provide maximum quality assurance/quality control a combination of field investigation, topographic map analysis, 1:20000 black and white back-up imagery interpretation, and consultation with Adirondack Park Agency personnel was utilized in the wetlands mapping process. Once all the photos were delineated, each overlay was reexamined for wetland delineation and classification accuracy. First, each overlay was checked, utilizing a moveable opaque mask between the photo and the overlay, for

incomplete polygons and/or linears, unlabelled polygons, and overall line quality. Secondly, each photo was checked for any wetlands not delineated and classified. A number of factors affect mapping quality and these conditions will be discussed in the Problems section of the report.

Park Agency staff reviewed all photo overlays, and edits or changes suggested by the Agency were completed in a timely and accurate manner. It is understood that wetlands delineation and classification from aerial photography is an inexact science and the Park Agency has the final say in questionable determinations.

PROBLEMS

Based upon previous experience working with wetlands in the Adirondacks, and specifically in the Au Sable-Boquet watersheds, it was anticipated that two wetland situations would cause the greatest problems in the mapping process, and, indeed, this was the case for this specific project. First, wetland coniferous evergreen forest (PFO4) is inherently difficult to distinguish from adjacent upland coniferous evergreen trees. The boundary usually has to be determined by a gentle break in slope, subtle changes in canopy height/crown size, and/or a slight change in vegetation signature. Secondly, wetlands, especially in the Champlain Valley, have been modified extensively by agriculture and development. Significant drainage and some filling of wetlands have occurred in this area. Adding to the interpretation problem, many areas in the Valley are underlain with dense marine and lacustrine clay soils that make it difficult to delineate wetlands even with undisturbed conditions. The following list, with representative examples, summarizes the range of difficulties encountered in mapping wetlands in the Au Sable/Boquet watersheds:

1. Different Flight Years. Example – Lake Placid east 8766-205 (05/07/95) and Lake Placid west 8023-173 (05/19/94). The problems associated with adjacent flight lines with different dates include (1) slightly different tonal shades which may be caused by differences in emulsion dye lots, exposure values, processing conditions, and/or age of film, (2) changes in wetland conditions caused by increased/decreased beaver activity, changes in hydrology/water level conditions, and/or differences in growing conditions.

2. Snow/Ice. Example – Street Mountain 8023-175. It was difficult to distinguish ice and snow from PEM1 in high elevation ponds and wetlands. Under these conditions it is thought that the delineation is accurate but the classification is questionable.

3. Conifer Wetland-Upland Boundary. Example – North Elba 8766-205. It was difficult to delineate the wetland boundary in these conifer areas. There was little change in signature (color) or crown characteristics. The delineation was based primarily upon a very gentle break in slope.

4. Shadowing. Example – Wilmington 8765-76. Extreme shadowing was present on Catamount Mountain. Color infrared film is notorious for poor detailing in shadow areas. Color infrared film has no blue sensitive layer and is exposed through a minus blue (yellow)
filter. Shadow areas are proportionally higher in blue wavelength electromagnetic energy because of Rayleigh scattering and image dark (often black) on the photography. The ability to delineate and classify wetlands is diminished with the excess shadowing.

5. PFO4/U. Example – North Elba 8765-48. The NE portion of North Meadows has a large conifer bottom-land area. It was difficult to separate out wetland from upland and the label PFO4/U is used in this instance.

6. R4/Logging Roads/ATV Trails. Example – Redford 8765-166. The north side of Potters Mountain has skid roads and possibly ATV trails that resemble R4 intermittent streams.

7. Side Slope Wetlands. Example – Dix Mountain 8765-150. There appears to be a side slope wetland complex complete with beaver activity. The cover type is mostly PFO4/EM1Bb. Side slope wetlands are usually more difficult to identify because topographic lows are the norm for wetland locations.

8. Low Sun Angle. Example - Wilmington 8765-94. The low sun angle on some images makes conifer shadows look like small POWH or POWHb's.

9. Exposure Fall-Off. Example – Au Sable Forks 8766-57. Some strong exposure fall-off on images makes interpretation difficult towards corners of imagery.

10. Upland Signature. Example – Peasleeville 8765-199 and AuSable Forks 8765-201. This area contains significant areas of upland that has a signature very much like PSS1 wetland signature.

11. R4 Headwater Areas. Example – Numerous Areas. It was sometimes difficult to determine exact courses of headwater (R4) intermittent streams, especially in relatively flat areas. Questionable sites were checked with USGS topographic quads.

12. Photo Scales. Example – Peru 8766-90. Some adjacent flight lines had slightly different photo scales, probably the result of minor differences in flight altitude. Adjusting the magnification of the individual eyepieces on the zoom stereoscope compensated for this anomaly.

13. Vernal Pools. Example – Clintonville 8766-159. It was sometimes difficult to identify vernal pools as POWH, PFO1/OWH, or POWHb, especially in higher elevations

14. R2 vs. R3. Example – Lewis 8766-155. Classifying Adirondack River deep-water habitats has been made difficult because of glaciation. Sections of the Au Sable and Boquet Rivers have floodplains and meandering channels (R2 Characteristics) with rapids and bouldery channels (R3 Characteristics).

15. Lake Champlain Wetlands. Example – Keeseville 8016-15 and Willsboro 8016-17. The Lake Champlain wetlands are in flood stage for this photography. Large areas appear to be POWH or L2OWH but in reality are PSS1 and PEM1 with an E water regime modifier.
Unless one were familiar with these wetlands, they would be mapped as open water.

16. Farm Roads vs. Drainage Ditches vs. Hedge Rows. Example – Essex 8014-80. It is sometimes difficult to distinguish between farm roads, drainage ditches, and hedgerows. All three features follow the edges of fields and appear nearly identical on some imagery.

17. Wet Soil vs. Wetland. Example – Peru 8766-163. Probably the hardest interpretation in the watershed. Almost impossible to differentiate between wet soil and wetland in these agricultural areas. Very difficult to figure out pre-agricultural wetland conditions. Much of photo 8766-163 could probably be considered suspect modified wetland. Adding to the problem is that many of the drainage ditches do not appear to be continuous – they may go underground or are incorporated in hedgerows or field/orchard borders.

MODIFIED WETLANDS

In addition to delineating and classifying wetlands in the Au Sable-Boquet watersheds, Adirondack Park Agency staff requested an inventory be undertaken for wetlands that may have been impacted by agricultural practices and/or development. Small stickers were placed on the overlays showing the location of impacted wetlands. The impacted areas were identified by using a small case "f" after the wetland label (PEM1Ef) if the area still appeared to be functioning as a wetland but is presently being farmed. An area was identified as a Uf if the site probably functioned as a wetland in the past but is now more like an upland location (through drainage) and being farmed. The modifier "d" was used where photo evidence indicated the field was drained – usually indicated by straight-line drainage courses across or along fields. It is possible that many drainage features were missed because of subsurface tile drains, ditching along roads, and ditching in hedgerows.

The following list (quad name, photo number, and impact) inventories the wetland areas that were identified as impacted. Sites with a double asterisk (**) appear to be wetlands with the most significant impacts.

1. Lake Placid - 8766-203. There is evidence of drainage ditches along the floodplain of West Branch of Au Sable River.

2. Franklin Falls – 8765-56. Drained pond at West Kilns on Lagus Brook drainage and
   a field that drains into Oncio Pond still looks very wet at the northwest end. It still appears to be farmed.

3. Lake Placid – 8765-50. Dry pond and wet field at North Country School.

4. Wilmington – 8765-162. Large wetland area in middle of large farm field.

5. ** Lake Placid – 8765-160. A floodplain complex located about 1 mile west of Upper Jay. It appears some wetland is currently being farmed and some previously farmed wetland is reverting back to wetland.

6. Redford – 8765-91. A possible Uf was identified approximately 1 inch north of sticker on overlay – there may be some drainage lines in lower portion of field.

7. Wilmington – 8765-93. Some small PSS1/EM1Ef's along flood plain of Little Black Brook just above Newberry Pond.

8. Wilmington – 8765-95. Several locations along Au Sable River northeast of Haselton
where agriculture has impacted wetlands.

9. ** Wilmington – 8765-95. Significant wetland drainage/farming along Beaver Brook floodplain south of Rt. 86.

10. Keene – 8765-95. Minor farming impact on wetlands along East Branch Au Sable
River.

11. ** Keene Valley – 8765-101. Considerable drainage ditching in wetland area at intersection of Rt.73 and Rt. 9N.

12. Keene Valley – 8765-101. The south half of Keene Valley Airport looks much wetter than north half – called it a Uf.

13. Au Sable Forks – 8766-57. Black Brook/West Branch interfluve area – some drainage and farming the wetland. There may also be some wetland that is now functioning as upland.

14. Au Sable Forks – 8766-55. Very wet looking field with drainage lines. This is located on what appears to be an old stream terrace above the East Branch of Au Sable River.

15. Jay Mountain – 8766-53. Large areas of Ufd on tributary to Rocky Branch approximately 2 miles south of Jay.

16. Jay Mountain – 8766-51. Farm fields along Styles Brook have PEM1Ef and possibly some Uf.

17. Au Sable Forks – 8785-203. Flooded field with drainage ditches – probably inundated by beaver activity.

18. Au Sable Forks – 8766-203. Two large fields of Uf and some PEM1Ef at headwaters of Green Street Brook just southwest of Haystack Mountain and northeast of North Jay near North Jay Cemetery.

19. Au Sable Forks – 8766-55. A small field has evidence of drainage – PEM1Ef.

20. Rocky Peak Ridge – 8766-2. Possible drained wetland (evidence of ditching) in northeast corner of quad – labeled Uf.

21. Peru – 8766-90. Lower portion of field just north of Boswell Road appears to be Uf.

22. Peru – 8766-90. Possible Uf north of Mannix Road.

23. Peru – 8766-92. Possible Uf near Caldwell Brook.

24. Peru – 8766-92. Two possible Uf sites northwest of Harkness.

25. Clintonville – 8766-94. Ufd and PEM1Ef along north bank of Au Sable River just east of Clintonville.

26. Lewis – 8766-98. Two very wet large fields (Ufd and PEM1Efd) along North Branch Boquet River at Deerhead.

27. Elizabethtown – 8766-102. Possible Uf and PEM1Ef northeast of Elizabethtown on Boquet River.

28. Elizabethtown – 8766-102. Large Uf south of Elizabethtown on flood plain of Boquet River – also some PEM1Ef.

29. Elizabethtown – 8766-102. Uf, PEM1Efb and PSS1/EM1Efb along Barton Brook northwest of Elizabethtown.

30. ** Peru – 8766-163. Potentially major modifications to pre-agricultural wetlands. Very difficult to interpret because of field cultivation, orchard planting, drainage, and heavy clay, naturally wet soils.

31. Clintonville – 8766-161. Two sites of Uf along floodplain of Au Sable River.

32. Elizabethtown – 8766-153. Very wet looking field (Uf) inside track (?) on Ledge Hill Road. Also some PEM1f nearby.

33. Keeseville – 8016-15. Large areas of flat, clay, poorly drained areas north of Au Sable Point along lake. Difficult to tell if wetland or wet soil. Ditching, drainage, and agriculture also modified this area.

34. ** Willsboro Bay – 8016-19. Very complex area along Mud Brook east of Northway to Port Douglas Road. Wetlands were probably cut and drained for agriculture. The fields appear to have been abandoned and probably functioned as Uf for a while. The beaver now occupy much of the site and the area again is functioning as a wetland.

35. Willsboro – 8016-23. A number of small PEM1Ef along the North Branch Boquet River floodplain.

36. Westport – 8016-27. A few Uf and PEM1Ef along floodplain of Boquet River.

37. Willsboro Bay – 8015-15. Some sizeable Uf south of Willsboro Bay.

38. ** Willsboro – 8015-13. A large area appears to have been drained for agriculture and has now reverted back to wetland with significant beaver activity present.

39. ** Willsboro – 8015-11. A large area of what was once drained fields is reverting back to wetland. Some significant Uf and PEM1Ef areas.

40. ** Essex – 8014-82. A large area currently being farmed but looks as if it may have been wetland prior to agriculture. Has evidence of extensive drainage ditches – located west of Lake Shore Road behind Crater Club.

DISCUSSION

The ability to delineate and classify wetlands from aerial photography depends upon many factors including image quality, emulsion type, photo scale, date of photography, interpretative equipment, uniqueness of wetland signature, photo interpreter ability and experience, and QA/QC protocol. For this project the imagery was generally quite good. With the exception of some low sun angle images, some exposure fall-off, some ice and snow in higher elevations, the U.S.G.S. 1:40000 color infrared positive transparency imagery was high quality photography for delineating wetlands in the Au Sable-Boquet watersheds, and the B&L SIS 95 zoom stereoscope was an ideal instrument to do the interpretation. The QA/QC standards that were adopted for the project dictate that all wetlands with identifiable signatures should have been delineated and classified. It is possible that some wetlands may have been missed (human error) but the interpretation of natural, non-impacted wetlands is considered to be highly accurate.

The ability to delineate and classify wetlands which have been modified by agriculture or development is much more difficult than recognizing non-impacted wetlands. A task that is ordinarily even difficult in the field, identifying wetlands altered by farming practices from aerial photography can only be a first step in examining wetlands impact. The list of modified wetlands in this report provides a starting point for considering possible areas for wetland impact analyses and /or wetland restoration projects.

Appendix 2. GIS data used in AuSable and Boquet River Watershed wetland analysis, Adirondack Park, New York, USA.

Name	Source	Publication Date	Number of Variables	Scale or Resolution	General Description
Adirondack Park Land Use and Development Plan (APLUDP)	NYS APA (shared CD)	1982	14 land use categories	1:24,000 polygons	NYS APA's land classification for land use and development
Adirondack Park watersheds	NYS APA (shared CD)	September 1991	13 watersheds	~1:250,000 polygons	major Park watershed boundaries
Hydrography (lakes)	NYS APA (shared CD)	May 2001	n/a	1:24,000 polygons	lakes and ponds
Hydrography (streams)	NYS APA (shared CD)	May 2001	n/a	1:24,000 lines	streams and rivers
Roads	NYS APA (internal)	July 2007	n/a	1:24,000 lines	original publisher: New York State Office of Cyber Security & Critical Infrastructure Coordination; data created as part of the Accident Location Information System (ALIS) project
Bedrock geology	NYS APA (shared CD)	July 1999	29 categories for material	1:250,000 polygons	from NYS Geological Survey & Chart Series Number 15; attributes: area, perimeter, bedrock, bedrock-id, material, ANC (acid neutralizing capacity)
Surficial geology	NYS APA (shared CD)	February 1999	17 categories for material	1:250,000 polygons	from NYS Geological Survey & Chart Series Number 15; attributes: area, perimeter, surficial, surficial-id, material
Adirondack Park blueline	NYS APA (shared CD)	1991	1 Park	1:24,000 polygon	Adirondack Park boundary
Municipal boundaries	NYS APA (shared CD)	1990	2 counties, 17 towns	1:24,000 polygons	county and town boundaries
Elevation (Digital elevation model, DEM)	NYS APA (internal)	unknown	continuous	10-m grid cells	elevation (m) above sea level; original publisher: U.S. Geological Survey and NYS Department of Environmental Conservation
Land position	derived from DEM	2007	continuous	10-m grid cells	distance weighted elevational difference; a cell's elevation in relation to its neighbors
Moisture	derived from DEM	2007	continuous	10-m grid cells	relative index of potential moisture according to landscape surface drainage and retention
Slope	derived from DEM	2007	continuous	10-m grid cells	degree of slope
Soil	NRCS	Sept/Dec 2006	> 200 map unit symbols	1:24,000 polygons	soil map units/hydric soil for Clinton and Essex counties, NY
EPA wetland maps	NYS APA (internal)	December 2007	2 (wetland = 1, non-wetland = 0)	1:24,000 polygons	wetland polygons with covertype labels, mapped from 1994/95 CIR 1:40,000 aerial photos

Appendix 3. Wetland labels for the AuSable and Boquet River watershed wetlands mapping project, Adirondack Park, NY, USA (2008).

SYSTEMS AND SUBSYSTEMS

R	Riverine		L	Lacustrine		P	Palustrine
		1 Tidal			1 Limnetic		No Subsystems
		2 Lower Perennial			2 Littoral		
		3 Upper Perennial					
		4 Intermittent					
		5 Unknown Perennial*					

CLASSES AND SUBCLASSES

SS	Scrub/Shrub		AB	Aquatic Bed		RS	Rocky Shore	
		1 Broad-Leaved Deciduous			1 Algal			1 Bedrock
		2 Needle-Leaved Deciduous			2 Aquatic Moss Rooted			2 Rubble
		3 Broad-Leaved Evergreen			3 Vascular Floating			
		4 Needle-Leaved Evergreen			4 Vascular Unknown	EM	Emergent	
		5 Dead			5 Submergent* Unknown			1 Persistent
		6 Deciduous*			6 Surface*			2 Non-persistent
		7 Evergreen*						
			ML	Moss/Lichen		US	Unconsolidated Shore	
FO	Forested				1 Moss			1 Cobble / Gravel
		1 Broad-Leaved Deciduous			2 Lichen			2 Sand
		2 Needle-Leaved Deciduous						3 Mud
		3 Broad-Leaved Evergreen	RS	Rock Bottom				4 Organic
		4 Needle-Leaved Evergreen			1 Bedrock			5 Vegetated
		5 Dead			2 Rubble			
		6 Deciduous*				OW	Open Water/Unknown Bottom*	
		7 Evergreen*	SB	Streambed				
					1 Bedrock			
UB	Unconsolidated Bottom				2 Ruble			
		1 Cobble / Gravel			3 Cobble / Gravel			
		2 Sand			4 Sand			
		3 Mud			5 Mud			
		4 Organic			6 Organic			
					7 Vegetated			

WATER REGIME MODIFIERS

Nontidal		Nontidal Combined		Nontidal and Tidal	
A	Temporary	Z	Intermittently Exposed / Permanent (G,E)*	U	Unknown
B	Saturated			K	Artificial
C	Seasonal	W	Intermittently Flooded/Temporary (A,J above)*		
D	Seasonally Flooded -Well Drained				
E	Seasonally Flooded -Saturated	Y	Saturated Semipermanent/All Seasonals (B,C,D,E,F above)*		
F	Semipermanent				
G	Intermittently Exposed				
H	Permanent				
J	Intermittently Flooded				

SPECIAL MODIFIERS

Special		Soils		pH Freshwater	
b	Beaver	g	Organic	a	Acid
d	Partially Drained/Ditched	h	Mineral	t	Circumneutral
f	Farmed			l	Alkaline
h	Diked/Impounded				
q	Questionable*				
r	Artificial				
s	Spoil				
x	Excavated				
/U	Upland Cover Type Mixed with Wetland				

*****Not included in "Classification of Wetlands and Deepwater Habitats of the United States." Created specifically for National Wetland Inventory or Adirondack Park Agency mapping efforts.

Appendix 4. Wetlands data table organized in order of decreasing area

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PFO4/SS4B	317	1201.56	2969.10	9.76
PSS1/EM1E	645	1084.29	2679.32	8.80
PFO4B	649	1084.24	2679.21	8.80
PSS1E	872	775.21	1915.57	6.29
PSS1/EM1Eb	364	690.42	1706.06	5.61
PFO1E	470	569.05	1406.14	4.62
PFO1/SS1E	381	517.82	1279.56	4.20
PFO4/SS4E	234	506.18	1250.80	4.11
PFO4/SS1B	234	391.67	967.84	3.18
PFO5/OWHb	397	361.73	893.86	2.94
PFO4/SS1E	258	352.25	870.43	2.86
PEM1Eb	248	288.33	712.47	2.34
PSS1B	479	277.85	686.57	2.26
PEM1E	241	263.72	651.66	2.14
PEM1Ef	230	240.90	595.28	1.96
PFO4E	250	231.22	571.36	1.88
PFO1/FO4B	132	215.46	532.42	1.75
PFO4/FO1B	89	202.82	501.17	1.65
PSS1/SS4E	188	201.59	498.14	1.64
PFO1/SS1B	173	194.69	481.09	1.58
PFO1B	202	176.40	435.88	1.43
PEM1/OWHb	165	170.77	421.98	1.39
PSS1/EM1B	105	166.15	410.57	1.35
PSS1/SS4B	121	123.95	306.28	1.01
PEM1/OWH	46	113.27	279.90	0.92
L2AB3/OWH	1	95.82	236.77	0.78
PSS4/SS1B	69	89.72	221.70	0.73
PFO1/FO4E	91	87.91	217.23	0.71

Appendix 4. Wetlands data table organized in order of decreasing area, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS1Eb	97	87.70	216.71	0.71
PSS4/SS1E	89	83.98	207.52	0.68
PFO4/FO1E	73	77.26	190.92	0.63
PSS4E	97	72.05	178.04	0.59
PSS1/EM1Fb	27	69.44	171.59	0.56
PSS1/EM1Edf	6	66.38	164.02	0.54
PSS4B	90	63.05	155.79	0.51
PFO4/SS4Eb	42	59.09	146.03	0.48
PSS1/OWHb	47	52.64	130.06	0.43
PFO1/EM1E	28	46.74	115.51	0.38
PFO4/SS4Bb	3	46.50	114.91	0.38
PFO4/EM1E	32	43.96	108.62	0.36
PSS4/EM1E	37	41.65	102.93	0.34
PSS4/EM1Eb	27	41.57	102.72	0.34
PSS4Eb	10	36.49	90.17	0.30
PFO4/SS1Eb	26	29.51	72.93	0.24
PSS1/EM1Ef	16	28.41	70.19	0.23
PEM1B	43	27.44	67.81	0.22
PFO4/OWHb	31	25.94	64.09	0.21
PSS4/EM1B	27	25.94	64.09	0.21
PSS1/EM1Ebfd	1	24.12	59.60	0.20
PSS3B	28	24.03	59.38	0.20
PFO4Eb	25	23.49	58.05	0.19
PFO4/EM1B	20	21.18	52.35	0.17
PFO1/SS1Eb	17	20.73	51.21	0.17
PSS5/OWHb	17	20.60	50.89	0.17
PSS1/EM1Ebdf	2	19.97	49.34	0.16
PFO1/SS1D	7	19.62	48.49	0.16
PSS4/SS3B	9	19.02	47.00	0.15

Appendix 4. Wetlands data table organized in order of decreasing area, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PFO4Bb	19	16.18	39.99	0.13
PAB3/OWHb	2	15.85	39.17	0.13
PSS4/SS1Eb	20	13.93	34.43	0.11
PSS3/EM1B	13	13.84	34.19	0.11
PEM1Edf	12	12.87	31.81	0.10
PSS3/EM1E	4	12.72	31.43	0.10
PFO4D	12	12.26	30.29	0.10
PFO4/SS1Bb	2	11.91	29.43	0.10
PSS1/SS4Eb	11	11.69	28.88	0.09
PFO1/FO4Bb	3	11.45	28.29	0.09
PEM1Bf	12	10.83	26.76	0.09
PEM1D	7	10.67	26.38	0.09
PSS4/SS1Bb	2	10.43	25.77	0.08
PSS1Bf	11	9.99	24.67	0.08
PSS1Ebdf	1	9.54	23.57	0.08
PSS3/EM1Bb	9	9.50	23.47	0.08
PSS1/SS3B	8	9.39	23.20	0.08
PFO4/EM1Eb	11	8.98	22.19	0.07
PFO5/EM1Hb	3	7.29	18.00	0.06
PFO1D	9	7.20	17.78	0.06
PSS1/OWH	17	7.18	17.73	0.06
PSS3/SS4B	3	6.95	17.17	0.06
PFO4/EM1Bb	7	6.89	17.03	0.06
PSS3/EM1Eb	4	6.34	15.66	0.05
PFO1Eb	15	5.59	13.80	0.05
PFO1/FO4Eb	7	5.12	12.66	0.04
PFO4/FO1D	3	4.86	12.02	0.04
PFO4/OWBb	1	4.78	11.80	0.04
PSS1Ebf	3	4.65	11.50	0.04

Appendix 4. Wetlands data table organized in order of decreasing area, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS1Ef	14	4.54	11.21	0.04
PFO1/OWHb	13	4.50	11.11	0.04
PSS4Bb	7	4.42	10.93	0.04
PFO5Eb	5	4.33	10.70	0.04
PSS1/OWE	2	3.99	9.85	0.03
PSS3/OWHb	5	3.95	9.77	0.03
PFO4/FO2B	1	3.93	9.72	0.03
PSS1/SS5Eb	1	3.77	9.31	0.03
PFO1/SS4B	5	3.76	9.29	0.03
PSS1Bb	4	3.68	9.09	0.03
PFO4/FO1Eb	5	3.62	8.94	0.03
PSS4/OWHb	8	3.58	8.85	0.03
PSS3/SS1B	2	3.55	8.78	0.03
PFO4/SS1D	5	3.51	8.67	0.03
PEM1/OWHh	3	3.48	8.60	0.03
PFO1/SS1Bf	1	3.48	8.60	0.03
PFO1/SS4E	9	3.36	8.31	0.03
PSS1D	3	3.28	8.10	0.03
PSS1/EM1Ex	4	3.25	8.03	0.03
PSS4/EM1Bf	1	3.23	7.99	0.03
PFO1Bb	1	3.15	7.78	0.03
PSS1/SS4Bb	3	3.03	7.48	0.02
PFO1/EM1Eb	6	2.99	7.39	0.02
PSS5Eb	1	2.89	7.15	0.02
PFO1/SS4Bb	1	2.88	7.12	0.02
PFO5/EM1Eb	1	2.85	7.05	0.02
PFO4/FO1Bb	1	2.84	7.02	0.02
PSS1/EM1Bd	1	2.68	6.63	0.02
PFO1/EM1B	5	2.47	6.10	0.02

