Trip A-1
SLOPERVILLE BOG AND ESKERS

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INTRODUCTION

On this trip we will explore a large wetland centrally located in a beach, outwash, and esker-kame moraine complex that forms the Lacona-Williamstown aquifer, the largest aquifer in Oswego County. This fieldtrip will use terms commonly used to designate glacially formed topographic features, and address specific names of plants and detailed descriptions of the characteristics of relevant wetland communities.

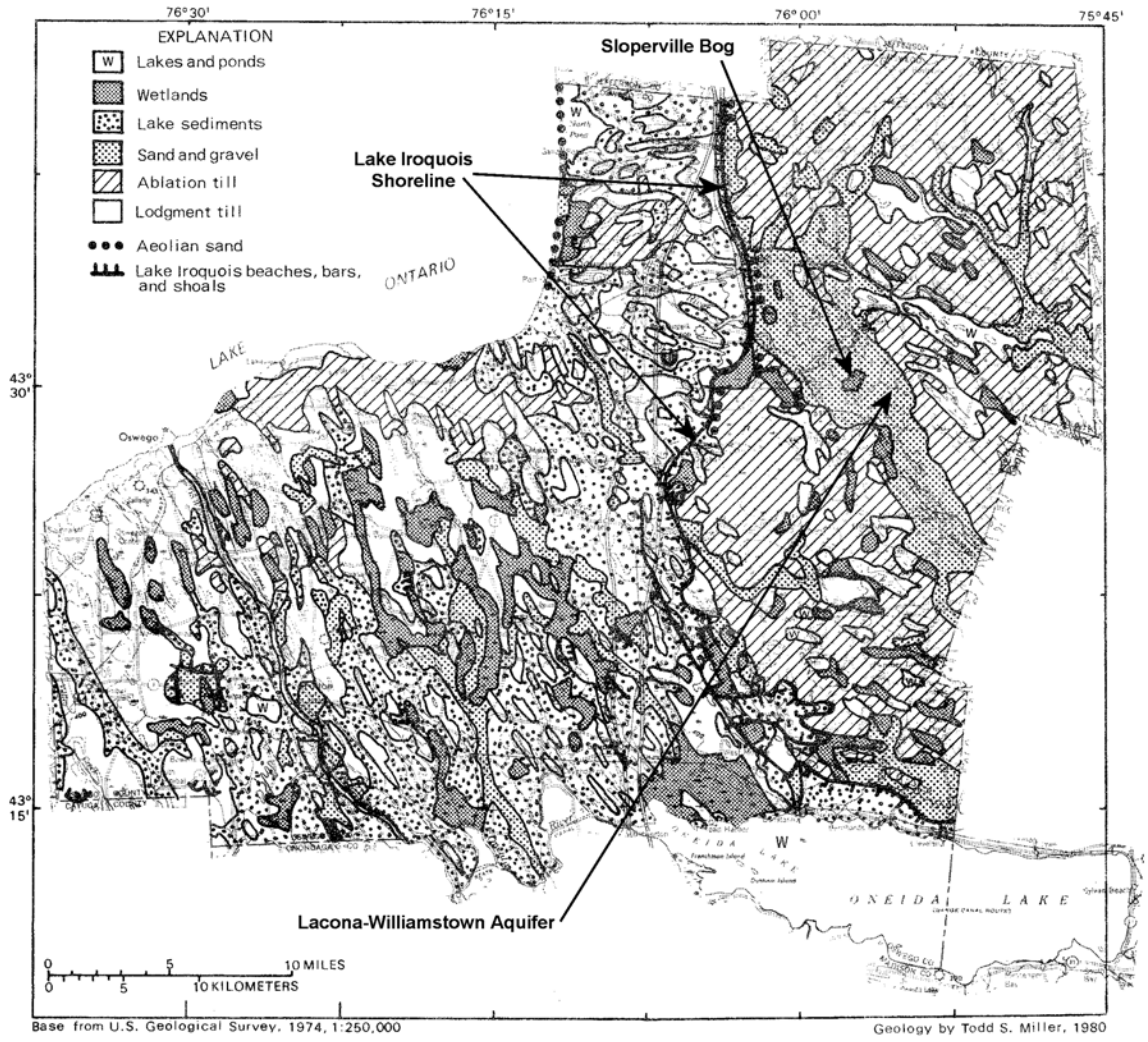

Figure 1 - Surficial geology of Oswego County (modified from Miller, 1982).

Sloperville Bog is part of a complex 73.5 ha (183.8 acre) wetland unit located in the northeast corner of the Town of Albion in Oswego County. It is situated in the adjoining west corners of the Orwell and Williamstown 7½' quadrangles. The bulk of the wetland and surrounding uplands are owned by Cotton-

Hanlon Inc., having been acquired from a private landowner in 1966[1]. The area has thus been protected from housing and other forms of development and presents a relatively unaltered landscape, flora, and fauna.

