LAKE CHAMPLAIN WETLANDS

ACQUISITION STUDY

prepared for

The Lake Champlain Wetland Acquisition Study Committee
Adirondack Park Agency
New York Department of Environmental Conservation
The Nature Conservancy
Vermont Department of Environmental Conservation
Vermont Department of Fish and Wildlife

In Cooperation with the
United States Environmental Protection Agency
and the Lake Champlain Management Conference

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This technical report is the eighth in a series of reports prepared under the Lake Champlain Basin Program. Those in print are listed below.

Lake Champlain Basin Program Technical Reports

1. *A Research and Monitoring Agenda for Lake Champlain.* Proceedings of a Workshop, December 17-19, 1991, Burlington, VT. Lake Champlain Research Consortium. May, 1992.

2. *Design and Initial Implementation of a Comprehensive Agricultural Monitoring and Evaluation Network for the Lake Champlain Basin.* NY-VT Strategic Core Group. February, 1993.

3. (A) *GIS Management Plan for the Lake Champlain Basin Program.* Vermont Center for Geographic Information, Inc., and Associates in Rural Development. March, 1993.

   (B) *Handbook of GIS Standards and Procedures for the Lake Champlain Basin Program.* Vermont Center for Geographic Information, Inc. March, 1993.

   (C) *GIS Data Inventory for the Lake Champlain Basin Program.* Vermont Center for Geographic Information, Inc. March, 1993.

4. (A) *Lake Champlain Economic Database Project. Executive Summary.* Holmes & Associates. March 1993.

   (B) *Socio-Economic Profile, Database, and Description of the Tourism Economy for the Lake Champlain Basin.* Holmes & Associates. March 1993

   (C) *Potential Applications of Economic Instruments for Environmental Protection in the Lake Champlain Basin.* Anthony Artuso. March 1993.

   (D) *Conceptual Framework for Evaluation of Pollution Control Strategies and Water Quality Standards for Lake Champlain.* Anthony Artuso. March 1993.

5. *Lake Champlain Sediment Toxics Assessment Program. An Assessment of Sediment - Associated Contaminants in Lake Champlain - Phase 1.* Alan McIntosh, Editor, UVM School of Natural Resources. February 1994.

   Lake Champlain Sediment Toxics Assessment Program. An Assessment of Sediment - Associated Contaminants in Lake Champlain - Phase 1. Executive Summary. Alan McIntosh, Editor, UVM School of Natural Resources. February 1994.

6. *(A) Lake Champlain Nonpoint Source Pollution Assessment.* Lenore Budd, Associates in Rural Development Inc. and Donald Meals, UVM School of Natural Resources. February 1994.

   (B) Lake Champlain Nonpoint Source Pollution Assessment. Appendices A-J. Lenore Budd, Associates in Rural Development Inc. and Donald Meals, UVM School of Natural Resources. February 1994.

7. *Internal Phosphorus Loading Studies of St. Albans Bay. Executive Summary.* VT Dept of Environmental Conservation. March 1994.

   (A) *Dynamic Mass Balance Model of Internal Phosphorus Loading in St. Albans Bay, Lake Champlain.* Eric Smeltzer, Neil Kamman, Karen Hyde and John C. Drake. March 1994.

   (B) *History of Phosphorus Loading to St. Albans Bay, 1850 - 1990.* Karen Hyde, Neil Kamman and Eric Smeltzer. March 1994.

   (C) *Assessment of Sediment Phosphorus Distribution and Long-Term Recycling in St. Albans Bay, Lake Champlain.* Scott Martin, Youngstown State University. March 1994.

8. *Lake Champlain Wetlands Acquisition Study.* Jon Binhammer, VT Nature Conservancy. June 1994.

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Executive Summary

One of the recommendations in the North American Waterfowl Management Plan's Lower Great Lakes/St. Lawrence Basin Joint Venture Plan of 1988 is to protect an additional 10,000 acres of breeding and migration habitat for black ducks and other waterfowl. One of the focus areas identified in the plan is the Lake Champlain Valley Region, with its lakeshore marshes and timbered swamps surrounded by highly productive agricultural soils and woodlands.

In this study, the author has sought to compile all of the existing information about the large wetlands in the Lake Champlain Valley. In addition, each wetland was evaluated to establish priorities for protection of the most important sites, in partial fulfillment of the goals of the North American Waterfowl Management Plan, as well as the goals of other land conservation organizations.

One consequence of this study was an application for funding Phase I of the acquisition process, called the Lake Champlain Wetland Protection Project, through the North American Wetlands Conservation Act, established by Congress in 1989. Under this act federal monies are available for the protection, enhancement and restoration of wetlands throughout the United States for the purpose of providing secure habitat for waterfowl, wetland birds, nongame wildlife and threatened and endangered species that inhabit or utilize wetlands in their life cycle.

As this report goes to print, The Nature Conservancy, together with the Vermont Department of Fish and Wildlife and the New York Department of Environmental Conservation has received funding for Phase I of this project and has embarked on the protection of the important wetlands identified in this study. Through this bi-state partnership, it is hoped that the remaining high quality wetlands in the Lake Champlain Valley will be placed in public ownership for the benefit of future generations of residents of and visitors to the Champlain Valley Region.

The report outlines the methodology used to evaluate the wetlands, and uses a ranking system to quantify the functions and values of each wetland to arrive at a total score. Site Conservation Plans were drawn for each high priority wetland. In New York, these sites are Kings Bay, Monty Bay, Dead or Scomotion Creek, Webb Royce Swamp, Bulwagga Bay, Huckleberry Mountain Marsh, and South Bay. In Vermont, these sites are Mud Creek, Rock River, Lower Lamoille Oxbow, Malletts Creek, Little Otter Creek, Otter Creek, East Creek, and Cornwall Swamp. Two sites, The Narrows and Poultney River, span the border between the states of Vermont and New York. The study also outlines recommendations for a protection strategy for all of the other sites in the study.

The Lake Champlain Valley is endowed with a number of very important wetlands with biological, physical, and cultural values. This study assembles the available information about the functions and values of these wetlands and provides recommendations for their ultimate disposition to protect those functions and values.

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I. INTRODUCTION

The Lake Champlain Wetlands Acquisition Study was begun in 1991. After several years of working to acquire ecologically significant wetlands in the Champlain Basin, several agencies and conservation organizations decided to pursue a cooperative approach to wetland protection that would satisfy the desires of all conservation entities to protect the highest quality wetlands in a diverse ecosystem. Representatives from the Vermont Fish and Wildlife Department, the New York Department of Environmental Conservation, Vermont Department of Environmental Conservation, the Vermont Nature Conservancy and the Adirondack Park Agency formed the Lake Champlain Wetland Acquisition Study Committee to expedite this process.

In 1991, the Committee applied for funding from the United States Environmental Protection Agency through the Lake Champlain Management Conference to study the wetlands of the Champlain Valley and draft a protection plan for the highest priority wetlands outlined by the study. Part of this work was to assemble an application for funding to the North American Wetlands Conservation Council to protect some of the highest priority wetlands.

II. PURPOSE

The purpose of this study was to evaluate the existing literature and information regarding the wetlands of the Champlain Valley, rank the wetlands according to their functions and values and develop site action plans to guide the acquisition and protection of the highest priority sites. The wetlands of the Champlain Valley of Vermont and New York provide numerous benefits to the ecosystem and the people of the region. They provide recreational opportunities for hunters, fishermen and wildlife viewers. They provide habitat for a diversity of fish and wildlife, endangered species, and food chain support for non-wetland wildlife. The wetlands also act as a filter for sediment and pollution, helping to maintain the water quality of the lake, and may play a part in flood control for the basin.

III. SCOPE AND METHODOLOGY

The focus area of this study was roughly the Lake Champlain Valley up to the foothills of the mountain ranges on either side of the lake. As such it is not inclusive of the entire Lake Champlain Watershed. This area was chosen because it approximates the area of the Champlain flyway, a migratory route for waterfowl and many other birds. The study area includes portions of Clinton, Essex, and Washington Counties in New York, and Grande Isle, Franklin, Chittenden, Addison, and Rutland Counties in Vermont.

A total of 320 wetlands, each over 50 acres in size were identified in the study area. Of these, 166 sites had a direct hydrological connection to Lake Champlain. The majority of these were either bay head wetlands, located in bays and low shale deposits along the lake, lakeside wetlands located along the shore or in small embayments, or deltaic wetlands at the mouths of major rivers entering the lake. Other wetlands were the following types: riverine,

riverine behind a levee, streamside, and kettle, isolated, and headwater wetlands (Greundling and Bogucki 1978).

Due to the large number of individual wetlands within the study area, a minimum size criterion of 50 acres was established to focus on the larger sites, the theory being that for most functions and values, with the notable exception of flood control, bigger is better. Also, sites under 50 acres that are contiguous to the lake and sites that have been identified by either the Vermont or New York Natural Heritage Programs as exceptional were considered more valuable and were included in the study. Thus, within the study area, sites over 50 acres contiguous to the lake or over 400 acres away from the lake, and any sites with rare, threatened or endangered species were included in the study.

Sites were located using National Wetland Inventory Maps for Vermont and Washington County, New York. Sites in Clinton and Essex Counties of New York were located using a combination of Adirondack Park Agency wetland regulatory maps, New York State Wetlands Inventory Maps, and New York Department of Environmental Conservation wetlands regulatory maps. Vermont and New York Natural Heritage Program sites were located using Natural Heritage topographic maps and county inventory reports.

Each site was named (if not already named on topographic maps), acreage was noted and cover types were color coded for easier analysis. A total of 139 sites were identified using the aforementioned criteria.

The literature on wetlands in the Lake Champlain Valley helped to familiarize the researcher with the wetland resource and provided information on each wetland to be utilized in the ranking process. Acquisition priority lists and waterfowl data were obtained from the Vermont Fish and Wildlife Department and the New York Department of Environmental Conservation; contacts for personal interviews were obtained from both departments.

A ranking system was designed to take the existing information on each wetland and evaluate it in relation to other wetlands. From the outset, it was understood that ranking systems are inherently problematic, and this one was no exception. It is a somewhat artificial way to evaluate natural areas, and the results are based solely upon the ranking criteria.

One problem with this ranking system was the lack of information regarding some of the smaller, less well studied sites. Moderate to extensive information was found on the larger wetlands which other researchers and biologists had previously identified and studied. However, many of the wetlands on the New York side of the lake and most of the wetlands in Grande Isle and Franklin Counties of Vermont had not been inventoried or studied prior to this study. In 1992 a program was begun by the New York Natural Heritage Program to inventory all wildlife management areas including wetlands along Lake Champlain; the Vermont Natural Heritage Program inventoried Franklin County, and the EPA funded an inventory of wetlands in Grande Isle County. In 1993, these programs plan to inventory Clinton County, New York and Addison County, Vermont. The results of these studies will undoubtedly have an impact on how we view wetlands in those areas, and ideally, the information about those wetlands should be included in this report in appendix form.

Secondly, a ranking system tends to rank sites with many different values of lesser importance higher than a site with an individual, outstanding value, even though the human utilization of those lesser values may be conflicting (Jenkins et al, 1991). For example, Colchester Bog is an outstanding peatland, but was ranked lower than Burlington Intervale largely due to the lack of wildlife value. It should be understood that, all the wetlands in this study are significant for one or more values simply due to their size, and their numerical rank should not be taken to diminish the value of any one of them. Just as some upland sites provide better wildlife habitat and other values, so too are some wetlands considered more valuable than others. Wetlands in the aggregate are very important in the ecosystem, and this ranking scheme was not meant to imply otherwise.

Information was gathered for each of fifteen different values in three categories: cultural attributes, physical attributes, and biological attributes. The cultural attributes include surrounding land use, recreation, and open space/aesthetics. The physical attributes are flood storage, surface/groundwater protection, and erosion control. Biological attributes are general wildlife value, waterfowl and wetland birds, wildlife diversity and significance, fisheries, threatened and endangered species, cover type, interspersion, unique communities, and plant species diversity. The greater weight assigned to biological determinants is deliberate - the main purpose of the study is to identify the highest priority wetlands, particularly from a biological perspective.

The individual attributes were given a numerical score from one to five, with five being the highest score possible. If no information was found about a particular quality, an "unknown" was marked to distinguish from a zero value (see Appendix B for details).

Due to the large number of sites, it was thought that a coarse filter should be used to reduce the list to a manageable number. This was done by first ranking all the wetlands according to biological attributes. Those wetlands with a score of at least 20 (of a possible 45 points) were then ranked for cultural and physical attributes.

