COASTAL WETLANDS ALONG LAKE ONTARIO AND THE ST. LAWRENCE RIVER IN JEFFERSON COUNTY, NEW YORK

State University of New York
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
Institute of Environmental Program Affairs
Syracuse, New York

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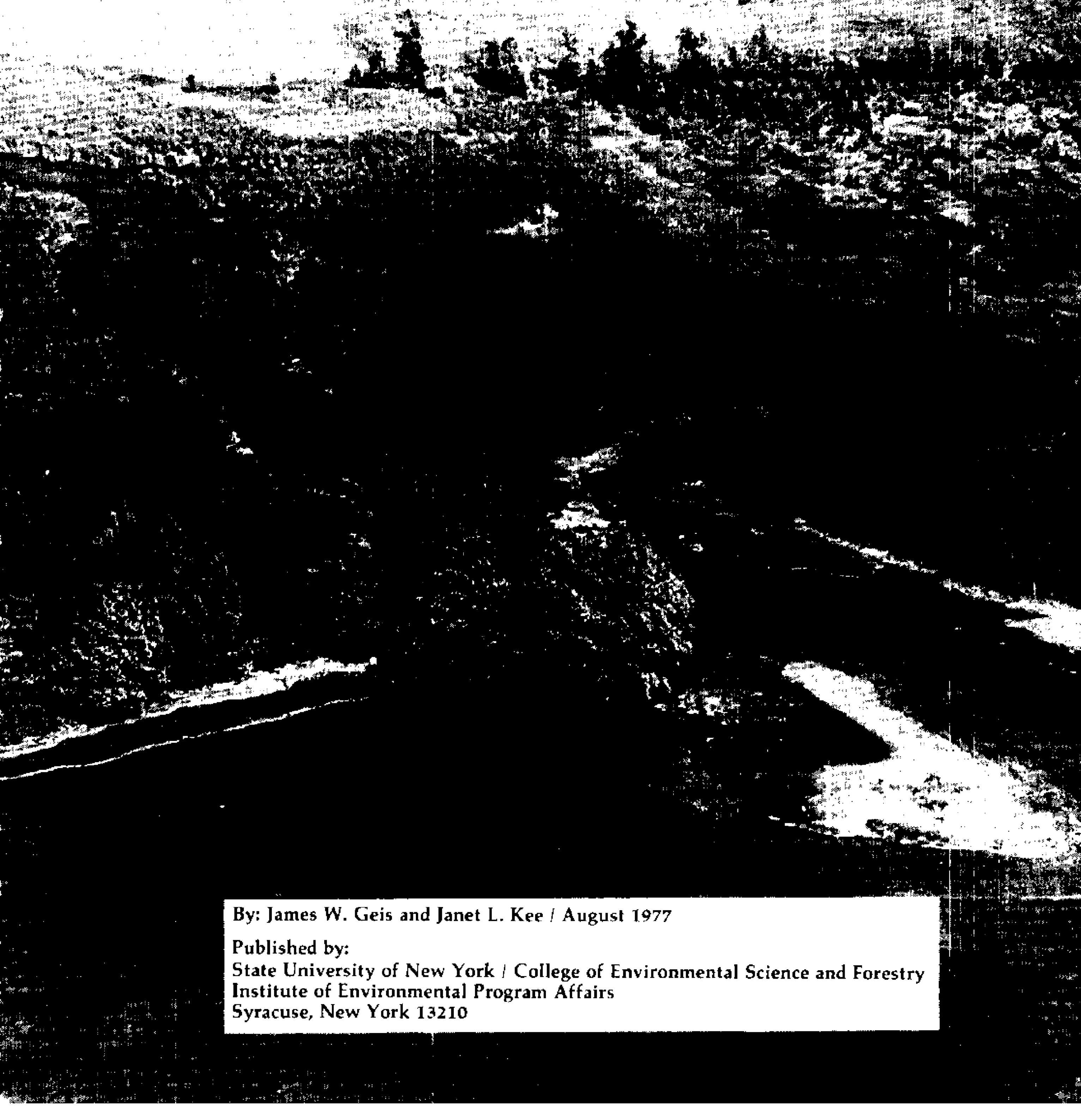

By: James W. Geis and Janet L. Kee / August 1977

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FOREWORD

This report is the result of research sponsored by the New York State Sea Grant Institute under a grant from the Office of Sea Grant, National Oceanic and Atmospheric Administration (NOAA), United States Department of Commerce. It considers techniques for the location, description and evaluation of wetland systems, and is part of a broader project which also concerns wetland plant community dynamics. Other reports covering different aspects will appear elsewhere.

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J.W.G./J.L.K.

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INTRODUCTION

The Jefferson County, New York shoreline of the Great Lakes-St. Lawrence River system is one of substantial geomorphic complexity (see Figure 1). While wetlands and associated aquatic habitats are abundant at land-water interfaces throughout this region, their occurrence, extent, and composition reflect shoreline complexity. To the south along Lake Ontario, such communities are essentially limited to flood ponds, shallow depressional areas separated from the lake by a continuous sandy beach barrier. They are hydrologically connected to the lake by subsurface seepage or through the stabilized outlets of tributary streams. While water depth is shallow enough to permit aquatic macrophyte growth lakeward of the barrier beach, wave action and substrate movement are prohibitive.

The northern portion of the Lake Ontario shoreline is cut by a series of bays of variable size. The largest and most complex bays (Henderson, Black River, and Chaumont, respectively south to north) occur in the middle of the section, while smaller bays are present northward to the origin of the St. Lawrence River. Flood ponds occur in this section too, but wetlands are most frequent in the shallow waters of bays which are protected from the open water. Their extent is greatest inland along the flood plains of tributary streams.

Along the St. Lawrence River wetlands occur most frequently along tributary streams entering the river and in bays protected from the open water by islands, shoals, and upland peninsulas. Since large bays and shallow waters out of the main channel are most abundant in the Thousand Islands Section of the river, wetlands are also most abundant in this section. They decrease in number upstream toward Cape Vincent and downstream in St. Lawrence County.

Wetlands and associated aquatic habitats are enormously important to the maintenance of fish and wildlife populations in the St. Lawrence-Eastern Ontario region. They serve as essential spawning and nursery habitat for native, warm water fisheries (Werner and Ford 1972). They also provide nesting, feeding and resting areas for migratory waterfowl, as well as essential habitat for resident fauna (Webb, Bart and Komarek 1972). Healthy fish and wildlife populations are among the most significant natural resources of the region. They contribute in no small way to the mixture of attractive features which supports a multi-million dollar recreational-use industry.

In recent years freshwater wetlands have been acknowledged as having broader significance in addition to their importance as fish and wildlife production areas (Larson 1973, Goodwin and Niering 1974). A second aspect of biological significance is that these unique systems often support uncommon or rare species of plants and animals. Hydrologically, they may influence water quantity by modifying discharge rates and affecting ground water or aquifer recharge. Water quality may also be improved through the removal of suspended sediments or by the filtering of organic or inorganic pollutants. The reduction of flood peaks and flooding frequency may also be related to the presence of wetlands in a watershed. Finally, the biological and aesthetic attributes of wetlands may result in increased human visitation for hunting, fishing, and nature study. A useful summary of these functions written for the land use planner is given by Lavine et al. (1974).

The publication of the first survey of wetlands on a national basis (Shaw and Fredine 1956) generated a significant increase in public awareness of wetland value. Since that time several northeastern states have enacted legislation which restricts specific modifications in certain wetlands or which requires that certain kinds of activities be reviewed by state or local agencies. In New York State certain wetland uses are subject to jurisdictional review in units larger than a minimum size (12.4 acres). A statewide wetland inventory is underway to locate and map wetlands, and the review process is being formulated. Prior to the passage of this legislation, wetlands in a portion of the state, the Adirondack Park, were designated as "critical environmental areas" under Executive Law. Certain land use or developmental activities involving wetlands were prohibited without a permit issued by the Adirondack Park Agency (Geis, Curran and Roman 1974).

The regulation of land use activities, whether accomplished through the review of applications for modifications or through the development of restrictive regulations and zoning ordinances, requires both system information and a framework within which to make value judgements. Both elements of the equation are imperfectly available for freshwater wetlands. While there is an extensive literature on wetland biology, there have been few studies directed towards the quantification of wetland functions. The coordinated efforts of the University of Massachusetts Wetlands Research Team (Larson 1973) represent a noteworthy exception. A similar approach has been proposed for the Adirondack Mountain Region of New York State (Geis et al. 1974), and the initial phases of that effort have been completed (Hardin 1975, Karlin 1975, Westfall 1975). We know of no comparable effort directed towards wetlands of Lake Ontario or the St. Lawrence River.

The present study is part of a larger project concerned with the dynamics of wetland plant communities as well as the application of data from community studies to wetland evaluation and management. Our objectives were to develop a system of wetland location and description which reflects community characteristics and permits dynamic interpretation; to apply that system to a regionally diverse area; and to explore the utility of this data base to the process of wetland evaluation.

Figure 1. Coastal wetlands of Jefferson County, New York. Maps and other descriptive materials are included for the lightly shaded and numbered areas. All other lake level-influenced wetlands greater than one acre are indicated by the darker shading.

Studies of the primary production, plant community composition, and community environment relationships were conducted simultaneously in representative wetland systems (Gilman 1976). While the results of these investigations will be reported elsewhere, they represent an integral link in the process of translating community ecology into the tools of the wetland manager and resource planner.

The Jefferson County, New York shoreline of Lake Ontario and the St. Lawrence River was selected for study since it contains numerous wetlands of various size which have developed in relation to a wide variety of environmental controls. In addition, it represents a realistic region in which to address the problems of comparative wetland evaluation, since conflicting pressures for shoreline use are well established. In 1972, over 51 percent of the land along the shoreline and inland one mile had been converted to some form of agricultural or developed land use (Geis and Luscombe 1972). Along the shoreline strip itself this figure was substantially higher, with seasonal residences, trailer camps and marinas representing the major kinds of developments. Developmental pressure remains high today, as the public continues to seek access to the resource. This pressure for the conversion of wetlands and associated aquatic habitats to other developed land uses now threatens the vitality of the natural system. As Webb et al. (1972) suggest, a carefully planned balance between development, preservation, and wildland management is necessary to sustain the beauty, interest and character of the region. Comparative wetland evaluation must, by necessity, play a role in that process.

WETLAND CONCEPT

Wetlands have been variously conceived and defined during the past 10 to 20 years as a result of both the range in interpretations provided by natural scientists and the increased interest in wetlands by the public. Legal definitions, restrictive legislation, and the rules and regulations of policy making organizations at various levels within a governmental hierarchy have all emerged from public concern. As a consequence many wetland definitions have been pragmatically conceived, and some among them are imperfectly related to ecological principle.

A perceptive discussion of these relationships is given by Cowardin et al. (1976). They emphasize that the continuous nature of the gradation from wet to moist to dry environments prohibits the development of a single, indisputable definition applicable to wetlands in all regions of the United States. To them wetlands are lands where "the water table is at, near, or above the land surface long enough each year to promote the formation of hydric soils and to support the growth of hydrophytes, as long as other environmental variables are favorable." An important distinction is made between wetlands and aquatic habitats, with aquatic habitats delineated as "permanently flooded lands lying below the deep water boundary of wetland." The deep water boundary of a freshwater wetland is set at two meters below the seasonal low water level, unless emergents, trees, or shrubs grow or have grown below this depth. If so, the deep water limit of that vegetation is taken as the wetland boundary. Finally, they point out that certain wetlands may be non-vegetated due to periodic or cyclic disruptions which characterize those system segments (for example, wave action, water level fluctuations, flow rates, or turbidity). These units can be recognized by their proximity to other wetlands and aquatic habitats. Vegetation would predictably develop in those units were it not for the disruptions.

One aspect of the Cowardin et al. (1976) approach, the separation of wetlands and aquatic habitats, warrants further comment. The deep water limit of the wetland continuum is the most difficult dimension to quantify. This is especially apparent when a single definition must apply to all wetlands, whether freshwater or salt water, across a landscape as diverse as that of the United States. If we accept the concept that the wettest extreme of the continuum is the deep water limit of aquatic macrophyte vegetation, then we have identified a marker which varies many fold from the limits of attached macrophytic algae in clear seas to the limits of weakly rooted vascular submergents in turbid inland waters. Also, the deep-water end of the continuum is more susceptible to disruption and is periodically non-vegetated. A wetland boundary so defined is difficult to locate during inventory. It cannot be accurately established with black and white aerial photography, and more sophisticated imagery or field reconnaissance are required.

To avoid this pitfall, Cowardin et al. (1976) designated the wetland boundary as coincident with the limit of emergent hydrophytes. Aquatic habitats, those continuum segments between the wetland boundary and the limits of rooted or attached macrophytes, are included equally within their new interim classification system. The major advantage of this separation is its application to wetland inventory, since emergent vegetation can be censused with conventional aerial photography. The Cowardin et al. (1976) system represents the conceptual basis for a new national inventory to be conducted by the U. S. Fish and Wildlife Service.

It should be mentioned that this wetland concept differs somewhat from the provisions of the New York State Freshwater Wetlands Law (Article 24, Environmental Conservation Law). That statute identifies the deep water extent of rooted aquatic vegetation as the wetland boundary. The inclusion of aquatic habitats, in the sense of Cowardin et al. (1976), in the definition of the term wetland as in the New York State statute is both common and biologically defensible. However, disadvantages occur during wetland inventory.

In our study, the presence of emergent vegetation was used to designate an area as wetland. The extent of both emergent and submerged aquatic plant communities was mapped within a wetland (see Development of Mapping Units). However, no attempt was made to locate and inventory aquatic habitats outside the limits of a wetland. The extent of these littoral communities must be determined through separate study. In general, it appears that littoral vegetation of varying densities occurs to a depth of 6 meters (mean low water datum) in the St. Lawrence River (Geis et al. 1977).

METHODS AND APPROACH

Selection of Wetlands for Study

An inventory of shoreline wetlands was made in 1974 using data from several sources. The inventory was limited to lake-level influenced systems. Inland units, even those close to the shoreline, were excluded. First, a general survey of the entire shoreline was conducted using panchromatic black and white aerial photography (Rist, Frost, Warneck and Partners, Watertown, New York. Series 71-120. May 1972. Scale 1:12,000). These data, along with a map of shoreline vegetation prepared for planning purposes (Geis and Luscombe 1972) and a previous wetland survey prepared by the Watertown Office of the New York State Department of Environmental Conservation (Anon. 1969), were used to identify individual wetlands greater than 25 acres. Low elevation, color photography was flown for each of these areas. With the exception of the Black River Bay wetlands, all systems larger than 25 acres were included in this set. In addition, several smaller wetlands were also included.

Imagery

All color aerial imagery was flown by the School of Environmental and Resource Engineering, State University of New York College of Environmental Science and Forestry, under the direction of Dr. Thomas M. Lillesand. Three externally mounted Hasselblad EL/M cameras were utilized for vertical photography from a Cessna 172 aircraft. Kodak Aerochrome ms type 2448 color film was used with a normal haze filter in 70 mm format. Lens focal length was 80 mm, and the elevation above the terrain was 3150 feet.

Prior to completing the aerial survey, color photographs of one diverse system (Wilson Bay) were taken at several times during the growing season (August, September and October). In addition, several kinds of imagery (color, filtered color, and color infrared) were flown for other wetlands in August. Comparisons of these films suggested that the combination of color and color infrared was most useful. When paired transparencies of these two types were available, interpretation was facilitated. However, while interpretation was easier with both imagery types, the color transparencies alone proved adequate, and that film was selected for survey use.

Maximum color separation of wetland vegetation occurred in early fall, coincident with the beginning of autumnal coloration, and most of the wetlands were photographed during this period. Systemmatic observations of the color of wetland vegetation (ground truth) were collected in association with each photo flight.

Development of Mapping Units

The mapping units utilized in this study were developed by comparing the resolving power of our inventory tools with data on the natural occurrence of wetland plant communities in the field. First, plant community composition and environment relationships were studied in two diverse Lake Ontario wetland systems. The product of these studies was a series of models illustrating compositional change across the wetland system (Gilman 1976). An example of one such model is given in Figure 2. The relative importance (in terms of coverage or standing crop biomass) of major species is plotted by sample plot over the mean annual water depth of that plot. The family of curves that results illustrates changes in the composition of major species in a streamside wetland system occurring on the flood plain of Campbell Creek. Methods of model generation are given in Gilman (1976).

In Figure 2 major changes in life form composition occur along the mean annual water depth axis at 50 to 60 cm, where emergent species replace submerged aquatics, and at about 10 cm, where two woody shrubs (cos and ca) become prominent. Changes in the relative proportions of species of the same general life form also suggest possible mapping units. In particular, emergent communities dominated by grasses and sedges (cc and cs) separate nicely from emergent communities dominated by cattails (tg). An equally pronounced change occurs at about 75 cm within the submerged aquatic segment of the gradient. This shallower community is best represented at mean annual water depths between 50 and 75 cm but limited in occurrence to the streambank position. Thus, while clearly recognizable in the model and visible in the field, it could not be used as a mapping unit at a scale of 1:12,000.

In addition to the two systems studied quantitively, compositional observations and environmental measurements were made in eight other shoreline wetlands over a three year period. Subjectively prepared compositional models were developed from these studies to suggest additional mapping units.

Field checking with sample imagery at a scale of 1:12,000 resulted in a final list of mapping units which could be accurately inventoried. By applying location and association criteria as well as the vegetative

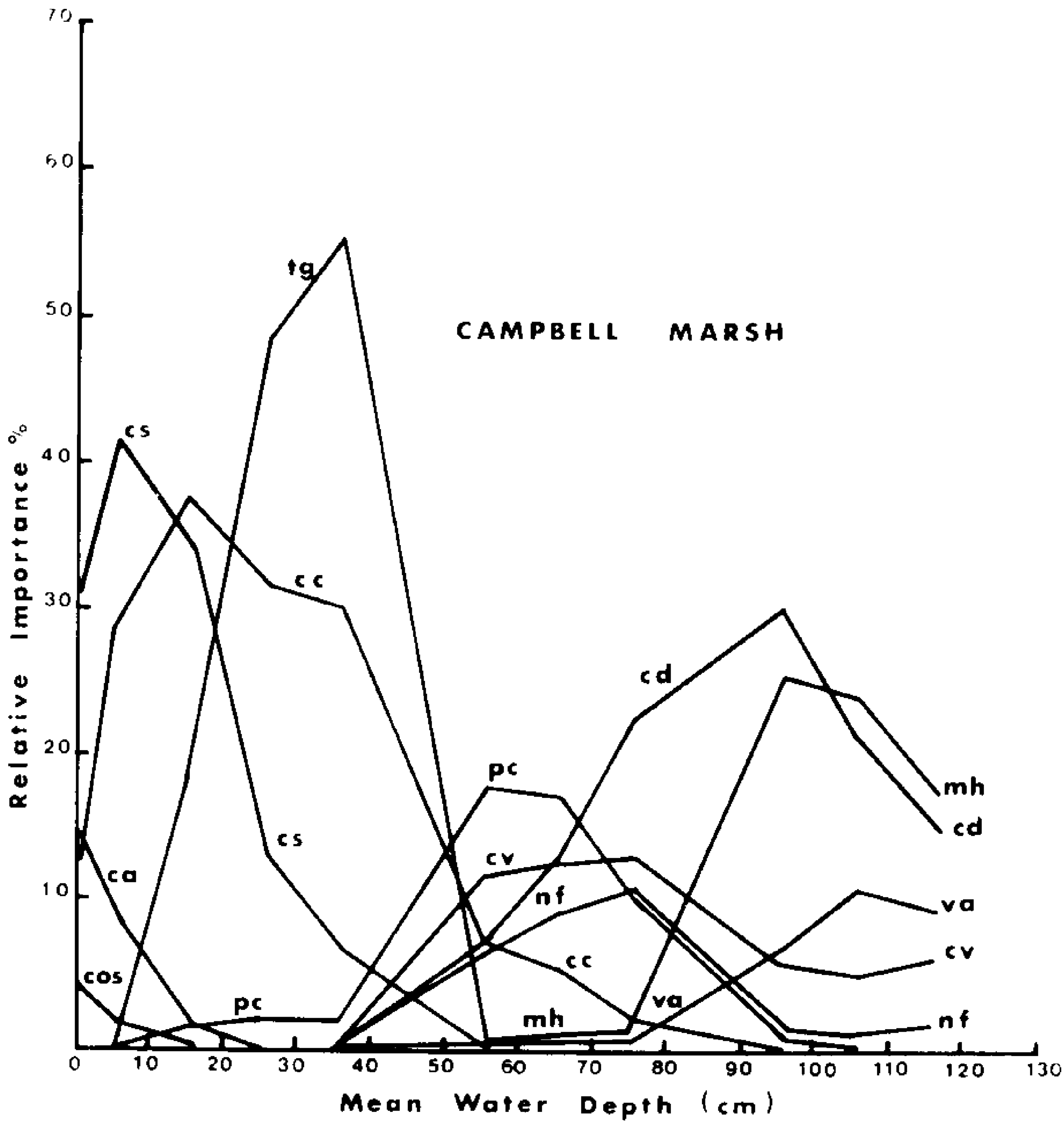

Figure 2. Distribution of wetland plant species along a water depth gradient at Campbell Marsh, Jefferson County, New York. Species indicated are *Myriophyllum heterophyllum* mh, *Ceratophyllum demersum* cd, *Vallisneria americana* va, *Chara vulgaris* cv, *Najas flexilis* nf, *Polygonum coccinium* pc, *Calamagrostis canadensis* cc, *Typha glauca* tg, *Carex stricta* cs, *Cornus amomum* ca, and *Cornus stolonifera* cos (from Gilman 1976).

signatures on color aerial transparencies, we found that we could determine community composition more accurately than it could be mapped at a scale of 1:12,000. We also found that shifts in vegetative life form were immediately apparent, and that changes in the representation of dominant species could be accurately assessed. However, we could not determine changes in the relative proportions of minor species from the photographs alone.

It is not our intention to generate a wetland classification system. Instead, mapping units which provide the maximum amount of plant community detail are applied at the chosen scale. These mapping units are considered to be equivalent to vegetative cover types, and there are no dynamic implications inherent across the type system. However, since community models represented the basis for cover type formulation, environmental and successional relationships drawn from those models can be applied to the mapping units on the ground. The significance of those predictions is dependent on limitations in the original models.

As can be seen in Figure 2, life form varies less rapidly along an environmental gradient than species composition. Therefore, the life form of the dominant group of species in each mapping unit is used as the descriptive name of that unit. Consequently, cover types may include more than one community type (sense of Whittaker 1962). The similarity between our use of life form designations and the excellent treatment of life forms of wetland plants in Golet and Larson (1974) is intentional. However, careful comparisons should be made before synonymy is assumed.

Photo Interpretation and Map Preparation

Primary photo interpretation was accomplished directly on the color transparencies. All questionable areas were field checked. Data were transferred to base maps prepared from unrectified black and white aerial photographs at the same scale (the Rist, Frost, Warneck and Partners series). When these high quality photographs were not available, other panchromatic photographs at a scale of 1:24,000 (Lockwood Mapping Inc., Spring 1968. Borrowed from LUNR User Service, Cornell University, Ithaca, New York) were used to fill gaps in the series. A zoom transfer scope was used to combine the two black and white imagery sources.

The area of occurrence of mapping units was determined by cutting Xerox copies of the final maps and weighing the mapping units to .0000 grams. Three replicate determinations were made for each wetland. This method was tested against planimeter determinations and found to be quicker, while not differing statistically from the planimeter standard. In addition, the variance of area data from weighing was lower than the variance of the planimeter data.

A summary report in tabular form was prepared for each of the larger wetland units. The limits of a wetland for area determination were set in one of two ways. For systems along stream channels or within bays with narrow mouths, a line was drawn across the mouth connecting the upland edges. Within larger bays, a line was drawn connecting the limits of emergent vegetation along the shoreline edges. Consequently, the area of some submergent communities extending outward beyond these arbitrary limits was excluded. Also included in the table is the location of the wetland within the smallest enclosing square or rectangle of the Universal Transverse Mercator (UTM) Grid System.

We recognize that the areas reported for our wetland maps are approximate, since unrectified base maps were used. To test the degree of error, sample comparisons were made by transferring our cover types to USGS 7.5 minute topographic maps. In all cases our data differed from the rectified totals by less than 10 percent.

Finally, an inventory was made of all coastal wetlands larger than about one acre along the shoreline. Most of these units were less than 15 acres in size, the only exceptions occurring in the Black River Bay wetland complex. Five broad mapping units, based on life form and hierarchially related to our cover types, were applied with the black and white photographs. Temporary base maps were prepared for area determination.

Evaluation Visit

During June of 1975 a visit was made to each of the individually mapped wetland systems. The trip served to collect all data necessary to apply wetland evaluation systems developed by Golet (1973) and the New York State Department of Environmental Conservation (Anon. 1973). Prior to field visitation, a day was spent with personnel of the Watertown Office of the New York State Department of Environmental Conservation to learn the way in which their system was applied. All judgments required by that system were made according to guidelines provided to us in that meeting.

In addition to collecting data and making the subjective judgments called for by the two systems, we gathered other biological data to support subsequent analyses. All area determinations were made from our wetland maps, utilizing tables which correlate the cover types to wetland classification systems (see Appendix A). Water chemistry data was collected from at least one location in each wetland. Water temperature and conductivity were determined with a YSI meter, while dissolved oxygen, total alkalinity, and pH were measured with LaMotte kits.

RESULTS AND DISCUSSION

Wetlands Along the Shoreline

The distribution of coastal wetlands along the Lake Ontario and St. Lawrence River shoreline in Jefferson County, New York is illustrated in Figure 1. The location of each of the 41 larger wetlands or wetland segments is indicated by light shading, and each unit is assigned an index number. Data for each wetland is presented individually in accompanying tables with the same number. The only exception to this pattern is in the Goose Bay-Cranberry Creek wetlands, which are combined in Table 29. Table 30 was eliminated to retain the equivalency of table numbers with the index numbers listed in Figure 1. In most cases one or more maps of the system under discussion follow each table. In other cases smaller wetlands have beem combined onto a single map to conserve space. Other unnumbered wetlands are also shown by the darker shading in Figure 1. Their characteristics are summarized in Table 42.

Wetlands occupy several characteristic locations depending on the nature of the land-water interface. Three broad categories of wetland systems can be identified along the shoreline according to the morphometry of the basin and the degree to which lake levels influence wetland hydrology. While many of our wetland cover types are present in all systems, community distribution and sensitivity to environmental change are somewhat basin specific.

Flood Ponds

Flood ponds occur in depressional areas physically separated from the lake by a barrier, usually a sand or cobble beach. Lake level control is expressed through either underground seepage or connecting channels which may be temporarily, semipermanently, or permanently open. Water levels are usually augmented by inputs from tributary streams, and the hydrologic connection between lake and flood pond is more permanent where tributary flows are high. A pond or shallow, open water area is usually associated with these systems.

The largest flood pond complex in this study area is centered in two state owned properties, the Lakeview Wildlife Management Area and Southwick Beach State Park (numbers 2 to 5 in Figure 1). Taken together they include over 2400 acres of wetlands. Two major streams, Sandy Creek and South Sandy Creek, drain through the wetland complex, and permanent outlets are present at two points along the sandy beach barrier. Examples of smaller flood pond systems occur at Black Pond (7), Point Peninsula Marsh (16), and Wilson Bay Marsh (21). Flood ponds are more common along the Lake Ontario shoreline where lowlands underlain by recent glacial and lacustrine deposits are situated immediately behind the present shoreline. Large flood ponds are absent along the St. Lawrence River, although smaller examples are present at Otter Point (34), Eel Bay (35), and other unnumbered systems.

Plant community composition differs substantially between flood ponds as a consequence of variations in the degree of hydrologic influence caused by lake levels. Those areas with deep, permanently functioning connecting channels have a water regime that closely follows that of the lake-river system (peak levels in June and July, lows in November and December, and a 2 to 4 foot annual fluctuation). The connecting channels of other flood ponds may close temporarily, on annual cycles, or for long periods due to the shifting of shoreline deposits. Different wetland plant communities are favored by fluctuating water levels as opposed to more stable regimes. Compositional changes occur when the pattern of water level synchrony is modified either naturally or through developmental activity.

Bays

Wetlands also develop in bays which cut into the shoreline of the lake or river and are protected from open water by islands, shoals, or upland peninsulas. Although submerged aquatic vegetation is present in the shallow waters of bays throughout the area, extensive bay wetlands are more common along the St. Lawrence River than the eastern shoreline of Lake Ontario. Large bay systems are present on Grindstone and Wellesley Islands (see 37 and 39-41) and along the mainland at Goose Bay (29 and 31). Smaller systems are present at Mud Bay (19), Isthmus Marsh (14), and Guffin Bay Marsh (12). Uplands associated with these systems are most frequently bedrock controlled, and the hydrologic connection with the lake or river is usually permanent.

Streamside Wetlands

Riparian wetlands often extend inland along the flood plains and banks of tributary streams entering the lake or river. Their extent is a function of flood plain width, being greatest along larger streams with broad flood plains and least where stream banks are steep. The most extensive streamside systems occur along the St. Lawrence River at French Creek (24) and Cranberry Creek (29). An exception occurs at Kent Creek (19) on Lake Ontario, where an extensive emergent wetland occupies the flood plain immediately upstream from Mud Bay.

Since most tributary streams enter the larger lake-river system through flood ponds and bays, the distinction between streamside wetlands and those of bays and flood ponds is imperfect. It is best seen at French Creek (24) where emergent wetland vegetation is absent from the bay itself and well developed along the channel of this riparian wetland. The other extreme is illustrated at Sandy Creek (3), where both Sandy Creek and South Sandy Creek flow into this extensive flood pond system. Emergent vegetation is limited to the high water line of the flood pond and essentially absent further inland along the steep banks of these two tributaries. At McCrae Bay (40) and Delaney Bay (39) on Grindstone Island and at the Cranberry Creek end of Goose Bay (29), categorization is less clear cut, and the separation between the narrow inland extensions of bays and the tributaries themselves is more subjective.

Cover Type Descriptions

The plant community composition of wetland cover types is described below. Also indicated are features which facilitate the separation of the cover types on aerial photographs. Several dominance-based communities may be present within any one mapping unit. Fourteen basic cover types (two of trees, four of shrubs, five of emergents, two of floating vegetation, and one of submergents) were applied at the 1:12,000 scale using color transparencies. Mixed types were recognized in areas where patterned combinations were too intermixed to separate at the 1:12,000 scale and in extensive transitional areas. A hierarchial approximation of these cover types (trees, shrubs, emergents, floating vegetation, and submergents) was applied at the 1:24,000 scale with black and white photographs in the smaller wetland units.

Water depth relationships utilized in the description of wetland cover types were generalized from depth data collected at staff gauges located in representative communities in 10 shoreline wetlands. Weekly readings were made over three growing seasons, resulting in two complete years (1974 and 1975) of water level data.

Submerged Aquatics

Aquatic communities dominated by weakly-rooted, submerged macrophytes occur in varying densities along the entire shoreline. Vascular species with long flexuous stems and narrow, linear or finely divided leaves predominate, although the submerged duckweed (*Lemna trisulca*)[1] and the algae (*Cladophora glomerata L.*) are locally abundant. Community development varies with water depth, the best expression occurring in shallow waters (mean annual water depth about 1.0 meters). Submerged aquatic species are sparsely represented or absent at greater depths and in areas unprotected from wave action. Small pockets of open water lacking rooted vegetation may be included within the body of this type.

Extensive submerged aquatic communities are most frequently asso-

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[1] Taxonomic nomenclature follows Fernald (1950) unless otherwise indicated.

ciated with flood ponds separated from the lake by a permanent or semi-permanent shoreline barrier. They are less extensive along tributary streams entering the basin. Community composition varies between these two kinds of wetland systems. The dominant species in both locations is *Ceratophyllum demersum*. In flood ponds other dominant species include *Elodea canadensis*, *Potamogeton crispus*, *P. zosteriformis*, and *Ranunculus trichophyllus*. Associated species of high importance include *Lemna trisulca*, *Cladophora glomerata*, *Myriophyllum exalbescens*, *Heteranthera dubia*, and *Utricularia vulgaris*. In tributary streams *Elodea canadensis*, *Vallisneria americana*, *Myriophyllum heterophyllum*, and *Potamogeton pectinatus* may assume dominance along with *Ceratophyllum* in the stream middle. A second group of species, including *Utricularia vulgaris*, *Ranunculus trichophyllus*, *Chara vulgaris* L., *Najas flexilis*, and *Potamogeton natans*, becomes increasingly important in shallow waters somewhat removed from the effect of currents near stream banks. Composition varies from point to point in both kinds of wetlands, and local dominance may be expressed by any one of the major species.

Submerged aquatic communities are most readily identified by their location at the open water edge of a wetland. Their color is irregular, but they are usually darker and more variable in texture than adjacent open water. They are readily separated from most emergent communities, but this distinction is less pronounced at the transition to broad leaved emergent or floating leaved communities. In both cases the density of reflective, green colonies is used as the differentiating feature, and submerged aquatic communities may include up to 10 percent canopy coverage by species associated with those two communities.

Floating Leaved Vegetation

Communities characterized by floating leaved species occur in shallower water (mean annual water depth about 0.7 meters) within submerged aquatic communities or at the interface between submergent and emergent communities. They are delineated by the presence of rhizomatous species with long, stiff petioles and broad, floating leaves. The two most common species, *Nymphaea tuberosa* and *Nuphar variegatum*, form dense, discontinuous patches which sometimes completely cover the water surface. Submerged aquatic species, particularly *Ceratophyllum demersum*, *Lemna trisulca*, *Cladophora glomerata*, *Elodea canadensis*, and *Potamogeton zosteriformis*, are abundant; and, these species usually account for a greater proportion of the standing crop biomass than *Nymphaea* and *Nuphar*. Other associated species include *Ranunculus trichophyllus*, *Utricularia vulgaris* and *Najas flexilis*.

Floating leaved communities are best developed in the quiet waters of flood ponds. They are absent as discreet communities from tributary streams with fast currents, even when water depth is appropriate. However, the major species intermix with submerged aquatics and broad leaved emergents to form the diverse stream bank community present throughout much of the area. In flood ponds floating leaved communities are most commonly present as discontinuous patches located between submerged communities and either robust emergent or narrow leaved meadow emergent communities.

The identification of communities characterized by floating leaved vegetation is hindered by the impact of herbivory, which may reduce canopy coverage substantially by midsummer. Prior to that time or in the absence of herbivore removal, these communities appear as discontinuous patches of reflective green leaves floating on the surface of the water. Drawdown in late summer and fall results in dark brown to black photo images consistent with shallow water over dark mud bottoms or exposed mudflats.

Floating Vegetation

Communities dominated by freely floating species are almost exclusively limited to flood pond wetland systems. As with floating leaved vegetation, this type also occurs as discontinuous patches in still waters which lack pronounced current and wave action. In such areas they are consistently present for long periods of time. Floating vegetation usually occurs in a mixed type with one of the emergent communities. It may remain following emergent dieback and is often indicative of areas which have experienced recent emergent death.

Two species of floating duckweeds, *Lemna minor* and *Spirodela polyrhiza*, along with aquatic liverwort *Riccia fluvitans* L., are the dominant species. *Utricularia vulgaris*, *Lemna trisulca*, *Cladophora glomerata*, *Ceratophyllum demersum*, *Elodea canadensis*, and *Potamogeton foliosus* are common associates. In mixed communities standing crop biomass is divided between the floating vegetation, its associated species, and the emergent component of the mixture.

The identification of communities characterized by floating vegetation is facilitated by their location within or adjacent to continuous emergent communities. A light yellow green color with uniform texture is also diagnostic. This image may be dotted by the darker green leaves of broad leaved emergents or by brown hummocks formerly occupied by meadow emergents.

Robust Emergents

Communities dominated by cattails form dense, uniform stands of great extent along the banks of tributary streams. Similar communities occur at the leading edge of emergent meadows adjacent to flood ponds. In both instances cattail-dominated communities border on those comprised of submerged or floating leaved aquatic species. The mean annual water depth of .3 to .5 meters exceeds that of other emergent communities, and meadows dominated by gramineous species increase in frequency with decreasing water depth. Robust emergents are less widespread in the shallow waters of protected bays.

Typha glauca is the major cattail species. *Typha latifolia*, while present in low numbers throughout the region, is more abundant in wetland systems along the St. Lawrence River than in those along the Lake Ontario shoreline. In both areas *T. latifolia* occurs most frequently as a recent colonizer on substrates which have experienced dieback. Associated species are consistently present in low numbers; these include *Polygonum coccineum*, *Acorus calamus*, *Carex lacustris*, *Carex stricta*, and *Calamagrostis canadensis*.

A dark yellow-green color with uniform texture is indicative of actively growing robust emergents. Color change occurs with the first frosts in the early fall. Yellow colors consistent with other emergent communities are absent, and a light straw brown color characterizes senescent stands. Identification is complicated by the fact that color change occurs in irregular patches within extensive stands, resulting in distinctly different photo images within communities of identical classification. This situation is especially pronounced when extensive areas of the two *Typha* species are present within the same system.

