

# H<sub>2</sub>O<sup>18</sup> as an analyzer of *Phragmites australis* invasion potential from wet to dry sites

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## Abstract

*Phragmites australis* is classified as an invasive wetland plant in the U.S. and Canada. There is a growing concern that the plant can colonize agricultural sites through water transport within the rhizome. During this study we will use H<sub>2</sub>O<sup>18</sup> as a tracer to determine how water moves through the plant. Preliminary results have shown differences in rhizome water content between control and treatment samples.

## Introduction

•*Phragmites australis* (Figure 1) is a facultative-wet wetland plant species that has recently been classified as a noxious weed. The plant may be able to colonize dry upland sites (Maheu-Giroux 2007). For this to occur, water must be translocated through its interconnected rhizome system (Chambers 1999).

•To understand water translocation within the rhizome we must first understand water utilization. To do this we will use H<sub>2</sub>O<sup>18</sup>, labeled water, as a tracer.

• Studies have not been conducted on water relations within the rhizome-leaf interface. Additionally it is unknown if water translocation through a *Phragmites australis* rhizome is possible.



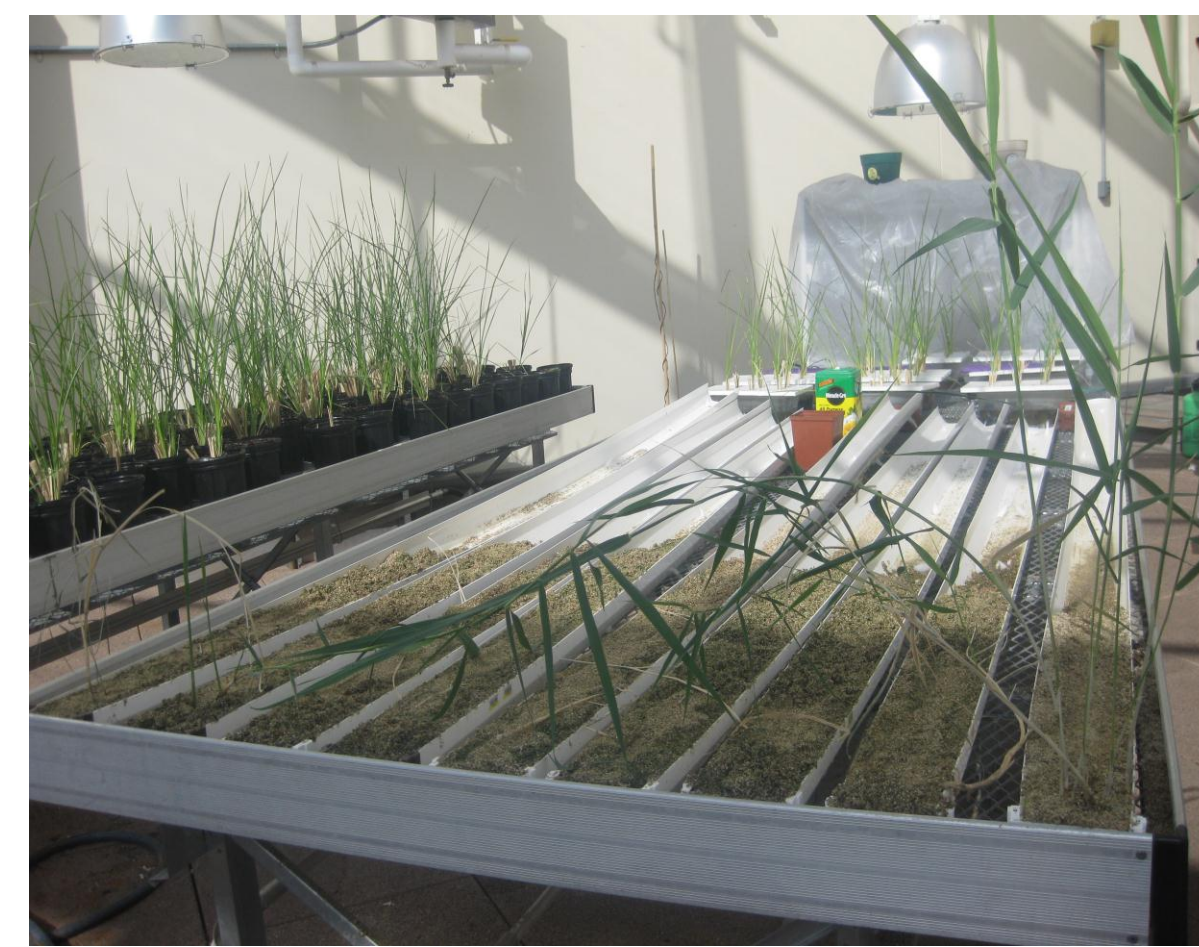
Figure 1. *P. australis* dominated stand (Forestry Images)

## Objectives

1) Test if *Phragmites australis* rhizomes and leaves produce different H<sub>2</sub>O<sup>18</sup> signatures between control and treatment samples.

2) These results will then be utilized in our sampling protocol to determine if rhizomes can translocate water from wet to dry sites.