In addition to the cultural, physical and biological values, a vulnerability rank was estimated for each wetland, based upon population change over a ten-year period in the county and/or the perceived threat of nearby development due to physical characteristics of the surrounding landscape. Also, a degradedness rank was estimated by viewing Soil Conservation Service aerial photographs of each site, looking at vegetation patterns and any disturbance caused by commercial, industrial or agricultural development in or adjacent to the wetland and speaking with knowledgeable biologists. Also, an estimate of the percentage of land in public ownership or owned by another conservation organization was noted.

Ranks of individual values were tallied to arrive at a total "score" for each wetland. Then the wetlands were rank-ordered by county. This was done because some counties, (i.e., Chittenden County in Vermont) have quite a bit more information on each particular wetland than other, outlying counties. Thus it is difficult to compare final ranking scores from county to county, but it can be assumed that the highest ranking sites in each county are roughly equivalent.

All of the highest priority wetlands were visited to field check wetland conditions and surrounding land uses. Site conservation plans were drawn for all of these wetlands, showing sites for rare, threatened and endangered species and other biological features, and detailing buffers of upland necessary to protect the functions and values of the wetland.

V. THREATS TO THE RESOURCE

The decline in wetland acreage across the country has been well documented. Wetlands loss in Vermont has been documented by Wanner (1979) and Tiner (1987). Documentation of wetlands loss in the Champlain Valley of New York was not found.

On average, the population of counties in the Champlain Valley has increased by 10% since 1980 (U.S. Department of Commerce). This has resulted in an increase in development in an area already rapidly developing due to the opportunities for water-based recreation and the consequent construction of vacation homes. In fact, the number of houses during the same ten-year period increased by 21%, more than double the average population growth rate (Teetor, 1992). In 1980 the Vermont Department of Public Health projected a growth rate of 27 percent over a twenty year period ending by the year 2000. Projected high growth counties in the Champlain Valley include Grande Isle (63%), Addison (35%), and Chittenden (22%) (Parsons, 1988). The current economic recession has undoubtedly had an impact on these projections.

In New York the population increase has not been as dramatic. Indeed, many towns in the southern part of the lake have experienced a negative population growth in the last ten years, while towns in the vicinity of Plattsburgh have experienced an increase, with Beekmantown experiencing a 20% growth rate. Development along the lake in New York, on the other hand, has increased in the last ten years.

The market for lakeshore property has increased dramatically and development has proceeded rapidly along the lake. A few of the wetlands in this study have been affected by this development; some wetlands have been negatively affected by marinas at the mouths of rivers and streams; and several marinas have been proposed at such sites. Regulations such as Section 404 of the Clean Water Act, the Vermont Wetland Rules and the New York and Adirondack Park Wetland Regulations should help to control this type of development where it conflicts with wetlands. However, upland acreage adjacent to wetlands may still be threatened by these trends, and upland buffers are important for maintaining the functions and values of a wetland.

Several studies have documented historic land use changes and perturbations of wetlands. The New England River Basin Commission (1979) studied altered wetlands and identified seven wetlands with either major hydrological changes or other developments. They are: Kings Bay, Monty Bay, Dead or Scomotion Creek and Ausable Marsh in New York; South Hero Creek, Lewis Creek, and Stevens Brook in Vermont. Barber et al(1977) documented land use changes in twelve wetlands on Lake Champlain, and found that residential, commercial, industrial and agricultural uses have increased significantly in most wetlands,

some due to adjacent development, some to roads, railroad and power line right-of-way development, and some due to enhancement activities by the U.S. Fish and Wildlife Service and state wildlife agencies. Stevens Brook, near St. Albans, Vermont has been altered by nutrient enrichment from the city's wastewater treatment plant. Many of the wetlands in this study have been degraded due to nutrient enrichment from non-point sources. Storrow and Worley (1979) and later Mazik (1984) investigated development trends in Vermont wetlands from 1937 to 1980 and found a diversity of projects that altered wetlands, chiefly utility corridors, buildings, and filling for agricultural or development purposes.

Another threat to the quality and integrity of Lake Champlain wetlands is invasive exotic species. While some exotic plant species such as flowering rush (Butomus umbellatus), may not displace native plants to a significant degree, others like purple loosestrife (Lythrum salicaria) often come to dominate the plant community over time (Pickart and Goodnight, 1990). Species of concern in the Champlain Valley include Phragmites (Phragmites communis), Eurasian milfoil (Myriophyllum spicatum), yellow floating heart (Nymphoides peltata), water chestnut (Trapa natans) and the zebra mussel (Dreissena polymorpha). Other species that may spread from the Hudson Canal include fanwort (Cabomba caroliniana) and European frog-bit (Hydrocharis morsusranae) (Countryman, 1977).

These exotics have caused serious problems in aquatic ecosystems, contributing to a decline in the quality of these systems for wildlife. Control programs for these species have failed to be effective without a continuous commitment of funding, manpower, and materials to do the work. Funding for these efforts has been limited, with the notable exceptions of the Missisquoi National Wildlife Refuge, which implemented a purple loosestrife control program in 1985 (Zelly, 1992 personal communication), and the water chestnut harvesting program in the southern portion of the lake, for which future funding is in doubt, and which primarily targets navigable waters of the lake and not specifically wetlands.

Many of these species thrive in nutrient enriched aquatic ecosystems. This characteristic exacerbates the problem of competition with native flora. Given the unnatural level of nutrient inputs to the watershed of Lake Champlain, exotic species are certain to cause more problems in the wetlands of the lake. Control efforts should take this factor into consideration.

VI. LITERATURE REVIEW

The wetlands in this study were ranked using information from the available literature. There are a number of studies of the wetlands of the Lake Champlain Valley. Excellent data was accumulated as a result of the International Joint Commission studies of the late 1970's when there was a proposal to regulate water levels in the lake through a water control structure on the Richelieu River in Quebec. These studies function as a baseline for further study of the ecological condition of the lake.

Greundling and Bogucki (1978) studied fifteen major wetlands along Lake Champlain. They classified each wetland according to geomorphological characters: bay head wetlands such as

Monty Bay, riverine wetlands such as East Creek, riverine levee wetlands such as Otter Creek, deltaic wetlands such as Missisquoi, and lakeside wetlands such as the Narrows. Cover type maps were created for twelve priority wetlands and 42 other wetlands on the lake. Biological characteristics were assessed in each priority wetland, including water quality, waterfowl, fisheries, and the quality of adjacent land as a buffer.

Myers and Foley (1977) studied the waterfowl, non-game birds and furbearers in nine wetlands along the lake. They found the best sites for waterfowl production to be South Hero Marsh, Otter Creek Complex, and Stevens Brook, with an average of over 60 broods in each wetland. Mississquoi and Otter Creek had the largest populations of furbearers, although it was noted that muskrat populations fluctuate greatly from year to year.

The Lake Champlain Fisheries Investigation (1977) inventoried the fisheries of eight wetlands on the lake. This study analyzed elevational gradients of 32 wetlands and determined that low gradient wetlands were preferred spawning sites for northern pike over steeper gradient sites because the steeper gradient sites tend to lose spawning and nursery habitat more quickly as the lake level drops throughout the spring. Fish such as bullhead, bullfin and bass spawn in deeper water so this is less of a concern.

Countryman (1977) studied vegetation of wetlands in Lake Champlain at eleven sites through a transect analysis. Species diversity was highest at East Creek in Vermont and Kings Bay in New York.

Henson and Potash (1977) studied nutrient absorption by wetlands. They determined that there is high phosphorus loading in the spring during snow melt when the lake level is high, but very little utilization by plants as the plants are still dormant at this time. When plants are able to utilize the nutrients, i.e., during the growing season, the water is usually confined to the main channel of the wetland or not apparent in the wetland at all. Without further research, it is difficult to tell what impact wetlands have on nutrient absorption in the Champlain Valley. However, by interpreting this study, the often touted nutrient absorbing quality may be overestimated in wetlands along rivers with levees and deep channels. A notable exception to this may be the wetlands in the southern third of the lake which have been "drowned" due to post-glacial uplift in the northern part of the lake and thus have a direct water connection to the lake (Rodgers, 1977).

Several natural resource inventories have been done that include wetlands in the Champlain Valley. Most of these inventories are of general biodiversity or rare, threatened and endangered species, and have been completed by Vermont and New York Natural Heritage Programs. However, in the Technical Appendix to his Wetlands Component of the 1988 Vermont Recreation Plan, Parsons (1988) assembled information on wetlands throughout the state into matrices which were used as a model for this study. Parsons, Thompson and Hudspeth (1988) also inventoried wetlands in the City of Burlington, Vermont.

Other inventories have been done on plants, plant communities, and natural areas. Jenkins (1989) inventoried the west shore of Lake Champlain, including some of the major wetlands found along it. The Vermont Natural Heritage Program (Fichtel, Popp, Marshall, 1992)

(Thompson, 1991) (Engstrom, 1991) (Engstrom and Lapin, 1991) has completed inventories of Chittenden and western Rutland Counties along the lake. Inventories are in progress on wildlife management areas in New York, wetlands in Grande Isle County of Vermont, and natural areas of Franklin County in Vermont. These inventories were all useful in ranking individual wetlands.

VII. RANKING

All of the wetlands were ranked based on existing information from the literature, interviews with local biologists, and information from maps and aerial photographs. Most of the established ranking systems are based on empirical data and, because this study did not involve field research, were not useful in this study, so a qualitative ranking system was developed that allowed for a quantitative analysis. Existing information was gathered for most of the wetland functions; ranks for some of the other fields were estimated based upon site visits, aerial photography or topographic features of the site.

A total of 139 sites were identified on National Wetlands Inventory maps and New York Wetlands Regulatory maps. Of those, 38 sites were located in New York and 101 sites were located in Vermont. These sites were ranked according to biological values as a coarse filter to narrow the field for the final ranking process.

Each field on the ranking form was given a rating from 1 to 5, with 5 being the highest score (see Appendix A). The following is an explanation of the scoring process:

Cultural Attributes

Surrounding land use:

> mostly forest = 5; mostly farm = 3-4;
> mostly rural residential = 1-2; mostly urban = 0
> Source: Soil Conservation Service aerial photographs.
> Notes/Justification: wetlands with undisturbed buffers are integrated with the upland portion of the ecosystem, and are more productive due to decreased disturbance.

Recreation:

> high usage = 5; medium usage = 3; low usage = 1
> Source: interviews with wildlife managers and others.
> Notes/Justification: wetlands provide hunting, fishing and passive forms of recreation and educational opportunities.

Open Space/Aesthetics:

> highly visible and located in a high density area = 5; poorly visible and located in a low density area = 1

Source: site visits, interviews with wildlife managers, topographic maps.
Notes/Justification: open space is important in a developing region. Visually appealing wetlands are excellent educational sites. Significant archaeological sites were also included in this rank.

Physical Attributes

Flood storage:

high potential = 5; moderate potential = 3; no potential = 0
Source: Parsons (1988) Technical Appendix, topographic maps, other literature.
Notes/Justification: wetlands fluctuating with lake level have no flood control function.

Surface/groundwater protection:

high potential = 5; moderate potential = 3; low potential = 1
Source: anecdotal information, estimates based upon physical features such as presence of a main channel, and levees.
Notes/Justification: this was a very difficult field to complete. Little is known about the capacity of individual wetlands to accomplish such protection. The ability of waters to spread out over the wetland may give some indication of the potential for surface water filtration. I presume that few of the wetlands in this study are important for ground water recharge, hence not important for groundwater supply.

Erosion control:

high potential = 5; moderate potential = 3; low potential =1
Source: Parsons (1988) Technical Appendix, anecdotal information.
Notes/Justification: the presence of streamside or lakeside emergent vegetation may dissipate wave action and slow erosion.

Biological Attributes

General wildlife value:

high value = 5; medium value = 3; low value = 1
Source: Parsons (1988) Technical Appendix, interviews with wildlife biologists and managers.
Notes/Justification: this field includes all game species except for waterfowl, which are included in the next attribute.

Waterfowl and wetland birds:

high value = 5; medium value = 3; low value = 1

Source: interviews with waterfowl biologists, waterfowl censuses conducted by the Vermont Fish and Wildlife Department (breeding and migratory); Wetland Priority List (Vermont F&W Dept.); information from the Vermont Institute of Natural Science and High Peaks Audubon Society; Myers and Foley (1977).
Notes/Justification: these sites are important for breeding and during migration, both functions were included in this ranking.