Narrow Leaved Meadow Emergents

Extensive, highly variable communities dominated by tall grasses and sedges occupy the greatest proportion of emergent meadows. These seasonally flooded communities are situated above the prevailing water level during much of the growing season. Soils remain wet to saturated throughout much of the year, although some surface drying occurs during maximum drawdown in the fall. The mean annual water depth of .15 to .25 meters is substantially less than that of robust emergents. Shrub cover is sparse within the body of the type. It increases gradually with decreasing water influence, resulting in the development of bushy shrub communities.

Carex stricta, *Calamagrostis canadensis*, and *Phalaris arundinacea* are the major gramineous species. *Calamagrostis* is more abundant in the wettest portions of the meadow, and *Phalaris* is proportionally more important at the drier extreme. Species from narrow leaved emergent communities increase in importance in depressional wet spots, and *Typha latifolia* may form local patches of high density in similar stations. Also consistent with this trend is an increase in the relative importance of *Carex lacustris* and a decrease in the expression of the three gramineous dominants.

Narrow leaved meadow emergent communities contain multiple strata as well as spatial variability. The dominant stratum reaches between 1.5 and 2 meters above the soil surface and is composed of *Calamagrostis*, *C. stricta* and *Phalaris* occurring predominantly on hummocks formed by *C. stricta*. Several submerged and floating species, predominantly *Utricularia vulgaris*, *Lemna minor*, *Spirodelia polyrhiza*, and *Riccia fluvitans*, are abundant in interhummock pools during high water in the spring. *Polygonum coccineum* and *Lysimachia thyrsiflora* become increasingly important interhummock species later in the growing season. A herbaceous component of intermediate height including *Campanula aparinoides*, *Cardamine pensylvanica*, *Thelypteris palustris*, and *Scutellaria epilobiifolia* is prominent in midsummer. The major shrub species within the meadow proper is *Spiraea latifolia*. Near the transition to bushy shrub communities, *Cornus amomum*, *C. racemosa*, *C. stolonifera*, *Viburnum cassinoides*, and *Ilex verticillata* become increasingly important.

Narrow leaved meadow emergent communities are highly variable in color and texture. Their position on the lower, moister side of shrub communities is useful, and the shrub-meadow contact is usually marked by the persistent, pale green of *Phalaris*. Where shrubs are absent and these communities grade into abandoned upland fields or pastures, the greater abundance in fall of colorful goldenrods and asters in the uplands is also helpful. In general, the texture of meadow emergents is more uniform than adjacent upland fields. During the growing season, meadow emergents are lighter and more yellow-green than *Typha*-dominated communities. In fall this color persists for a short period after *Typha* senescence. Comparisons with all other components of a wetland are necessary before finally deciding on the extent of this cover type.

Narrow Leaved Emergents

This cover type is a variant of the narrow leaved meadow emergent type which occurs in areas with slightly higher mean annual water levels and which retain standing water for a longer period during the growing season. It frequently occurs in areas that have experienced recent emergent dieback due to high water levels and may represent a successional community of short duration. While the major gramineous species of meadow emergent communities are present in low numbers, this unit is dominated by dense stands of giant burreed, *Sparganium eurycarpum*. Associated species include *Polygonum coccineum*, *Alisma trivale*, *Carex lacustris*, *Bidens cernua* and *B. frondosa*.

This cover type is readily identified by its location and pronounced early fall color change. It occurs most frequently in patches within meadow emergent communities or at the transition between meadow emergents and robust emergents. It is also present along the banks of tributary streams adjacent to or intermixed with stream bank communities. A distinct, golden brown to bronze color characterizes the early fall foliage, and this photo image increases in prominence with the density of *Sparganium*. In late summer the yellow clumps of flowering *Bidens* separated by green *Sparganium* foliage may also provide a distinctive pattern.

Dead Emergents

Distributional adjustments among the various emergent communities of a particular system are a normal feature of shoreline wetlands. Such adjustments may occur gradually through competitive interaction or dramatically when environmental events exceed the tolerance limits of species present on sites where they are marginally fit. The high lake levels of the 1972, 1973 and 1974 water years had a dramatic impact on emergent communities, and high water dieback was apparent in most shoreline wetlands. Robust emergent and narrow leaved meadow emergent communities were most frequently affected, and the mapping unit identified as dead emergents was applied in both cases.

Dead areas in robust emergents appear most frequently at the leading edge of a *Typha*-dominated community or along stream channels and breaks in the continuous mat. Such areas appear prematurely light brown, or, in the absence of recolonization, as bleached white due to persistent older detritus. Dead areas of meadow emergents appear at the transition with robust emergents, along the edges of ephemeral streams, or as isolated patches in depressional sites. These areas are often associated with and probably recolonized by *Sparganium eurycarpum* and associated species. Dark brown to black colors of exposed, muddy soil are characteristic when standing water is absent.

Broad Leaved Emergents

Broad leaved emergent communities are characterized by the presence of rhizomatous species with long, stiff petioles which raise broad leaves several decimeters above the surface of the water. The major species are *Peltandra virginica*, *Sagittaria latifolia*, and *S. rigida*, with *Pontederia cordata* occurring as a less frequent associate. While these species are represented in other shoreline communities, they form dense, structurally-distinct communities only in those flood ponds that lack a permanent hydrologic connection to the lake or river. A more stable water regime, without substantial drawdown, is consistent with the occurrence of these communities. *Nymphaea tuberosa* and *Nuphar varigatum* are common associates, especially at the periphery of the community, and the submerged aquatic species *Ceratophyllum demersum*, *Elodea canadensis*, *Utricularia vulgaris*, and *Ranunculus trichophyllus* are abundant throughout.

Broad leaved emergent communities are usually well developed in wetlands that support the widespread occurrence of aquatic shrub communities. While these two cover types may occur adjacent to each other, they may also intergrade, forming mixed types. Broad leaved emergents also occur as small islands surrounded by submerged aquatics. In broad flood plains of tributary streams, they may occur between the submergents in the stream middle and the stream bank communities toward the upland. A patchy, yellow-green color without seasonal color change is characteristic. As was mentioned for floating leaved vegetation, heavy herbivore pressure may result in the removal of this signature by late summer.

Tall Slender Shrubs

Tall slender shrub communities form dense thickets in the flood plains of tributary streams entering wetlands. They may occupy the entire flood plain of minor tributaries, extending upstream a substantial distance from the main body of the wetland. Within wetlands, they may form similar communities of lesser extent at the interface between the emergent meadow communities and flooded woods. *Alnus rugosa* is the overwhelming dominant. Other common shrub species of less importance include *Ilex verticillata*, *Viburnum cassinoides*, and several species of the genus *Salix*. The understory is sparse, although *Lysimachia nummularia*, *Cardamine pensylvanica*, and *Impatiens capensis* are frequent associates.

A dense, dark green photographic pattern characterizes this cover type. Some texture is apparent due to the visibility of individual crowns, but the overall image is one of uniformity. Tall slender shrubs are readily separated from other shrub communities by their density, their lack of autumnal color change, and their location within the wetland system.

Bushy Shrubs

Bushy shrub communities occur at the wetland-upland interface along much of the shoreline. Most frequently they are present between the best drained portions of emergent meadows and shrub-dominated uplands which have developed following the abandonment of previously tilled or pastured lands. Bushy shrubs also occur as narrow, marginal communities where wetlands are bordered by upland forests. Shallow standing water is present briefly during late spring, and the surface soil is exposed during the majority of the growing season.

Shrub cover within this type is incomplete, ranging from 20 to 80 percent, and species from narrow leaved meadow emergent communities persist between shrub clumps. The major woody species are *Cornus amomum*, *C. stolonifera*, *Viburnum cassinoides*, *Ilex verticillata* and *Spiraea latifolia*. Gramineous species present between shrub clumps include *Carex stricta*, *Calamagrostis canadensis*, and *Phalaris arundinacea*, with *Phalaris* being the most abundant. *Lycopus americanus*, *Agrostis perennis*, *Cardamine pensylvanica* and *Anenome canadensis* are associated species of lesser importance both under the shrubs and mixed with the grasses.

Bushy shrubs may be visually differentiated from other shrub communities by the presence of emergent meadow grasses between clumps.

They lack the bright, fall-flowering herbs and coarse grasses of adjacent upland communities. Individual shrub clumps are usually smaller in diameter than in the uplands, although total coverage may be equivalent. The late summer-early fall photo image is a mixture of multicolored shrub canopies separated by the pale green grasses of varying density.

Aquatic Shrubs

Aquatic shrub communities are most extensive in flood ponds that are characterized by relatively stable water levels. Such systems occur most frequently where the hydrologic connection between the lake or river and the wetland is either temporary or indirect through below ground seepage. Seasonal water level fluctuations are reduced, and .5 to 1.0 meters of standing water may be present throughout the growing season. Water depths in aquatic shrub communities of two wetlands varied from a mean maximum of .7 meters to a mean minimum of .35 meters during the 1975 water year. Two low shrub species, *Cephalanthus occidentalis* and *Decodon verticillatus* dominate these communities. Broad leaved emergent species such as *Peltandra virginica* and *Sagittaria latifolia* along with the submerged aquatic species *Elodea canadensis*, *Ceratophyllum demersum*, *Utricularia vulgaris*, *Chara vulgaris*, and *Najas flexilis* are frequent associates.

Aquatic shrub communities are frequently associated with broad leaved emergent communities, and mixed types are common. They are replaced by submerged aquatic species where water depth increases of currents develop, and small patches of open water colonized by submerged aquatics may be present within the shrub community. Dead canopies of larger shrubs and, less frequently, trees are common on internal islands and hummocks. In wetlands where aquatic shrubs are widespread, the texture of the cover type is one of evenness due to the overlapping and intergrown nature of the canopies. A pronounced early fall color change from dark yellow-green to reddish brown or red facilitates identification.

Dead Shrubs

Areas of dead shrubby vegetation large enough to locate on a map may occur within any of the shrub-dominated community types. Individual bushy shrubs established within narrow leaved meadow emergent communities are extremely vulnerable to environmental fluctuations, and distributional adjustments often occur through shrub death at the contact between these mapping units. More frequently, the dead shrub cover type is applied to patches of dead vegetation within aquatic shrub communities, especially near internal stream channels. The submerged and floating aquatic components of the shrub community usually remain present in these areas. A gray appearance with individual, defoliated crowns visible is important in type delineation.

Flooded Deciduous Trees

Communities dominated by deciduous tree species which tolerate periodic inundation are well represented along the shoreline. They occur most frequently in the flood plains of major tributary streams, although the most extensive stands surround several large flood pond complexes. *Acer saccharinum*, *Acer rubrum*, *Fraxinus pensylvanicum*, and *Fraxinus nigra* are widespread and may assume dominance in individual systems. *Fraxinus americana*, *Salix fragilis*, *Salix nigra*, *Populus deltoides* and *Ulmus americana* are frequent canopy associates of lesser importance. The regional decline of *U. americana* from Dutch Elm disease has resulted in prominent openings within the otherwise continuous canopies of several wetlands. Shrub species are poorly represented beneath the canopies of most flooded deciduous tree communities, the only exception being those areas which have experienced recent elm death. *Cornus amomum*, *C. stolonifera*, and *Alnus rugosa* have proliferated in these areas. Freely floating species (*Lemna minor*, *Spirodela polyrhiza*, and *Riccia fluvitans*) are present during the late spring when standing water is present. Following drawdown a herbaceous layer dominated by *Onoclea sensibilis*, *Boehmeria cylindrica*, *Impatiens capensis*, *Caltha palustris* and *Lysimachia nummularia* becomes prominent.

The identification of this community type is particularly difficult, especially the separation from adjacent upland forests. Topographic location within a flood plain is a useful criterion, but a clearcut flood plain boundary on the ground is much less prominent in aerial photographs. In contrast to most upland forests, flooded tree communities in this region invariably lack coniferous species. The presence of *Pinus strobus* or *Tsuga canadensis* in residual woods or *Juniperus virginiana* and *Thuja occidentalis* in cut over systems is indicative of an upland condition. Flooded timber usually undergoes an earlier color change and leaf fall than adjacent upland forests. The purples and pale yellows of *Fraxinus* species, the bright yellows of *Acer saccharinum*, and bright reds of *Acer rubrum* are helpful for interpreting early fall photography. Finally, the presence of isolated gray canopies of dead elms represents an additional characteristic. We have found that the careful application of all of these criteria can provide reliable separations.

Dead Flooded Deciduous Trees

This cover type is located most frequently at the leading edge of flooded communities dominated by deciduous tree species. It occurs less frequently as internal pockets within continuous flooded tree communities. Floating species are often present where death is extensive, providing a pale green cast to the water surface. The presence of individual tree crowns lacking foliage is distinctive.

Other Cover Types

Since the present study was limited to the shoreline of one county, several cover types developed in the initial phases of the project were not applied. Two of these types (Flooded Coniferous Trees and Low Semideciduous Shrubs) become prominent northward and inland along the St. Lawrence River. They are limited to mire-forming systems, most frequently in areas underlaid with acid igneous bedrock.

Two other cover types, while present in this shoreline segment, were too limited in area of occurrence to warrant mapping. The first, a narrow leaved emergent variant, is a bullrush-dominated type which occurs with greater frequency on bars and deltas of the St. Lawrence County shoreline. The principal species is *Scirpus americanus*, and submerged aquatic species are present below its sparse canopy. The second type is a meadow emergent variant dominated by the giant reed grass, *Phragmites communis*. Species associated with the robust emergent cover type are also present here. All of these cover types exhibit distinctive signatures on color aerial photographs.

A fifth community occurs regularly throughout the area as a thin band between the flood plain bank and stream middle of tributaries. Although unique in composition and location, it could not be identified on color aerial photographs or mapped at a scale of 1:12,000. This stream bank community is characterized by a highly diverse mixture of submerged, floating, and emergent species. Prominent among the emergent species are *Sparganium eurycarpum*, *S. androcladum*, *Sagittaria rigida*, and *Sagittaria cuneata*. Submerged dominants include *Ceratophyllum demersum*, *Utricularia vulgaris*, *Chara vulgaris*, and *Potamogeton natans*. Of particular significance is the occurrence of wild rice, *Zizania aquatica*, in selected stands where the community is best developed. The rich mixture of plant species desirable as wildlife food makes this a community of extremely high value.

Correlation with Wetland Classification and Mapping Systems

Vegetative cover is widely recognized as one of the most reliable criteria for the development of wetland classification and inventory systems (Golet 1973). However, since wetland classification systems reflect the practical processes of inventory, evaluation, and management (Cowardin et al. 1976), other features are also assessed and utilized. In order to permit wider usage of the wetland cover type maps included in this report, we have attempted to suggest correlations between our cover types and several prominent wetland classification systems as applied to the Jefferson County shoreline. General observations are made in relation to each classification system, and a table listing possible correlations is included as Appendix A.

New York State System

The classification system used in the New York State Wetland Inventory (Fried 1973, Hardy and Johnston 1975) is more appropriately a land description and characterization system than a wetland classification system. Twelve "cover types" are assigned through the interpretation of black and white aerial photographs at a scale of 1:24,000. Cover type distinctions are based on a combination of characteristics: vegetative appearance or physiognomy, location, special land use, and other recognizable features of potential significance to wildlife utilization. Six cover types are based on vegetative composition (flooded deciduous trees, dead flooded deciduous trees, flooded shrubs, emergents, floating vegetation, flooded conifers); two on land use (drained muckland, reverted drained muckland); one on special location (wet meadow); and one on a combination of vegetative appearance and substrate character (matted vegetation). This latter category was used initially as a cover type and subsequently as an additional descriptive feature. Finally, the system includes one non-wetland cover type of potential wildlife significance (upland body) and one cover type (open water) which may or may not include submerged aquatic vegetation. Mixed types are also permitted.

The cover type descriptions of Hardy and Johnston (1975) nicely characterize the photographic appearance of each type, but classification criteria are not enumerated in detail. However, by combining our mapping units of similar general life form, five of the six New York State cover types based on vegetative appearance can be created (recall that flooded conifers do not occur along the shoreline). Two other categories (open water and upland body) can be interpreted from our maps. The remaining four cover types (wet meadow, matted vegetation, drained muckland, reverted drained muckland) are not present in the study area.

First National Wetlands Inventory

The classification system used in the first national wetlands inventory (Martin et al. 1953, Shaw and Fredine 1956) defined 20 types of freshwater and saltwater wetlands based on water depth during the growing season, degree of seasonal flooding, and dominant vegetation life form. Six of the eight freshwater wetland types might be applied to lake level-influenced systems along Lake Ontario and the St. Lawrence River. Of the remaining two types "bogs" are absent from the shoreline, and we interpret "meadows" as occurring inland above the level of lake influence.

Freshwater Wetlands of the Northeastern States

Golet and Larson (1974) refined the freshwater wetland types of Martin et al. (1953) as applied to the northeastern states by developing a series of subtypes based on vegetative characteristics. Careful vegetative descriptions, including life form and general species composition, were provided for each class and subclass. They defined 24 subclasses of freshwater wetlands and reduced somewhat the ambiguity of the original system. However, as can be seen in Appendix A, similar cover types can develop under slightly different environmental conditions; and the overlap in the original Martin et al. (1953) categories ("classes" here) has not been entirely removed by added detail.

New National Classification

The first working draft of a new national classification for wetlands and aquatic habitats has recently been published (Cowardin et al. 1976). Since further modifications are anticipated, no correlations are attempted here. The system is conceptually advanced, progressing hierarchially from general classification criteria to more specific ones. Consistent application is possible at different levels in the hierarchy and by users with different degrees of expertise.

An individual familiar with the new classification system can apply it directly to the cover types used on our maps. In addition to our cover type descriptions, the following detail is necessary for construction of habitat types under the new system.

Wetlands in the study area occur in non-tidal, fresh water which is circumneutral to alkaline and mineral rich. All systems are lake level-influenced, and natural water level fluctuations in the lake-river system have been modified by control structures on the St. Lawrence River. Individual cover types may develop under conditions which range from temporarily to permanently flooded. Soils and sediments are generally organic, although some flooded deciduous forest soils may contain less than 20 percent organic matter and most deep water submerged aquatic species are rooted in mineral sediments.

Description of Wetland Systems

Larger Wetlands

The 41 larger wetlands or wetland segments identified in Figure 1 are treated individually in the accompanying tables and maps (Tables 1-41). Together these units represent over 7207 acres of wetlands; 4442 acres occur along Lake Ontario and 2765 acres occur along the St. Lawrence River shoreline.

Smaller Wetlands

An additional 59 wetlands were located from black and white aerial photography. These areas are individually described in Table 42, according to location and the area occupied by five component cover

Table 1. Characteristics of Cranberry Pond Marsh.

UTM COORDINATES: 0403-4839, 0405-4839, 0405-4837, 0403-4837.

TOWN: Ellisburg USGS QUAD SHEET: Ellisburg

DESCRIPTION:

Cranberry Pond Marsh is a productive flood pond system located immediately south of the Lakeview Wildlife Management Area and separated from the lake by the same sandy beach barrier. Water flows from the pond to the lake through an earthen dam which was either built or modified by beaver. At the time of visitation (June 18, 1975), the water level was stabilized 4 feet above that of Lake Ontario. It is unlikely that water enters the wetland from the lake at this connecting channel, even during the spring, with the dam at its present height. However, the presence of two extensive cover types (Flooded and Dead Flooded Deciduous Trees, Dead Flooded Deciduous Trees and Aquatic Shrubs) suggests that a different water regime was present in the recent past. Stabilized, elevated water levels resulting from damming would account for these changes in plant community composition.

A shallow pond with heavy submerged aquatic growth occurs at the center of the system. It is surrounded by cover types dominated by woody species. Some development of seasonal residences has occurred along the barrier beach and in the adjacent woods. Unimproved pasture occurs beyond the surrounding upland woods.

COVER TYPE	ACRES
Flooded Deciduous Trees	34.9
Dead Flooded Deciduous Trees	2.9
Aquatic Shrubs	4.2
Robust Emergents	9.1
Floating Leaved Vegetation	1.4
Submerged Aquatics	38.5
Flooded and Dead Flooded Deciduous Trees	64.4
Dead Flooded Deciduous Trees and Aquatic Shrubs	9.7
Broad Leaved Emergents and Aquatic Shrubs	7.9
Narrow Leaved Meadow Emergents and Aquatic Shrubs	21.6
Enclosed Upland	1.8
TOTAL	196.4

CRANBERRY POND MARSH

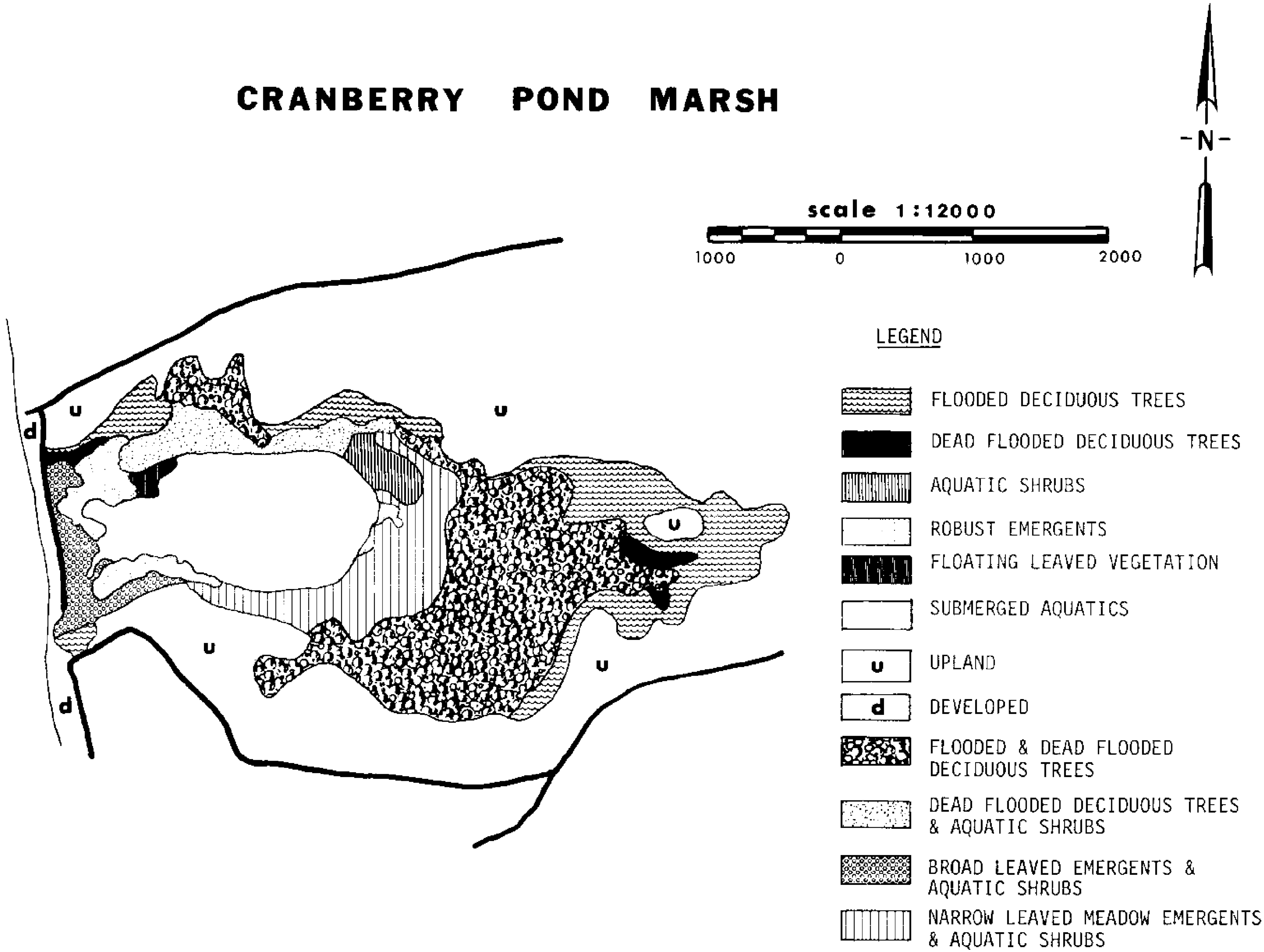

Table 2. Characteristics of Colwell Ponds Marsh.

UTM COORDINATES: 0402-4841, 0405-4841, 0405-4838, 0402-4838.

TOWN: Ellisburg USGS QUAD SHEET: Ellisburg

DESCRIPTION:

The Colwell Ponds Marsh is part of a large and complex flood pond system which we have divided into segments (Tables 2-5) to permit presentation. It occurs as two state-owned parcels, the Lakeview Wildlife Management Area and Southwick Beach State Park. The complex occupies lowland sites separated from Lake Ontario by a well established sandy beach barrier, with individual dunes ranging to over 50 feet in height. Stream flows from several tributaries, including Sandy Creek and South Sandy Creek, enter the wetland complex, and there are two deep connecting channels to the lake. Taken together this flood pond system exceeds 2400 acres in size.

Two permanent ponds, North and South Colwell Ponds, are present in this segment, and a deep outlet channel connects South Colwell Pond with the lake. The most prominent vegetational feature is a continuous section of meadow emergents approaching 250 acres in size. Vegetative interspersion increases near the ponds and stream channels. The surrounding uplands are either woods or abandoned fields. The area is in state ownership, with recreational access at South Colwell Pond.

COVER TYPE	ACRES
Flooded Deciduous Trees	26.6
Bushy Shrubs	18.8
Aquatic Shrubs	6.3
Robust Emergents	77.0
Floating Leaved Vegetation	20.7
Narrow Leaved Meadow Emergents	247.9
Narrow Leaved Emergents	2.3
Dead Emergents	17.2
Submerged Aquatics	199.7
Floating Leaved Vegetation and Submerged Aquatics	3.4
Floating Leaved Vegetation and Dead Emergents	4.0
Narrow Leaved Meadow Emergents and Dead Emergents	19.3
Enclosed Upland	13.7
TOTAL	656.9

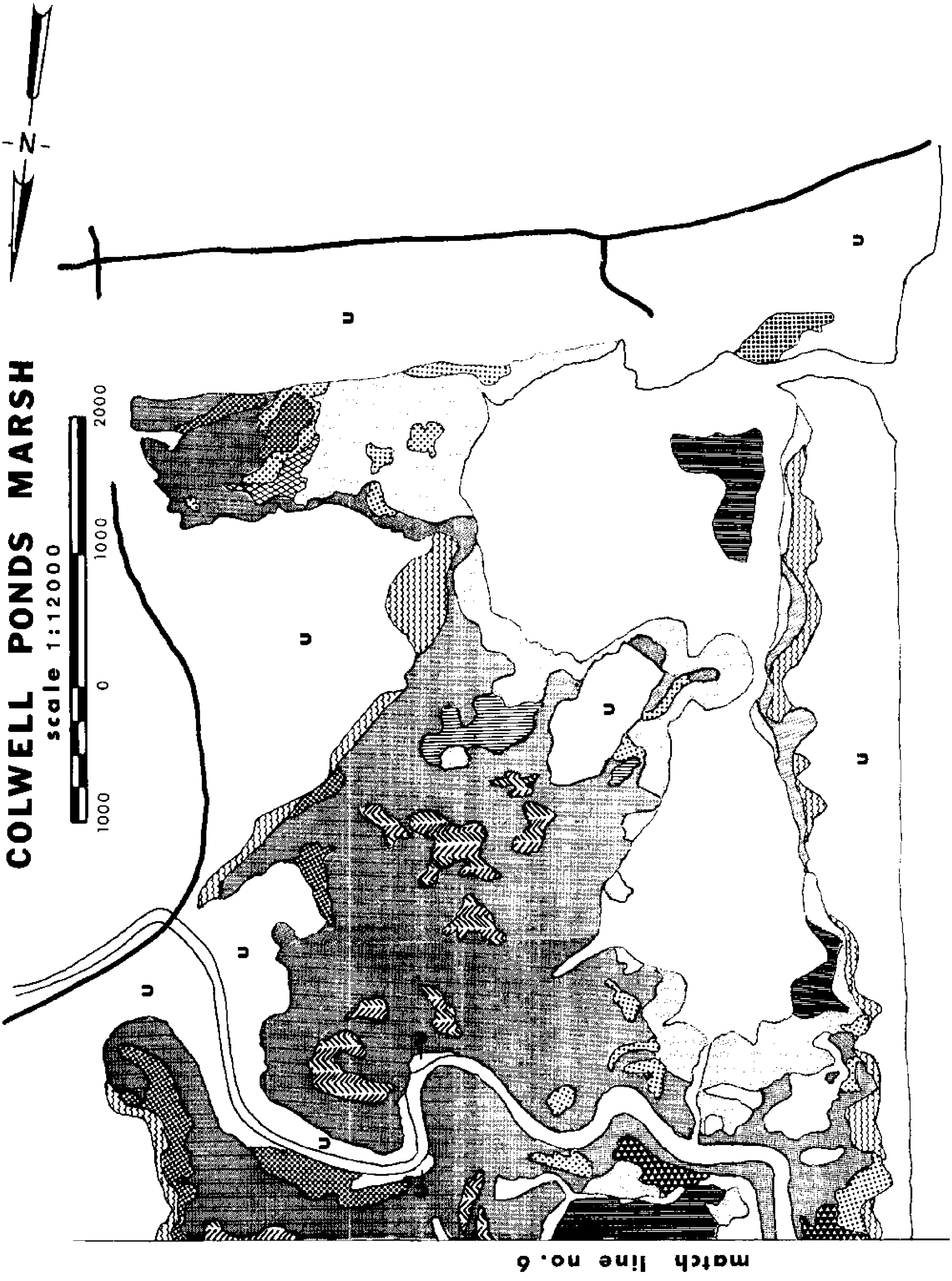
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Table 3. Characteristics of Sandy Creek Marsh.

UTM COORDINATES: 0402-4843, 0405-4843, 0405-4841, 0402-4841.

TOWN: Ellisburg USGS QUAD SHEET: Ellisburg

DESCRIPTION:

The wetland segment identified here as Sandy Creek Marsh is the vast central section of the Lakeview Wildlife Management Area (see Table 2). It contains two permanent ponds and a deep connecting channel which passes through the barrier beach to the lake at Floodwood Pond. Internally, there is a network of natural and artificial channels connecting ponds and tributary streams. Emergent vegetation predominates, and interspersion is highest around ponds and connecting channels. A dike designed to modify internal water levels is also a prominent feature. The dike and vegetation associated with it occupy over 12 acres of the wetland.

COVER TYPE	ACRES
Flooded Deciduous Trees	45.3
Bushy Shrubs	3.5
Robust Emergents	181.5
Floating Leaved Vegetation	44.1
Narrow Leaved Meadow Emergents	383.3
Dead Emergents	86.7
Submerged Aquatics	154.5
Floating Leaved Vegetation and Dead Emergents	0.5
Narrow Leaved Meadow Emergents and Dead Emergents	59.5
Dead Emergents and Submerged Aquatics	36.0
Dike, Submerged Aquatics and Narrow Leaved Meadow Emergents	12.5
TOTAL	1007.4

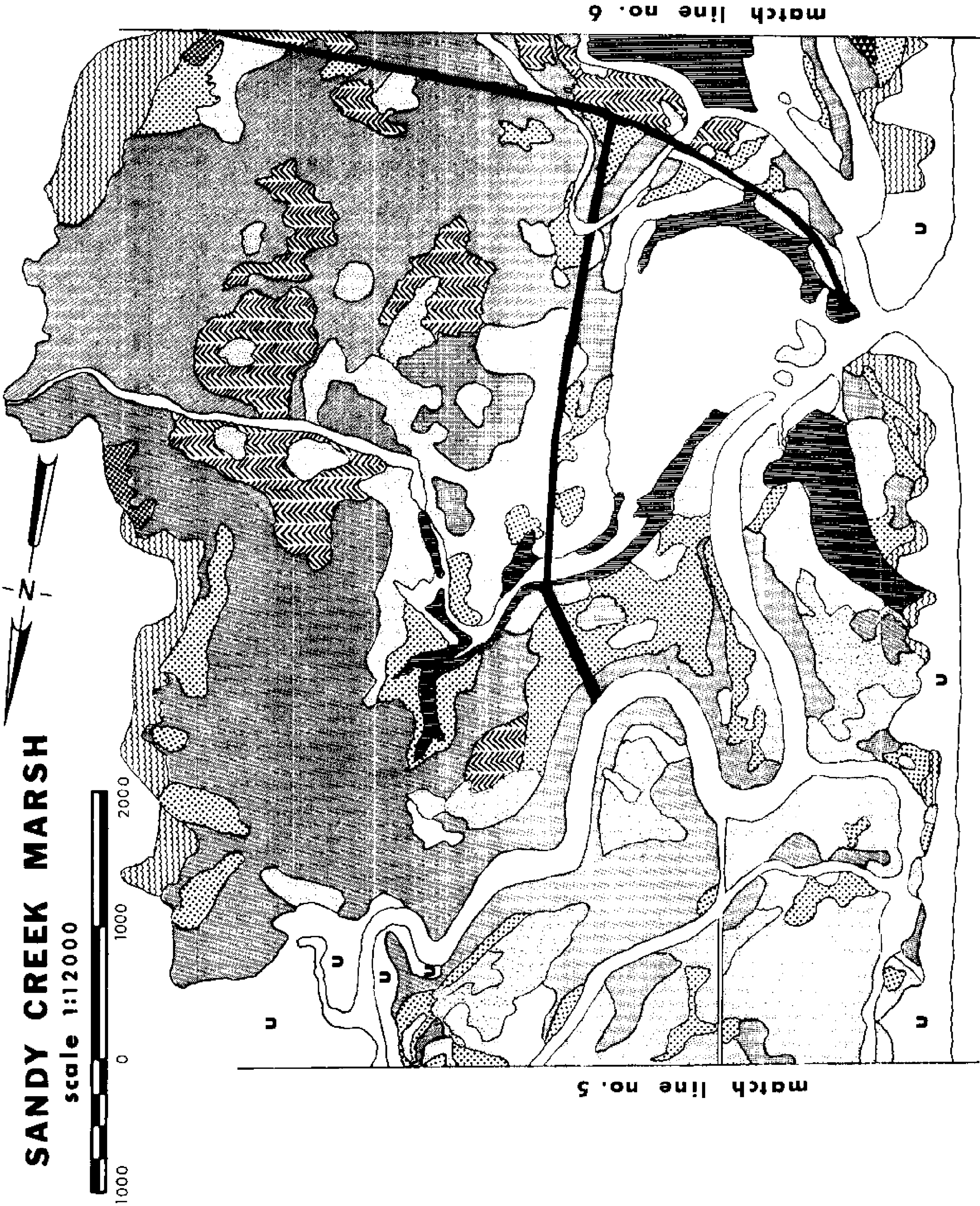
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Table 4. Characteristics of Lakeview Pond Marsh.

UTM COORDINATES: 0402-4846, 0405-4846, 0405-4843, 0402-4843.

TOWN: Ellisburg

USGS QUAD SHEET: Henderson and Ellisburg

DESCRIPTION:

The Lakeview Pond Marsh is also a segment of the state-owned flood pond complex described in Table 2. Moderately interspersed emergent communities surround a shallow pond which exceeds 200 acres in size. The pond is connected to the remainder of the complex through a well established channel to Sandy Creek. The area is heavily used for hunting and fishing, with public access provided by road to the east side of the pond.

