NON-NATIVE PHRAGMITES (*Phragmites australis*)

Problem Overview

Phragmites australis, also known as common reed or phragmites, is an invasive perennial grass that has spread rapidly throughout coastal and interior wetlands, riparian corridors, roadside ditches and other disturbed areas within the Great Lakes basin. There are varieties of phragmites native to the Great Lakes region, but these grow more slowly and less aggressively than the non-native strain, which is thought to have originated in Europe. The European strain was probably transported to the Atlantic Seaboard of the United States through ballast material transported by ships at some point between the late 18th and early 19th centuries. Since introduction, the non-native strain of phragmites has spread pervasively through the Great Lakes region and other regions of the United States by both natural and human-driven dispersal mechanisms.

Phragmites is a warm season grass with hollow, rigid, woody stems and a vigorous root system consisting of horizontal underground stems called rhizomes. This extensive underground root system provides a means of dispersal of the plant, as the rhizomes can continue to support new growth when fragmented. Mature phragmites plants can produce up to 2,000 seeds annually, which are spread by wind and water, providing another significant mechanism for spread. In low water conditions, phragmites can also expand via horizontal above-ground stems, called stolons or "runners." Non-native phragmites does not grow as aggressively in wetlands with established flora; however, tolerance to a range of water qualities and soil conditions such as those at disturbed sites has contributed to the rapid expansion of this invasive plant.

Due to its dense growth both above and below ground, phragmites can create mono-dominant stands 10-15 feet in height that effectively crowd and shade out native wetland and coastal species. As native assemblages are replaced by phragmites, species diversity is reduced and wildlife habitat quality is degraded. Dense phragmites stands can even alter the hydrologic regime of invaded wetlands by increasing evaporation and trapping sediment. Economic impacts of invasive phragmites infestations include reductions in property values and revenue loss from impacted recreational activities due to impeded access to coastal areas and restricted views. There is concern over the aesthetic impacts of phragmites when large stands alter views of lakes and wetlands. Public safety is also an issue, as large stands of phragmites near residential development represent a fire hazard. Considerable research has been conducted on the management of phragmites, but control practices are often expensive, long-term and complicated (see Management section).

Photo: 2008 Fact Sheet: Giant Reed, Plant Conservation Alliance, Alien Plant Working Group. http://www.nps.gov/plants/ALIEN/fact/phau1.htm
Revision Date: 1/14/2008

Identification

Non-native phragmites is a perennial grass that returns every year without re-seeding. The plant consists of hollow, tan, ribbed stems that can grow up to one inch in diameter. Phragmites can be recognized by its purple-brown seed head which develops into long feathery panicles (branched clusters of small flowers) by late July. The panicles can grow up to 8 inches in width and 6 to 20 inches in length. Phragmites has alternating leaves that are flat, stiff, and dark gray-green in color. The leaf span is 2 to 2.5 inches in width and 8 to 15 inches in length, tapering into a point at the end. Phragmites is supported by a deep rhizomous root system which can penetrate the soil between 1 to 6 feet and grow horizontally over 60 feet in length. The white to light yellow rootstalks can host up to 60 stems per square foot. In order to differentiate between native and non-native forms of phragmites, one must observe multiple characteristics including the ease of removal of leaf sheaths, density of stems, and stem color, texture, and flexibility, among others. Differentiation between native and non-native phragmites can be difficult; helpful resources are available from the Michigan Natural Features Inventory (http://web4.msue.msu.edu/mnfi/phragmites/native-or-not.cfm). In addition, a free diagnostic service is offered by Cornell University (http://invasiveplants.net/diag/diagnostic.asp).

Size: Phragmites can grow over 15 feet in height, forming dense stands and root masses.

Native range: Phragmites is found worldwide except for Antarctica and in every U.S. state except Alaska and Hawaii.

