Toward Rehabilitation of the Crown Marsh - Long Point, Lake Erie, Ontario

1 May 2007

Long Point Crown Marsh Rehabilitation Steering Committee

Background

Importance of Great Lakes coastal marshes

Great Lakes coastal marshes are some of the most productive ecosystems in Ontario. These marshes also are critical habitat for a large number and a wide variety of resident and migrant wildlife (e.g., fish, reptiles, amphibians, passerine birds, marsh birds, waterfowl, etc) (Dennis et al. 1984, Herdendorf 1992, Petrie 1998). In addition, several species of plants and animals that are classified as federal and/or provincial Species at Risk (SAR) occur within Great Lakes coastal marshes (Table 1; COSEWIC 2006, COSSARO 2006).

Importance of the Crown Marsh

The Crown Marsh is one of several wetlands that make up the globally important wetland complex at Long Point, Lake Erie, Ontario (Figure 1). This 1750 acre marsh is characterized by an interspersion of emergent aquatic vegetation, mainly cattail (*Typha* spp), common reed (*Phragmites australis*), and bulrushes (*Juncus* spp), and shallow, open water areas that are directly and naturally connected to Inner Long Point Bay, Lake Erie. Because of its direct hydrologic link to Lake Erie, the Crown Marsh is classified as a Great Lakes coastal marsh (Herdendorf 1992). Thus, similar to other Great Lakes coastal marshes, the productivity and plant/animal community characteristics and abundances within the Crown Marsh are influenced by the short- and long-term water level fluctuations and the limnological regime of both Inner Long Point Bay and Lake Erie.

The Crown Marsh widely recognized throughout Ontario, and Canada, as a prime destination for outdoor recreation. In contrast to other major marsh complexes at Long Point that are either privately (e.g., Long Point Company Marsh, Turkey Point Company Marsh) or federally (e.g., The Big Creek and Long Point National Wildlife Areas) owned, the Crown Marsh is owned by the Province of Ontario and is accessible to the public throughout the entire year. During winter, spring, and summer, many people hike, boat, bird-watch and fish or simply enjoy the wide array of habitats that occur within the Crown Marsh. Much of the marsh is open to the public for controlled waterfowl hunting during autumn; establishment of the Long Point Waterfowl Management Unit in 1961 has provided thousands of people with opportunities to hunt waterfowl and to observe large concentrations of waterfowl and other birds during their fall migrations (Petrie 1998).

Potential problems for wildlife & habitat

Many long-time marsh-users and Long Point area residents have observed major changes in water-levels, vegetation communities, and wildlife-use of the Crown Marsh, particularly during the past 10 years. These observations prompted the Long Point Waterfowlers' Association (LPWA) to engage the Long Point Waterfowl and Wetlands Research Fund (LPWWRF) to conduct a quantitative investigation into historic changes in waterfowl use and habitat

characteristics of the Crown Marsh and other major wetland complexes at Long Point (Badzinski et al. 2006b). Several of the major findings reported in that study included: 1) a long-term decline in numbers of waterfowl hunters using the marsh since 1961 (but particularly since the early 1980s), 2) general declines in use of the marsh by several duck species since the mid/late 1970s, 3) substantial changes and fluctuations in proportions of water, wetland vegetation, and dry/built up areas within the marsh between historic time periods, and 4) a reduction in open water area relative to emergent marsh vegetation, thus poor habitat interspersion, compared to other Long Point marshes in more recent (1990s) years. Badzinski et al. (2006b) speculated that low Lake Erie water levels and sub-optimal marsh habitat conditions (e.g., poor interspersion of open water and emergent marsh vegetation, reduction in depth and extent of water, reduction in some aquatic foods, and increased prevalence of large, unbroken monocultures of cattail (*Typha* spp) and *Phragmites australis* [see also Wilcox et al. 2003, Meyer 2003]) has likely reduced attractiveness of the Crown Marsh for some waterfowl and other wetland-dependent wildlife during, and since, the 1990s. The authors also stated there was a need for formalized discussions regarding the potential for intensive habitat management and future rehabilitation of the Crown Marsh.

Crown Marsh Rehabilitation Day

On August 15th 2006, the LPWA hosted a Long Point Crown Marsh Rehabilitation Review Day at the Bird Studies Canada headquarters in Port Rowan. Over 35 natural resource professionals (most specialists in various aspects of wetland, waterfowl, avian, and fisheries ecology) met to discuss the current state of habitat conditions and wildlife-use in the Crown Marsh, as well as future potential management options. LPWWRF staff presented research which suggested that the Crown Marsh was in a sub-optimal state with respect to waterfowl use and habitat quality (Badzinski et al. 2006b). LPWA members also took participants on both land-based and boat tours of the marsh so they could witness the current habitat conditions. At the end of the day, there was a round-table discussion which resulted in group consensus that habitat conditions currently are sub-optimal and that some form habitat management will be necessary to increase the ecological value to some areas of the Crown Marsh.