Current features of the topography and surficial geology of Oswego County are largely the result of glacial and melt water action during the most recent (Wisconsinan) glaciation and wave and wind action along the shores of proglacial Lake Iroquois and its successors. The ancient shoreline of Lake Iroquois extends south from the northern boundary of the county at approximately 76°03.75'W turning east parallel to the north shore of Oneida Lake at about 43°15'N (Figure 1). The central and western portions of the county, west and south of the Lake Iroquois shoreline, are part of the Erie-Ontario Coastal Plain, much of which features a landscape of drumlins with intervening streams and wetlands. The northeastern portion of the county is part of the Tug Hill Plateau, rising from about 150 m (500 ft) along the Lake Iroquois shore line to about 516 m (1,720 ft) at the northeast corner of the county. The topography here features a complex mix of kames, eskers, kettles, outwash plains, and wetlands. Surficial deposits include extensive areas of ablation till and sand and gravel with scattered pockets of lodgment till (Figure 1) (Miller 1982).

Oswego County is unusually rich in wetlands (sites permanently or periodically flooded or saturated by seepage and supporting emergent wetland vegetation). The 858 wetlands greater than 4.96 ha (12.4 acres) in size or of unusual local importance included in the "The Oswego County Wetlands Mapping Inventory Project" cover a total of 37,200 ha (93,000 acres) representing 15% of the county's total land area (Jones et al. 1983a).

Wetlands are commonly and broadly categorized according to the nature of the substrate and the physiognomy of the vegetation. Wetlands with a substrate of mineral soil are broadly distinguished as marshes, if dominated by herbaceous plants, or swamps, if dominated by woody plants. Where conditions are such as to limit aeration, partly decomposed plant remains may accumulate resulting in a substrate of organic peat. Most forested peatlands, like forested mineral soil wetlands, are called swamps, the different types characterized by the presence and/or dominance of different tree species. Open peatlands, dominated by herbaceous vegetation and especially those where plant roots and peat form a floating mat, are commonly called "bogs". Wetland ecologists, however, often reserve the term "bog" for peatlands where the input of water and dissolved minerals is primarily from direct precipitation with little if any contribution from ground water or surface runoff. Bogs in this strict sense have not been found in Oswego County. Floating mat peatlands fed by surface runoff, ground water, or adjacent flowing streams are referred to as "fens". Fens exhibit a gradation of features allowing identification of "poor fens", "medium fens" and "rich fens". A fen built up on the soils of a lake shore or stream floodplain where the mat is periodically inundated instead of floating with changing water levels is sometimes called a sedge meadow (Edinger et al., 2002), though some authors use this term only in association with sedge dominated marshes (Crum, 1988). Any of these open peatlands may be gradually invaded by woody plants turning a rich or medium fen into a shrub fen or a poor fen into a dwarf shrub bog (Edinger et al., 2002).

Eighty eight (88) of the 858 wetlands identified by the 1983 Oswego County wetlands inventory were cited as being or containing "bogs". Over the last ten years collaborative research with Peter A. Rosenbaum (Biology Department at Oswego) has focused on evaluation of these sites as potential habitat for species of plants and animals recognized as rare and endangered.

The majority of these peatlands ("bogs") are poor fens of the sort commonly referred to as "kettlehole bogs"[2]. Characteristically, these fens develop in the ponds formed in kettles, localized depressions resulting from thawing of isolated blocks of glacial ice that were buried in ablation till or kame deposits. These basins often have no surface drainage and are fed by surface runoff from a small watershed and/or by

[1] Cotton-Hanlin is a timberland management company with holdings in New York and Pennsylvania. Lands in the Sloperville Bog area are leased to a private hunting club and public access is not available during the hunting season, including the spring turkey season.

[2] Authorities differ on whether a "kettlehole bog" should be called a poor fen (Edinger et al., 2002) or a bog (Johnson, 1985).

ground water. In the classic model, a floating mat of Sphagnum peat develops around the edge of the pond, gradually covers the pond, and eventually fills the basin.