Appendix 4. Wetlands data table organized in order of decreasing area, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PFO1/FO4D	2	2.40	5.93	0.02
PFO1/SS1Bb	1	2.37	5.86	0.02
PSS3Bb	3	2.17	5.37	0.02
PFO1/OWH	5	2.07	5.13	0.02
PFO2/EM1B	3	2.06	5.10	0.02
PSS1/EM1Hb	2	1.95	4.81	0.02
PFO5/SS5Eb	1	1.86	4.60	0.02
PSS1/EM1Bf	5	1.74	4.30	0.01
PAB3/OWH	1	1.73	4.28	0.01
PSS1/EM1Ebd	1	1.55	3.82	0.01
PFO2/SS4B	1	1.54	3.80	0.01
PFO5/OWHbh	1	1.42	3.50	0.01
PFO1/SS1Bh	1	1.35	3.33	0.01
PSS1/SS4Bx	2	1.32	3.25	0.01
PSS4/SS3Bb	1	1.19	2.95	0.01
PFO1Ef	2	1.18	2.92	0.01
PEM1Bx	2	1.04	2.58	0.01
PFO4/SS1b	1	1.01	2.49	0.01
PFO1/SS1Ef	1	1.00	2.47	0.01
PFO1/EM1Ef	1	0.75	1.85	0.01
PSS5/SS4Eb	1	0.74	1.83	0.01
PFO4/OWH	2	0.69	1.71	0.01
PFO4/EM1Hb	2	0.61	1.51	0.00
PFO4/SS4D	1	0.61	1.52	0.00
PFO4/FO5Hb	1	0.60	1.49	0.00
PSS3E	2	0.56	1.39	0.00
PFO1F	3	0.55	1.35	0.00
PSS1/SS3E	1	0.55	1.35	0.00
PFO2/SS1E	1	0.52	1.29	0.00

Appendix 4. Wetlands data table organized in order of decreasing area cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS1/SS4Hb	2	0.49	1.20	0.00
PSS4/EM1Bb	1	0.46	1.14	0.00
PEM1/OWE	1	0.45	1.11	0.00
PSS1Bx	1	0.44	1.08	0.00
PFO5/SS1Bb	1	0.43	1.06	0.00
PSS4/SS1Ex	1	0.40	1.00	0.00
PSS1F	1	0.39	0.97	0.00
PSS4/EM1Ex	1	0.33	0.80	0.00
PFO4/FO5E	2	0.29	0.71	0.00
PFO1/SS1F	1	0.23	0.57	0.00
PFO5/OWH	2	0.23	0.58	0.00
PEM1/OWHx	1	0.20	0.49	0.00
PFO1Bd	1	0.18	0.45	0.00
Total wetlands	9041	12315.00	30430.90	100.00

Appendix 5. Wetlands data table organized in order of decreasing number of occurrences

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS1E	872	775.21	1915.57	6.29
PFO4B	649	1084.24	2679.21	8.80
PSS1/EM1E	645	1084.29	2679.32	8.80
PSS1B	479	277.85	686.57	2.26
PFO1E	470	569.05	1406.14	4.62
PFO5/OWHb	397	361.73	893.86	2.94
PFO1/SS1E	381	517.82	1279.56	4.20
PSS1/EM1Eb	364	690.42	1706.06	5.61
PFO4/SS4B	317	1201.56	2969.10	9.76
PFO4/SS1E	258	352.25	870.43	2.86
PFO4E	250	231.22	571.36	1.88
PEM1Eb	248	288.33	712.47	2.34
PEM1E	241	263.72	651.66	2.14
PFO4/SS1B	234	391.67	967.84	3.18
PFO4/SS4E	234	506.18	1250.80	4.11
PEM1Ef	230	240.90	595.28	1.96
PFO1B	202	176.40	435.88	1.43
PSS1/SS4E	188	201.59	498.14	1.64
PFO1/SS1B	173	194.69	481.09	1.58
PEM1/OWHb	165	170.77	421.98	1.39
PFO1/FO4B	132	215.46	532.42	1.75
PSS1/SS4B	121	123.95	306.28	1.01
PSS1/EM1B	105	166.15	410.57	1.35
PSS1Eb	97	87.70	216.71	0.71
PSS4E	97	72.05	178.04	0.59
PFO1/FO4E	91	87.91	217.23	0.71
PSS4B	90	63.05	155.79	0.51
PFO4/FO1B	89	202.82	501.17	1.65

Appendix 5. Wetlands data table organized in order of decreasing number of occurrences, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS4/SS1E	89	83.98	207.52	0.68
PFO4/FO1E	73	77.26	190.92	0.63
PSS4/SS1B	69	89.72	221.70	0.73
PSS1/OWHb	47	52.64	130.06	0.43
PEM1/OWH	46	113.27	279.90	0.92
PEM1B	43	27.44	67.81	0.22
PFO4/SS4Eb	42	59.09	146.03	0.48
PSS4/EM1E	37	41.65	102.93	0.34
PFO4/EM1E	32	43.96	108.62	0.36
PFO4/OWHb	31	25.94	64.09	0.21
PFO1/EM1E	28	46.74	115.51	0.38
PSS3B	28	24.03	59.38	0.20
PSS1/EM1Fb	27	69.44	171.59	0.56
PSS4/EM1B	27	25.94	64.09	0.21
PSS4/EM1Eb	27	41.57	102.72	0.34
PFO4/SS1Eb	26	29.51	72.93	0.24
PFO4Eb	25	23.49	58.05	0.19
PFO4/EM1B	20	21.18	52.35	0.17
PSS4/SS1Eb	20	13.93	34.43	0.11
PFO4Bb	19	16.18	39.99	0.13
PFO1/SS1Eb	17	20.73	51.21	0.17
PSS1/OWH	17	7.18	17.73	0.06
PSS5/OWHb	17	20.60	50.89	0.17
PSS1/EM1Ef	16	28.41	70.19	0.23
PFO1Eb	15	5.59	13.80	0.05
PSS1Ef	14	4.54	11.21	0.04
PFO1/OWHb	13	4.50	11.11	0.04
PSS3/EM1B	13	13.84	34.19	0.11
PEM1Bf	12	10.83	26.76	0.09

Appendix 5. Wetlands data table organized in order of decreasing number of occurrences, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PEM1Edf	12	12.87	31.81	0.10
PFO4D	12	12.26	30.29	0.10
PFO4/EM1Eb	11	8.98	22.19	0.07
PSS1/SS4Eb	11	11.69	28.88	0.09
PSS1Bf	11	9.99	24.67	0.08
PSS4Eb	10	36.49	90.17	0.30
PFO1/SS4E	9	3.36	8.31	0.03
PFO1D	9	7.20	17.78	0.06
PSS3/EM1Bb	9	9.50	23.47	0.08
PSS4/SS3B	9	19.02	47.00	0.15
PSS1/SS3B	8	9.39	23.20	0.08
PSS4/OWHb	8	3.58	8.85	0.03
PEM1D	7	10.67	26.38	0.09
PFO1/FO4Eb	7	5.12	12.66	0.04
PFO1/SS1D	7	19.62	48.49	0.16
PFO4/EM1Bb	7	6.89	17.03	0.06
PSS4Bb	7	4.42	10.93	0.04
PFO1/EM1Eb	6	2.99	7.39	0.02
PSS1/EM1Edf	6	66.38	164.02	0.54
PFO1/EM1B	5	2.47	6.10	0.02
PFO1/OWH	5	2.07	5.13	0.02
PFO1/SS4B	5	3.76	9.29	0.03
PFO4/FO1Eb	5	3.62	8.94	0.03
PFO4/SS1D	5	3.51	8.67	0.03
PFO5Eb	5	4.33	10.70	0.04
PSS1/EM1Bf	5	1.74	4.30	0.01
PSS3/OWHb	5	3.95	9.77	0.03
PSS1/EM1Ex	4	3.25	8.03	0.03
PSS1Bb	4	3.68	9.09	0.03

Appendix 5. Wetlands data table organized in order of decreasing number of occurrences, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS3/EM1E	4	12.72	31.43	0.10
PSS3/EM1Eb	4	6.34	15.66	0.05
PEM1/OWHh	3	3.48	8.60	0.03
PFO1/FO4Bb	3	11.45	28.29	0.09
PFO1F	3	0.55	1.35	0.00
PFO2/EM1B	3	2.06	5.10	0.02
PFO4/FO1D	3	4.86	12.02	0.04
PFO4/SS4Bb	3	46.50	114.91	0.38
PFO5/EM1Hb	3	7.29	18.00	0.06
PSS1/SS4Bb	3	3.03	7.48	0.02
PSS1D	3	3.28	8.10	0.03
PSS1Ebf	3	4.65	11.50	0.04
PSS3/SS4B	3	6.95	17.17	0.06
PSS3Bb	3	2.17	5.37	0.02
PAB3/OWHb	2	15.85	39.17	0.13
PEM1Bx	2	1.04	2.58	0.01
PFO1/FO4D	2	2.40	5.93	0.02
PFO1Ef	2	1.18	2.92	0.01
PFO4/EM1Hb	2	0.61	1.51	0.00
PFO4/FO5E	2	0.29	0.71	0.00
PFO4/OWH	2	0.69	1.71	0.01
PFO4/SS1Bb	2	11.91	29.43	0.10
PFO5/OWH	2	0.23	0.58	0.00
PSS1/EM1Ebdf	2	19.97	49.34	0.16
PSS1/EM1Hb	2	1.95	4.81	0.02
PSS1/OWE	2	3.99	9.85	0.03
PSS1/SS4Bx	2	1.32	3.25	0.01
PSS1/SS4Hb	2	0.49	1.20	0.00
PSS3/SS1B	2	3.55	8.78	0.03

Appendix 5. Wetlands data table organized in order of decreasing number of occurrences, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS3E	2	0.56	1.39	0.00
PSS4/SS1Bb	2	10.43	25.77	0.08
L2AB3/OWH	1	95.82	236.77	0.78
PAB3/OWH	1	1.73	4.28	0.01
PEM1/OWE	1	0.45	1.11	0.00
PEM1/OWHx	1	0.20	0.49	0.00
PFO1/EM1Ef	1	0.75	1.85	0.01
PFO1/SS1Bb	1	2.37	5.86	0.02
PFO1/SS1Bf	1	3.48	8.60	0.03
PFO1/SS1Bh	1	1.35	3.33	0.01
PFO1/SS1Ef	1	1.00	2.47	0.01
PFO1/SS1F	1	0.23	0.57	0.00
PFO1/SS4Bb	1	2.88	7.12	0.02
PFO1Bb	1	3.15	7.78	0.03
PFO1Bd	1	0.18	0.45	0.00
PFO2/SS1E	1	0.52	1.29	0.00
PFO2/SS4B	1	1.54	3.80	0.01
PFO4/FO1Bb	1	2.84	7.02	0.02
PFO4/FO2B	1	3.93	9.72	0.03
PFO4/FO5Hb	1	0.60	1.49	0.00
PFO4/OWBb	1	4.78	11.80	0.04
PFO4/SS1b	1	1.01	2.49	0.01
PFO4/SS4D	1	0.61	1.52	0.00
PFO5/EM1Eb	1	2.85	7.05	0.02
PFO5/OWHbh	1	1.42	3.50	0.01
PFO5/SS1Bb	1	0.43	1.06	0.00
PFO5/SS5Eb	1	1.86	4.60	0.02
PSS1/EM1Bd	1	2.68	6.63	0.02
PSS1/EM1Ebd	1	1.55	3.82	0.01

Appendix 5. Wetlands data table organized in order of decreasing number of occurrences, cont.

NWI Cover Type Label	Number of Occurrences	Cover Type Area (ha)	Cover Type Area (ac)	% of Wetland Coverage
PSS1/EM1Ebfd	1	24.12	59.60	0.20
PSS1/SS3E	1	0.55	1.35	0.00
PSS1/SS5Eb	1	3.77	9.31	0.03
PSS1Bx	1	0.44	1.08	0.00
PSS1Ebdf	1	9.54	23.57	0.08
PSS1F	1	0.39	0.97	0.00
PSS4/EM1Bb	1	0.46	1.14	0.00
PSS4/EM1Bf	1	3.23	7.99	0.03
PSS4/EM1Ex	1	0.33	0.80	0.00
PSS4/SS1Ex	1	0.40	1.00	0.00
PSS4/SS3Bb	1	1.19	2.95	0.01
PSS5/SS4Eb	1	0.74	1.83	0.01
PSS5Eb	1	2.89	7.15	0.02
Total wetlands	9041	12315.00	30430.90	100.00

Appendix 6. AuSable and Boquet River watershed wetland field site descriptions.

Augur Lake / Mud Pond (APA ID# 26, AuSable Watershed) APA/NHP

Medium fen

This is small shrub-dominated medium fen in a wetland embayment at the south end of Augur Lake, a partially developed lake in the eastern Adirondack foothills. The surrounding wetlands include patches of shallow and deep water marsh, and a floating bog mat featuring a black spruce-tamarack bog. The fen lies within an 82 acre wetland complex located near the northern edge of an irregularly shaped 1,270 acre roadless area. The fen is only somewhat buffered to the northeast, less than 225 m from a residence, but well buffered in the other directions. Beyond the roadless area the surrounding landscape is a combination of residential development, forest lands recovering from recent timber harvest and maturing forest logged after the 1916 fire.

The fen features variable structure ranging from a dense, grounded low shrub-dominated mat, to areas with low shrubs in standing water surrounded by floating-leaved aquatics. The description and cover values are based on three observation points. The tall shrub layer (5 m) is poorly developed with only scattered red maple (*Acer rubrum*) present (<1% cover). The short shrub layer is diverse and somewhat dwarfed, ranging from 0.5 to 1 m in height. Sweet bayberry (*Myrica gale*) is dominant with cover from 55 to 85%. Swamp loosestrife (*Decodon verticillatus*) was the most common associate particularly along the mat edge, reaching 15% cover in areas. The remaining short shrub species include speckled alder (*Alnus incana* ssp. *rugosa*), common winterberry (*Ilex verticillata*), highbush cranberry (*Vaccinium corymbosum*), swamp rose (*Rosa palustris*), and narrow-leaved meadowsweet (*Spiraea alba*), all with less than 5% cover. The herb layer was somewhat sparsely developed on the grounded mat. Royal fern (*Osmunda regalis*), the more abundant species, has up to 9% cover in areas. Marsh St. John's wort (*Triadenum virginicum*), pitcher-plant (*Sarracenia purpurea*), roundleaf sundew (*Drosera rotundifolia*), threeway sedge (*Dulichium arundinaceum*), bristly sedge (*Carex comosa*), and other *Carex* were all present at 2% cover or less. In areas with floating-leaved aquatics, American white water lily (*Nymphaea odorata* ssp. *odorata*) was the most abundant species averaging 20% cover while yellow pond lily (*Nuphar variegata*) was present at <1%. Standing water cover varied from 5-70% locally and some areas of the mat had small areas of bare peat.

This fen occurs in a single patch of 9.11 acres. It is in the low end of the size range for this community type. This community is situated within a moderately sized, but unprotected landscape that is in good condition and classified primarily for resource management. It is intact and well connected to the surrounding wetlands and broader natural landscape. Invasive exotic plants were not observed within the fen or surrounding wetlands. It appears subject to only natural disturbance processes.

The fen is in an area of transition from metanorthosite and anorthositic gneiss, to hybrid rock of metanorthosite and sedimentary rock. The fen is underlain by a complex of Rumney-Burnt Vly soils.

The continued development of the shoreline of Augur Lake or surrounding uplands is the primary potential threat. Any intensive timber harvesting in the surrounding uplands that leads to increased runoff or sedimentation is also a potential threat.

AuSable River Delta, Deep Emergent Marsh (APA ID# 15, AuSable Watershed) APA/NHP

Deep emergent marsh

The extensive emergent marshes along Dead Creek and its backwaters retain a hydrological connection to Lake Champlain, and are one component of a vast wetland mosaic. The wetlands are predominantly high quality, including: shallow and deep emergent marshes (but do include some areas intensively managed, via dredging, for waterfowl), shrub swamp, along with mature and maturing floodplain forest occupying the AuSable River delta. The marsh is located near the edge of an irregularly shaped 700 acre roadless block within a 6,500 landscape comprised of over 75% natural communities (many of them mature or only slightly disturbed) imbedded within a patchwork of agricultural lands, successional old fields and forests, and low density residential development.

The deep emergent marsh described here is on the west side of Dead Creek. It is a moderately sized 25-acre deep emergent marsh that occurs in three patches ranging in size from less than one to 23.5 acres. The patches are separated by 90 m or less. The marsh is associated with an extensive complex of high quality wetland and upland communities occupying extensive deltaic deposits. It is fairly well connected on two sides to its immediate surrounding landscape, but it is has little buffer from roads and dikes adjacent to its both its eastern and western most reaches.

This marsh is in good condition and moderate in size. It is part of a large, important deltaic ecosystem providing a fair to good connection to the broader landscape. The marsh has good inherent habitat and species diversity, corresponding to the gradient of water levels present. The hydrologic regime and connection to Lake Champlain remain intact. Invasive exotic plants are present locally at low to moderate cover.

The deep emergent marsh exhibits well developed zonation with water levels of 0.6 to 1.5 m. The emergent aquatic vegetation height varies among the zones ranging from 0.4 to 1 m and the most abundant species include hardstem bulrush (*Scirpus acutus*, 0-65%), river bulrush (*Bolboschoenus fluviatilis*, 0-60%), common spikerush (*Eleocharis palustris*, 6-25%), and slender bulrush (*Schoenoplectus heterochaetus*, 0-21%). Other associated native emergent species (compiled from all surveys) include broad-leaf cattail (*Typha latifolia*), eastern wild rice (*Zizania aquatica*), pickerelweed (*Pontederia cordata*), broadfruit bur-reed (*Sparganium eurycarpum*), threeway sedge (*Dulichium arundinaceum*), longroot smartweed (*Persicaria amphibia*), and narrowleaf cattail (*Typha angustifolia*). A widely scattered short shrub layer of common buttonbush (*Cephalanthus occidentalis*) averages 1.6 m in height and less than 1% cover and is present in areas with a more consolidated substrate. Locally, patches of submergent and floating-leaved aquatic plants including yellow pond lily (*Nuphar advena*), American white waterlily (*Nymphaea odorata* ssp. *odorata*), watershield (*Brasenia schreberi*) and Canadian waterweed (*Elodea canadensis*) occur in deeper water areas with more open canopies. Invasive exotic plant species including purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*) occur sporadically within the marsh reaching maximum local cover of 4% and 30% respectively. Dredging for the creation of waterfowl habitat has degraded interior portions of the surrounding marsh.

The surficial geology is undifferentiated quaternary age, glacial and alluvial deposits of marine and lacustrine sand. The soils are muck and aquents over alluvial silt and sand.

To ensure the presence of the deep emergent marsh, managers should maintain natural hydrology and channel morphology in the entire wetland complex. They should also eradicate or control exotic plant species, especially purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*), while their populations remain local.

AuSable River Delta, Floodplain Forest (APA ID# 15, AuSable Watershed) APA/NHP

Floodplain forest

This wetland complex is part of the AuSable Marsh State Game Management Area. The floodplain forest is described here. It is a large, high quality mature floodplain forest with an intact flooding regime and well developed levees. It features high species and habitat diversity over the moisture and elevation gradients and is an excellent example of this community for the Lake Champlain valley. A number of exotic invasive plant species are present at low abundance, but otherwise anthropogenic disturbance is minimal. No evidence of past logging was seen.

This extensive floodplain forest occurs on the levees and terraces bordering the upper and lower mouths of the AuSable River where it drains into Lake Champlain. This is part of a deltaic ecosystem supporting a mosaic of high quality wetland and upland communities including a well developed sand spit and extensive sand beaches. The neighboring wetland communities include deep and shallow emergent marshes, and shrub swamps. These wetlands are predominantly high quality, but do include some areas intensively managed, via dredging, for waterfowl. The floodplain forest is located near the edge of an irregularly shaped 700 acre roadless block within a 6,500 landscape. It is comprised of over 75% natural communities (many of them mature or only slightly disturbed) imbedded within a patchwork of agricultural lands, successional old fields and forests, and low density residential development.

This is a very large, 332.6 acre, stable floodplain forest occurring in 5 patches ranging in size from 0.66 to 830 acres and separated by 45 m or less. This community is situated in a moderately sized, partially protected landscape that is fair to excellent condition. Its connectivity among patches and with neighboring wetlands is excellent. Its connection to the broader landscape is good and occurs primarily along the river corridors draining through it.

The floodplain forest's canopy cover varies from 50% to 97% with canopy heights from 22 to 30 m and averaging 27 m. The average diameter at breast height (dbh) of the dominants ranges from 38 to 90 cm locally. The dbh of silver maple (*Acer saccharinum*) ranges up to 95 cm, swamp white oak (*Quercus bicolor*) up to 90 cm dbh, and eastern cottonwood (*Populus deltoides*) up to 80 cm dbh. Overall, silver maple (*Acer saccharinum*) is the most prevalent tree species (18-97%), with scattered local areas where swamp white oak (*Quercus bicolor*, 0-63%) or green ash (*Fraxinus pennsylvanica*, 0-42%) dominate. The subcanopy is poorly developed reaching 15 m and 24% cover locally where it occurs. American basswood (*Tilia americana*, 22%) and green ash (*Fraxinus pennsylvanica*, 3%) were the only species noted in this layer. Additional associate tree species (compiled from all surveys) are eastern cottonwood (*Populus deltoides*), black ash (*Fraxinus nigra*), white ash (*Fraxinus americana*), and butternut (*Juglans cinerea*). Both the tall and short shrub layers are poorly developed reaching 3.3 m and 0.4-1.8 m respectively, with each averaging 2.5% cover. Native tall shrubs in order of frequency (with % cover) include nannyberry (*Viburnum lentago*, 0-5%), boxelder (*Acer negundo*, 0-2%), and silky dogwood (*Cornus amomum*, 0-18%).

The short shrub layer shares all but two species, silky dogwood (*Cornus amomum*) and common winterberry (*Ilex verticillata*, 0-4%), with the tall shrub layer, and also has scattered seedlings of all the dominant tree species. The vine layer is diverse but local and with low cover (0.1-4%). The most important species in decreasing order of prevalence are groundnut (*Apios americana*, 0-3%), American hogpeanut (*Amphicarpaea bracteata*, 0-3%), Virginia creeper (*Parthenocissus quiquefolia*, 0-1%), and eastern poison ivy (*Toxicodendron radicans*, 0-0.3%). The herbaceous layer is very well developed, except in low, dry swales and channels, with cover ranging from 15-98%. Ostrich fern (*Matteuccia struthiopteris*, 1-92%) is dominant except in the low, dry sparsely vegetated areas; other common species (and their average cover) are Canadian woodnettle (*Laportea canadensis*, 5%) and sensitive fern (*Onoclea sensibilis*, 4%). Additional associated herbaceous species (compiled from all surveys) include jewelweed (*Impatiens* sp.), cutleaf coneflower (*Rudbeckia laciniata*), zigzag goldenrod (*Solidago flexicaulis*), Jack in the pulpit (*Arisaema triphyllum*), white snakeroot (*Ageratina altisima*), meadow horsetail (*Equisetum pretense*), field horsetail (*Equisetum arvense*), melic mannagrass (*Glyceria melicaria*), whitegrass (*Leersia virginica*), smallspike false nettle (*Boehmeria cylindrica*), and hop sedge (*Carex lupulina*). A suite of invasive exotic shrubs, vines, and herbs are scattered throughout the forest and open river banks at low cover (averaging 1% or less) including common buckthorn (*Rhamnus cathartica*), reed canarygrass (*Phalaris arundinacea*), creeping jenny (*Lysimachia nummularia*), bouncingbet (*Saponaria officinalis*), climbing nightshade (*Solanum dulcamara*), and American bittersweet (*Celastrus scandens*).

This site is a product of fluvial and wave and wind processes working and reworking unconsolidated glacial lacustrine sediments and quaternary alluvial deposits where these river channels empty into Lake Champlain. Many soil types are present within the floodplain forest varying with their position topographically and with the delta. The mapped soil types are Cornish silt loam, Lovewell very fine sandy loam, fluvaquents - udifluvents complex, saprist and aquents ponded, and udorthents smoothed.

Any management should maintain the natural processes. The invasive exotic plants should be monitored and ideally eradicated or controlled with priority given to reed canarygrass (*Phalaris arundinacea*), common buckthorn (*Rhamnus cathartica*), bouncingbet (*Saponaria officinalis*) and creeping jenny (*Lysimachia nummularia*). Potential additional threats to the floodplain forest include the development or expansion of new or existing dikes, roads, railroads, campgrounds, and/or recreational facilities.

Beaver Brook, North (APA ID# 16, AuSable Watershed) NHP

Sedge meadow, shrub swamp, and shallow emergent marsh

This is an extensive section of moderate quality wetland in a narrow stream valley along a privately owned section of Beaver Brook south of Route 86 in the Town of Wilmington. Located in the Adirondack High Peaks region, the valley has a long history of intensive human use dating back to at least the turn of the 19th century when the area was categorized as open land used for farmland and grazing (APA 2000a). At that time, the valley was surrounded by a landscape that included areas logged for both softwood and hardwood, standing unlogged green timber, and denuded lands. Currently, the uplands surrounding the stream corridor are open agricultural lands, old fields, conifer plantations, conifer dominated successional woodlands, and forests.