Crown Marsh Rehabilitation Steering Committee & future direction

Several months after the Long Point Crown Marsh Rehabilitation Review Day (8 December 2006), a sub-set of meeting participants, representing several resource management/research organizations and public stakeholder groups, formed the Long Point Crown Marsh Rehabilitation Steering Committee (LPCMRSC). This group has committed to: 1) develop a long-term Crown Marsh Rehabilitation Plan, 2) engage public and various stakeholders regarding input to the plan, and 3) locate/securing funding for potential future research, management, and monitoring projects. The Crown Marsh has been subjected to several types of management practices since settlement (ca. early 1880s) of the Long Point area (see Table 2), so a precedent has already been set for managing this marsh. However, the committee thought a prudent first step toward making specific recommendations on rehabilitation of the Crown Marsh would be to synthesize and broadly review scientific literature on possible types of marsh management techniques and floral and faunal response to such manipulations, and then provide broad recommendations on how to proceed. The remainder of this document will present this information.

Review of Marsh Habitat Management Techniques

General overview of marsh management

Habitat management involves the manipulation of habitat features, mainly water, and plant communities to benefit animal communities. Management of marsh vegetation is typically done to change the overall state of succession, alter plant species composition, or to create specific juxtapositions of vegetation and water (or other specific habitat features such as mudflats, etc) that tend to increase and/or decrease the abundances of wildlife species occurring within the marsh. Human-induced manipulations often are directed at increasing the supply of food, hiding cover, thermal shelter, water, and space, or at improving the distribution of wildlife, all of which ultimately can increase carrying capacity of a marsh (Payne 1992).

The state of succession or the prevalence of desirable habitat features depends largely on the specific short- and long-term management goals and the ease of manipulating or maintaining a marsh in a desired state. A marsh could be managed, for example, to maximize population density of a key wildlife species with narrow habitat requirements/niche, but this would limit use by a wide variety of wildlife, thus effectively reducing species richness and biodiversity. Often marshes are managed to maximize population densities of key wildlife species or groups (guilds) of species that have broad habitat requirements, which tends to provide indirect benefits for a wide variety of organisms. Thus, management for generalist species often results in increased species richness and biodiversity, but can be unfavorable for species with specific habitat needs. Control or eradication of nuisance, exotic, or invasive plant species also can be accomplished by employing different habitat management techniques, but effectiveness of desired or intended responses may vary among techniques.

Basic wildlife responses to marsh management

The appropriate use of any habitat management technique will typically result in a noticeable wildlife response. Wildlife sometimes responds relatively quickly to a habitat alteration. For example, waterfowl may begin using a previously dry wetland basin in a favorable location soon after it is re-flooded with water. More often, however, wildlife response to management activities is not immediate or detectable because of the time it takes for vegetation to respond to a habitat manipulation. This may be particularly so if management activities altered or destroyed an existing plant community to allow establishment of one that is more attractive for wildlife food or cover. Managers often strive to maintain habitat conditions within marshes so there is roughly equal (50:50) interspersion of open water and emergent vegetation, the hemi-marsh state. Numerous studies suggest that wetlands approximating the hemi-marsh condition often provide optimal habitat diversity and complexity, which results in maximum wildlife diversity and abundance (Kaminski and Prince 1981, Murkin et al. 1982, Murkin et al. 1997, Smith et al. 2004).

The major feature of wetlands that dictates vegetation community characteristics is the presence and dynamics of water. Ability of managers to manipulate water levels within marshes is a very important factor dictating effectiveness of certain mechanisms of habitat management. So, with respect to marsh management, there are two major types of marshes: 1) those with water control capabilities and 2) those without water control capability.

Marshes with water control

Marshes with water control capabilities are commonly called controlled marshes. Controlled marshes are surrounded by a series of dikes or levees that contain water (diked impoundment) and employ water control structures, such as motorized pumps or mechanical spillways, to allow manipulation of the hydrologic regime of the soil. These marshes can be natural marshes with dikes constructed within them or are man-made wetlands created in areas where hydric soils did not previously exist.