Poor fens are fed by surface runoff and ground water relatively low in mineral content (weakly minerotrophic). The peat is composed mostly of the remains of *Sphagnum* (peat) mosses with a minor amount of material derived from grass-like (graminoid) plants of the sedge family (Cyperaceae) and from woody plants. pH is quite low ranging from 3.5 to 5.0 (Edinger et al., 2002). The surface of the peat is covered with a nearly continuous layer of living *Sphagnum*. The *Sphagnum* peat constitutes a chemical environment in which the low pH is maintained and the common plant nutrients, particularly calcium, nitrogen, phosphorous, and potassium, are bound in forms unavailable to most plant species. Woody plants such as eastern white pine (*Pinus strobus*), tamarack or eastern larch (*Larix laricina*), black spruce (*Picea mariana*), and red maple (*Acer rubrum*) are often present as stunted, slow growing individuals. Shrubs particularly adapted to growth in acid, low nutrient habitats, many of them in the Heath family (Ericaceae), are usually present and may be abundant. Included here are highbush blueberry (*Vaccinium corymbosum*), black huckleberry (*Gaylussacia baccata*), leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), bog rosemary (*Andromeda glaucophylla*), and small cranberry (*Vaccinium oxycoccos*). Graminoids in the Cyperaceae commonly include certain species of *Carex* (sedge), *Rhynchospora* (beakrush), and *Eriophorum* (cottongrass). Carnivorous plants, such as pitcher plant (*Sarracenia purpurea*), sundews (*Drosera rotundifolia* and *D. intermedia*), and bladderworts (*Utricularia* spp.), are abundant. Wild orchids, such as swamp pink (*Arethusa bulbosa*), grass pink (*Calopogon tuberosus*), pink ladyslipper (*Cypripedium acaule*), white fringed orchid (*Platanthera blephariglottis*), and rose pogonia (*Pogonia ophioglossoides*), are also characteristic species of this community. Poor fens, highly localized and somewhat unusual in our area, are similar in many ways to the vast muskeg of the taiga, the boreal forest community which circles the globe in more northern latitudes. Like alpine ecological communities at high altitudes, poor fens may remain as relict representatives of more widespread communities that occupied our area as the glaciers receded in the late Pleistocene.

Thirteen (13) of the eighty eight (88) peatland containing wetlands cited in the wetlands inventory support medium fens. Medium fens are fed by moderately mineralized ground waters that, in our area, are probably enriched in calcium as the result of passing through calcareous sands or gravels. In most cases the wetland with which they are associated has a perennial outlet stream. The peat formed in medium fens is a mixture of the remains of sedges, mosses, and woody plants with sedges predominating. Medium fens have a pH of from 4.5 to 6.5 (Edinger et al. 2002). Medium fens we have explored in Oswego County are often situated along the margins of a pond. In these cases, the pH of the pond waters is usually significantly higher (7.0 to 8.8) than that of the bordering fen. Where a sedge-dominated medium fen borders an area of *Sphagnum* dominated poor fen, the transition from medium to low pH can be as sharp as the visual line that marks the edge of the *Sphagnum* mat. The dominant plants of medium fens are mat forming sedges such as *Carex lasiocarpa*, and *Cladium mariscoides* (bog-rush). *Sphagnum* mosses are usually confined to hummocks that build up around scattered trees and shrubs or clumps of royal fern (*Osmunda regalis*). A characteristic shrub of medium fens is sweet gale (*Myrica gale*). Leatherleaf and the other ericaceous shrubs also seen in poor fens may be present and abundant. The large cranberry (*Vaccinium macrocarpon*) is more likely to be more abundant than the small cranberry. Black spruce is often absent and northern white-cedar (*Thuja occidentalis*) and poison sumac (*Toxicodendron vernix*) are often present as well as eastern larch, white pine, and red maple.

Rich fens, which to our knowledge are not represented in Oswego County, usually occur in areas of carbonate bedrock. The pH of these systems ranges from 6.0 to 7.8. Graminoid peat formed from the dominant sedges may be accompanied by layers of marl. *Sphagnum* is absent or confined to hummocks. Characteristic sedges include the spikerush *Eleocharis rostellata*, the bog-rush, and the sedges *Carex flava, C. lasiocarpa, and C. hystericina*. Other herbaceous plants of rich fens are grass-of-parnassus (*Parnassia glauca*) and Kalm's lobelia (*Lobelia kalmii*). Characteristic woody plants include shrubby cinquefoil (*Potentilla fruticosa*), bayberry (*Myrica pensylvanica*), poison sumac, red maple, northern white cedar, eastern larch, sweet gale, and swamp fly honeysuckle (*Lonicera oblongifolia*).

The classifications that result from study of ecological communities represent, at best, a rough approximation of the actual situation in nature. Boundaries between different types of communities consist

of gradients, sometimes abrupt and sometimes gradual, in all recognized parameters. Particular plant species that characterize a wetland community in central New York may not be characteristic of the same community as represented in the lake states or northern New England and a given wetland, like Sloperville Bog, may contain a mosaic of different wetland community types.