The wetland borders a marsh headwater stream and is predominantly a blue-joint reedgrass (*Calamagrostis canadensis* var. *canadensis*) dominated shallow emergent marsh with associates including tussock, lake-bank and three-way sedges (*Carex stricta*, *C. lacustris* and *Dulichium arundinaceum*). The marshes are interspersed with patches of a speckled alder (*Alnus incana* ssp. *rugosa*) and willow (*Salix* spp.) dominated shrub swamp with blue-joint reedgrass (*Calamagrostis canadensis* var. *canadensis*) as an important associate. Beds of emergent and floating leaved aquatic plants including pondweeds (*Potamogeton* spp.) and northern arrowhead (*Sagittaria cuneata*) occupy local sections of the brook, while in some areas the sedges become more abundant and the marsh grades into sedge meadow. Old beaver dams and beaver meadows are frequent along this stretch of the brook and small patches of the invasive plant purple loosestrife (*Lythrum salicaria*) are also present.

The soils of the wetland and streambed are a complex of peat and loam primarily formed in loamy alluvium. These are surrounded by loamy ablation till, sandy glaciofluvial or glaciolacustrine deposits which are all derived from anorthositic gneiss bedrock (USDA. NRCS. 2007).

Beaver Brook, South (APA ID# 16, AuSable Watershed) NHP

Sedge meadow, shrub swamp, and shallow emergent marsh

This is a small section of a larger wetland in a narrow stream valley within the Town of Wilmington in the Adirondack High Peaks region. This section borders Beaver Creek and is bisected by a road. The surrounding uplands have scattered low density residential development along the road embedded within a mix of conifer plantations, beech-maple mesic forest, spruce-northern hardwood forest and hemlock-northern hardwood forest regrowth. Some of these uplands have recently been intensively managed for timber products and, around the turn of the 19th century, the area was primarily open land used for farming and grazing imbedded within waste and denuded lands (APA 2000a).

The wetland borders a marsh headwater stream that has been impacted by intensive beaver activity along with past ditching and draining to aid timber management. As a result, the groundlayer throughout the site is characterized by a high percentage of standing water. The associated wetland mosaic is comprised predominantly of a speckled alder (*Alnus incana* ssp. *rugosa*) and willow (*Salix* spp.) dominated shrub swamp with associates including hardhack spiraea (*Spiraea tomentosa*), silky dogwood (*Cornus amomum*), and blue-joint reedgrass (*Calamagrostis canadensis*). This is interspersed with patches of blue-joint reedgrass dominated shallow emergent marsh and sedge meadows dominated by tussock sedge (*Carex stricta*) and hardhack spiraea (*Spiraea tomentosa*). Associates in the emergent marsh and sedge meadow include marsh fern (*Thelypteris palustris*), water horsetail (*Equisetum fluviatile*), tear-thumb (*Persicaria arifolia*), silky dogwood (*Cornus amomum*), speckled alder (*Alnus incana* ssp. *rugosa*), and the weedy native, reed canary grass (*Phalaris arundinacea*).

The site features a complex suite of soils including fine sands, loamy fine sand, fine sandy loam and peat. The streamside wetland soils have formed primarily in loamy alluvium, with neighboring pockets of sandy ablation till, sandy glaciolacustrine deposits, or loamy lodgement till. These are all derived from the anorthositic gneiss bedrock that is predominant in the Adirondacks (USDA. NRCS. 2007).

Behind Keene Valley School (APA ID# 29, AuSable Watershed) NHP

Shrub swamp

This small, moderate quality wetland complex borders an impoundment formed by the damming of an unnamed tributary that drains a portion Rooster Comb Mountain into the East Branch of the AuSable River. Located in the Adirondack High Peaks region in the Town of Keene on the edge of the Hamlet of Keene Valley, it is surrounded partially by residential and municipal development, while the remainder borders the successional northern hardwood forest, hemlock-northern hardwood forest on the neighboring mountain slopes. This section of the AuSable River Valley has a long history of intensive human use dating to at least the turn of the 19th century, when the area was categorized as open land used for farmland and grazing (APA 2000a).

The wetlands include a shrub swamp dominated by speckled alder (*Alnus incana* ssp. *rugosa*), northern meadow-sweet (*Spiraea alba* var. *latifolia*), and silky dogwood (*Cornus amomum*), with diverse groundlayers dominated by sensitive fern (*Onoclea sensibilis*) and sedges, including inland, bristly-stalk, and owl-fruit sedge (*Carex* cf. *interior, C. leptalea, C. stipata*).

The wetland soils are loamy fine sand and fine sands formed primarily in organic material over either sandy glaciofluvial derived from anorthositic gneiss or sandy glaciolacustrine deposits derived from igneous and sedimentary bedrock (USDA. NRCS. 2007).

Blake Brook (APA ID# 25, AuSable Watershed) APA/NHP

Sedge meadow

This sedge meadow is situated in a narrow stream valley occupied by a series of shallow emergent marshes, shrub swamps, beaver meadows, and in its northernmost reaches, woody dominated peatlands. Its immediate neighboring wetlands are an approximately 50 acre mosaic of good quality shrub swamp, beaver ponds, and shallow emergent marsh embedded in a long but narrow, 2,800-acre, irregularly shaped natural stream corridor unbisected by roads. Beyond the stream corridor to the west lie intensively managed successional forests and conifer plantations, and scattered low density residential development. To the east beyond its narrowly buffered jeep trail are vast northern successional hardwood, beech-maple mesic forests, and spruce-northern hardwood forests varying in age from young to mature that are laced with unpaved logging roads and jeep trails.

This meadow occurs within a long, intact stream corridor; a bridge crosses it 2 miles upstream but its natural flow and channel morphology are maintained. However, unpaved roads do pass within 100 meters of the wetland to the east, bisecting one of its minor tributaries, interrupting the connection with the extensive undeveloped forests surrounding Slush Pond Mountain. The remainder of the immediate landscape is comprised of conifer dominated forests and small upland and wetland openings with a minor component of pine plantation in the uplands to the west. This sedge meadow is moderately sized with the potential for expansion over time. It occurs in six patches ranging in size from 0.13 to 5.98 acres. The hydrologic regime is intact and the meadow has a moderate diversity of species and well developed tussocks. Invasive exotic plants have less than 1% cover.

This open sedge meadow occupies a series of small basins through which Blake Brook flows. It is expanding and contracting over time as the water level of Blake Brook changes. It has well developed tussocks and a sparse scattered shrub layer. The meadow is dominated by tall graminoids reaching an average height of 1 m. Tussock sedge (*Carex stricta*) is the dominant species with 40 - 60% cover, blue-joint reedgrass (*Calamagrotis canadensis*, 20 - 45%) is the most common associate, and hairy sedge (*Carex lacustris*, 0 - 60%) dominates along the marsh edges. Other herbs occurring at 2% or less cover in decreasing order of prevalence are Fraser's marsh St. Johns-wort (*Triadenum fraseri*), rattlesnake mannagrass (*Glyceria canadensis*), eastern marsh fern (*Thelypteris palustris*), tufted loosestrife (*Lysimachia thyrsiflora*), northern bog bedstraw (*Galium labradoricum*), blueflag iris (*Iris versicolor*), broadleaf arrowhead (*Sagittaria latifolia*), spotted jewelweed (*Impatiens capensis*), hooded skullcap (*Scutellaria galericulata*), and bulb-bearing water-hemlock (*Cicuta bulbifera*). The tall and short shrub layers are sparse averaging less than 1% and 3.7% cover, and heights of 2.75 m and 1.4 m respectively. Narrow-leaved meadowsweet (*Spiraea alba* var. *latifolia*, 0 - 4%) and meadow willow (*Salix* c.f. *petiolaris*, 0 -2%) are the most common short shrubs, while speckled alder (*Alnus incana* ssp. *rugosa*) and black spruce (*Picea mariana*) occur as scattered tall shrubs. Sphagnum mosses (0 - 3%) occur in scattered pockets in the low areas between tussocks.

The meadow rests atop a surficial deposit of lacustrine quartz sand, over leucogranite and granite gneiss bedrock. The meadow is underlain by a complex of Beseman - Rumney and Loxley soils comprised of mucks, mucky peat, and silt loam.

Potential threats to this sedge meadow are increased duration of flooding due to natural (beaver) or human-induced hydrologic alterations, and the spread of invasive exotic plants, especially reed canary grass (*Phalaris arundinacea*).

Note: As of June 2007, this land is now under conservation easement the NYS Department of Environmental Conservation.

Cook Road Floodplain (APA ID# 33, Boquet Watershed) APA/NHP

Floodplain forest

This floodplain forest is mature with good species and substrate diversity including higher and lower terraces and a diversity of canopy dominants. Invasive plant species were present but at very low cover. At just under 26 acres, this is a moderately sized floodplain forest.

This stretch of the Boquet River is undammed for more than 20 miles upstream so its flood regime remains intact. The forest has a moderate buffer to its west where it connects to a relatively intact upland forest. It is also buffered somewhat by the open wetlands bordering the east side of the river but these are strongly dominated by reed canary grass (*Phalaris arundinacea*). The forest has a narrow connection with a sizable block of forest in the surrounding mountains and hills immediately to the west of the valley.

This community is a narrow floodplain forest occupying the broad valley of the Boquet River within the lowlands bordering Lake Champlain. Hay fields occur to the north, small open wet meadows and marshes along the east bank of the river and conifer dominated

woodland patches surround the site to the west. A conifer plantation forms the community's southern border. The wider landscape in the valley is dominated by agricultural land managed for hay production and a small amount of low density residential development, and small scattered towns.

This diverse, multi-successional stage floodplain forest occupies a series of terraces and tongues bordering the Boquet River. The diameter at breast height (dbh) of its canopy dominants varies from 18 to 50 cm, and it features a high level of structural, microtopographic and compositional diversity. In local areas along the river, black willow (*Salix nigra*) is present as an emergent tree with 30% cover. Throughout the remainder of the forest the tree layer averages 70% cover, but local areas have only 45%, and the canopy height ranges from 25 to 40, averaging 33 m. The canopy dominants are diverse with different species occupying the distinct microtopographic settings. Green ash (*Fraxinus pennsylvanica*) is the most prevalent species in the lower and moderate height terraces with 0 to 70% cover. Bitternut hickory (*Carya cordiformis*) occurs across the topographic gradient ranging from 0 to 60% cover. On the higher richer terraces, American basswood (*Tilia americana*, 0 to 60%) and sugar maple (*Acer saccharum*, 0 to 20%) dominate. The subcanopy is patchy but well developed where it occurs with heights of 13 to 24 m and averaging 21 m with cover ranging from 7 to 70%. Black maple (*Acer nigrum*) is the most widely distributed and prevalent species with 20 to 70% cover, followed by boxelder (*Acer negundo*, 0 to 15%) and bitternut hickory (*Carya cordiformis*, 0 to 5%). American hornbeam (*Carpinus caroliniana*), green ash (*Fraxinus pennsylvanica*), American basswood (*Tilia americana*), and sugar maple (*Acer saccharum*) are important local associates at 7%, 7%, 10%, and 65% cover respectively. Both the tall and short shrub layers are patchy and sparse with their best development on the higher terraces. They reach a maximum of 7% and 12% cover locally, but respectively average only 2.7% and 3.2% cover, and 3.7 and 0.5 m in height. Each of the prevalent canopy and subcanopy species is present in the tall shrub layer. The only species present that is not represented in these layers is American elm (*Ulmus americana*) at 0 to 4%. The invasive exotic shrub Tatarian honeysuckle (*Lonicera tatarica*) is the most prevalent species in the short shrub layer reaching 10% locally. Common buckthorn (*Rhamnus cathartica*) is also frequent but at cover consistently <1%. American basswood (*Tilia americana*, 0 to 2%) and bitternut hickory (*Carya cordiformis*, 0 to 3%) were the most common native species. The vine layer was very sparse and scattered with only two species, Virginia creeper (*Parthenocissus quinquefolia*) and catbird grape (*Vitis palmata*), present each at 1% local cover. Throughout most of the forest the herbaceous layer (with 14 to 80% cover) was dominated by ostrich fern (*Matteuccia struthiopteris*, 50 to 70%) and Canadian woodnettle (*Laportea Canadensis*, 30 to 50%). Zigzag goldenrod (*Solidago flexicaulis*) was also widely distributed, but never exceeded 5% cover. Other species occurring in special microtopographic niches included (local cover is listed) paleleaf woodland sunflower (*Helianthus strumosus*, 45%), cinnamon fern (*Osmunda cinnamomea*, 35%), white snakeroot (*Ageratina altissima*, 4 to 15%), and winter bentgrass (*Agrostis hyemalis*, 15%). On the highest terraces at cover values of 2% or less, a suite of indicators of rich sites was present including wild leek (*Allium tricoccum*), bloodroot (*Sanguinaria canadensis*), and blue cohosh (*Caulophyllum thalictroides*). The exotic creeping jenny (*Lysimachia nummularia*) was present locally within the site reaching 40% cover in one area. On the lower terraces, bare alluvial sand ranged from 8 to 40% cover, while on the higher terraces and lowest scoured back channels, bare exposed soil ranged from 5 to 60%. Coarse woody debris was also common covering 5 to 15% locally.

Efforts should be made to control or eradicate the exotic the invasive plants, creeping jenny (*Lysimachia nummularia*), Tatarian honeysuckle (*Lonicera tatarica*), and common buckthorn (*Rhamnus carthartica*). Any disruption of the hydrologic regime also poses a potential threat.

Crater Club (APA ID# 11, Boquet Watershed) NHP

Shallow emergent marsh, shrub swamp, and silver maple – ash swamp

This site is located on a small, privately owned ridge just west of Lake Champlain in the Town of Essex, within the western Champlain Valley. It supports small, scattered, low to moderate quality, mineral soil wetlands imbedded within an area of successional woodlands and shrublands. These are surrounded by active agricultural fields and low density residential development. The residual impacts from historic logging and agriculture, including farming and grazing, dating back to the turn of the 19th century are moderate to high (APA 2000a).

Three wetland types were found at this site. The first is a nearly monotypic, common cattail (*Typha latifolia*) dominated shallow emergent marsh with water horsetail (*Equisetum fluviatile*) and scattered silky dogwood (*Cornus amomum*). The second is a dense silky dogwood (*Cornus amomum*) dominated shrub swamp. The third is very small silver maple – ash swamp (*Acer saccharinum – Fraxinus* sp. swamp) variant dominated by swamp white oak *(Quercus bicolor*) and green ash (*Fraxinus pennsylvanica*), over a shrubby understory of non-native buckthorn (*Rhamnus cathartica*) with pockets of sedges (*Carex grayi*, and *C. lupulina*), spotted jewelweed (*Impatiens capensis*), violets (*Viola* spp.), and swamp white oak *(Quercus bicolor*) and green ash (*Fraxinus pennsylvanica*) seedlings.

The site has an exceptional diversity of soils. These include fine sandy loam, loamy fine sands, clay, silty clay loam, silt loams and very cobbly fine sandy loam. These were formed in clayey, silty, or sandy glaciolacustrine deposits derived from limestone, dolostone, shale or sandstone bedrock, along with loamy lodgment till derived from limestone bedrock (USDA. NRCS. 2007).

Little Cherry Patch Pond (APA ID# 17, AuSable Watershed) NHP

Shallow emergent marsh, poor fen, medium fen, and black spruce – tamarack bog

This small, moderate quality wetland complex borders Little Cherry Patch Pond and its inlet stream in the Adirondack High Peaks region in the Town of North Elba. The complex is embedded in an area that was classified as standing green timber at the turn of the 19th century (APA 2000). More recently the wetlands have been impacted by raised water levels resulting from hydrologic alterations that have occurred during the construction and ongoing maintenance of Highway 86. The surrounding area has a recent history of both natural and human disturbance from the softwood logging and burning around the turn of the 19th century to the extensive loss of canopy cover (50-100%) during the 1950 blowdown (APA 2000a , APA 2000b).

The site currently supports a mosaic of wetland types including shallow emergent marsh, inland poor fen, medium fen and open canopied conifer wetlands. A common cattail (*Typha latifolia*) dominated marsh borders portions of the pond along with the inlet and outlet streams. The inland poor fen and medium fen occur as small, patchy

areas on both floating and grounded mats bordering the pond and outlet stream. The poor fen areas are dominated by sphagnum mosses, silvery and beaked sedges *(Carex canescens* and *C. utriculata*), while the medium fen is dominated by sweet gale (*Myrica gale*) and tussock sedge (*Carex stricta*). The open canopied black spruce-tamarack bog is dominated by tamarack (*Larix laricina*), black spruce (*Picea mariana*), and leatherleaf (*Chamaedaphne calyculata*).

The wetland soils include a complex of peat and loam soils formed primarily in loamy alluvium, with peripheral areas of loamy lodgement till both derived from gneiss bedrock (USDA. NRCS. 2007).

Military Pond Outlet (APA ID# 24, AuSable Watershed) APA/NHP

Northern white cedar swamp

The wetlands here are in a basin surrounding Military Pond. The northern white cedar swamp is a diverse, mature swamp with a good amount of structural, microtopographic and compositional diversity. Invasive exotic species are lacking within the occurrence, but hydrologic disruptions from beaver activity along Military Pond outlet appear to have killed off northern white cedar, diminishing the size of the cedar dominated area. At 19.4 acres, this is a moderately sized example of northern white cedar swamp that may have potential to increase in extent. This occurrence lies along the eastern edge of a more than 500-acre core area of mixed conifer peatland and swamp lying within a large wetland basin bordered by roads, but unbisected. The larger landscape supports managed forest lands, numerous wetland-lined stream corridors, ponds and scattered agricultural development.

This wetland community is a moist to wet cedar swamp occupying a portion of a large peatland complex bordering a large stream-side basin between three ridges in the northeast Adirondacks. Extensive wetlands including dwarf shrub bog, shallow emergent marsh, red maple-hardwood swamp and possibly spruce-fir swamp share its basin. In the surrounding uplands it is bordered by spruce northern hardwood forests along most of its eastern and southern edges. It is situated near the edge of an irregularly shaped, 3,075-acre roadless area and is currently buffered by a minimum of 40 m from the well-maintained dirt access road to its east. To the south and west, a mix of spruce-fir northern hardwood and successional northern hardwood forests form the matrix at low elevations giving way to hardwood forests on the upper slopes and ridges. These forests are in various states of recovery from prior logging. The surrounding lands are classified as Resource Management, while Rural Use lands lie west, north, and southeast and Wild Forest lands lie to the east.

This swamp features a good amount of structural, microtopographic and compositional diversity. The tree layer has a fairly open canopy, with an average of 15 m in height and 55% cover. It is strongly dominated by northern white cedar (*Thuja occidentalis*) which averages 50% cover. Other canopy associates with cover of 4% or less include balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), and red maple (*Acer rubrum*). The tall shrub layer is well developed and diverse, averaging 4.5 m in height and ranges from 16 to 25% cover. Balsam fir (*Abies balsamea*, 4 to 12% cover) and speckled alder (*Alnus incana* ssp. *rugosa*, 3 to 10% cover) are the most important species. A diversity of associates are also present averaging 2 to 4% cover locally. In order of decreasing prevalence, they are red maple (*Acer rubrum*), northern white cedar (*Thuja occidentalis*), and black ash (*Fraxinus nigra*). The short shrub layer is patchy, with dense

cover averaging 65% and a height of 1.6 m in areas of more open canopy, and scattered individuals reaching only 5% cover and 1-m tall in areas with a well developed canopy and tall shrub layer. Speckled alder (*Alnus incana* ssp. *rugosa*) is dominant (40%) in more open areas. A diversity of associates are present throughout the swamp with cover ranging from 10 to 1%, these include (in decreasing order of prevalence) balsam fir (*Abies balsamea*), common winterberry (*Ilex verticillata*), black spruce (*Picea mariana*), dwarf red blackberry (*Rubus pubescens*), mountain holly (*Nemopanthus mucronatus*), black ash (*Fraxinus nigra*), and northern wild raisin (*Viburnum nudum* var. *cassinoides*). The herbaceous layer has an average height of 0.6 m and cover ranging from 28 to 50%. It is diverse with species occupying the many niches provided by the water filled mucky hollows, dry hummocks, moss carpet, and decomposing coarse woody debris. Cinnamon fern (*Osmunda cinnamomea*) is dominant with 15 to 20% cover, sedges (*Carex* spp.) are also important with cover of individual species ranging from 2 to 15%. Creeping snowberry (*Gaultheria hispidula*) is common with 1-5% cover, while northern bugleweed (*Lycopus uniflorus*), bunchberry (*Cornus canadensis*), eastern marsh fern (*Thelypteris palustris*), wild sarsaparilla (*Aralia nudicaulis*), and beggartick (*Bidens* sp.) were also present at 2 to 3% cover. Numerous other herb species reach 1% cover or less. The nonvascular layer, composed nearly exclusively by *Sphagnum* spp., is very well developed with cover ranging from 67 to 90%.

The swamp rests upon till and kame deposits overlying leucogranite and granite gneiss bedrock. The soils associated with this cedar swamp are members of two complexes: the Beseman-Loxeley-Rumney and Searsport-Borosaprists-Naumberg series.

The primary potential threat to this swamp is cedar mortality resulting from increased flooding due to natural (beaver) or human-induced hydrologic alterations.

Note: The land is under conservation easement which may allow future logging but will preclude development.

Mud Pond, in Black Brook (APA ID# 21, AuSable Watershed) APA/NHP

Dwarf shrub bog, black spruce-tamarack bog, spruce-fir swamp

This 23.3-acre dwarf shrub bog occurs as two patches of 8.3 and 15.0 acres, separated by less than 5 m. The bog is a moderately-sized example of this community. This community lies within a 200-acre roadless core that adjoins a large, protected landscape in good to excellent condition. The bog is fairly well connected to its landscape, except to the south where a road and power line corridor each bisect its outlet stream.

The dwarf shrub bog is situated in a small hanging valley situated on glacial till between two mountains in the western Adirondack foothills. It forms a portion of the headwaters of a large lake lying in the valley to the southwest. A narrow band of swamp surrounds the bog to the east and west. Black spruce-tamarack bog forms its western edge. The forested bog grades into a small band of spruce-fir swamp which also borders the shrub bog to the east. Immediately south of the shrub bog the forested matrix is broken up by a field, a few residences with extensive lawns, along with utility and road corridors that cross the bog's outlet stream. The bog lies within a 200-acre core unbisected by roads, on the edge of an extensive "intact" forest. To its north the bogs is buffered by only 50 m from a jeep trail. The "intact" forest is comprised of a mosaic of more than 6,500 acres of spruce-northern hardwoods, pine-northern hardwoods, and beech-maple mesic forests. Many of these forests have been logged; as a result they are traversed by many

logging roads and trails. The wider landscape is dominated by extensive conifer forests, and lakes with interceding areas of forested wetlands, low mountains, small hamlets, and scattered low density housing.

The extensive, shrub-dominated bog mat covers nearly half of the area of Mud Pond. The tree layer averages 9 m in height and is patchy with cover ranging from 18 to 30% where it occurs. Tamarack (*Larix laricina*, 3-30%) and black spruce (*Picea mariana*, 0-20%) are the dominant species. The short shrub layer is very diverse and strongly dominated by ericaceous shrubs. It ranges in height from an excessively stunted 0.1 m to 0.5 m, with an average of just over 0.4 m. Leatherleaf (*Chamaedaphne calyculata*) is the overwhelming dominant with 15 to 65% cover. Other prevalent shrub species are sheep laurel (*Kalmia angustifolia*, 0-15%), bog Labrador tea (*Rhododendron groenlandicum*, 0-10%), white pine (*Pinus strobus*, 0-3%) and small cranberry (*Vaccinium oxycoccos*, 0-1%). The tall shrub layer was patchy with tamarack (*Larix laricina*, 7%) and black spruce (*Picea mariana*, 3-10%), and averaged 3.75 m and 13% cover where present. The herbaceous layer averaged 0.4 m but reached 0.7 m in the area dominated by woolyfruit sedge (*Carex lasiocarpa*). The most frequent species were tawny cottongrass (*Eriophorum virginicum*, 0-15%) and pitcher plant (*Sarracenia purpurea*, 0-2%). Other herbs present locally in one of the bog's numerous microhabitats (hummocks, hollows, pools, and Sphagnum lawns and carpets) include softleaf sedge (*Carex disperma*), mud sedge (*Carex limosa*), threeseeded sedge (*Carex trisperma*), roundleaf sundew (*Drosera rotundifolia*), and white beakrush (*Rhynchospora alba*). The nonvascular layer was strongly dominated by Sphagnum with cover values ranging from a high of 98% in wetter areas with very stunted shrubs, down to 75% in areas where the short shrub layer was taller.

The bog has formed in a depression within a mantle of glacial till deposited over crystalline silicate rock of charnockite, granitic and quartz syenite gneiss. The bog is underlain by Loxley-Beseman Complex muck soils.

The primary potential threat to this bog is alteration to the hydrology of Mud Pond.

Noblewood (APA ID# 7, Boquet Watershed) NHP

Silver maple-ash swamp

This small, moderate quality site is located with Noblewood Park at the confluence of the Boquet River and Lake Champlain in the Lake Champlain Valley in the Town of Willsboro. At the turn of the century, this area was embedded in a matrix of open land that was used for farming and grazing (APA 2000a). The surrounding upland slopes and ridges within Noblewood Park are hemlock-northern hardwood forest and seepy beech-maple mesic forest. Beyond Noblewood Park is a mosaic of low density residential development, successional forests, and old fields.