Occurrences in the Great Lakes Basin

Peat cores suggest that native phragmites has been present in wetlands in North America for more than 3,000 years. Non-native phragmites likely arrived in the Great Lakes in the late 19th century and is now found in every Great Lakes state as well as the provinces of Ontario and Quebec. The distribution of non-native phragmites in the Great Lakes is largely coastal, with inland infestations common in some states.

Means of Introduction and Spread: Phragmites is believed to have arrived in the United States between the late 18th and early 19th centuries, via peat and sediments in ship ballasts that were discharged into Atlantic coastal marshes. Vegetative spread of phragmites through rhizomes and stolons is a significant means of range expansion, often accelerated by human activities such as construction and transport of dredge materials; the species can also spread naturally through dispersal of seeds by wind, water, and animals. Rhizome fragments and seeds of phragmites can also be dispersed naturally by wave action. Phragmites has been intentionally

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introduced to some areas as a filter plant in water treatment lagoons and as a tool to stabilize shorelines in restoration projects. Growth of phragmites is often facilitated by human disturbances, such as increased salinity due to runoff containing road salt, that allow it to out-compete native species.

Status: Non-native phragmites has become established throughout the United States; it is of particular concern in the Great Lakes region where over the last two decades it has rapidly spread through freshwater wetlands and coastal areas.

Distribution Maps: Geographic information on the national distribution of phragmites for individual states on a county level at: http://plants.usda.gov/java/profile?symbol=PHAU7. This database is provided by the U.S. Department of Agriculture National Resources Conservation Service.

Management

Due to the hardiness and extensive root system of phragmites, complete eradication is extremely difficult once the plant is established. Furthermore, management and control techniques must account for cases in which there is a need to protect the native strain of phragmites in areas infested with non-native phragmites. Unlike the non-native strain, native phragmites populations provide many ecosystem benefits including bank stabilization and native bird habitat. Appropriate management plans should determine the type of phragmites strain prior to treatment and assess potentially undesirable consequences of removal, given the potential for damaging the native strain, if present.

Phragmites eradication and control techniques currently in use are listed below. It is important to note that effective phragmites management plans typically require a combination of these methods over several years. Strategies will vary depending on the density of the phragmites stand and the characteristics of the invaded site. Most sites will require ongoing treatment on a long-term basis to prevent recolonization by this persistent invasive plant. The Michigan Department of Environmental Quality (DEQ) offers a helpful phragmites control and management guide for resource and land managers, summarized below and available at http://www.michigan.gov/documents/deq/deq-ogl-ais-guide-PhragBook-Email_212418_7.pdf.

- **Chemical Control**: Herbicide application is usually recommended as the primary control method, and is often the first step in control programs. Glyphosate and imazapyr, both broad-spectrum herbicides, have proven effective at controlling phragmites.
- **Prescribed Fire**: Controlled burns are often implemented following herbicide treatments to remove phragmites biomass and promote resurgence of native species.
- **Mechanical Removal**: Mechanical removal, either by hand cutting or the use of equipment such as weed whips and small mowers, also serves to remove excess phragmites biomass and to promote growth of native plants. This type of removal is particularly useful when prescribed burning is not possible.
- **Water Level Management:** In sites where water levels can be controlled, such as impoundments, flooding is often used as a follow-up treatment to herbicide application and prescribed fire.

Landowners can find phragmites control information from the Michigan DEQ at http://www.michigan.gov/documents/deq/deq-ogl-Guide-Phragmites_204659_7.pdf. Additionally, a video has been developed on phragmites infestations on Beaver Island located in Peaine Township, Mich. outlining a useful ten-step management plan for newly established phragmites stands. Visit http://www.agreatlakesjewel.org/phragmites/ to watch the video and learn more about the plan.

Relevant Policy and Regulatory Issues: Non-native phragmites is not listed as a noxious weed by any of the U.S. states or Canadian provinces in the Great Lakes region. Some Great Lakes jurisdictions (e.g., Michigan and Wisconsin) have listed phragmites as a restricted invasive species, regulating its possession and transport. For instance, in Michigan it is unlawful for a person to knowingly possess live phragmites unless there are plans to submit the specimen for identification, or if possession is in conjunction with lawful removal activities.