SLOPERVILLE BOG

Sloperville bog is part of the largest of three segments of the wetland designated as OR-29 on the Oswego County Wetlands map. Beaverdam Brook enters the wetland from the southeast, threading its way around and through a complex of eskers before expanding into an area of open water in the southern portion of the wetland and then exiting through a constriction at the southwest corner of the wetland immediately south of the south end of Sloperville Drive (Fig. 2). Water is retained in the northern portion

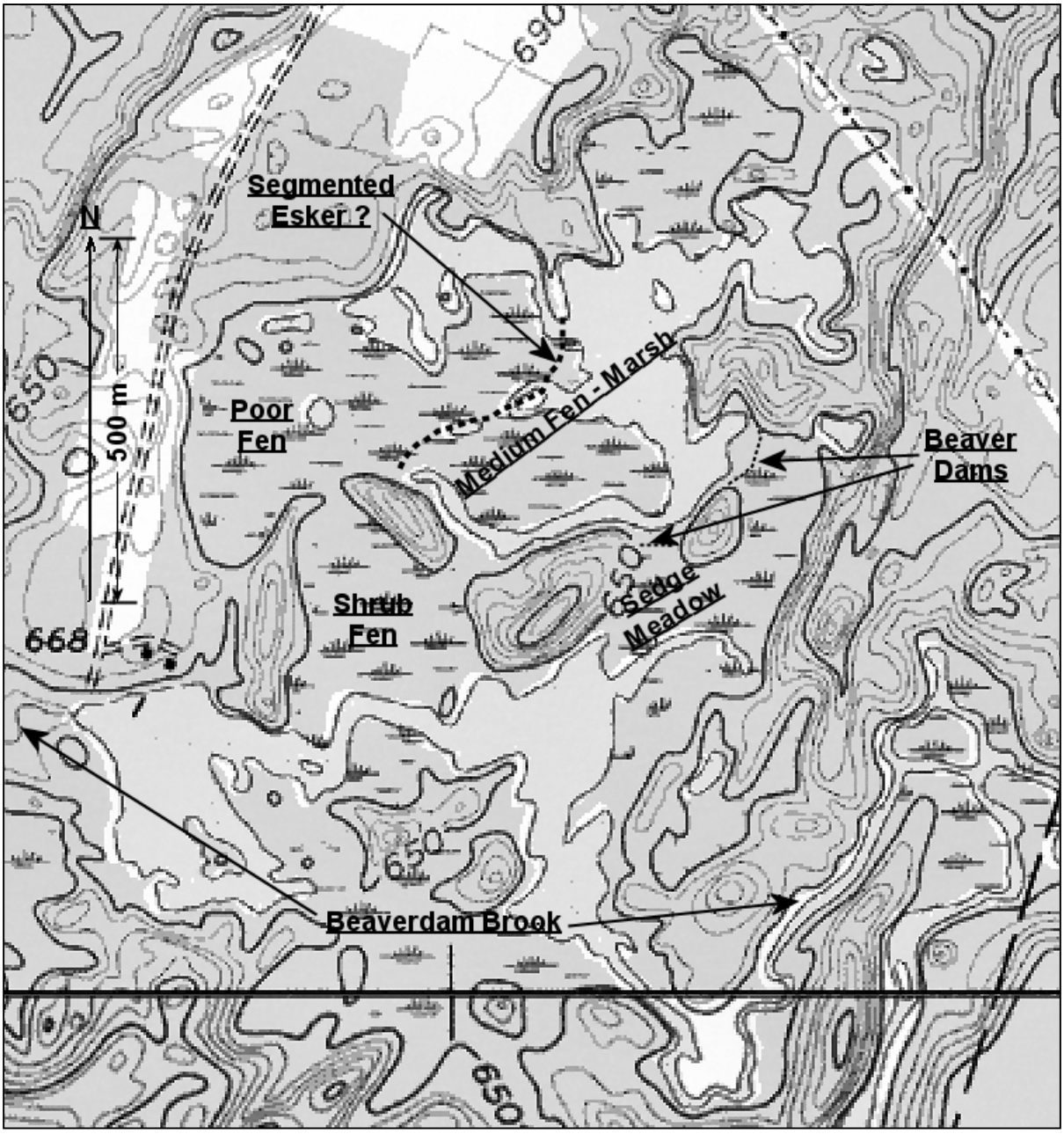

Figure 2 – Sloperville bog showing features mentioned described in the text.