COVER TYPE	ACRES
Flooded Deciduous Trees	3.6
Tall Slender Shrubs	9.3
Bushy Shrubs	12.3
Aquatic Shrubs	0.6
Robust Emergents	217.3
Narrow Leaved Meadow Emergents	84.0
Narrow Leaved Emergents	3.6
Dead Emergents	35.0
Submerged Aquatics	216.7
Narrow Leaved Meadow Emergents and Bushy Shrubs	6.3
Floating Leaved Vegetation and Aquatic Shrubs	0.3
TOTAL	589.0

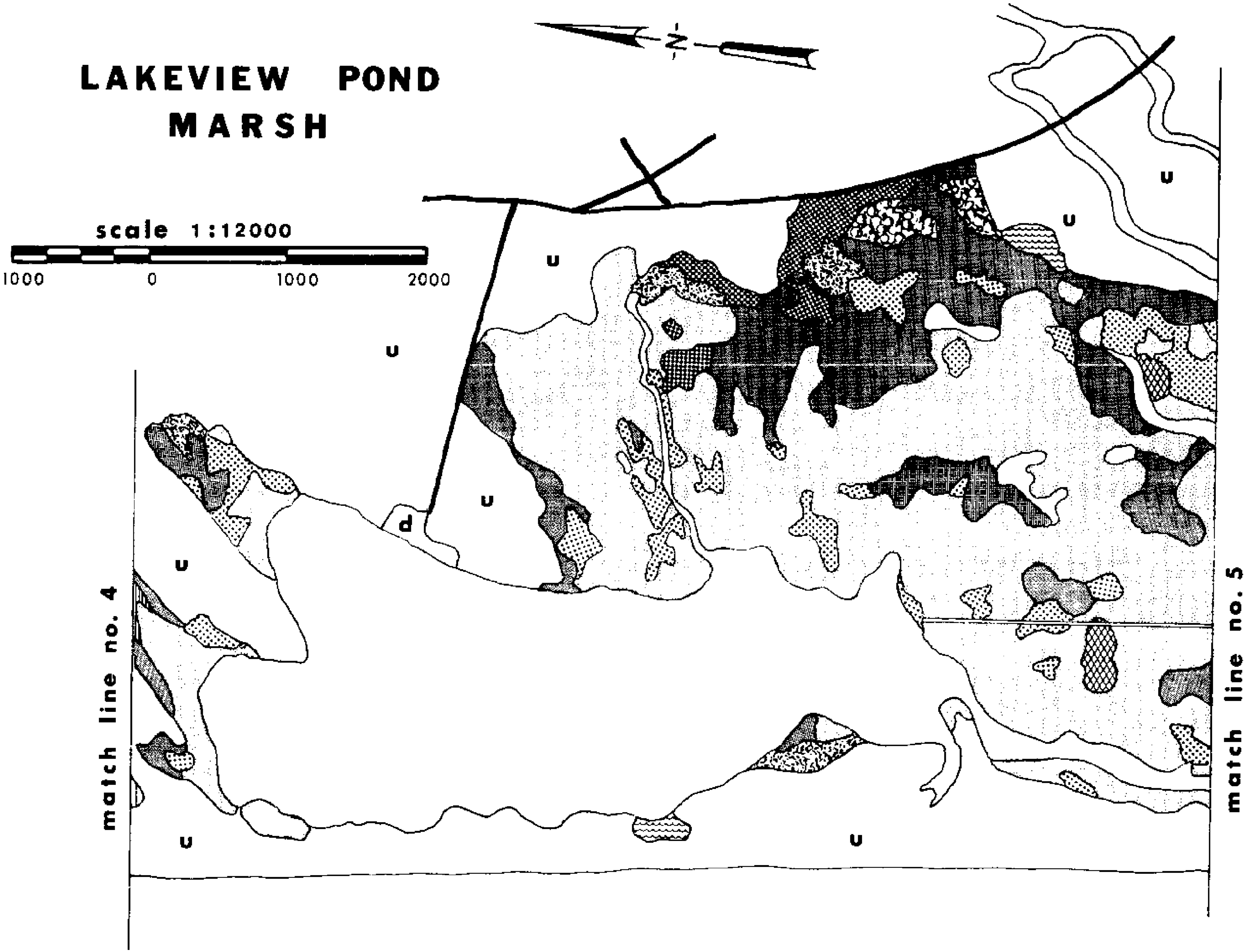

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Table 5. Characteristics of Southwick Beach Marshes.

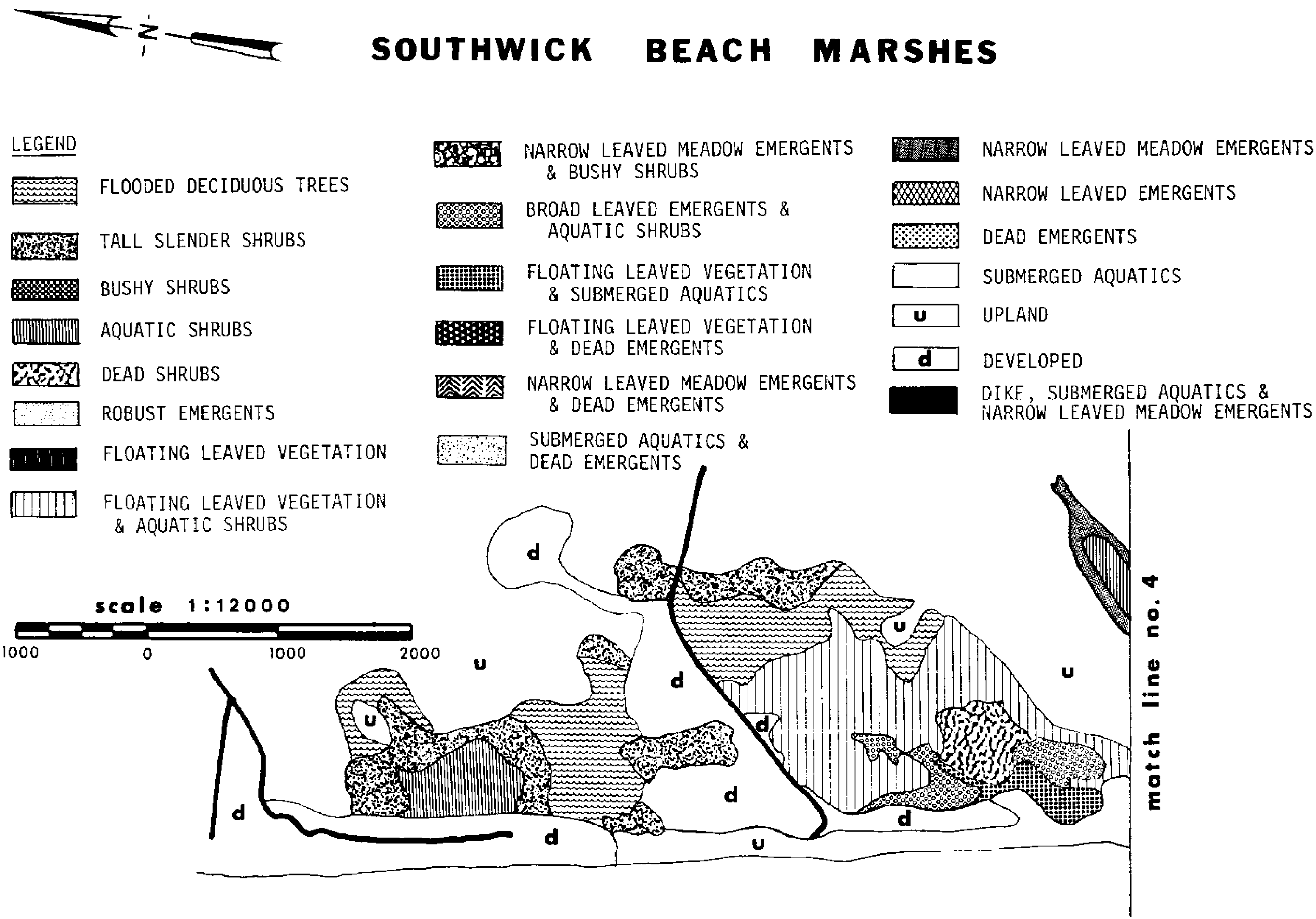
UTM COORDINATES: 0401-4848, 0403-4848, 0403-4846, 0401-4846.

TOWN: Ellisburg USGS QUAD SHEET: Henderson

DESCRIPTION:

Two marshes separated by construction activity associated with the development of Southwick Beach State Park comprise this northern most segment of the Lakeview-Southwick flood pond complex (see Table 2). The northern marsh is hydrologically connected to the lake and the southern marsh by underground seepage. In contrast, water flows freely between the southern marsh and the remainder of the flood pond complex. Both marshes are dominated by woody vegetation, with trees and shrubs characterizing the northern marsh and shrubs mixed with emergents in the southern one.

COVER TYPE	ACRES
Flooded Deciduous Trees	41.0
Tall Slender Shrubs	31.7
Aquatic Shrubs	12.1
Dead Shrubs	7.2
Narrow Leaved Meadow Emergents	3.9
Floating Leaved Vegetation and Aquatic Shrubs	43.2
Broad Leaved Emergents and Aquatic Shrubs	8.8
Floating Leaved Emergents and Submerged Aquatics	4.7
Enclosed Upland	1.5
TOTAL	154.1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LEGEND
FLOODED DECIDUOUS TREES
TALL SLENDER SHRUBS
BUSHY SHRUBS
AQUATIC SHRUBS
DEAD SHRUBS
ROBUST EMERGENTS
FLOATING LEAVED VEGETATION
FLOATING LEAVED VEGETATION & AQUATIC SHRUBS
NARROW LEAVED MEADOW EMERGENTS & BUSHY SHRUBS
BROAD LEAVED EMERGENTS & AQUATIC SHRUBS
FLOATING LEAVED VEGETATION & SUBMERGED AQUATICS
FLOATING LEAVED VEGETATION & DEAD EMERGENTS
NARROW LEAVED MEADOW EMERGENTS & DEAD EMERGENTS
SUBMERGED AQUATICS & DEAD EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
DEAD EMERGENTS
SUBMERGED AQUATICS
u UPLAND
d DEVELOPED
DIKE, SUBMERGED AQUATICS & NARROW LEAVED MEADOW EMERGENTS
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match line no. 4

Table 6. Characteristics of Little Stony Creek Marsh.

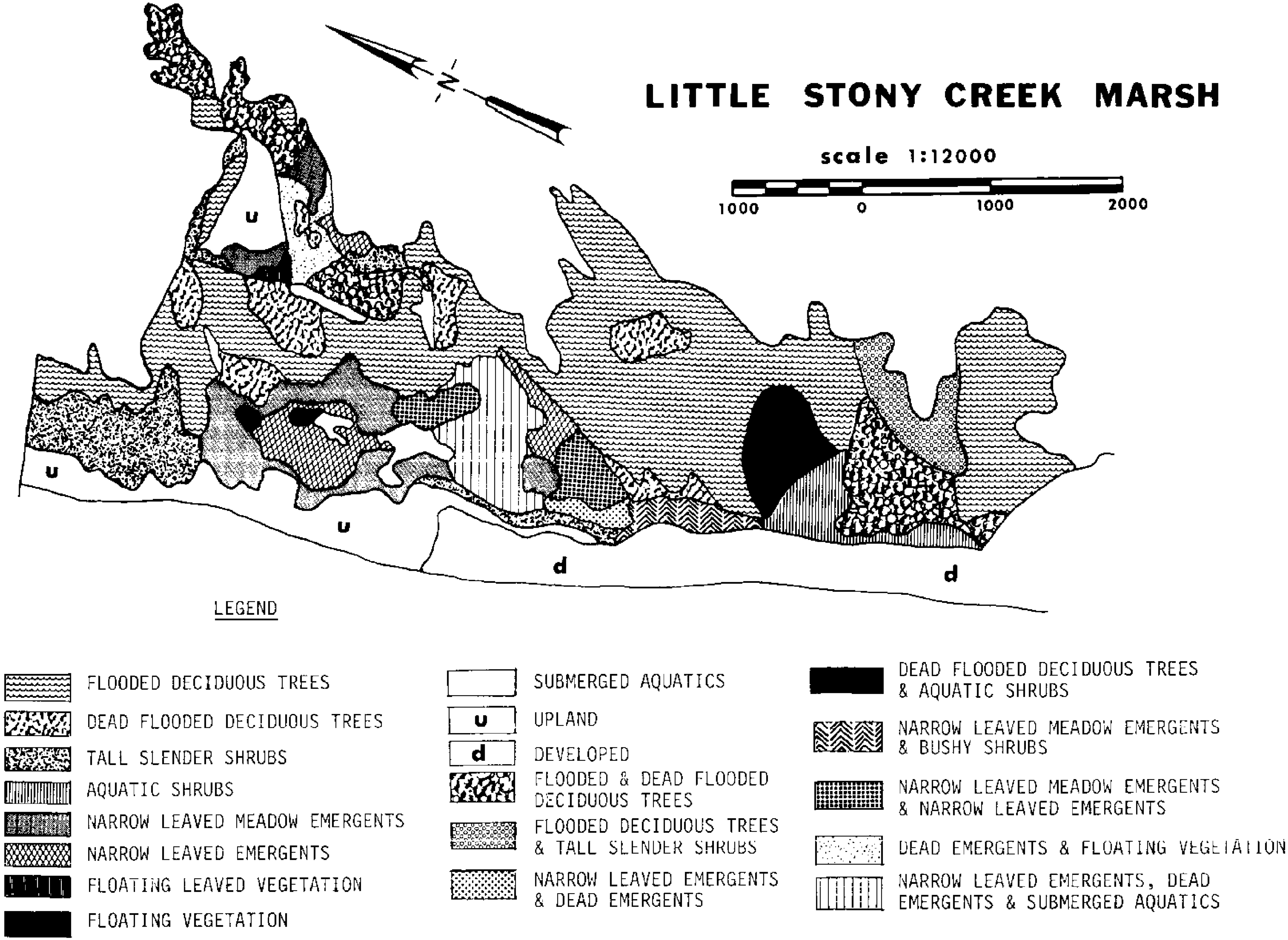
UTM COORDINATES: 0401-4851, 0403-4851, 0403-4848, 0401-4848.

TOWN: Ellisburg USGS QUAD SHEET: Henderson

DESCRIPTION:

Little Stony Creek Marsh occupies lowland sites immediately north of the Lakeview-Southwick flood pond complex and is separated from Lake Ontario by the same barrier beach. Stream flow from Little Stony Creek enters the wetland from the east and flows into the lake through Black Pond (see Table 7). The two segments (Black Pond and Little Stony) are continuous, forming a flood pond system which exceeds 400 acres. Communities characterized by trees and shrubs predominate, but the system taken together is diverse and well interspersed. The sandy beach barrier has been developed with cottages and an access road for about half of its length. Some dumping of fill and refuse into the wetland has occurred, and the potential for a continuation of these activities remains.

COVER TYPE	ACRES
Flooded Deciduous Trees	138.7
Dead Flooded Deciduous Trees	21.8
Tall Slender Shrubs	24.9
Aquatic Shrubs	9.8
Narrow Leaved Meadow Emergents	25.0
Narrow Leaved Emergents	14.3
Floating Leaved Vegetation	0.9
Floating Vegetation	1.3
Submerged Aquatics	6.6
Flooded and Dead Flooded Deciduous Trees	32.2
Flooded Deciduous Trees and Tall Slender Shrubs	10.2
Narrow Leaved Meadow Emergents and Dead Emergents	2.3
Dead Flooded Deciduous Trees and Aquatic Shrubs	10.2
Narrow Leaved Meadow Emergents and Bushy Shrubs	5.1
Narrow Leaved Meadow Emergents and Narrow Leaved Emergents	8.8
Dead Emergents and Floating Vegetation	5.0
Narrow Leaved Emergents, Dead Emergents and Submerged Aquatics	14.9
Enclosed Upland	8.0
TOTAL	340.0



LITTLE STONY CREEK MARSH
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LEGEND
FLOODED DECIDUOUS TREES
DEAD FLOODED DECIDUOUS TREES
TALL SLENDER SHRUBS
AQUATIC SHRUBS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
FLOATING LEAVED VEGETATION
FLOATING VEGETATION
SUBMERGED AQUATICS
u UPLAND
d DEVELOPED
FLOODED & DEAD FLOODED DECIDUOUS TREES
FLOODED DECIDUOUS TREES & TALL SLENDER SHRUBS
NARROW LEAVED EMERGENTS & DEAD EMERGENTS
DEAD FLOODED DECIDUOUS TREES & AQUATIC SHRUBS
NARROW LEAVED MEADOW EMERGENTS & BUSHY SHRUBS
NARROW LEAVED MEADOW EMERGENTS & NARROW LEAVED EMERGENTS
DEAD EMERGENTS & FLOATING VEGETATION
NARROW LEAVED EMERGENTS, DEAD EMERGENTS & SUBMERGED AQUATICS

Table 7. Characteristics of Black Pond Marsh.

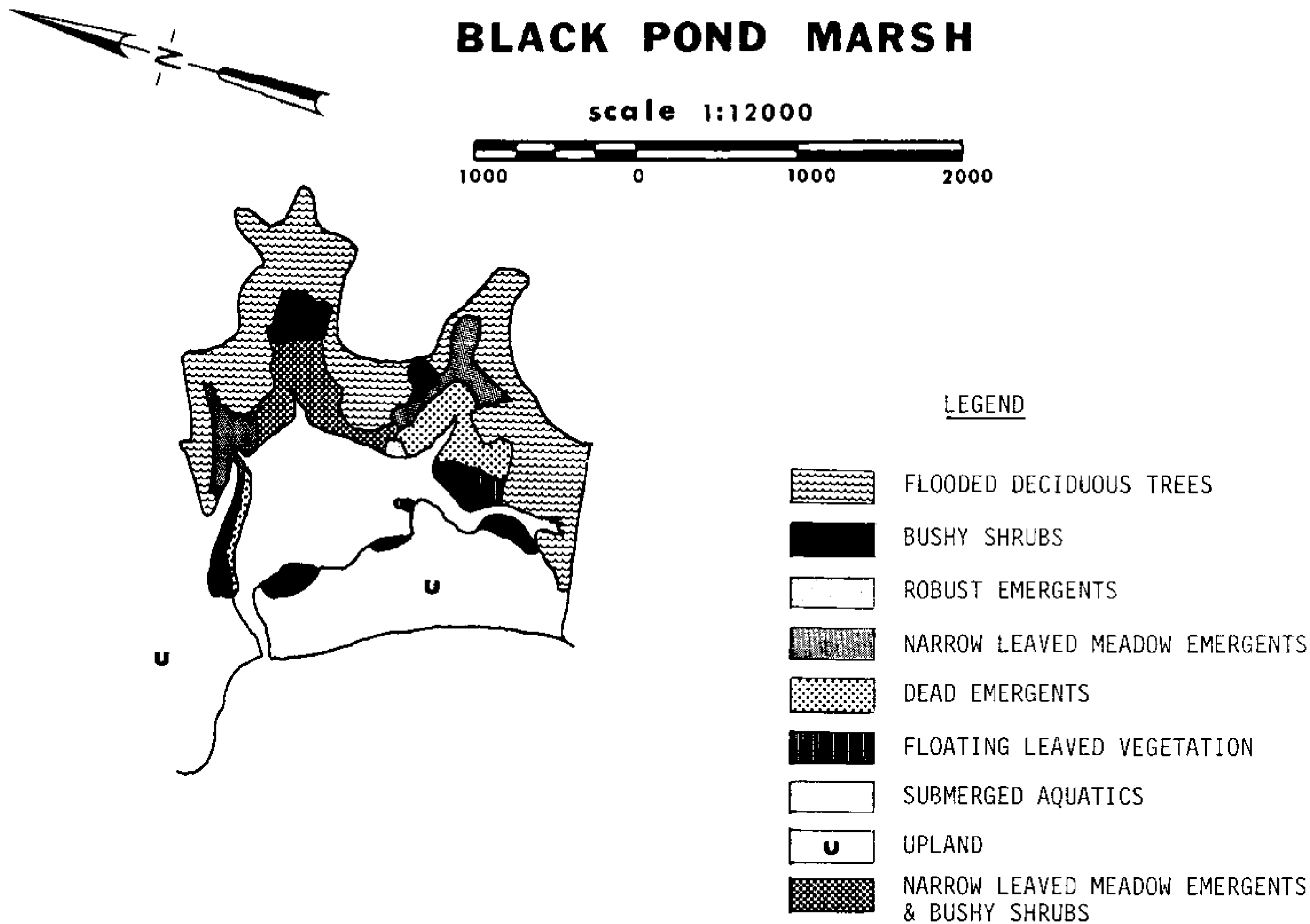
UTM COORDINATES: 0400-4852, 0402-4852, 0402-4850, 0400-4850.

TOWN: Ellisburg USGS QUAD SHEET: Henderson

DESCRIPTION:

Black Pond Marsh is arbitrarily separated from Little Stony Creek Marsh at a narrow point where the creek enters the pond. Water from this flood pond system flows into Lake Ontario through a connecting channel at the northern end of the pond. This connection is semi-permanent; it sands over in early summer and opens again in late summer or fall. While the timing of channel closure varies from year to year, summer residents indicate that it occurs annually and maintains water above the lake level for a temporary period. A shallow, open-water area occurs at the center of the system, and emergent and woody communities occur about the periphery. Wetland vegetation also extends inland along two minor tributary streams.

COVER TYPE	ACRES
Flooded Deciduous Trees	36.1
Bushy Shrubs	6.7
Robust Emergents	0.3
Narrow Leaved Meadow Emergents	5.8
Dead Emergents	5.9
Floating Leaved Vegetation	2.7
Submerged Aquatics	22.6
Narrow Leaved Meadow Emergents and Bushy Shrubs	6.2
TOTAL	86.3


N
BLACK POND MARSH
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LEGEND
FLOODED DECIDUOUS TREES
BUSHY SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
DEAD EMERGENTS
FLOATING LEAVED VEGETATION
SUBMERGED AQUATICS
U UPLAND
NARROW LEAVED MEADOW EMERGENTS & BUSHY SHRUBS

Table 8. Characteristics of Stony Creek Marsh.

UTM COORDINATES: 0400-4853, 0402-4853, 0402-4852, 0400-4852.

TOWN: Henderson USGS QUAD SHEET: Henderson

DESCRIPTION:

Stony Creek Marsh is a streamside wetland which occupies the flood plain of Stony Creek inland from the point where it flows into a bay of Lake Ontario. Emergent vegetation is absent from the bay itself, and the creek mouth is stabilized by narrow, upland peninsulas. Emergent vegetation dominates the wetland, and steep stream banks prohibit the full spectrum of wetland communities. Extensive cattail mats along the stream channel are subject to breakage and internal movement. Much of the surrounding upland has been developed, and there has been some marginal filling for cottage construction.

COVER TYPE	ACRES
Flooded Deciduous Trees	2.4
Bushy Shrubs	5.0
Robust Emergents	41.6
Narrow Leaved Meadow Emergents	4.0
Narrow Leaved Emergents	1.8
Dead Emergents	1.2
Floating Leaved Vegetation	2.4
Submerged Aquatics	24.2
Aquatic Shrubs	5.9
Narrow Leaved Meadow Emergents and Dead Emergents	1.4
Floating Vegetation and Dead Emergents	3.7
TOTAL	93.6

STONY CREEK MARSH

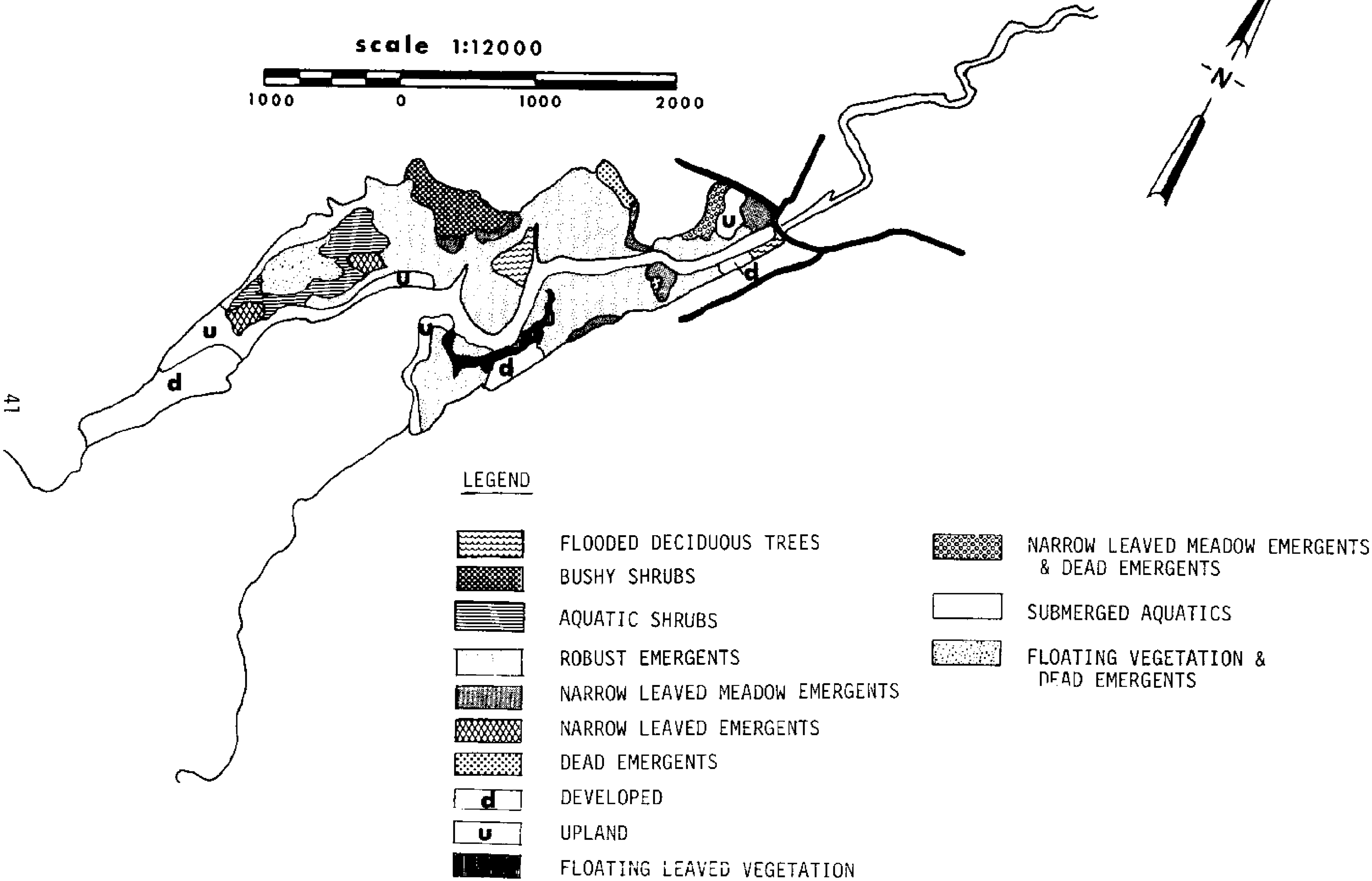


Table 9. Characteristics of Ray Bay Marsh.

UTM COORDINATES: 0398-4855, 0399-4855, 0399-4854, 0398-4854.

TOWN: Henderson USGS QUAD SHEET: Stony Point

DESCRIPTION:

Ray Bay Marsh is a small flood pond system developed along a minor tributary stream which enters Lake Ontario at Ray Bay. A stabilized connecting channel passes through a culvert and beneath a road at the western end of the wetland. The culvert is subject to plugging from lake sand, and water is periodically impounded within the wetland. Narrow leaved meadow emergent species dominate the marsh, although there is a substantial area of dead vegetation resulting both from recent high water episodes and impoundment due to culvert plugging. The wetland is surrounded by abandoned fields in mixed herbaceous and shrubby vegetation. Development is limited to the shoreline strip.

COVER TYPE	ACRES
Flooded Deciduous Trees	3.5
Bushy Shrubs	0.2
Robust Emergents	1.8
Narrow Leaved Meadow Emergents	8.5
Narrow Leaved Emergents	0.4
Dead Emergents	5.1
Floating Leaved Vegetation	0.3
Submerged Aquatics	3.4
Dead Emergents and Floating Leaved Vegetation	3.3
Narrow Leaved Meadow Emergents and Bushy Shrubs	1.2
TOTAL	27.7

RAY BAY MARSH

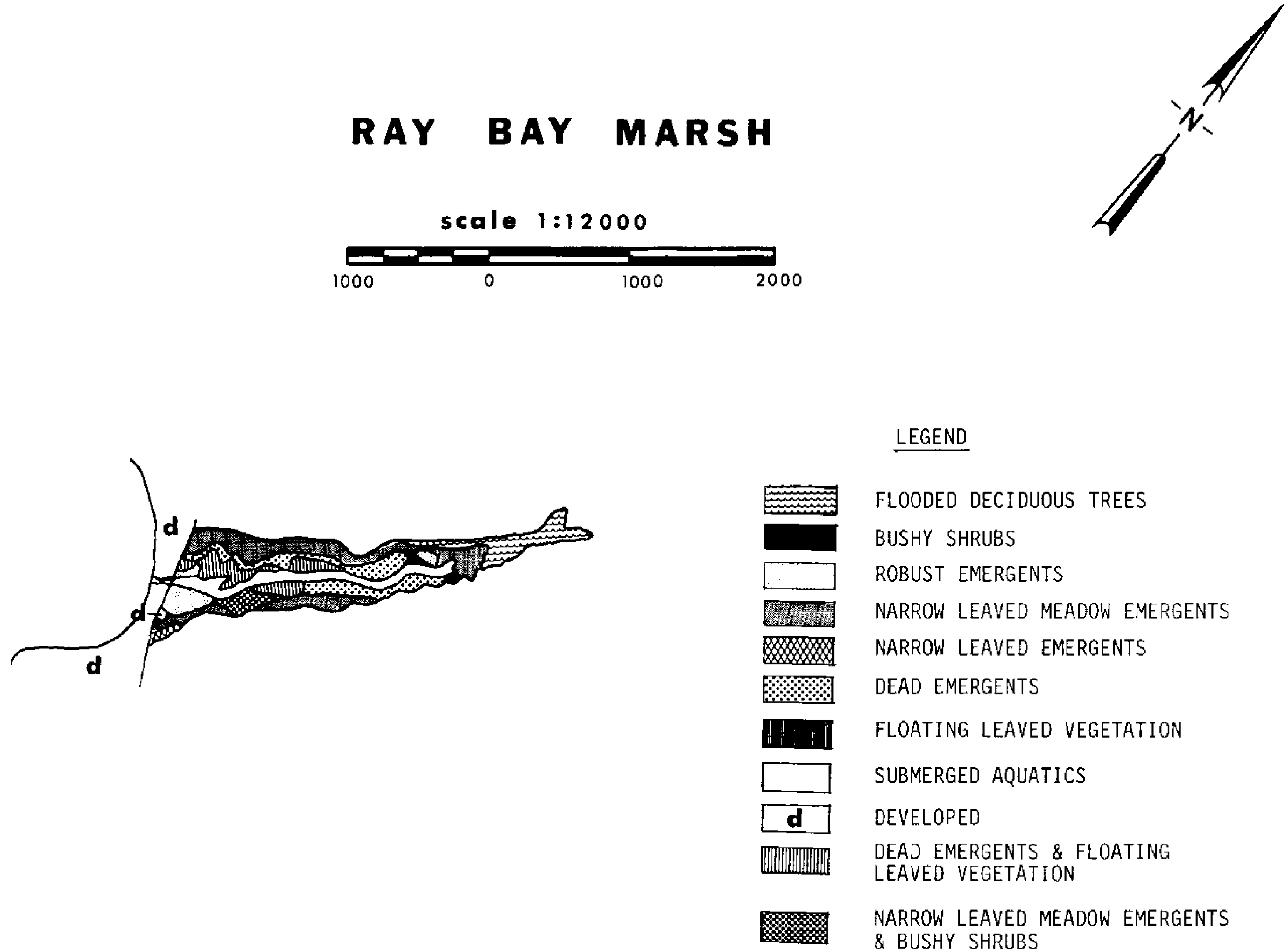


Table 10. Characteristics of Campbell Marsh.

UTM COORDINATES: 0409-4863, 0411-4863, 0411-4862, 0409-4862.

TOWN: Hounsfield USGS QUAD SHEET: Sackets Harbor

DESCRIPTION:

Campbell Marsh is a streamside wetland developed along a minor tributary which flows into Lake Ontario at Henderson Harbor. Two roads and bridges cross the wetland at its middle. Robust emergents predominate below the bridge, while meadow emergents and an extensive area of flooded timber occur in the flood plain upstream. Stream flow is continuous, although it may become reduced slightly in late summer and fall due to sand accumulation at the low barrier beach near the stream mouth. Filling for the construction of a marina and cottages has resulted in some loss of wetland area below the bridge.

COVER TYPE	ACRES
Flooded Deciduous Trees	28.1
Tall Slender Shrubs	0.5
Bushy Shrubs	2.6
Robust Emergents	17.7
Narrow Leaved Meadow Emergents	11.8
Dead Emergents	0.6
Floating Leaved Vegetation	2.7
Submerged Aquatics	5.9
Flooded and Dead Flooded Deciduous Trees	3.7
TOTAL	73.6

CAMPBELL MARSH

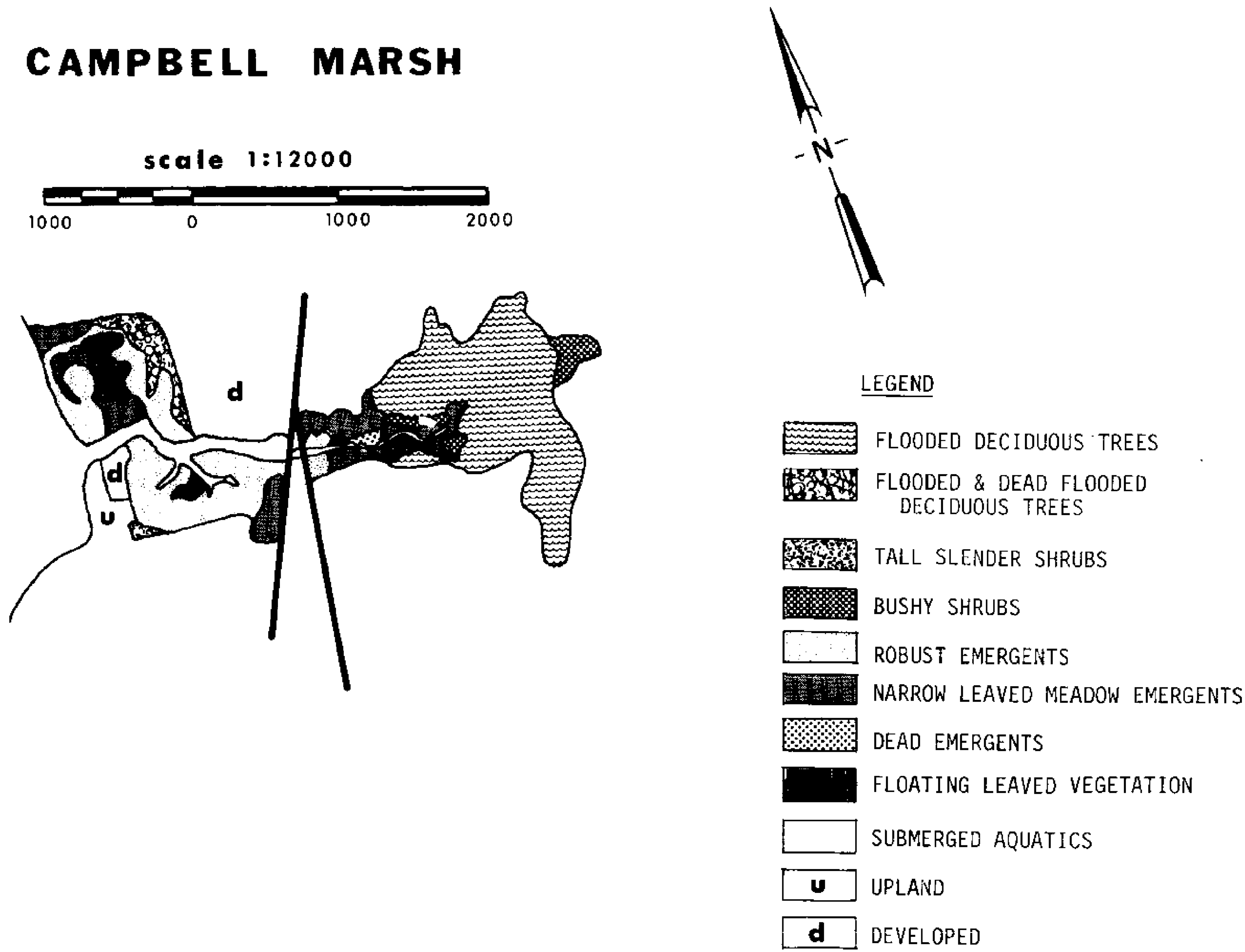


Table 11. Characteristics of Sherwin Bay Marsh.

UTM COORDINATES: 0405-4870, 0407-4870, 0407-4869, 0405-4869.

TOWN: Brownville USGS QUAD SHEET: Henderson Bay

DESCRIPTION:

This flood pond system occurs on low ground which fronts on Sherwin Bay. Emergent communities surround a shallow open water area at the center and extend inland along two arms of Sherwin Creek. The wetland is connected to the bay through a channel opening which has been stabilized by bridge footings and road fill. The wetland itself is separated from the bay by a cobble beach barrier which has also been reinforced with stone to support a permanent road. Adjacent uplands are actively used for pasture and cropland. The area is readily accessible and, as a result, heavily used for hunting, fishing, and picnicking.