There are three general methods that can be used to add or remove water from controlled marshes, including use of gravity, tides, and motorized pumps. Use of motorized pumps is a relatively expensive method, as compared to passive methods of using elevation gradients (gravity) and tides or seasonally high water-levels, to alter water levels, but allows greater and precise control of timing and depth of inundation. Large natural marshes can be divided into various interconnected diked impoundments or cells that can be managed independently.

Controlled marshes are relatively common in some regions of the lower Great Lakes where there have been historically high rates of wetland losses, particularly at Lake St. Clair and along Lake Erie in the US (Bookhout et al. 1989). Controlled marshes, depending on the elevation gradient of the bottom, can be managed for mudflat habitat, moist-soil seed production, and deep-water marsh/submerged aquatic plants. Draw-downs and/or flooding are used to create these various marsh conditions which attract a wide diversity of resident marsh birds and wildlife, as well as migrant shorebirds, waterbirds, and waterfowl (Smith et al. 1989). Actively altering water levels creates habitat diversity in large monotypic stands of emergent vegetation (e.g., cattail) by flooding stems and creating favorable conditions for flood-kill or marsh herbivores to create openings in dense vegetation (Beule 1979).

Marshes without water control

Marshes without water control capabilities can be challenging for vegetation management and for creating optimal interspersion of water and emergent marsh plants due to limitations associated with hydrologic alteration. However, creation of a variety of ponds with varied amounts of open water, size, depth, and dominant vegetation types can attract a wide variety of wildlife. If aquatic food production is limited and waterfowl use is desired, permits can be obtained to deposit cereal grains in certain areas of the marsh provided that hunting is not allowed within a minimum distance of the grain (Bookhout et al. 1989). There are, however, several different methods that can be used to create new and enhance or expand existing open water areas within marshes without water control to attract waterfowl and other wildlife, including level ditches and potholes.

Level ditches are relatively wide, ungraded ditches that are closed at each end and excavated in dry areas of emergent marshes where groundwater is close enough to the surface to fill the depression. Series of level ditches are optimally spaced throughout a marsh and provide several main purposes: 1) improve water distribution in marshes with dense, unbroken stands of emergent vegetation, 2) increase production and/or use by wildlife (e.g., muskrat, waterfowl, marshbirds, reptiles, amphibians, and invertebrates), 3) provide open areas for courtship, brood-rearing, feeding, and roosting waterbirds/waterfowl, 4) increase submerged aquatic plant

production, and 5) provide access for harvest and other marsh management activities (Payne 1992).

Potholes are relatively small (<1.6 ha), shallow depressions containing water, which provide breeding, resting and feeding habitat for waterfowl and other marsh wildlife. These habitat features can be naturally-occurring or can be created by excavation or explosives and typically are less expensive to create than level ditches. Excavated potholes tend to last longer than ones created with explosives, thus have greater potential for wildlife use (Payne 1992). Potholes can be situated in clusters and strategically placed throughout larger marsh complexes to concentrate or distribute wildlife optimally. Management of potholes is accomplished mainly by protection from sedimentation, drainage, and pollution; dredging and floating mechanical cutters (cookie cutter) can be used periodically to deepen, widen, and remove undesirable vegetation (Payne 1992).

Management and control of vegetation in a marsh can be accomplished by using physical (water level manipulation, prescribed burn, mechanical treatment) and chemical (fertilizer and herbicide) applications, as well through biological methods. Often, combinations of several specific mechanisms within each of these three broad management categories can be used to create a desired habitat response. These specific methods will be briefly outlined and discussed below.

Physical methods for vegetation management

Water level manipulation: drawdown & flooding-Water level manipulation, as discussed above, is probably the most effective physical method to manage marsh plant communities, especially in controlled marshes. Many different factors, including water depth, soil texture, pH, and organic content, can affect plant distribution and zonation within marshes (Keddy 2000), so managers may initially need to take an experimental approach in order to achieve desired seasonal plant and wildlife responses. Permanent or constant water levels are used in non-acidic wetlands with low turbidity to slow ecological succession, provide nesting and brood-rearing habitat for waterfowl, marshbirds, and waterbirds, plus provide habitat for muskrat, fish, reptiles, and amphibians (Payne 1992, Murkin et al. 1997). In mid-latitude regions of North America, appropriately timed drawdowns are used to: 1) stimulate germination and plant growth from seed/tuber bank to either provide food or re-establish resilient emergent plant species used for cover by resident or migrant wildlife, 2) stimulate dead plant decomposition and release of nutrients to the soil, 3) kill undesirable plants and fish, 4) reduce excessive muskrat populations, and 5) increase invertebrate populations for waterfowl, marshbirds, and shorebirds (Kadlec 1960, Kaminski and Prince 1981, Murkin et al. 1982, Bookhout et al. 1989, Murkin et al. 1997).

