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MONITORING *PHRAGMITES AUSTRALIS* AT LONG POINT, ONTARIO: PAST, PRESENT, AND FUTURE

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Abstract:

In May of 1999, a study of Phragmites australis, an invasive emergent wetland grass, was initiated at Long Point, Ontario. Although P. australis has been present in North America for at least 3000 years, it has only recently started to spread vigorously along the eastern seaboard of North America and throughout the lower Great Lakes. Reasons for the rapid spread of P. australis are unclear. Previous invasions typically followed disturbances or stresses such as an altered hydrologic regime, dredging, or increased nutrient availability. Recent invasions may have been caused by the introduction of a more invasive genotype (s) from Europe, and/or increased temperatures. The distribution of Phragmites australis has expanded rapidly at Long Point over the past 10 years. Long Point was designated as a Ramsar site in 1982, primarily because of its international importance as a waterfowl staging area. Long Point has also been designated as a World Biosphere Reserve by UNESCO, and a Globally Important Bird Area by Birdlife International. The spread of monodominant stands of Phragmites is a threat to important food resources and habitat for waterfowl and other wildlife. This is a cause for concern because Long Point is an internationally important waterfowl staging area. It is therefore critical to document the distribution and rate of spread of Phragmites and to identify which stands are invasive in order to focus management decisions.

The present distribution of Phragmites will be determined from aerial photography flown July 7th, 1999. Historical distribution will be determined from aerial photography interpreted by the Canadian Wildlife Service as part of a larger study to map historical wetland communities (Maynard and Snell, in progress). Geographic Information Systems (GIS) software will be used to create, manage, analyze, and display the spatial information. Separate databases will be developed for each available year of aerial photography. This format will allow us to examine the extent of Phragmites spread, determine which plant species/communities it is replacing, and provide a visual means for analyzing the spatial distribution. Scenarios will also be developed to predict the extent to which Phragmites could colonize Long Point's wetlands. Results of June 1999 high resolution CASI imagery (Jollineau et al., in progress) identifying wetland communities at Long Point will be compared with the June 1999 aerial photography using GIS and assessed as a possible method for future monitoring of Phragmites. Following this, we hope that through field experiments and collaboration with other scientists, we will be able to determine the most economic and ecologically suitable method of controlling Phragmites at Long Point.

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Introduction

Phragmites australis is a tall emergent grass, commonly known as 'giant reed' or 'common reed'. The name *Phragmites* comes from the Greek word for fence - *phragma* because of the plant's fence like growth along streams and around wetlands. *Phragmites* is a highly productive marsh macrophyte which grows in dense clones that may dominate many hectares of marsh emergent zone, thereby replacing aquatic plant species that are more preferred or beneficial to wildlife (Millar 1976). It is highly variable having at least 42 different phenotypes (Marks et al. 1999). *Phragmites* has annual cane-like shoots that reach heights of 2 to 6m and disperses by seeds or rhizome fragments. Rhizomes are responsible for renewing and maintaining the population; a single plant spreads at a rate of 1-2m per year. The dead canes

remain standing for 3 to 4 years before becoming part of the slowly decomposing litter (Thompson and Shay 1984). The weight of dead canes may exceed that of living shoots and as a result wildlife use of mature stands is minimal.