COVER TYPE	ACRES
Robust Emergents	12.3
Narrow Leaved Meadow Emergents	21.9
Narrow Leaved Emergents	1.5
Dead Emergents	2.6
Floating Leaved Vegetation	15.4
Submerged Aquatics	16.8
Floating Leaved Vegetation and Dead Emergents	1.8
Floating Leaved Vegetation and Robust Emergents	1.5
Narrow Leaved Meadow Emergents and Narrow Leaved Emergents	2.7
TOTAL	76.5

SHERWIN BAY MARSH

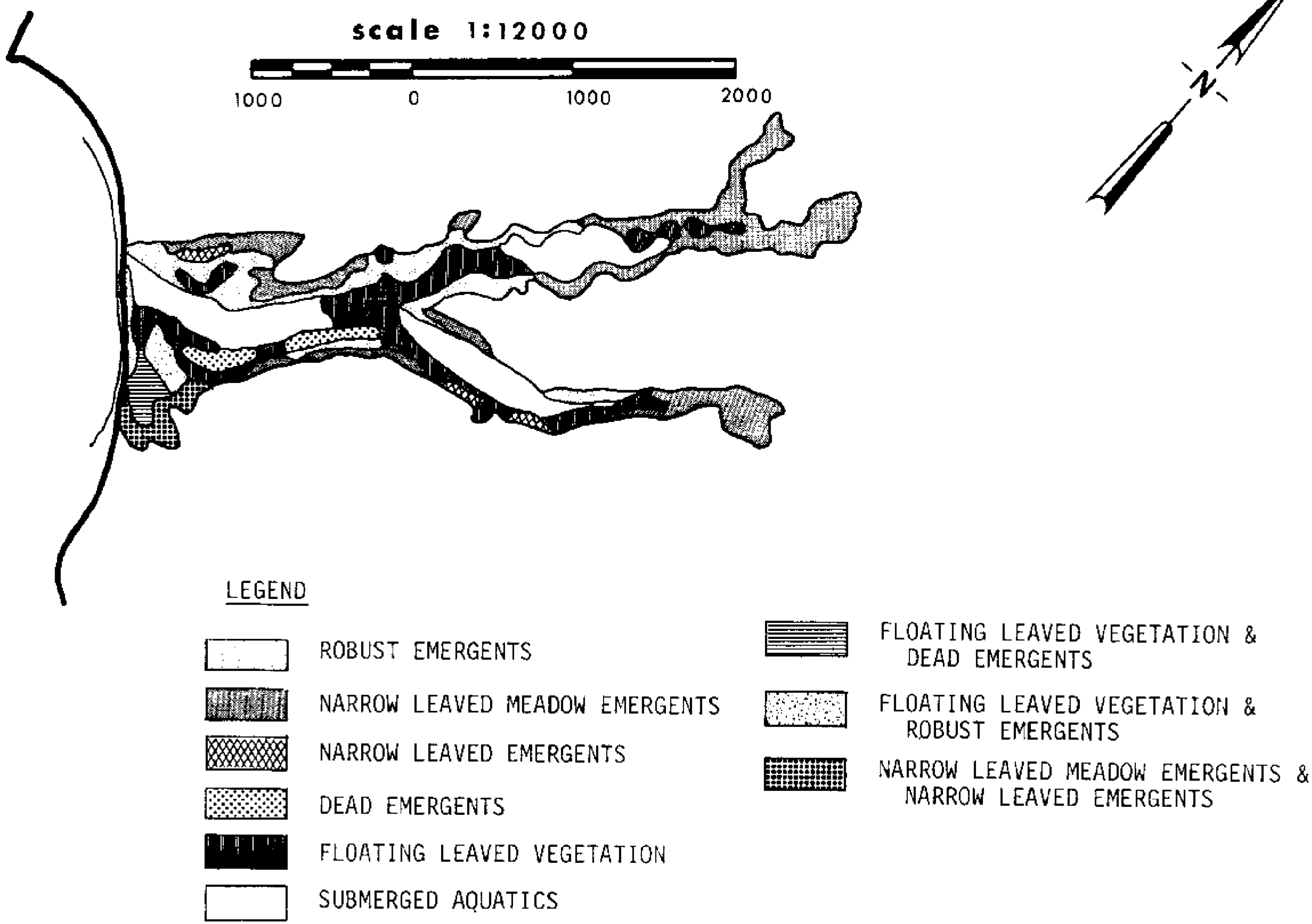


Table 12. Characteristics of Guffin Bay Marsh.

UTM COORDINATES: 0410-4878, 0412-4878, 0412-4876, 0410-4876.

TOWN: Brownville USGS QUAD SHEET: Dexter

DESCRIPTION:

Guffin Bay Marsh occurs around the periphery of a narrow inland extension of Chaumont Bay facing Lake Ontario. Emergent vegetation occupies a thin band of shallow water between the bay and the adjacent upland. It is most extensive inland along Guffin Creek, but its occurrence has been limited throughout by filling for boat docks and cottages. The water in the bay is highly turbid and the density of submerged aquatic vegetation has been accordingly reduced. High turbidity may be a result of bank erosion caused during cottage construction or a quarry operation upstream. A shifting bar deposit at the mouth of Guffin Creek appears to be related to quarrying activity.

COVER TYPE	ACRES
Robust Emergents	14.9
Narrow Leaved Meadow Emergents	2.4
Dead Emergents	2.9
Floating Leaved Vegetation	15.8
Submerged Aquatics	27.1
TOTAL	63.1

GUFFIN BAY MARSH

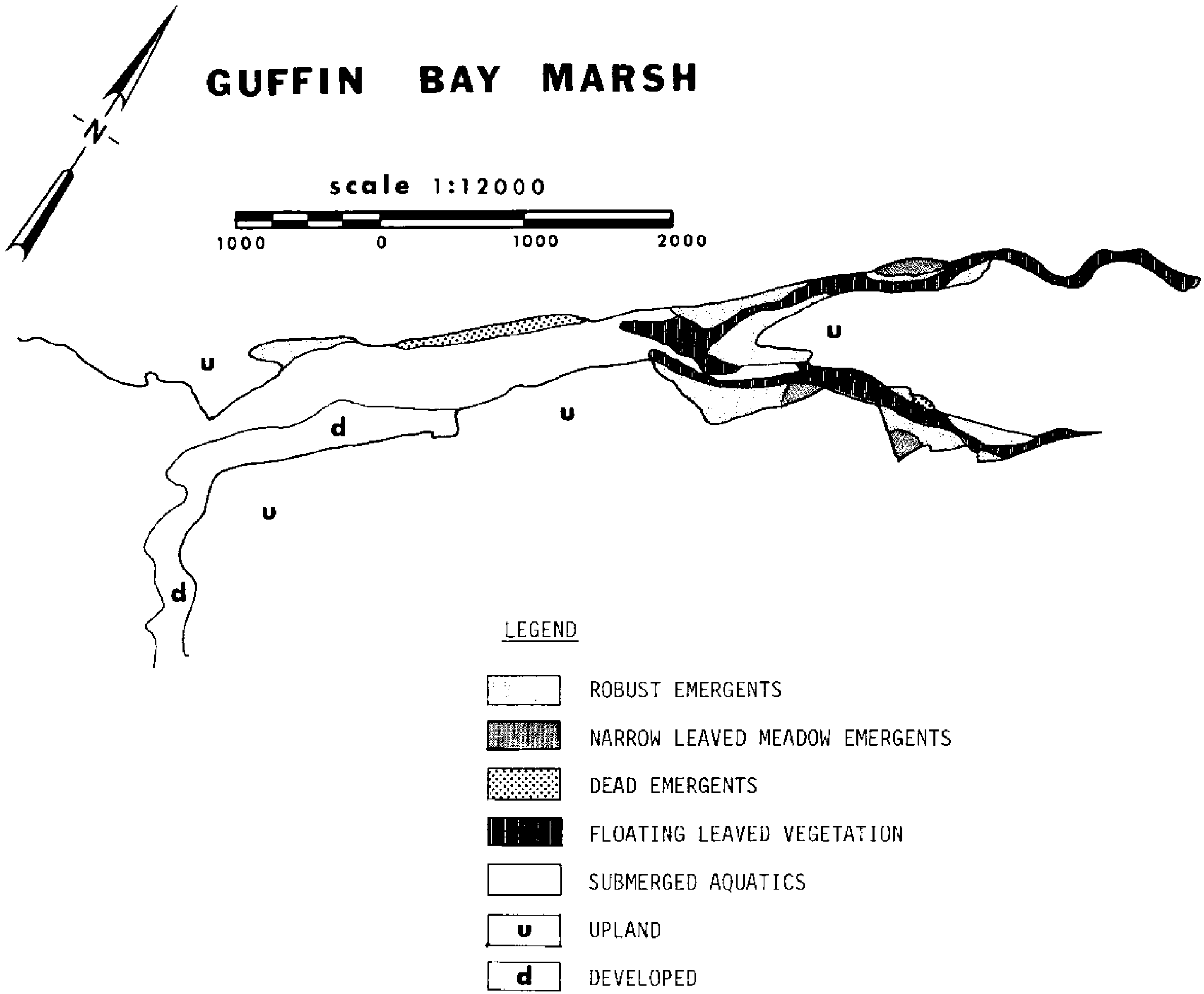


Table 13. Characteristics of Long Carry Marsh.

UTM COORDINATES: 0397-4879, 0399-4879, 0399-4878, 0397-4878.

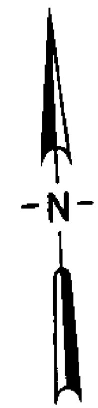
TOWN: Lyme USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

This small emergent wetland occurs in the shallows of an inlet at the north end of Chaumont Bay (the Long Carrying Place). Deep sediments at the wetland margin result in a gradual increase in water depth toward the center of the protected inlet. There is a tendency for both peripheral expansion of existing robust emergents and a high susceptibility to damage from water level changes. Emergent death from recent high water episodes was unusually pronounced. The wetland is surrounded by roads and active agricultural land. Livestock graze and water in the wetland at several spots.

COVER TYPE	ACRES
Robust Emergents	2.2
Narrow Leaved Meadow Emergents	4.9
Dead Emergents	3.1
Floating Leaved Vegetation	1.3
Submerged Aquatics	7.1
TOTAL	18.6

LONG CARRY MARSH



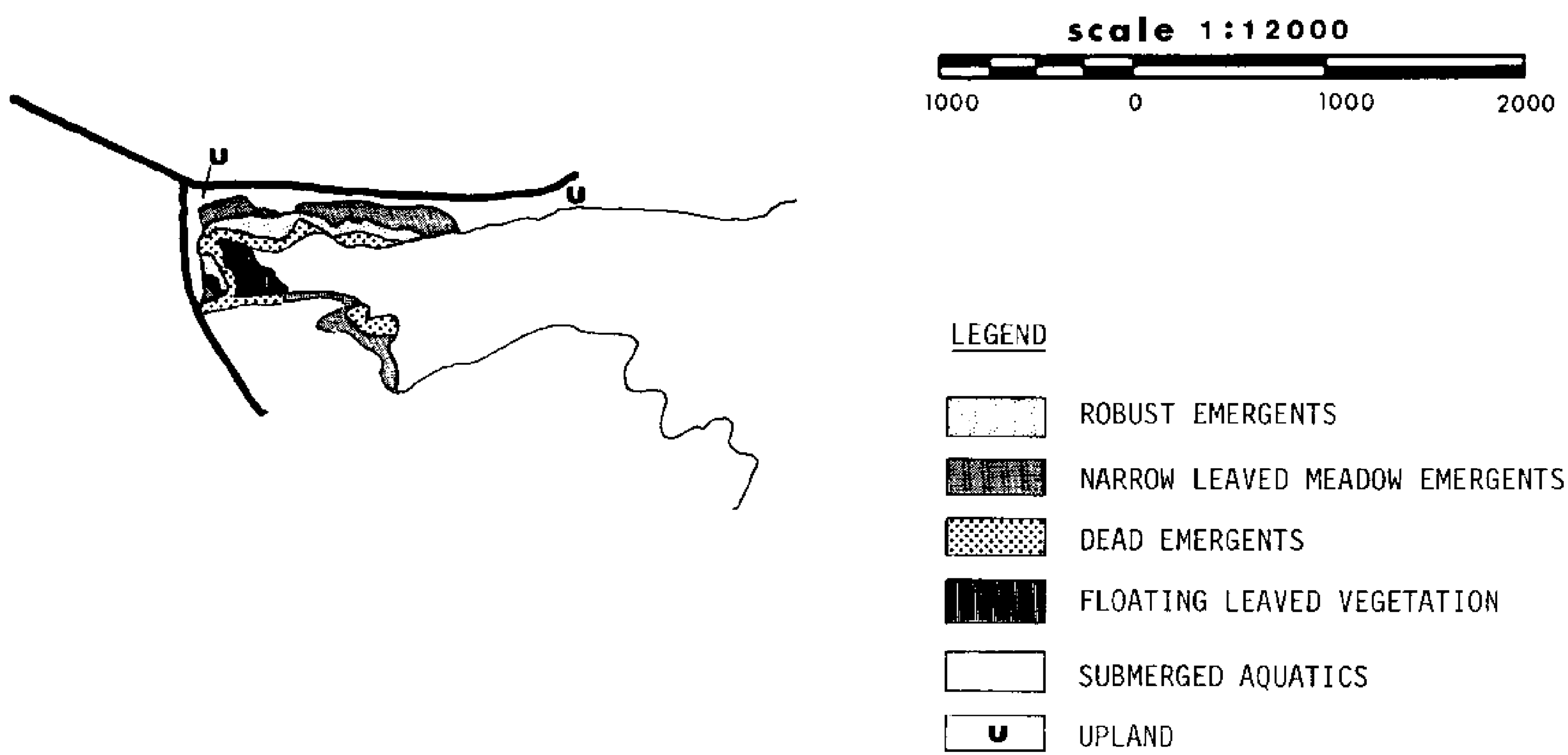


Table 14. Characteristics of Isthmus Marsh.

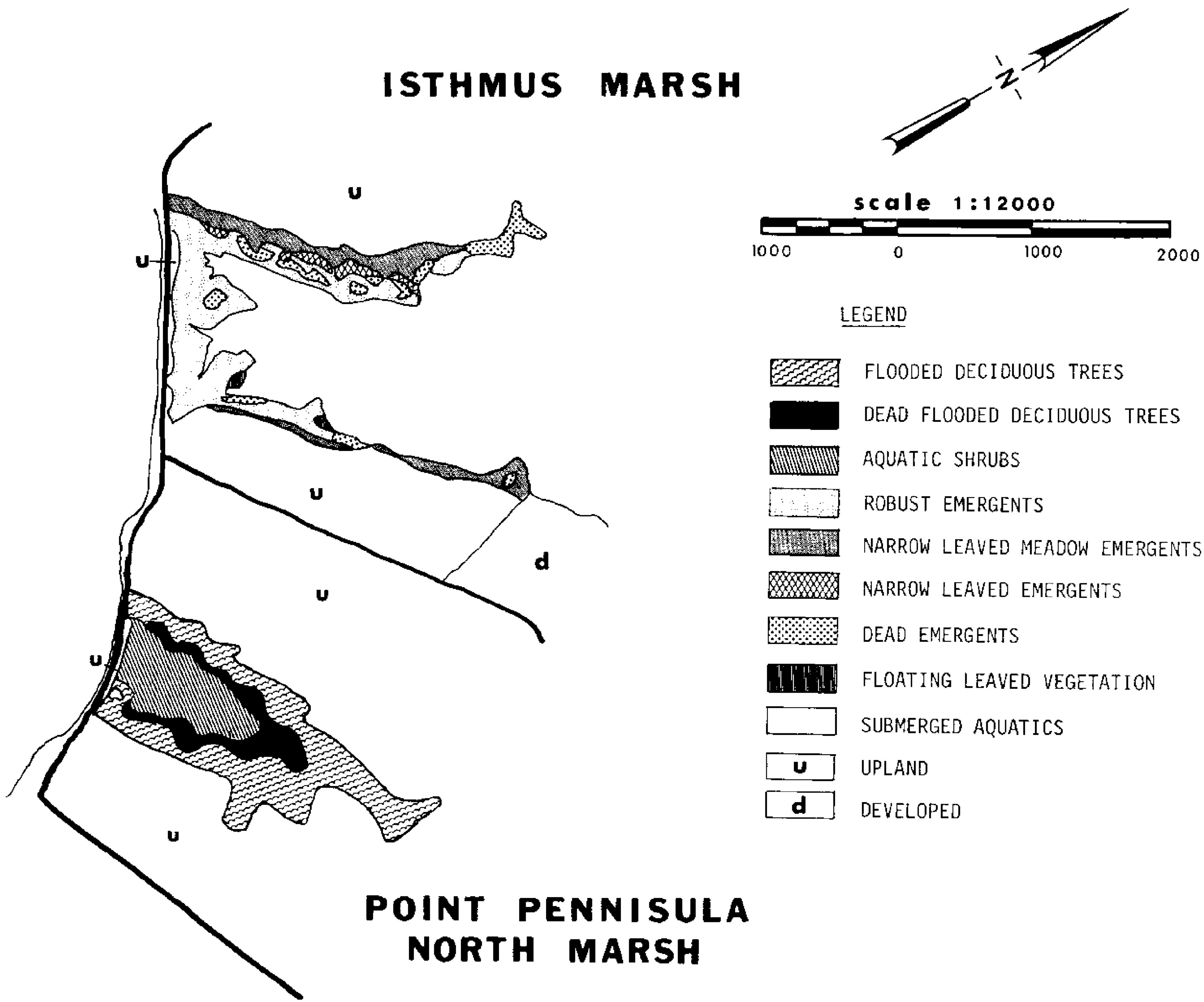
UTM COORDINATES: 0396-4875, 0398-4875, 0398-4873, 0396-4873.

TOWN: Lyme USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

Isthmus Marsh has developed in shallow waters of western Chaumont Bay adjacent to a narrow strip of land connecting Point Peninsula with the remainder of the mainland shoreline. Although this isthmus has been stabilized by the construction of a surfaced road, underground seepage between Lake Ontario and Chaumont Bay still occurs at this point. Emergent vegetation is present along the protected shoreline, and submerged aquatic species form dense communities between the shoreline arms. The surrounding uplands are in active pasture, and grazing and watering of livestock occurs in the emergent meadows.

COVER TYPE	ACRES
Robust Emergents	19.4
Narrow Leaved Meadow Emergents	10.8
Narrow Leaved Emergents	2.0
Dead Emergents	5.5
Floating Leaved Vegetation	0.5
Submerged Aquatics	62.9
TOTAL	101.1


ISTHMUS MARSH
POINT PENNISULA NORTH MARSH
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scale 1:12000
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LEGEND
FLOODED DECIDUOUS TREES
DEAD FLOODED DECIDUOUS TREES
AQUATIC SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
DEAD EMERGENTS
FLOATING LEAVED VEGETATION
SUBMERGED AQUATICS
u UPLAND
d DEVELOPED
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d

Table 15. Characteristics of Point Peninsula North Marsh.

UTM COORDINATES: 0397-4874, 0399-4874, 0399-4873, 0397-4873.

TOWN: Lyme USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

This small flood pond system occurs on Point Peninsula facing Lake Ontario. It is isolated from the lake by a cobble dike which has been improved and stabilized by the construction of a road. Three culverts run from the wetland to the lake side of the dike; however, two are plugged, and all three are located well above lake level. As a result, water from the wetland communicates with the lake only through underground seepage and water levels are quite stable. Aquatic shrubs are prominent in the center of the wetland with flooded and dead flooded trees behind. Woodland and grazed pasture surround the system.

COVER TYPE	ACRES
Flooded Deciduous Trees	23.4
Dead Flooded Deciduous Trees	6.6
Aquatic Shrubs	11.0
Submerged Aquatics	0.1
TOTAL	41.1

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Table 16. Characteristics of Point Peninsula Marsh.

UTM COORDINATES: 0398-4873, 0400-4873, 0400-4871, 0398-4871.

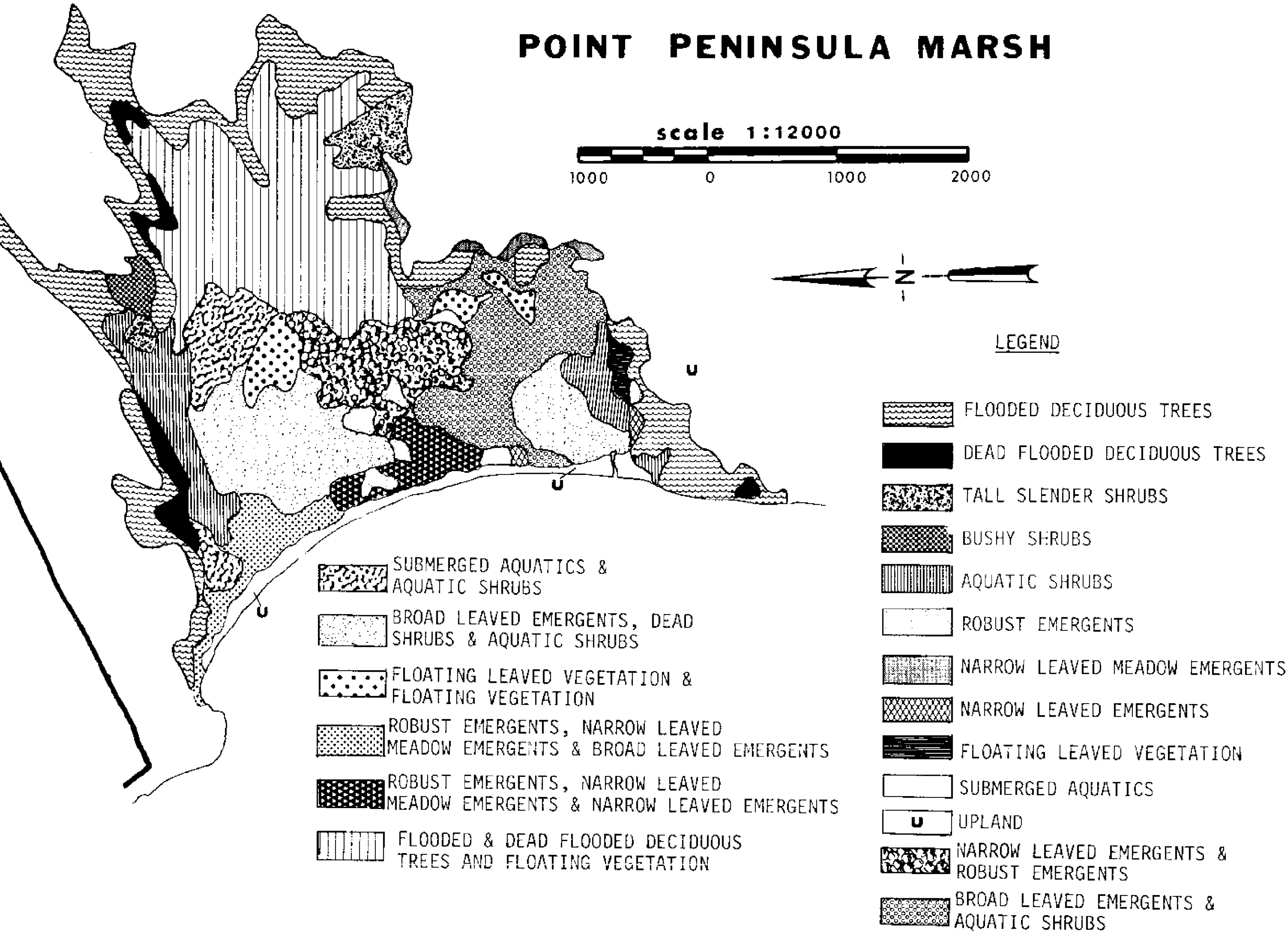
TOWN: Lyme

USGS QUAD SHEET: Point Peninsula and Cape Vincent South

DESCRIPTION:

Point Peninsula Marsh is a large and complex flood pond system on the western edge of Point Peninsula facing Lake Ontario. A well developed sand and cobble barrier beach separates the wetland from the lake. A semi-permanent connecting channel is present at the southern end, but it closes periodically due to sand accumulation. The system is dominated by a diverse mixture of emergent and woody plant species. Interspersion is high, and recent compositional adjustments are suggested by patches of dead vegetation and unusual type mixtures. In addition to its vegetative significance, the wetland is important because of its relative isolation and inaccessability. It is surrounded by forest and pasture land, and there is no direct road access.

COVER TYPE	ACRES
Flooded Deciduous Trees	62.0
Dead Flooded Deciduous Trees	7.1
Tall Slender Shrubs	7.1
Bushy Shrubs	2.7
Aquatic Shrubs	18.0
Robust Emergents	3.9
Narrow Leaved Meadow Emergents	2.9
Narrow Leaved Emergents	1.0
Floating Leaved Vegetation	1.5
Submerged Aquatics	0.7
Narrow Leaved Emergents and Robust Emergents	18.3
Broad Leaved Emergents and Aquatic Shrubs	27.3
Submerged Aquatics and Aquatic Shrubs	11.9
Broad Leaved Emergents, Dead Emergents and Aquatic Shrubs	33.6
Floating Leaved Vegetation and Floating Vegetation	7.5
Robust Emergents, Narrow Leaved Meadow Emergents and Broad Leaved Emergents	9.8
Robust Emergents, Narrow Leaved Meadow Emergents and Narrow Leaved Emergents	7.4
Flooded and Dead Flooded Deciduous Trees	59.5
TOTAL	282.2


POINT PENINSULA MARSH
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LEGEND
FLOODED DECIDUOUS TREES
DEAD FLOODED DECIDUOUS TREES
TALL SLENDER SHRUBS
BUSHY SHRUBS
AQUATIC SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
FLOATING LEAVED VEGETATION
SUBMERGED AQUATICS
UPLAND
NARROW LEAVED EMERGENTS & ROBUST EMERGENTS
BROAD LEAVED EMERGENTS & AQUATIC SHRUBS
SUBMERGED AQUATICS & AQUATIC SHRUBS
BROAD LEAVED EMERGENTS, DEAD SHRUBS & AQUATIC SHRUBS
FLOATING LEAVED VEGETATION & FLOATING VEGETATION
ROBUST EMERGENTS, NARROW LEAVED MEADOW EMERGENTS & BROAD LEAVED EMERGENTS
ROBUST EMERGENTS, NARROW LEAVED MEADOW EMERGENTS & NARROW LEAVED EMERGENTS
FLOODED & DEAD FLOODED DECIDUOUS TREES AND FLOATING VEGETATION

Table 17. Characteristics of Little Fox Creek Marsh.

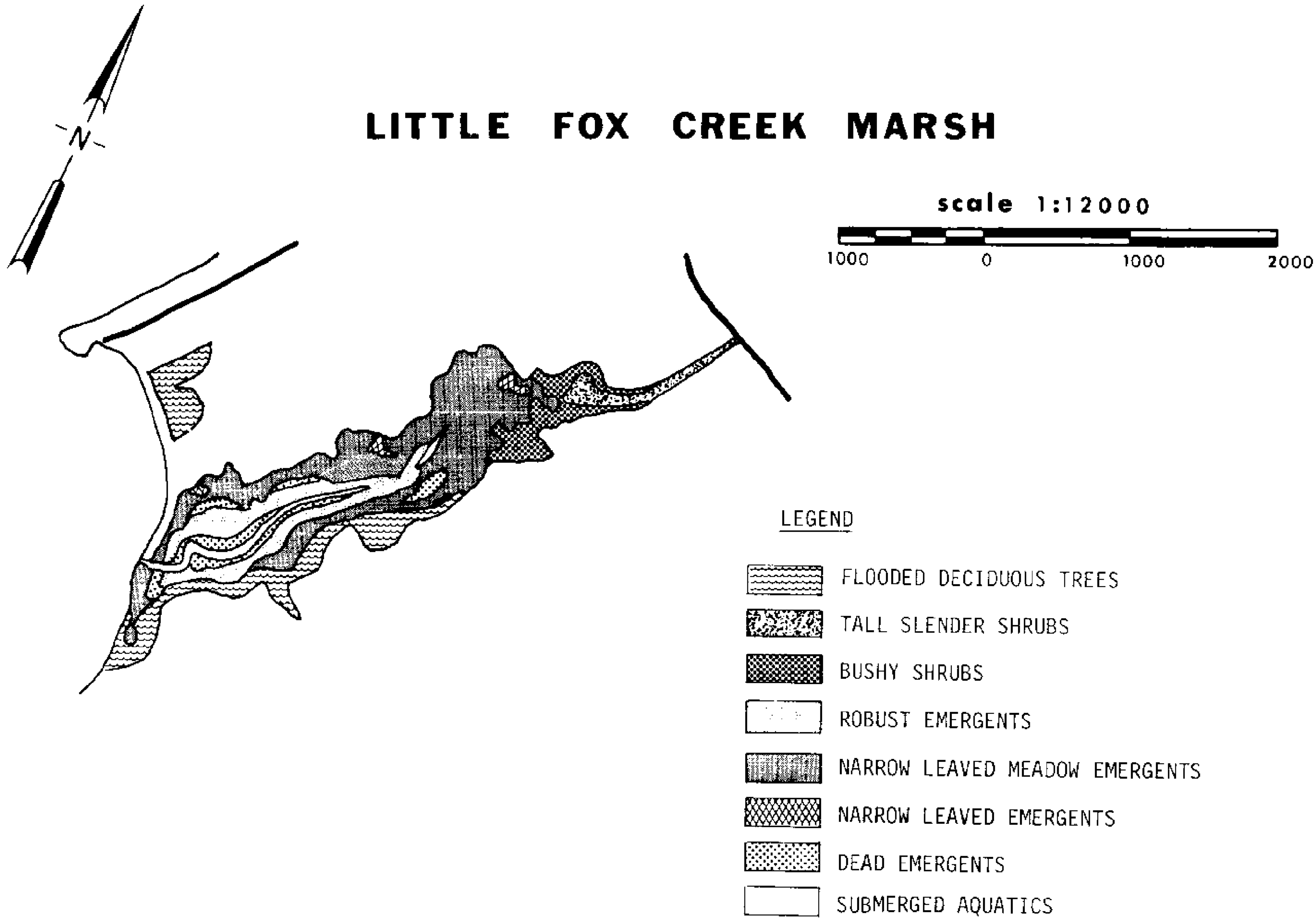
UTM COORDINATES: 0396-4879, 0397-4879, 0397-4877, 0396-4877.

TOWN: Lyme USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

This streamside wetland occupies the flood plain of Little Fox Creek, a minor tributary which flows into Lake Ontario. The mouth of the stream is not deeply cut, and flows may become reduced in the summer due to sand accumulation. As a result, water may be temporarily impounded as in a flood pond. The system is surrounded by abandoned fields dominated by perennial herbs and shrubs. Although the creek is crossed by a road, the wetland is somewhat removed from active development.

COVER TYPE	ACRES
Flooded Deciduous Trees	12.5
Tall Slender Shrubs	2.7
Bushy Shrubs	5.5
Narrow Leaved Meadow Emergents	25.3
Narrow Leaved Emergents	1.0
Dead Emergents	4.8
Submerged Aquatics	2.2
Robust Emergents	8.6
TOTAL	62.6


LITTLE FOX CREEK MARSH
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scale 1:12000
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LEGEND
FLOODED DECIDUOUS TREES
TALL SLENDER SHRUBS
BUSHY SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
DEAD EMERGENTS
SUBMERGED AQUATICS

Table 18. Characteristics of Fox Creek Marsh.

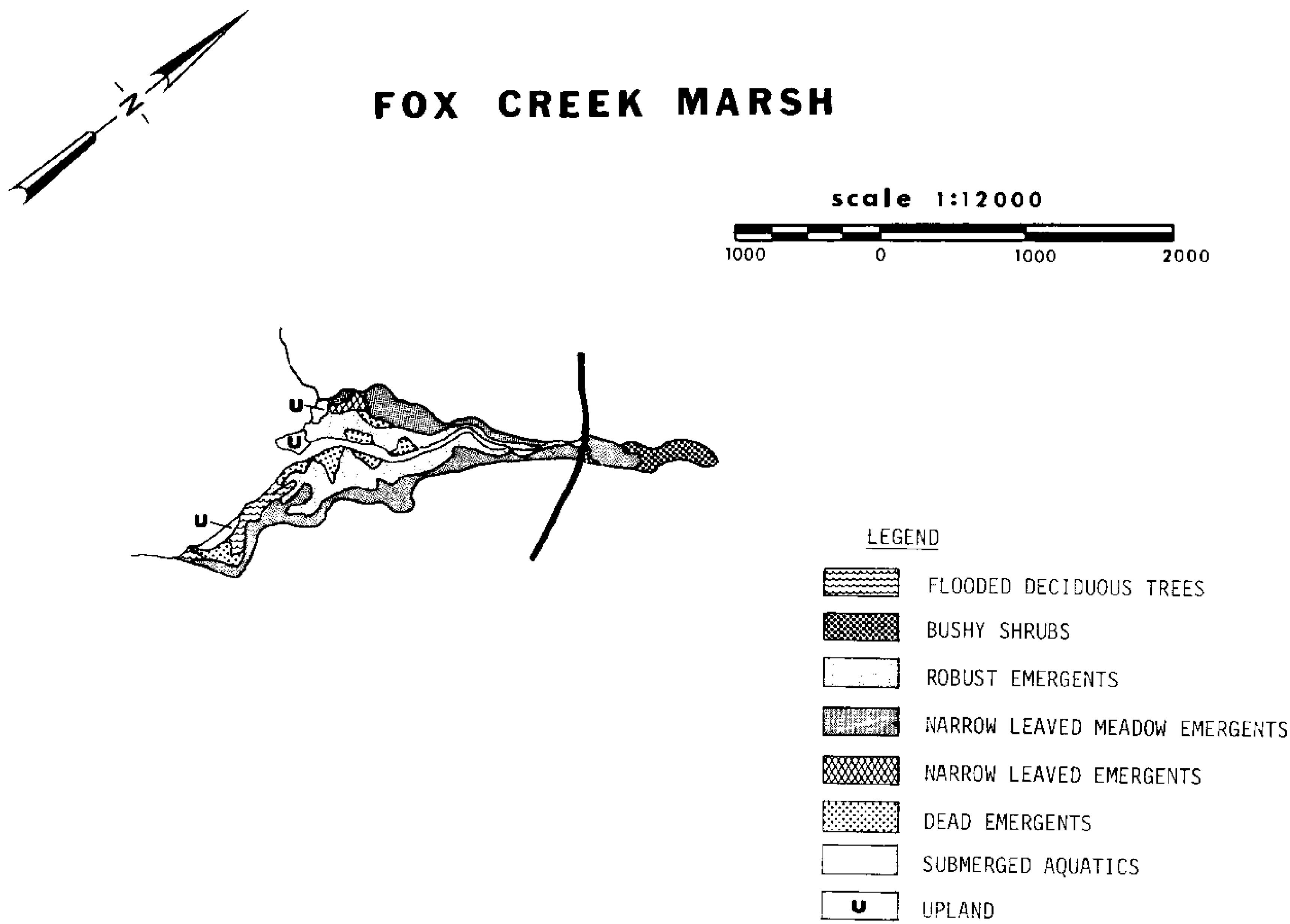
UTM COORDINATES: 0396-4880, 0397-4880, 0397-4878, 0396-4878.

TOWN: Lyme USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

Fox Creek Marsh is located less than one mile from Little Fox Creek Marsh, and the two streamside systems have much in common. The wetland is widest behind the barrier beach and lateral to the stream channel at its mouth. Fox Creek carries a greater volume of streamflow, and its outlet is less subject to closure. Both systems are dominated by emergent vegetation and surrounded by abandoned fields. Also, both systems are somewhat isolated and relatively unaffected by development.

COVER TYPE	ACRES
Flooded Deciduous Trees	1.6
Bushy Shrubs	2.3
Robust Emergents	8.3
Narrow Leaved Meadow Emergents	12.0
Narrow Leaved Emergents	0.7
Dead Emergents	3.2
Submerged Aquatics	2.3
TOTAL	30.4


FOX CREEK MARSH
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LEGEND
FLOODED DECIDUOUS TREES
BUSHY SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
DEAD EMERGENTS
SUBMERGED AQUATICS
U
UPLAND

Table 19. Characteristics of Mud Creek Marsh.

UTM COORDINATES: 0393-4882, 0398-4882, 0398-4880, 0393-4880.

TOWN: Cape Vincent USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

Mud Creek (also known as Kent Creek) enters Lake Ontario through a long, narrow bay. The wetland can be divided into two distinct sections, one on either side of the road and bridge which crosses its middle. On the lakeward side of the road, emergent vegetation is limited to two undisturbed patches along the bay shoreline. Much of the remainder has been filled and developed for cottages and marinas. Submerged aquatic vegetation of low density is present throughout the bay. Upstream from the road, the marsh becomes an extensive streamside wetland, with emergent communities of varying composition occupying the flood plain. Abandoned fields and pastures border the wetland upstream from the bridge.

COVER TYPE	ACRES
Robust Emergents	59.6
Narrow Leaved Meadow Emergents	66.7
Dead Emergents	6.8
Floating Leaved Vegetation	1.2
Submerged Aquatics	160.2
Narrow Leaved Emergents	3.2
Bushy Shrubs	1.9
TOTAL	299.6

Table 20. Characteristics of Mud Bay Marsh.

