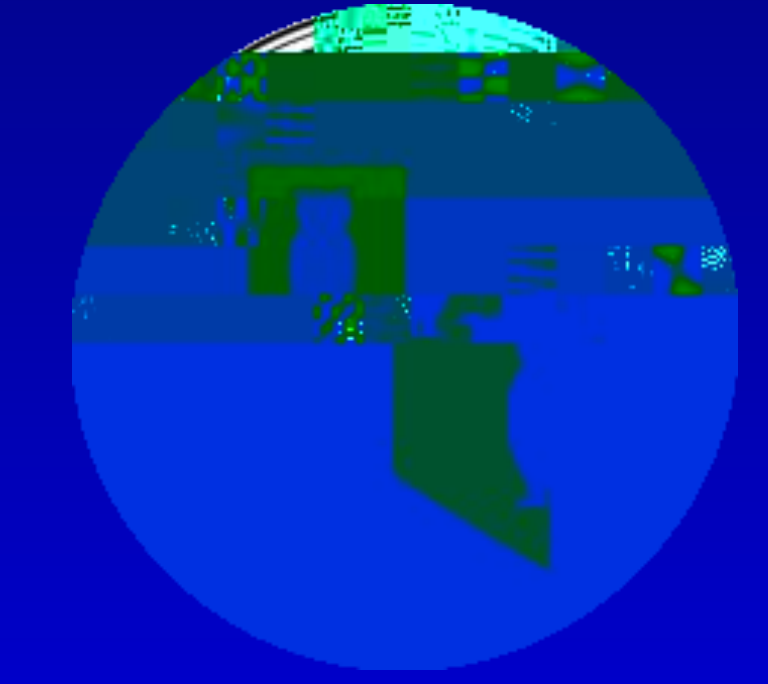


# Comparison of ecosystem services provided by *Phragmites australis* vs native plant species via meta-analysis.

Logan Wallace Shepard, Frances Romero, and Thomas Mozdzer  
Biology Department, Bryn Mawr College



## Abstract

## Introduction

*Phragmites australis*, is commonly considered an invasive species in North America, but there are at least two lineages of the reed. One invasive lineage is common in Europe and Asia (*Phragmites australis* subsp. *australis*) and a non-invasive lineage is common in North America (*Phragmites australis* subsp. *americanus*). Our meta-analysis focuses on the invasive *Phragmites australis* and compares it to native plant communities in tidal wetlands. We will be analyzing the data in order to determine if there are in fact instances where *Phragmites australis* is beneficial in combating industrialization and climate change.

This project explored the ecosystem services of the invasive common reed, *Phragmites australis*, in comparison with native plant communities in tidal wetlands. This involved a thorough literature review using specific search criteria, screening papers using tracktable methodology, and extracting data from papers or corresponding authors. Currently we have begun extracting data from the 269 papers that passed our initial screening. Our next steps fall into two categories: data analysis and data visualization. We will be analyzing the data in order to determine if there are in fact instances where *Phragmites australis* is beneficial in combating industrialization and climate change.

## Results

### Screening 1

Our first screening included reading titles and abstracts of every paper that showed up using our search words (798 in total) to see if it included North America and *Phragmites australis*. This left 462 at the end of the screening, including papers that did not specify location or species. Most papers were excluded because they were conducted in Europe or Asia.

### Screening 2

The second screening of the 462 reiterated the requirements for screening one, as some studies ended up being conducted in multiple places or using the North American strand but in a different country. Studies in different languages or conducted in countries outside of North America were excluded. Screening 2 also required a native reference that was compared to the *Phragmites australis*. The study also needed to be conducted in a tidal marsh system. After screening 2 there were 269 papers that passed. Most papers were excluded for not containing a native reference.

### Screening 3

Screening 3 was done at the same time as data extraction, and most papers were excluded for not having data for ecosystem services, not having consistent study sites, or not having comparable data for their native reference. Many papers did not report their data in numerical form, and corresponding authors were contacted for this data. In some instances the authors no longer had the data (when studies were over 15 years old), and then the study was excluded, despite it being a viable paper otherwise. Screening 3 is still underway along with data extraction.

## Methods

This project was begun by establishing the protocol that would be used to search for papers in Web of Science and screen the papers located in the search. This was a collaborative effort by the authors, and two other biologists; Judith Weis and Erik Kiviat. This protocol determined the 66 search term combinations that were used in Web of Science to find the 798 initial papers. The search terms included the combination of either *Phragmites*, *Spartina*, X or *Phragmites*, Native, X. X being one of the following:

- “Nutrient uptake”
- “Metal sequestration”
- Bird
- avian
- Fish
- nekton
- Invertebrates
- Animal
- Habitat
- GPP
- “Gross Primary Production”
- “Ecosystem service”
- Wildlife
- “Carbon storage”
- Soil
- “Blue Carbon”
- “Surface elevation”
- Accretion
- SET
- “Wave attenuation”
- Erosion
- “Aboveground biomass”
- “Belowground biomass”

The abstracts of these 798 papers were then subjected to an initial screening. Of the 798, 462 adhered to the criteria that the study must be conducted in North America and included *Phragmites*. We recorded if and why papers failed the screening, to eliminate bias. In the second screening, we accessed and read the papers resulting in 269 papers that adhered to the criteria that the study must be done in North America, include *Phragmites*, include a native reference, and be conducted in a tidal system. Currently screening 3 and data extraction is being done on those 269 papers. Thus far about half have been eliminated based on the fact that there was not enough data to extract. In our final steps, we will use the R programming language with specifically designed models to analyze the extracted data.