Wildlife diversity and significance:

high = 5; medium = 3; low = 1
Source: Greundling and Bogucki (1978), Myers and Foley (1977), interviews with wildlife biologists and heritage program biologists.
Notes/Justification: this field includes all other non-game animal species and the significance of the site to all species.

Fisheries:

high value = 5; moderate value = 3; low value = 1
Source: interviews with fisheries biologists, Lake Champlain Fisheries Investigation (1977), Greundling and Bogucki (1978).
Notes/Justification: low gradient wetlands ranked high because of the greater potential for flooded meadow land as spawning sites, steep gradient wetlands ranked lower.

Threatened and endangered species:

ranked by biodiversity rank - B1&B2 = 5; B3 = 4; B4 = 3, B5 = 2-1, depending upon the quality of the site.
Source: Vermont and New York Natural Heritage Programs and extrapolations from heritage program inventories.
Notes/Justification: the biodiversity rank is based upon the threatened and endangered species and examples of natural communities found at a site.

Covertype:

>60% emergent marsh = 5; >45% emergent marsh = 4; >30% emergent marsh = 3; >15% emergent marsh = 2; <15% emergent marsh = 1
Source: National Wetlands Inventory maps, New York State Wetland Inventory maps.
Notes/Justification: Emergent wetlands have a high index of loss, scrub-shrub wetlands have a moderate index of loss, and forested wetlands have a low index of loss (Parsons, 1988). Thus, emergent wetlands are more threatened than the other types.

Interspersion:

high = 5; medium = 3; low = 1
Source: National Wetland Inventory maps.

Notes/Justification: Wetlands with greater interspersion of habitat types are more productive for a variety of wildlife (Racine, 1982).

Unique communities:

highly significant plant community = 5; state significant plant community = 4; locally significant plant community or other significance = 3; largest community of its kind in the region = 1-2; not a significant plant community = 0
Source: Jenkins, Benjamin & Thompson (1991), Vermont and New York Natural Heritage Program inventories, Adirondack Council's 20/20 Report (Davis, 1988).
Notes: some softwood swamps, fens, and bogs are the most significant wetlands in this study.

Plant species diversity:

high = 5; medium = 3; low = 1
Source: Countryman (1977), Vermont and New York Natural Heritage Program site narratives.
Notes: information for this field was lacking for most of the wetlands.

Vulnerability, Degradedness, Percent Protection

Vulnerability:

high, medium, low
Source: U.S. Census Bureau data, population growth projections by the Vermont Department of Health; location near a developed or rapidly developing municipality.
Notes: this rank was estimated by the researcher.

Degradedness:

high, medium, low
Source: Soil Conservation Service aerial photographs, Barber et al (1977), Storrow and Worley (1979).
Note: This was an estimate of the impacts of agricultural, commercial, industrial or residential development on a wetland.

Percent protection:

Percentage of the wetland in public or conservation organization ownership, including conservation easements.
Source: topographic maps, information from the Vermont state land surveyors office, county tax maps, maps from the New York Department of Environmental Conservation.
Note: these figures were estimates only, and not based upon surveyed acreage determinations.

After all the wetlands were ranked, a final "score" was obtained for each, and the wetlands were rank-ordered by county. Comparisons of wetland scores from county to county are not recommended due to a lack of information in each field from some counties. Also, score comparisons should not be made from Vermont to New York as there was less information about New York sites. Appendix B of this report is a qualitative matrix of these values. Appendix C is the final ranking of the wetlands.

VIII. SITE ACTION PLANS

Several high-ranking wetlands were chosen as sites for acquisition due to a number of factors. These were the rank of the site and the percent protection of the site. Chief among these was the low to moderate percentage of protection. It is important that critical boundaries should be filled out at sites with a moderate amount of state ownership to ensure long term viability of the site and eliminate inappropriate intrusions that would alter the values if the wetland. However, there are several wetlands that have very little or no conservation ownership. These high quality sites should be targeted for acquisition in the next ten years. Sites located in rapidly developing areas need protection soon as further development in the buffer may compromise the integrity of the wetland. In some respects buffers are more important to protect, but to insure cohesive management of the wetland and allow for public access, both the wetland and upland buffer lands should be acquired. Also, land ownership patterns, wherein a tract may include both wetland and upland acreage, may dictate the conservation strategy. The following is a list of these targeted sites:

<u>Vermont</u>
Mud Creek, Alburg
Rock River, Highgate
Malletts Creek, Colchester
Lower Lamoille Oxbow, Milton
East Creek, Orwell
Lower Otter/ Little Otter Complex, Ferrisburgh
Cornwall Swamp, Cornwall
Poultney River Marshes, West Haven
The Narrows, West Haven, Benson

<u>New York</u>
Kings Bay, Champlain
Monty Bay, Beekmantown, Chazy
Dead Creek, Plattsburgh, Beekmantown
Webb Royce Swamp, Westport, Essex
Bulwagga Bay, Crown Point
Huckleberry Mountain Marsh, Putnam
South Bay, Fort Ann
Poultney River, Whitehall
The Narrows, Whitehall, Dresden, Putnam

Site action plans were written for each of these sites. The sites were visited, photographs were taken, and a narrative was written that includes biological characteristics of the wetland, threats to the resource, and recommendations for the protection of the wetland values. The following are narratives about each of the sites:

Mud Creek - Alburg, Vermont

Mud Creek is a large, sinuous wetland that is approximately 75% protected by the state of Vermont Fish and Wildlife Department as Mud Creek State Waterfowl Area. The wetland is made up of emergent marsh as a result of the damming of Mud Creek, hardwood swamp, hardwood/cedar swamp, and across the Canadian border, spruce-fir-tamarack swamp. The wetland is part of a long, sinuous chain that extends from north of the Canadian border to the southern part of the Lamotte Passage, and as such is an intriguing geomorphological feature.

The emergent marsh is quite diverse, with numerous aquatics, several species of burreed, water lilies, and pickerel weed among others. The cattail marsh around the open water is very dense, and its density and extent have increased in the last ten years. Rafts of cattail are known to float around the wetland.

The forested wetland is very large, encompassing the northern and southern portions of this wetland. The forests are flooded in the spring, providing nesting habitat for black ducks and wood ducks. Little is known of the ecological importance of the forested wetland; however, in concert with others of its kind, such as South Alburg swamp, this habitat accounts for almost all of the natural area left in the islands region of the lake. The importance of these forested areas for wildlife and possibly nesting and/or staging areas for neotropical migratory birds can only be surmised. Further work is needed in this area.

The marsh is habitat for a number of rare species, including the second largest colony of black terns in the state, which are a federal candidate-endangered species. Federal candidate least bitterns and state watch-list American bitterns also inhabit the marsh, as well as sora, common moorhen, sedge wren and pied billed grebe. Black-crowned night herons, rare in Vermont, also use the marsh and dead timber areas. The state-endangered striped chorus frog was formerly found in an adjacent wetland, but is now presumed to be extirpated. The rare spiny softshell turtle is often found basking on logs and rocks in the southern portion of the wetland near the lake. Rare plants in the wetland include yellow water crowfoot, cattail sedge, matted spikerush, Torrey's rush and nodding trillium.

There has been little disturbance of this wetland for a number of years. The state should acquire inholdings in the northern portion of the wetland, and acquire the remaining wetland acreage between Rt. 78 and the lake. The need for additional buffer acreage should be examined, especially near existing roads and power sources, as these areas are most vulnerable to development. An analysis of nutrient inputs to the wetland, which may help to account for the density of cattail stands, should be done.

Rock River Wetlands - Highgate, Vermont

This wetland, in the lower floodplain of the Rock River, is a large expanse of an open forest/shrub/emergent marsh. The river itself meanders through the wetland and floods as the lake floods. The levees along the river are fairly wide, about 75 feet or so on either side and, probably due to a lack of access, have the most mature stands of floodplain forest trees. Large silver maples and cottonwood are co-dominant. This is especially true of the levees north of the "middle road" that cuts across the wetland. South of the road there seems to have been more cutting and flooding, resulting in a younger condition of the forest.

Behind the levees are large expanses of swamp forest, having standing water for most of the year. Stunted silver maples and a few green ash form the sparse canopy of about 35% cover. Patches of shrubs, such as red-osier dogwood and buttonbush form small copses throughout the swamp, maybe covering 15 to 20% of the area. The rest of the understory is a mix of wild rice, cattail, burreed, and other emergent plants. This area completely floods in the spring to a depth of two to three feet, providing excellent habitat for nesting black ducks and mallards. Wood ducks are present also, but the number of mature trees with available nesting cavities may be the limiting factor here.

Farther away from the river on the south side is a floodplain forest with swamp white oak, cottonwood and silver maple co-dominating, some more mature stands than others. Some firewood cutting occurs here because of easier access from dry land. The rare plants that are found in this wetland are Gray's sedge, yellow water crowfoot, cursed crowfoot and small bedstraw.

Surrounding land use is farm and abandoned farmland, as well as some forest land. The larger bottomland and floodplain forest areas provide a buffer for the rest of the habitat.

Malletts Creek, aka Munson Flat - Colchester, Vermont

This is a large and multi-faceted wetland with a variety of habitats. The mouth of the creek as it enters Lake Champlain is dominated by small bluffs on either side. Behind this a deep rush marsh is found east to the Interstate 89 bridge, that bisects the west side of the wetland. The channel broadens a bit on the east side of the interstate, with cattails and wild rice dominant on the south side and a thin strip of floodplain forest on the north, where the rare false hop sedge occurs.

A ten acre island is just upstream, with limestone or dolomite outcrops and an oak-hickory forest with a well-developed shrub understory. The rare vetchling and sneezeweed are found along the edge of wetland on the island. The east end of the island grades into a red maple-black ash swamp. The open water around the island is lined with dense stands of Elodea with only a few other submergent plants. Southeast of the island is a large stand of wild rice, with scattered dead trees in the forested background.

Floodplain forests are found along the levees of several creeks entering the marsh. While not extensive, these provide habitat diversity. Upstream the creek enters a slightly more

disturbed area of open marsh with large stands of reed canary grass and cattails before reentering flooded timber, most of which is dead.

At the east end of the flats near Rt. 7 (2) reed canary grass is dominant except for trees along the levees of the tributaries and some small sedge meadows. These wet meadows, some hayed and some too wet to mow, are quite extensive, covering an area of perhaps 80 acres. These meadows are excellent spawning habitat for northern pike in the spring during peak lake levels.

There is a noticeable lack of invasive species, such as purple loosestrife and Phragmites in the wetland. However, the presumed alien strain of reed canary grass is dominant in some sections and may be increasing with an increase in beaver activity, as forest cover is replaced by emergents.

The most remarkable feature of this wetland is the fact that it is fairly isolated despite being in a moderately highly developed area in Chittenden County. The surrounding land use is primarily abandoned farm fields on the north, residential lots on the east, and active hay meadow on the east and south sides. Given the proximity to an interstate exit and the rate of population growth in Chittenden County (32% over the last 20 years), this wetland could be severely degraded in a relatively short time due to development in the adjacent buffer areas.

The Fish and Wildlife Department, which owns a 20 acre foothold in the marsh, should acquire the remaining wetland acreage and acquire conservation easements or management leases on the wet meadows to protect adequate northern pike spawning sites.

Lower Lamoille Oxbow - Milton, Vermont

This is diverse wetland complex, located in the Lamoille flats just before the Lamoille River enters the lake at Sandbar Wildlife Management Area. As such, this area is a complement to the 1100 acres of the Sandbar wetland area located just downstream.

There are wetlands on both sides of the Lamoille River. The wetland north of the river is hardwood/cedar swamp, with former stream meanders and old sandbars providing slight topographic relief. A strip of floodplain forest occurs along the edge of the river.

The wetlands on the south side of the river are a diverse mixture of floodplain forest near the river, a rich oxbow lake bordered by an extensive bottomland forest - one of the largest in the Champlain Valley, a large beaver pond and associated shrub swamp, and some small hardwood/hemlock/cedar swamps on the southeast side. The rare wild rye occurs near the river.

High banks of outwash deposits separate developed areas from the wetland, and provide a buffer. Such a remote area is undoubtedly a refuge for a diversity of wildlife. The value of the wetland for wildlife is greatly enhanced by its relative remoteness. Wood ducks and black ducks are common in the oxbow lake, while common mergansers are frequently seen along the river.