The lowlands feature an alternating series of wetland and upland community types. The uplands bordering the river mouth are open sand spits and beaches that provide important habitat for migrating and resident birds. Just inland from the river, the uplands support dry forest communities dominated by white pines (*Pinus strobus*) and oaks (*Quercus* spp.), while the low depressions have sparsely vegetated pools that maintain a seasonal hydrologic connection to Lake Champlain. The pools are surrounded by a variant of silver maple-ash swamp. The canopy overhanging the pools is dominated by large swamp white oak (*Quercus bicolor*), with associated green ash

(*Fraxinus pennsylvanica*) and Freeman maple (*Acer x freemanii*). Herbaceous cover is very low and patchy. Scattered shrubs are present including common winterberry (*Ilex verticillata*), northern meadow-sweet (*Spiraea alba* var. *latifolia*), and red osier dogwood (*Cornus sericea* ssp. *sericea*). The invasive plant, creeping jenny (*Lysimachia nummularia*), is present locally. Along the river, upstream of the confluence is a diverse, young, somewhat springy area transitional between shrub swamp and young floodplain forest with hydrology apparently altered by the bisecting road that leads to the canoe launch along the river. Its dominants are small diameter trees and saplings of silver maple (*Acer saccharinum*) and black ash (*Fraxinus nigra*) over a hummocky groundlayer dominated by a diverse suite of ferns, including ostrich, sensitive, cinnamon and royal ferns (*Matteuccia struthiopteris, Onoclea sensibilis, Osmunda cinnamomea, O. regalis*), and common cattail (*Typha latifolia*). Higher terrace areas also support bitternut hickory (*Carya cordiformis*) and larger diameter green ash (*Fraxinus pennsylvanica*), silver (*Acer saccharinum*) and Freeman maple (*Acer x freemanii*) trees.

The wetland soils are fine sandy loam formed primarily in loamy alluvium derived from limestone and dolostone bedrock with smaller areas of sandy glaciolacustrine deposits derived from igneous and sedimentary bedrock (USDA. NRCS. 2007).

North Wadhams (APA ID# 1, Boquet Watershed) NHP

Shallow emergent marsh, deep emergent marsh, floodplain forest

This is a low to moderate quality wetland complex bordering the main stem of the Boquet River, in the western Lake Champlain Valley in the Town of Westport. This section of the Boquet River Valley has a long history of intensive human use dating back to at least the turn of the 19th century when the area was categorized as open land used for farmland and grazing (APA 2000a). Currently, this portion of the valley has an extensive farmland matrix with small villages, low density development, and embedded low foothills covered with hemlock-northern hardwood forests.

The complex features a narrow strip of young floodplain forest occupying a high river terrace and an old backwater slough in various stages of succession. Its wetlands feature a mosaic of shallow and deep emergent marsh, along with a higher drier variant of floodplain forest. The quality of the marshes has been degraded by the invasion and spread of the invasive exotic plants purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis* ssp. *australis*). Native species are also present. The most abundant native species in the shallow emergent marsh are common cattail (*Typha latifolia*), blue-joint reedgrass (*Calamagrostis canadensis* var. *canadensis*), and the lake-bank, mountain fringed, and porcupine sedges (*Carex lacustris, C. gynandra,* and *C. hystericina*). The floodplain forest is dominated by musclewood (*Carpinus caroliniana* ssp. *virginiana*) with American basswood (*Tilia americana*) and sugar maple (*Acer saccharum*) as canopy associates and a predominantly fern and vine dominated groundlayer over bare scoured sand. The most common species in the groundlayer are sensitive and ostrich ferns (*Onoclea sensibilis* and *Matteuccia struthiopteris)* and eastern poison ivy (*Toxicodendron radicans*). Additional herb species of note include pale-leaf sunflower (*Helianthus strumosus*) and broad-leaved goldenrod (*Solidago flexicaulis*). The invasive plants creeping jenny (*Lysimachia nummularia*) and Japanese barberry (*Berberis thunbergii*) are also present. A deep emergent marsh is present in the large, old oxbow in the center of the wetland. It is dominated by pondweeds (*Potamogeton* spp.) with variegated yellow pond-lily (*Nuphar variegata*) as the most common associate.

The wetland soils are fine sandy loams, loamy fine sand, and silt loam formed in loamy alluvium, or silty glaciolacustrine deposits both derived from anorthosite and sedimentary bedrock. The higher elevation upland areas formed in loamy ablation till or loamy till derived from anorthosite and sedimentary bedrock (USDA. NRCS. 2007).

Riverside Road (APA ID# 18, AuSable Watershed) NHP

Shrub swamp, shallow emergent marsh

This moderate to low quality wetland complex in and around an oxbow, borders an actively meandering section of the West Branch of the AuSable River in the Adirondack High Peaks region in the Town of North Elba. The valley bordering this branch of the AuSable has a long history of agriculture. At the turn of the century this area was classified as open land used for farming and grazing (APA 2000a). Currently, the area features low density residential and recreational development including golf courses and an airport, active hay fields, successional old fields, and shrublands, embedded within a matrix of regrown spruce-northern hardwood forest and conifer dominated flats communities.

The oxbow's water level was formerly maintained by a beaver dam which has been recently breached. The wetlands surrounding the meander are disturbed and successional. They include a speckled alder (*Alnus incana* ssp. *rugosa*) dominated shrub swamp, a shallow emergent marsh dominated the weedy native, reed canary gras*s* (*Phalaris arundinacea*), with scattered pockets of red spruce (*Picea rubens*), a revegetating bed of a formerly beaver maintained oxbow lake and a frequently flooded, mowed grass field.

The wetland soils are loam and a complex of frequently flooded fluvaquents-udifluvents formed in loamy alluvium derived from gneiss or igneous and sedimentary bedrock (USDA. NRCS. 2007).

Riverside Road/Rt. 86 Junction (APA ID# 30, AuSable Watershed) NHP

Shrub swamp, shallow emergent marsh, and red maple-hardwood swamp

This moderate quality wetland complex occurs along a gently meandering section of the West Branch of the AuSable River in the Town of North Elba within the Adirondack High Peaks region. The area straddles lands that were logged for softwood or supported green timber at the turn of the 19th century (APA 2000a). Currently, the surrounding uplands are predominantly mature or maturing spruce-northern hardwood forests embedded with ponds, lakes and small tributary streams. Many of the lakes and ponds support open peatland communities, while beaver dams and meadows are frequent along the stream drainages.

This site features three oxbow lakes in varying stages of succession. The vegetation of the old oxbow includes shrub swamp, shallow emergent marsh, and seepy red maple-hardwood swamps. The shrub swamp is dominated by speckled alder (*Alnus incana* ssp. *rugosa*) and northern meadow-sweet (*Spiraea alba* var. *latifolia*), with meadow willow (*Salix c.f. petiolaris*) as an associate. Sapling sized northern white cedar (*Thuja occidentalis*) and black ash (*Fraxinus nigra*) are also frequent. The diverse groundlayer is dominated by Canada manna-grass (*Glyceria canadensis*) and lake-bank sedge (*Carex*

lacustris), with associates including fringed sedge (*Carex crinita*), marsh cinquefoil (*Comarum palustre*), swamp loosestrife (*Lysimachia terrestris*), and sensitive and crested shield ferns (*Onoclea sensibilis* and *Dryopteris cristata*). The seepy hardwood swamp is dominated by yellow birch (*Betula alleghaniensis*) with black ash and American elm (*Ulmus americana*) over a patchy shrub layer of speckled alder, dwarf red blackberry (*Rubus pubescens*) and scattered balsam fir (*Abies balsamea*) saplings. The groundlayer is characterized by hummocks and water filled hollows. Its flora is diverse with roundleaf goldenrod (*Solidago patula*), fowl mannagrass (*Glyceria striata*), spotted jewelweed (*Impatiens capensis*), sensitive fern (*Onoclea sensibilis*), purplestem aster (*Symphyotrichum puniceum* var. *puniceum*), and nodding, owlfruit, and longhair sedges (*Carex gynandra*, *C. stipata*, *C. comosa*) as the most common species. The shallow emergent marsh occupying most newly dewatered areas is dominated by creeping bentgrass (*Agrostis stolonifera*) with fowl mannagrass (*Glyceria striata*) and sensitive fern (*Onoclea sensibilis*), along with scattered shrubs of hardhack spiraea (*Spiraea tomentosa*) and speckled alder.

The wetland soils are primarily a hydric complex of loams and fine sandy loams formed in loamy alluvium derived from pyroxene-quartz syenite gneiss bedrock. The surrounding uplands are capped with loamy till derived from the same gneiss bedrock (USDA. NRCS. 2007).

Rogers Pond at Coon Mountain (APA ID# 2, Boquet Watershed) NHP

Flooded conifer swamp, deep emergent marsh

This low to moderate quality wetland complex is nestled between Coon Mountain and Ainger Hill in the Town of Westport in the western Lake Champlain Valley. This portion of the valley has a long history of agriculture. At the turn of the century, the surrounding areas were classified as open land used for farming and grazing (APA 2000a). The lands adjacent to the complex are a mix of scattered low density residential development. The surrounding slopes and low hills are covered with hemlock-northern hardwood and beech-maple mesic forests featuring a mix of northern hardwoods and the more typically Appalachian species of oaks and hickories. Agriculture, focused predominantly on hay and forage production, is the dominant land use in the neighboring valley.

The wetlands have been impacted by beaver activity resulting in raised water levels in the outlet stream and a subsequent die off of the conifer swamp which formerly occupied much of the basin. A small, wet peat mat does persist surrounding the remaining open water in the center of the pond. Species reported from the mat include tamarack (*Larix laricina*), pitcher plant (*Sarracenia purpurea*), and sphagnum moss. Marsh species tolerant of higher water levels including common cattail (*Typha latifolia*) and hairy swamp loosestrife (*Decodon verticillatus*) have colonized the areas in the eastern portion of the basin. The outlet stream supports beds of deep emergent marsh, dominated by floating leaved aquatic plants, particularly pondweeds (*Potamegeton* spp.). In the shallower water areas and along the shore, blueflag (*Iris versicolor*) and marsh fern (*Thelypteris palustris*) are common. The invasive plant purple loosestrife (*Lythrum salicaria*) is present in the outlet stream and open water of the basin.

The wetland soils are peats formed in either organic material or glaviofluvial deposits. The surrounding uplands are capped with sandy and loamy tills derived from igneous and sedimentary bedrock (USDA. NRCS. 2007).

Rt. 73/9N Junction (Norton Brook Meadow) (APA ID# 20, AuSable Watershed) NHP

Shallow emergent marsh

This site features a low to moderate quality wetland complex situated in a small glacial lake bed that formerly occupied the nearly level river valley bordering meandering sections of Norton Brook. It is located along the East Branch of the AuSable River in the Town of Keene in the Adirondack High Peaks region. This section of the AuSable River Valley and the surrounding hillsides have a long history of intensive human use dating back at least to the turn of the 19th century, when the area was categorized as open land used for farmland and grazing (APA 2000a). At the time, the higher slopes and mountains were predominantly green timber with interspersed burned over areas. At present, the surrounding area consists of low density residential development, successional old fields, shrub swamp embedded within lower mountain slopes supporting beech-maple mesic, hemlock-northern hardwood, and spruce-northern hardwood forests.

The wetland features a disturbed, open shallow emergent marsh strongly dominated by reed canary grass (*Phalaris arundinacea*) with scattered small patches of willow shrubs *(Salix c.f. petiolaris*). Other herbs present at very low cover include bluegrasses (*Poa* spp.), American purple vetch (*Vicia americana*), and spotted joe-pye-weed (*Eutrochium maculatum* var. *maculatum*). The eastern portion of the marsh is impounded by Route 73 and common cattail is (*Typha latifolia*) the most common species there. The unimpounded marsh is mowed regularly to maintain its open character. Willow (*Salix* spp.) dominated shrub swamps and pockets of lowland hardwoods surround the meadow.

The wetland soils are silt loams formed in silty alluvium derived from gneiss bedrock (USDA. NRCS. 2007).

South Meadow (APA ID# 19, AuSable Watershed) APA/NHP

Sedge meadow, shrub swamp, shallow and deep emergent marsh, and mixed conifer swamp

This sedge meadow is moderately-sized and situated in a former glacial lake basin within the northern High Peaks of the Adirondacks. It is bordered by relatively discrete patches of shrub swamp, shallow and deep emergent marsh, and mixed conifer swamps. The surrounding upland communities are mature and maturing: hemlock-northern hardwoods on the lower slopes and flats, transitioning to beech-maple mesic forest or spruce-northern hardwood forest, and grading into mountain spruce-fir forest as elevation increases on the surrounding mountain slopes.

This is a species poor example of a sedge meadow, with more than 90% of its plant species diversity concentrated along the brook. However, invasive exotic plants are absent. The characteristic tussock microtopography is present, and the natural hydrologic regime is intact. At 30 acres, this is a moderate-sized example of this meadow type. It occurs as seven patches separated by 90 m or less. This meadow is imbedded in a more than 30,000-acre block of natural wetlands and forests, unbisected by roads, near the western edge of the High Peaks Wilderness Area.

The sedge meadow is open and extensive with well developed tussocks, occupying the slightly raised terraces bordering South Meadow and Klondike Brooks. The meadow is nearly monotypic in composition east of South Meadow Brook, and tussock sedge (*Carex stricta*) is strongly dominant throughout, except along the brook margins. The species cover data are based on two observation points and a walk through the meadow. Scattered trees of both black spruce and tamarack reaching up to 13 m are present at under 1% cover. The tall shrub layer (2.1 m) is patchy with scattered peachleaf willow (*Salix amygdaloides*) and speckled alder (*Alnus incana* ssp. *rugosa*) totaling under 1% cover. The short shrub layer (1.2 m) is sparse with narrow-leaved meadowsweet (*Spiraea alba*) and meadow willow (*Salix petiolaris* c.f.). It is best developed in the southern patches and west of South Brook reaching up to 8% cover locally. The herbaceous layer (0.9 m) is dense, 93% cover or higher, but relatively species poor. Tussock sedge (*Carex stricta*) is dominant with cover ranging from 93% east of South Meadow to 80% west of the river. Blue-joint reedgrass (*Calamagrostis canadensis*) cover reaches 15% locally but was absent within the surveyed area east of South Meadow brook. Other notable herbs present (at 2% or less cover) either west of or along the brooks include roundleaf goldenrod (*Solidago patula*), rough-leaf goldenrod (*Solidago rugosa*), golden ragwort (*Packera aurea*), swamp milkweed (*Asclepias incarnata*), bedstraw (*Galium* sp.), American vetch (*Vicia americana*), spotted joepyeweed (*Eutrochium maculatum var. maculatum*), devil's darning needles (*Clematis virginiana*), flat-top fragrant goldenrod (*Euthamia graminfolia*), Canada mannagrass (*Glyceria canadensis*), sensitive fern (*Onoclea sensibilis*), and brome (*Bromus* sp.). *Carex* spp. duff has up to 6% cover with the greatest amount in the monotypic areas.

The underlying bedrock is metanorthosite and anorthositic gneiss. The soils are of the Burnt Vly - Rumney - Pleasant Valley complex.

Significant forest acreage surrounding the occurrence was burned prior to 1916, and additional pockets of blowdown occurred in 1950. One pocket of logging of softwoods in the wetland complex's easternmost portion occurred prior to 1916. The other bordering lands were standing green timber unburned as of 1916 and have not been logged since.

No potential threats were noted.

Sycamore Floodplain (APA ID# 6, Boquet Watershed) APA/NHP

Floodplain forest

This floodplain forest on narrow alluvial terraces of the Bouquet River is just above its confluence with Lake Champlain and embedded in a matrix of active and abandoned agricultural lands, pine plantations, small villages, and scattered patches of natural forest and wetlands in various states of disturbance. The adjacent uplands to the north and south are forested with hemlock-northern hardwoods, and beech-maple mesic forest totaling approximately 400 acres in two patches. Shrub swamps and shallow emergent marshes are in fair to good condition totaling 400 acres. They occur in the low, more permanently inundated depressions behind the terraces and in the low backwaters that remain hydrologically connected to the river. Certain patches of the forest are very poorly buffered, with only topography or a narrow strip of native vegetation separating them from agricultural fields or sand mining pits. The river is dammed less than one mile upstream of the occurrence but the effects of ecological processes resulting from yearly flooding are still evident. Upstream, scattered patches of native vegetation line the river but in general floodplain forest development is lacking.

The floodplain is centered within an irregularly shaped 790-acre area of young to mature forest and agricultural fields unbisected by roads.

The forest has good canopy and subcanopy tree species diversity. Structural complexity is beginning to develop with patches representing canopy-dominant diameter at breast height (dbh) sizes from pole to mature. The forest includes a moderate diversity of herbaceous species and habitats across the hydrologic gradient, with invasive exotics present but at low cover (less than 1%). Recovery from past disturbances of grazing and perhaps logging is progressing.

The floodplain forest is 33 acres, a moderately sized example for the St. Lawrence-Lake Champlain ecoregion. The forest is situated within a small, protected natural landscape of varying successional states that is fragmented from the remainder of the natural landscape by agriculture, residential, and municipal development. It has only fair connections to other natural portions of the landscape primarily via the river and lake.

A series of patches occupying the high alluvial terraces, and low forested swales bordering the main river channel, this floodplain forest is comprised of a mixture of young to mature forest patches with canopy heights ranging from 17 to 32 m. The dominant tree is silver maple (*Acer saccharinum*, 15-65 cm dbh) with green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), and Freeman maple (*Acer* x *freemanii*) present locally within the various patches. Overall canopy tree average dbh varies with patch maturity ranging from 15-20 cm in the younger stands, while in the mature stands it is 26 cm for green ash (*Fraxinus pennsylvanica*), 80 cm for sycamore (*Platanus occidentalis*), and 65 cm for silver/Freeman maple (*Acer saccharinum/* x *freemanii)*. Additional tree species noted in earlier surveys of the stand on the north bank just above the confluence are: red maple (*Acer rubrum*), bitternut hickory (*Carya cordiformis*), and swamp white oak (*Quercus bicolor*). Both the tall and short shrub layers are generally sparse and local, with a few areas of dense silver maple (*Acer saccharinum*) seedlings reaching 1.7 m and 37% cover. Green ash (*Fraxinus pennsylvanica*, 0-7%), American elm (*Ulmus americana*, <1%) are also present in the short shrub layer. American elm (*Ulmus americana*, 0-4%) at an average of 4-m tall was the only species documented in the tall shrub layer. The ground layer was strongly fern dominated but varied with microtopographic setting. Ostrich fern (*Matteuccia struthiopteris*, 0-98%), sensitive fern (*Onoclea sensibilis*, 10-96%) and rice cutgrass (*Leersia oryzoides*, 0-53%) are the most prevalent species. Additional minor associates (maximum cover <5%) in the herbaceous layer are redtop (*Agrostis gigantean*), common boneset (*Eupatorium perfoliatum*), Canadian woodnettle (*Laportea canadensis*), calico aster (*Symphyotrichum lateriflorum*), crowned beggarticks (*Bidens coronata*), spotted jewelweed (*Impatiens capensis*), riverbank wildrye (*Elymus riparius*), and cardinalflower (*Lobelia cardinalis*). Invasive exotic plants present locally and at low cover (<2%) are garlic mustard (*Alliaria petiolata*), creeping jenny (*Lysimachia nummularia*), purple loosestrife (*Lythrum salicaria*), and Japanese knotweed (*Fallopia* c.f. *japonica* var. *japonica*). Structural complexity is developing in the more mature patches where standing snags (13 -68 cm) of the dominant canopy species are present.

The predominant soils are Rippowam fine sandy loams.

The primary potential threats are alterations to the flooding regime from changes in management of the Willsboro Dam and the continued spread of invasive exotic plant

species. Efforts to eradicate the invasive exotic plant species present should be considered while their populations remain small.

Taylor Mountain Pond (APA ID# 46, Boquet Watershed) NHP

Dwarf shrub bog, shrub swamp, and transitional sedge meadow-shallow emergent marsh

This moderate quality wetland complex occupies an area of glacial inwash bordering a lacustrine delta in a somewhat narrow stream valley between Taylor and Carson Mountains. Located in the Town of Lewis in the eastern Adirondack Foothills, the complex has formed as a series of natural (beaver) impoundments and is fed by tributaries draining Oak Hill and Carson Mountain. It is embedded in a matrix of hills and mountains that were covered with standing green timber around the turn of the 19th century (APA 2000a). During this period the area including the bordering valley lands and some lower slopes were open land used for farming and grazing. Currently, a small area of open agricultural field is present just beyond the wetland boundary and low density residential development is common along the roads. The surrounding area features a matrix of extensive beech-maple mesic, hemlock-northern hardwood, and spruce-northern hardwood forests in various stages of maturity due to past logging and natural disturbance. Embedded with this matrix are a few quarries, numerous ponds, and small peatlands.

The site supports a stream-side mosaic of both peatland and mineral soil wetlands whose outlet stream drains into Big Pond. Past hydrologic alterations from beaver activity have drowned a sizable area of the conifer swamp. The remaining wetlands include a dwarf shrub bog dominated by leatherleaf (*Chamaedaphne calyculata)* and sphagnum mosses with scattered trees and tall saplings of black spruce (*Picea mariana*) and tamarack (*Larix laricina*) with a sparse layer of herbs featuring lake-bank and tussock sedge (*Carex lacustris* and *C. stricta*). An herbaceous wetland, transitional between sedge meadow and shallow emergent marsh, is also present. It is dominated by tussock sedge, blue-joint reedgrass (*Calamagrostis canadensis* var. *canadensis*), lake-bank sedge (*Carex lacustris*) sphagnum mosses and speckled alder (*Alnus incana* ssp. *rugosa*) intermingled with a significant amount of decaying herbaceous leaf litter. Along the edges of the bog and marsh, small areas of speckled alder dominated shrub swamp are present with red osier dogwood (*Cornus sericea*), saplings of red maple (*Acer rubrum* var. *rubrum*), and tamarack (*Larix laricina*). Standing dead conifer snags are common throughout the wetland.

The wetland soils are a complex of occasionally flooded loam and peat formed in organic material over sandy glaciofluvial deposits (USDA. NRCS. 2007).

Webb-Royce Swamp (APA ID# 5, Boquet Watershed) NHP

Shallow emergent (cattail) marsh

This is a half public, half privately owned, low-quality wetland straddling the boundary between the Towns of Essex and Westport in the Lake Champlain Valley. It is imbedded within an agricultural landscape of row crops and hay fields and adjoins the forested portion of the Split Rock Wild Forest. The area has a long history of disturbance and around the turn of the 19th century it was primarily open land used for farming and grazing (APA 2000a).

The wetland formerly supported both open water and swamp white oak (*Quercus bicolor*) dominated forested wetlands. Its current composition and condition of the wetland reflect the relatively recent and extensive impacts from water level changes resulting from both ditching and beaver damming. These changes to the swamp's hydrology have facilitated its conversion to a dense nearly monotypic common tail (*Typha latifolia*) marsh with scattered shrubs and small green ash (*Fraxinus pennsylvanica*) trees.

The wetland soils include both mucky silty clay loam and mucky peat soils formed primarily in organic material over clayey glaciolacustrine deposits overlying rich limestone and dolostone bedrock (USDA. NRCS. 2007).

Wickham Marsh (APA ID#22, AuSable Watershed) NHP

Deep emergent marsh, shrub fen, northern white cedar swamp

This large variable-quality wetland complex on post-glacial deltaic sands along the shore of Lake Champlain in the Town of Chesterfield features a mosaic of streams, marshes, fens and swamps. The area is embedded in lands with a history of disturbance dating back to the turn of the 19th century (APA 2000a). The disturbances included logging, farming, and grazing, while most of the uplands bordering the marsh supported green timber. Currently, the uplands support a matrix of forests embedded with conifer plantations and low density residential development. Forest types present in the immediate vicinity include successional northern hardwood, pitch pine-oak, maple-basswood rich mesic, and hemlock-northern hardwood forests.

Deep emergent marsh covers the greatest area within the complex but its highest quality communities are a rich shrub fen in its center and narrow bands of northern white cedar swamp that line much of its northern and southern periphery. The rich shrub fen and northern white cedar swamp are considered significant community occurrences from a statewide perspective by NY Natural Heritage. The quality of the site has been lowered by prior ditching, dredging, and dike construction conducted as part of past waterfowl management efforts in the marsh and shrub swamp. Construction of an embankment for a railroad and a road has impounded the eastern edge of the swamp and greatly decreased its hydrologic connection to Lake Champlain. As a result of these past disturbances, the invasive exotic plants common reed *(Phragmites australis* ssp. *australis*) and purple loosestrife (*Lythrum salicaria*) have become well established in the wetland.