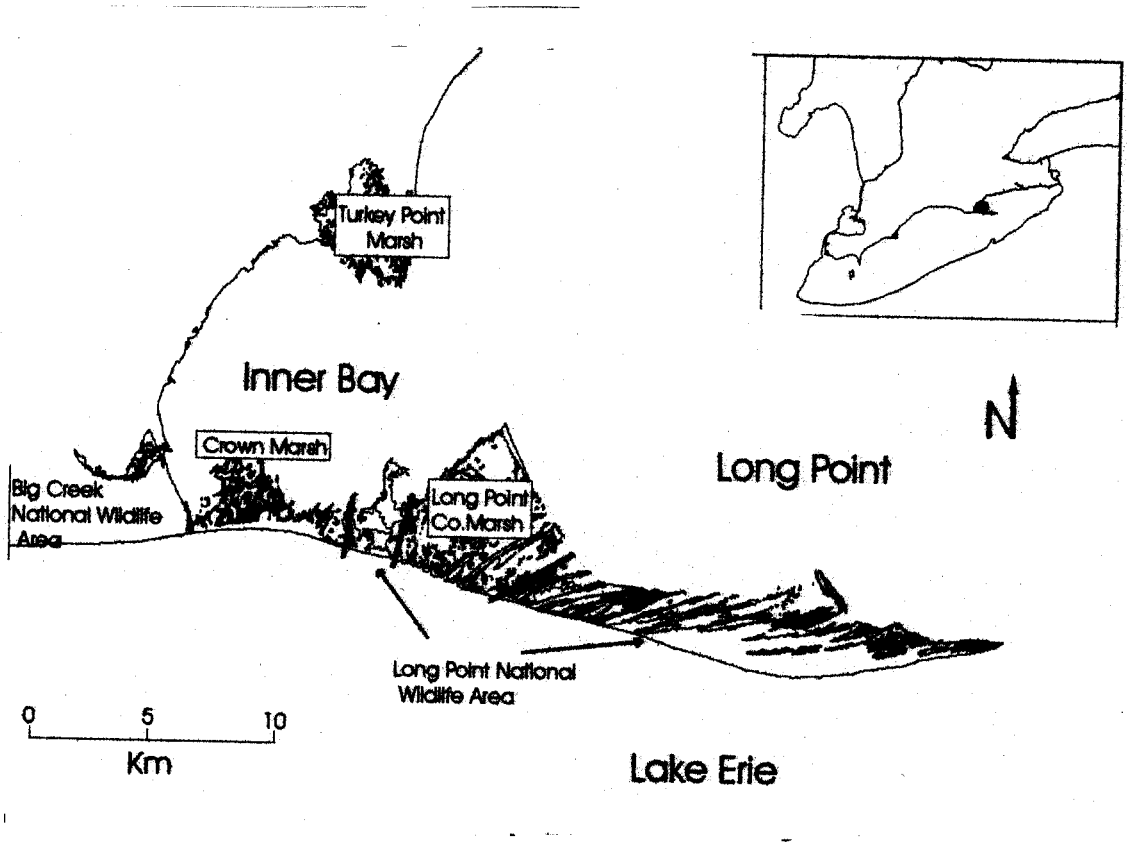
Phragmites is one of the most widely distributed plants in the world, occurring in every continent except Antarctica (Marks et al. 1999). As such, it occurs over a wide climatic range, from the tropics (O° latitude) to the arctic (>70° latitude), but is most common in temperate regions (McKee and Richards 1996). In North America, *Phragmites* is widespread, typically growing in marshes, swamps, fens and prairie potholes. Because *P. australis* has recently invaded and formed near-monotypic stands in many eastern North American wetlands, there has been some debate as to whether it is indigenous. Convincing evidence that it was here long before European contact is now available from at least two sources. Niering and Warren (1977) found remains in 3000 year old peat from tidal marshes in Connecticut. Also, identifiable remains of *Phragmites* constituting parts of a twined mat and other woven objects, dating from 600 to 900 A.D., were found during archaeological investigations in southwestern Colorado (Breternitz et al. 1986)(Kane and Gross 1986).

Phragmites australis has spread very rapidly at Long Point over the past five years. Invasions typically follow disturbances or stresses such as an altered hydrologic regime, dredging or increased nutrient availability. At Long Point, the *Phragmites* invasion may be the result of a more invasive genotype(s) from Europe (Marks et al. 1994), or it may be related to warmer temperatures, drier climate and/or clearer water conditions. The spread of monodominant stands of *Phragmites* is a threat to important food resources and habitat for waterfowl, fish and other wildlife. This is problematic because, the relatively pristine state of Long Point's wetlands, as well as its geographic location on the Atlantic flyway, between wintering areas on the Gulf and Atlantic coasts and arctic and prairie breeding areas, make it one of the most important waterfowl staging areas in North America (Dennis et al. 1984, Wilcox 1994, Wilcox and Knapton 1994, Petrie 1998). The goal of the Waterfowl and Wetlands Research Fund is: 1st, to document the spread of *Phragmites* at Long Point, 2nd, to examine methods of monitoring it (i.e., Compact Airborne Spectrographic Imager (CASI) vs. aerial photography), and 3rd, to explore possible management options. As such, this study is the first step.

Methods

The Long Point National Wildlife Area, coastal marshes of the Inner Bay, Big Creek Marsh and Turkey Point Marsh were selected for study **(Figure 1)**. Aerial photographs were taken by Northway-Photomap Inc., using forward motion compensation cameras at a scale of 1: 10000. The entire study area was photographed in black and white with stereo coverage in July 1999.