East Creek - Orwell, Vermont

East Creek is the site of the largest narrow-leaved cattail marsh in the state. The size and convoluted shoreline with many small sheltered areas of open water, along with the fact that the entire area is relatively undisturbed by human activity in the wetland area, make this an extremely productive wetland in terms of waterfowl and wildlife. The marsh is habitat for a number of marsh nesting birds such as the American bittern, common moorhen, Virginia rail, least bittern, green-backed heron, great blue heron, black duck, mallard, wood duck, and blue-wing teal. The margin of the marsh is a site for the federal candidate-endangered species lake cress as well as the rare slender naiad.

In addition to the marsh habitat, East Creek includes a couple of small floodplain forests that include very large silver maple and green ash, which provide habitat diversity. Some portions have been heavily cut or grazed but with protection will become good examples of this type of forest. The community includes several rare plant species, such as green dragon and false hop sedge, and the rare red-headed woodpecker. A couple of rare fish species, the bridle shiner and the blackchin shiner, also occur in the creek.

East Creek is probably one of the least developed large wetland systems associated with a river or creek on Lake Champlain. Most have at least some development on their fringe or the watershed passes through largely developed areas. East Creek has a relatively small drainage that is almost entirely agricultural. Orwell is under development pressure and the wetlands and adjacent farmlands should be acquired or protected through conservation easements to prevent fragmentation of ownership that will destroy both the farms and the possibility of comprehensive long-term management of the East Creek marsh. Buffer land will also greatly improve the wetland by removing unnatural levels of nutrients and sediment caused by cows grazing in and immediately adjacent to the wetlands. Nutrients from non-point sources should be controlled by working with landowners and the Soil Conservation Service cost-share programs to implement proper nutrient management practices. A large portion of the East Creek marsh is owned and managed by The Nature Conservancy.

Otter Creek Marshes - Ferrisburgh, Vermont

Lower Otter Creek is bordered by long wetlands, approximately 1500 feet wide, that stretch for more more than five miles from near the city of Vergennes to the mouth of the river at the Fort Cassin peninsula. The wetlands sit adjacent to the creek, opposite a large natural levee that was improved at one time as a path for oxen to pull loaded boats from Lake Champlain up to the city of Vergennes.

The wetlands range from open marshes to floodplain forests and swamps, and include a diversity of habitat types. These wetlands are directly adjacent to the Dead Creek marshes and are very close to the Little Otter Creek wetlands, together forming a large expanse of wetland acreage over a relatively small geographic area.

Lower Otter Creek is home to a number of rare plants. These include the cat-tail sedge, water hemp, lance-leaved loosestrife, yellow water crowfoot, narrow blue-eyed grass and

green dragon. In addition, the wetlands are a highly productive wildlife area used by a multitude of waterfowl and wetland birds such as mallard, blue-winged teal, least bittern and osprey both for nesting and for feeding as well as a staging area during migration. Federally endangered bald eagles utilize the wetlands during the fall and early winter during migration.

The Vermont Department of Fish and Wildlife owns and manages about 380 acres of wetlands along Otter Creek. Acquisition of additional parcels will ensure that the high productivity of the wetland will continue. Those wetland tracts with open water and an oxbow lake should be targeted first. Upland sites along the river should be considered for acquisition of conservation easements to prohibit marina development and subsequent increased boat traffic in the river.

Little Otter Creek Marshes - Ferrisburgh, Vermont

The Little Otter Creek Marshes are some of the highest quality wetlands in the state, ranking among Missisquoi delta and Lamoille delta. They are located within the greater Otter Creek Complex, a series of wetlands within or adjacent to Town Farm Bay in Ferrisburgh and Charlotte. This complex is made up of marshes on Thorpe-Kimball brooks, Lewis Creek, Little Otter Creek, Otter Creek, and the northern third of Dead Creek.

Little Otter Creek marsh is a large expanse of marshland in a flooded river channel and tributaries of the channel, called "slangs". It has been called the "best large expanse of marshland in Vermont" (Vogelmann, 1971). A diversity of vegetation types occurs here, with the dominant species being cattails and buttonbush. Plant species diversity in the wetland is very high. Wild rice is an abundant waterfowl food during migration. Waterfowl breeding is considered to be excellent, with wood ducks and mallards abundant. This site also has some of the largest mudflats on the lake, utilized by shorebirds during fall migration.

These marshes also support the highest diversity of rare and endangered animals outside of Mississquoi NWR. These include osprey, migrant loggerhead shrike, sedge wren, black tern, least bittern, sora, and common moorhen. Rare plants found here include tupelo, lake cress, false hop sedge, and vetchling.

Threats to the wetland include runoff from adjacent farms and development near the lake. This is very open country, highly desirable for residential development. The Vermont Fish and Wildlife Department owns and manages about 800 acres of the 1200 acre marsh. The state should acquire the remaining acreage with a sufficient buffer to maintain the quality of the marsh edge. Conservation easements should be negotiated on adjacent farms to prevent development from encroaching on this highly productive system. The watershed of this wetland should be considered in all protection efforts, as a serious threat to the marsh system is nutrient enrichment from non-point sources.

Cornwall Swamp - Cornwall, Vermont

This is a 3000 acre hardwood swamp on the flat land bordering Otter Creek. The forest is flooded every spring and occasionally in the fall. It is part of a 15,000 acre swamp complex along Otter Creek, which includes Middlebury Swamp, Whiting Swamp, Leicester Swamp, Long Swamp, Salisbury Swamp and Brandon Swamp.

The swamp forest is dominated by red maple, with stands of black ash, white cedar, black spruce, and tamarack. The shrub and herbaceous layer is quite diverse, and a number of rare species occur here. These are false cyperus, thin-flowered sedge, showy lady's-slipper, ram's head lady's-slipper, small yellow lady's-slipper, lily-leaved twayblade, swamp fly-honeysuckle, white adder's-mouth, green adder's-mouth, and eastern jacob's ladder.

The swamp floods in the spring, providing roosting and feeding habitat for migrating wood ducks and black ducks. This swamp is also a breeding area for a number of species of neotropical migrant birds, and may be an important staging area during migration for these birds. In fact, the swamp is unique in that it harbors breeding populations of typical upland nesting warblers as well as large breeding populations of typical swamp nesting species like the winter wren and northern waterthrush.

Cornwall swamp is an excellent hardwood swamp community, half of which is protected by the Vermont Fish and Wildlife Department. The state should complete the acquisition of this important site and manage it as a natural area. Selective logging in the winter in buffer zones may be appropriate, but a large contiguous portion of the interior wetland should be left undisturbed.

Poultney River Wetlands - West Haven, Vermont and Whitehall, New York

Near its mouth, the Poultney River is adjacent to a series of extremely high quality wetlands, forming a chain of wetland habitat. Although the origin of these wetlands in unclear, the influence of the Poultney River and the "drowning" of the southern end of Lake Champlain have both had a unique influence on the structure of these marshes and swamps. The wetlands occur on both the New York and Vermont sides of the river. The following is a description of the wetlands from the southern part of the river northward.

Ward Marsh (VT) is a large, emergent marsh with strip of floodplain forest on the river side and fields running right up to the edge of the marsh. The marsh is dominated by cattail with areas of bulrush and a small amount of shrub swamp at the northern end of the wetland. It is owned by the State of Vermont. Hemmert Marsh (NY) is a large, emergent marsh dominated by cattail.

Finch Marsh (NY) is a beaver-inundated expansive open water area with marsh vegetation on the edges. Large areas of dead standing timber are located at the east end and at the northern fringe below Warner hill. Floating emergent vegetation is well developed. This site is very scenic as the cliffs of Warner Hill overlook the wetland.

Blue Hole (VT) consists of two emergent marshes on either side of the road. The upper marsh (w. of road) is dominated by cattail with a large stand of Sagittaria in open water. The lower marsh has bulrush with cattail and open water in the center. Blue Hole Floodplain Forest (VT) is a small, floodplain forest with a few large trees, mostly silver maple and ash with large trunks of American elm (dead) and herbaceous layer of sensitive fern and wood nettle.

Pasture Marsh (NY) is a very shallow marsh full of cattail with willow around the edges. The wetland was probably affected by agricultural activities at one time. Schoolhouse Marsh (VT)
is a large wetland with flooded timber on the south side, shrub swamp on the east end and a large percentage of open water. This is a site for the rare plant called green dragon. Big Hollow Brook wetland (VT) is a small, forested wetland, flooded by Big Hollow brook.

Ward Marsh (NY) is a large curving wetland with floodplain forest nearest the river, opening into emergent marsh and shrub swamp wetland ending in live and dead timber. Evidently there was once a water control structure on this tributary of the river flooding the marsh to a greater degree. Corriscaden Marsh (VT) is a moderately-sized wetland with abundant open water, flooded timber on the south end and some cattail on the east side. The marsh seems more remote than the others, as it is bordered by steep banks on the east side.

Billings Marsh (VT) is a very large and impressive emergent marsh with a good interspersion of Sagittaria and cattail. A hayfield on north side is very close to the edge of the wetland, so a larger buffer is necessary. This is one of the finest wetlands in the chain. Upper Poultney - South Marsh (NY) is a large wetland with circular zonation - flooded timber and floodplain forest around the edge and the southern and northern sides, a ring of cattails, and open water in the center with submergent vegetation.

Reed Marshes (VT) consist of three marshes connected by channels, with open water and floating emergent marsh on the south side (surrounded by hay meadow) with sedge meadow on the eastern edge. Forested wetland and shrub swamp is found in the middle section and shrub swamp and open water on the north end. The corn field at the edge of this marsh should be revegated as a buffer for the marsh, or planted with buckwheat for wildlife food.

Upper Poultney - North Marsh (NY) is very similar to Upper Poultney - South Marsh. It has a similar circular zonation with open water and floating emergents in the center surrounded by shrub swamp and forested wetland. Coggman Creek Marsh (VT)
is a large emergent sedge meadow/cattail marsh with a stream flowing through it. A good example of a mature floodplain forest occurs on the south end with ostrich fern and nettle in the understory. The rare green dragon is found here and along the river edge just downstream.

Taken as a whole, these wetlands are some of the finest in the Champlain Valley. Water quality is for the most part excellent and plant species diversity and interspersion is outstanding. The Nature Conservancy in partnership with the States of Vermont and New York should acquire the highest quality sites in this chain.

The Narrows Marshes - Putnam, Dresden, Whitehall, NY and West Haven, Benson, VT

The Narrows Marshes are a linear series of marshes and setbacks that line the main channel of Lake Champlain from the village of Whitehall in New York to near Benson Landing in Vermont. Other data bases and authors describe the Narrows as a subset of the aforementioned area, specifically the ledges and narrowing of the lake at a point immediately south of the town of Dresden in New York.

The marshes on either side of the lake channel are for the most part deep water marshes, having been "drowned" by the rebounding of the land at the northern end of the lake. Thus the name "Drowned Lands" for the marshes at the foot of Bald Mountain in West Haven, Vermont is appropriate. At one time these marshes were part of the upland floodplain of the proto-Poultney/Mettowee river, which meandered through this narrow valley to near present-day Crown Point. As the land rebounded after glaciation, this valley was flooded as the land began to tilt to the south (Rodgers, 1977).

These marshes are bounded on both sides of the lake by fairly steep bluffs that inhibit easy access to the lake shore. However, there are a few docks and small marinas along the channel, especially in places where there is a direct connection of open water to firm ground. Most of this lakeshore is undeveloped as a result of these limitations, and most of the margins of these marshes are consequently forested.

Possibly due to this forested character and the sheer size of these wetlands, this has historically been a good black duck breeding area. The marshes along the channel are dominated by cattail, often on top of a natural silt levee (and dredge spoil from the dredging of the channel by the Army Corps of Engineers). Behind the levee is open water and deep emergent marsh, depending upon the depth of the water (due to ancient oxbows and levees left by the prehistoric river).

A railroad bed on the New York side of the lake cuts off the many bays from the main lake. These bays or setbacks are, in general, high quality wetlands with a good interspersion of open water to emergents and submergents. Because they are physically disconnected from the lake due to the railroad, they have not seen the degradation brought about by boat traffic on the main lake and the introduction of exotic species, especially the water chestnut (Trapa natans) from the Champlain canal.

Two disturbances have influenced these wetlands. Boat traffic through the Narrows is very common. The result is increased sediment in the already turbid water, as the soft clays in the lower basin are easily suspended by wave action. The exotic water chestnut has spread rapidly in these marshes, despite efforts to eliminate it, and now both states are attempting to control its spread northward on the lake rather than attempting an eradication program. It is unclear what effect these two disturbances have on the wetlands as no studies have been done, but Jenkins (1989) suggests that the turbidity has a negative effect on submergent plant density and diversity. With the shading of the water column by the introduced water chestnut, rare species such as the lake cress, a federal candidate endangered species, may soon be extirpated from these wetlands.