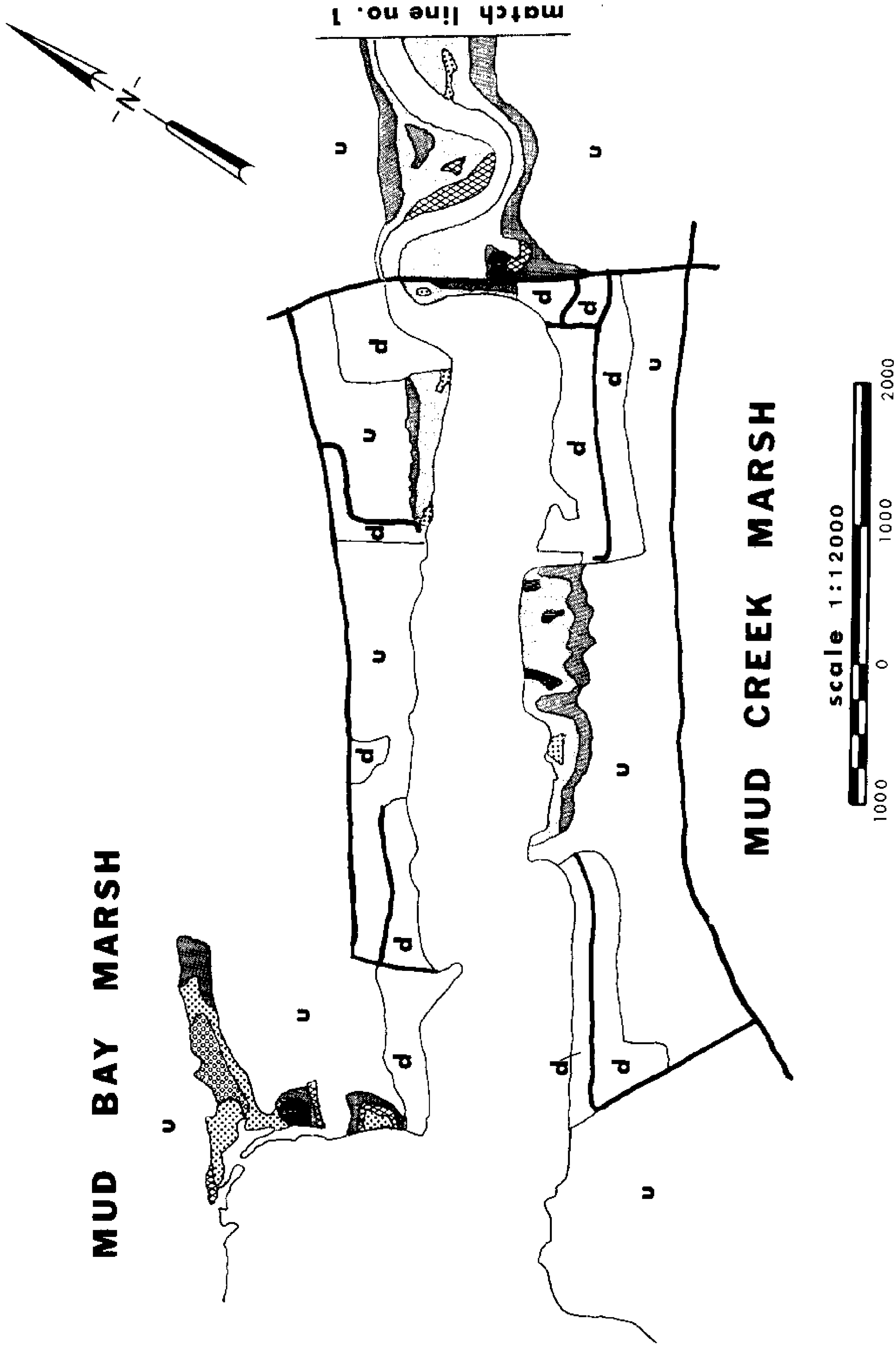
UTM COORDINATES: 0392-4882, 0394-4882, 0394-4880, 0392-4880.

TOWN: Cape Vincent USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

This small flood pond complex occurs along the northern shoreline of Mud Bay. It is composed of two small sections, each separated from the lake by a cobble beach barrier. The barrier is intact at the smaller of the two sections, but it has been recently broken at the larger section resulting in disruption of the emergent community. Since the cobble barrier is low and weakly formed, a continuing cycle change is probable for some time to come as the barrier becomes partially reformed and broken again. The system is surrounded by poor pasture and, although close to Mud Creek, its shoreline has not been developed.

COVER TYPE	ACRES
Narrow Leaved Meadow Emergents	3.4
Narrow Leaved Emergents	1.3
Dead Emergents	5.7
Floating Leaved Vegetation	0.9
Submerged Aquatics	1.2
Floating Leaved Vegetation and Submerged Aquatics	2.8
TOTAL	15.3


MUD BAY MARSH
MUD CREEK MARSH
match line no. 1
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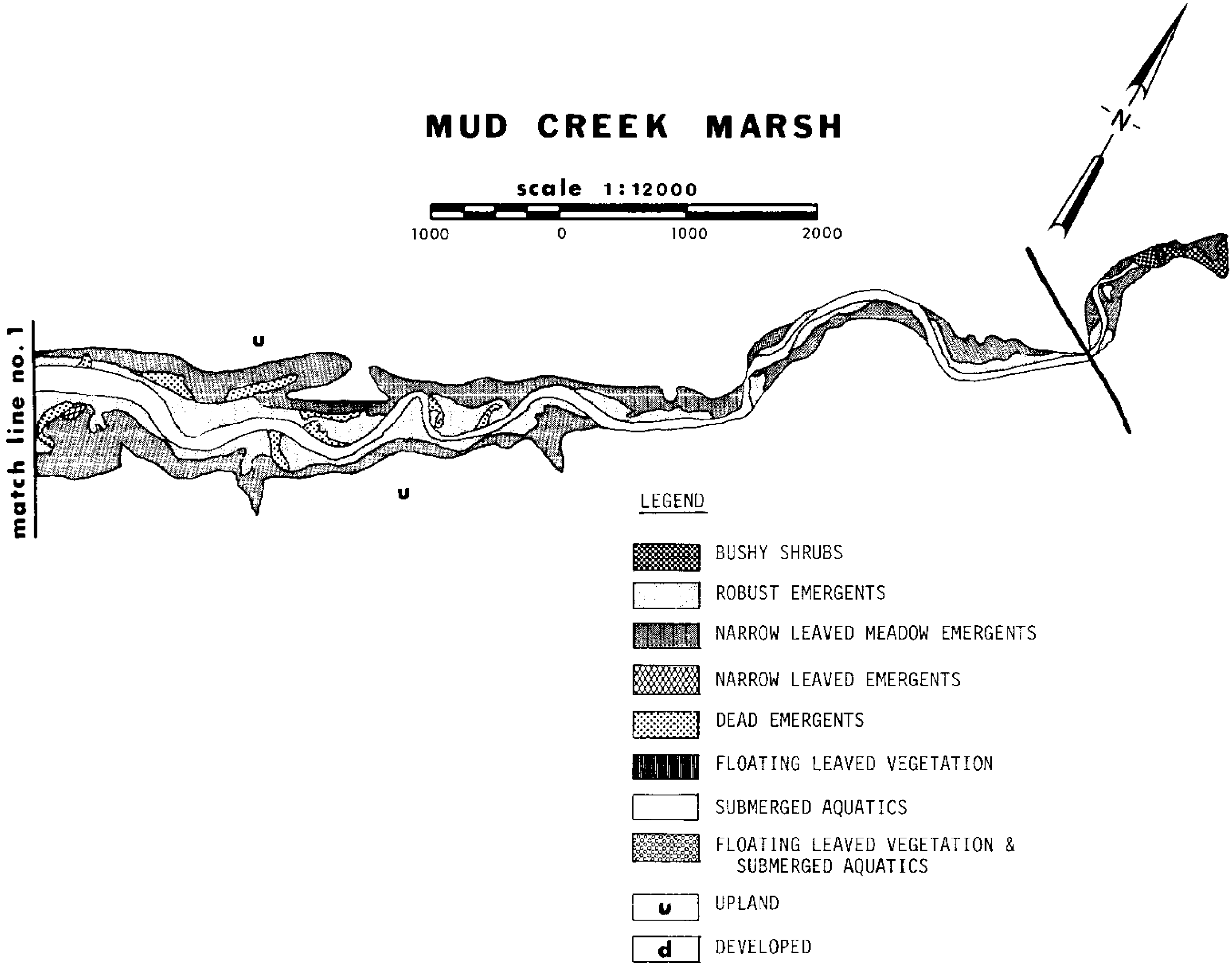

MUD CREEK MARSH
scale 1:12000
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BUSHY SHRUBS
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SUBMERGED AQUATICS
FLOATING LEAVED VEGETATION & SUBMERGED AQUATICS
u UPLAND
d DEVELOPED

Table 21. Characteristics of Wilson Bay Marsh.

UTM COORDINATES: 0392-4884, 0394-4884, 0394-4882, 0392-4882.

TOWN: Cape Vincent USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

Wilson Bay Marsh is one of the largest and most significant shrub-dominated wetlands along the shoreline. This flood pond system is located in a depressional area behind a cobble barrier beach at the end of Wilson Bay. The barrier has been improved and stabilized by the construction of a road across its top. A plank dam and culvert provide access to the lake at high water (about three or four months a year). The wetland is dominated by an extensive section of aquatic shrubs and shrubs mixed with emergents. The transition to the upland occurs through an equally extensive area of flooded timber. Pasture and abandoned fields surround the wetland on all sides. Some grazing and watering of livestock has occurred along the southern side of the wetland.

COVER TYPE	ACRES
Flooded Deciduous Trees	23.2
Dead Flooded Deciduous Trees	22.0
Tall Slender Shrubs	6.1
Aquatic Shrubs	70.2
Narrow Leaved Meadow Emergents	2.3
Narrow Leaved Emergents	1.7
Flooded and Dead Flooded Deciduous Trees	1.6
Floating Leaved Vegetation, Submerged Aquatics and Aquatic Shrubs	15.2
Floating Leaved Vegetation and Submerged Aquatics	13.8
Broad Leaved Emergents and Submerged Aquatics	5.4
Broad Leaved Emergents and Floating Vegetation	24.1
Broad Leaved Emergents and Aquatic Shrubs	23.9
TOTAL	209.5

WILSON BAY MARSH

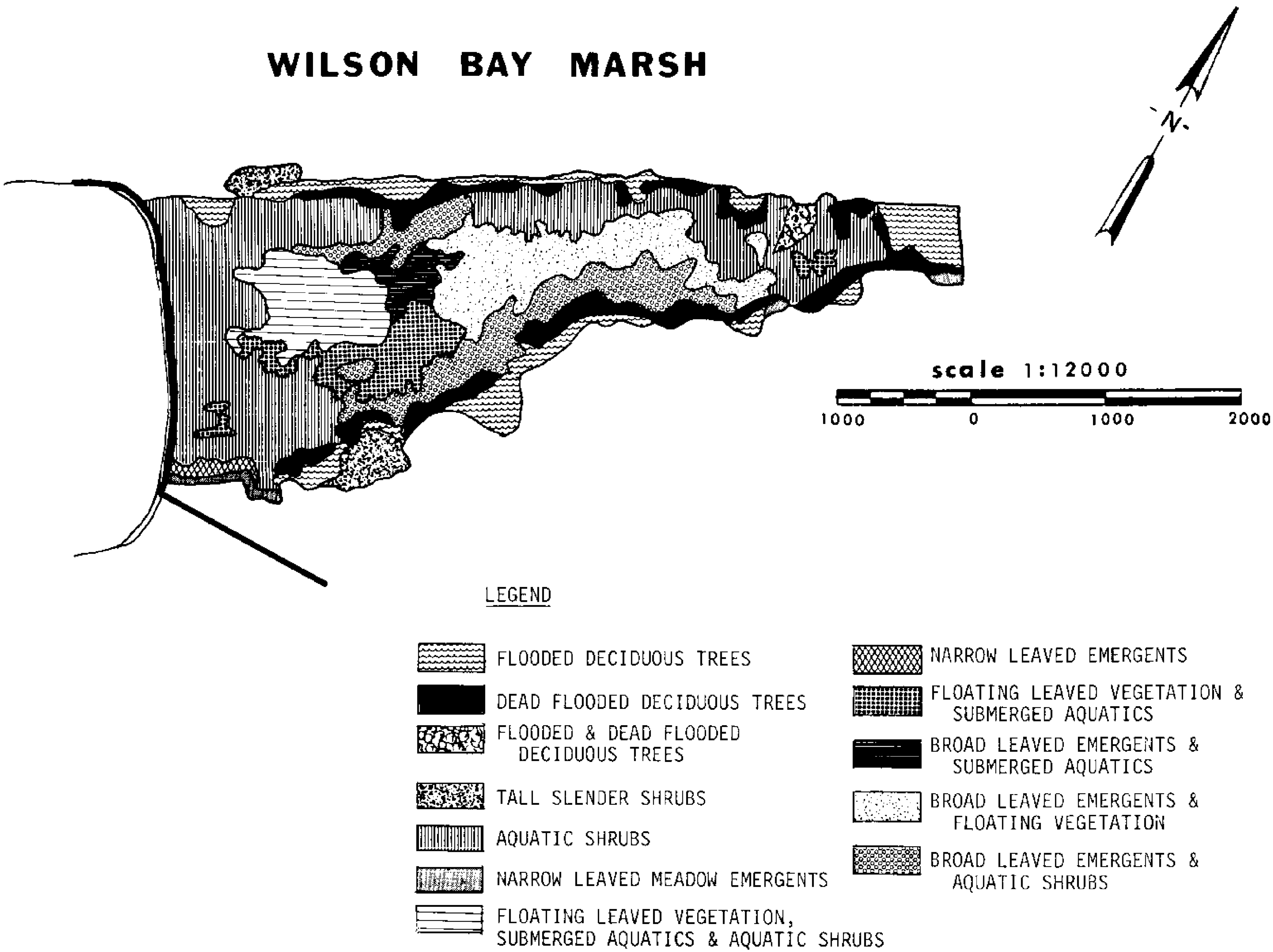


Table 22. Characteristics of Wilson Point Marsh.

UTM COORDINATES: 0391-4884, 0392-4884, 0392-4883, 0391-4883.

TOWN: Cape Vincent USGS QUAD SHEET: Cape Vincent South

DESCRIPTION:

Wilson Point and Fuller Bay Marshes are small flood pond systems located along the Lake Ontario shoreline between Wilson Bay and the origin of the St. Lawrence River. Both wetlands are separated from the lake by cobble beach barriers, and their hydrologic connection with the lake is by underground seepage. A small open water area with submerged and floating species is present at Fuller Bay, and emergent meadows are better represented here as well. Both systems are well removed from roads and surrounded by agricultural lands, some of which have been abandoned and reverted to woody growth. Woody vegetation predominates, with aquatic shrubs at Wilson Point and flooded trees at Fuller Bay.

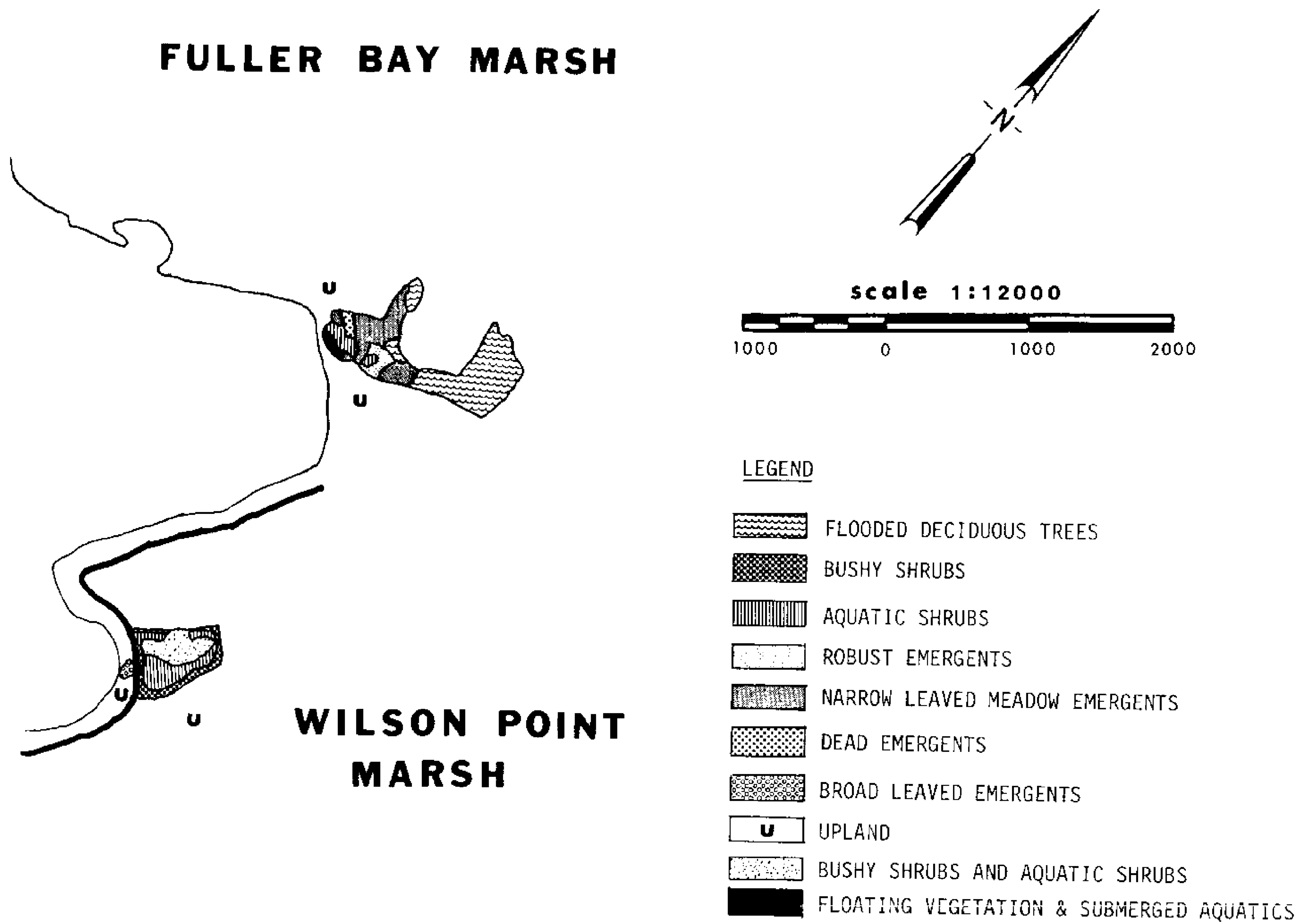
COVER TYPE	ACRES
Bushy Shrubs	1.7
Aquatic Shrubs	2.1
Broad Leaved Emergents	1.8
Bushy and Aquatic Shrubs	0.3
TOTAL	5.9

Table 23. Characteristics of Fuller Bay Marsh.

UTM COORDINATES: 0391-4884, 0392-4884, 0392-4883, 0391-4883.

TOWN: Cape Vincent USGS QUAD SHEED: Cape Vincent South

COVER TYPE	ACRES
Flooded Deciduous Trees	6.3
Aquatic Shrubs	0.9
Robust Emergents	0.7
Narrow Leaved Meadow Emergents	3.2
Dead Emergents	0.2
Floating Vegetation and Submerged Aquatics	0.3
TOTAL	11.6


FULLER BAY MARSH
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LEGEND
FLOODED DECIDUOUS TREES
BUSHY SHRUBS
AQUATIC SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
DEAD EMERGENTS
BROAD LEAVED EMERGENTS
U
UPLAND
BUSHY SHRUBS AND AQUATIC SHRUBS
FLOATING VEGETATION & SUBMERGED AQUATICS

Table 24. Characteristics of French Creek Marsh.

UTM COORDINATES: 0408-4898, 0414-4898, 0414-4892, 0408-4892.

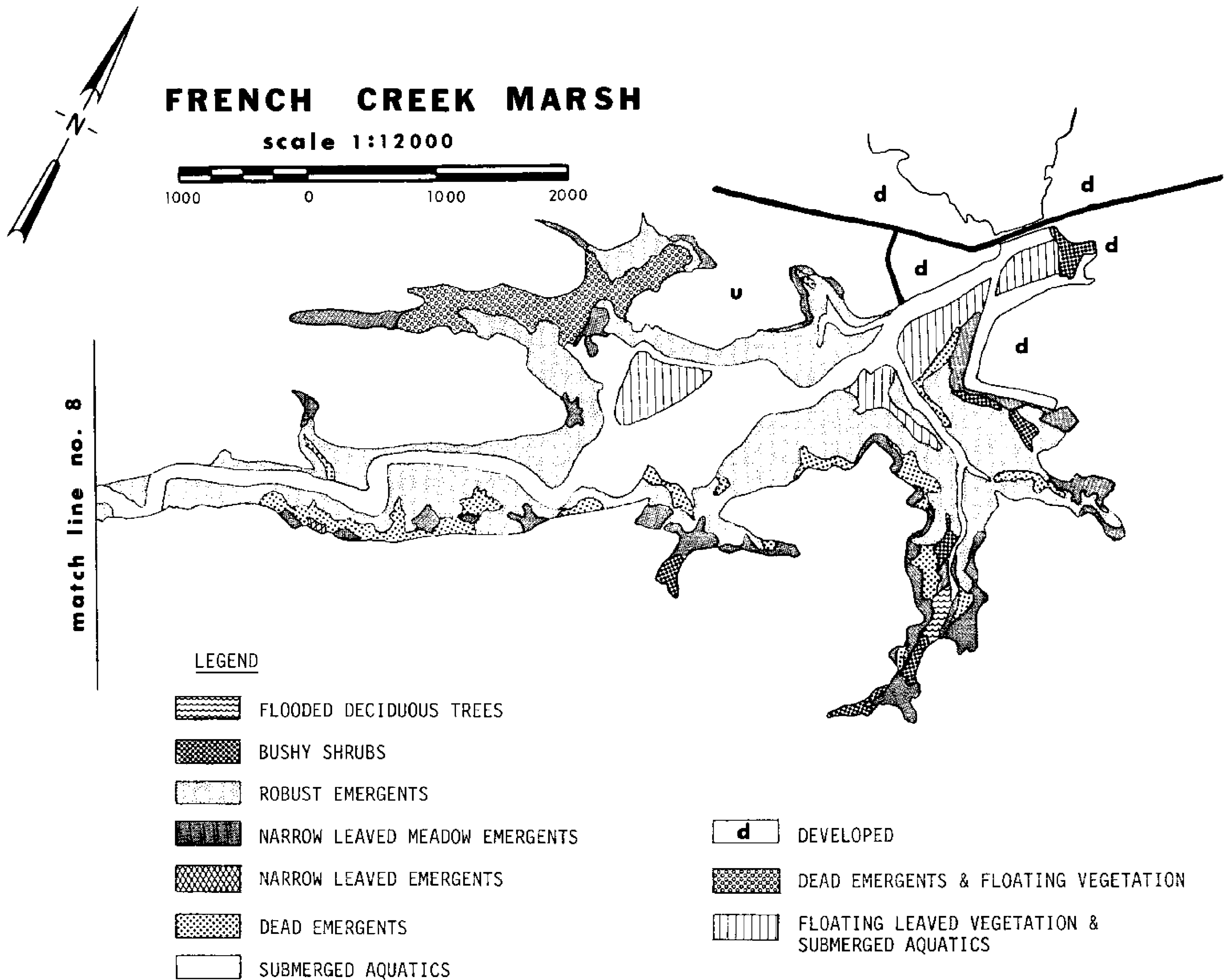
TOWN: Clayton

USGS QUAD SHEET: St. Lawrence and Clayton

DESCRIPTION:

French Creek Marsh is a long and diverse streamside system extending inland for about five miles from the St. Lawrence River at Clayton. The flood plain of the creek is broad in places, resulting in extensive emergent communities. Agricultural utilization extends almost to the flood plain, especially downstream, and the area of bushy shrubs and flooded deciduous trees has been limited. French Creek is a major tributary with a continuous flow and a mouth stabilized by a bridge, marina, and cottage development. Extensive emergent meadows line the flood plain, with the area almost equally divided between robust and narrow leaved meadow species. Grazing and watering of livestock extend into the wetland at several points upstream.

COVER TYPE	ACRES
Flooded Deciduous Trees	6.4
Bushy Shrubs	17.9
Aquatic Shrubs	3.5
Robust Emergents	193.9
Narrow Leaved Meadow Emergents	170.3
Narrow Leaved Emergents	2.5
Dead Emergents	97.9
Submerged Aquatics	140.1
Tall Slender Shrubs	3.2
Dead Emergents and Floating Vegetation	23.4
Floating Leaved Vegetation and Submerged Aquatics	16.4
TOTAL	675.5



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ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
DEAD EMERGENTS
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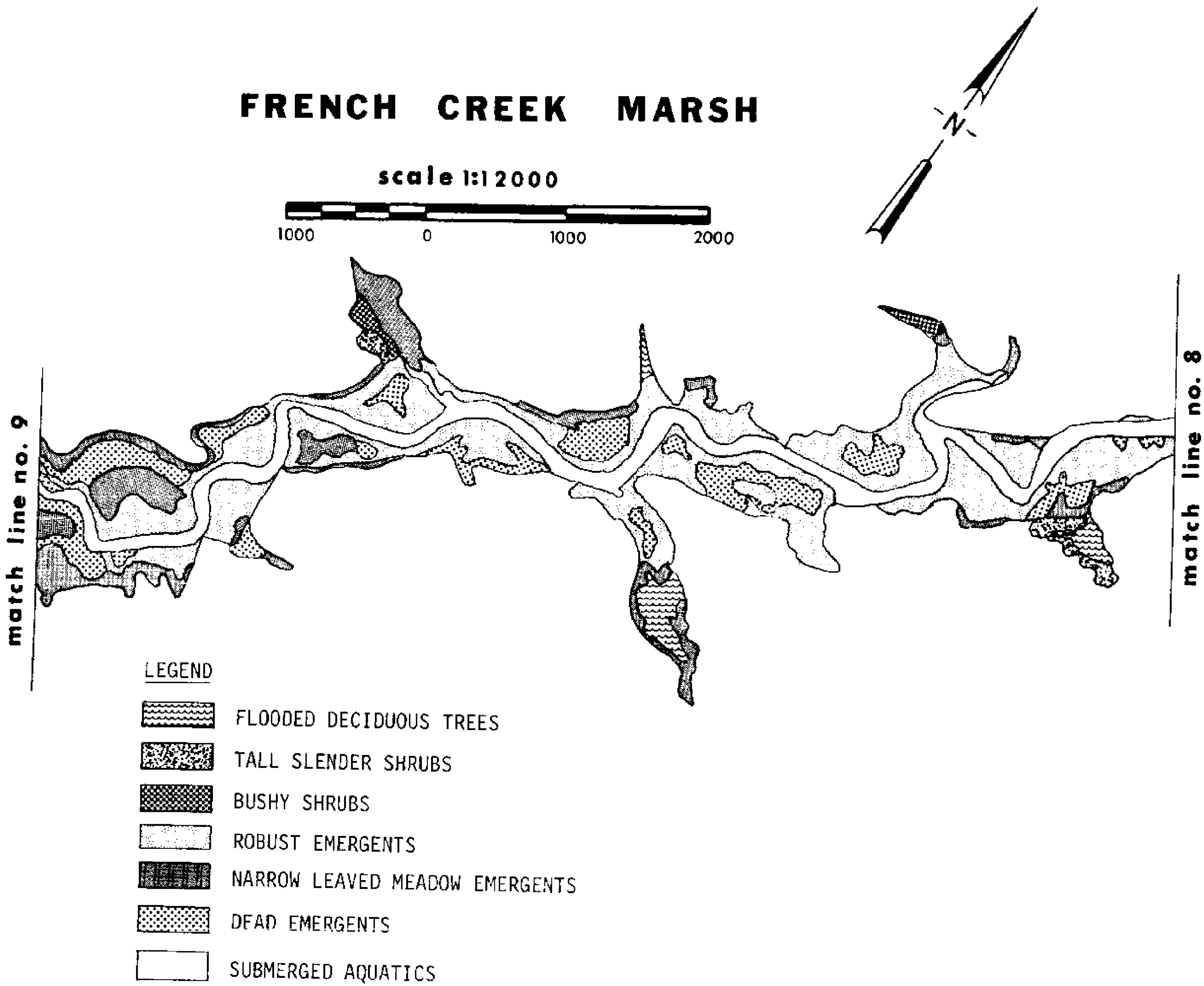
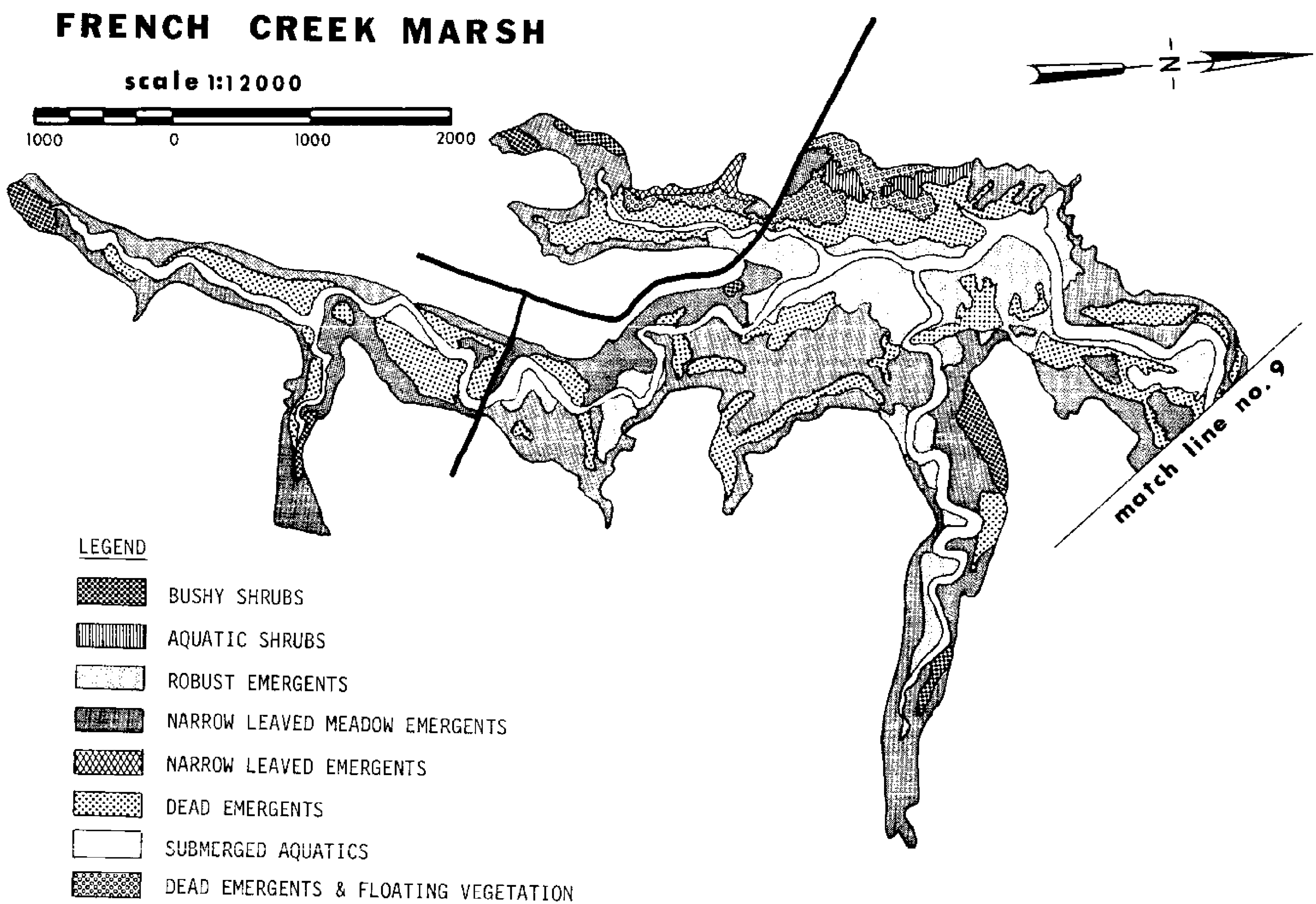
DEAD EMERGENTS & FLOATING VEGETATION
FLOATING LEAVED VEGETATION & SUBMERGED AQUATICS

FRENCH CREEK MARSH

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BUSHY SHRUBS
AQUATIC SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
DEAD EMERGENTS
SUBMERGED AQUATICS
DEAD EMERGENTS & FLOATING VEGETATION

Table 25. Characteristics of Blind Bay Marsh.

UTM COORDINATES: 0418-4902, 0420-4902, 0420-4901, 0418-4901.

TOWN: Orleans USGS QUAD SHEET: Thousand Island Park

DESCRIPTION:

Blind Bay Marsh occupies the periphery of a small bay off the St. Lawrence River. The emergent meadows are cattail dominated, and there is an extensive area of shallow water submerged aquatic vegetation. Marina and cottage developments have altered much of the shoreline, and water chemistry data taken during June of 1975 suggests that there may be substantial sewage leakage. The undeveloped uplands occur mainly as herbaceous fields, both grazed and abandoned, with a lesser area in shrubland.

COVER TYPE	ACRES
Bushy Shrubs	0.2
Robust Emergents	25.8
Narrow Leaved Meadow Emergents	8.1
Narrow Leaved Emergents	0.2
Dead Emergents	3.2
Submerged Aquatics	31.4
TOTAL	68.9

BLIND BAY MARSH

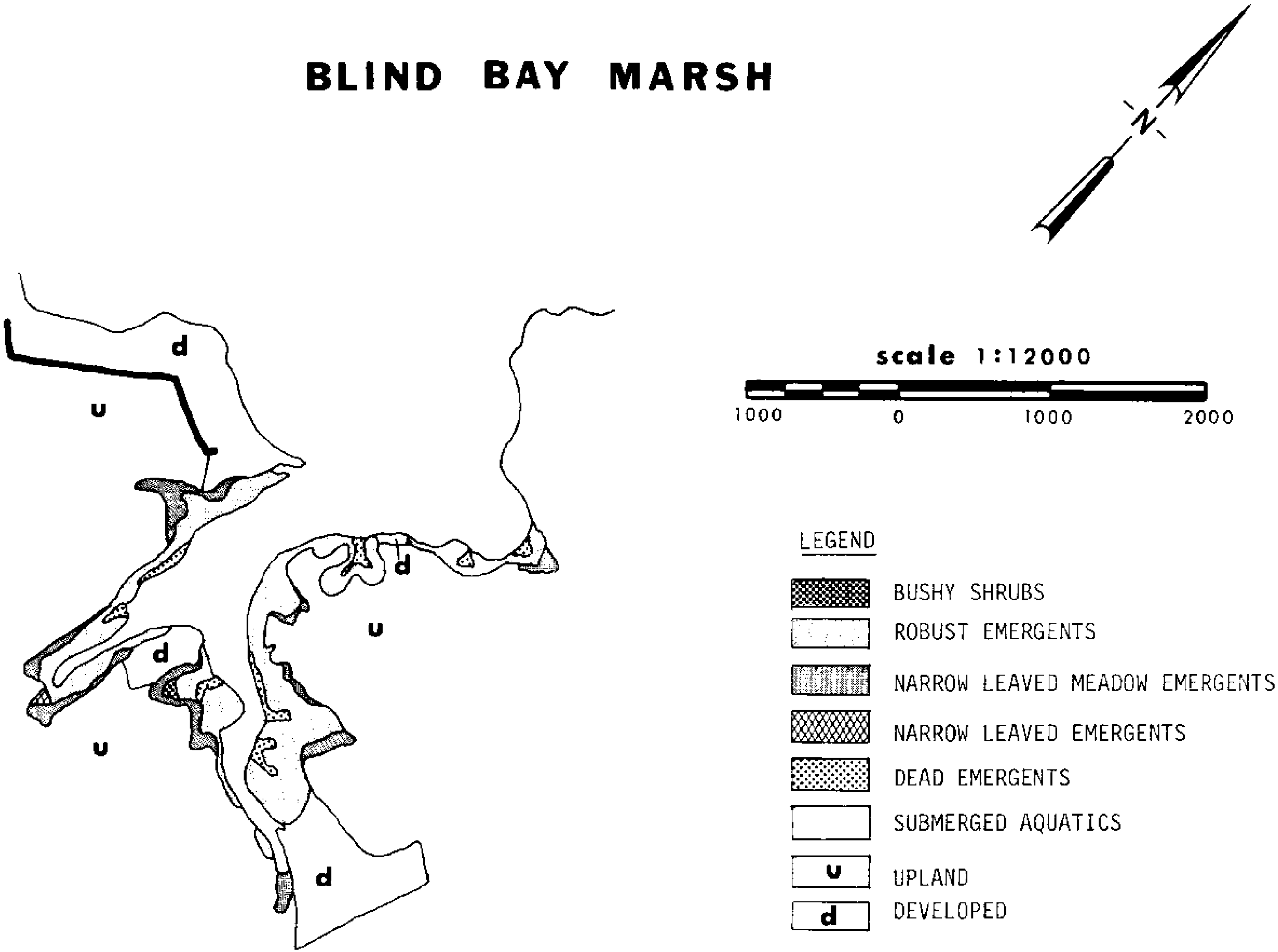


Table 26. Characteristics of Moore Landing Marsh.

UTM COORDINATES: 0421-4906, 0422-4906, 0422-4904, 0421-4904.

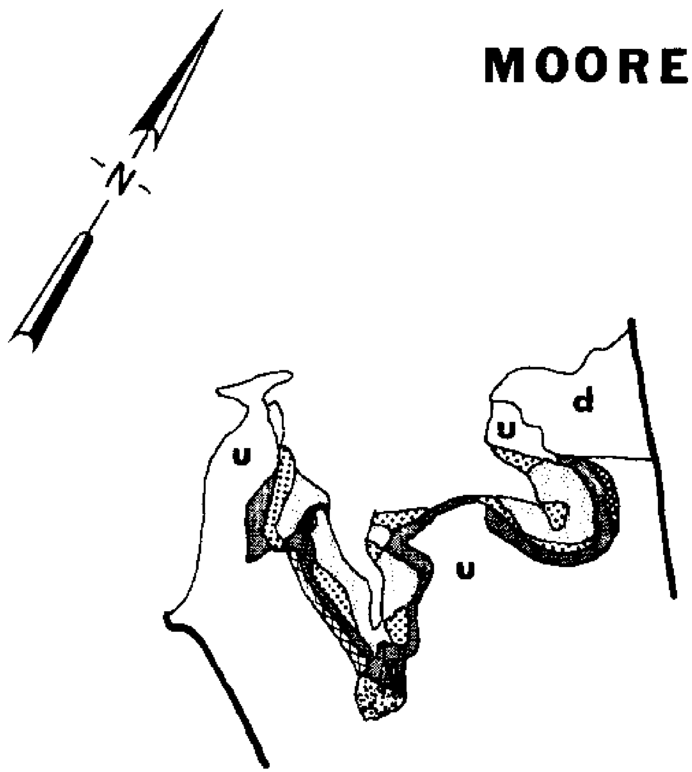
TOWN: Alexandria Bay USGS QUAD SHEET: Orleans

DESCRIPTION:

Moore Landing Marsh is a small bayside system located along the St. Lawrence River near the Thousand Island Bridge. It is surrounded by fields and a mowed pasture, and there has been very little development due to the extent of surrounding state ownership. Water chemistry samples taken in June of 1975 revealed unusually cold water with a high electrical conductivity. This suggests that the bay is spring fed with limestone seepage water. Emergent vegetation predominates and the communities are well interspersed.