Figure 1. Study Area: Long Point



Aerial Photo Interpretation

Aerial photos were interpreted using a mirror stereoscope based on the classification system developed by Snell and Cecile Environmental Research (1992). The classes are: open water; submergents; emergents; meadow; open bog; and trees and shrubs. Emergents are further divided into three categories: flat wet emergents; tall, dense possibly drier emergents; and a mixture of the former two or conditions between. The wetland boundary was outlined and the wetland communities were interpreted according to the classification presented in **Table 1.** The adjacent upland was interpreted according to the classification presented in **Table 2.**

Historical aerial photography (1944, 1955, 1964, 1972, 1978, 1985, 1995) is being interpreted as part of a larger study being undertaken by the Canadian Wildlife Service to map historical wetland communities (Maynard and Snell in progress). The 1999 aerial photo interpretation will be overlaid on the 1995 photographs to detect real changes in *Phragmites* distribution and abundance, as well as other wetland vegetation communities. Vegetation communities will be scribed onto Ontario Basic Maps to minimize distortion.

Table 1. Marsh Vegetation Community Classes (Snell and Cecile Environmental Research 1992)

Map Symbol	Description	
Class	subclass	
O		Open water, submergents possible but not visible on the photos
W		Some evidence of submergents OR dominantly water with some emergent or floating or flooded vegetation
E1		Flat or wet emergents. If species identification is Possible, E1 may include:
	EL	*Lemna* (duckweed)
	EM	*Nelumbo* (American lotus)
	EN	*Nuphar* or *Nymphaea* (bullhead-lily or fragrant water-lily
	EZ	*Zizania* (wild-rice)
E		Mixture or E1 and E2 or conditions between. If species identification is possible, E may include
	CW	Cat-tail dominant but with significant interspersed water
	EA	*Sagittaria* (arrowhead)
	EB	*Sparganium* (burr reed)
	EC	*Decadon* (swamp loosestrife)
	EK	*Pontederia* (pickerel-weed)
	ES	*Scirpus* (bulrush)
	ET	Trees and Shrubs in Water
	Tc	*Cephalanthus* (buttonbush)
E2		Taller, denser and possibly drier emergents. If species identification is possible, E2 may include
	C	Cat-tail (*Typha*)
	CM	Cat-tail with non-water gaps
	ED	*Bidens* (water marigold)
	EG	Grass/sedge hummocks which can include subdominant cat-tail with water
	EP	*Phragmites* (reed)
	ER	Popular seedlings, *Polygonum* (water smartweed), cat-tai
E3		Light coloured, solid, high, possibly managed emergent
E4		Dark coloured, solid, high, possibly managed emergent
M1		Wet meadow but not as hummocky as EG
M		Meadow, can include small shrubs
G		Open bog
T		Trees, large shrubs or scattered trees
U		Sandbar or remnant dike

Table 2. Adjacent Land Use Classes (Snell and Cecile Environmental Research, 1992)

Map Symbol	Description
A	Agriculture, large estate lawns or rural managed open space, including farm buildings
B	General Built-up
BR	Permanent homes or equivalent size
BI	Built-up Industrial or commercial and associated disturbed Land
Cg	Smaller homes-likely cottages
D	Pond
I	Idle Land, rough pasture, scrubby vegetation
K	Diked wetland not affected by lake levels
L	Lake
Mr	Marsh
Or	Orchard, Tree Nursery or Young Reforestation
P	Park or park-like (managed with scattered trees) including private hunt clubs
Pc	Park Campground
R	River, Canal
S	Marina
Tp	Causeway, Raised road, or dike
X	Sand, rock, disturbed soil, fill, pavement
Z	Wooded area or reforestation

Field Reconnaissance

Marshes associated with Long Point, Big Creek Marsh, Turkey Point Marsh, and the coastal marshes of the Inner Bay were visited and the vegetation community types identified and cross-referenced on the aerial photographs.

Geographic Information Systems (GIS*)*

GIS software will be used to create, manage, analyze and display spatial information for analysis. All years will be georeferenced and digitized using a GIS program. Separate databases (layers) will be developed for each year of aerial photography, to allow us to examine the extent of spread of *Phragmites* and to provide a visual means for displaying and analyzing the spatial distribution.

Assessment of CASI Imagery

Using a GIS, results of June 1999 CASI imagery will be compared with June 1999 aerial photography: i.e., size and location of wetland communities, identification of wetland communities, ease in identifying *Phragmites*. This will enable us to assess the possibility of using CASI imagery as a cost effective method for future *Phragmites* monitoring.

Schedule

This paper reports on work in progress. The following provides a brief outline of our expected study schedule: aerial photo interpretation and field reconnaissance are complete – summer 1999; vegetation communities will be scribed onto Ontario Basic Maps -fall 1999; wetland and adjacent plant communities will be digitized -fall 1999; GIS analysis will be completed in 2000 as well as the assessment of CASI imagery.

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