Drawdowns and flooding are used by managers to create several different marsh conditions that are important for different groups of wildlife, including mudflats, shallow marsh (hemi-marsh), and deep marsh. Mudflats (< 0.03 m water) often are managed for dense stands of annual, moist-soil seed plants that are favored food for waterfowl; open, shallow mudflats provide shorebirds and other waterbirds access to invertebrates or buried seeds (Rundle and Fredrickson 1981, Smith et al. 1989). Mud flats are often managed in conjunction with a shallow marsh condition. Shallow marsh (0.03 - 0.30 m water), or hemi-marsh, is an approximate 1:1 ratio of

emergent plants to open water (with interspersed vegetation patches) that often provides the most optimal combination of food (mainly emergent perennials and submerged plants) and cover for waterfowl (Murkin et al. 1982, Bookhout et al. 1989, Pederson et al. 1989, Murkin et al. 1997, Smith et al. 2004). Deep marsh (0.30 - 1.20 m water) areas are used most by diving waterbirds and contain few persistent emergent plants, but mainly submerged aquatic plants. Deep marsh management promotes control of undesirable vegetation and can attract diving ducks and other waterbirds.

Prescribed burns-Prescribed burns can be used to physically change the marsh plant community structure. There are four main reasons for under-taking a prescribed burn in a marsh: 1) to provide new green shoot, roots, and rhizomes of sedges and grasses for geese and other herbivores, particularly in coastal estuarine marshes, 2) increase exposure of seeds to marshbirds and waterfowl, 3) improve habitat suitability for muskrat, waterfowl, and marshbirds by removing decaying organic matter, creating complexity in monocultures of impenetrable stands of cattail, *Phragmites australis*, bulrush, etc, promote growth of annual seed-producing plants, and 4) can create depressions in the marsh substrate to hold water (Wright and Bailey 1982, Gordon et al. 1989, Payne 1992). Plant response to burning varies among species, but seed banks do not seem to be affected (Smith and Kadlec 1985, Kirby et al. 1988). For example, burning has been used with variable success to control the invasive plant *Phragmites australis* in North America (Gorbik 1986, Clay and Suprenant 1987, Marks et al. 1994, Getsinger et al. 2006).

Mechanical treatment: excavation, cutting, crushing, & explosives-Mechanical treatments often are used to physically remove, cut, crush, or destroy marsh vegetation. Combinations of these treatments can be used simultaneously or in succession to achieve the desired vegetation response. For example, control/management of cattail can employ the following combination of methods, including cutting and prolonged deep flooding (often preceded by herbicide treatment), cutting on ice and then crushing, crushing alone, excavation and removal to create openings or contoured marsh bottoms, and herbicide treatment alone (Beule 1979). Machines such as draglines, dredges, back-hoes, and bulldozers can be used to remove vegetation and for excavating and contouring the marsh bottom to achieve favorable gradients for plant establishment and wildlife. Cutting and destroying marsh vegetation on a small-scale can be done with hand-tools (e.g., heavy-duty hedge-trimmers, weed-trimmers, and sickle-bar mowers), but is extremely time consuming and strenuous. Most often large-scale vegetation management projects employ floating mowing machines (cookie-cutter) in wet impoundments and tractors or tracked machines towing large mowers (sickle bar, bush hog, batwing), disks, crushers (heavy, spiked rolling drum), roto-tillers in dry impoundments (Payne 1992). Use of explosives is a relatively inexpensive technique to create open water in extensive stands of emergent vegetation (Payne 1992).

Chemical methods for vegetation management

Chemical treatments, mainly herbicides, effectively kill plants which makes them a useful tool for habitat management. Herbicides are attractive because they are effective and are relatively inexpensive and simple to use. However, most herbicides lack specificity and can have lethal or sub-lethal effects on non-target plants, may be persistent in the environment, and possibly on animals via unintended habitat modification (Engel 1990). As a result, chemical treatment is often used only when water level manipulation or other physical treatment methods

are impossible, ineffective, or impractical. Federal, state, and provincial governments provide lists of herbicides that are approved for use and approval must be obtained before herbicide application in aquatic and wetland habitats. The Ministry of Health - Pest Management Regulatory Agency is responsible for regulations for herbicide use within Canada; a public registry is available at their website (http://www.pmra-arla.gc.ca/english/index-e.html#Top) which outlines uses and restrictions for all herbicides approved for use in Canada.