of the basin by an undulating esker meandering on an east-west course across the middle of the basin. The dam formed by the esker is completed by beaver dams at two points where the esker is broached or submerged. This northern section receives runoff from a limited watershed. A steady flow of water in the stream draining from the northeastern of the two beaver dam areas suggests a significant and continuing inflow of ground water into the northern part of the basin. The northwestern lobe of the basin supports the extensive poor fen known as Sloperville Bog. Roughly half way across the basin to the east the poor fen changes over to medium fen and marsh dominated by *Carex lasiocarpa* and then gives way to open water. In the eastern part of the basin immediately below the beaver dams is a sedge meadow traversed by narrow rivulets that drain into the stream draining the northern part of the wetland down to Beaverdam Brook. Further west a shrub fen has developed in a cove bounded by the main esker that extends across the basin (Figure 2). A total of 136 species of vascular plants (clubmosses, ferns, conifers, and flowering plans) have so far been recorded from the Sloperville bog wetland. The ecological communities of the southern half of the basin have not yet been intensively explored and characterized.

The poor fen in the northwestern lobe of the basin is perhaps the most easily accessed and negotiated poor fen in the county and for that reason it is a favorite for introducing students to this type of ecological community. The surface of the mat is firm, except at the edges, and virtually flat. The vegetation on most of the fen is low and open posing no obstacle to progress over the surface.

The classic kettlehole bog or poor fen of the glaciated northeastern United States consists of a central pond surrounded by the floating mat of an open fen which gives way at its inland margins to shrubs and eventually trees, the whole comprising a series of concentric zones around the pond. The floating mat of the Sloperville poor fen, in contrast, extends to the edges of the basin separated from the mainland only by a narrow moat where incoming surface runoff supplies sufficient oxygen and mineral nutrients to facilitate decomposition of plant materials. There is a central pond, in this case immediately surrounded by a narrow floating mat consisting primarily of the sedge *Carex limosa* and dense clumps of leatherleaf. This, in turn, is surrounded by a zone of dense, head high blueberry and huckleberry bushes along with relatively tall black spruce and larch. A few other isolated, smaller groves of spruce and larch also occur in the fen. A total of fifty four (54) species of vascular plants, all more or less characteristic of poor fens in this region, have been recorded from this fen. This includes all of the orchid species so far found in the wetland and most of the carnivorous plants. Except for the thicket surrounding the central pond, the woody plants of this fen are quite stunted compared to individuals in some other poor fens of the area. Dwarf mistletoe (*Arceuthobium pusillum*), a diminutive parasitic flowering plant, can be found on the branches of some of the black spruce in the thicket on the northeast edge of the central pond area.

Roughly half way across this northern basin some isolated upland islands interrupt the fen. In this area, the poor fen of the western lobe of the basin gives way to a *Carex lasiocarpa* dominated fen, then to an area of partially submerged *C. lasiocarpa* and finally to shallow, open water. The restriction of the poor fen to the northwestern lobe of the wetland suggests that there is some limitation on drainage from this section into the rest of the basin. It is tempting to suggest that the isolated islands across the center of the basin may be the exposed portions of a segmented esker the rest of which has been buried by flooding and accumulation of peat and other sediments in the basin (Figure 2) (Jones et al., 1983b). Such a sub-surface ridge might restrict the drainage of water from the western portion of this basin. Investigation of this possibility would contribute greatly to an understanding of the nature of Sloperville Bog.

The medium fen and area of open water in the eastern part of the basin present a complex of habitats from which fifty three (53) species of plants have been recorded. Species characteristic of medium fen, marsh, shrub swamp, and aquatic habitats are included.

Directly down stream from the western of the two beaver dams currently controlling the water level in the large northern basin is a shrubby area leading to the flood plain of the stream draining the basin through the eastern beaver dam (Fig. 2). Seepage from this area flows through shallow, narrow rivulets into the stream running south below the eastern beaver dam. A small pond impounded by a second dam below the main eastern dam provides habitat from which twenty two (22) aquatic and lake shore plant species were recorded on one visit in July 2004. Thirteen (13) of these have not been recorded from other sections of the

wetland north of Beaverdam Brook and an additional five (5) have been seen elsewhere only in the medium fen and open water area directly north of the beaver dams.