The emergent vegetation marsh is dominated by common cattail (*Typha latifolia*) with dense patches of sweet gale (*Myrica gale*) and hairy swamp loosestrife (*Decodon verticillatus*), with swamp milkweed (*Asclepias incarnata*) and American woollyfruit sedge (*Carex lasiocarpa*). Spring-fed marsh headwater streams flow through the marsh and support dense beds of the floating leaved aquatics variegated yellow pond-lily (*Nuphar variegata*) and white water-lily (*Nymphaea odorata* ssp. *odorata*) along much of their course. The northern white cedar swamp is dominated by northern white cedar (*Thuja occidentalis)*, cinnamon fern *(Osmunda cinnamomea)*, and naked bishop's cap *(Mitella nuda*). The rich shrub fen is dominated by American woollyfruit sedge (*Carex lasiocarpa*), leatherleaf (*Chamaedaphne calyculata)* and large cranberry (*Vaccinium macrocarpon)*. Smaller areas of shallow emergent marsh and shrub swamp are found

along the streams and between the fen and cedar swamp. Beaver have been active throughout the site raising water levels in the marsh and drowning portions of the cedar swamp, killing numerous trees.

The underlying wetland soils are a mix of fine sandy loam and muck soils formed on organic material, gravelly outwash derived from limestone bedrock, sandy glaciolacustrine deposits and loamy alluvium both derived from igneous and sedimentary bedrock (USDA. NRCS. 2007).

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Appendix 7. National Wetland Inventory classification code to NY Natural Heritage Program potential ecological communities crosswalk. First approximation (8-28-07) with revisions through 9-16-08.

NWI	NWI code as text	Potential NYNHP ecological communities	Comments
L1OWH	Lacustine, limnetic, open water unknown bottom, permanent	Any of our unvegetated lake types, except for Great Lakes types, that occur in this part of NY.	Summer-stratified monomictic lake is limited to Lake Champlain within the AuSable/Boquet watershed
L1OWHb	Lacustine, limnetic, open water unknown bottom, permanent, beaver	Eutrophic pond	
L1OWHh	Lacustine, limnetic, open water unknown bottom, permanent, diked or impounded	Reservoir/artificial impoundment	
PEM1/OWH	Palustrine emergent persistent, open water permanent	Shallow emergent marsh or Deep emergent marsh	Deep emergent marsh with >= 30% cover of persistent spp such as cattails or Canada bluejoint grass. **At least one of these is mislabeled POW/EM1H.**
PEM1/OWHb	Palustrine emergent persistent, open water permanent, beaver	Eutrophic pond or Shallow emergent marsh or Deep emergent marsh or Sedge meadow	Deep emergent marsh with >= 30% cover of persistent spp such as cattails or Canada bluejoint grass
PEM1/OWHh	Palustrine emergent persistent, open water permanent, diked or impounded	Impounded marsh or reedgrass/purple loosestrife marsh	
PEM1B	Palustrine emergent persistent, saturated	Shallow emergent marsh or Inland poor fen	The "B" indicates saturation. Typically the interpreter would look for the absence of streams or other drainage channels. I get the impression that shallow emergent marsh or inland poor fen may have channels within them. If so, they would be interpreted as "E", seasonally flooded/saturated.
PEM1Bf	Palustrine emergent persistent, saturated, farmed	Cropland	
PEM1Bx	Palustrine emergent persistent, saturated, excavated	Shallow emergent marsh	The condition may be "degraded" via compositional simplification
PEM1D	Palustrine emergent persistent, seasonally flooded well drained	Inland non-calcareous lakeshore (riverside variant) or Cobble shore wet meadow	Similar to inland lakeshore types but these are noted as having flooded or saturated hydrology. Cobble shore meadows are apparently restricted to Lake Champlain and the St. Lawrence River.
PEM1E	Palustrine emergent persistent, seasonally flooded saturated	Sedge meadow or Shallow emergent marsh	See note for PEM1B above.

PEM1Eb	Palustrine emergent persistent, seasonally flooded saturated, beaver	Sedge meadow or Shallow emergent marsh	Depending on the amount of beaver activity and the stage of succession, the condition may be "degraded" via compositional simplification
PEM1Ef	Palustrine emergent persistent, seasonally flooded saturated, farmed	Cropland	
PEM1Efd	Palustrine emergent persistent, seasonally flooded saturated, farmed, partially drained/ditched	Cropland	
PFO1/EM1E	Palustrine forested broad-lvd deciduous, emergent persistent, seasonally flooded saturated	Red maple - hardwood swamp	What about Silver maple - ash swamp? These can have an emergent componet and are probably more common than red maple swamps in the Lake Champlain floodplain. Possibly also Floodplain Forest and perhaps Vernal Pool.
PFO1/FO4B	Palustrine forested broad-lvd deciduous, forested needle-lvd evergreen, saturated	Red maple - tamarack peat swamp or Hemlock-hardwood swamp or Northern white cedar swamp or Spruce - fir swamp	Red maple - tamarack peat swamp would be limited to rich sites.
PFO1/FO4Bb	Palustrine forested broad-lvd deciduous, forested needle-lvd evergreen, saturated beaver	Red maple - tamarack peat swamp or Hemlock-hardwood swamp or Northern white cedar swamp or Spruce - fir swamp	Depending on the amount of beaver activity and the stage of succession, the condition may be "degraded" via compositional simplification. Red maple - tamarack peat swamp would be limited to rich sites.
PFO1/FO4D	Palustrine forested broad-lvd deciduous, forested needle-lvd evergreen, seasonally flooded well drained	Floodplain forest	The Adirondack variant with red maple and balsam fir as components.
PFO1/FO4E	Palustrine forested broad-lvd deciduous, forested needle-lvd evergreen, seasonally flooded saturated	Red maple - hardwood swamp or Hemlock - hardwood swamp	
PFO1/FO4Eb	Palustrine forested broad-lvd deciduous, forested needle-lvd evergreen, seasonally flooded saturated, beaver	Red maple - hardwood swamp or Hemlock - hardwood swamp	
PFO1/OWHb	Palustrine forested broad-lvd deciduous, open water unknown bottom, permanent, beaver	Floodplain forest or Red maple - hardwood swamp or Eutrophic pond	
PFO1/SS1B	Palustrine forested broad-lvd deciduous, scrub shrub broad-lvd deciduous, saturated	Red maple - hardwood swamp or Silver maple - ash swamp Red maple-Tamarack peat swamp	
PFO1/SS1D	Palustrine forested broad-lvd deciduous deciduous, scrub shrub broad-lvd deciduous, seasonally flooded well drained	Floodplain forest. This could definitely include Silver maple-ash swamp and perhaps Red maple-hardwood swamp.	Open canopied or with regenerating patches

PFO1/SS1E	Palustrine forested broad-lvd deciduous, scrub shrub broad-lvd deciduous, seasonally flooded saturated	Red maple -hardwood swamp or Silver maple - ash swamp or Red maple - black gum swamp or Shrub swamp	Red maple - black gum swamp potential would be limited to the Lake Champlain Valley. By definition there are no tree sized plants in Shrub swamp, therefore no FO1 component can be present.
PFO1/SS1F	Palustrine forested broad-lvd deciduous, scrub shrub broad-lvd deciduous, semipermanent	Red maple - hardwood swamp or Shrub swamp	Depending on the amount of flooding and the stage of succession, the condition my be "degraded" via compositional simplification. The type may eventually convert to emergent vegetation. By definition there are no tree sized plants in Shrub swamp, therefore no FO1 component can be present.
PFO1/SS4E	Palustrine forested broad-lvd deciduous, scrub shrub needle-lvd evergreen, seasonally flooded saturated	Hemlock - hardwood swamp	One attributed example in four quads. Dominated by hardwoods with a significant component of conifer <= 6 meters.
PFO1B	Palustrine forested broad-lvd deciduous, saturated	Red maple - hardwood swamp or Silver maple - ash swamp	Silver maple - ash swamp would be limited to low elevation sites in the Champlain Valley.
PFO1Bb	Palustrine forested broad-lvd deciduous, saturated, beaver	Red maple - hardwood swamp	
PFO1D	Palustrine forested broad-lvd deciduous, seasonally flooded well drained	Floodplain forest. This could definitely include Silver maple-ash swamp and perhaps Red maple-hardwood swamp.	
PFO1E	Palustrine forested broad-lvd deciduous, seasonally flooded saturated	Red maple -hardwood swamp or Silver maple - ash swamp or Red maple - black gum swamp	Red maple - black gum swamp potential would be limited to the Lake Champlain Valley. Black gum not identified north of Bolton Landing on Lake George.
PFO1Ef	Palustrine forested broad-lvd deciduous, seasonally flooded saturated, farmed	Degraded: Red maple - hardwood swamp or Silver -maple ash swamp	
PFO2/SS1E	Palustrine forested needle-lvd deciduous, scrub shrub broad-lvd deciduous, seasonally flooded saturated	Red maple - tamarack peat swamp or Highbush blueberry bog thicket or Black spruce - tamarack bog	Flooding regime may remove conifer component over time and trend site towards hardwood or shrub swamp. Red maple - tamarack peat swamp would be limited to rich sites.
PFO4/EM1B	Palustrine forested needle-lvd evergreen, emergent persistent, saturated	Inland poor fen or Regenerating/young: Black spruce - tamarack bog (variant lacking tamarack) or Spruce - fir swamp or Northern white cedar swamp	Northern white cedar swamp is limited to rich bedrock or groundwater sites.

PFO4/EM1Bb	Palustrine forested needle-lvd evergreen, emergent persistent, saturated, beaver	Regenerating/young: Black spruce - tamarack bog (variant lacking tamarack) or Spruce - fir swamp or Northern white cedar swamp	
PFO4/EM1E	Palustrine forested needle-lvd evergreen, emergent persistent, seasonally flooded saturated	Hemlock - hardwood swamp or Spruce - fir swamp; Shallow emergent marsh	Things typed with a mix of FO and EM are likely to include discrete areas of two distinct NYNHP communities.
PFO4/EM1Eb	Palustrine forested needle-lvd evergreen, emergent persistent, seasonally flooded saturated, beaver	Hemlock - hardwoood swamp or Spruce - fir swamp; Shallow emergent marsh	Things typed with a mix of FO and EM are likely to include discrete areas of two distinct NYNHP communities.
PFO4/FO1B	Palustrine forested needle-lvd evergreen, forested broad-lvd deciduous, saturated	Hemlock - hardwood swamp or Red maple - tamarack peat swamp or Northern white cedar swamp or Spruce - fir swamp	Red maple - tamarack peat swamp would be limited to rich sites.
PFO4/FO1D	Palustrine forested needle-lvd evergreen, forested broad-lvd deciduous, seasonally flooded well drained	Floodplain forest	The Adirondack variant with red maple and balsam fir as components.
PFO4/FO1E	Palustrine forested needle-lvd evergreen, forested broad-lvd deciduous, seasonally flooded saturated	Hemlock - hardwood swamp or Red maple - tamarack peat swamp	Broad leaved components are more important. Red maple - tamarack peat swamp would be limited to rich sites.
PFO4/OWBb	Palustrine forested needle-lvd evergreen, open water unknown bottom , saturated, beaver	Red maple - tamarack peat swamp or Hemlock-hardwood swamp or Northern white cedar swamp or Spruce - fir swamp	This type attribution appears only once (c25se - Keene) and is probably a mistaken OWH that was inadvertently labeled OWB. However this particular wetland shows no open water and should have been caught in QA/QC. That means this is a duplicate label to the one below.
PFO4/OWHb	Palustrine forested needle-lvd evergreen, open water unknown bottom, permanent, beaver	Black spruce - tamarack bog or Spruce -fir swamp or Northern white cedar swamp; Eutrophic pond	This coding indicates two distinct community types are present within the delineated polygon. All classification descriptors with "/" mean that there are two distinct and juxtaposed covertypes that cannot be drawn separately.
PFO4/SS1B	Palustrine forested needle-lvd evergreen, scrub shrub broad-lvd deciduous, saturated	Black spruce - tamarack bog or Spruce - fir swamp or Highbush blueberry bog thicket	This classifier could also describe Hemlock-hardwood swamp, and northern white cedar swamp.
PFO4/SS1D	Palustrine forested needle-lvd evergreen, scrub shrub broad-lvd deciduous, seasonally flooded well drained	Floodplain forest	The Adirondack variant with red maple and balsam fir as components. The Adirondack Variant is not described in "Ecological Communities of NYS". By the existing definition no PFO4 would qualify as a floodplain forest. The variant needs to be described better

PFO4/SS1E	Palustrine forested needle-lvd evergreen, scrub shrub broad-lvd deciduous, seasonally flooded saturated	Black spruce - tamarack bog or Red maple - tamarack peat swamp or Shrub swamp or Highbush blueberry bog thicket	Tends towards shrub dominance. Red maple - tamarack peat swamp cannot be PFO4; it must be PFO1 or PFO2. The "E" water regime indicates stream(s) running through the covertype. This classifier typically occurs in the floodplain of small streams.
PFO4/SS1Eb	Palustrine forested needle-lvd evergreen, scrub shrub broad-lvd deciduous, seasonally flooded saturated, beaver	Shrub swamp	With higher hummock or small island inclusions that support conifers
PFO4/SS4B	Palustrine forested needle-lvd evergreen, scrub shrub needle-lvd evergreen, saturated	Black spruce - tamarack bog or Spruce - fir swamp or Northern white cedar swamp	Northern white cedar swamp is limited to rich bedrock or groundwater sites.
PFO4/SS4E	Palustrine forested needle-lvd evergreen, scrub shrub needle-lvd evergreen, seasonally flooded saturated	Floodplain forest	The Adirondack variant with red maple and balsam fir as components.
PFO4/SS4Eb	Palustrine forested needle-lvd evergreen, scrub shrub needle-lvd evergreen, seasonally flooded saturated, beaver	Spruce -fir swamp or Black spruce - tamarack bog	Flooding regime may remove conifer component over time and trend site towards hardwood or shrub swamp
PFO4B	Palustrine forested needle-lvd evergreen, saturated	Spruce -fir swamp or Black spruce - tamarack bog (dense canopied variant) or Northern white cedar swamp or Hemlock - hardwood swamp	Northern white cedar swamp is limited to rich bedrock or groundwater sites.
PFO4Bb	Palustrine forested needle-lvd evergreen, saturated, beaver	Black spruce -tamarack bog or Spruce - fir swamp or Northern white cedar swamp	Northern white cedar swamp is limited to rich bedrock or groundwater sites.
PFO4D	Palustrine forested needle-lvd evergreen, seasonally flooded well drained	Floodplain forest or Spruce flats or Balsam flats	The Adirondack variant with red maple and balsam fir as components. The flats communities do not have wetland soils.
PFO4E	Palustrine forested needle-lvd evergreen, seasonally flooded saturated	Floodplain forest or Spruce - fir swamp	The Adirondack variant with red maple and balsam fir as components. Two strange examples of this in ridge top depressions look to be Spruce - fir swamp
PFO4Eb	Palustrine forested needle-lvd evergreen, seasonally flooded saturated, beaver	Hemlock - hardwood swamp	Only one example of this that is likely to be on slightly raised microtopographic site otherwise the flooding regime may remove conifer component over time and trend site towards hardwood or shrub swamp.
PFO5/EM1Hb	Palustrine forested dead, emergent persistent, permanent, beaver	Shallow emergent marsh or Deep emergent marsh (dominated by persistent species)	
PFO5/OWHb	Palustrine forested dead, open water unknown bottom, permanent, beaver	Any NYNHP wetland forest type flooded out	

PFO5Eb	Palustrine forested dead, seasonally flooded saturated, beaver	Any NYNHP wetland forest type flooded out	
POWH	Palustrine open water unknown bottom, permanent	Eutrophic pond or Oxbow lake or Backwater slough	Oligotrophic pond or bog lake are also possible, but did not see in spot checking. All of these POWH polygons could include Deep Emergent Marsh and Shallow Emergent Marsh. Neither of these covertypes are typically seen on leaf-off imagery. What appears to be the shallows of a lake or pond could very well be vegetated and therefore one of these two wetland types depending on depth.
POWHb	Palustrine open water unknown bottom, permanent, beaver	Eutrophic pond	Bog lakes may also be classed as this type in certain limited contexts.
POWHh	Palustrine open water unknown bottom, permanent, diked or impounded	Reservoir/artificial impoundment	
POWHhx	Palustrine open water unknown bottom, permanent, diked or impounded, excavated	Reservoir/artificial impoundment or farm pond/artificial pond or quarry pond	
POWHx	Palustrine open water unknown bottom, permanent, excavated	Farm pond/artificial pond or quarry pond	
POWHxh	Palustrine open water unknown bottom, permanent, excavated, diked or impounded	Reservoir/artificial impoundment or farm pond/artificial pond or quarry pond	
PSS1/EM1B	Palustrine scrub shrub broad-lvd deciduous, emergent persistent, saturated	Medium fen or Shrub swamp or Highbush blueberry bog thicket or Rich shrub fen (much less probable)	Rich shrub fen limited to rich sites
PSS1/EM1E	Palustrine scrub shrub broad-lvd deciduous, emergent persistent, seasonally flooded saturated	Highbush blueberry bog thicket or Shrub swamp or Medium fen or Shallow emergent marsh	This coding indicates two distinct community types may be present within a delineated polygon .
PSS1/EM1Eb	Palustrine scrub shrub broad-lvd deciduous, emergent persistent, seasonally flooded saturated, beaver	Shrub swamp or Highbush blueberry bog thicket or Shallow emergent marsh	This coding indicates two distinct community types maybe present within a delineated polygon .
PSS1/EM1Ef	Palustrine scrub shrub broad-lvd deciduous, emergent persistent, seasonally flooded saturated, farmed	Degraded: Shrub swamp? Or Successional shrubland	This type is not attributed within the four review quads. This would be wetland variant of Successional shrubland. Potential for the presence of more recovered natural communities may exist, but without examples any attribution would only be a guess. Successional shrubland would be characterized by a predominance of upland shrub spp. mixed with wetland indicators.

PSS1/EM1Efd	Palustrine scrub shrub broad-lvd deciduous, emergent persistent, seasonally flooded saturated, farmed, partially drained or ditched	Degraded: Shrub swamp? Or Successional shrubland	This type is not attributed within the four review quads. Potential for the presence of more recovered natural communities may exist, but without examples any attribution would only be a guess. Successional shrubland would be characterized by a predominance of upland shrub spp. mixed with wetland indicators.
PSS1/EM1Fb	Palustrine scrub shrub broad-lvd deciduous, emergent persistent, semipermanent, beaver	Shrub swamp (may also include Deep emergent marsh or Shallow emergent marsh?)	This coding indicates two distinct community types maybe present within the delineated polygon. The Deep emergent marsh would be dominated by a persistent spp such as Typha.
PSS1/OWH	Palustrine scrub shrub broad-lvd deciduous, open water unknown bottom, permanent	Shrub swamp (especially buttonbush dominated)	
PSS1/OWHb	Palustrine scrub shrub broad-lvd deciduous, open water unknown bottom, permanent, beaver	Shrub swamp	
PSS1/SS4B	Palustrine scrub shrub broad-lvd deciduous, scrub shrub needle-lvd evergreen, saturated	Highbush blueberry bog thicket or Dwarf shrub bog, rich graminoid fen, patterned peatland	
PSS1/SS4E	Palustrine scrub shrub broad-lvd deciduous, scrub shrub needle-lvd evergreen, seasonally flooded saturated	Highbush blueberry bog thicket or young/successional Red maple - tamarack peat swamp	Flooding regime may remove conifer component over time and trend site towards hardwood or shrub swamp. Red maple - tamarack peat swamp would be limited to rich sites.
PSS1B	Palustrine scrub shrub broad-lvd deciduous, saturated	Shrub swamp or Highbush blueberry thicket or Medium fen	
PSS1Bb	Palustrine scrub shrub broad-lvd deciduous, saturated, beaver	Shrub swamp or Highbush blueberry thicket or Medium fen	Depending on the amount of beaver activity and the stage of succession, the condition my be "degraded" via the compositional simplification.
PSS1Bf	Palustrine scrub shrub broad-lvd deciduous, saturated, farmed	Degraded: Shrub swamp	Potential for the presence of successional versions of other ecological communities may exist, but without examples any attributions would only be a guess.
PSS1D	Palustrine scrub shrub broad-lvd deciduous, seasonally flooded well drained	Early successional or disturbed Floodplain forest	
PSS1E	Palustrine scrub shrub broad-lvd deciduous, seasonally flooded saturated	Shrub swamp or Highbush blueberry bog thicket or Medium fen	

PSS1Eb	Palustrine scrub shrub broad-lvd deciduous, seasonally flooded saturated, beaver	Shrub swamp or Medium fen	Depending on the amount of beaver activity and the stage of succession, the condition may be "degraded" via the compositional simplification. Red maple - tamarack peat swamp would be limited to rich sites.
PSS1Ef	Palustrine scrub shrub broad-lvd deciduous, seasonally flooded saturated, farmed	Degraded: Shrub swamp or Successional shrubland (wetland variant)	Potential for the presence of successional versions of other ecological communities may exist, but without examples any attributions would only be a guess. Successional shrubland would be characterized by a predominance of upland shrub spp. mixed with wetland indicators.
PSS3/EM1B	Palustrine scrub shrub broad-lvd evergreen, emergent persistent, saturated	Dwarf shrub bog or Inland poor fen or Medium fen	
PSS3/EM1E	Palustrine scrub shrub broad-lvd evergreen, emergent persistent, seasonally flooded, saturated	Dwarf shrub bog or Medium fen	At least one of these is mislabeled PSS3EM1E (no forward slash).
PSS3B	Palustrine scrub shrub broad-lvd evergreen, saturated	Dwarf shrub bog or Medium fen	
PSS3B	Palustrine scrub shrub broad-lvd evergreen saturated, acid	Dwarf shrub bog	pH modifiers were seldom used in this delineation, otherwise this NWI code might be PSS3Ba for the acidic properties of this type
PSS4/EM1B	Palustrine scrub shrub needle-lvd evergreen, emergent persistent, saturated	Dwarf shrub bog or Inland poor fen. Young or regenerating Hemlock - hardwood swamp or Spruce - fir swamp	
PSS4/EM1E	Palustrine scrub shrub needle-lvd evergreen, emergent persistent, seasonally flooded saturated	Successional shrubland, Young or regenerating: Hemlock - hardwood swamp or Spruce - fir swamp or Black spruce - tamarack bog or Northern white cedar swamp; Shallow emergent marsh	Some of these polygons appear to be ground water or seepage types. The successional attribution is due to apparent land clearing. Polygons of this class may include discrete areas of multiple structural classes of NYNHP communities. Successional shrubland would be characterized by a predominance of upland shrub spp. mixed with wetland indicators.
PSS4/EM1Eb	Palustrine scrub shrub needle-lvd evergreen, emergent persistent, seasonally flooded saturated, beaver	Young or regenerating: Hemlock - hardwood swamp, or Northern white cedar swamp, or Spruce-fir swamp; Shallow emergent marsh	Young or stunted version of the forest types. Northern white cedar swamp would be limited to richer sites. Polygons of this class may include multiple structural classes of NYNHP communities

PSS4/SS1B	Palustrine scrub shrub needle-lvd evergreen, scrub shrub broad-lvd deciduous, saturated	Dwarf shrub bog or Black spruce - tamarack bog	With stunted trees under 6 meters
PSS4/SS1E	Palustrine scrub shrub needle-lvd evergreen, scrub shrub broad-lvd deciduous, seasonally flooded saturated	Black spruce - tamarack bog or Red maple - tamarack peat swamp	Seasonal flooding would eventually eliminate most/all conifers. Red maple - tamarack peat swamp would be limited to rich sites.
PSS4B	Palustrine scrub shrub needle-lvd evergreen, saturated	Black spruce - tamarack bog or Spruce - fir swamp (regenerating or young)	
PSS4E	Palustrine scrub shrub needle-lvd evergreen, seasonally flooded saturated	Hemlock - hardwood swamp, or Spruce - fir swamp (young or regenerating)	Flooding regime may remove conifer component over time and trend site towards hardwood or shrub swamp
PSS4Eb	Palustrine scrub shrub needle-lvd evergreen, seasonally flooded saturated, beaver	Young or regenerating Hemlock - hardwood swamp or Spruce - fir swamp	Flooding regime may remove conifer component over time and trend site towards hardwood or shrub swamp
PSS5/OWHb	Palustrine scrub shrub dead, open water unknown bottom, permanent, beaver	Potentially any flooded out shrub wetland type	
PUB3D	Palustrine unconsolidated bottom mud, seasonally flooded well drained	Inland non-calcareous lakeshore? (riverside variant)	This type would typically be sparsely vegetated.
PUS4D	Palustrine unconsolidated shore organic, seasonally flooded well drained	Inland non-calcareous lakeshore? (riverside variant)	This type would typically be sparsely vegetated. The NWI polygon coded to this type (quad c25se - Keene) doesn't appear to be on organic soils?
R2OWH	Riverine lower perennial, open water unknown bottom, permanent	Unconfined river	Could also possibly be Confined river but this type wasn't seen in spot checking
R3OWH	Riverine upper perennial, open water unknown bottom, permanent	Rocky headwater stream	
R3UB3H	Riverine upper perennial, unconsolidated bottom mud, permanent	Marsh headwater stream	
Ufd	Upland, farmed, partially drained or ditched	Successional old field (wetland variant), cropland	Some of these appear to be no longer farmed, but are herbaceous dominated, so an old field designation was applied. At some point if wetland hydrology is maintained the site would "succeed" to Reedgrass/purple loosestrife marsh, or if native species are dominant to Shallow emergent marsh.

This crosswalk was created by Elizabeth Spencer (NY NHP), and reviewed by Greg Edinger (NY NHP), Ariel Diggory (APA) and Dan Spada (APA).

Appendix 8. NY Natural Heritage Program ecological communities to National Wetland Inventory classification code crosswalk.