Herbicides can be applied by hand-held or backpack sprayers for spot-treatment or small-scale applications, but can be efficiently applied over larger areas with large boom sprayer mounted to tractors, tracked vehicles, all-terrain vehicles, helicopters, or fixed-wing aircraft. A recent study conducted in Michigan found that appropriate concentrations, timing, and application of glyphosate and imazapyr (both approved for use in US wetlands) can be used effectively to reduce and control *Phragmites australis* in Great Lakes coastal wetlands associated with Lake St. Clair; combining herbicide use with several mechanical treatment techniques greatly extended the control period (Getsinger et al. 2006). Other studies have evaluated effectiveness of herbicides for use in controlling *Phragmites australis* (Riemer 1976, Marks et al. 1994, Kay 1995, Monteiro et al. 1999, Moreira et al. 1999) and cattail (Beule 1979, Solberg and Higgins 1993).

Biological agents for vegetation management

Biological agents can be used to effectively alter wildlife habitat in marshes. Both domestic and wild animals can be used to achieve desired habitat responses under appropriate conditions. Controlled grazing (trampling) by livestock can be used to open up dense stands of cover to improve waterfowl and waterbird nesting and habitat use, plus it tends to decrease undesirable perennial plants and favors production of annuals which often are desirable food-producing plants (Chabreck et al. 1989, Pederson et al 1989). Controlled grazing is most common in coastal areas of the southern US and on prairies and rangelands in the western US and Canada where free-ranging livestock are prevalent. This technique is not practical in Great Lakes coastal marshes.

Some species of wildlife, such as Tundra Swans (*Cygnus columbianus*), Canada Geese (*Branta canadensis*), Snow Geese (*Chen caerulescens*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), can aid managers with habitat management in some situations, but can also be detrimental in others (Daiber 1986, Pederson et al 1989, Reinecke et al. 1989, Stutzenbaker and Weller 1989, Payne 1992, Yallop et al. 2004, Badzinski et al. 2006a, Clark 1997). For example, muskrats, if populations are properly managed through trapping and water level manipulation, can be an asset in maintaining a hemi-marsh, but too many can cause vegetation eat-outs and dike damage in controlled marshes (Payne 1992, Clark 1997). Great Lakes coastal wetlands typically contain muskrats, so they may be an important agent to consider for biological control.

General Recommendations for Crown Marsh Rehabilitation

Based on the review above, it is clear that there are many potential options available to enhance habitat conditions and increase wildlife use within the Crown Marsh. There are several major interacting factors that are currently contributing to the impoverished state of the marsh: 1)

lack of, or limited, water within certain areas of the marsh, particularly inland from the Inner Bay and in the west end of the marsh, 2) large, unbroken stands of cattail, 3) lack of large open water areas which are needed for optimal habitat interspersion (equal ratio of emergent vegetation and water) and increased aquatic food availability and space for waterbirds, and 4) the continued expansion and the existing large, unbroken stands of the invasive, exotic plant *Phragmites australis* (Wilcox et al. 2003, Badzinski et al 2006). Below is a list of general recommendations that will augment past management (see Table 1) and may direct future management activities to most effectively increase the long-term wildlife and habitat value of the Crown Marsh.

1. **Increase habitat interspersion by creating a mosaic of open water areas in large unbroken tracts of cattail and/or *Phragmites australis*.** Basins could be excavated with heavy equipment. Ponds of various depths, sizes, and shapes will increase habitat diversity and create nesting, feeding, and roosting habitat for a variety of marsh wildlife. Larger sized ponds will provide roost habitat and possibly aquatic foods for waterbirds. When possible ponds should be connected by channels to the Inner Bay, which would provide a water supply, facilitate nutrient exchange, and allow fish (and humans) access. Some ponds may be isolated from the Inner Bay and be provisioned by groundwater.

2. **Create a controlled marsh to facilitate water level manipulation and vegetation management.** The west end of the Crown Marsh is well suited for a controlled marsh because it is currently dry and already has landforms and man-made structures that would facilitate dike construction and access to source water for flooding. This section of the marsh also has large, dense stands of *Phragmites australis*, which contain limited wildlife diversity (Marks et al. 1994, Meyer 2003). A marsh with water control and several independent impoundments would enable managers to manage for several different marsh conditions (e.g., mudflats, hemi-marsh, deep marsh) within and over seasons and years and would optimize natural food production, cover, nesting habitat, roosting areas for marsh-dependent wildlife.