COVER TYPE	ACRES
Tall Slender Shrubs	1.0
Bushy Shrubs	0.5
Robust Emergents	7.9
Narrow Leaved Meadow Emergents	7.4
Narrow Leaved Emergents	1.1
Dead Emergents	4.6
Floating Leaved Vegetation	0.5
Submerged Aquatics	15.9
TOTAL	38.9

MOORE LANDING MARSH



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LEGEND

- TALL SLENDER SHRUBS
- BUSHY SHRUBS
- ROBUST EMERGENTS
- NARROW LEAVED MEADOW EMERGENTS
- NARROW LEAVED EMERGENTS
- DEAD EMERGENTS
- FLOATING LEAVED VEGETATION
- SUBMERGED AQUATICS
- u UPLAND
- d DEVELOPED

Table 27. Characteristics of Swan Bay Marsh.

UTM COORDINATES: 0422-4906, 0423-4906, 0423-4907, 0422-4907.

TOWN: Alexandria USGS QUAD SHEET: Alexandria Bay

DESCRIPTION:

Swan Bay Marsh occurs along the south and west edges of Swan Bay on the St. Lawrence River. Shallow water with rooted aquatic macrophytes extends outward to an abrupt transition where it meets the main channel of the river. The wetland is dominated by emergent species, and the cover types are well interspersed. Wetland vegetation grades into woodland nearer the river and herbaceous fields and pastures on the southern and eastern sides. Some filling for cottage construction has occurred along the eastern edge of the wetland, but most of the adjacent upland is undeveloped.

COVER TYPE	ACRES
Flooded Deciduous Trees	0.8
Bushy Shrubs	1.2
Robust Emergents	8.2
Narrow Leaved Meadow Emergents	3.9
Narrow Leaved Emergents	1.8
Dead Emergents	3.8
Floating Leaved Vegetation	2.7
Submerged Aquatics	3.2
Narrow Leaved Meadow Emergents and Narrow Leaved Emergents	0.8
Dead Emergents and Floating Vegetation	1.3
TOTAL	27.7

SWAN BAY MARSH

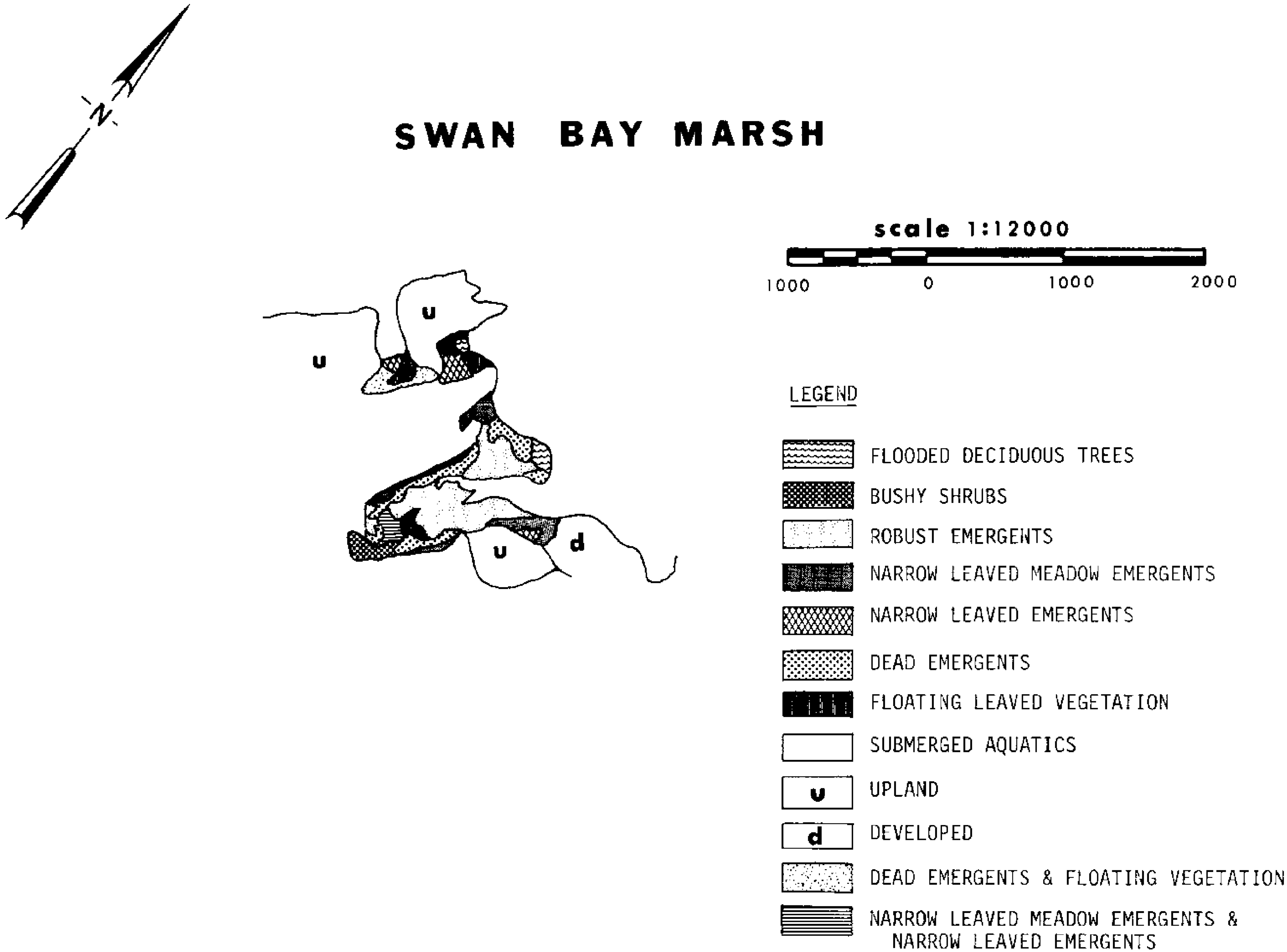


Table 28. Characteristics of Point Vivian Marsh.

UTM COORDINATES: 0424-4908, 0425-4908, 0425-4906, 0424-4906.

TOWN: Alexandria USGS QUAD SHEET: Alexandria Bay

DESCRIPTION:

Point Vivian Marsh occupies a small bay of the St. Lawrence River, extending inland slightly along the flood plain of a tributary stream. Emergent vegetation is most extensive, but there are dense beds of submerged aquatic species in the shallow waters. Some cottage development has occurred along the southern edge. However, most of the wetland is surrounded by abandoned fields and pasture.

COVER TYPE	ACRES
Robust Emergents	21.3
Narrow Leaved Meadow Emergents	16.9
Narrow Leaved Emergents	3.7
Dead Emergents	6.6
Floating Leaved Vegetation	4.8
Submerged Aquatics	10.3
TOTAL	63.6

POINT VIVIAN MARSH

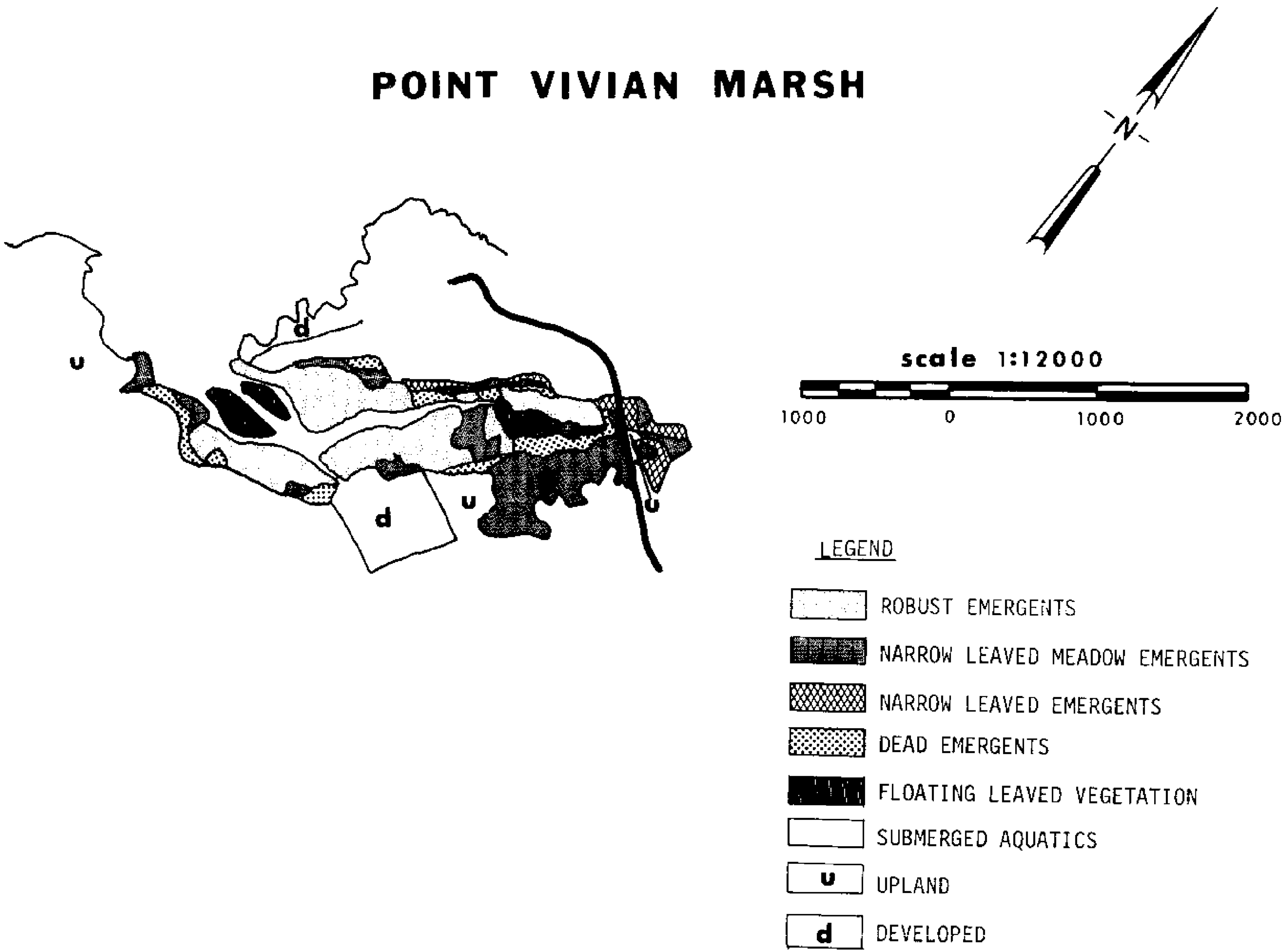


Table 29. Characteristics of Goose Bay-Cranberry Creek Marsh.

UTM COORDINATES: 0429-4913, 0432-4913, 0432-4908, 0429-4908.

TOWN: Alexandria USGS QUAD SHEET: Redwood

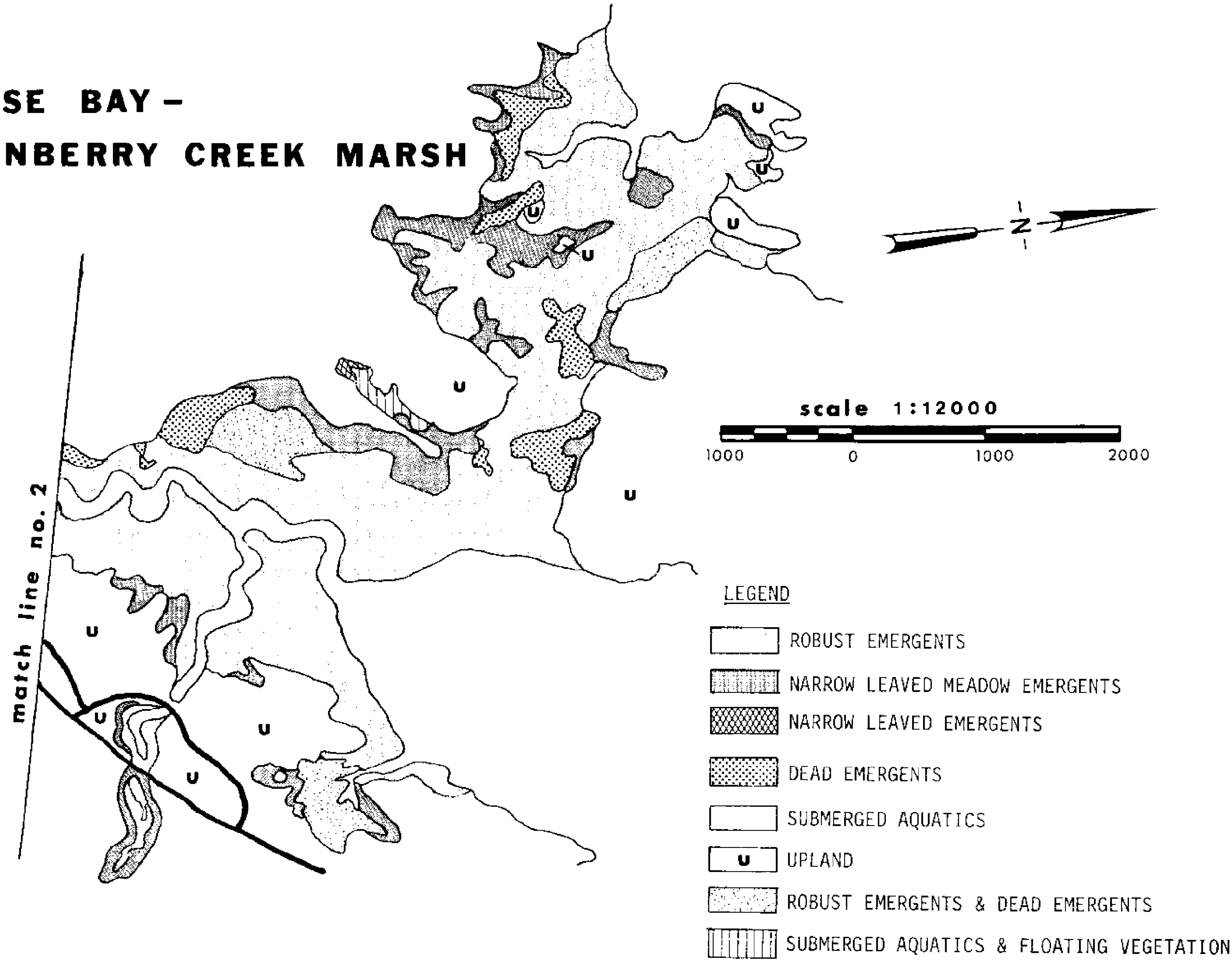
DESCRIPTION:

Goose Bay is the largest bay along the New York shoreline of the St. Lawrence River in Jefferson County, and the wetlands that have formed along its periphery are among the most significant in the region. The bay is protected from the main body of the river by islands and upland peninsulas which narrow its mouth. The central section of the bay is shallow and vegetated throughout. Submerged aquatic vegetation extends to the riverward margins of the bay where depths exceed 6 meters (mean low water datum). This extensive area of submerged aquatic vegetation is not included in data presented for the Goose Bay marshes. Our treatment is limited to emergent wetlands located at the northeastern and southwestern ends of the bay. The wetlands at the northeastern enc are called Goose Bay Marsh and are described in Table 31. The extensive emergent meadows at the southwestern end are combined and treated here as Goose Bay-Cranberry Creek Marsh. Included is the wetland segment extending from the mouth of the bay to Cranberry Creek (point 30 in Figure 1) and the streamside extension which occupies the flood plain of the creek inland for several miles (point 29 in Figure 1). Data from these two segments are combined below.

The Goose Bay-Cranberry Creek Marshes occur as an extensive cattail-dominated front with greater interspersion of types inland and along Cranberry Creek. Surrounding uplands are shallow to bedrock and predominantly forested. Cottage developments have avoided the wetland sites and are concentrated on forested land. These are highly productive wetlands in an unusual state of preservation.

COVER TYPE	ACRES
Tall Slender Shrubs	15.9
Bushy Shrubs	1.0
Aquatic Shrubs	0.8
Robust Emergents	176.2
Narrow Leaved Meadow Emergents	56.5
Narrow Leaved Emergents	0.5
Dead Emergents	19.9
Submerged Aquatics	92.1
Robust Emergents and Dead Emergents	34.5
Robust Emergents, Submerged Aquatics, and Floating Leaved Vegetation	14.8
Submerged Aquatics and Floating Vegetation	22.2
Enclosed Upland	0.7
TOTAL	437.0

GOOSE BAY – CRANBERRY CREEK MARSH



GOOSE BAY – CRANBERRY CREEK MARSH

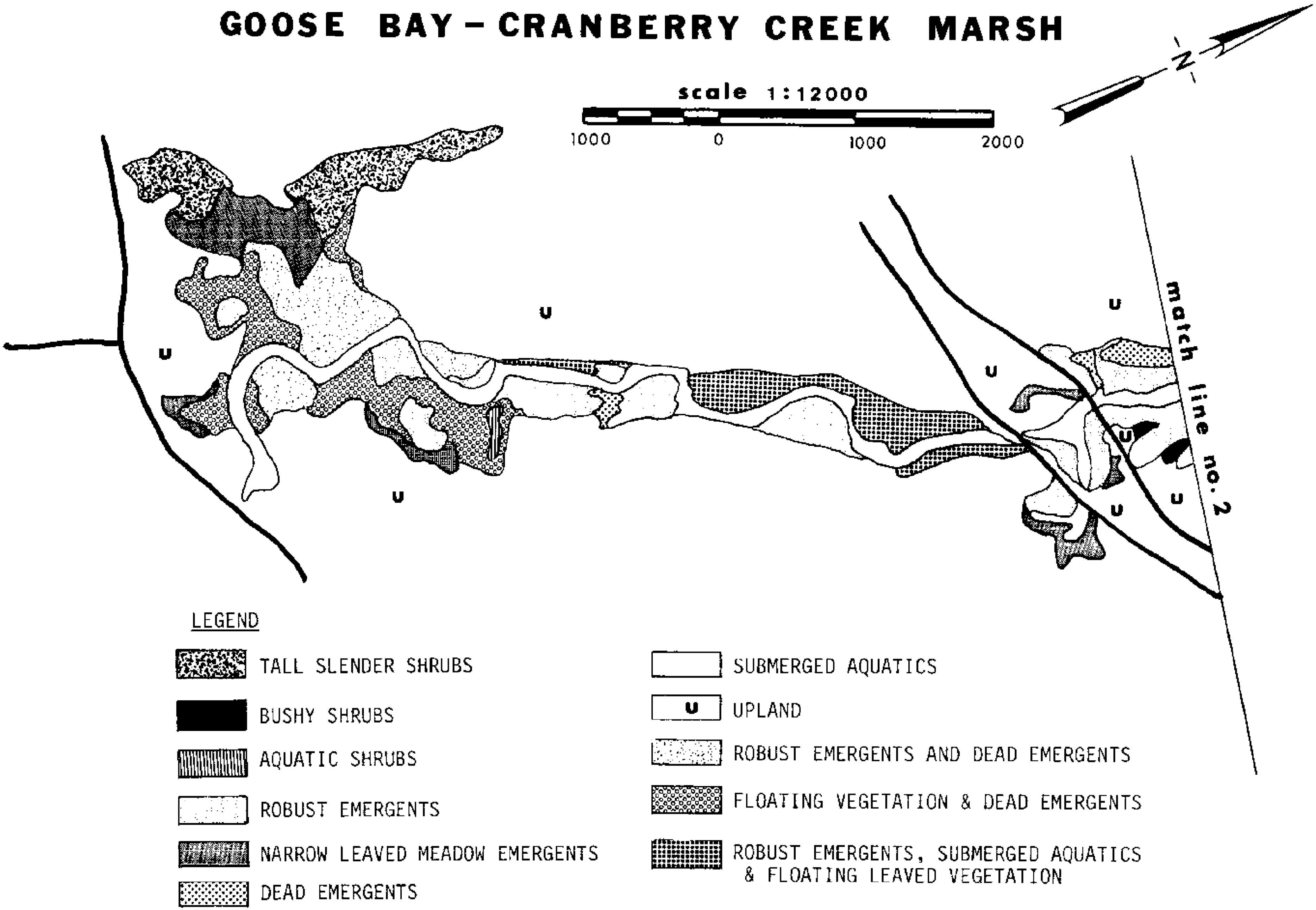


Table 31. Characteristics of Goose Bay Marsh.

UTM COORDINATES: 0432-4915, 0434-4915, 0434-4913, 0432-4913.

TOWN: Alexandria

USGS QUAD SHEET: Chippewa Bay and Redwood

DESCRIPTION:

Situated at the northeastern end of Goose Bay, the Goose Bay Marsh occurs as four recognizable segments, each representing an inland extension of emergent vegetation along low ground. The moisture status of each of the segments is river-level dependent. Tributary streams are present in each segment, although none is as well developed as Cranberry Creek. Cottages and boat docks are more abundant than at the southwestern end of the bay, but the basic character of the wetlands is quite similar. For further details see Table 29.

COVER TYPE	ACRES
Flooded Deciduous Trees	4.9
Bushy Shrubs	7.8
Aquatic Shrubs	4.4
Robust Emergents	65.2
Narrow Leaved Meadow Emergents	61.3
Narrow Leaved Emergents	2.4
Dead Emergents	9.3
Submerged Aquatics	113.3
Dead Emergents and Floating Vegetation	11.0
Narrow Leaved Meadow Emergents and Narrow Leaved Emergents	0.9
Enclosed Upland	14.8
TOTAL	295.3

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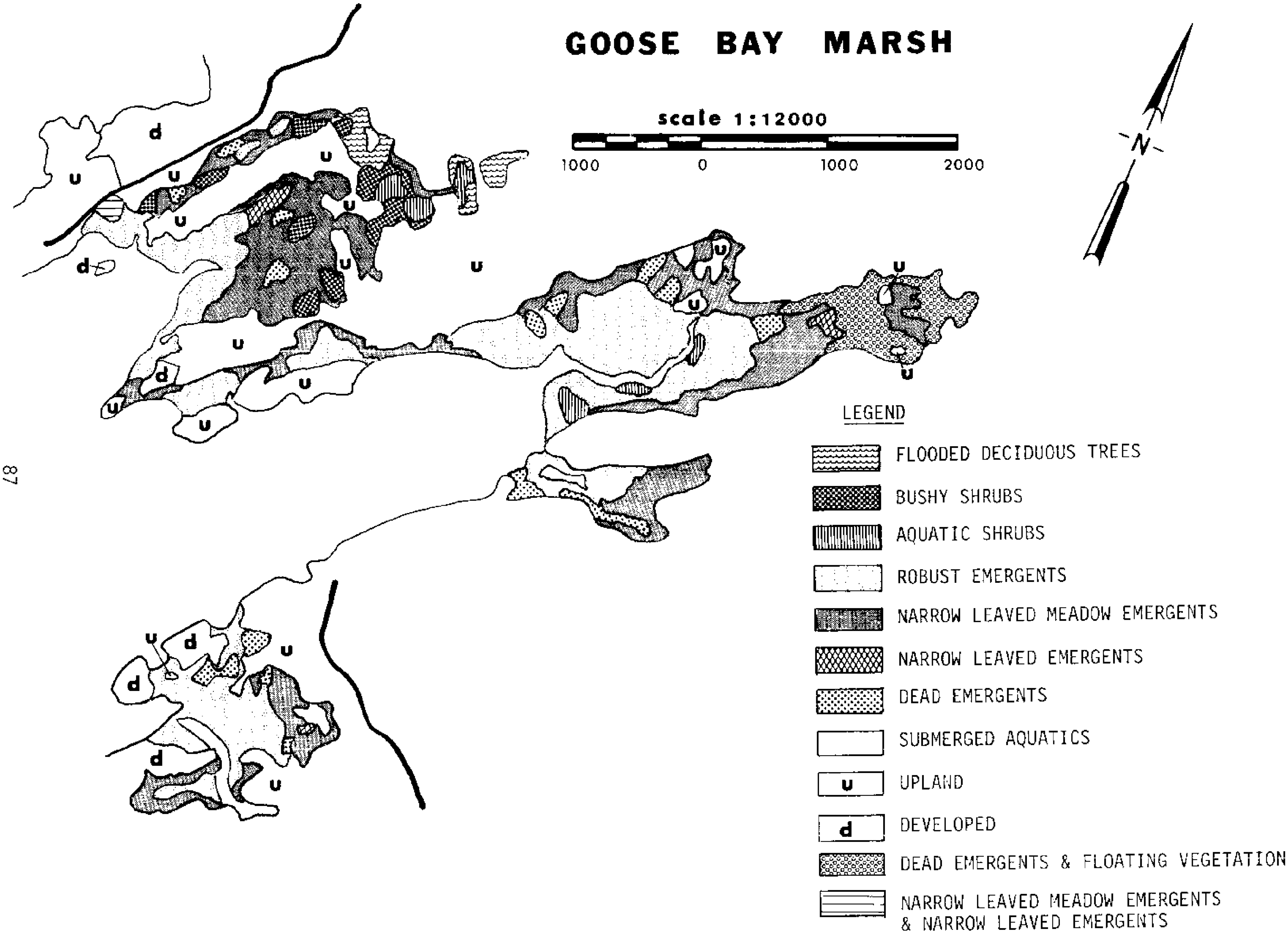
GOOSE BAY MARSH
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LEGEND
FLOODED DECIDUOUS TREES
BUSHY SHRUBS
AQUATIC SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
NARROW LEAVED EMERGENTS
DEAD EMERGENTS
SUBMERGED AQUATICS
u UPLAND
d DEVELOPED
DEAD EMERGENTS & FLOATING VEGETATION
NARROW LEAVED MEADOW EMERGENTS & NARROW LEAVED EMERGENTS

Table 32. Characteristics of Westminster Marsh.

UTM COORDINATES: 0424-4911, 0426-4911, 0426-4910, 0424-4910.

TOWN: Alexandria USGS QUAD SHEET: Alexandria Bay

DESCRIPTION:

Westminster Marsh is located at the northeastern end of Wellesley Island on property owned by the Thousand Island Club. This streamside wetland has been modified repeatedly over the years to conform to the land use needs of that organization. Existing vegetation occurs along a tributary stream which has been well channelized, resulting in high banks and a restricted flood plain. Other bridges and landfills associated with the golf course also impact the wetland. The major vegetative feature is a sparse submergent complex occurring in the warm, turbid waters of the stream. Emergents form narrow strips along the banks in places, and a large patch of cattail has recently colonized the mouth of the tributary.

COVER TYPE	ACRES
Bushy Shrubs	2.3
Robust Emergents	11.7
Narrow Leaved Meadow Emergents	3.7
Narrow Leaved Emergents	0.2
Floating Leaved Vegetation	0.3
Submerged Aquatics	29.5
Enclosed Upland	2.3
TOTAL	50.0

WESTMINSTER MARSH

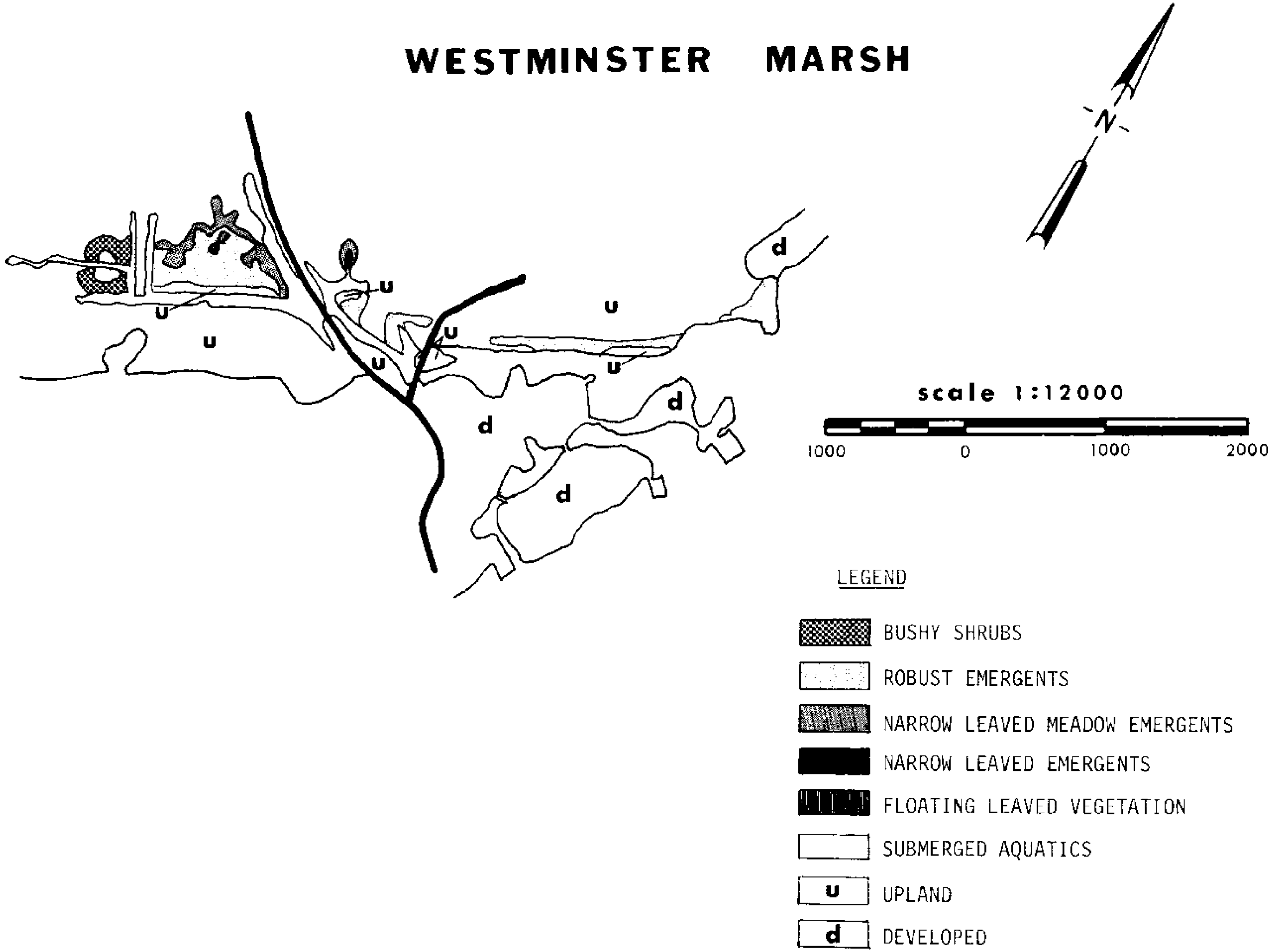


Table 33. Characteristics of Barnett Marsh.

UTM COORDINATES: 0422-4910, 0423-4910, 0423-4907, 0422-4907.

TOWN: Alexandria USGS QUAD SHEET: Alexandria Bay

DESCRIPTION:

Barnett Marsh is a streamside wetland which occupies the broad flood plain of a tributary stream flowing into Lake of the Isles. It is somewhat isolated from the flow of the St. Lawrence since Lake of the Isles is almost completely enclosed by Wellesley Island. Surrounding uplands are forested and shallow to bedrock. Development has been minimal, and the wetland is in a superb state of preservation. The vegetation present exhibits a greater variety than is common to other streamside systems. There is some evidence of periodic beaver activity, and the temporary impoundment of water by beaver could explain the mixture of cover types present in the wetland.

COVER TYPE	ACRES
Flooded Deciduous Trees	3.6
Bushy Shrubs	10.7
Aquatic Shrubs	11.7
Robust Emergents	48.3
Narrow Leaved Meadow Emergents	31.3
Dead Emergents	1.2
Submerged Aquatics	26.3
Dead Emergents and Floating Vegetation	12.5
Narrow Leaved Meadow Emergents and Bushy Shrubs	6.4
TOTAL	152.0

BARNETT MARSH

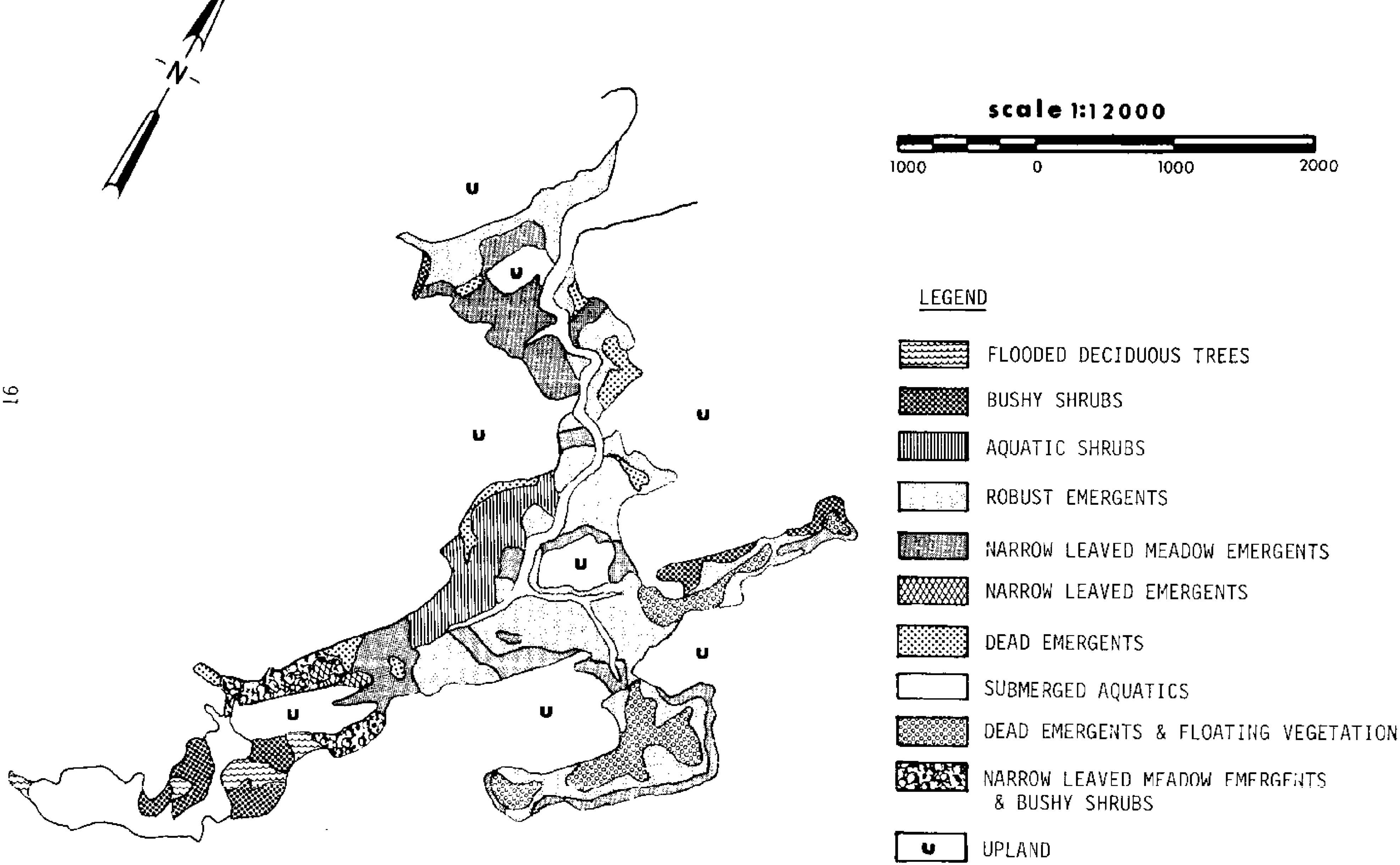


Table 34. Characteristics of Otter Point Marsh.

UTM COORDINATES: 0419-4908, 0421-4908, 0421-4907, 0419-4907.

TOWN: Orleans USGS QUAD SHEET: Thousand Island Park

DESCRIPTION:

This small wetland system is located in a bay at the southwestern end of Lake of the Isles. A road across the middle of the wetland separates it into two systems. While a culvert is present beneath the road, it does not allow for communication of water freely between the two segments. Thus, road construction activities have modified this unit into two hydrologically separate units: one flood pond with slow subsurface drainage, and one bayside system of limited extent.