Restoration of the wetlands in this system through removal of water chestnut may be a possibility, however expensive, but the disturbance of boat traffic will probably never be adequately controlled, leaving this system vulnerable (especially with the proximity of the Champlain canal) to infestations by other weedy aquatics.

More research should be done to determine the quality of these wetlands for wildlife. The literature is contradictory on this topic; Myers (1990) ranks this as the highest acquisition priority for Rutland County. Taber (1949) states that the Narrows is one of the best brood rearing sites due to higher water levels in summer, while Greundling and Bogucki (1978) rank this wetland as poor for waterfowl and fisheries. Myers and Foley (1977) found low numbers of waterfowl and furbearers in the Narrows.

This is one of the largest expanses of emergent marsh in the Champlain Valley, and, while small parts of the wetland may be poor in value, such a large expanse may be of greater value as a whole. Without further study, acquisition of all the wetland acreage may be premature. However, acquisition of the higher quality setbacks on the New York side and some of the pothole areas behind the main channel may be appropriate at this time, if an effort is made to understand and control the impact of the water chestnut invasion.

Kings Bay - Champlain, New York

Kings Bay wetland is a large, low floodplain on the lake that floods every spring. A little more than half of the wetland is protected as the Kings Bay State Wetland Game Management Area by the New York Department of Environmental Conservation. The wetland is made up of floodplain forest, swamp forest, cattail marsh, bulrush marsh, and shrub swamp.

This site is an important waterfowl production area, as it is large and relatively undisturbed during the breeding season. The forest and dead timber areas provide nest sites for wood ducks, black ducks, and mallards.

The site also hosts a few rare plant species within the intact floodplain forest community. The community is dominated by silver maple and swamp white oak. The rare plants include the state-rare false hop sedge and cat-tail sedge, as well as Gray's sedge, which is regionally rare in the Champlain Valley.

Hydrological impacts of the wetland have been the result of the construction of the management area access road, the Point au Fer road, and the Stony Point road. In these areas the forest has succeeded to open marsh and shrub swamp due to the increase in water levels. In these areas waterfowl habitat is favored.

This is an important site, and the state should acquire the remainder of the wetland acreage in fee title to protect the core of the wetland from the impacts of development adjacent to the wetland. The core of the wetland, especially the extensive forested portions, should be managed as a natural area and timber cutting should be restricted to buffer zones and areas with little ecological value. A good example of an old floodplain forest is located on the

north end of the management area access road. This should be protected from off-road vehicles and timber cutting.

Monty Bay Wetlands - Beekmantown and Chazy, New York

Monty Bay is a large bay-head wetland surrounded by productive agricultural land. The majority of the wetland is dominated by floodplain forest with silver maple, swamp white oak, and cottonwood. The central section is emergent marsh grading into dead timber.

The wetland is seasonally flooded, and in this respect, not dissimilar to others of its kind. Because of the flooding, this is an excellent area for waterfowl production, especially black ducks and wood ducks. Osprey, northern harrier, and bald eagles are also known to utilize this site.

The wetland has not been inventoried by the New York Natural Heritage Program, but it has the potential for a number of rare species typical of these lakebed floodplain forests. The regionally rare Gray's sedge is known to occur along Riley Brook. There are a large number of tall eastern cottonwood trees in the wetland, which provide the preferred canopy structure for the cerulean warbler, a federal candidate-endangered species, but it is not known whether this species occurs here.

Other than logging, this site has had relatively few disturbances, especially in terms of hydrology. East of the Lake Shore Road the wetland has been altered by agricultural activities. A few camps on Point au Roche are very close to the wetland, but the forest provides a buffer for the emergent and open water zones of the wetland.

The New York Department of Environmental Conservation has protected about 60 percent of this wetland; however, there are at least seven inholdings within the core of the wetland. These parcels should be acquired by the state and protected as a part of the wildlife management area. Existing stands of cottonwood along Riley Brook and elsewhere should be protected from cutting. Water control structures should be discouraged here, since the wetland is relatively free from any hydrological disturbances, and as a result, is one of the more natural wetlands in the northern part of the lake.

Dead Creek aka Scomotion Creek - Plattsburgh and Beekmantown, New York

This wetland is along the sluggish, lake level Dead Creek before it enters Cumberland Bay at Plattsburgh. The wetland is an extensive area of emergent marsh, floodplain forest and shrub swamp. Although this wetland is adjacent to a large industrial development, it has retained much of its value for wildlife.

This is an important site for waterfowl. Wood ducks and mallards use the marshes for breeding. In the late summer, heavy growths of duckweed and stable water levels draw ducks from surrounding areas. This high plant productivity provides an important food source before and during fall migration.

Apparently, no rare species have been found in the wetland. However, there is a potential for ospreys to nest here as they utilize the wetland during migration. Also, Dead Creek is an important spawning area for burbot, and may provide habitat for some rare fishes and reptiles.

This site has been affected by condominium and industrial development especially at the mouth of the creek. However, upstream from the city of Plattsburgh the marsh retains its high quality. Potential threats to the wetland are abundant. Future industrial development may damage the buffer land and impact the wetland. Farm runoff, especially from manure spread during the winter months, has the potential to increase the growth of emergent vegetation and decrease the open water in the wetland.

Because of the proximity of this site to the city of Plattsburgh, this wetland is an exceptional natural resource for the city, and should be protected. The New York Department of Environmental Conservation should acquire the wetland acreage in fee title and negotiate conservation easements on the adjacent buffer lands to reduce impacts from human disturbance during the breeding season. The department should work with the Soil Conservation Service and local farmers to reduce nitrogen and phosphorus inputs from farms in the small watershed.

Webb Royce Swamp - Essex and Westport, New York

This is a large beaver-influenced wetland at the foot of Split Rock Mountain along Lake Champlain. The marsh is made up of an open water zone, an extensive shallow water marsh with buttonbush and water lily, and a large sedge meadow on the east side of the swamp.

The forested wetland is predominantly a dead timber swamp, especially on the north and south ends. This is excellent habitat for waterfowl, particularly wood ducks which are abundant at this site. A floodplain forest is at the extreme north end of the swamp, dominated by silver maple and swamp white oak.

The swamp is located within the Adirondack Council's proposed Champlain Valley Reserve, a lowland zone adjacent to Lake Champlain with fertile soils. The acquisition of Webb Royce Swamp and conservation easements on buffer lands surrounding the swamp will not only protect the wetland resource but aid in the continued use of these productive soils. Such protection would also serve as a model for the coexistence of agriculture and wetland wildlife in a diverse landscape.

Bulwagga Bay - Crown Point, New York

Bulwagga Bay is a large, shallow bay of Lake Champlain near the busy village of Port Henry. The bay itself is largely undeveloped on the east side and only has a handful of lakeshore camps on the west side. The undeveloped character of the bay shore adds to the character of the wetlands at the south end of the bay, and given the potential for second home development along the lake in this area, the integrity of the wetlands is at risk.

The zone of submergent vegetation has presumed to have expanded dramatically in recent years due to the Eurasian milfoil infestation. Unfortunately, the infestation of water chestnut is imminent. Together, these aquatic pests may out-compete the federal candidate-endangered lake cress and the state-rare straight leaf pondweed, which are known to occur in the submergent zone.

The emergent marsh is very diverse, with water smartweed, water lily and pickerel weed dominating and cattails on the fringes. The area is bisected by the railroad, which has caused the marshes on the south and west sides to flood, limiting the encroachment of emergent vegetation. The marsh is not large, but together with open water areas behind the RR tracks, provides good habitat for a variety of ducks. Disturbance on the west side of the marsh from Route 22 and associated developments is unfortunate, but may not dramatically impact the wetland other than visually.

The south end of the wetland is dominated by a moderately sized floodplain forest community. Disturbance in this area seems to be minimal, and a number of rare plants occur here including cat-tail sedge, false hop sedge and lance-leaved loosestrife.

Overall, this is an outstanding natural area that should be protected. However, if the water chestnut population increases unchecked the submergent zone of this wetland may be severely degraded. The marsh and upland buffer lands on the south side of the wetland should be acquired by the State of New York or The Nature Conservancy and managed for the full range of biodiversity the site holds.

Huckleberry Mountain Marsh - Putnam, New York

This is a very attractive wetland. The fact that it is located in a long, arching valley make it an interesting topographic feature and probably add to its value for wildlife. Although it appears not to have a central channel, there are several small streams that feed into it. There is plenty of open water, particularly in the dead timber area.

The dead timber area is very large, and interspersed among the dead trees are small copses of sedge hummocks and a few shrubs, with occasional cattails on the shoreline. This is excellent habitat for wood ducks and black ducks. There are several wood duck nest boxes in this area.

Shrub swamp dominates the eastern end of the swamp, with plenty of open channels and a diversity of vegetation, from rafts of pickerel weed to beds of buttonbush. Finally near the outlet to the lake, a solid bed of cattails reigns just west of the RR tracks. Some open water is found here, but not much. I suspect that if there is not a direct channel to the lake (which I am unsure of) this cattail bed may provide a barrier to water chestnut infestation.

The surrounding land use on the west side of the wetland is primarily pasture and abandoned fields, with a forest buffer to the marsh. Shrubby pasture is abundant on the northwest side of Lower Road, at the base of Huckleberry Mountain. The surrounding land use on the eastern end of the marsh is a large apple orchard, which is in some places within 75 feet of

the marsh. It is unclear what impact this operation has on the marsh.

Threats to this wetland include pesticide and herbicide runoff and drift from the orchard as well as the level of activity in the orchard during harvest. Road widening and road salt applications could have an impact because the town road is situated very close to the marsh. Logging near or in the southwestern portion of the marsh may impact the wetland also. Finally, the ever-present threat of invasive exotic species may loom in the future, but at present, very few of these species are present in the wetland.

The state should acquire this wetland as a wildlife management area, and encourage appropriate land use on adjacent lands to protect the resource.

South Bay Wetlands - Fort Ann, New York

Aesthetically, this wetland is the most spectacular on the lake. The wetland is at the extreme southern end of Lake Champlain where South Bay Creek enters the lake. 700 foot cliffs of The Diameter rise directly out of the wetland on the west side and undeveloped mountains rise up on the east. A sinuous esker winds its way through the marsh, and on either side of the creek, marshy setbacks are lined with strips of floodplain forest.

The cliffs above the wetland provide habitat for 8 species of rare plants and the federally endangered peregrine falcon. A large talus slope separates the wetland from the cliffs. The wetland hosts 3 rare plants including the federal candidate-endangered species lake cress and two outstanding examples of natural communities, floodplain forest and shrub swamp.

Threats to the wetland from development are few. The surrounding land is mostly used for timber production. The village of South Bay at the upper end of South Bay Creek doesn't seem to pose much of a threat to the wetland. The water chestnut, on the other hand, has been spreading south into South Bay from the Rt.22 bridge and currently forms a solid mat in a couple of the western bays at the north end of South Bay. It will, over time make its way to the southern reaches of the bay and influence the diverse wetland community there.

Nonetheless, this spectacular assemblage of upland and wetland communities is striking in that at present, there seems to be very little disturbance, and if any wetland and adjacent upland habitat on the lake is close to pre-settlement condition, it is this one. The upland areas should be protected as Forest Preserve and the wetlands should be acquired and managed as a natural area; the invading water chestnut should be controlled soon so it does not permanently degrade the wetland system.

VIII. RECOMMENDATIONS FOR LOWER PRIORITY SITES

Grand Isle County

South Alburg Swamp, Alburg, Vermont is a large hardwood swamp with a stunted spruce-fir-tamarack swamp and bog in the center, which is very significant given its location in the

Champlain Valley. The hydrology of the northern part of the swamp has been negatively affected by the development of Routes 2 and 129. The beach frontage on the southern end which harbors a couple of very rare plants has been carved into some of the narrowest 10-acre "spaghetti" lots on the lake. This wetland is a good candidate for Class I status under the existing Vermont Wetland Rules, affording at least a 100 foot buffer from development. In addition, a conservation easement should be pursued that would restrict logging in the boggy softwood and cedar stands in the swamp.

The Marsh, Isle la Motte, Vermont is a large hardwood swamp bisecting the island. This wetland needs more field work to determine its conservation value. However, such a large wetland is certainly significant for breeding waterfowl. At present, the existing wetland rules are adequate for its protection.