Most phragmites control activities require permits from state and/or federal agencies. For example, in Michigan a General Permit from the DEQ is required to mow or otherwise mechanically remove phragmites below the ordinary high water mark of the Great Lakes (the approximate location of the highest line on the shore established by water level fluctuations, as indicated by physical characteristics; see http://www.lre.usace.army.mil/_kd/go.cfm?destination=Page&pge_id=1879&dialog=0 for more information). A different permit is required to apply herbicides in standing water or below the ordinary high water mark of the Great Lakes. It is recommended that herbicides be applied by a licensed, certified applicator; for some herbicides this is mandatory. A permit from the U.S. Army Corps of Engineers is required for any phragmites control activities that affect Great Lakes coastal areas. (For more information on permitting in Michigan, see http://www.michigan.gov/deq/0,1607,7-135-3313_3681_3710-178183--,00.html.)

Some jurisdictions have promulgated regulations on a local level to combat phragmites. For example, in Peaine Township, Mich., an ordinance was passed in 2008 allowing all phragmites-infested properties, including privately-owned properties, to be accessible to officials for inspection and treatment (see http://www.beaverislandassociation.org/phragmites/). A resolution passed in 2010 in Clay Township, Mich. establishes a support system for local landowners dealing with invasive phragmites on their properties (see http://www.claytownship.org/Phragmites/).

References

- Clay Township, Michigan. Clay Township Phragmites Management Advisory Board Homepage. <http://www.claytownship.org/Phragmites/>

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- Cornell University Ecology and Management of Invasive Plants Program. Phragmites: Common Reed. Morphological differences between native and introduced genotypes. < http://invasiveplants.net/phragmites/morphology.htm>
- Global Invasive Species Database. *Phragmites australis*. http://www.invasivespecies.net/database/species/ecology.asp?si=301&fr=1&sts=sss&lang=EN
- Gucker, C.L. 2008. *Phragmites australis*. Fire Effects Information System. U.S. Department of Agriculture (USDA), Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/
- Michigan Department of Environmental Quality. A guide to the control and management of invasive phragmites. http://www.michigan.gov/documents/deq/deq-ogl-ais-guide-PhragBook-Email_212418_7.pdf
- Michigan Department of Environmental Quality. Control and Management of Invasive Phragmites. http://www.michigan.gov/deq/0,1607,7-135-3313_3681_3710-178183--,00.html
- Michigan Legislature. Natural Resources and Environmental Protection Act 451 of 1994. Part 413: Transgenic and Nonnative Organisms. http://www.legislature.mi.gov/(S(na2mm4554yhk3t45smoz1y3x))/mileg.aspx?page=getObject&objectName=mcl-451-1994-III-2-1-WILDLIFE-CONSERVATION-413
- Peaine Township, Beaver Island, Michigan. Invasive Phragmites: What It Is, What We Can Do. http://www.agreatlakesjewel.org/phragmites/
- Saltonstall, K. 2003. Genetic Variation among North American Populations of *Phragmites Australis*: Implications of Management. *Estuaries* 26: 444-451.
- U.S. Army Corps of Engineers, Detroit District. Ordinary High Water Mark and Low Water Datum. http://www.lre.usace.army.mil/_kd/go.cfm?destination=Page&pge_id=1879&dialog=0
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2010. The PLANTS Database. PLANTS Profile: *Phragmites australis*. National Plant Data Center, Baton Rouge, LA 70874-4490 USA. http://plants.usda.gov
- Wisconsin Department of Natural Resources. Chapter NR 40: Invasive Species Identification, Classification and Control. http://www.legis.state.wi.us/rsb/code/nr/nr040.pdf

Studies, Assessments and Management Plans

Radar Detection and Monitoring of Invasive *Phragmites* in the Coastal Great Lakes (2011)
Michigan Technological University
Michigan Tech Research Institute in collaboration with the U.S. Fish and Wildlife Service and the U.S. Geological Survey has compiled phragmites distribution maps for the entire U.S. portion of land area within the Great Lakes basin. They also conducted ground surveys to confirm results.
http://mtri.org/phragmitesmaps.html

Clay Township Phragmites Management Plan (2010)
Clay Township, St. Clair County, Michigan
http://www.claytownship.org/phragmites/docs/PhragmitesManagementPlan.pdf
This long-term management plan is an example of actions at the local government level to coordinate and improve management and control of invasive phragmites on private property.