3. **Eliminate and/or control *Phragmites australis* stands that are established in the marsh.** Current scientific research should be thoroughly reviewed to determine potential methods for effective control of *Phragmites australis*. Research using experimental manipulations could be undertaken to determine which methods produce best results in the Crown Marsh. The west end of the marsh would be an ideal area for control given the extent of *Phragmites* at that location. If a controlled marsh was established in that location (see above #2), experimental research (if deemed necessary after literature review) on effects of cutting, flooding, burning, and/or herbicide application could be conducted. This information would be invaluable for developing a long-term control program within the Crown Marsh, at other Long Point marshes, and possibly throughout North America.

Vision, Objectives, & Immediate Goals

Based on data and recommendations presented above, the Long Point Crown Marsh Steering Committee believes that the Long Point Crown Marsh (LPCM) currently is in a sub-optimal condition. Below, the LPCM Steering Committee will define its long-term Vision for the Long Point Crown Marsh, establish a set of objectives which will guide management of the marsh, and outline initial goals for starting rehabilitation activities within the marsh during 2007/2008.

Vision

To secure and enhance the ecological integrity of the Long Point Crown Marsh (LPCM) by creating and maintaining a diverse and healthy wetland ecosystem that will provide habitat for a wide array of native flora and fauna while also allowing continued sustainable use of natural resources by various user groups.

Objectives

1. Create, restore, and enhance habitat to increase biodiversity of marsh-dependent fish and wildlife.
2. Increase vegetation diversity and habitat interspersion by creating a mosaic of open water areas in large unbroken stands of marsh vegetation.
3. Eliminate or control invasive exotic plants and/or wildlife, specifically *Phragmites australis*, within the marsh.
4. Ensure, when possible and appropriate, hydrologic connectivity (via channels) among marsh vegetation communities, natural or man-made ponds, and Inner Long Point Bay-Lake Erie.
5. Facilitate recreational and educational uses of the marsh.
6. Implement adaptive management techniques to mitigate environmental factors (e.g., climate change, exotic species, etc.) which may compromise the ecological integrity of the marsh.

Goals for 2007- 2008

1. Develop a pilot rehabilitation project within an appropriate portion of the LPCM that will employ adaptive management techniques to address three interacting factors hypothesized to be contributing to the impoverishment of the LPCM: 1) generally low water levels in some areas of the marsh; 2) sub-optimal interspersion of open water and emergent vegetation; 3) large and expanding monotypic stands of *Phragmites australis* and/or cattail.

2. Initiate the pilot project within an adaptive management framework whereby the effects of the management techniques employed will be monitored / measured and used to refine future management activities. An adaptive management approach will aid in development of future short- and long-term goals and will allow for assessing potential for rehabilitation of other parts of the LPCM.

Future plans

The next step in this ongoing process is to obtain input from a wide array of marsh-users and identify the specific management priorities/objectives for the LPCM; a meeting between the LPCMRSC and the public would facilitate information exchange. Fund-raising also will be a key factor in determining future courses of action for marsh rehabilitation. However, it is apparent that some form of management that is more intensive than what has been employed in the past is warranted to maximize the wildlife, esthetic, education, and recreation value of the marsh.

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Long Point Crown Marsh Rehabilitation Steering Committee:

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Scott Petrie, LPWWRF

Dave Reid, OMNR

Dave Richards, OMNR – Norfolk Land Stewardship Council

Owen Steele, Ducks Unlimited Canada

Cam Thomson, LPWA

Table 1. Species at Risk (SAR) and rare/sensitive habitat types documented at the Long Point Crown Marsh, Ontario.

