DID PHRAGMITES AUSTRALIS INVASION IN THE GREAT LAKES BEGIN IN 1988 RATHER THAN 1999?

Douglas A. Wilcox

The College at Brockport State University of New York

Lake Michigan-Huron













Introduced (background, left, dark leaves) and native *Phragmites* clones (front, right, light green leaves)

Was invasive *Phragmites* present prior to expansion after the 1997 high lake level, or was it introduced in widespread fashion in a very short time?

I had data set a data set that could potentially hold the answer.

Dickinson Island, St. Clair River delta, L. St. Clair





Lake St. Clair hydrograph 1960-2010

high beach ridge





Lake St. Clair hydrograph 1960-2010 sampling at high and low elevations 1988-1996

above-ground biomass sampling



Dickinson Island sampling

Sept.	13-14	19-20	20-21	18-19	18-19
	1988	1989	1990	1991	1996
lake level max (m)	175.35	175.35	175.25	175.40	175.49
lake level sampled (m)	175.09	175.21	175.26	175.16	175.47
# quads high elev.	10	10	10	10	-
# quads low elev.	35	35	35	35	35





mean biomass and Importance Values

prominent species on higher elevation ridge

1988-1991



species with decreasing mean biomass and IV

lower elevation

1988-1996



S. latifolia and *J. canadensis* with decreasing mean biomass and IV

lower elevation

1988-1996

Sagittaria latifolia 150 Mean Biomass DIV 0.4 100 Mean above-ground biomass (g/m²) 0.2 50 0 0 1988 1989 1990 1991 1996 mportance Value Juncus canadensis 350 Mean Biomass DIV 300 0.8 250 0.6 200 150 0.4 100 0.2 50 0 0 1988 1989 1990 1991 1996

species with increasing mean biomass and IV

lower elevation

1988-1996



P. australis and *T. angustifolia* with increasing mean biomass and IV





How and when did *Phragmites* invade Dickinson Island?

Was it there before the 1988 low lake level?

Did it expand greatly after the 1999 low lake level?

If so, why in 1999 and not 1988?

seed bank inoculated in 1988? routine seiches kept it too wet? time needed for genetic diversity?

vegetative growth from stolons, rhizomes, fragments







Figure 57. Distribution of Wetland Vegetation at Dickinson Island (St. Clair Delt), 1964



Figure 56. Distribution of Wetland Vegetation at Dickinson Island (St. Clair Delta), 1949

Jaworski et al. 1979

DICKINSON ISLAND BISECT, 1977

1977



Figure 55. Bisect Across Dickinson Island (St. Clair Delta), July 26 and October 7, 1977

low lake level in 1964, high in 1975, moderate in 1977



YEAR



1975 high

1977 mod.

1964 low

sampled a different transect in 1988 and 2005



Figure 5. Cover of Phragmites along Dickinson Island marsh transect.

P. australis with increasing mean biomass and IV

lower elevation 1988-1996

role of topography vs. lake level?



Jaworski et al. 1979

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DICKINSON ISLAND BISECT





Would topography vs. lake level also explain the timeline of *Phragmites* invasion in other lakes?

mapped hectares of *Phragmites*, Long Point Lake Erie



K. Wilcox et al. 2003

Lake Michigan-Huron 1860-2010





Figure 3. Cross-sectional diagram of Fish Point wetland showing elevations of transects 1–7 that followed topographic contours with specific water-level histories following high lake levels in 1986. Referenced shorelines are May-August means. Water level depicted is from first sampling date (30 August 1988) and referenced to International Great Lakes Datum 1985.











Lake Michigan-Huron





Regarding 2005 vs. 2003 sampling of Saginaw Bay sites that found a 2- to 5-fold increase in *Phragmites*, Tulbure and Johnston (2010) stated:

"Decreases in water depth and (increased) bare soil area were associated with the greatest increases in *Phragmites* cover."

"...the newly exposed flats created by rapidly receding water levels, as occurred in Lakes Michigan and Huron, provided excellent substrate for introduced *Phragmites* colonization."



Arcadia Lake wetlands





summer peak lake level 176.63m







summer peak lake level 176.91m





2002

summer peak lake level 176.33m





2010

summer peak lake level 176.28m



Vegetation observed in 2002 responded to a 2001 lake level peak that was 0.56m lower than that observed in 1995; by 2010, that level had been reached three times.

The more substrate exposed, the greater area for seed-bank response.





"I heard that he discovered how to control Phragmites."