Control of Phragmites in a Michigan Great Lakes Marsh (2007)
Getsinger, K.D., LS. Nelson, L.A.M. Glomski, E. Kafcas, J. Schafer, S. Kogge, and M. Nurse. 2007. U.S. Army Engineer Research and Development Center, Vicksburg, MS.
This report presents the results of small- and large-scale invasive phragmites treatment demonstrations, comparing and assessing outcomes from different treatment regimes and providing recommendations.

Phragmites Control Plan (2007)
U.S. Fish and Wildlife Service
http://www.fws.gov/bearriver/Phragmites_Control_Plan.pdf
This document outlines a management plan for phragmites in the Bear River Migratory Bird Refuge in Utah.

Official Assessment of *Phragmites Australis* in Indiana's Natural Areas (2003)
Indiana Department of Natural Resources, Invasive Plant Species Assessment Work Group
Assessment Results: http://www.in.gov/dnr/files/phragmitesresults.pdf
Recommendations: http://www.in.gov/dnr/files/phragmitesrecommendations.pdf
This assessment analyzes different aspects of phragmites management in Indiana, including: invasion status, ecological impacts of invasion, potential for expansion, difficulty of management, and commercial value. Recommendations are provided to various government entities and stakeholder groups.

Common reed (2002)
In: Van Driesche, R., *et al*. 2002. Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04.
http://invasiveplants.net/monitor/9CommonReed.aspx
This report summarizes research into natural insect enemies of phragmites and makes recommendations for future work.

Phragmites: Common Reed
Cornell University, Ecology and Management of Invasive Plants Program
http://invasiveplants.net/phragmites/Default.asp
Researchers at Cornell University are investigating potential biological control methods for use in phragmites management. Their website also contains information on a free diagnostic service to assist in distinguishing between native and non-native phragmites.

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A Guide to the Control and Management of Invasive Phragmites
Michigan Department of Natural Resources and Environment
http://www.michigan.gov/documents/deq/deq-ogl-ais-guide-PhragBook-Email_212418_7.pdf
This document provides phragmites management guidance to land and resources managers. It describes the methods of phragmites eradication and control currently in use, and suggests comprehensive management strategies for various management situations based on stand characteristics and site hydrology.

Meeting the Challenge of Invasive Plants: A Framework for Action
Michigan DNR, Wildlife Division
http://web4.msue.msu.edu/mnfi/education/InvasivesDNREStrategicPlan.pdf
This document assesses the status of invasive plants in Michigan and outlines a strategy to address their negative impacts to wildlife. Strategic goals are described, creating a central framework of prevention, early detection and rapid response, and long-term control. Non-native phragmites is used for illustrative purposes throughout the document.

Fighting Invasive Phragmites
The Beaver Island Association
http://www.beaverislandassociation.org/phragmites/ and http://www.agreatlakesjewel.org/phragmites/
This website and video tell the story of a phragmites rapid response initiative on Beaver Island, Michigan, located in northern Lake Michigan. Local governments, landowners, and the Michigan Department of Natural Resources (DNR) joined forces beginning in 2006 to eradicate phragmites populations on the island. Featured in the video is Peaine Township, one of two townships on the island, where an ordinance was passed allowing all phragmites-infested properties to be accessed for treatment. In the first year of treatment, the area of phragmites infestation on the island was reduced from 27 to only 3 acres. As of 2011, phragmites on Beaver Island is almost entirely eradicated and requires only moderate control efforts. This success can be attributed to rapid mobilization and response, cooperation of multiple stakeholder groups, and public outreach and education. The Beaver Island initiative can serve as a model for other local communities dealing with the early stages of phragmites invasion.