Scientific name	Common name (group)	COSEWIC[a]	COSSARO[a]	GRank	SRank
Ammodramus henslow	Henslow's Sparrow (bird)	END	END-R	G4	S1B,SZN
	Sensitive species (reptile)	THR	THR	G5	S3
Aristida basiramea	Three-awn (plant)			G5T5?	S2
Bidens coronata	Southern Tickseed (plant)			G5	S2
Bufo fowleri	Fowler's Toad (amphibian)	THR	THR	G5	S2
Carex tetanica	Rigid Sedge (plant)			G4G5	S3
Celithemis eponina	Halloween Pennant (insect)			G5	S3
Chlidonias niger	Black Tern (bird)	NAR	SC	G4	S3B,SZN
Cicindela hirticol	Beach-dune Tiger Beetle (insect)			G5	S2?
Clemmys guttata	Spotted Turtle (reptile)	END	SC	G5	S3
Cyperus erythrorhizos	Red-root Flatsedge (plant)			G5	S3
Cyperus flavescens	Yellow Flatsedge (plant)			G5	S2
Echinochloa walteri	Walter's Barnyard Grass (plant)			G5	S3
	Sensitive species (reptile)	THR	THR	G3	S3
	Sensitive species (reptile)	THR	THR	G5	S3
Emydoidea blandingii	Blanding's Turtle (reptile)	THR	THR	G4	S3
Erimyzon sucetta	Lake Chubsucker (fish)	THR	THR	G5	S2
	Sensitive species (reptile)	SC	END	G4	S2
Graptemys geographica	Northern Map Turtle (reptile)	SC	SC	G5	S3
	Sensitive species (reptile)	THR	THR	G5	S3
Hibiscus moscheuto	Swamp Rose-mallow (plant)	SC	SC	G5	S3
Ixobrychus exilis	Least Bittern (bird)	THR	THR	G5	S3B,SZN
Lampsilis fasciola	Wavy-rayed Lampmussel (mussel)	END	END	G4	S1
Lepisosteus oculatus	Spotted Gar (fish)	THR	THR	G5	S2
Linum medium var.	Wild Flax (plant)			G5T5	S1
Moxostoma erythrurum	Golden Redhorse (fish)	NAR	NAR	G5	S4
Notropis anogenus	Pugnose Shiner (fish)	END	END	G3	S2
Nuphar advena	Yellow Pond-lily (plant)			G5T5	S3
Ptelea trifoliata	Common Hoptree (plant)	THR	THR	G5	S3
Rallus elegans	King Rail (bird)	END	END-R	G4G5	S2B,SZN
Scleria verticilla	Low Nutrush (plant)			G5	S3
Spiranthes magnicamporum	Great Plains Ladies'-tresses (plant)			G4	S3
	Sensitive species (reptile)	THR	THR	G5	S3
Strophostyles helvola	Wild Bean (plant)			G5	S3
Symphyotrichum dumosum	Bushy Aster (plant)			G5	S2
Thamnophis sauritus	Eastern Ribbonsnake (reptile)	SC	SC	G5	S3
	Cottonwood Dune Savannah			G1G2	S1
	White Cedar - Tamarack			G4G5	S5

[a] Status abbreviations: END = Endangered, THR = Threatened, SC = Special Concern, NAR = Not at Risk; COSSARO Status definitions go to: http://nhic.mnr.gov.on.ca/MNR/nhic/glossary/mnr.cfm; for COSEWIC definitions go to: http://nhic.mnr.gov.on.ca/MNR/nhic/glossary/cosewic.cfm).

[b] Global ranking based on consensus of a network of Natural Heritage Programs / Conservation Data Centers, scientific experts, and the Nature Conservancy by which a rarity rank is designated based on the range-wide status of a species, subspecies or variety (for definitions of ranks go to: http://nhic.mnr.gov.on.ca/MNR/nhic/glossary/grank.cfm).

[c] Sub-national / provincial ranking assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario (for definitions of ranks go to: http://nhic.mnr.gov.on.ca/MNR/nhic/glossary/srank.cfm).

Table 2. The history of management activities within the Crown Marsh – Long Point, Lake Erie, Ontario.

Period	Activity – description and rationale	Source
Late 1880s – early 1900s	**Channel stabilization** – A severe storm breached the Long Point sandspit and Crown Marsh near the present-day "Old Cut" in 1883. Soon after, the federal government of the day installed channel stabilization structures and dredged periodically to facilitate commercial boat passage between Lake Erie and Inner Long Point Bay.	Down by the Bay
Early 1900s	**Aquatic vegetation control** - fishermen who set up on the edges of the Crown Marsh often removed wild rice (*Zizania palustris*) and other aquatic plants using large v-shaped blades drawn by boat. This facilitated boating and retrieval of seines to the big rollers at their fish shacks.	Leighton Brown, pers. comm. – Long Point area resident
Mid 1900s	**Channel dredging & retention wall construction** – Such activities were undertaken within the Crown Marsh largely to allow construction of the marinas and cottages developments on the east and north sides of Highway 59. Maintenance via limited dredging and retaining wall maintenance continues today under permits issued by Ontario Ministry of Natural Resources (OMNR) and the Department of Fisheries and Oceans (DFO).	Jim Malcom, pers. comm. - LPWA
Early 1960s	**Pond excavation/creation** – the Department of Lands and Forests (DLF) authorized and instated the Long Point Waterfowl Management Unit (LPWMU) within the Crown Marsh in 1961. In accordance with a plan created by DLF, 11 shooting ponds and 1 sanctuary/feed pond were excavated; 64 blinds also were installed for public hunting.	Jim Malcom, pers. comm. - LPWA
1961-2005	**Aquatic vegetation control** – Periodically during this time, a floating machine called a "cookie cutter" has been used to cut and remove aquatic vegetation (mainly cattail) within channels and open water areas of the marsh to facilitate boat access and blind placement.	Jim Malcom, pers. comm. – LPWA
2005/06	**Pond & channel excavation** – over time, numerous existing ponds and channels have in-filled with sediments and monotypic stands of cattail and *Phragmites australis*. LPWA (lead), OMNR, Delta Waterfowl, and Ducks Unlimited Canada funded a project where heavy equipment was used to excavate (widen and deepen) ponds and channels.	Jim Malcom, pers. comm. - LPWA