NY Natural Heritage Program Ecological Community Name	Cowardin Classification Alpha-numeric
Deep Emergent Marsh	E1, POW, E1/OW
Shallow Emergent Marsh	E1, POW, E1/OW
Shrub swamp	S1,S1/E1,
Cobble shore wet meadow	E1
Inland calcareous lake shore	E1
Inland non-calcareous lake shore	E1
Sedge meadow	S1/E1, E1
Rich graminoid fen	S1/E1, E1, S1/S4, S4/S1
Medium fen	E1, S3, S3/E1
Inland poor fen	E1, S3, S3/S4, S4/S3, S3/E1, S4/E1
Sliding fen	E1, S3, S4, S3/S4, S3/E1, S4/E1
Patterned peatland	S3, S4, S1, S3/S4, S3/S1, S1/S4, S1/S3, S4/S3, S4/S1
Dwarf shrub bog	S3, S3/S1, S3/E1, S1/S3, S1/E1, S1, S1/S4
Highbush blueberry bog thicket	S1, S1/E1, S4/S1, S1/S4
Floodplain forest	F1, F1/S1, F1/E1
Red maple-hardwood swamp	F1, F1/S1, F1/E1
Silver maple-ash swamp	F1, F1/S1, F1/E1
Vernal pool	E1, F1, F1/E1
Hemlock-hardwood swamp	F4/E1, F4/F1, F4, F1/F4, F1, F4/S4, F4/S1
Spruce-fir swamp	F4, F4/F1, F4,/S4, F4/S1, F1/F4, F4/F2, F1
Red maple-tamarack peat swamp	F2, F1, F1/S1, F1/F2, F1/F4, F2/F1, F2/S1, F2/F4
Northern white cedar swamp	F4, F4/F1, F4/F2, F4/S1, F4/E1, F2/F4, F1/F4
Black spruce-tamarack bog	F4, F4/F2, F2/F4, F4/S4, F4/S1, F4/E1
Shrub swamp	S1, S1/E1

S1 - Broad-leaved, deciduous shrub swamp
S3 - Broad-leaved, evergreen shrub swamp
S4 - Needle-leaved, evergreen shrub swamp
F1 - Broad-leaved, deciduous forested swamp
F2 - Needle-leaved, deciduous forested swamp
F4 - Needle-leaved, evergreen forested swamp
E1 - Persistent emergent marsh

Appendix 9. Metadata for the outer watershed boundary of the AuSable and Boquet River Watershed, Adirondack Park, NY, USA (2007).

Metadata:

- Identification Information
- Data_Quality_Information
- Spatial_Data_Organization_Information
- Spatial_Reference_Information
- Entity_and_Attribute_Information
- Distribution Information
- Metadata_Reference_Information

Identification_Information:

Citation:
Citation_Information:
Originator: New York State Adirondack Park Agency
Originator: W. Mark Rooks, Project Director (compiler)
Publication_Date: 20071231
Title:
New York State Adirondack Park Au Sable-Boquet River Basin Outer Watershed Boundary
Edition: Version 1.0
Geospatial_Data_Presentation_Form: vector digital data
Series_Information:
Series_Name: Watershed Scale Protection for Adirondack Wetlands
Issue_Identification: A Biological Assessment Method to Protect and Restore Wetland Communities in the Au Sable and Boquet River Watersheds of the Adirondack Park
Publication_Information:
Publication_Place: Ray Brook, NY
Publisher: New York State Adirondack Park Agency
Online_Linkage: ausboq_ws_83
Description:
Abstract:
An Arc/Info coverage was prepared containing the outer watershed boundary of the Au Sable-Boquet River Basin located in northern New York State for the New York State Adirondack Park Agency (APA). The watershed boundary was delineated using the most current 1:24000 and 1:25000 scale USGS topographic maps. The 30 individual quadrangle files comprising the study area were merged into a single file and exported as an Arc Interchange File (e00) to the New York State, Executive Department, Adirondack Park Agency (NYS APA) running ArcInfo version 9.x.
Purpose:
This digital polygon file was intended for use in determining the area included in the surface drainage of the Au Sable-Boquet River Basin within the NYS Adirondack Park. It was used as a clipping polygon for the wetlands data layer.
Supplemental_Information:

The data set was digitized using ArcGIS ArcInfo by the Remote Sensing/GIS Laboratory at Plattsburgh State University from paper original 7.5' and 7.5' x 15' United States Geological Survey (USGS) maps. Maximum allowable RMS error was 0.003, snapdistance 20.0 meters, snaptype closest, weed tolerance 3.0 meters, and a fuzzy tolerance of 1.219 meters. Hard copies of the coverage at 1:24000 or 1:25000 scale showing arcs and dangle nodes were carefully checked against the topographic manuscript for digitizing accuracy. The coverage was transferred to the New York State, Executive Department, Adirondack Park Agency (NYS APA) running ArcGIS ArcInfo version 9.x.
Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 1966
Ending_Date: 1990
Currentness_Reference:
topographic map publication date
Status:
Progress: Complete
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -74.082232
East_Bounding_Coordinate: -73.287741
North_Bounding_Coordinate: 44.644059
South_Bounding_Coordinate: 44.013935
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Geographic Information System (GIS)
Theme_Keyword: ArcInfo coverage
Theme_Keyword: Watershed
Place:
Place_Keyword_Thesaurus: Geographic Names Information System
Place_Keyword: New York
Place_Keyword: Adirondack Park
Place_Keyword: Adirondack Mountains
Place_Keyword: Au Sable-Boquet River Basin
Place_Keyword: AuSable River
Place_Keyword: Boquet River
Stratum:
Stratum_Keyword_Thesaurus: none
Temporal:
Temporal_Keyword: Date of USGS quadrangles: 1966-1990
Access_Constraints: None
Use_Constraints:
These data may not be used for legal determinations. Please credit use of this data set to the New York State Adirondack Park Agency, Ray Brook, New York 12977. Please send a copy of any reports or papers in which these data were used or referenced to the above address, Attention: Susan VanWormer, Librarian.
Point_of_Contact:

Contact_Information:
Contact_Organization_Primary:
Contact_Organization: NYS Adirondack Park Agency
Contact_Person: W. Mark Rooks
Contact_Position: Associate Adirondack Park Project Analyst, Biological Resources
Contact_Address:
Address_Type: mailing and physical address
Address:
Route 86, P.O. Box 99
City: Ray Brook
State_or_Province: New York
Postal_Code: 12977
Country: USA
Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: wmrooks@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Data_Set_Credit:
Funding was provided by the US Environmental Protection Agency Office of Wetlands Protection; State Wetlands Protection Program; Project #S200404 to the New York State Adirondack Park Agency. Subcontractors for portions of the grant were the Remote Sensing/GIS Laboratory, Plattsburgh State University,
Security_Information:
Security_Classification_System: None
Security_Classification: Unclassified
Security_Handling_Description: None
Native_Data_Set_Environment:
Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 2; ESRI ArcCatalog 9.1.0.780

Back to Top

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
Watershed boundary integrity was examined to ensure a complete polygon. ARCVALUE was used as an identifier in the wetlands data to denote the study area boundary. All arcs in the outer watershed boundary coverage posses an ARCVALUE of 99.
Quantitative_Attribute_Accuracy_Assessment:
Attribute_Accuracy_Value: Unknown
Logical_Consistency_Report:
The coverage is a single polygon.
Completeness_Report:
Extensive quality assurance/quality control measures were taken for all steps of database creation; including double-blind delineation, hard copy checks of digital files against original manuscripts, and confirmation of some boundary segments with aerial photography. Identifiable errors will be corrected periodically or as needed.
Positional_Accuracy:

Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
Watershed delineations were made by two independent individuals and the NYS Adirondack Park Agency. Discrepancies were resolved by a third individual. Watershed boundaries that were in apparent conflict as evidenced by wetland delineations were resolved by consultations between NYS Adirondack Park Agency and SUNY Plattsburgh Remote Sensing/GIS Laboratory personnel.
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report:
No vertical coordinates are associated with this data set.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: USGS
Publication_Date: 1966-1990
Title:
USGS 7.5' and 7.5' x 15' Topographic Quadrangles
Publication_Information:
Source_Scale_Denominator: 24000 and 25000
Type_of_Source_Media: paper
Source_Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 1966
Ending_Date: 1990
Source_Currentness_Reference:
publication date
Source_Citation_Abbreviation:
ABQUADS
Source_Contribution:
Used to determine quadrangle-based study area boundary.
Source_Information:
Source_Citation:
Citation_Information:
Originator: New York State Adirondack Park Agency
Publication_Date: 19930914
Title:
New York State Adirondack Park Boundary
Source_Scale_Denominator: 24000
Type_of_Source_Media: digital ArcInfo coverage
Source_Citation_Abbreviation:
BLUELN
Source_Contribution:
Used as a portion of the study area outer boundary.
Source_Information:
Source_Citation:
Citation_Information:
Title:

Northern Forest Lands Quadrangle File (derived from the data set "NYTM Coordinates 11/22/89" purchased from NYSDOT - Mapping Services Bureau)
Source_Scale_Denominator: None
Type_of_Source_Media: disc
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 19910725
Source_Currentness_Reference:
publication date
Source_Citation_Abbreviation:
NFLSQUAD
Source_Contribution:
Subsets provided quadrangle corner tic templates for digitizing and quadrangle boundaries for clipping. Original UTM coordinates were accurate to 0.1 meter.
Source_Information:
Source_Citation:
Citation_Information:
Originator: NYS Adirondack Park Agency
Publication_Date: 2000
Title:
Upper Hudson Watershed; outer study area boundary
Source_Scale_Denominator: 24000
Type_of_Source_Media: digital ArcInfo coverage
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2000
Source_Citation_Abbreviation:
UHOUTER
Source_Contribution:
Used as a portion of the Au Sable-Boquet River Basin study area boundary.
Source_Information:
Source_Citation:
Citation_Information:
Originator: NYS Adirondack Park Agency
Publication_Date: 2002
Title:
St Lawrence River Watershed: Part II; outer study area boundary
Source_Scale_Denominator: 24000
Type_of_Source_Media: digital ArcInfo coverage
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2002
Source_Citation_Abbreviation:
STLAW2OUTER
Source_Contribution:
Used as a portion of the Au Sable-Boquet River Basin study area boundary.
Process_Step:

Process_Description:
The outer boundary of the Au Sable-Boquet River Basin within the NYS Adirondack Park was identified on the most recent 1:24000 or 1:25000 scale USGS topographic maps. Metric maps were used when available because they are more accurate. When metric 1:25000 topographic quadrangles were unavailable, 1:24000 scale English maps were used. The watershed boundary was delineated by two independent delineators at the NYS Adirondack Park Agency using two sets of identical topographic maps. Delineations were performed according to methods described in National Handbook of Recommended Methods for Water Data Acquisition, Office of Water Data Coordination, Geological Survey, Washington, D. C. (1977). Interpretation differences were resolved by a third individual at the NYS Adirondack Park Agency. Some modifications of the boundary, particularly along the northern edge, were made based on air photo interpretations.
Source_Used_Citation_Abbreviation:
ABQUADS
Source_Produced_Citation_Abbreviation:
WS-TOPO
Process_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: NYS Adirondack Park Agency
Contact_Person: W. Mark Rooks
Contact_Position: Associate Adirondack Park Project Analyst, Biological Resources
Contact_Address:
Address_Type: mailing and physical address
Address:
Route 86, P.O. Box 99
Address:
101 Broad Street
City: Ray Brook
State_or_Province: New York
Postal_Code: 12977
Country: USA
Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: wmrooks@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Process_Step:
Process_Description:
The watershed boundary was digitized from reconciled watershed quadrangle maps using a digitizing tablet and ArcGIS ArcInfo into a quadrangle boundary and tic coverage in UTM Zone 18 NAD27. Maximum allowed RMS error for each digitizing session was 0.003 or less. Digital quadrangle boundaries were removed and all individual quadrangle files were edgematched to adjacent quadrangle files then appended into one coverage. Some modifications of the watershed boundary, particularly along the northern edge, were made based on photo interpretations.
Source_Used_Citation_Abbreviation:

WS-TOPO
Source_Used_Citation_Abbreviation:
NFLSQUAD
Source_Produced_Citation_Abbreviation:
WS-DIG
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Eileen B. Allen
Contact_Organization: State University of New York at Plattsburgh
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address:
Center for Earth & Environmental Science
Address:
101 Broad Street
City: Plattsburgh
State_or_Province: New York
Postal_Code: 12901
Country: USA
Contact_Voice_Telephone: (518) 564-2020
Contact_Facsimile_Telephone: (518) 564-5267
Contact_Electronic_Mail_Address: eileen.allen@plattsburgh.edu
Process_Step:
Process_Description:
Add the NYS Adirondack Park Boundary digital file, the Upper Hudson outer watershed boundary file, and the St. Lawrence II outer watershed boundary file to the digitized watershed boundary created in the previous step. Subset to the Au Sable-Boquet study area boundary, ensuring that the boundary was a single complete polygon.
Source_Used_Citation_Abbreviation:
WS-DIG
Source_Used_Citation_Abbreviation:
BLUELN
Source_Used_Citation_Abbreviation:
UHOUTER
Source_Used_Citation_Abbreviation:
STLAW2OUTER
Source_Produced_Citation_Abbreviation:
AUSBOQ_WS_27
Process_Step:
Process_Description:
Project AUSBOQ_WS_27 to AUSBOQ_WS_83 with the command line PROJECT COVER AUSBOQ_WS_27 AUSBOQ_WS_83 (parameters, Projection UTM, Units meters, Zone 18, Datum NAD83 NADCON).
Source_Used_Citation_Abbreviation:
AUSBOQ_WS_27
Source_Produced_Citation_Abbreviation:
AUSBOQ_WS_83

Process_Step:
Process_Description:
Export AUSBOQ_WS_83 to the NYS Adirondack Park Agency.
Source_Used_Citation_Abbreviation:
AUSBOQ_WS_83
Source_Produced_Citation_Abbreviation:
AUSBOQ_WS_83.E00

Back to Top

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Complete chain
Point_and_Vector_Object_Count: 20
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Label point
Point_and_Vector_Object_Count: 1
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: GT-polygon composed of chains
Point_and_Vector_Object_Count: 1
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Point
Point_and_Vector_Object_Count: 48

Back to Top

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:
Grid_Coordinate_System_Name: Universal Transverse Mercator
Universal_Transverse_Mercator:
UTM_Zone_Number: 18
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 0.999600
Longitude_of_Central_Meridian: -75.000000
Latitude_of_Projection_Origin: 0.000000
False_Easting: 500000.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000128
Ordinate_Resolution: 0.000128
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222

Back to Top

Entity_and_Attribute_Information:

Detailed_Description:
Entity_Type:
Entity_Type_Label: ausboq_ws_83.aat
Entity_Type_Definition:
Arc attribute table
Entity_Type_Definition_Source:
ArcInfo
Attribute:
Attribute_Label: FID
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: Shape
Attribute_Definition:
Feature geometry.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Coordinates defining the features.
Attribute:
Attribute_Label: FNODE#
Attribute_Definition:
Internal node number for the beginning of an arc (from-node).
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: TNODE#
Attribute_Definition:
Internal node number for the end of an arc (to-node).
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: LPOLY#
Attribute_Definition:
Internal node number for the left polygon.

Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: RPOLY#
Attribute_Definition:
Internal node number for the right polygon.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: LENGTH
Attribute_Definition:
Length of feature in internal units.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Positive real numbers that are automatically generated.
Attribute:
Attribute_Label: AUSBOQ_WS_83#
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: AUSBOQ_WS_83-ID
Attribute_Definition:
User-defined feature number.
Attribute_Definition_Source:
ESRI
Attribute:
Attribute_Label: ARCVALUE
Attribute_Definition:
Value to uniquely identify the study area boundary.
Attribute_Definition_Source:
user-defined
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 99
Enumerated_Domain_Value_Definition:
Au Sable-Boquet River Basin outer study area boundary
Enumerated_Domain_Value_Definition_Source:

user-defined
Attribute_Measurement_Frequency:
None planned
Detailed_Description:
Entity_Type:
Entity_Type_Label: ausboq_ws_83.pat
Entity_Type_Definition:
Polygon attribute table
Entity_Type_Definition_Source:
ArcInfo
Attribute:
Attribute_Label: FID
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: Shape
Attribute_Definition:
Feature geometry.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Coordinates defining the features.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: AREA
Attribute_Definition:
Area of feature in internal units squared.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Positive real numbers that are automatically generated.
Beginning_Date_of_Attribute_Values: 1994 (imagery date)
Ending_Date_of_Attribute_Values: 1995 (imagery date)
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: PERIMETER
Attribute_Definition:
Perimeter of feature in internal units.
Attribute_Definition_Source:

ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Positive real numbers that are automatically generated.
Beginning_Date_of_Attribute_Values: 1994 (imagery date)
Ending_Date_of_Attribute_Values: 1995 (imagery date)
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: AUSBOQ_WS_83#
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: AUSBOQ_WS_83-ID
Attribute_Definition:
User-defined feature number.
Attribute_Definition_Source:
ESRI
Attribute_Measurement_Frequency:
As needed

Back to Top

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: NYS Adirondack Park Agency
Contact_Person: W. Mark Rooks
Contact_Position: Associate Adirondack Park Project Analyst, Biological Resources
Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: wmrooks@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Resource_Description: Downloadable Data, may be available on other media such as CD. Wetlands in the Au Sable-Boquet River Basin.
Distribution_Liability:
Although these data have been processed successfully on a computer system at the NYS APA, no warranty expressed or implied is made regarding the accuracy or utility of the data on any other system or for general or scientific purposes, nor shall the act of distribution constitute any such warranty. This disclaimer applies both to individual use of the data and aggregate use with other data. It is strongly recommended that these data be directly acquired from the NYS APA, and not indirectly through other sources which may have changed the data in some way. It is also strongly recommended that careful attention be paid to the contents of the

metadata file associated with these data. The NYS APA shall not be held liable for improper or incorrect use of the data described and/or contained herein. These data shall not be used for legal jurisdictional determinations.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: ARCE
Format_Version_Number: ArcInfo 9.1
File_Decompression_Technique: no compression applied
Transfer_Size: 0.098
Technical_Prerequisites:
These data were created in ESRI's ArcGIS 9.1 ArcInfo coverage format.

Back to Top

Metadata_Reference_Information:
Metadata_Date: 20071220
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Eileen B. Allen
Contact_Organization: State University of NY at Plattsburgh, GIS Laboratory
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address:
Center for Earth and Environmental Science
Address:
101 Broad Street
City: Plattsburgh
State_or_Province: New York
Postal_Code: 12901
Country: USA
Contact_Voice_Telephone: (518) 564-2020
Contact_Facsimile_Telephone: (518) 564-5267
Contact_Electronic_Mail_Address: eileen.allen@plattsburgh.edu
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Security_Information:
Metadata_Security_Classification_System: none
Metadata_Security_Classification: Unclassified
Metadata_Security_Handling_Description:
none
Metadata_Extensions:
Online_Linkage: http://www.esri.com/metadata/esriprof80.html
Profile_Name: ESRI Metadata Profile

Back to Top

Appendix 10. Metadata for the Sub-catchment Basins of the AuSable and Boquet River Watershed, Adirondack Park, NY, USA (2007).

Metadata:

- Identification_Information
- Data_Quality_Information
- Spatial_Data_Organization_Information
- Spatial_Reference_Information
- Entity_and_Attribute_Information
- Distribution_Information
- Metadata_Reference_Information

Identification_Information:
Citation:
Citation_Information:
Originator: Adirondack Park Agency
Publication_Date: 20080930
Title: Subcatchment Basins of the AuSable/Boquet Watershed
Geospatial_Data_Presentation_Form: raster digital data
Online_Linkage:
\\APPSERVER\D\GIS\GISSpecialProjects\epa\AusableBoquet\SubBasinDigitize\AUB.mdb
Description:
Abstract:
A delineation of the watersheds of all named streams and all ponds identified by a Department of Environmental Conservation pond number within the larger watershed of the AuSable and Boquet Rivers in the Adirondack Park.
Purpose:
The data was developed to assist state and town governments, as well as lake managers in assessing and protecting water quality by providing information about the source of the water in each water body.
Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2008
Currentness_Reference: 20080930
Status:
Progress: Complete
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -74.082818
East_Bounding_Coordinate: -73.348422
North_Bounding_Coordinate: 44.584887
South_Bounding_Coordinate: 44.014706
Keywords:
Theme:

Theme_Keyword_Thesaurus: World-wide web
Theme_Keyword: watershed
Theme_Keyword: AuSable River
Theme_Keyword: Boquet River
Place:
Place_Keyword: Adirondack
Access_Constraints: data is for public use
Use_Constraints: data is for public use
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: New York State Adirondack Park Agency
Contact_Person: Mary O'Dell
Contact_Position: Biologist I
Contact_Address:
Address_Type: mailing address
Address: PO Box 99
City: Ray Brook
State_or_Province: New York
Postal_Code: 12977
Country: USA
Contact_Voice_Telephone: 518-891-4050
Contact_Facsimile_Telephone: 518-891-3938
Data_Set_Credit: New York State Adirondack Park Agency
Native_Data_Set_Environment:
Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 9.0.0.535

Data_Quality_Information:
Lineage:
Process_Step:
Process_Description:
The original subcatchment lines were drawn on 1:24000 and 1:25000 quad maps, then traced onto sheets of mylar. A series of 6-8 tick marks depicting UTM coordinates were added to the mylar. The mylar sheets were scanned and the image was saved in a TIF format. The TIF image was added to ArcMap. Pyramids were built for the raster data set. The raster data was georeferenced using the tick marks as control points. The table of georeferenced points was saved as a text file. ArcScan was used to vectorize the raster data using the following settings: Intersection Solution: Median Maximum Line Width: 20 Compression Tolerance: .025 Smoothing Weight: 3 Gap Closure Tolerance: 100 Fan Angle: 45 Hole Size: 0 The new vector data was added as a feature class in line form to the geodatabase. Noise and tick marks were deleted. Each line was checked against existing topo and quad layers and corrections were made in an ArcScan editing session. A new polygon feature dataset was created from the line feature class. The symbology was changed to display a unique value for each polygon and the polygons were checked to ensure that they were all closed. Attributes were added to the table. OID was automatically assigned by the program, length and area were automatically calculated by the program, This#=OID, class was visually checked, I was assigned if no outlet was visible on aerial photos, POND is the

DEC pond number for ponds or a user assigned alphanumeric code for streams and rivers with smaller numbers reflecting more downstream locations (Example: AUS000 is the main channel of the AuSable River, AUS010 is the first named tributary to the AuSable as you move upstream from its mouth). NSUBS is the number of polygons which drain through that polygon. (For headwater streams or ponds, NSUBS is 1). FLOWTO is the OID of the polygon which that polygon drains directly into. (For isolated ponds, FLOWTO is surmised from topography information.) Watershed sub-basins were created from the subcatchment polygons using the following AML: \\apaappserver\ApaGis$\MasterData\Watersheds\24k\macros (file://\apaappserver$24k) Sub-basins were then merged into basins.

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: G-polygon
Point_and_Vector_Object_Count: 222

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:
Grid_Coordinate_System_Name: Universal Transverse Mercator
Universal_Transverse_Mercator:
UTM_Zone_Number: 18
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 0.999600
Longitude_of_Central_Meridian: -75.000000
Latitude_of_Projection_Origin: 0.000000
False_Easting: 500000.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000512
Ordinate_Resolution: 0.000512
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1927
Ellipsoid_Name: Clarke 1866
Semi-major_Axis: 6378206.400000
Denominator_of_Flattening_Ratio: 294.978698
Vertical_Coordinate_System_Definition:
Altitude_System_Definition:
Altitude_Resolution: 0.000010
Altitude_Encoding_Method:
Explicit elevation coordinate included with horizontal coordinates

---

Entity_and_Attribute_Information:

Detailed_Description:
Entity_Type:
Entity_Type_Label: Basins
Attribute:
Attribute_Label: OID
Attribute_Definition: Internal feature number.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: Shape
Attribute_Definition: Feature geometry.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain: Coordinates defining the features.
Attribute:
Attribute_Label: THIS_NO
Attribute:
Attribute_Label: FLOWTO_NO
Attribute:
Attribute_Label: POND
Attribute:
Attribute_Label: CLASS
Attribute:
Attribute_Label: NSUBS
Attribute:
Attribute_Label: Shape_Length
Attribute_Definition: Length of feature in internal units.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain: Positive real numbers that are automatically generated.
Attribute:
Attribute_Label: Shape_Area
Attribute_Definition: Area of feature in internal units squared.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain: Positive real numbers that are automatically generated.

Distribution_Information:
Resource_Description: Downloadable Data

Metadata_Reference_Information:
Metadata_Date: 20080916
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: New York State Adirondack Park Agency
Contact_Person: Mary O'Dell
Contact_Position: Biologist I

Contact_Address:
Address_Type:
REQUIRED: The mailing and/or physical address for the organization or individual.
City: REQUIRED: The city of the address.
State_or_Province: REQUIRED: The state or province of the address.
Postal_Code: REQUIRED: The ZIP or other postal code of the address.
Contact_Voice_Telephone: 518-891-4050
Contact_Facsimile_Telephone: 518-891-3938
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile

Generated by mp version 2.8.6 on Tue Sep 30 2008

Appendix 11. Metadata for the digital wetland map of the AuSable and Boquet River Watershed, Adirondack Park, NY, USA (2007).