The flood plain of the stream draining the northern basin supports a sedge meadow dominated by *Carex lasiocarpa*. Plant species records as currently kept for this area include the shrubby margins of the flood plain as well as the open sedge meadow itself. Sixty three (63) species have been recorded from this area making it the most diverse part of the wetland surveyed to date. The sedge meadow has a level surface consisting of a firmly grounded layer of peat crisscrossed by deer trails and narrow channels draining water into the stream. In addition to *Carex. lasiocarpa*, other species found here that are characteristic of medium fens include yellow sedge (*C. flava*), marsh bellflower (*Campanula aparinoides*), marsh cinquefoil (*Potentilla palustris*), and lesser bladderwort (*Utricularia minor*). The lesser bladderwort is unusually abundant, flowering in great numbers in the small drainage channels and deer trails in this community. This diminutive plant is rarely noticed outside of its flowering season, two or three weeks in late June to early July. Although it is now known to occur in a variety of shallow water habitats, it seems to have been noticed in flower only in medium fens. Because of the scarcity of documented records of its existence in New York State, *U. minor* was listed as a S2S3 (imperiled to rare in the state) species on the New York Natural Heritage Program Rare Plant Status List for 2003 (Young and Weldy, 2003). Intensive investigations that year involved search for plants in non-flowering condition and revealed that the species is much more common than previously thought. Its status was changed to S3 (rare in the state) for the 2004 list and it has been transferred from the "active" rare plant species list to the "watch" list (Young and Weldy, 2004).

A shrubby fen occupies a cove of the wetland south across the esker from the main poor fen. It is bounded on the south by Beaverdam Brook. Shrubs and small trees are quite dense in the northern (inland) portions of this area. The community becomes more open towards the south along the brook. In contrast to the level topography of the poor fen and the sedge meadow previously described, this shrub fen area presents a hummocky surface of a sort commonly found in other medium fens in the region.

DISCUSSION

The Freshwater Wetlands Act of 1975 established procedures and regulations designed to protect and conserve wetlands in New York State. This act provides a framework within which draining, filling, and shoreline development of wetlands can be controlled. Where properly applied and enforced, these laws have done much to alleviate physical modification of wetlands and pollution through direct discharge and surface runoff. In the political and social atmosphere that has accompanied establishment of these protections, informed land management on the part of land owners, such as Cotton-Hanlin, government agencies, land trusts, and conservation organizations is encouraged by positive recognition and support of the public.

The recognition of peatlands as special places goes back to ancient times (Glob, 1969). Biologists and conservationists know these wetlands as delicately balanced and easily damaged ecosystems that provide habitat for unusual, specialized, and often rare plants and animals. Much effort has been expended on characterization of the flora and fauna of these sites and on investigation of the chemical and physiological phenomena that take place in them. Interpretation of plant microfossils – spores and pollen grains – recovered from the depths of the accumulated peat has provided clues to changes in vegetation and, by inference, climate since the last glaciation. It is clear that these are sites worthy of protection and conservation. It is also clear that protection and conservation can be achieved only with an understanding of the reasons for the formation and persistence of these unusual wetlands in the context of the broader landscape.

The existence of a particular wetland community depends on the nature of the water entering the system and the pattern and rate of flow into, within, and through the system. The nature of water entering a wetland depends on where that water came from and what it has passed over or through on its way to the wetland. The pattern and rate of flow of water within the system will be influenced by the nature and distribution of accumulated organic and inorganic sediments and by the topography and permeability of the basin. In practice, ecologists and conservationists usually limit their considerations of an ecological

community to observations made at or near the surface, only occasionally sampling subsurface conditions by probing or taking cores from peat and other sediments. The surface watershed and the streams providing inflow to a wetland may be investigated in order to locate natural determinants of water quality and sources of pollution. Stream flow might be estimated and ground water inflow can sometimes be recognized. However, subsurface features such as the origin and flow of ground water and the size, shape, and permeability of the submerged basin are rarely investigated. Perhaps the trip to Sloperville Bog will suggest possibilities for hydrological and geological investigations that will help us understand and protect these and other wetlands in the region.

ACKNOWLEDGEMENTS

Special thanks to Bob O'Brien, Cotton-Hanlin forester, for providing access to the Sloperville properties and information on Cotton-Hanlin's holdings. Access to the original data sheets for the Oswego County Wetlands Inventory project and the Oswego County wetlands GIS files was provided by the Environmental Management Council of the Oswego County Department of Planning and Community Development

ROAD LOG TO SLOPERVILLE BOG

From the intersection of Interstate 81 and Route 104 proceed to Sloperville Bog as follows:

CUMULATIVE MILEAGE	MILES	ROUTE
0.0	0.0	Intersection, I 81 & Rt. 104, proceed east on 104
3.4	3.4	Turn north on Rt. 22
7.8	4.4	Turn east on Rt. 13
8.0	0.2	Turn north on Cemetary St. - continues as Rt. 22
9.9	1.9	Turn south on Sloperville Drive (Hamlin Road on USGS quad)
10.4	0.5	Park at roadside, Sloperville Bog east of road

In case of confusion in Altmar, follow the white arrow in the air photo provided below:

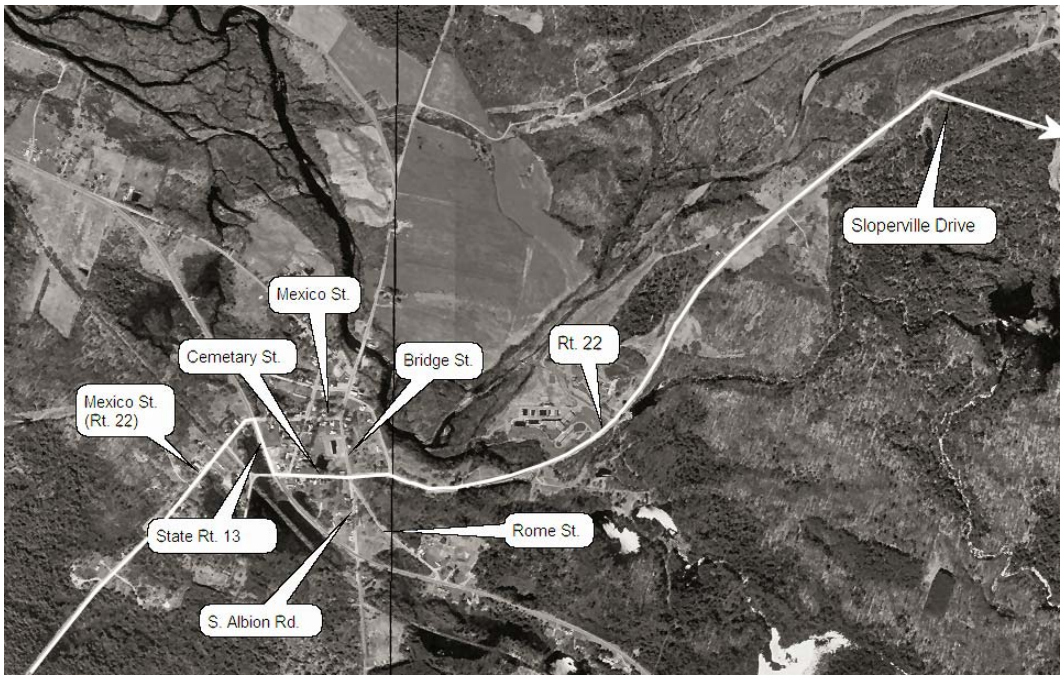

Figure 3 – Composite air photograph of the Altmar, NY area to show the location of the Sloperville bog.