South Hero Marsh, South Hero, Vermont is a very high quality wetland for waterfowl. Impacts of road development at the mouth of the creek have altered the hydrology, but the marsh is in excellent condition. Roads paralleling the marsh are far enough away to reduce, yet not eliminate, the pressure from development. The Vermont Fish and Wildlife should acquire vulnerable tracts as necessary. An application should be considered to the Water Resources Board for Class I status, since development along the margins could impair the value of the wetland for waterfowl and water birds.

Kelly Bay, Alburg, Vermont has had impacts from railroad right-of-way development and an invasion of purple loosestrife. However, there remain some fine stands of mature floodplain forest as well as extensive aquatic weed beds in the bay itself that deserve further study. This site should be carefully regulated under the existing wetland rules.

Sandbar Bridge Marsh, South Hero, Vermont is a small, productive wetland set back from the lake with a good interspersion of emergent marsh and open water areas, which make for excellent waterfowl breeding habitat. In addition it may harbor some rare species, but an inventory needs to be done. This site, which has been affected by dike and farm road development as well as illegal dumping, should be regulated under the existing wetland rules.

Franklin County

Missisquoi Delta, Swanton, Vermont is the crown jewel of wetlands in the Champlain Valley. Not enough can be said about this wetland complex which consists of emergent marsh, floodplain forest, lowland bog, red maple swamp and the largest great blue heron rookery in the state. All remaining wetland and upland buffer tracts should be acquired and added the Missisquoi National Wildlife Refuge for management.

Fairfield Swamp, Fairfield, St. Albans, Swanton, Vermont is mostly protected by the Vermont Fish and Wildlife Dept. Timber management in the state owned portion of the swamp should be reviewed and possibly altered to restore a hardwood/cedar swamp community on the site. Wetland acreage south of Rt.36 should be regulated under the existing wetland rules or acquired as needed for the protection of water quality in the northern end of the swamp and an important wildlife habitat corridor.

Stevens/Jewett Brook, St. Albans, Vermont is partially protected as the Black Creek Wildlife Management Area (approx. 250 acres), and is a historic black tern nesting site. This site has been degraded by nutrient loading from the St. Albans wastewater treatment facility as well as non-point sources. The state should acquire additional acreage as necessary, and should study the long term impact of nutrient loading on the marsh ecosystem.

Franklin Bog, Franklin, Vermont is a very high quality lowland bog with several rare plant species, partially owned by the Vermont Nature Conservancy. The Conservancy should acquire additional tracts to protect the entire site from development in the buffer that may affect the hydrology or water chemistry of the wetland.

Carman's Marsh, Swanton, Vermont is an excellent spawning area for northern pike. Protection should extend south of Rt. 78 to accommodate northern pike spawning.

Chittenden County

Winooski Delta, Burlington and Colchester, Vermont is a high quality wetland in a growing metropolitan area. See Nongame and Natural Heritage Program (NNHP) (1992). The wetlands are an important natural area for metropolitan Burlington, providing wildlife and recreational opportunities for local residents. It is uncommon to find such an important and largely intact natural area within a highly developed urban area. The delta and the wetlands upstream should be valued by local residents and protected from future threats.

Sandbar Wildlife Management Area, Milton & Colchester, Vermont is almost entirely protected and managed by the Vermont Fish and Wildlife Department. This is one of the three highest quality marshes in the state. See NNHP (1992) for more information.

Shelburne Pond, Shelburne, Vermont is a largely undeveloped pond with extensive wetlands on its margin near the largest city in the state. Almost 70 percent of this site is protected by The Nature Conservancy and managed by the University of Vermont Environmental Program. Additional acreage should be acquired to round out the protection of this important site for both waterfowl and endangered species. See NNHP (1992).

LaPlatte River Marsh, Shelburne, Vermont is almost entirely protected by The Nature Conservancy. Development adjacent to the wetlands should be properly buffered from the wetland. See NNHP (1992) for details on this site.

Burlington Intervale, Burlington, Vermont is an extensive sedge meadow and marsh with some open water in a highly visible location. It is protected by the Vermont Fish and Wildlife Department. An observation platform or blind at this location or at the Winooski Valley Park District's Ethan Allen Homestead would provide for public education about Vermont's wetlands. See Parsons et al (1988) and NNHP (1992).

Towne Swamp, Milton, Vermont is a 1000-acre swamp with three distinct natural communities. Protection of this site should include some protection from extensive forest management. While some limited logging in the winter may not permanently degrade the

wetland, clearcutting will damage the natural features of the wetland and would probably not comply with silvicultural standards for deer wintering areas (Vermont Wetland Rules, 1990). This site should be protected through local zoning and the Vermont Wetland Rules. Consideration should be made to apply for Class I status for this wetland. See NNHP (1992).

Pine Island Shrub Swamp, Colchester, Vermont is one of the largest alder swamps in the state. This swamp should be protected from development by rigorous attention to the existing Vermont Wetland Rules. This site should be studied and/or inventoried further to determine its value.

Williston Bog, Williston, Vermont, also called Mud Pond, is owned by the Town of Williston and managed as a natural area. This can be an excellent site for public education about wetlands. See NNHP (1992).

Thorp-Kimball Brook, Charlotte, Vermont contains good examples of floodplain forest, emergent marsh, and bottomland forest and is adjacent to an example of an old Champlain Valley forest managed by The Nature Conservancy. Recent efforts to protect this site have been unsuccessful. However, due to the significance of this site to the Town of Charlotte, the Charlotte Conservation Commission should explore avenues for its protection. See NNHP (1992).

64 Acres, Essex, Vermont, a floodplain forest on the Winooski River is owned and managed by the Winooski Valley Park District.
The Park District should be prepared for management of exotic species such as Japanese knotweed at this site.

Colchester Bog, Colchester, Vermont is a lake level bog owned by the University of Vermont and used extensively for educational purposes. Such careful use should continue.

Upper LaPlatte Floodplain Forest, Hinesburg, Vermont is an unusual floodplain forest located in a rapidly developing area. This site should be protected through a conservation easement that limits or preferably restricts timber cutting in the floodplain forest. See NNHP (1992).

Westford Swamp, Westford and Essex, Vermont is a high quality spruce-fir swamp and bog with a beaver pond. The site requires further study to determine the level of protection needed. See NNHP (1992).

Hidden Swamp, Westford, Vermont is owned by the Town of Westford and should be designated as a town natural area.
See NNHP (1992).

Addison County

Whitney Creek, Addison, Vermont is made up of Hospital and Tremble Creeks and the narrow peninsula of agricultural land between them. This site provides excellent waterfowl

habitat and mudflats for migrating shorebirds. Portions of the site are currently being protected with acquisitions in fee title and conservation easements by the Vermont Fish and Wildlife Department with help from The Nature Conservancy, The Vermont Housing and Conservation Board, and the Waterfowl Stamp Fund.

Salisbury Swamp, Salisbury, Vermont is a large hardwood/cedar swamp with a number of rare plants. Along with Brandon Swamp, Cornwall Swamp, Middlebury Swamp, Leicester Swamp and Long Swamp, this makes a chain of 15,000 acres of swamp on the upper reaches of the Otter Creek. One small tract is owned by the State of Vermont. This site should be studied to determine protection needs in lieu of other nearby protected swamps such as Cornwall. The entire swamp complex should be studied to determine its importance in the ecosystem.

Dead Creek, Addison & Panton, Vermont is a shallow, sluggish stream with a cattail marsh fringe. Nearly 75 percent of this wetland is owned and managed by the Vermont Fish and Wildlife Department. Sections in Panton have the least amount of protection but the marsh is not as extensive here. This site is managed for waterfowl, including a large concentration of Canada and snow geese during fall migration. Invasive exotic species such as water chestnut which have appeared here should be monitored and controlled every year. The impacts on the wetland of nutrient loading from subsurface drainage of adjacent farms should be studied.

Lemon Fair River Flats, Bridport, Vermont is a very wide, flat basin that floods every spring and sometimes in fall offering a large undisturbed staging area for waterfowl and water birds. The land is almost entirely used for agriculture and supports almost no natural plant community with the exception of one small floodplain forest. Yet the wetland is a very important stopover area during migration. This site should be regulated through the Vermont Wetland Rules and floodplain regulations. Any plans to alter the hydrology of this site other than clearing existing drainage ditches should be discouraged.

Bristol Pond, Bristol, Vermont, is a swamp surrounding an open pond that formerly had a couple of very rare species, now extirpated by beaver activity that has flooded the cedar swamp. This wetland still provides habitat for a number of animal species. The Vermont Fish and Wildlife Department owns an access area to the pond. This site should be protected through the existing wetland rules.

Lemon Fair River, Weybridge and Cornwall, Vermont, is a linear wetland along the river that has been affected by agricultural activities. No further protection is necessary.

Shoreham Cedar Swamp, Shoreham, Vermont, is a 1000 acre swamp that provides a refuge for a number of species of wildlife, but is not exceptional in any value. The site deserves more study, and should be protected through the existing wetland rules.

Marsh Hill Wetland, Ferrisburgh, Vermont has been heavily affected by agricultural activities, yet contains one rare plant population. The site should be protected through existing wetland rules.

Red Rock Bay, Orwell, Vermont is considered to be a part of the Narrows wetlands.

Hand's Cove, Shoreham, Vermont is a 50 acre wetland along the lake that needs more study before any recommendations are made. Small lakeside wetlands such as this may, in the aggregate, be very important to the aquatic ecosystem.

Pond Brook Cedars, Monkton, Vermont, a calcareous seepage swamp, is home to a number of rare plants and is a deer wintering area. An assessment should be done to determine if this wetland should be granted Class I status by the Water Resources Board.

North New Haven Cedars, New Haven, Vermont is another cedar swamp that has been affected by beaver dams. No recommendation can be made at this time due to lack of information.

Rutland County

Lake Bomoseen Marsh, Hubbardton and Castleton, Vermont is a high quality marsh, and with the adjacent Love's marsh is rich in species diversity, but compromised by prior drawdowns of the lake for Eurasian milfoil control. Drawdowns of water in these marshes should be discouraged. This site should be considered as a candidate for Class I status under the Vermont Wetland Rules.

Tinmouth Channel, Tinmouth, Vermont is a highly alkaline linear wetland; the southern headwaters contain a large open fen and tamarack swamp. The Vermont Fish and Wildlife Department owns the northern section. The fen is unprotected and should be acquired. The rest of the wetland should be granted Class I status with a 250 foot buffer from development and/or gravel mining.

West Rutland Marsh, West Rutland, Vermont is a large open cattail marsh that has been significantly disturbed by industrial development and has a number of problem exotic species. Yet it retains value for wildlife and is a significant area for marsh birds. Because of this and the fact that it provides surface water filtration, this site should be protected through town zoning and attention to the existing wetland rules.

Scanlon Bog, Brandon, Vermont is presently protected as a provisional Class I wetland and is partially owned by The Nature Conservancy.

Brandon Swamp, Brandon, Vermont is a portion of the aforementioned 15,000 acre swamp complex on the upper Otter Creek. It has a number of rare plants. Limited timber harvest along the margins during winter should not diminish the natural area qualities, but clearcutting should be discouraged. The site should be protected through the existing wetland rules.

Horton Marsh, West Haven, Vermont is considered to be part of the Narrows.

Old Marsh Pond, Benson, Vermont, is a diverse, open water marsh, with a couple of rare

plants and a rare turtle, and is adjacent to Beaver Meadow wetland within the Rattlesnake Ridge area of Fair Haven, an important site for natural diversity in Rutland County. This wetland should be protected through local zoning or the local conservation commission.

Walker Swamp and Cranberry Swamp, Benson, Vermont are partly within the Pond Woods Wildlife Management Area (WMA). Cranberrry swamp is a rich fen (see Thompson, 1991, for details). Additional acreage that includes these wetlands should be acquired by the State of Vermont as part of the WMA.

Clinton County, New York

Ausable Delta, Ausable and Peru, a sandy delta of the Ausable River, is a large wetland with a high diversity of plants and animals. The marshes and floodplain forests provide habitat for a number of species of breeding waterfowl. It also has an outstanding example of an undisturbed sand beach with quite a few rare plants. While most of the wetland is protected within the Ausable Wildlife Management Area, a fairly extensive old growth silver maple and cottonwood floodplain forest occurs on private land. Privately owned tracts of wetland and buffer habitat should be acquired by the state to complete the protection of this important site.

Chazy River Mouth, Champlain, is a small but important wetland partly owned by the New York Department of Environmental Conservation as a portion of the Kings Bay WMA. It is used by black terns late in the breeding season. Conservation easements should be acquired on wetland acreage across the river and down the shore to protect from lakeshore development in and adjacent to the wetlands.