## Methods



1) *Phragmites australis* rhizomes were grown in nine, 3.0 m long vinyl watering troughs filled with vermiculite (Michigan Technological University, Houghton MI)



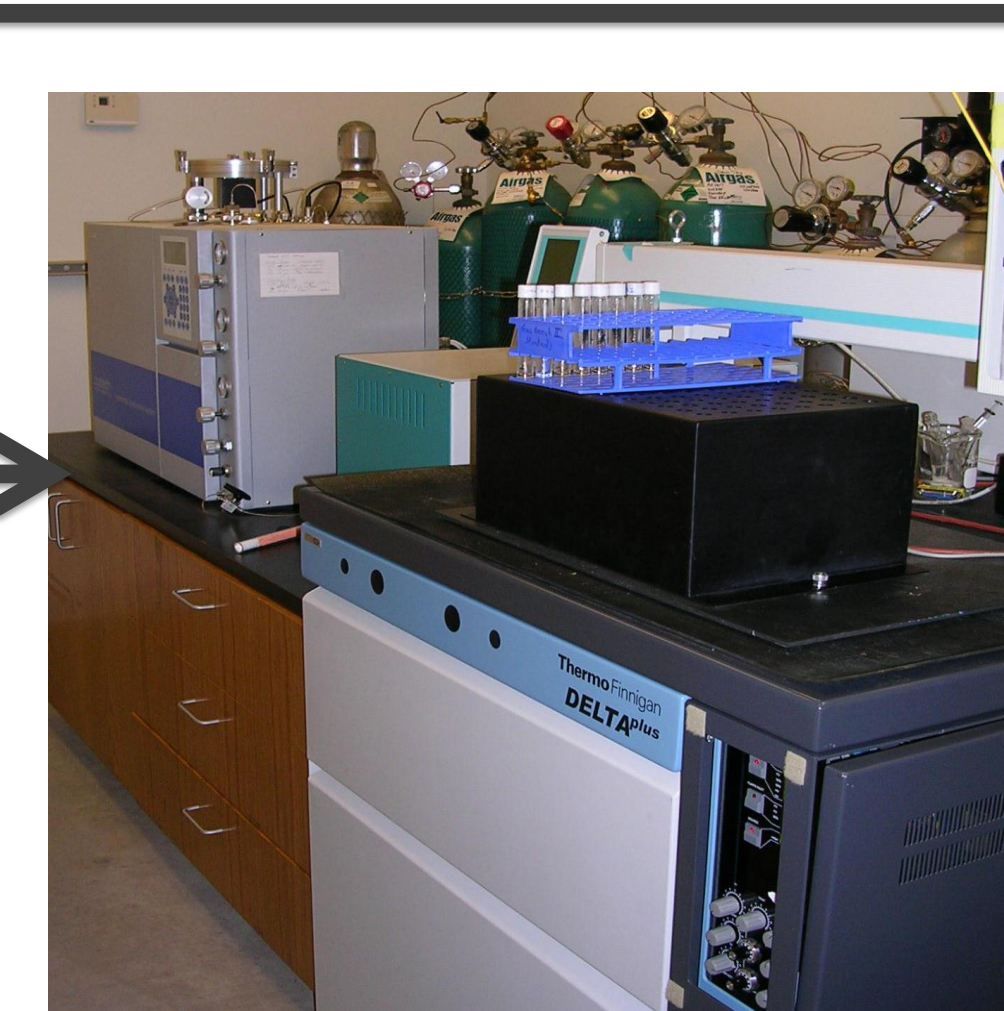
2) Six rhizome/stem fragments were isolated from the troughs and grown in pans (Figure 3a and 3b) filled with either control water or treatment water (H<sub>2</sub>O<sup>18</sup>).



3) Close up of *Phragmites australis* segment growing in O18 water. Rhizome and leaf samples were collected from each pan.



4) Water was removed from the samples through vacuum extraction (US Forest Service, Houghton MI).



5) Water samples were tested using a GasBench II connected to a ThermoFinnigan Deltaplus Continuous Flow-Stable Isotope Ratio Mass Spectrophotometer to determine presence and concentration of H<sub>2</sub>O<sup>18</sup> in each sample.

## Initial Raw Data

Sample ID	δO18 (o/oo)
O18 labeled water	2.3
O18 water from treatment pan	9.5
Rhizome from treatment plant	8.3
Leaf from treatment plant	29.6

Table 1: Content of <sup>18</sup>O in treatment water sample compared to the scientific standard of 0.

Sample ID	δO18 (o/oo)
Control Water	-12.9
Water from control pan	-5.9
Rhizome from control plant	-5.6
Leaf from control plant	20.7

Table 2: Content of <sup>18</sup>O in control water sample compared to the scientific standard of 0.

## Results

- Both treatments show elevated values of <sup>18</sup>O in their leaves.
- Water in the pan had a higher than normal <sup>18</sup>O value for both treatments.
- The resulting <sup>18</sup>O values for the rhizomes of both treatments are similar to that of the pan water each was grown in.



Figure 5. *P. australis* (Forestry images)

## Conclusions/Speculations

1) Fractionation is occurring in the leaves of both treatments and sampling in further tests would yield inaccurate results.

2) <sup>18</sup>O in the rhizomes was similar to that of the pan even though evaporation slightly increased <sup>18</sup>O in the pan. This indicates that rhizomes may store water from their environment without modification.

3) In order to capture the movement of water by *Phragmites australis* from wet to dry sites it appears that we should sample rhizomes.

## Literature cited

Chambers RM, Meyerson LA, Saltonstall K. 1999. Expansion of *Phragmites australis* into tidal wetlands of North America. *Aquatic Botany*. 64: 261-273

Maheu-Giroux M, de Blois S. 2006. Landscape ecology of *Phragmites australis* invasion in networks of linear wetlands. *Landscape Ecol*. 22:285-301

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