Metadata:

- Identification_Information
- Data_Quality_Information
- Spatial_Data_Organization_Information
- Spatial_Reference_Information
- Entity_and_Attribute_Information
- Distribution_Information
- Metadata_Reference_Information

Identification_Information:

Citation:
Citation_Information:
Originator: New York State Adirondack Park Agency
Originator: W. Mark Rooks, Project Director (compiler)
Publication_Date: 20071231
Title:
New York State Adirondack Park Wetland Boundaries in the Au Sable-Boquet River Basin
Edition: Version 1.0
Geospatial_Data_Presentation_Form: vector digital data
Series_Information:
Series_Name: Watershed Scale Protection for Adirondack Wetlands
Issue_Identification: A Biological Assessment Method to Protect and Restore Wetland Communities in the Au Sable and Boquet River Watersheds of the Adirondack Park
Publication_Information:
Publication_Place: Ray Brook, NY
Publisher: New York State Adirondack Park Agency
Online_Linkage: ausboq_wtl_83
Description:
Abstract:
All or part of 30 USGS 7.5' quadrangle-based wetland coverages were prepared for the Au Sable-Boquet watershed within the New York State Adirondack Park using ArcGIS 8.x and 9.x at the Remote Sensing/GIS Laboratory, Plattsburgh State University. Wetlands were delineated on 1:40000 color infrared NAPP transparencies, transferred to orthophoto overlays using an Image Interpretations Systems Stereo Zoom Transfer Scope, and scanned into ArcGIS Arc/Info format. A digital watershed data layer derived from USGS 7.5' and 7.5' x 15' topographic maps defined the outer boundary of the mapped area. This wetlands database consists of both polygon and linear features labeled using National Wetlands Inventory (NWI) conventions. The 30 individual quadrangle files were merged into a single file and exported as an Arc Interchange File (e00) to the New York State, Executive Department, Adirondack Park Agency (NYS APA) running ArcInfo version 9.x.
Purpose:

The wetlands database is part of a larger database designed to help evaluate watershed/wetland relationships and provide data for cumulative impact assessments. In addition, the Au Sable-Boquet project seeks to identify upland areas that have potential for wetlands restoration projects. The outreach efforts to share the Agency natural resource database will encourage resource appreciation and wise use, particularly in a regional context.
Supplemental_Information:
Hard copies of 30 7.5' quadrangle-based wetland line overlays were scanned at 400 dpi into a tiff format using a an HP 815mfp large format scanner housed at the SUNY Plattsburgh Remote Sensing/GIS Laboratory. Scanned files were vectorized using R2V 5.5 for Windows from Able Software. Digital wetland vector files were georeferenced (UTM Zone 18, NAD27) into a digital quadrangle file containing four bounding tics using ArcGIS ArcInfo 8.x and 9.x. Digital files were vectorized, transformed, edited, and attributed at the Remote Sensing/GIS Laboratory, Plattsburgh State University. Maximum allowable RMS was 0.003, snapdistance 20.0 meters, snaptype closest, weed tolerance 3.0 meters, and a fuzzy tolerance of 1.219 meters. Wetland labels were added as label components using a digitizer menu customized for this project. Wetland labels were also added during heads-up editing with a customized on-screen menu. Wetland label columns were concatenated into a unified wetland label using ArcInfo Info. Wetland labels follow the conventions established by Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. Office of Biological Services, U.S. Fish and Wildlife Service. U.S. Department of the Interior, Washington, D.C. 103 pp. Some modifications to the conventions were made to accommodate this project and are noted in the NWI label tables accompanying this metadata. Files were transported to the NYS APA as ArcInfo export files (no compression) .
Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 19940503
Ending_Date: 19950507
Currentness_Reference:
imagery date
Status:
Progress: Complete
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -74.130115
East_Bounding_Coordinate: -73.230867
North_Bounding_Coordinate: 44.758216
South_Bounding_Coordinate: 43.991095
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Wetlands
Theme_Keyword: Vegetation
Theme_Keyword: NWI cover types
Theme_Keyword: Geographic Information System (GIS)

Theme_Keyword: ArcInfo coverage
Place:
Place_Keyword_Thesaurus: Geographic Names Information System
Place_Keyword: New York
Place_Keyword: Adirondack Park
Place_Keyword: Adirondack Mountains
Place_Keyword: Au Sable-Boquet River Basin
Place_Keyword: AuSable River
Place_Keyword: Boquet River
Stratum:
Stratum_Keyword_Thesaurus: None
Temporal:
Temporal_Keyword_Thesaurus: None
Temporal_Keyword: Date of aerial photography: 1994-1995
Temporal_Keyword: Date of orthophoto quadrangles: 1976-1981
Access_Constraints: None
Use_Constraints:
These data may not be used for legal determinations. Please credit use of this data set to the New York State Adirondack Park Agency, Ray Brook, New York 12977. Please send a copy of any reports or papers in which these data were used or referenced to the above address, Attention: Susan VanWormer, Librarian.
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: NYS Adirondack Park Agency
Contact_Person: W. Mark Rooks
Contact_Position: Associate Adirondack Park Project Analyst, Biological Resources
Contact_Address:
Address_Type: mailing and physical address
Address:
Route 86, P.O. Box 99
City: Ray Brook
State_or_Province: New York
Postal_Code: 12977
Country: USA
Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: wmrooks@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Data_Set_Credit:
Funding was provided by the US Environmental Protection Agency Office of Wetlands Protection; State Wetlands Protection Program; Project #S200404 to the New York State Adirondack Park Agency. Subcontractors for portions of the grant were the Remote Sensing/GIS Laboratory, Plattsburgh State University,
Security_Information:
Security_Classification_System: None
Security_Classification: Unclassified
Security_Handling_Description: None
Native_Data_Set_Environment:

Microsoft Windows XP Version 5.1 (Build 2600) Service Pack 2; ESRI ArcCatalog 9.1.0.780

Back to Top

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

Attributes assigned to polygon features consist of unique User-Ids and wetland labels. Linear attributes include a User-ID, ARCVALUE to uniquely identify the quadrangle borders and watershed boundary throughout the study area, and wetland labels. Polygon and linear wetland labels were derived from photointerpretation techniques. Wetland labels were entered by superimposing the orthophoto label overlay upon a hard copy of the wetland coverage arcs and labels on a digitizing table. To minimize typographical errors, both polygon and linear wetland labels were entered utilizing a digitizer menu consisting of columns representing wetland label components. Label columns were concatenated in ArcInfo Info to create a unified wetland cover type label. The ARCVALUE item was visually checked on the computer screen for integrity and labeling accuracy. Polygon and linear wetland labels were summarized in ArcMap to identify nonsensical or illogical NWI labels, which were corrected in ArcInfo ArcEdit.

Quantitative_Attribute_Accuracy_Assessment:

Attribute_Accuracy_Value: Unknown

Attribute_Accuracy_Explanation:

Polygon and linear wetland cover type labels were derived from photointerpretation techniques. All photo overlays were checked by an independent interpreter for missing wetlands, uplands delineated as wetland, incorrectly delineated polygons, missing wetland labels, and incorrect wetland labels. Photo overlays were directly compared to orthophoto overlays utilizing a Kail Reflecting Reducer/Enlarger. This process helped to verify the transfer of wetland cover type labels and to discover missing or extraneous arcs. Digitized and scanned coverage hard copies were directly compared to orthophoto overlays to check for missing arcs. The process of digitally labeling the wetland coverages also helped to resolve some missing, incomplete, and nonsensical labels. Polygonal and linear wetlands were color-coded in ArcGIS ArcMap to facilitate quality control when reviewed. Finally, all wetland labels were printed in tabular form and proof-read to ensure both complete labeling of the coverage and logical label content.

Logical_Consistency_Report:

Polygons: All polygons were required to possess either a wetland or upland cover type (i.e., a SYSTEM entry and therefore a final NWILABEL entry were mandatory). During the labeling process, digital polygons were checked for the presence of a label point. Incomplete polygons were repaired and sliver polygons were eliminated. All scanned wetlands files were transformed into a blank quadrangle file containing quadrangle boundaries and tics.

Arcs: Only linear wetlands arcs received a wetland label. ArcMap was used to color-code linear wetlands to help discover those linear wetlands missing a label or those that were labeled improperly. Only linear wetlands were allowed to exhibit dangle nodes.

Inter-coverage consistency: ArcInfo's EDGEMATCH routine was utilized to match arcs between coverages. Wetland labels along adjacent coverage edges were proofread using ArcMap and corrected in ArcInfo ArcEdit.
Completeness_Report:
Extensive quality assurance/quality control measures were taken for all steps of database creation. All wetland labels were reviewed for conformance to National Wetlands Inventory standards. It is expected that because the derivation of data from photointerpretation techniques, uncorrectable errors and mistakes may be present. Identifiable mistakes will be corrected as needed. These wetland maps contain only those wetlands that were identifiable from the aerial photographs used in the project.
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
The outer arc of all individual quadrangle-based wetland files correspond to USGS 7.5' quadrangle boundaries. Scanned wetland files were transformed into the quadrangle template with a UTM Zone 18 NAD27 projection and metric coordinates. Horizontal positional accuracy has error potential from several different steps: photointerpretation, transfer to orthophotos, and digitizing techniques. Maximum allowable RMS error was 0.003 for each digitizing session. While great care was taken at every step, no formal quantitative accuracy assessment was conducted. An attempt was made in all mapping operations (delineation, transfer, digitizing) to have horizontal accuracy correct to plus or minus one pencil width (about 12 meters at 1:24000). Users should note that because of available resources, aerial photographic interpretations were transferred to orthoimagery base maps of a different date than the photography used for wetlands delineations.
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report:
No vertical coordinates are associated with this data set. Topographic displacements of air photo delineations were corrected to match stable-base USGS orthophoto quadrangle transparencies using an IIS Stereo Zoom Scope.
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: Northern Forest Lands Project, SUNY ESF (ed.)
Publication_Date: 19910725
Title:
Northern Forest Lands Quadrangle File (derived from the data set "NYTM Coordinates 11/22/89" purchased from NYSDOT - Mapping Services Bureau)
Geospatial_Data_Presentation_Form: vector digital data
Source_Scale_Denominator: 24000
Type_of_Source_Media: disc
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 19910725
Source_Currentness_Reference:
publication date

Source_Citation_Abbreviation:
NFLSQUAD
Source_Contribution:
Subsets provided quadrangle border and corner tic templates for digitizing into or for transforming scanned files to ground coordinates.
Source_Information:
Source_Citation:
Citation_Information:
Originator: USGS
Publication_Date: 1996-1990
Title:
USGS 7.5' and 7.5' X 15' Topographic Quadrangles
Source_Scale_Denominator: 24000 and 25000
Type_of_Source_Media: paper
Source_Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 1966
Ending_Date: 1990
Source_Currentness_Reference:
publication date
Source_Citation_Abbreviation:
ABOUTER
Source_Contribution:
Used to determine quadrangle-based study area boundary.
Source_Information:
Source_Citation:
Citation_Information:
Originator: USGS
Title:
National Aerial Photography Program (NAPP)
Geospatial_Data_Presentation_Form: remote-sensing image
Source_Scale_Denominator: 40000
Type_of_Source_Media: 9" X 9" color infrared vertical aerial photographic transparencies
Source_Time_Period_of_Content:
Time_Period_Information:
Multiple_Dates/Times:
Single_Date/Time:
Calendar_Date: 19940503
Single_Date/Time:
Calendar_Date: 19940504
Single_Date/Time:
Calendar_Date: 19950507
Single_Date/Time:
Calendar_Date: 19940514
Source_Currentness_Reference:
flight dates
Source_Citation_Abbreviation:
PHOTO

Source_Contribution:
Source for wetlands delineations and cover types for all quadrangles.
Source_Information:
Source_Citation:
Citation_Information:
Originator: USGS
Title:
USGS 7.5' Orthophotoquad
Source_Scale_Denominator: 24000
Type_of_Source_Media: stable-base transparency
Source_Time_Period_of_Content:
Time_Period_Information:
Multiple_Dates/Times:
Single_Date/Time:
Calendar_Date: 19810508
Single_Date/Time:
Calendar_Date: 19760513
Source_Currentness_Reference:
Date of aerial photograph used for orthophoto creation.
Source_Citation_Abbreviation:
ORTHO
Source_Contribution:
Map base for transfer of wetland photo overlay delineations.
Process_Step:
Process_Description:
Wetlands polygons were transferred from aerial photograph overlays to orthophoto overlays using an IIS Stereo Zoom Transfer Scope. The orthophoto overlays were scanned with an HP 815mfp large format scanner at 400 dpi into a tiff file.
Source_Used_Citation_Abbreviation:
PHOTO wetland overlay
Source_Produced_Citation_Abbreviation:
ORTHO-POLY
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Eileen B. Allen
Contact_Organization: State University of NY at Plattsburgh
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address:
Center for Earth & Environmental Science
Address:
101 Broad Street
City: Plattsburgh
State_or_Province: NY
Postal_Code: 12901
Country: USA
Contact_Voice_Telephone: (518) 564-2020

Contact_Facsimile_Telephone: (518) 564-5267
Contact_Electronic_Mail_Address: eileen.allen@plattsburgh.edu
Process_Step:
Process_Description:
Wetland labels were created by transferring wetland labels denoted on aerial photograph overlays using a Kargl Reflecting Projector (optical reducer/enlarger) to orthophoto overlays.
Source_Used_Citation_Abbreviation:
PHOTO wetland overlay
Source_Produced_Citation_Abbreviation:
ORTHO-LABEL
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Eileen B. Allen
Process_Step:
Process_Description:
Create a file using ArcEdit with four quadrangle border arcs and four corner tics for each of the 30 7.5' USGS quadrangles in the study area. Build each coverage and assign ARCVALUE and appropriate arc User-IDs.
Source_Used_Citation_Abbreviation:
NFLSQUAD
Source_Produced_Citation_Abbreviation:
QD
Process_Step:
Process_Description:
Autovectorize scanned wetland file (400 dpi, TIFF format) using R2V software (Able Software Co., Lexington, MA) and a 1.1 smoothing factor. Edit vectors in R2V.
Source_Used_Citation_Abbreviation:
ORTHO-POLY
Source_Produced_Citation_Abbreviation:
WTLVECT
Process_Step:
Process_Description:
Generate a vector file from the R2V export file (gen). Clean in ArcInfo with a 0.00 dangle tolerance and 0.800 fuzzy tolerance. Tics were scanned as a vector cross-hairs; convert tic crosshairs and assign new tid IDS in ArcInfo ArcEdit. Remove tics added by R2V, and BUILD coverage.
Source_Used_Citation_Abbreviation:
WTLVECT
Source_Produced_Citation_Abbreviation:
WTLMAP
Process_Step:
Process_Description:
Copy digital quadrangle file (COPY QD TIC) and create a tic-only file with UTM NAD27 coordinates. BUILD coverage.
Source_Used_Citation_Abbreviation:
QD
Source_Produced_Citation_Abbreviation:

TIC
Process_Step:
Process_Description:
Transform scanned polygons (digitizer units) into the empty tic file (UTM NAD27 coordinates) (TRANSFORM WTLMAP TIC).
Source_Used_Citation_Abbreviation:
WTLMAP
Source_Used_Citation_Abbreviation:
TIC
Source_Produced_Citation_Abbreviation:
WTLTIC
Process_Step:
Process_Description:
Clean scanned wetlands file with a dangle tolerance of 0.00 and a fuzzy tolerance of 1.219 (CLEAN WTLTIC WTLFILES 0.00 1.219). Calculate all arc User-Ids to a value greater than 5 (values less than this were reserved for quadrangle and watershed boundaries). BUILD coverage.
Source_Used_Citation_Abbreviation:
WTLTIC
Source_Produced_Citation_Abbreviation:
WTLFILES
Process_Step:
Process_Description:
Add outer study area boundary to 7.5' wetland file (UNION ABOUTER WTLFILES WTA 0.00) as needed. CREATELABELS and BUILD.
Source_Used_Citation_Abbreviation:
ABOUTER
Source_Used_Citation_Abbreviation:
WTLFILES
Source_Produced_Citation_Abbreviation:
WTA
Process_Step:
Process_Description:
Add quadrangle boundary to WTA, clipping to the quadrangle boundary, to produce a final wetland polygon file (IDENTITY QD WTA WTL POLY 0.00) ready for wetland columns.
Source_Used_Citation_Abbreviation:
QD
Source_Used_Citation_Abbreviation:
WTA
Source_Produced_Citation_Abbreviation:
WTL
Process_Step:
Process_Description:
Add appropriate arc and polygon label columns to each wetland coverage with a macro. Create label point with unique User-ID for each polygon (CREATELABELS WTLFILES, or CREATELABELS WTL). BUILD and check with LABELERRORS. Calculate unique User-IDs for wetland arcs
Source_Used_Citation_Abbreviation:
WTLFILES

Source_Used_Citation_Abbreviation:
WTL
Source_Produced_Citation_Abbreviation:
WTLA
Process_Step:
Process_Description:
Create hard copy of coverage in ArcPlot showing label points and arcs. Check against ORTHO-POLY. Use this map for arc and polygon label entry.
Source_Used_Citation_Abbreviation:
WTLA
Source_Produced_Citation_Abbreviation:
WTLA-edits
Process_Step:
Process_Description:
Make map corrections in ArcEdit. MOVEITEM using a custom digitizer or screen menu to add wetland label components to arcs and polygons. BUILD or CLEAN as appropriate.
Source_Used_Citation_Abbreviation:
WTLA-edits
Source_Produced_Citation_Abbreviation:
WTLB
Process_Step:
Process_Description:
Concatenate SYSTEM, CLASS1, CLASS2, REGIME, SPECIAL1, SPECIAL2, and SPECIAL3 into NWILABEL using ArcInfo Info for both arcs and label points. BUILD.
Source_Used_Citation_Abbreviation:
WTLB
Source_Produced_Citation_Abbreviation:
WTLC
Process_Step:
Process_Description:
Use ArcMap to summarize wetland labels and examine coverages for labeling mistakes. Make any edit changes in ArcInfo ArcEdit. BUILD or CLEAN.
Source_Used_Citation_Abbreviation:
WTLC
Source_Produced_Citation_Abbreviation:
WTLD
Process_Step:
Process_Description:
Edgematch arcs (using interactive EDGEMATCH) along adjoining quadrangles. North and east quadrangle edges were held constant unless errors were discovered. CLEAN.
Source_Used_Citation_Abbreviation:
WTLD
Source_Produced_Citation_Abbreviation:
WTLE
Process_Step:
Process_Description:

Use ArcMap to check that polygons and linear wetlands posses the same NWILABEL along adjoining quadrangle boundaries. Use ArcInfo ArcEdit to correct and BUILD if necessary.
Source_Used_Citation_Abbreviation:
WTLE
Source_Produced_Citation_Abbreviation:
WTLF
Process_Step:
Process_Description:
Visually examine the wetland coverages in ArcMap, using a consistent layer symbology to discover wetland spatial and attribute problems. BUILD or CLEAN as needed.
Source_Used_Citation_Abbreviation:
WTLF
Source_Produced_Citation_Abbreviation:
WETLAND
Process_Step:
Process_Description:
Append WETLAND coverages into a single AUSBOQ_WTL file. Examine the coverage using ArcMap and ArcEdit routines to note spatial and attribute problems. In particular, summarize all arc and polygon wetland labels to check for improper labels and search for unlabeled polygons, particularly along quadrangle borders. All polygons must have a SYSTEM value, including upland polygons. EXPORT AUSBOQ_WTL (EXPORT COVER FINALWTL AUSBOQ_WTL). Transport to NYS APA on CD.
Source_Used_Citation_Abbreviation:
WETLAND
Source_Produced_Citation_Abbreviation:
AUSBOQ_WTL_27
Process_Step:
Process_Description:
Project AUSBOQ_WTL_27 to AUSBOQ_WTL_83 with the command line PROJECT COVER AUSBOQ_WTL_27 AUSBOQ_WTL_83 (parameters, Projection UTM, Units meters, Zone 18, Datum NAD83 NADCON).
Source_Used_Citation_Abbreviation:
AUSBOQ_WTL_27
Source_Produced_Citation_Abbreviation:
AUSBOQ_WTL_83
Process_Step:
Process_Description:
EXPORT AUSBOQ_WTL_83 (EXPORT COVER AUSBOQ_WTL_83 AUSBOQ_WTL_83). Transport to NYS APA on CD.
Source_Used_Citation_Abbreviation:
AUSBOQ_WTL_83
Source_Produced_Citation_Abbreviation:
AUSBOQ_WTL_83.E00
Cloud_Cover: 0%

Back to Top

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference_Method:
Wetlands are defined as polygons identified by a software-placed label point or as an arc labeled with a wetland cover type. Some arcs and polygons represent boundaries imposed by the quadrangle borders and therefore do not represent true feature boundaries. All non-wetland polygons possess either a U SYSTEM and NWILABEL or have blank wetland cover types (outside the study area). All non-wetland arcs possess a blank cover type label.
Direct_Spatial_Reference_Method: Vector
Point_and_Vector_Object_Information:
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Complete chain
Point_and_Vector_Object_Count: 33228
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Label point
Point_and_Vector_Object_Count: 11284
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: GT-polygon composed of chains
Point_and_Vector_Object_Count: 11284
SDTS_Terms_Description:
SDTS_Point_and_Vector_Object_Type: Point
Point_and_Vector_Object_Count: 48

Back to Top

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:
Grid_Coordinate_System_Name: Universal Transverse Mercator
Universal_Transverse_Mercator:
UTM_Zone_Number: 18
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 0.999600
Longitude_of_Central_Meridian: -75.000000
Latitude_of_Projection_Origin: 0.000000
False_Easting: 500000.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abscissa_Resolution: 0.000128
Ordinate_Resolution: 0.000128
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222

Back to Top

Entity_and_Attribute_Information:

Detailed_Description:
Entity_Type:
Entity_Type_Label: ausboq_wtl_83.aat
Entity_Type_Definition:
Arc attribute table
Entity_Type_Definition_Source:
ArcInfo
Attribute:
Attribute_Label: FID
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: Shape
Attribute_Definition:
Feature geometry.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Coordinates defining the features.
Attribute:
Attribute_Label: FNODE#
Attribute_Definition:
Internal node number for the beginning of an arc (from-node).
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: TNODE#
Attribute_Definition:
Internal node number for the end of an arc (to-node).
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: LPOLY#
Attribute_Definition:
Internal node number for the left polygon.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:

Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: RPOLY#
Attribute_Definition:
Internal node number for the right polygon.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Whole numbers that are automatically generated.
Attribute:
Attribute_Label: LENGTH
Attribute_Definition:
Length of feature in internal units.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Positive real numbers that are automatically generated.
Attribute:
Attribute_Label: AUSBOQ_WTL_83#
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: AUSBOQ_WTL_83-ID
Attribute_Definition:
User-defined feature number.
Attribute_Definition_Source:
ESRI
Attribute:
Attribute_Label: ARCVALUE
Attribute_Definition:
Value to uniquely identify the quadrangle borders throughout the study area; also a unique value (99) for the Au Sable-Boquet River Basin Study Area (study area boundary). Linear wetlands and wetland polygon boundaries are given a value of 0.
Attribute_Definition_Source:
user-defined
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: 0
Enumerated_Domain_Value_Definition:
wetland arc
Enumerated_Domain_Value_Definition_Source:

user-defined
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Measurement_Frequency:
None planned
Attribute:
Attribute_Label: SYSTEM
Attribute_Definition:
Complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors. This parameter is mandatory for all linear wetlands in the study area.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: P
Enumerated_Domain_Value_Definition:
Palustrine habitat, non-tidal, less than 8 ha (20 acres) and less than 2 meters deep
Enumerated_Domain:
Enumerated_Domain_Value: R2
Enumerated_Domain_Value_Definition:
Lower perennial riverine
Enumerated_Domain:
Enumerated_Domain_Value: R3
Enumerated_Domain_Value_Definition:
Upper perennial riverine
Enumerated_Domain:
Enumerated_Domain_Value: R4
Enumerated_Domain_Value_Definition:
Intermittent riverine
Enumerated_Domain:
Enumerated_Domain_Value: U
Enumerated_Domain_Value_Definition:
Upland
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: CLASS1
Attribute_Definition:
General appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Covers at least 30% of the substrate. A value in this column is mandatory for all linear wetlands.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:

Enumerated_Domain:
Enumerated_Domain_Value: EM1
Enumerated_Domain_Value_Definition:
Persistent emergent
Enumerated_Domain:
Enumerated_Domain_Value: FO1
Enumerated_Domain_Value_Definition:
Forested, broad-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: FO4
Enumerated_Domain_Value_Definition:
Forested, evergreen
Enumerated_Domain:
Enumerated_Domain_Value: FO5
Enumerated_Domain_Value_Definition:
Forested, dead
Enumerated_Domain:
Enumerated_Domain_Value: OW
Enumerated_Domain_Value_Definition:
Open water
Enumerated_Domain:
Enumerated_Domain_Value: SB3
Enumerated_Domain_Value_Definition:
Streambed, cobble/gravel
Enumerated_Domain:
Enumerated_Domain_Value: SS1
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), broad-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: SS4
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), Needle-leaved evergreen
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: CLASS2
Attribute_Definition:
General appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Covers at least 30% of the substrate. Life form must be the same or lower in height than CLASS1. If the same general life form as CLASS1 (ex. FO), CLASS2 has equal or less areal extent. A value in this column is not mandatory.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:

Enumerated_Domain:
Enumerated_Domain_Value: /EM1
Enumerated_Domain_Value_Definition:
Persistent emergent
Enumerated_Domain:
Enumerated_Domain_Value: /FO1
Enumerated_Domain_Value_Definition:
Forested, broad-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: /FO4
Enumerated_Domain_Value_Definition:
Forested, evergreen
Enumerated_Domain:
Enumerated_Domain_Value: /OW
Enumerated_Domain_Value_Definition:
Open water
Enumerated_Domain:
Enumerated_Domain_Value: /SS1
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), broad-leaved deciduous
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: REGIME
Attribute_Definition:
The water regime modifier describes the hydrologic characteristics of the community. Only non-tidal regimes were used in the Adirondacks. A value in this column is mandatory for all linear wetlands.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: B
Enumerated_Domain_Value_Definition:
Saturated
Enumerated_Domain:
Enumerated_Domain_Value: E
Enumerated_Domain_Value_Definition:
Seasonally flooded - saturated
Enumerated_Domain:
Enumerated_Domain_Value: H
Enumerated_Domain_Value_Definition:
Permanent
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995

Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: SPECIAL1
Attribute_Definition:
Special modifiers are used to denote man-made or beaver modifications to the habitat. Optional parameter.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: b
Enumerated_Domain_Value_Definition:
Beaver
Enumerated_Domain:
Enumerated_Domain_Value: d
Enumerated_Domain_Value_Definition:
Partially drained, ditched
Enumerated_Domain:
Enumerated_Domain_Value: f
Enumerated_Domain_Value_Definition:
Farmed
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: SPECIAL2
Attribute_Definition:
Special modifiers are used to denote man-made or beaver modifications to the habitat. Optional parameter.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: f
Enumerated_Domain_Value_Definition:
Farmed
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:

As needed
Attribute:
Attribute_Label: SPECIAL3
Attribute_Definition:
Special modifiers are used to denote man-made or beaver modifications to the habitat. Optional parameter.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: NWILABEL
Attribute_Definition:
Unified label of SYSTEM, CLASS1, CLASS2, REGIME, SPECIAL1, SPECIAL2, and SPECIAL3. See the definitions of the individual components. This attribute is considered the NWI wetland label. Mandatory parameter for all linear wetlands within the study area, including linear uplands.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: see component values
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Detailed_Description:
Entity_Type:
Entity_Type_Label: ausboq_wtl_83.pat
Entity_Type_Definition:
Polygon attribute table
Entity_Type_Definition_Source:
ArcInfo
Attribute:
Attribute_Label: FID
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute_Measurement_Frequency:
As needed

Attribute:
Attribute_Label: Shape
Attribute_Definition:
Feature geometry.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Coordinates defining the features.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: AREA
Attribute_Definition:
Area of feature in internal units squared.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Positive real numbers that are automatically generated.
Beginning_Date_of_Attribute_Values: 1994 (imagery date)
Ending_Date_of_Attribute_Values: 1995 (imagery date)
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: PERIMETER
Attribute_Definition:
Perimeter of feature in internal units.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Positive real numbers that are automatically generated.
Beginning_Date_of_Attribute_Values: 1994 (imagery date)
Ending_Date_of_Attribute_Values: 1995 (imagery date)
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: AUSBOQ_WTL_83#
Attribute_Definition:
Internal feature number.
Attribute_Definition_Source:
ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: AUSBOQ_WTL_83-ID
Attribute_Definition:
User-defined feature number.