Cumberland Bay, Plattsburgh and Beekmantown, is a large expanse of seasonally flooded swamp, dominated by red maple and white cedar. Most of the wetland is protected as Cumberland Bay State Park. This site should be inventoried for rare plants and animals. Until that time, the portions of the wetland not in state ownership should be protected through the existing New York wetlands regulations.

Rouses Point wetland, Champlain, on the Canadian Border, is part of a larger, more significant wetland on the Canadian side, especially for northern pike spawning. Aerial photographs indicate historical disturbance of the wetland on the U.S. side. This site should be protected from further disturbance through the New York wetland regulations.

Ticonderoga Creek, Ticonderoga, is almost completely protected by the Fort Ticonderoga Association, and is a visually appealing marsh jutting out into the lake. It is a prime spawning area for the bass and sunfish family. The Fort Ticonderoga Association should protect this site from disturbance.

Putnam Creek Mouth, Crown Point, is an outstanding example of an undisturbed deep emergent marsh, with a diversity of aquatic and emergent plants. The best parts of the wetland are protected by the New York Department of Environmental Conservation as the Putts Creek Wildlife Management Area. The site should be managed as a natural area;

habitat enhancement should be discouraged.

Wickham Marsh, Chesterfield, is a diverse assemblage of rich shrub fen community, cedar swamp, and emergent marsh. The site is entirely within the Wickham Marsh Wildlife Management Area.

Boquet River Mouth, Willsboro, is a linear floodplain forest along an important salmon river. The Adirondack Nature Conservancy and Land Trust holds a conservation easement on most of the wetland. Other floodplain forests along this river are important as well (see Davis 1988).

Washington County, New York

Mill Bay, Putnam, is a fairly large bay of Lake Champlain that has been separated from the lake by the Delaware and Hudson Railroad grade. The marsh is quite diverse, with extensive beds of pickerelweed and other emergents, and is surrounded by steep wooded hills, affording protection for the many waterfowl that breed at this site. The bay itself is considered to be waters of the state under the Public Trust Doctrine, and apparently from the county tax maps, this includes the marsh as well. This should be verified. This site should receive further study and should be protected through the Adirondack Park Agency wetland regulations. The wetland should be monitored for the incursion of the exotic water chestnut from the lake.

Head of Lake Champlain, Whitehall, is a portion of the Narrows marshes located across the river from Austin Hill, but is outside of the Adirondack Park. The quality of this site is unknown, but it encompasses 260 acres. This site should be protected through the existing New York wetland regulations.

Charter Marsh, Putnam, is a relatively small bay wetland. The marsh is largely emergent and shrub swamp surrounded by forest and farm fields. It is fed by the relatively clean Five Mile Creek. This site should be protected through the existing Adirondack Park Agency wetland regulations.

X. SUMMARY

The wetlands of the Lake Champlain Valley are an irreplaceable natural resource. They provide habitat for waterfowl, fisheries, nongame wildlife, and rare and endangered species. They provide recreational and educational opportunities for New Yorkers and Vermonters, and maintain scenic open space in a rapidly developing region. The wetlands also provide water quality enhancement through filtration of sediment and pollutants before reaching Lake Champlain.

This study assessed the functions and values of the major wetlands in the Champlain Valley, and ranked them according to those functions and values. Site conservation plans were completed with the purpose of protecting the highest quality wetlands from degradation by future development. Recommendations were made for each wetland in this study.

It is hoped that future efforts to protect wetlands will use this study in targeting the most vulnerable and the highest quality sites. Further research is needed on the smaller, under-studied sites to determine their value in the ecosystem. As more information on these wetlands becomes available, it should be added to the wetland matrices in Appendix C of this report periodically in order to update the ranking of the wetlands.

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Appendix A: Wetland Ranking Form

Lake Champlain Wetland Inventory - Values

Rate each wetland for each value on a scale of one to five, five being the highest rating, three intermediate, and 1 low rating. Mark a U for unknown values.

Sitename_____
Town/State_____ Acres_____

Cultural Attributes

Surrounding land use ____
Recreation ____
Open space/aesthetics ____

Physical Attributes

Flood storage ____
Surface/groundwater protection ____
Erosion control ____

Biological Attributes

General wildlife value ____
Waterfowl and wetland birds ____
Wildlife diversity and significance ____
Fish ____
Threatened and Endangered Species ____
Covertype* ____
Interspersion ____
Unique communities (Best example) ____
Plant Species Diversity ____

_____ Total score

*Emergent wetlands comprise 61% of total loss of wetland acreage, scrub-shrub wetlands 38% and forested wetlands 1%

Appendix B: Wetland Matrices

Grand Isle County, Vermont

Site Name	% Prot	Land Use	Recreation	Open Space	Flood Control	Water quality	Erosion Control	Wildlife Value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
Mud Creek 1540 acres	65	Farm	High	Med.	None	Low-Med.	Low	Med.-High	High	High	High	B3	45% timber	High	U	U	L	L-M
South Alburg Swamp 1100 acres	0	Farm	High	Low	None	Low-Med.	U	High	Med.	Med.-High	Med.-High	B4	70% timber	Med.	SS	U	L-M	M
The Marsh 355 acres	0	Farm	High	Med.	None	Med.	U	Med.	Med.-High	High	High	U	45% timber	Med.	LC	U	L	L-M
South Hero Marsh 315 acres	5	Farm	Med-High	Low	None	Low-Med.	U	High	High	Med.-High	High	B5	52% timber	Low-Med.	LS	Low	M-H	L
Kelly Bay 290 acres	0	Res. Farm	Med.-High	Low	None	Low	Low-Med	High	High	U	High	B4	48% timber	Med.	SS	U	M-H	M-H
Sandbar Bridge Marsh 70 acres	0	Farm and camp	Med.-High	Low-Med.	None	Low-Med.	U	Med.-High	Med.-High	U	High	U	80% emergent	Med.	U	U	H	M-H

Franklin County, Vermont

Site Name	% Prot	Land Use	Recreation	Open Space	Flood Control	Water quality	Erosion Control	Wildlife Value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
Mississquoi Delta 7236 acres	90	Farm	High	High	None	Med.	Low	High	High	High	High	B2	35% emergent	High	HS	High	L-M	L
Fairfield Swamp 600+ acres	80	Forest	High	U	Med.	Med.	U	High	Med.-High	Med.	Med.	B4	75% timber	Med.-High	U	U	M	L
Stevens/Jewett Brook 330 acres	80	Farm	Med.-High	U	None	High	U	Med.	High	High	High	B4	31% dead timber	High	U	Low	M-H	L-M
Rock River 660 acres	5	Farm	U	Low	None	Med.	Low	Med.-High	High	U	High	B4?	80% timber	High	U	High	M-H	L
Franklin Bog 280 acres	50	Farm	High	Low	Low-Med.	Low-Med.	None	U	Med.-High	U	None	B3	50% shrub	High	HS	U	L	L
Carman's Marsh 108 acres	90	Farm and Res.	High	Med.	None	U	Med.	High	High	U	High	U	60% timber	High	U	U	L-M	L-M
Lake Carmi Bog 440 acres	90 ?	U	High	Low	None	Low	None	U	Low-Med.	U	Med.	B3	70% timber	Med.	SS	U		

Chittenden County, Vermont																		
Site Name	% Prot	Land Use	Recreation	Open Space	flood Control	Water quality	Erosion Control	Wildlife Value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
Winooski Delta 625 acres	60	Urban	High	High	None	Med.-High	High	High	High	High	High	B4	13% emergent	High	SS	High	M-H	M
Sandbar 1160 acres	95	Res. Rec.	High	Med.-High	None	Low-Med.	Low-Med.	High	High	High	High	B3	21% emergent	High	HS	Med.	L-M	L
Malletts Creek 500 acres	15	Farm Res.	Med. - High	Med-High	None	High	Med.	Med.	High	Med.-High	High	B4	34% emergent	High	LS	Med.	M	M
Shelburne Pond 490 acres	70	For. Farm	Med.-High	High	None	High	Low	Med. -High	Med.-High	Med.-High	High	B3	45% emergent	Med.-High	SS	High	M	M
LaPlatte River Marsh 375 acres	85	Farm Ind.	High	High	None	High	Low-Med.	High	High	Med.-High	High	B3	14% emergent	Med.-High	SS	U	L-M	L-M
Lower Lamoille Oxbow 525 acres	40	For. Farm	Med.	Low	Low	Med.	None	High	Med.-High	High	Med.-High	B3	10% emergent	Med.-High	HS	U	M	L
Burlington Intervale 265 a.	60	Urban	High	High	Low	High	None	Med.-High	Med.-High	Med.-High	Med.	B4	80% emergent	Med.-High	SS	U	M	M
Towne Swamp 900 acres	0	Farm Res.	Med.-High	Low	Low-Med.	Med.-High	None	Med.-High	Med-High	Med.-High	Low	B3	10% emergent	Med.	SS	Med.-High	M-H	L-M
Pine Island Shrub Swamp 545a	50	Farm	U	Med.-High	Low	Med.-High	None	High	Med.-High	High	Low	B4?	20% emergent	Med	HS	U	M-H	L-M
Williston Bog 110 acres	80	Rural	High	Med.	U	Med.	None	Med.	Med.	Med.-High	Low	B4	0% emergent	Med.-High	SS	U	M	L
Thorp-Kimball Brooks 160 acres	0	For. Farm	U	Low-Med.	None	Med.	None	Med.	Med.-High	Med.-High	Med.	B4	34% emergent	Med.-High	SS	U	M-H	L
64 Acres	100	Res.	High	High	None	None	Med.	High	Med.	Med.-High	None	B4	0% emergent	Low-Med.	SS	U	L	L-M
Colchester Bog 190 acres	100	Res.	High	High	None	None	None	Med.	Med.	Med.	None	B3	13% emergent	Med.-High	SS	U	M	L-M
Upper LaPlatte Floodplain 145 a	0	Farm	U	Low-Med.	U	Low-Med.	Low-Med.	Med.-High	Med.	U	None	B3	40% emergent	Med.	HS	U	H	L
Westford Swamp 100 acres	0	For. Res.	U	U	Low	Med.	None	High	U	U	U	B4	10% emergent	Med.	SS	High	M-H	L
Hidden Swamp 20 acres	0	Forest	U	U	U	U	U	High	U	U	None	B4	<70% emergent	Med.	HS	Low	M	L

Addison County, Vermont																		
Site Name	% Prot	Land Use	Recreation	Open Space	Flood control	Water quality	Erosion control	Wildlife value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
East Creek 525 acres	40	Farm	High	Med.	None	Med.	Med.-High	High	High	High	High	B3	53% emergent	High	SS	High	M	L
Lower Otter Creek 1840 acres	30	Res. Farm	High	Med.	Low	High	Med.	High	High	High	High	B4	30% emergent	Med.-High	HS	Low	M	L
Cornwall Swamp 1250 acres	70	Farm	High	Low	High	Low-Med.	None	High	High	High	Low	B2	15% emergent	Med.	HS	High	L-M	L
Little Otter Creek 1280 acres	65	Farm	High	Med.	None	Med.	Med.	High	High	High	High	B3	23% emergent	Med.	HS	U	M	L
Salisbury Swamp 500? acres	1	Farm	High	Low	Med.	Med.	None	High	Med.-High	Med.-High	Med.	B3	5% emergent	Med.	HS	High	L-M	L
Whitney Creek Marsh 560 acres	30	Farm Res.	High	Low	None	High	None	High	High	High	High	B3	17% emergent	Med.-High	HS	U	H	M
Dead Creek 2120 acres	75	Farm	High	Med.-High	Low	High	Low	High	High	High	High	B4	34% emergent	Low-Med.		Low	M	L
Lemon Fair River Flats 1332 ac	0	Farm	Low-Med.	High	Med.-High	High	None	High	High	High	High	B5?	85% emergent	Med.		None	L-M	M-H
Bristol Pond 500 acres	10	Farm	Med.-High	High	Low	Med.	None	Med.-High	Med.-High	Med.-High	High	B4	0% emergent	Med.	SS	U	L-M	L-M
Lower Lemon Fair River 540 acres	0	Farm	Med.	Low	Med.	Low	None	High	Med.-High	High	High	B5?	65% emergent	High	LS	U	M	M
Lewis Creek 200 acres?	50	Res. Farm	High	Low	None	High	Low	High	High	High	High	B5?	34% emergent	Med.		U	M	L
Shoreham Cedar Swamp 1100 ac	0	Farm	High	Med.	Low	Low	None	High	Low-Med.	Med.-High	Med.	B5?	12% emergent	Low	SS		M-H	M
Marsh Hill Swamp 150 acres?	0	Farm	U	None	High	Low-Med.	None	High	Med.-High	High	Med.	B4	30% emergent	Med.		U	L-M	H
Hand's Cove 50 acres	0	Farm	Med.-High	Low	None	Low-Med.	None	High	Med.-High	Med.-High	High	U	35% emergent	Med.		U	M-H	U