COVER TYPE	ACRES
Tall Slender Shrubs	0.9
Robust Emergents	3.8
Narrow Leaved Meadow Emergents	0.8
Dead Emergents	3.9
Floating Leaved Vegetation	1.3
Submerged Aquatics	0.7
Floating Vegetation and Submerged Aquatics	1.7
TOTAL	13.1

OTTER POINT MARSH

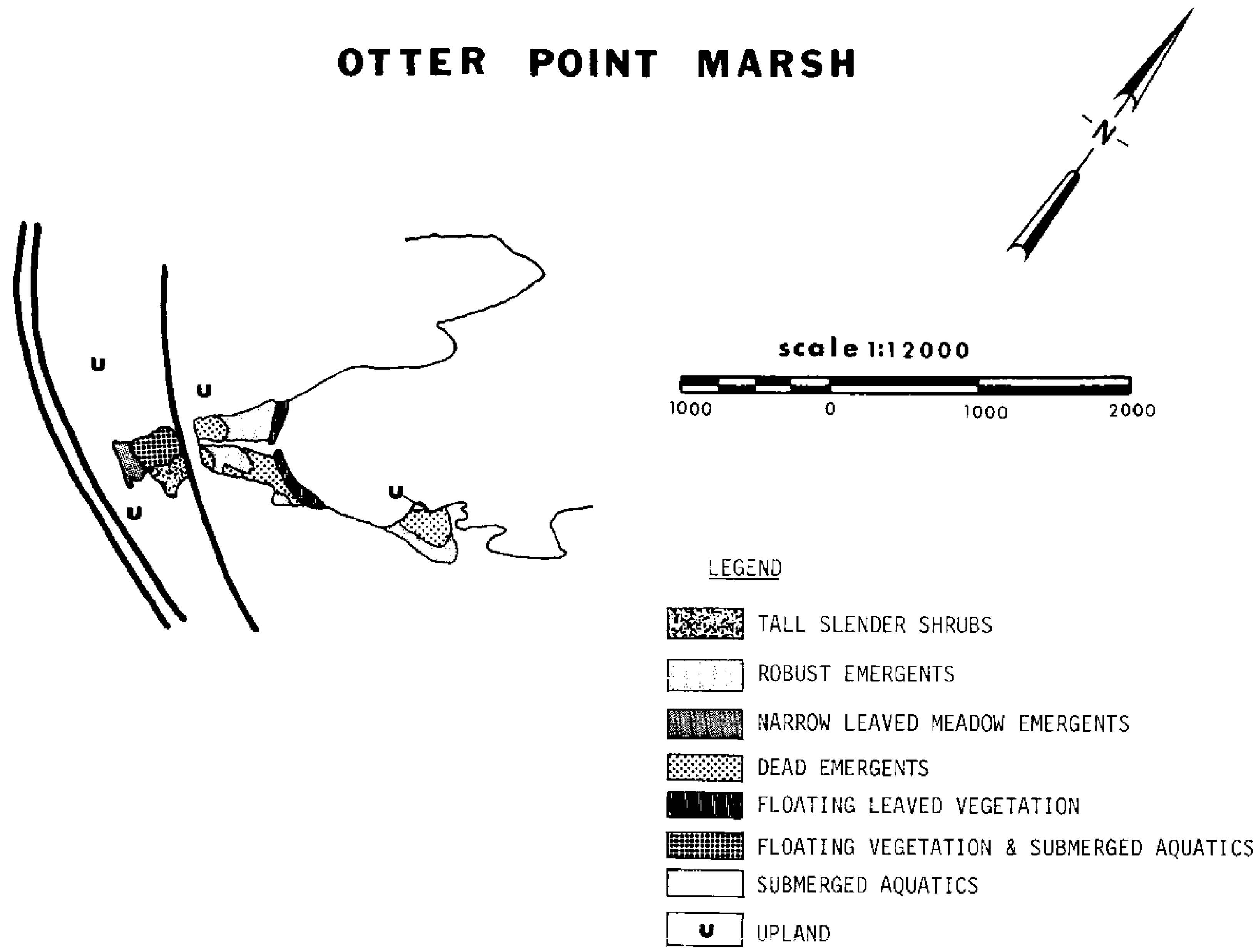


Table 35. Characteristics of Eel Bay Marshes.

UTM COORDINATES: 0418-4909, 0420-4909, 0420-4907, 0418-4907.

TOWN: Orleans USGS QUAD SHEET: Thousand Island Park

DESCRIPTION:

Eel Bay Marshes span the thin peninsula of land that separates Lake of the Isles from the main stream of the St. Lawrence River to the southwest. At one time water may have flowed across the peninsula through the wetland. However, road construction, both within the state park and along the interstate highway, has segmented the system into a series of units without hydrologic continuity. The segment facing Lake of the Isles appears to respond like other bay-side systems in the region, and the other segments appear to behave like flood ponds without functional outlets. Vegetative readjustment is occurring following widespread death in emergent communities related to impoundment. Vegetative interspersion is high as is the number of unusual compositional mixtures.

COVER TYPE	ACRES
Flooded Deciduous Trees	3.4
Dead Flooded Deciduous Trees	4.2
Tall Slender Shrubs	9.2
Bushy Shrubs	14.8
Aquatic Shrubs	1.0
Robust Emergents	39.5
Narrow Leaved Meadow Emergents	17.3
Narrow Leaved Emergents	1.4
Dead Emergents	5.4
Floating Leaved Vegetation	4.6
Submerged Aquatics	13.4
Flooded and Dead Flooded Deciduous Trees	2.8
Floating Vegetation and Dead Emergents	6.3
Floating Leaved Vegetation and Robust Emergents	1.2
Floating Leaved Vegetation and Broad Leaved Emergents	10.3
Floating Leaved Vegetation and Dead Emergents	2.0
Floating Leaved Vegetation and Submerged Aquatics	9.8
Enclosed Upland	15.4
TOTAL	162.0

EEL BAY MARSHES

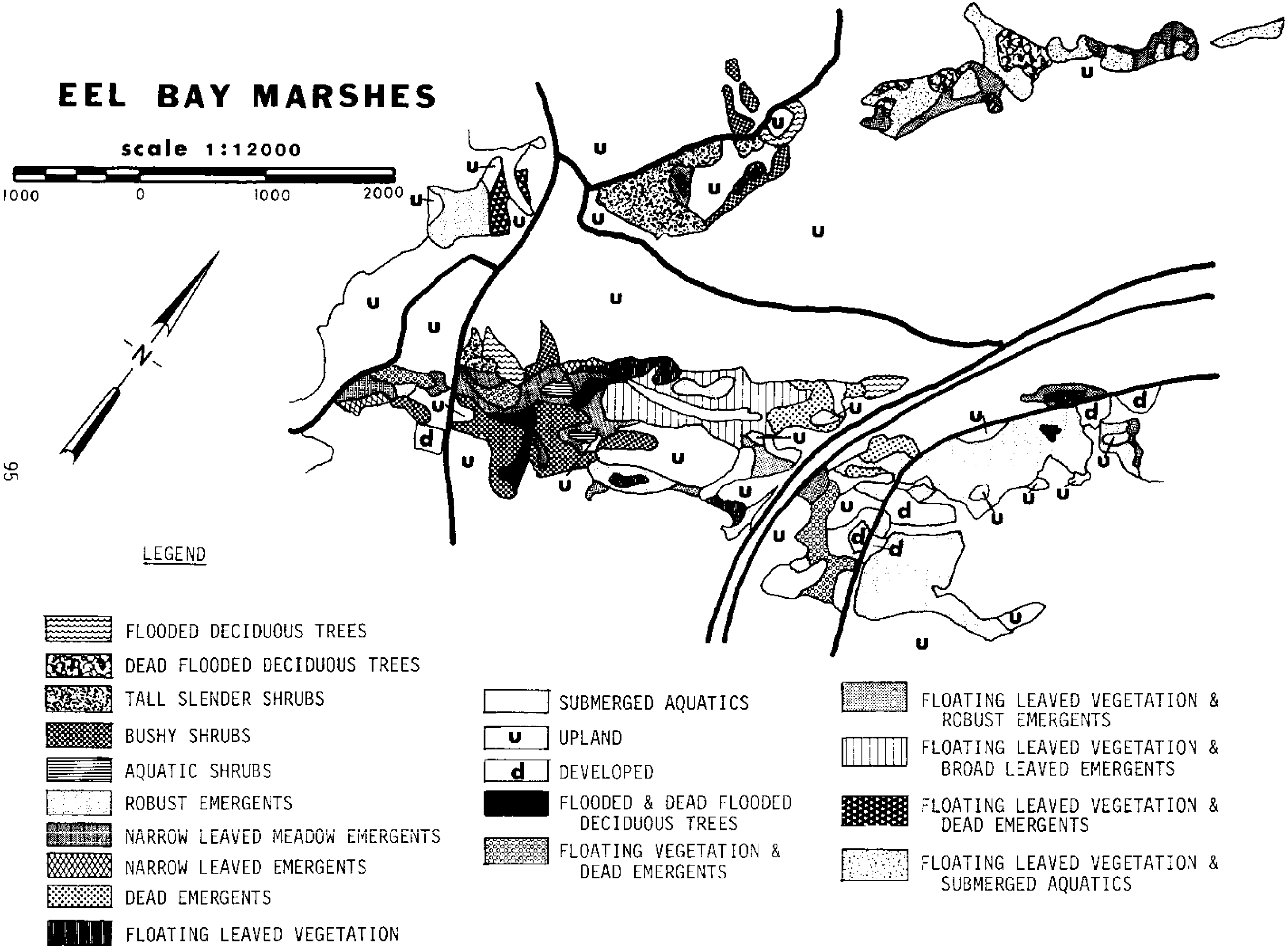


Table 36. Characteristics of Rift Marsh.

UTM COORDINATES: 0420-4911, 0421-4911, 0421-4909, 4020-4909.

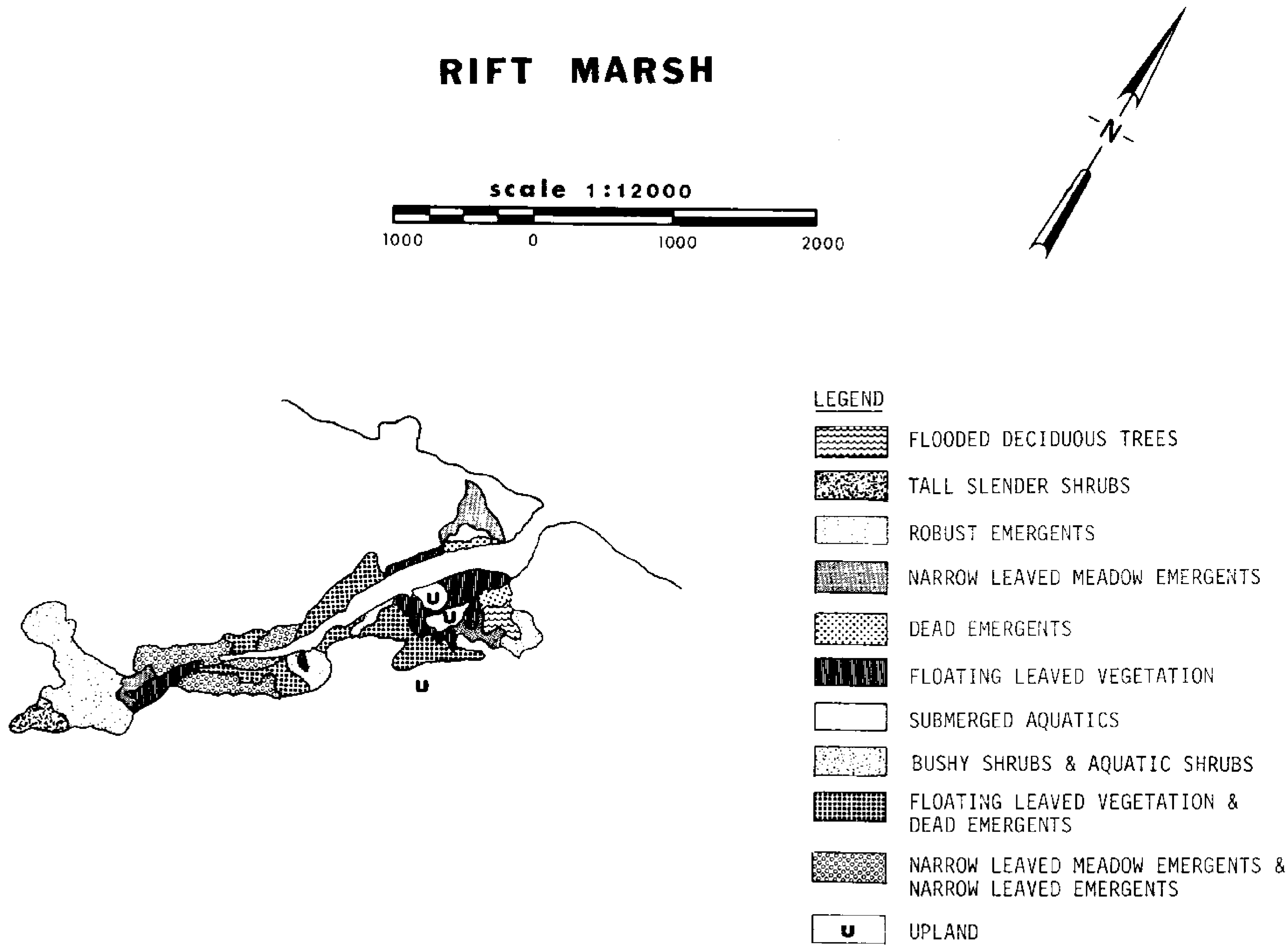
TOWN: Orleans USGS QUAD SHEET: Alexandria Bay

DESCRIPTION:

Rift Marsh is located along a narrow bay into Wellesley Island from a channel or "rift" that separates Wellesley from the adjacent Canadian Hill Island. The wetland continues further inland along a narrow tributary stream. There is some evidence of beaver impoundments near the rear of the system, and there has been substantial emergent death due to recent high water. Since river levels control the moisture status of the wetland throughout its extent, the system is best considered a bayside rather than a streamside wetland.

COVER TYPE	ACRES
Flooded Deciduous Trees	1.0
Tall Slender Shrubs	1.5
Robust Emergents	2.2
Narrow Leaved Meadow Emergents	3.8
Dead Emergents	1.1
Floating Leaved Vegetation	6.4
Submerged Aquatics	8.0
Bushy Shrubs and Aquatic Shrubs	9.0
Floating Leaved Vegetation and Dead Emergents	9.7
Narrow Leaved Meadow Emergents and Narrow Leaved Emergents	6.1
Enclosed Upland	1.4
TOTAL	50.2

RIFT MARSH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LEGEND
FLOODED DECIDUOUS TREES
TALL SLENDER SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
DEAD EMERGENTS
FLOATING LEAVED VEGETATION
SUBMERGED AQUATICS
BUSHY SHRUBS & AQUATIC SHRUBS
FLOATING LEAVED VEGETATION & DEAD EMERGENTS
NARROW LEAVED MEADOW EMERGENTS & NARROW LEAVED EMERGENTS
UPLAND

Table 37. Characteristics of Flatiron Marsh.

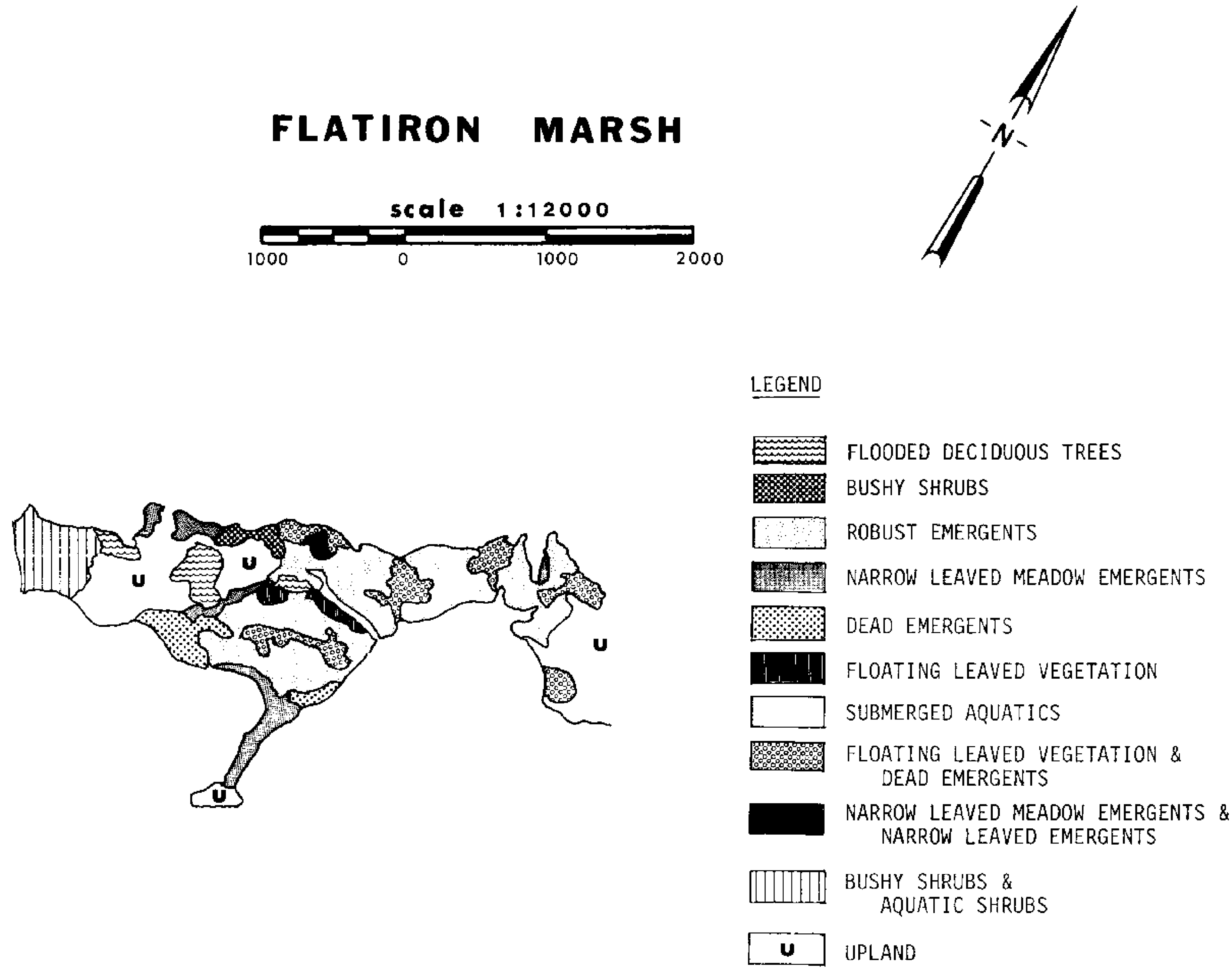
UTM COORDINATES: 0416-4909, 0418-4909, 0418-4907, 0416-4907.

TOWN: Orleans USGS QUAD SHEET: Thousand Island Park

DESCRIPTION:

Flatiron Marsh is an emergent wetland system which has developed in shallow waters at the northern edge of Eel Bay on Wellesley Island. The robust emergent mapping unit is the most extensive, and cattails matted together by overlapping rhizomes form a weakly-anchored wetland edge. Although the bay is somewhat protected, wave action regularly causes this mat to break apart and become redistributed. The surrounding land is in forest or dense shrubs.

COVER TYPE	ACRES
Flooded Deciduous Trees	3.7
Bushy Shrubs	1.4
Robust Emergents	25.4
Narrow Leaved Meadow Emergents	6.5
Dead Emergents	4.1
Floating Leaved Vegetation	1.5
Submerged Aquatics	1.6
Floating Leaved Vegetation and Dead Emergents	9.6
Narrow Leaved Meadow Emergents and Narrow Leaved Emergents	0.6
Bushy Shrubs and Aquatic Shrubs	6.5
TOTAL	60.9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LEGEND
FLOODED DECIDUOUS TREES
BUSHY SHRUBS
ROBUST EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
DEAD EMERGENTS
FLOATING LEAVED VEGETATION
SUBMERGED AQUATICS
FLOATING LEAVED VEGETATION & DEAD EMERGENTS
NARROW LEAVED MEADOW EMERGENTS & NARROW LEAVED EMERGENTS
BUSHY SHRUBS & AQUATIC SHRUBS
U
UPLAND

Table 38. Characteristics of South Bay Marsh.

UTM COORDINATES: 0417-4906, 0419-4906, 0419-4904, 0417-4904.

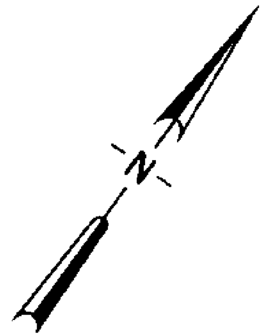
TOWN: Orleans USGS QUAD SHEET: Thousand Island Park

DESCRIPTION:

South Bay Marsh is a small bayside wetland on the southeastern end of Wellesley Island facing the main channel of the St. Lawrence River. Emergent vegetation forms a thin band along the shoreline of the bay, with robust emergents being the dominant cover type. While submerged vegetation occurring between the arms of shoreline emergents is included in our data, an extensive submergent zone is present beyond these artificial limits. The surrounding upland is mostly forested, and recent filling has occurred along the eastern edge.

COVER TYPE	ACRES
Flooded Deciduous Trees	0.5
Dead Flooded Deciduous Trees	0.5
Robust Emergents	8.7
Narrow Leaved Meadow Emergents	2.1
Dead Emergents	1.1
Submerged Aquatics	38.0
Narrow Leaved Emergents	0.1
Floating Leaved Vegetation	0.1
Enclosed Upland	1.7
TOTAL	52.8

SOUTH BAY MARSH



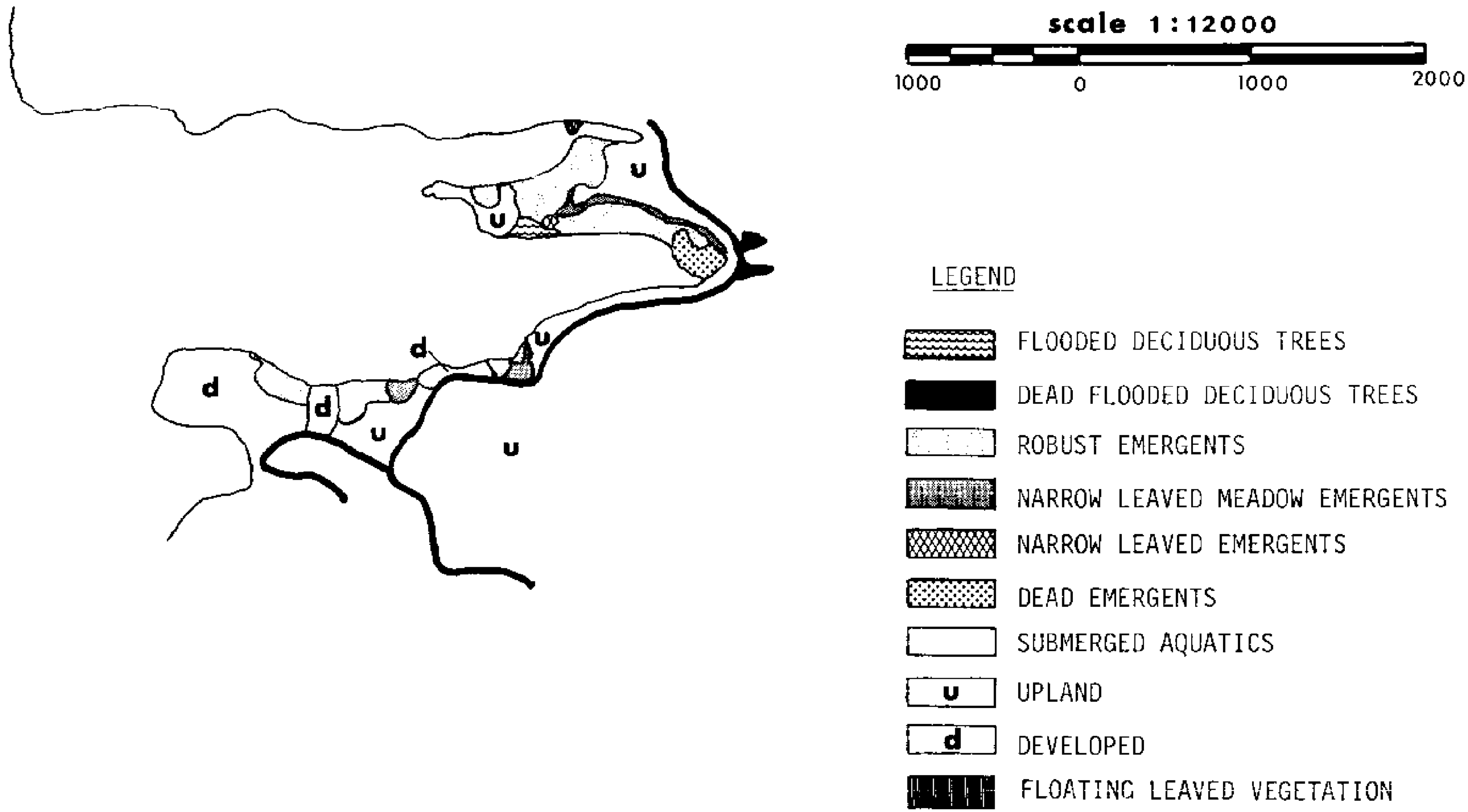


Table 39. Characteristics of Delaney Marsh.

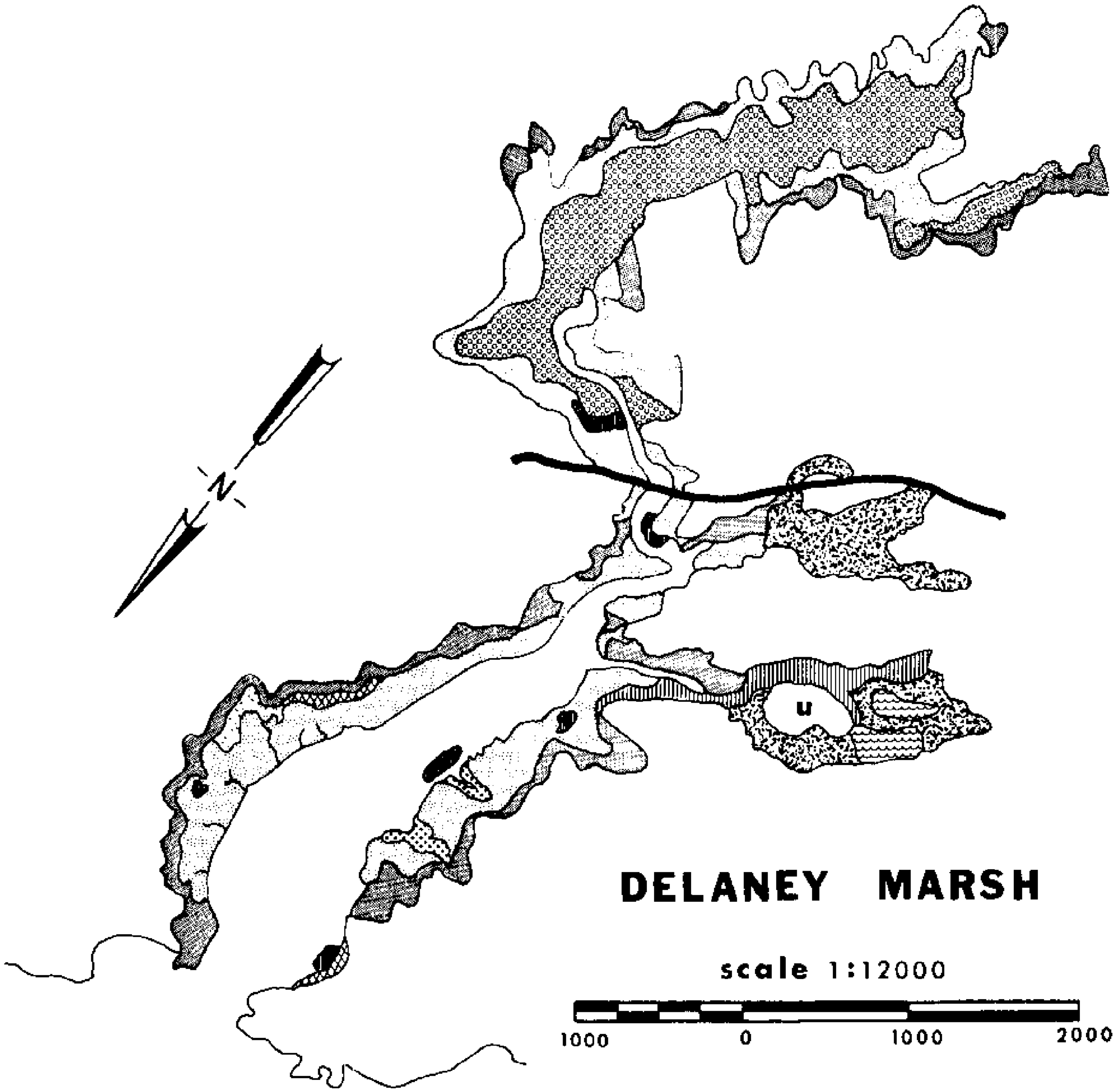
UTM COORDINATES: 0412-4906, 0414-4906, 0414-4903, 0412-4903.

TOWN: Clayton USGS QUAD SHEET: Thousand Island Park

DESCRIPTION:

Of the three large wetlands on Grindstone Island, Delaney Marsh contains the greatest concentration of emergent vegetation. Emergent communities form a narrow band along the edges of the bay and extend inland further in the flood plains of the three tributaries which flow into the bay. As such, the marsh contains elements of both bayside and streamside systems. A road crosses the wetland at its middle, and construction activity at that point has resulted in the impoundment of water upstream. A 35 acre dead emergent zone appears related to this recent modification. The wetland is surrounded by shrubby fields and pasture land. With the exception of the road, there has been little encroachment into the wetland.

COVER TYPE	ACRES
Flooded Deciduous Trees	2.7
Tall Slender Shrubs	16.9
Robust Emergents	60.2
Dead Emergents	1.8
Submerged Aquatics	44.8
Floating Leaved Vegetation	2.6
Narrow Leaved Meadow Emergents	32.3
Narrow Leaved Emergents	2.0
Dead Emergents and Floating Vegetation	35.6
Narrow Leaved Emergents and Floating Leaved Vegetation	1.4
Narrow Leaved Meadow Emergents and Floating Leaved Vegetation	6.2
Enclosed Upland	3.0
TOTAL	209.5



LEGEND

- FLOODED DECIDUOUS TREES
- TALL SLENDER SHRUBS
- ROBUST EMERGENTS
- DEAD EMERGENTS
- SUBMERGED AQUATICS
- u UPLAND
- FLOATING LEAVED VEGETATION
- NARROW LEAVED MEADOW EMERGENTS
- NARROW LEAVED EMERGENTS
- DEAD EMERGENTS & FLOATING VEGETATION
- NARROW LEAVED EMERGENTS & FLOATING LEAVED VEGETATION
- NARROW LEAVED MEADOW EMERGENTS & FLOATING LEAVED VEGETATION

Table 40. Characteristics of McCrae Marsh.

UTM COORDINATES: 0409-4905, 0411-4905, 0411-4903, 0409-4903.

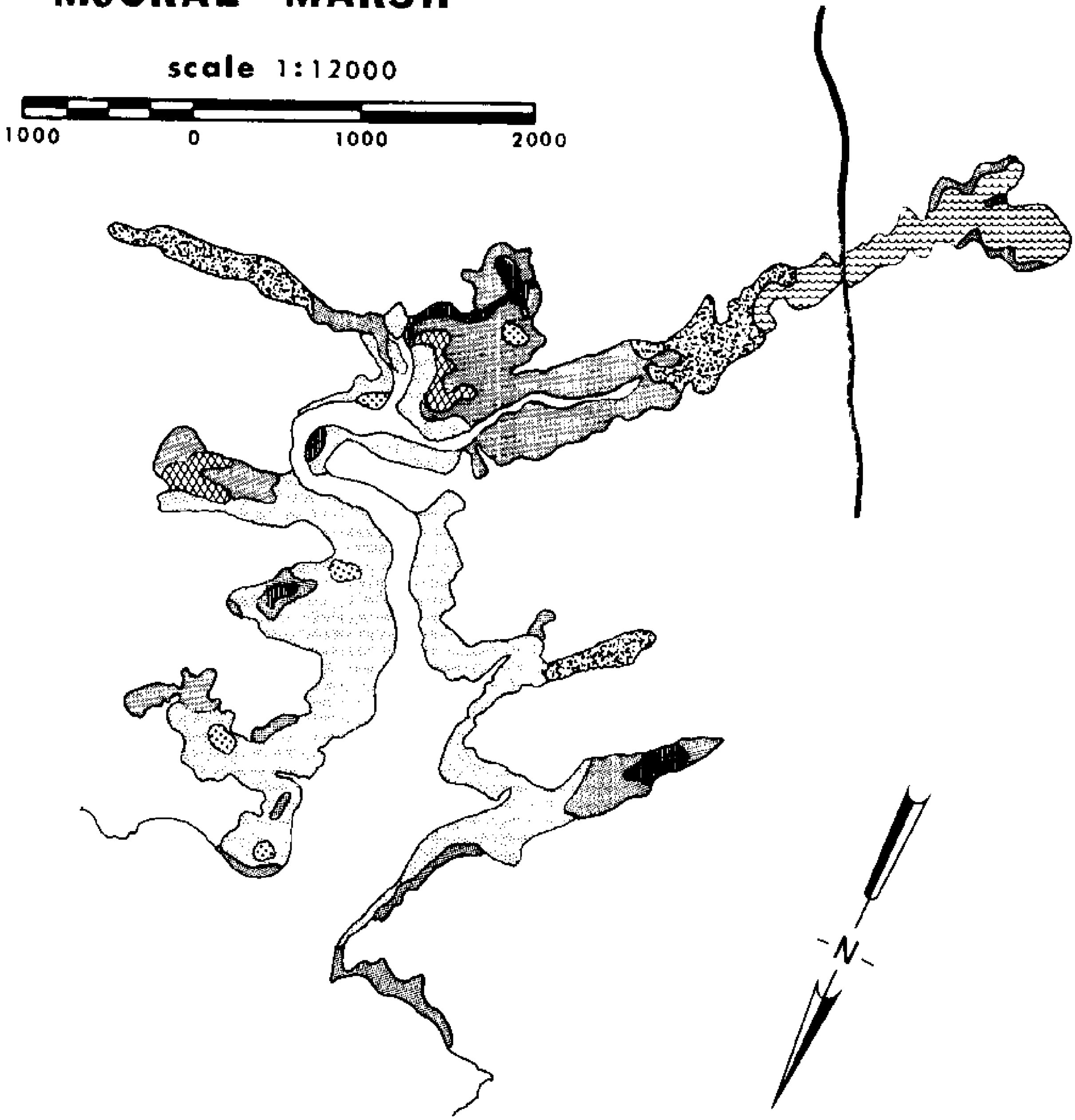
TOWN: Clayton USGS QUAD SHEET: Gananoque, Ontario

DESCRIPTION:

McCrae Marsh is also located on Grindstone Island and is quite similar in general appearance to Delaney Marsh. The bay section is wider at its mouth and the gradation to the upland is more abrupt, resulting in a simpler emergent complex. Greater vegetative variety occurs along the inland extensions in tributary flood plains. Woody communities are well represented in these areas, and interspersion is higher. Although there has been some grazing livestock in the emergent meadows, the wetland is more isolated and less impacted than Delaney Marsh.

COVER TYPE	ACRES
Flooded Deciduous Trees	11.4
Tall Slender Shrubs	13.1
Robust Emergents	52.7
Dead Emergents	1.8
Narrow Leaved Meadow Emergents	38.2
Narrow Leaved Emergents	3.1
Floating Leaved Vegetation	3.9
Submerged Aquatics	40.5
TOTAL	164.7

McCRAE MARSH



LEGEND

FLOODED DECIDUOUS TREES	NARROW LEAVED MEADOW EMERGENTS
TALL SLENDER SHRUBS	NARROW LEAVED EMERGENTS
ROBUST EMERGENTS	FLOATING LEAVED VEGETATION
DEAD EMERGENTS	SUBMERGED AQUATICS

Table 41. Characteristics of Flynn Bay Marsh.