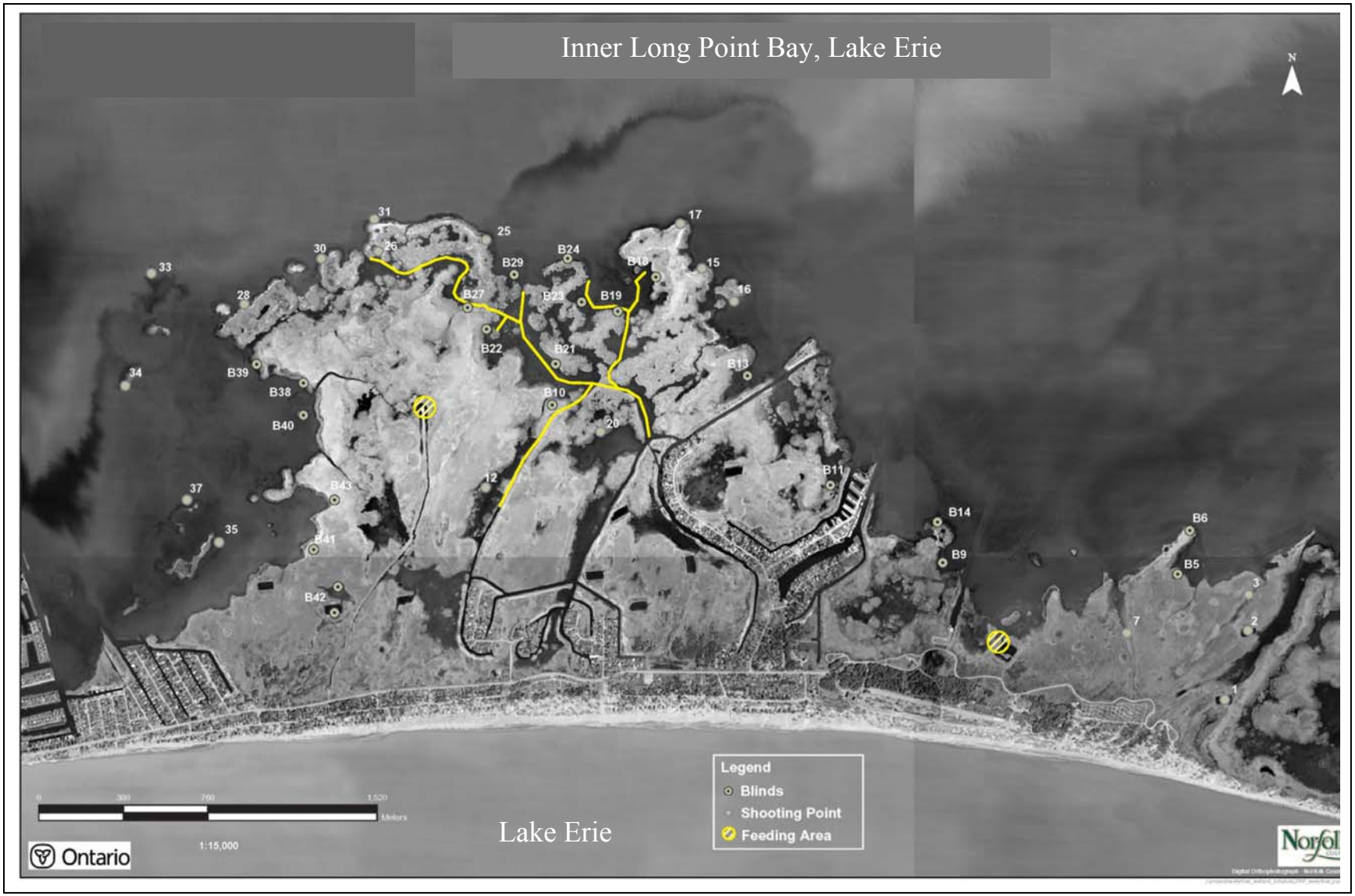

Figure 1. An aerial view (2002) of the Crown Marsh located at Long Point, Ontario.