Attribute_Definition_Source:
ESRI
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: SYSTEM
Attribute_Definition:
Complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors. This parameter is mandatory for all polygons in the study area.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: L1
Enumerated_Domain_Value_Definition:
Lacustrine limnetic habitat, greater than 8 ha (20 acres) and more than 2 meters deep
Enumerated_Domain_Value_Definition_Source:
Cowardin et al 1979
Enumerated_Domain:
Enumerated_Domain_Value: L2
Enumerated_Domain_Value_Definition:
Lacustrine littoral habitat, greater than 8 ha (20 acres) and less than 2 meters deep
Enumerated_Domain_Value_Definition_Source:
Cowardin et al 1979
Enumerated_Domain:
Enumerated_Domain_Value: P
Enumerated_Domain_Value_Definition:
Palustrine habitat, non-tidal, less than 8 ha (20 acres) and less than 2 meters deep
Enumerated_Domain:
Enumerated_Domain_Value: R2
Enumerated_Domain_Value_Definition:
Lower perennial riverine
Enumerated_Domain:
Enumerated_Domain_Value: R3
Enumerated_Domain_Value_Definition:
Upper perennial riverine
Enumerated_Domain:
Enumerated_Domain_Value: U
Enumerated_Domain_Value_Definition:
Upland
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: CLASS1
Attribute_Definition:

General appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Covers at least 30% of the substrate. A value in this column is mandatory for all linear wetlands.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: AB3
Enumerated_Domain_Value_Definition:
Aquatic bed, rooted vascular
Enumerated_Domain:
Enumerated_Domain_Value: EM1
Enumerated_Domain_Value_Definition:
Persistent emergent
Enumerated_Domain:
Enumerated_Domain_Value: FO1
Enumerated_Domain_Value_Definition:
Forested, broad-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: FO2
Enumerated_Domain_Value_Definition:
Forested, needle-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: FO4
Enumerated_Domain_Value_Definition:
Forested, evergreen
Enumerated_Domain:
Enumerated_Domain_Value: FO5
Enumerated_Domain_Value_Definition:
Forested, dead
Enumerated_Domain:
Enumerated_Domain_Value: OW
Enumerated_Domain_Value_Definition:
Open water
Enumerated_Domain:
Enumerated_Domain_Value: SB3
Enumerated_Domain_Value_Definition:
Streambed, cobble/gravel
Enumerated_Domain:
Enumerated_Domain_Value: SS1
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), broad-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: SS3
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), broad-leaved evergreen
Enumerated_Domain:
Enumerated_Domain_Value: SS4
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), needle-leaved evergreen

Enumerated_Domain:
Enumerated_Domain_Value: SS5
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), dead
Enumerated_Domain:
Enumerated_Domain_Value: UB2
Enumerated_Domain_Value_Definition:
Unconsolidated bottom, sand
Enumerated_Domain:
Enumerated_Domain_Value: UB3
Enumerated_Domain_Value_Definition:
Unconsolidated bottom, mud
Enumerated_Domain:
Enumerated_Domain_Value: US2
Enumerated_Domain_Value_Definition:
Unconsolidated shore, sand
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute:
Attribute_Label: CLASS2
Attribute_Definition:
General appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Covers at least 30% of the substrate. Life form must be the same or lower in height than CLASS1. If the same general life form as CLASS1 (ex. FO), CLASS2 has equal or less areal extent. A value in this column is not mandatory.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: /EM1
Enumerated_Domain_Value_Definition:
Persistent emergent
Enumerated_Domain:
Enumerated_Domain_Value: /FO1
Enumerated_Domain_Value_Definition:
Forested, broad-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: /FO2
Enumerated_Domain_Value_Definition:
Forested, needle-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: /FO4
Enumerated_Domain_Value_Definition:
Forested, evergreen
Enumerated_Domain:
Enumerated_Domain_Value: /FO5

Enumerated_Domain_Value_Definition:
Forested, dead
Enumerated_Domain:
Enumerated_Domain_Value: /OW
Enumerated_Domain_Value_Definition:
Open water
Enumerated_Domain:
Enumerated_Domain_Value: /SS1
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), broad-leaved deciduous
Enumerated_Domain:
Enumerated_Domain_Value: /SS3
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), broad-leaved evergreen
Enumerated_Domain:
Enumerated_Domain_Value: /SS4
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), needle-leaved evergreen
Enumerated_Domain:
Enumerated_Domain_Value: /SS5
Enumerated_Domain_Value_Definition:
Scrub/shrub (shorter than 6 meters), dead
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: REGIME
Attribute_Definition:
The water regime modifier describes the hydrologic characteristics of the community. Only non-tidal regimes were used in the Adirondacks. A value in this column is mandatory for all wetland polygons.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: B
Enumerated_Domain_Value_Definition:
Saturated
Enumerated_Domain:
Enumerated_Domain_Value: D
Enumerated_Domain_Value_Definition:
Seasonally flooded - well drained
Enumerated_Domain:
Enumerated_Domain_Value: E
Enumerated_Domain_Value_Definition:
Seasonally flooded - saturated

Enumerated_Domain:
Enumerated_Domain_Value: F
Enumerated_Domain_Value_Definition:
Semipermanent
Enumerated_Domain:
Enumerated_Domain_Value: H
Enumerated_Domain_Value_Definition:
Permanent
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: SPECIAL1
Attribute_Definition:
Special modifiers are used to denote man-made or beaver modifications to the habitat. Optional parameter.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: b
Enumerated_Domain_Value_Definition:
Beaver
Enumerated_Domain:
Enumerated_Domain_Value: d
Enumerated_Domain_Value_Definition:
Partially drained, ditched
Enumerated_Domain:
Enumerated_Domain_Value: f
Enumerated_Domain_Value_Definition:
Farmed
Enumerated_Domain:
Enumerated_Domain_Value: h
Enumerated_Domain_Value_Definition:
Diked/impounded
Enumerated_Domain:
Enumerated_Domain_Value: r
Enumerated_Domain_Value_Definition:
Artificial
Enumerated_Domain:
Enumerated_Domain_Value: x
Enumerated_Domain_Value_Definition:
Excavated
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:

Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: SPECIAL2
Attribute_Definition:
Special modifiers are used to denote man-made or beaver modifications to the habitat. Optional parameter.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: d
Enumerated_Domain_Value_Definition:
Partially drained, ditched
Enumerated_Domain:
Enumerated_Domain_Value: f
Enumerated_Domain_Value_Definition:
Farmed
Enumerated_Domain:
Enumerated_Domain_Value: h
Enumerated_Domain_Value_Definition:
Diked/impounded
Enumerated_Domain:
Enumerated_Domain_Value: q
Enumerated_Domain_Value_Definition:
Questionable
Enumerated_Domain_Value_Definition_Source:
Special modifier developed for this project, denotes upland areas that may be suitable for wetland reversion.
Enumerated_Domain:
Enumerated_Domain_Value: x
Enumerated_Domain_Value_Definition:
Excavated
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: SPECIAL3
Attribute_Definition:
Special modifiers are used to denote man-made or beaver modifications to the habitat. Optional parameter.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:

Enumerated_Domain:
Enumerated_Domain_Value: d
Enumerated_Domain_Value_Definition:
Partially drained, ditched
Enumerated_Domain:
Enumerated_Domain_Value: f
Enumerated_Domain_Value_Definition:
Farmed
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed
Attribute:
Attribute_Label: NWILABEL
Attribute_Definition:
Unified label of SYSTEM, CLASS1, CLASS2, REGIME, SPECIAL1, SPECIAL2, and SPECIAL3. See the definitions of the individual components. This attribute is considered the NWI wetland label. Mandatory parameter for all polygons within the study area, including upland polygons.
Attribute_Definition_Source:
Cowardin et al 1979
Attribute_Domain_Values:
Enumerated_Domain:
Enumerated_Domain_Value: see component values
Beginning_Date_of_Attribute_Values: 1994
Ending_Date_of_Attribute_Values: 1995
Attribute_Value_Accuracy_Information:
Attribute_Value_Accuracy_Explanation:
Attributes derived from photointerpretation techniques.
Attribute_Measurement_Frequency:
As needed

Back to Top

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: NYS Adirondack Park Agency
Contact_Person: W. Mark Rooks
Contact_Position: Associate Adirondack Park Project Analyst, Biological Resources
Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: wmrooks@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Resource_Description: Downloadable Data, may be available on other media such as CD. Wetlands in the Au Sable-Boquet River Basin.

Distribution_Liability:
Although these data have been processed successfully on a computer system at the NYS APA, no warranty expressed or implied is made regarding the accuracy or utility of the data on any other system or for general or scientific purposes, nor shall the act of distribution constitute any such warranty. This disclaimer applies both to individual use of the data and aggregate use with other data. It is strongly recommended that these data be directly acquired from the NYS APA, and not indirectly through other sources which may have changed the data in some way. It is also strongly recommended that careful attention be paid to the contents of the metadata file associated with these data. The NYS APA shall not be held liable for improper or incorrect use of the data described and/or contained herein. These data shall not be used for legal jurisdictional determinations.
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: ARCE
Format_Version_Number: ArcInfo 9.1
File_Decompression_Technique: no compression applied
Transfer_Size: 8.304
Technical_Prerequisites:
These data were created in ESRI's ArcGIS 9.1 ArcInfo coverage format.

Back to Top

Metadata_Reference_Information:
Metadata_Date: 20071220
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Eileen B. Allen
Contact_Organization: State University of NY at Plattsburgh, GIS Laboratory
Contact_Position: GIS Coordinator
Contact_Address:
Address_Type: mailing and physical address
Address:
Center for Earth and Environmental Science
Address:
101 Broad Street
City: Plattsburgh
State_or_Province: New York
Postal_Code: 12901
Country: USA
Contact_Voice_Telephone: (518) 564-2020
Contact_Facsimile_Telephone: (518) 564-5267
Contact_Electronic_Mail_Address: eileen.allen@plattsburgh.edu
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Security_Information:
Metadata_Security_Classification_System: none

Metadata_Security_Classification: Unclassified
Metadata_Security_Handling_Description:
none
Metadata_Extensions:
Online_Linkage: http://www.esri.com/metadata/esriprof80.html
Profile_Name: ESRI Metadata Profile

Back to Top

Appendix 12. Metadata for the Ecological Land Unit model for the AuSable and Boquet River Watershed, Adirondack Park, NY, USA (2008).

Metadata:

- Identification_Information
- Data_Quality_Information
- Spatial_Data_Organization_Information
- Spatial_Reference_Information
- Entity_and_Attribute_Information
- Distribution_Information
- Metadata_Reference_Information

Identification_Information:

Citation:
Citation_Information:
Originator: New York State Adirondack Park Agency
Publication_Date: 20081231
Title:
New York State Adirondack Park AuSable and Boquet River Watershed Ecological Land Unit Model
Edition: Version 1.0
Geospatial_Data_Presentation_Form: raster digital data
Series_Information:
Series_Name: Watershed Scale Protection for Adirondack Wetlands
Issue_Identification:
A Biological Assessment Method to Protect and Restore Wetland Communities in the Au Sable and Boquet River Watersheds of the Adirondack Park
Publication_Information:
Publication_Place: Ray Brook, NY
Publisher: New York State Adirondack Park Agency
Online_Linkage: abwelu17jul07
Description:
Abstract:
The Ecological Land Unit (ELU) model represents the enduring landscape features of the AuSable and Boquet River Watershed (Adirondack Park, New York, USA) by 10x10m gridcells. Each ELU is a four-digit code where the thousands place indicates elevation, the hundreds place indicates soil, and the tens and ones places together indicate landform, a combination of slope, land position, moisture, and aspect. The ELU code itself does not have a numerical value, rather the code represents ecological features of the unit (enduring landscape features) that can be translated to a likely ecological expression (potential natural vegetation).
Purpose:
The data set was developed with the intention of mapping existing and potential wetlands and locating candidate sites for wetland mitigation. The rationale was that if a location has the enduring landscape features (represented in the ELU) that typically support wetlands, but does not contain an existing wetland, then that

location is a better candidate for wetland mitigation than an area that does not contain those features.
Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 1966
Ending_Date: 2006
Currentness_Reference:
Earliest and latest publication dates of the data that contributed to the ELU model.
Status:
Progress: Complete
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -74.086052
East_Bounding_Coordinate: -73.311381
North_Bounding_Coordinate: 44.632978
South_Bounding_Coordinate: 44.014806
Keywords:
Theme:
Theme_Keyword_Thesaurus: None
Theme_Keyword: Geographic Information System (GIS)
Theme_Keyword: Raster
Theme_Keyword: Ecological Land Unit (ELU)
Theme_Keyword: Wetland Mitigation
Place:
Place_Keyword_Thesaurus: Geographic Names Information System
Place_Keyword: New York
Place_Keyword: Adirondack Park
Place_Keyword: Adirondack Mountains
Place_Keyword: AuSable and Boquet River Watershed
Place_Keyword: AuSable River
Place_Keyword: Boquet River
Stratum:
Stratum_Keyword_Thesaurus: None
Temporal:
Temporal_Keyword_Thesaurus: None
Access_Constraints: None
Use_Constraints:
These data may not be used for legal determinations. Please credit use of this data set to the New York State Adirondack Park Agency, Ray Brook, New York 12977. Please send a copy of any reports or papers in which these data were used or referenced to the above address, Attention: Susan VanWormer, Librarian.
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: New York State Adirondack Park Agency
Contact_Person: Ariel A. Diggory
Contact_Position: Environmental Program Specialist
Contact_Address:

Address_Type: mailing and physical address
Address: Route 86, P.O. Box 99
City: Ray Brook
State_or_Province: New York
Postal_Code: 12977
Country: USA
Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: aadiggor@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Data_Set_Credit:
Funding was provided by the US Environmental Protection Agency Office of Wetlands Protection; State Wetlands Protection Program; Project #S200404 to the New York State Adirondack Park Agency.
Security_Information:
Security_Classification_System: None
Security_Classification: Unclassified
Security_Handling_Description: None
Native_Data_Set_Environment:
Microsoft Windows 2000 Version 5.2 (Build 3790) Service Pack 2; ESRI ArcCatalog 9.3.0.1770

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
To quantify the accuracy of the ELU model, we compared the ELU model's predictions to reference data using a confusion matrix, which assesses where the model and reference data agree and disagree. We used the most current wetland maps for the region (hereafter referred to as EPA wetland maps because they were created as part of this EPA-funded project) as our reference data, indicating wetland presence or absence. The EPA wetland maps represent existing wetlands delineated from 1994/95 color infrared aerial photography. However, the design of the ELU was to depict both those existing wetlands as well as potential wetlands, i.e., those places with the enduring landscape features to support a wetland but that did not support a wetland when the 1994/95 air photos were taken. Therefore, the ELU model should depict all existing wetlands as delineated from the photos, possibly missing man-made or beaver-made wetlands in areas that otherwise lack wetland features, and it should also indicate more wetlands than the reference wetland maps because it was designed to find not just the existing wetlands, but the potential wetlands. A 100% match between the ELU and the reference EPA wetland maps was never expected. The confusion matrix indicated an overall accuracy of 70.4% for the ELU model. The user's accuracy for wetland absence was 96.3% and for wetland presence was 42.8%. Producer's accuracy for wetland absence was 62.4% and for wetland presence was 91.6%. These accuracy percentages indicated that the ELU method often misclassified non-wetlands as wetland, but the ELU method rarely classified a location as non-wetland when it was a true wetland. The ELU model's kappa statistic was 0.397. The false positive rate was 58.3% while the false negative rate was 3.2%.
Quantitative_Attribute_Accuracy_Assessment:
Attribute_Accuracy_Explanation:

Of the 2,000 sample points in the validation data set, >/= 90.1% of locations the ELU classified as wetland because of detailed hydric soil, with or without a moist/wet flat landform, correctly indicated the presence of wetlands. Similarly, 90.2% of locations the ELU classified as wetland because of hydric soil complex and a moist/wet flat landform also correctly indicated the presence of wetlands. However, only 76.9% of locations the ELU classified as wetland because of a hydric soil complex alone were indeed wetlands.
Examining predictions of wetland absence, >/= 90.7% of locations classified as cliff, flat summit, or "not wetland" (a broad "other" category) correctly indicated the absence of wetlands. The categories of dry flat, streams, and lakes performed poorly. Only 44.6% of locations labeled dry flat by the ELU agreed with the non-wetland status on the EPA maps. It seemed that even without a hydric soil map unit or a moist/wet flat landform, these dry flats contained a fair amount of wetlands. Only 13.4% of locations labeled streams by the ELU and 33.8% of locations labeled lakes by the ELU agreed with the non-wetland status on the EPA wetland maps. Instead, a majority of locations labeled stream or lake by the ELU corresponded to wetland presence on the EPA maps.
Completeness_Report:
The ELU model has not been field verified. It has, however, been compared with wetlands identified by air photo interpretation.
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report:
Since positional accuracy is lost as geographic data is processed and derived, we recommend field verification of any candidate wetland mitigation site indicated by the ELU model.
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: No vertical coordinates are associated with this data set.
Lineage:
Process_Step:
Process_Description:
This ELU model was adapted from an ELU model created by The Nature Conservancy. Rasters were created and classified for each part of the ELU model code and than summed to produce the 4-digit ELU model. The thousands place indicates elevation, the hundreds place indicates soil, and the tens and ones places together indicate landform, a combination of slope, land position, moisture, and aspect.
Source_Used_Citation_Abbreviation:
Anderson, M. G., M. D. Merrill, F. B. Biasi. 1998. Connecticut River Watershed analysis: ecological communities and Neo-tropical migratory birds. The Nature Conservancy.

Spatial_Data_Organization_Information:
Direct_Spatial_Reference_Method: Raster
Raster_Object_Information:
Raster_Object_Type: Grid Cell
Row_Count: 6772
Column_Count: 6071
Vertical_Count: 1

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Planar:
Grid_Coordinate_System:
Grid_Coordinate_System_Name: Universal Transverse Mercator
Universal_Transverse_Mercator:
UTM_Zone_Number: 18
Transverse_Mercator:
Scale_Factor_at_Central_Meridian: 0.999600
Longitude_of_Central_Meridian: -75.000000
Latitude_of_Projection_Origin: 0.000000
False_Easting: 500000.000000
False_Northing: 0.000000
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: row and column
Coordinate_Representation:
Abscissa_Resolution: 10.000000
Ordinate_Resolution: 10.000000
Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137.000000
Denominator_of_Flattening_Ratio: 298.257222

Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: abwelu17jul07.vat
Attribute:
Attribute_Label: Rowid
Attribute_Definition: Internal feature number.
Attribute_Definition_Source: ESRI
Attribute_Domain_Values:
Unrepresentable_Domain:
Sequential unique whole numbers that are automatically generated.
Attribute:
Attribute_Label: VALUE
Attribute_Definition: 4-digit ELU code
Attribute:
Attribute_Label: COUNT
Attribute_Definition: count of 4-digit ELU code
Overview_Description:
Entity_and_Attribute_Overview:
(a) Elevation categories represented by the thousands place of the ELU code.
1000 = 0.0 - 243.8 m (0 - 800 ft) low elevations
2000 = 248.8 - 518.2 m (800 - 1700 ft)
3000 = 518.2 - 762.0 m (1700 - 2500 ft) mid elevations
4000 = 762.0 - 1219.2 m (2500 - 4000 ft)

5000 = 1219.2 - 1628.9 m (4000 - 5344 ft) alpine
(b) Soil categories represented by the hundreds place of the ELU code.
0 no hydric soil
100 water
200 order 2 hydric soils (detailed mapping)
300 order 3 hydric soils (soil complexes)
700 clay spot
800 wet spot
900 marsh spot
(note: ELU codes 400, 500, 600 were not assigned)
(c) Landform categories represented by the tens and ones places of the ELU code and their component parts.
10 cliff (any land position, "cliff" slope, any moisture, no water)
11 steep slope (any land position, "steep slope" slope, any moisture, no water)
12 slope crest ("ridge" land position, "side slope" slope, any moisture, no water)
13 upper slope ("wide ridge" land position, "side slope" slope, any moisture, no water)
14 flat summit ("ridge/wide ridge" land position, "flat" slope, any moistuer, no water)
20 side slope, N-facing ("slope/flat" land position, "side slope" slope, any moisture, no water)
21 cove, N-facing ("cove/toe slope" land position, "side slope" slope, any moisture, no water)
22 side slope, S-facing ("slope/flat" land position, "side slope" slope, any moisture, no water)
23 cove, S-facing ("cove/toe slope" land position, "side slope" slope, any moisture, no water)
30 dry flat ("slope/flat" land position, "flat" slope, "dry" moisture, no water)
31 moist flat ("slope/flat land position, "flat" slope, "moist" moisture, no water)
32 wet flat ("slope/flat" land position, "flat" slope, "wet" moisture, no water)
33 slope bottom ("cove/toe slope" land position, "flat" moisture, any moisture, no water)
40 streams (any land position, any slope, any moisture, "stream" water)
42 lakes (any land position, any slope, any moisture, "lake" water)

Distribution_Information:
Distributor:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: New York State Adirondack Park Agency
Contact_Person: W. Mark Rooks
Contact_Position: Associate Adirondack Park Project Analyst, Biological Resources
Contact_Address:
Address_Type: mailing and physical address
Address: Route 86, P.O. Box 99
City: Ray Brook
State_or_Province: New York
Postal_Code: 12977
Country: USA

Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: wrmrooks@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Resource_Description: Downloadable Data
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Transfer_Size: 5.519

Metadata_Reference_Information:
Metadata_Date: 20081003
Metadata_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: New York State Adirondack Park Agency
Contact_Person: Ariel A. Diggory
Contact_Position: Environmental Program Specialist
Contact_Address:
Address_Type: mailing and physical address
Address: Route 86, P.O. Box 99
City: Ray Brook
State_or_Province: New York
Postal_Code: 12977
Country: USA
Contact_Voice_Telephone: (518) 891-4050
Contact_Facsimile_Telephone: (518) 891-3938
Contact_Electronic_Mail_Address: aadiggor@gw.dec.state.ny.us
Hours_of_Service: 8:30 AM - 4:30 PM Monday through Friday
Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998
Metadata_Time_Convention: local time
Metadata_Extensions:
Online_Linkage: <http://www.esri.com/metadata/esriprof80.html>
Profile_Name: ESRI Metadata Profile