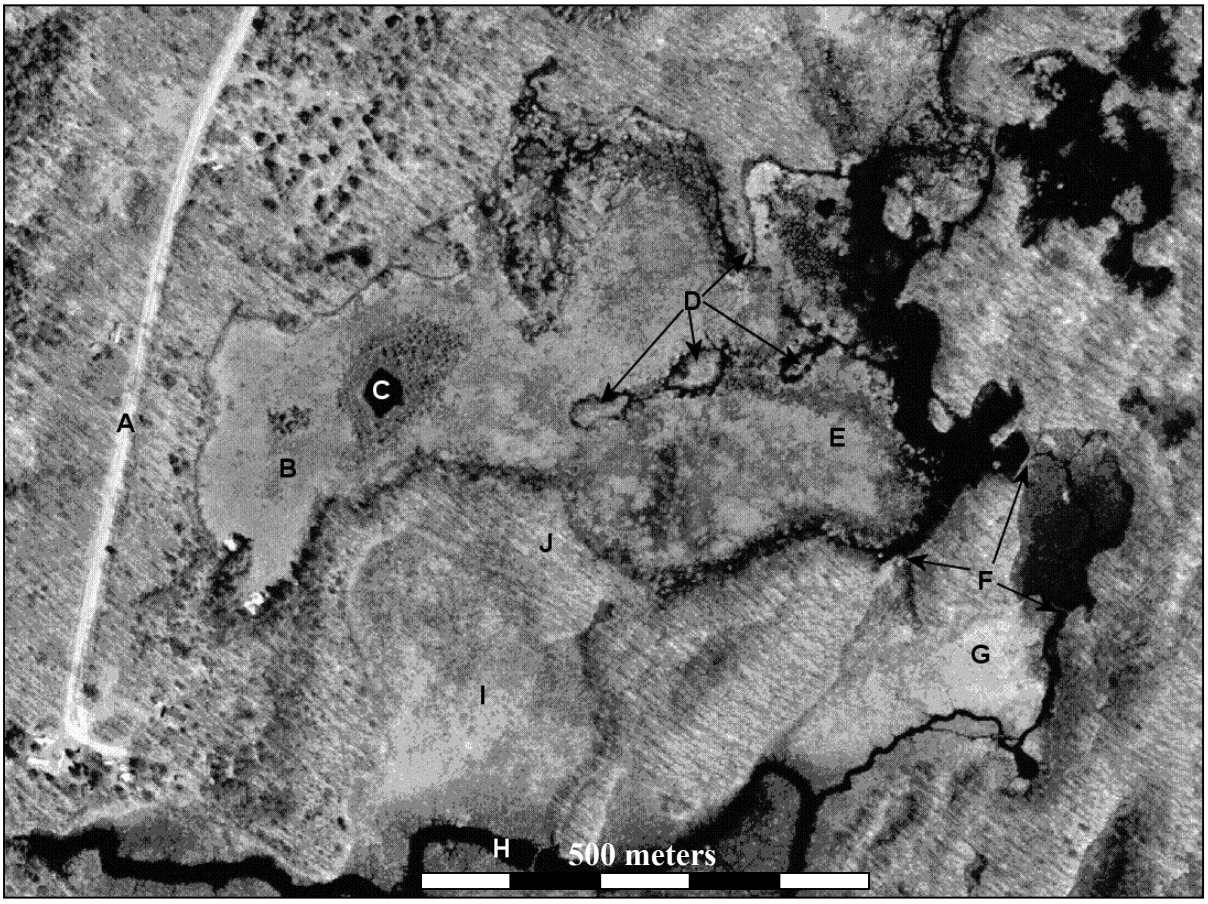

Figure 4 – High resolution air photograph of the Sloperville bog showing the field guide locations. The data source is the New York State G.I.S. Clearinghouse.

A: Sloperville Drive.

B: Poor fen. Floating mat of *Sphagnum* peat with surface layer of living *Sphagnum*. Dwarf shrubs, ferns, sedges and other bog plants make up herbaceous layer. Carnivorous plants abundant in spots.

C: Central pond surrounded by narrow floating mat of dwarf shrubs and sedges in thicket of blueberries, huckleberries, larch, black spruce (Figure 5).

D: Peninsula and islands, perhaps emergent portions of segmented esker separating western and eastern portions of northern basin and restricting drainage from western portion (Figure 6).

E: Medium fen → marsh → open water.

F: Beaver dams.

G: Sedge meadow on floodplain of stream draining northern basin. Open community dominated by the sedge *Carex lasiocarpa* on firmly grounded mat of sedge peat. Small drainage channels cross the meadow.

H: Beaverdam Brook.

I: Shrub fen. Mixture of small trees, shrubs, and herbaceous plants on mixed peat. Hummocks built up around shrubs, ferns, and sedge tussocks.

J: Main esker separating Sloppervillle Bog from Beaverdam Brook.

Figure 5 – Photograph of the area of open water near the center of the Sloperville bog labeled "C" in Figure 4. The view is looking southeast and the hill in the distance is labeled "J" on Figure 4.

Figure 6 – Photograph of the Sloperville bog. The view is to the north from the south side of the bog and the clusters of large trees occur at points "D" on Figure 4. The region of the photo is floating bog mat from the place where the photo was taken to the region of trees on the distant hill.

REFERENCES

CRUM, H., 1988, A Focus on Peatlands and Peat Mosses: Ann Arbor, The University of Michigan Press, 306 p.

EDINGER, G.J., EVANS, D.J., GEBAUER, S., HOWARD, T.G., HUNT, D.M., and OLIVERO, A.M., 2002, Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review): Albany, NY,

New York Natural Heritage Program, New York State Department of Environmental Conservation.
GLOB, P.V., 1969, The Bog People: Iron Age Man Preserved: Ithaca, NY, Cornell University Press, 200 p.
JOHNSON, C.W., 1985, Bogs of the Northeast: Hanover, NH, University Press of New England, 269 p.
JONES, S.A., COREY, M.E., and ZICARI, L., 1983a, The Oswego County Wetlands Mapping Inventory Project: Introduction and Summary: Oswego, New York, Oswego County Environmental Management Council.
JONES, S.A., COREY, M.E., and ZICARI, L., 1983b, The Wetlands of Oswego County, New York: The Interrelationships of Glaciation, Surficial Geologic Deposits, and Wetland Formation: Oswego, New York, Oswego County Environmental Management Council.
MILLER, T.S., 1982, Geology and Ground-Water Resources of Oswego County, New York, Water-Resources Investigations: Ithaca, New York, U.S. Dept. of the Interior, Geological Survey, p. 37.
YOUNG, S.M., and WELDY, T.W., 2003, New York Natural Heritage Program Rare Plant Status List, May 2003: Albany, N. Y., New York Natural Heritage Program.
YOUNG, S.M., and WELDY, T.W., 2004, New York Natural Heritage Program Rare Plant Status List, May 2004: Albany, NY, New York Natural Heritage Program.