Pond Brook Cedars 200 acres?	0	Farm	Med.-High	Low-Med.	Low-Med.	Low-Med.	None	Med.-High	Low-Med.	Med.-High	Low	B4	5% emergent	Med.	SS	U	M-H	L-M
North New Haven Cedar Swamp 475 a	0	Farm	Med.-High	U	Low	Low-Med.	None	High	Med.	Med.-High	U	U	20% emergent	Med.-High		U	L-M	L
Upper Little Otter Creek 375 acres	0	Farm	U	U	U	U	U	High	Med.-High	High	Low	U	25% emergent	Med.		U	M-H	H

Rutland County, Vermont

Site Name	% Prot	Land Use	Recreation	Open Space	Flood Control	Water quality	Erosion Control	Wildlife Value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
Lake Bomoseen Marsh 300 acres	20	Res.	Med.	High	None	Med.-High	Med.	High	High	High	High	B4	75% emergent	Med.	HS	Med.-High	H	M
Tinmouth Channel 825 acres?	80	Farm res.	High	Low	Med.	High	None	High	Med.	Med.-High	High	B2	60% SS/EM	High	SS	High	M	L
Poultney River Marshes 960 acres	30	Farm	High	Low	None	High	None	High	Med.-High	High	High	B2	45% emergent	High	SS	U	L-M	L
West Rutland Marsh >500 acres	0	Res. Ind.	High	Med-High	High	High	None	Med.	High	High	High	B4	70% emergent	Low	SS	U	M-H	H
The Narrows Marshes 1325 acres	0	Farm Res.	High	Low	None	Low-Med.	High	High	Med.-High	Med.-High	High	B4?	27% emergent	Med.		Low	M-L	M-H
Scanlon Bog 50 acres	60	Res.	Med.	High	Low	Low-Med.	None	Med.-High	Med.	med.-High	None	B3	80% SS/EM	Med.	SS	U	H	L
Brandon Swamp 500 acres?	0	Farm	Med.-High	Low	Med.	Med.	None	Med.-High	Med.-High	Med.-High	Med.	B4	5% emergent	Low-Med.	HS	U	L	L
Old Marsh Pond 60 acres	?	Forest	Med.	U	U	Med.-High	U	Med.	Med.	Med.	Med.-High	B4	70 % emergent	Med.-High		U	M	L
Walker Swamp / Cranberry Swamp 110 ac	60	Forest	Med.-High	U	U	U	U	High	High	Med.-High	U	B4	16 % emergent	Med.	LS	U	L	L-M

Clinton County, New York

Site Name	% Prot	Land Use	Recreation	Open Space	Flood Control	Water quality	Erosion Control	Wildlife Value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
Ausable Delta 970 acres	80	Park Res.	High	Med.	None	Med.-High	Low-Med.	High	Med.-High	High	Med.	B3?	15% emergent	Med.-High	HS	Med.	L-M	L-M
Kings Bay 630 acres	60	For. Farm	High	Low	None	None	Med.	High	High	High	High	B4?	40% emergent	Med.-High		High	M	L
Monty Bay 630 acres	60	Farm	High	Low-Med.	None	Med.	Low	High	High	High	High	B4?	40% emergent	Med.		Low	M	L
Dead Creek 1050 acres	0	Farm Urban	Low-Med.	High	Low	Med.-High	Low	High	Med.-High	High	High	B5?	40% emergent	Low-Med.		U	H	H-M
Chazy River Mouth 190 acres	50	Farm Res.	High	Low	None	None	Low-Med.	High	High	High	High	B5?	60% emergent	Med.		U	L	M
Cumberland Bay 515 acres	65	Res. Farm	High	Med.	None	Med.	None	Med.	Med.	Med.	High	B4?	15% emergent	Med.	LS	U	M-H	L-M
Rouses Point 350 acres	0	Ind. Farm	Low	High	None	Med.	Med.	Med.-high	Med.-High	Med.	High	B4?	10% emergent	U		U	L-M	M-H

Essex County, New York

Site Name	% Prot	Land Use	Recreation	Open Space	Flood Control	Water quality	Erosion Control	Wildlife Value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
Bulwagga Bay 200 acres	0	Res. Farm	High	Med.-High	None	Low-Med.	Low	High	High	High	High	B3	65% emergent	High	HS	U	L-M	L-M
Webb Royce Swamp 300 acres	0	Farm	Med.	High	Low-Med.	Med.	Low-Med.	High	High	High	U	U	35% emergent	Med.-High	SS	U	L-M	L
Ticonderoga Creek 200 acres	60	Res. Fort	High	High	None	Med.	Low	Med.-High	High	U	High	U	30% emergent	High	HS	U	L-M	L
Putnam Creek Mouth 400 acres	30	Res.	Med.-High	Med.-High	None	Med.-high	U	High	High	High	Med.	B4?	10% emergent	Med.-High	U	U	M	M
Wickham Marsh 420 acres	100	Forest	High	Med-High	None	Low	Low	High	High	High	Med.	B3?	35% emergent	Med.	SS	U	L	L-M
Boquet River Mouth 190 acres	70	Forest	Med.-High	U	None	Low	None?	U	U	High	High	B3?	U	U	SS	U	L-M	L

Washington County, New York

Site Name	% Prot	Land Use	Recreation	Open Space	Flood Control	Water quality	Erosion Control	Wildlife Value	Waterfowl	Wildlife Diversity	Fish	Biodiversity	Cover-type	Interspersion	Communities	Plant Diversity	Vuln	Degr
South Bay Wetland 125 acres	0	Forest	Med.-High	Med.	None	Med.	Low-Med.	High	Med.-High	High	High	B3	45% emergent	Med.-High	HS	U	L	L
Poultney River Wetlands 960 acres	30	Farm For.	High	Low	None	High	None	High	High	High	High	B2	45% emergent	High	SS	U	L-M	L
The Narrows Marshes 1325 acres	0	Farm Res.	High	Low	None	Low-Med.	High	High	Med.-High	Med.-High	High	B4?	27% emergent	Med.		Low	M-L	M-H
Huckleberry Mountain Marsh 200 acres	0	Farm For.	Med.	Med.	None	Low-Med.	None	High	High	High	High	U	25% emergent	Med.		U	L	L
Mill Bay 100 acres	0	Forest	Med.-High	Low	None	Med.	Low	Med.-High	High	High	Med.-High	U	80% emergent	Low-Med.		U	L	L
Head of Lake Champlain 265 acres	0	Farm	U	Low	None	Low	Med.	Med.	High	Med.	High	U	65% emergent	Med.-High		U	L	M
Charter Marsh 60 acres	0	Farm Res.	Med.-High	Low	None	Low-Med.	Low-Med.	U	U	U	U	U	50% emergent	Med.		U	L-M	M

Appendix C: Final Ranking

Lake Champlain Wetlands Inventory

Final Ranking

Sitename	Acres	Score	Vuln	Degrad	%Prot
Vermont					
Grand Isle County					
1. *Mud Creek	1542	46	L	L-M	70
2. South Hero Marsh	312	41	M-H	L	5
3 South Alburg Swamp	1098	41	L-M	M	0
4. The Marsh	354	39	L	L-M	0
5. Kelly Bay	288	38.5	M-H	M-H	0
6. Sandbar Bridge Marsh	66	33	H	M-H	0
Franklin County					
7. Mississquoi Delta	7236	62	L-M	L	85
8. Fairfield Swamp	600+	42	M	L	80
9. Stevens/Jewett Brook	330	40.5	M-H	L-M	80
10.*Rock River	660	39	M-H	L	0
11.Carman's Marsh	108	37	L-M	L-M	90
12.Franklin Bog	280	35	L	L	50
Chittenden County					
13.Winooski Delta	624	59.5	M-H	L-M	60
14.Sandbar	1158	58.5	L-M	L	95
15.Shelburne Pond	492	55.5	M	L+	65
16.*Malletts Creek	504	54.5	M	L-M	15
17.LaPlatte River Marsh	372	53.5	L-M	L-M	85
18.*Lower Lamoille Oxbow	294	47	M	L	0
19.Burlington Intervale	264	46.5	L-M	M	60?
20.Towne Swamp	900	45	M-H	L-M	0
21.Pine Island Shrub Swamp	546	42.5	M-H	L-M	40
22.Williston Bog	108	39.5	M	L	80
23.Thorp-Kimball Brooks	160	38	M-H	L	30?
24.64 Acres	75	37	L	L-M	100?
25.Colchester Bog	192	34.5	M	L-M	100
26.Upper LaPlatte FF	144	33.5	H	L	0
27.Westford Swamp	100	31	M-H	L	0
28.Hidden Swamp	20	25	M	L	0

Sitename	Acres	Score	Vuln	Degr	% Prot
Addison County					
29.*East Creek	522	61.5	M-H	L	50
30.*Lower Otter Complex	1840	57	M	L	40
31.*Cornwall Swamp	3000	54.5	M	L	55
32.*Little Otter Complex	1280	54	M	L	55
33.Salisbury Swamp	500	52	L-M	L	1
34.Whitney Creek	560	50.5	H	M	30
35.Dead Creek	2120	50	M-H	L	65
36.Lemon Fair River Flats	1332	47	L-M	M-H	0
37.Bristol Pond	500	46	L-M	L-M	10
38.*Lewis Creek	396	42	M	L	50
39.Lower Lemon Fair	540	40	M	L	0
40.Pond Brook Cedars	?	38.5	M-H	L-M	0
41.Shoreham Cedar Swamp	1098	38.5	M-H	M	0
42.Marsh Hill Wetland	?	38	L-M	H	0
43.Red Rock Bay	?	36.5	M	M	0
44.Hand's Cove	48	36	M-H	U	0
45.North New Haven Cedars	474	31.5	L-M	L	0
46.Upper Little Otter	372	21.5	M-H	H	0
Rutland County					
47.Lake Bomoseen Marsh	300	58	H	M	20
48.*Tinmouth Channel	1500	56.5	M	L	70
49.*Poultney River Marshes	960	52.5	L-M	L	35
50.West Rutland Marsh	500	50.5	M-H	H	0
51.*The Narrows (VT)	1322	46	L-M	M	25
52.Brandon Swamp	400	40	L	L	0
53.Scanlon Bog	50	39.5	H	L	55
54.Horton Marsh	120	36	L-M	L-M	0
55.Old Marsh Pond	125	33	M	L	0
56.Walker Swamp	42	31	L	L	100
New York					
Clinton County					
57.Ausable Delta	972	51.5	L-M	L-M	80
58.*Kings Bay	632	50	M	L	60
59.*Monty Bay	632	45	M	L	60
60.*Dead Creek	1047	43	H	H	0
61.Chazy River Delta	188	40	L	L	?
62.Cumberland Bay	516	40	M-H	L-M	65
63.Rouses Point	349	35	L-M	M-H	0
Essex County					
64.*Bulwagga Bay	180	53	L-M	L-M	0
65.Wickham Marsh	420	50.5	L	L	100
66.*Webb Royce Swamp	300	45	L-M	L	0
67.Ticonderoga Creek	204	45	L-M	L	35
68.Putnam Creek Mouth	396	42	M	M	30
69.Boquet River Mouth	186	28	L-M	L	?

Sitename	Acres	Score	Vuln	Degr	% Prot
Washington County					
70.*South Bay	104	53.5	L	L	0
71.*Poultney Wetlands	200	49.5	L	L	35
72.*The Narrows (NY)	1322	45.5	L-M	L	0
73.Huckleberry Mtn. Marsh	192	39.5	L	L	0
74.Mill Bay	102	39	L	M	0
75.Head of Lake Champlain	264	32	L	M	0
76.Charter Marsh	54	20	L-M	M-H	0

* = Priority sites for North American Wetlands Conservation Act proposals

Vuln = Vulnerability Rank
Degrad = Degradedness Rank
%Prot = Percentage of Protection

Appendix D: Map

LAKE CHAMPLAIN WETLANDS

Numbers correspond to numbered wetlands in Appendix C