U.S. and Canadian Federal Resources

General Information on Phragmites
Plant Conservation Alliance, Alien Plant Working Group
http://www.nps.gov/plants/ALIEN/fact/phau1.htm
This fact sheet includes an illustrated guide for distinguishing native and alien phragmites species

PLANTS Profile: *Phragmites australis* (common reed)
United States Department of Agriculture-Natural Resources Conservation Service
http://plants.usda.gov/java/profile?symbol=PHAU7

Species Profile: Common reed
U.S. Department of Agriculture, National Invasive Species Information Center
http://www.invasivespeciesinfo.gov/aquatics/commonreed.shtml

Phragmites australis
USDA Forest Service, Fire Effects Information System
http://www.fs.fed.us/database/feis/plants/graminoid/phraus/all.html

***Phragmites australis* Article Citation Search**
USDA National Agricultural Library - AGRICOLA Database
http://agricola.nal.usda.gov/cgi-bin/Pwebrecon.cgi?DB=local&CNT=20&CMD=%28%22Phragmites+australis%22%29+AND+%28inva?+OR+introduc?+OR+alien+OR+exotic+OR+weed?%29&STARTDB=AGRIDB

GRIN Taxonomy for Plants: *Phragmites australis*
USDA Agricultural Research Service, Beltsville Area - Germplasm Resources Information Network
http://www.ars-grin.gov/cgi-bin/npgs/html/tax_search.pl?phragmites+australis

Managing Invasive Plants: Concepts, Principles, and Practices
U.S. Fish and Wildlife Service, National Wildlife Refuge System
http://www.fws.gov/invasives/staffTrainingModule/index.html
This training module for USFWS staff contains excellent information on formulating invasive plant management plans, the importance of assessments and monitoring in invasive plant management, and commonly-used management and control techniques.

Common reed, *Phragmites australis*
Environment Canada
http://www.ec.gc.ca/stl/default.asp?lang=En&n=1ED761A5-1

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State and Provincial Resources

Common Reed (*Phragmites australis*)
Illinois-Indiana Sea Grant, Exotic Aquatics on the Move
http://www.iisgcp.org/EXOTICSP/commonreed.htm

Common/Giant Reed
Indiana Department of Natural Resources
http://www.in.gov/dnr/files/PHRAGMITES2.pdf

Invasive Plant Species Fact Sheet: Common Reed (*Phragmites australis)*
Indiana Department of Natural Resources, Invasive Plant Species Assessment Work Group
http://www.in.gov/dnr/files/Phragmites.pdf

Control and Management of Invasive Phragmites
Michigan DEQ
http://www.michigan.gov/deq/0,1607,7-135-3313_3677_8314-178183--,00.html

Phragmites (*Phragmites australis*)
Midwest Invasive Species Information Network
http://www.misin.msu.edu/facts/
(Browse for "Phragmites" or "*Phragmites australis"* in the species search windows)

Invasive Plants of Ohio: Common reed grass
Ohio Department of Natural Resources
http://www.dnr.state.oh.us/Portals/3/invasive/pdf/invasivefactsheet5.pdf

Common reed: *Phragmites australis*
Pennsylvania Dept. of Conservation and Natural Resources
http://www.dcnr.state.pa.us/forestry/invasivetutorial/common_reed.htm

The Common Reed (*Phragmites Australis)*: A Threat to Quebec's Wetlands?
Report prepared for the Government of Quebec's Interministerial Committee on the Common Reed and for Ducks Unlimited Canada
http://www.ducks.ca/fr/province/qc/nouvelle/pdf/phra_08e.pdf

***Phragmites australis* (Common reed grass)**
Wisconsin Department of Natural Resources, Bureau of Watershed Management
http://dnr.wi.gov/org/water/greatlakes/Phragmites2007.pdf

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