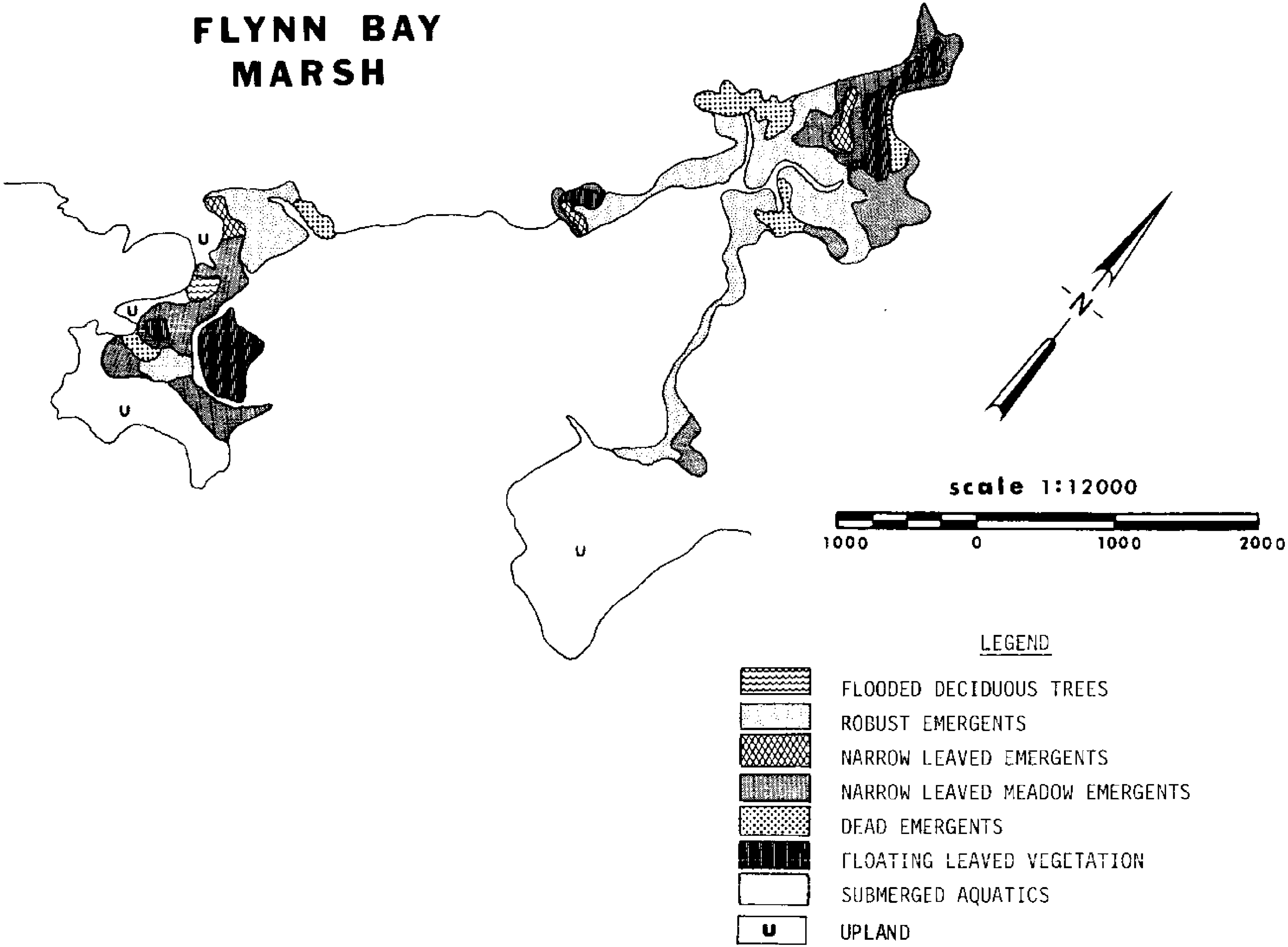
UTM COORDINATES: 0408-4902, 0410-4902, 0410-4900, 0408-4900.

TOWN: Clayton USGS QUAD SHEET: Gananoque, Ontario

DESCRIPTION:

Flynn Bay Marsh has developed around the periphery of a wide-mouth bay facing the main channel of the St. Lawrence River. It has the smallest emergent vegetation area of the three Grindstone Island wetlands. However, when the extensive submergent zone at bay center is included, it has the greatest total wetland area. The bay is exposed to current and wave action, and submergent vegetation is sparse. The surrounding uplands are rocky and covered with poor pasture and shrubby fields.

COVER TYPE	ACRES
Flooded Deciduous Trees	0.8
Robust Emergents	31.2
Narrow Leaved Meadow Emergents	25.4
Narrow Leaved Emergents	2.8
Dead Emergents	7.5
Floating Leaved Vegetation	10.0
Submerged Aquatics	157.8
TOTAL	235.5


FLYNN BAY
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LEGEND
FLOODED DECIDUOUS TREES
ROBUST EMERGENTS
NARROW LEAVED EMERGENTS
NARROW LEAVED MEADOW EMERGENTS
DEAD EMERGENTS
FLOATING LEAVED VEGETATION
SUBMERGED AQUATICS
UPLAND
U

types. In general, they range from 1 to 20 acres in size. The only exceptions occur along the eight emergent wetland segments identified as components of the Black River complex. When combined these segments represent 227 acres.

The Black River complex is inadequately described in this report, due to the unavailability of color imagery for the area and limitations of black and white photographs. It occurs as a well intermixed assemblage of submerged and robust emergent communities on shallow sediments at the mouth of the Black River in Black River Bay. The wetland probably exceeds 1200 acres, although the actual extent of the submerged components cannot be accurately assessed without color photography. It is one of the largest and most significant wetlands along the shoreline, supporting a significant warm water fishery and serving as an important feeding and resting location for migratory waterfowl (Werner and Ford 1972, Webb et al. 1972).

Wetland Area Along the Shoreline

By combining the areas occupied by large and smaller wetlands, an estimate of 7742 acres of lake level-influenced wetlands is obtained for the Jefferson County shoreline. Over 93 percent of this total is represented in the 41 larger wetland segments, while the remainder occurs as isolated emergent units.

A frequency analysis of wetland numbers by size classes is given in Table 43. It was obtained by combining contiguous units and scoring them according to the arbitrary class limits given in the table. In this way, the Black River complex was treated as one unit, as was the Black Pond-Little Stony complex (Tables 6 and 7) and the Lakeview Wildlife Management Area-Southwick Beach State Park complex (Tables 2-5). The mean wetland size from these data (7742 acres divided among 89 units) is 87.0 acres.

The actual area of wetlands and aquatic habitats along the shoreline must include the shallow waters which support or could support submerged aquatic communities. Although we have not attempted to determine the limits of these littoral systems, our study suggests that this could accurately be accomplished with color aerial photographs. An approximation could be obtained by combining all areas within the 6 meter depth contour on NOAA Nautical Charts. Islands and shoals should be included as well as areas along the mainland shoreline.

Dead Vegetation

Higher than normal water levels occurred along Lake Ontario and the St. Lawrence River during 1972, 1973, and 1974, resulting in severe damage to riparian land owners and the natural environment. An

Table 42. Location and Description of Smaller Wetlands Along the Jefferson County Shoreline.

UTM Coordinates Quad Sheet/Town	Area By Cover					
	Flooded Trees	Shrubs	Emer-gents	Floating Vegetation	Submerged Aquatics	Total
0400-4852, 0401-4852 0401-4851, 0400-4851 Henderson/Ellisburg	-	-	3.1	.5	.2	3.8
0395-4857, 0396-4857 0396-4855, 0395-4855 Stony Point/Henderson	-	-	1.6	.5	-	2.1
0398-4860, 0400-4860 0400-4859, 0398-4859 Point Peninsula/Lyme	-	-	3.5	-	-	3.5
0402-4856, 0403-4856 0403-4855, 0402-4855 Henderson/Henderson	-	-	5.9	.5	.2	6.6
0409-4862, 0410-4862 0410-4861, 0409-4861 Henderson Bay and Sackets Harbor/Henderson	-	.9	3.0	-	.2	4.1
0409-4866, 0410-4866 0410-4864, 0409-4864 Henderson Bay/Hounsfield	-	2.4	8.7	-	.4	11.5
0409-4866, 0410-4866 0410-4864, 0409-4864 Henderson Bay/Hounsfield	1.2	.2	13.1	.5	.6	15.6
0412-4870, 0414-4870 0414-4869, 0412-4869 Sackets Harbor/ Hounsville	-	1.2	13.9	-	.2	15.3
0413-4869, 0414-4869 0414-4868, 0413-4868 Sackets Harbor/ Hounsville	-	2.8	16.7	2.4	1.2	23.1 *

Table 42. Continued.

UTM Coordinates Quad Sheet/Town	Area By Cover: Flooded Trees	Shrubs	Emergents	Floating Vegetation	Submerged Aquatics	Total
0414-4869, 0415-4869 0415-4868, 0414-4868 Sackets Harbor/ Hounsville	-	.6	29.2	-	1.6	31.4 *
0414-4870, 0416-4870 0416-4869, 0414-4869 Sackets Harbor/ Hounsville	1.0	1.1	21.0	-	18.4	41.5 *
0416-4870, 0417-4870 0417-4869, 0416-4869 Sackets Harbor/ Hounsville	3.0	-	2.3	-	.8	5.1
0414-4871, 0415-4871 0415-4870, 0414-4870 Sackets Harbor/ Brownville	-	5.5	36.1	-	.3	41.9 *
0412-4872, 0413-4872 0413-4871, 0412-4871 Sackets Harbor/ Brownville	-	.8	7.9	-	.3	9.0 *
0413-4872, 0415-4872 0415-4871, 0413-4871 Sackets Harbor/ Hounsfield	-	2.7	33.3	6.2	6.9	49.1 *
0414-4873, 0415-4873 0415-4872, 0414-4872 Sackets Harbor/ Brownville	-	1.7	11.9	-	1.6	15.2 *
0413-4874, 0415-4874 0415-4872, 0413-4872 Dexter/Brownville	-	1.6	10.2	-	-	11.8
0412-4873, 0414-4873 0414-4872, 0412-4872 Sackets Harbor/ Brownville	-	-	15.7	-	.4	16.1 *

Table 42. Continued

UTM Coordinates Quad Sheet/Town	Area By Cover Flooded Trees	Shrubs	Emer-gents	Floating Vegetation	Submerged Aquatics	Total
0408-4869, 0409-4869 0409-4868, 0408-4868 Henderson Bay/ Brownville	-	-	.6	-	.3	.9
0404-4873, 0405-4873 0405-4872, 0404-4872 Henderson Bay/ Brownville	-	2.0	3.3	.4	-	5.7
0409-4877, 0410-4877 0410-4876, 0409-4876 Chaumont/Lyme	-	-	1.0	-	-	1.0
0409-4880, 0410-4880 0410-4879, 0409-4879 Chaumont/Lyme	-	-	9.4	-	1.1	10.5
0407-4880, 0408-4880 0408-4879, 0407-4879 Chaumont/Lyme	-	-	3.7	-	1.6	5.3
0406-4880, 0407-4880 0407-4879, 0406-4879 Chaumont/Lyme	-	-	1.9	-	.8	2.7
0404-4880, 0405-4880 0405-4878, 0404-4878 Chaumont/Lyme	-	.6	2.0	-	.3	2.9
0401-4880, 0402-4880 0402-4879, 0401-4879 Chaumont/Lyme	-	-	3.6	-	-	3.6
0400-4880, 0401-4880 0401-4879, 0406-4879 Chaumont/Lyme	-	-	2.3	-	.2	2.5
0398-4878, 0399-4878 0399-4877, 0398-4877 Cape Vincent South/Lyme	-	-	1.0	-	.4	1.4

Table 42. Continued.

UTM Coordinates Quad Sheet/Town	Area By Cover					
	Flooded Trees	Shrubs	Emer-gents	Floating Vegetation	Submerged Aquatics	Total
0397-4877, 0398-4877 0398-4876, 0397-4876 Cape Vincent South/Lyme	-	.9	8.7	-	1.5	11.1
0396-4875, 0398-4875 0398-4874, 0396-4874 Cape Vincent South/Lyme	-	-	2.5	-	2.3	4.8
0402-4876, 0403-4876 0403-4875, 0402-4875 Chaumont/Lyme	1.4	.5	3.6	-	-	5.5
0403-4876, 0404-4876 0404-4875, 0403-4875 Chaumont/Lyme	-	1.8	2.3	.9	-	5.0
0398-4871, 0399-4871 0399-4870, 0398-4870 Point Peninsula/Lyme	-	-	4.4	1.3	2.9	8.6
0395-4875, 0396-4875 0396-4874, 0395-4874 Cape Vincent South/Lyme	-	6.9	-	1.3	-	8.2
0391-4881, 0392-4881 0392-4880, 0391-4880 Cape Vincent South/ Cape Vincent	-	.5	2.0	-	-	2.5
0391-4881, 0392-4881 0392-4880, 0391-4880 Cape Vincent South/ Cape Vincent	-	.4	-	-	-	.4
0397-4891, 0398-4891 0398-4889, 0397-4889 Cape Vincent North/ Cape Vincent	-	1.9	1.4	-	.1	3.4
0400-4992, 0401-4992 0401-4990, 0400-4990 St. Lawrence/Cape Vincent	-	-	1.6	-	.1	1.7

Table 42. Continued

UTM Coordinates Quad Sheet/Town	Area By Cover Flooded Trees	Shrubs	Emer-gents	Floating Vegetation	Submerged Aquatics	Total
0403-4895, 0404-4895 0404-4894, 0403-4894 St. Lawrence/Clayton	-	1.1	.7	-	-	1.8
0413-4899, 0414-4899 0414-4898, 0413-4898 Clayton/Clayton	-	-	1.8	-	-	1.8
0414-4900, 0415-4900 0415-4899, 0414-4899 Clayton/Clayton	-	-	2.1	.3	-	2.4
0419-4904, 0421-4904 0421-4903, 0419-4903 Thousand Island Park/ Orleans	-	-	4.6	-	-	4.6
0423-4907, 0424-4907 0424-4906, 0423-4906 Alexandria Bay/ Alexandria	-	-	5.4	-	.2	5.6
0426-4909, 0428-4909 0428-4908, 0426-4908 Alexandria Bay/ Alexandria	-	-	15.3	-	3.0	18.3
0427-4911, 0428-4911 0428-4910, 0427-4910 Alexandria Bay/ Alexandria	-	-	1.7	-	-	1.7
0428-4912, 0429-4912 0429-4910, 0428-4910 Alexandria Bay/ Alexandria	-	-	6.4	-	.6	7.0
0431-4913, 0432-4913 0432-4912, 0431-4912 Redwood/Alexandria	-	-	4.8	-	-	4.8

Table 42. Continued.

UTM Coordinates Quad Sheet/Town	Area By Cover: Flooded Trees	Shrubs	Emergents	Floating Vegetation	Submerged Aquatics	Total
0425-4912, 0427-4912 0427-4911, 0425-4911 Alexandria Bay/ Alexandria	-	2.7	15.6	-	-	18.3
0423-4911, 0424-4911 0424-4910, 0423-4910 Alexandria Bay/ Alexandria	-	-	2.5	-	-	2.5
0421-4911, 0423-4911 0423-4910, 0421-4910 Alexandria Bay/Orleans	-	.3	11.5	-	1.0	12.8
0406-4114, 0406-4115 0405-4115, 0405-4114 Thousand Island Park/ Clayton	-	-	12.4	-	3.1	15.5
0406-4114, 0406-4115 0405-4115, 0405-4114 Thousand Island Park/ Clayton	-	-	6.0	-	3.8	9.8
0414-4905, 0415-4905 0415-4904, 0414-4904 Thousand Island Park/ Clayton	-	-	1.4	-	1.3	2.7
0413-4903, 0414-4903 0414-4902, 0413-4902 Thousand Island Park/ Clayton	-	-	1.0	-	.4	1.4
0412-4903, 0413-4903 0413-4902, 0412-4902 Thousand Island Park/ Clayton	-	-	.7	-	.2	.9
0411-4903, 0412-4903 0412-4901, 0411-4901 Thousand Island Park/ Clayton	-	-	7.0	-	4.0	11.0

Table 42. Continued

UTM Coordinates Quad Sheet/Town	Area By Cover: Flooded Trees	Shrubs	Emer-gents	Floating Vegetation	Submerged Aquatics	Total
0410-4901, 0411-4901 0411-4900, 0410-4900 Thousand Island Park/ Clayton	-	-	.9	-	-	.9
0408-4901, 0409-4901 0409-4900, 0408-4900 Gananoque/Clayton	-	-	2.6	-	.6	3.2
0407-4902, 0409-4902 0409-4900, 0407-4900 Gananoque, Clayton	-	4.0	7.1	-	1.7	12.8
TOTALS	6.6	45.1	403.9	14.8	64.8	535.2

* Included within the Black River wetland complex.

Table 43. Distribution of Wetlands by Size Class along the Jefferson County Shoreline.

	Number of Wetlands			
Size Class, Acres	Large Units	Smaller Units	Total	Percent Total
1 - 10	1	39	40	44.9
10 - 20	4	12	16	18.0
20 - 50	6	-	6	6.7
50 - 100	10	-	10	11.2
100 - 500	14	1	15	16.9
500+	2	-	2	2.2
TOTAL	37	52	89	

analysis of these impacts and their origin has been prepared by the St. Lawrence-Eastern Ontario Commission (Palm 1975). Since field observations and quantitative studies were conducted during 1973 and 1974, we were able to make direct observations of high water impact during the development of inventory tools (see Cover Type Descriptions). As a result the area occupied by dead deciduous trees, dead shrubs, and dead emergents is identified on the maps for each wetland.

The extent of dead vegetation is tabulated in Table 44 for the larger shoreline wetlands. These figures represent recent vegetative dieback coincident with the most recent episode of high water (1972-1974). This conclusion is based on concurrent measurements of water levels and field reconnaissance throughout the period. The impact of water levels on community composition is considered in more detail in Gilman (1976).

A total of 769 acres of dead vegetation were inventoried in three broad cover categories. Most of the dieback (78.6 percent of the total dead area) occurred in the emergent cover types. While some die back would be expected to occur in individual systems each year along the shoreline, most of this total appears to be related to the synchronously high water levels throughout the lake-river system. A total of 10.7 percent of the total area contained dead vegetation. The fraction is higher (16.1 percent) when the area of dead emergents is equated to the total area of emergent vegetation in the 41 wetland segments. Also, the impact was highest in flood ponds, with less dead vegetation present in wetlands along bays and tributary streams.

In areas where the influence of high water was less prolonged, reduced dry matter production occurred rather than complete vegetative death. Gilman (1976) found that the net primary of narrow leaved meadow emergent communities averaged 735.8 g/m^2 (grams per square meter) in healthy streamside systems, 567.3 g/m^2 in a partially impacted flood pond community of similar composition, and 100.7 g/m^2 in dead emergent areas in the same flood pond system. These data are for above ground plant parts and are not adjusted for ash content. The dead community contained the previous years detritus, but little current growth of component grasses or sedges. Species composition was more similar to that of adjacent submerged aquatic communities, rather than partially impacted communities of meadow emergents.

A complete assessment of the impact of high water levels on wetland vegetation is far from simple. The short term response is swift, and reduced primary production or vegetative death are the immediate consequences. However, productivity appears to recover with equal rapidity if the high water episode is temporary. Visual inspection during 1975 and 1976 suggested that the standing crop biomass of previously dead areas approached that of non-impacted areas by the 1976 growing season. Community composition was markedly different, with *Sparganium eurycarpum* forming dense, monospecific

Table 44. Area of Dead Vegetation in Study Wetlands.

Wetland Name	Total Area, Acres	Area of Dead Vegetation in Acres				
		Emergents	Shrubs	Trees	Total Acres	Total %
Barnett	152.0	13.7			13.7	9.0
Black Pond	86.3	5.9			5.9	6.8
Blind Bay	68.9	3.2			3.2	4.6
Campbell	73.6	0.6		1.8	2.4	3.3
Colwell Ponds	656.9	28.8			28.8	4.4
Cranberry Pond	196.4			40.0	40.0	20.4
Delaney	209.5	37.4			37.4	17.9
Eel Bay	162.0	13.7		5.6	19.3	11.9
Flatiron	60.9	13.7			13.7	22.5
Flynn	235.5	7.5			7.5	3.2
Fox Creek	30.4	3.2			3.2	10.5
French Creek	675.5	121.3			121.3	18.0
Fuller Bay	11.6	0.2			0.2	1.7
Goose Bay	295.3	20.3			20.3	6.9
Goose Bay-Cranberry Creek	437.0	59.4			59.4	13.6
Guffin Bay	63.1	2.9			2.9	4.6
Isthmus	101.1	5.5			5.5	5.4
Kent Creek	299.6	6.8			6.8	2.3
Lakeview	589.0	35.0			35.0	6.0
Little Fox	62.6	4.8			4.8	7.7
Little Stony	340.0	8.6		43.0	51.6	15.2
Long Carry	18.6	3.1			3.1	16.7
McCrae	164.7	1.8			1.8	1.1
Moore Landing	38.9	4.6			4.6	11.8
Mud Bay	15.3	5.7			5.7	37.3
Otter Point	13.1	3.9			3.9	29.8
Point Peninsula	282.2	16.8		36.8	53.6	19.0
Point Peninsula North	41.1			6.6	6.6	16.1
Point Vivian	63.6	6.6			6.6	10.4
Ray Bay	27.7	8.4			8.4	30.3
Rift	50.2	10.8			10.8	21.5
Sandy Creek	1007.4	134.7			134.7	13.4
Sherwin Bay	76.5	4.4			4.4	5.8
South Bay	52.8	1.1		0.5	1.6	3.0
Southwick Beach	154.1		7.2		7.2	4.7
Stony Creek	93.6	5.6			5.6	6.0
Swan Bay	27.7	5.1			5.1	18.4
Westminster	50.0				0.0	0.0
Wilson Bay	209.5			22.8	22.8	10.9
Wilson Point	5.9				0.0	0.0
TOTAL	7206.6	605.1	7.2	157.1	769.4	10.7

stands in areas of prior dieback. Such revegetation and system repair would not be expected to occur if the impact was either periodic or perpetual. Although detailed studies have not been conducted, it appears that a temporary high water impact results in: reduced primary production or dieback, with some productivity recovery in 2 to 3 years; simplification of community composition and structure; and an increase in the interspersion of cover types within wetland systems. The long term effects are unknown.

The Evaluation of Shoreline Wetlands

Two regionally appropriate wetland evaluation systems were applied to each of the larger wetland segments. The Golet (1973) system utilizes 10 evaluation criteria, each of which represents an aspect of wetland character that encourages wildlife productivity and diversity. Each criterion is scaled by a simple ranking system with 3.0 as the highest score and 1.0 as the lowest score. Since some criteria are more important than others to wildlife production and diversity, the score is weighted by a significance coefficient (5 for the most significant criterion and 1 for the least important). The weighted scores are summed to yield a single, numerical index (range 38 to 108) which represents the relative wildlife value of the wetland.

An attractive feature of the system is that the evaluation criteria are incorporated into a companion classification system. Following classification to the full extent specified by the 10 qualifying criteria, evaluation becomes a routine numerical procedure. These classification/evaluation criteria, listed in order of decreasing significance, are: number of wetland classes, dominant wetland class, size, number of wetland subclasses, geomorphic position, surrounding habitats, the ratio of vegetation to water surface, interspersion, juxtaposition to other wetlands, and water alkalinity.

Golet suggests that his approach is designed for decision-makers. It utilizes uncomplicated, objective criteria, while remaining as sensitive as possible. While it is suitable for grouping wetlands for preservation and acquisition, he recognizes that other subjectively assessed criteria are also significant in that process. These would include uniqueness of the system, presence of rare biota, enhancement potential, and the character of present impacts.

A priority rating system for wetland acquisition has been developed by the New York State Department of Environmental Conservation (Anon. 1973). The system is described by the equation:

$$\text{Desirability for Acquisition} = 5(P \times V + A)$$

Where: P = productivity, rated 1-10
V = vulnerability, rated 1.0-1.5
A = additional points to a maximum of 5

There is a substantial degree of similarity between the two approaches in the criteria used to assess productivity. The New York State system adopts a less specific interpretation of productivity than does the Golet (1973) system. Up to nine criteria can be utilized, and each criterion is scored from 0 to 10. The mean value of those criteria applied is taken as the productivity score (P). Criteria utilized for productivity estimation are: water alkalinity, percent of wetland in 6 to 24 inch water depth class, fertility of adjacent soil, Soil Conservation Service Wildlife Suitability Rating, vegetative interspersion, ratio of vegetation to water surface, the variety and abundance of vegetative species, and the variety and abundance of wildlife species.

The assessment of vulnerability and additional points represents an attempt to confront other subjective aspects which relate to the priority of preservation. Vulnerability reflects the degree of present deterioration due to human disturbance, and higher values reflect greater vulnerability. Extra points may be awarded according to established criteria for biological uniqueness (presence of rare or endangered species, regional uniqueness of the habitat, or special habitat functions such as fish spawning beds or migratory waterfowl resting areas), the presence of other wetland values (sediment filtration, flood control, potential recreational use, or aesthetic significance), or the location of the wetland near sites of geological or historical importance.

A comparison of evaluation scores by wetland is given in Table 45. Simple linear correlation coefficients were calculated between the Golet score and the New York scores. A weak positive relationship exists between the Golet score and the New York productivity score ($r = .41$, $P < .05$). Both systems appear to evaluate wildlife productivity in a generally similar fashion. However, the low correlation coefficient suggests that the relationship is defined by extremes rather than similarity in ranking throughout the sample series. A greater spread in rankings is provided by the Golet system (range 66 to 101.5, mean is 85.3) than the New York system (range 4.5 to 7.3, mean is 6.0).

When extra points are added to the New York score, the correlation with the Golet score improves slightly ($r = .57$, $P < .01$). A comparable correlation exists between the total New York score and the Golet score ($r = .58$, $P < .01$). Since extra points are assigned for both biological and non-biological features in the New York State system, it could be interpreted that there is convergence of independent values in higher value systems. Some support for this notion is provided by the strong, positive correlation coefficient obtained by comparing the New York productivity score with the sum of productive and extra points ($r = .84$, $P < .001$). The maintenance of correlation between the total New York score and the Golet score is less readily explained, since the total New York score includes an adjustment for vulnerability and since the

Table 45. Evaluation Ratings for Sample Wetlands.

Wetland Name	New York State Rating: Productivity	Extra Points	Total Rating	Golet Rating
Barnett	5.4	5	59.0	90.5
Black Pond	5.7	5	60.0	90.0
Blind Bay	6.7	5	59.0	78.5
Campbell	6.0	5	60.5	82.0
Colwell Ponds	5.5	5	57.5	99.0
Cranberry Pond	6.3	4	56.5	91.5
Delaney	6.7	4	50.5	98.0
Eel Bay	6.5	5	52.5	97.5
Flatiron	6.0	4	56.0	88.0
Flynn	5.4	4	50.5	79.0
Fox Creek	6.5	4	59.5	82.0
French Creek	5.8	5	58.9	94.5
Fuller Bay	4.7	3	44.5	69.0
Goose Bay	5.7	5	60.5	87.5
Goose Bay-Cranberry Creek	6.0	5	62.0	93.5
Guffin Bay	6.8	4	57.5	72.5
Isthmus	6.2	5	61.5	81.5
Kent Creek	6.2	5	61.0	90.5
Lakeview	6.3	5	61.5	101.5
Little Fox	5.4	4	53.5	92.0
Little Stony	5.2	5	56.0	89.0
Long Carry	6.4	5	62.5	76.5
McCrae	6.5	5	62.0	96.0
Moore Landing	6.0	5	61.0	80.0
Mud Bay	6.2	4	58.0	82.5
Otter Point	6.4	4	50.5	74.5
Point Peninsula	6.7	5	65.0	93.0
Point Peninsula North	4.8	4	50.5	73.0
Point Vivian	6.2	5	61.5	88.5
Ray Bay	5.8	4	56.0	87.0
Rift	6.7	4	59.5	84.5
Sandy Creek	6.3	5	61.5	96.0
Sherwin Bay	5.8	5	59.5	81.0
South Bay	4.8	4	47.0	68.5
Southwick Beach	6.0	5	57.0	83.0
Stony Creek	6.5	4	56.3	87.0
Swan Bay	6.2	5	61.3	87.5
Westminster	5.5	4	33.0	66.0
Wilson Bay	7.3	5	68.5	90.0
Wilson Point	4.5	3	43.5	69.0
Mean	6.0	4.5	56.8	85.3
Standard Deviation	0.63	0.60	6.59	9.21

relationship between the total New York score and New York productivity ($r = .60$, $P < .01$) is slightly lower.

An alternative evaluation strategy is outlined by Geis et al. (1974) for wetlands in the Adirondack Mountains. They suggest that a composite numerical rating obtained by summing scores for different wetland values may obscure rather than resolve comparative significance. A non-addative solution based on a profile of scores developed for independent aspects of wetland importance is proposed. Since few wetlands have equally high or low scores in all value categories, summing scores may contract rather than expand the range of the composite index. Likewise, a wetland need not have high ratings in all value categories to be a high value system.

While we are not prepared to offer such a system for lake level-influenced wetlands along Lake Ontario and the St. Lawrence River, several features can be identified which might represent useful comparative indices. The selection of evaluation criteria is tempered by the regional similarity of wetlands across the sample series. All are hydrologically connected to the lake-river system. They are influenced by its cyclic changes in water levels and by the circulation of its nutrient-rich fresh waters. Their significance in flood control, ground water recharge, and water chemistry modifications is reduced by the proximity of the lake. They vary somewhat in actual and potential recreational utilization, but all offer access to the lake and its shoreline resources. They also vary in degree of current exploitation, and an assessment of these relationships would be useful for specific kinds of comparative evaluations. Other distinctions can be made among units in the series according to several broad vegetation categories.

Wildlife Use Potential

Plant community composition varies widely between shoreline wetlands, resulting in substantial differences in wildlife habitat between systems. Several of the criteria employed to assess productivity in both New York State and Golet evaluation systems could be used to score these differences. The number of vegetative cover types, the interspersion of types, and the ratio of water surface to emergent vegetation surface are the most important criteria. Other criteria are of less comparative value due to similarities across the sample series.

A second aspect of wildlife use potential is fish spawning access. The presence or absence of a functional connecting channel determines whether lake fishes can enter the wetland for spawning. Other aspects determine spawning success, but access is a necessary prerequisite. As mentioned in the description of individual wetlands, this attribute varies widely across the larger shoreline wetlands studied.

Actual Wildlife Use and Biological Uniqueness

An accurate determination of resident and migratory wildlife populations in wetlands requires careful sampling over a substantial period of time. Even a subjective assessment of wildlife use necessitates field observation at frequent intervals. While such data are of direct significance to comparative evaluation, they are only available in unusual instances. Fortunately, the studies of Webb *et al.* (1972) and Werner and Ford (1972) have generated such data uniformly for this study area. Included in these reports are the locations of significant fish and wildlife production areas and the occurrence of unique habitats. Data of this type represent significant comparative criteria.

Wetland Size

The relationships between size and wetland value is appropriately discussed by Golet (1973). It is an index of greatest comparative significance when the systems display a measure of similarity in other attributes. In addition, some of the features which are difficult to score directly seem related to size. These would include recreational use and hydrologic significance, as well as aspects of wildlife utilization.

Enhancement Opportunities

During the course of our evaluation visits we made systematic observations concerning enhancement opportunities in the larger wetlands. Significant improvements can be effected across the series by both restricting certain undesirable activities and by modifying the connections between the lake-river system and certain wetlands. While there are other opportunities for the enhancement of particular wildlife values through the manipulation of vegetation or water levels, these considerations are more appropriately left to the resource professionals in the Watertown office of the New York State Department of Environmental Conservation.

Specific cases where enhancement potential is high are noted in Table 46. Most notes concern the construction or improvement of structures connecting the wetland with the lake or river. They are suggested on the assumption that an increase in spawning habitat will benefit the entire basin. These connections should be designed to allow the free flow of water, at least during the spring high water period. The nature of the present hydrologic connection should be examined prior to modification, since any alteration can drastically affect seasonal water levels. The vitality of most wetland plant communities is intimately linked to the annual drawdown cycle, and any modification of this cycle can have profound effects.

Other notes concern particularly obvious cases of dumping of refuse and fill or the presence of pollutants. Not listed are the numerous examples of minor encroachment or the presence of grazing and watering of stock through the wetland. While this latter practice is both legal and well established in local tradition, it is destructive to valuable emergent meadow habitat. We estimate that 20 to 25 percent of the emergent meadows along the shoreline currently experience impact from grazing and trampling.

Table 46. Notes Concerning the Enhancement Potential of Wetlands in Jefferson County, New York.

Wetland Name	Notes
Cranberry Pond (1)	Construct a permanent outlet to wetland to create spawning access to the lake.
Southwick Beach (5)	Construct connecting channels or culverts to link the northern wetland segment with the lake through the Lakeview Pond system. Restrict filling and dumping from cottages along the barrier beach.
Little Stony Creek (6)	Restrict dumping and filling from cottages along the barrier beach.
Black Pond (7)	Stabilize erosion of the banks of the channel connecting the pond with the lake.
Ray Bay (9)	Improve culvert connection between marsh and lake to permit spawning access and equalize marsh and lake water levels.
Guffin Bay (12)	Locate and restrict the source of siltation into bay
Point Peninsula North (15)	Install proper culvert to allow spawning access to wetland.
Point Peninsula (16)	Deepen and stabilize connecting channel between marsh and lake.
Wilson Bay (21)	Add a second culvert and water control structure to facilitate spawning access.
Wilson Point (22)	Install a culvert through the barrier beach to allow spawning access.
Fuller Bay (23)	Install a culvert through the barrier beach to allow spawning access.
Blind Bay (25)	Investigate possible sewage pollution.
Otter Point (34)	Construct culverts to drain upper portion of wetland.
Eel Bay (35)	Construct proper culverts to permit movement of water through the wetland and into Lake of the Isles.
Delaney (39)	Remove dam at road bridge. Replace with culvert to connect upper wetland segment to lake.

SUMMARY

A system of vegetative cover description and mapping is developed for lake level-influenced wetlands along Lake Ontario and the St. Lawrence River in Jefferson County, New York. The system is applied to 41 individual wetlands or wetland segments along the shoreline using low elevation, 70 mm color aerial transparencies. A detailed description, including a wetland map, is provided for each of these systems. By combining the area of all other wetlands greater than one acre in size with that of the wetlands in the sample series, a figure of 7742 acres of wetlands is obtained. The total shoreline wetland area (in the sense of New York State freshwater wetlands legislation) would include adjacent aquatic and littoral communities not inventoried in this study. Since rooted aquatic vegetation extends to about 6 meters (mean low water datum) in the St. Lawrence River, the total shoreline wetland area would be substantially greater than reported here.

Over 769 acres of recently killed wetland vegetation was located in the larger shoreline wetlands. This represents over 10.7 percent of the total area in these wetland units. Vegetative death is attributed to recent periods of high water levels in the Lake Ontario-St. Lawrence River system during 1972-1974. Most of the dead vegetation (78.6 percent) occurred in emergent cover types. The full impact of high water damage is not reflected in this figure since substantial reductions in primary production may occur in areas where the prevailing cover is not completely killed. A long-term assessment of these impacts is not clear-cut. Primary production may recover rapidly if the impact is temporary; however, changes in species composition will take longer to repair. Other immediate consequences are an increase in the interspersion of cover types and the simplification of species composition in impacted areas.

Two regionally appropriate wetland evaluation systems were applied to the 41 wetland segments. A weak positive correlation between the Golet score and the New York State productivity score suggests that both systems are assessing wildlife productivity in a generally similar fashion. Further comparisons suggest that there may be convergence of independent aspects of wetland value in high value systems. The potential for non-addative wetland evaluation systems is explored, and several parameters are identified as useful for the implementation of such a system along the shoreline. Wetlands which might be enhanced by modifying the connection with the lake-river system or by restricting certain undesirable activities are also listed.

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Appendix A. Relationships Between Wetland Cover Types in the Study Area and Wetland Classification.

	Wetland Classes and Types		
Vegetative Cover Types	New York System	Martin et al. (1953)	Golet and Larson (1974)
Flooded Deciduous Trees	Flooded Deciduous Trees	Wooded Swamps	Deciduous Wooded Swamp
Dead Flooded Deciduous Trees	Dead Flooded Deciduous Trees	Wooded Swamps	Dead Woody Deep Marsh
Tall Slender Shrubs	Flooded Shrubs	Shrub Swamps	Sapling Shrub Swamp
Bushy Shrubs	Flooded Shrubs	Shrub Swamps	A) Seasonally Flooded Shrub Flats B) Bushy Shrub Swamp
Aquatic Shrubs	Flooded Shrubs	Shrub Swamps	*Shrub Deep Marsh and Subshrub Deep Marsh Aquatic Shrub Swamp
Dead Shrubs	Flooded Shrubs	Shrub Swamps	Dead Woody Deep Marsh
Robust Emergents	Emergents	Inland Deep Fresh Marsh	A) Seasonally Flooded Emergent Flats B) Robust Deep Marsh
Narrow Leaved Meadow Emergents	Emergents	A) Seasonally Flooded Basins and Flats B) Shallow Fresh Marsh	A) Seasonally Flooded Emergent Flats B) Narrow Leaved Shallow Marsh
Narrow Leaved Emergents	Emergents	A) Seasonally Flooded Basins and Flats B) Shallow Fresh Marsh	A) Seasonally Flooded Emergent Flats B) Narrow Leaved Shallow Marsh

Appendix A. Continued.

	Wetland Classes and Types		
Vegetative Cover Types	New York System	Martin et al. (1953)	Golet and Larson (1974)
Dead Emergents	Emergents	Inland Shallow Fresh Marsh Inland Deep Fresh Marsh Seasonally Flooded Basins and Flats	Seasonally Flooded Emergent Flats Narrow Leaved Shallow Marsh Robust Deep Marsh
Broad Leaved Emergents	Emergents	Inland Deep Fresh Marsh	Broad Leaved Deep Marsh
Floating Leaved Vegetation	Floating Vegetation	Inland Deep Fresh Marsh	Vegetated Open Water
Floating Vegetation	Floating Vegetation	Inland Deep Fresh Marsh	Vegetated Open Water
Submerged Aquatics	Open Water	Inland Deep Fresh Marsh	Vegetated Open Water Nonvegetated Open Water

A. Cover type occurs along a tributary stream

B. Cover type occurs around bay or flood pond

* Aquatic shrub and subshrub species freely intermix in our study area.