Facilitating Adaptive Management of non-native *Phragmites australis* in Wisconsin

Field Protocol

Purpose: To assess outcome of *Phragmites* treatments, monitor plant community response, and quantify change in *Phragmites* populations.

Patch characteristics

Percent establishment
Percent establishment is an estimate of the extent to which live *Phragmites* exists throughout the patch (or management unit). Establishment is selected from three percent ranges of total area taken up by live Phragmites: 0-10%, 11-50%, and 51-100%. Select the range that suits the patch according to your best judgement. This estimate should only be made for live *Phragmites* (stems that are still green). Percent establishment is observed in relation to the total area of the MU-- two patches of *Phragmites* would have the same percent establishment (i.e., take up equal percentages of the MU) if they cover the same area, even if one has a lower density of live stems than the other. For additional information see the PAMF Participant Guide.
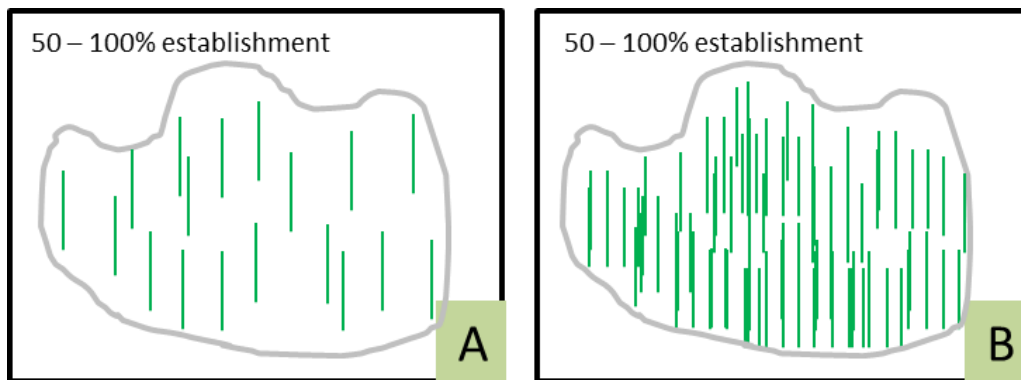
Treatment
Phragmites patches will be monitored among three temporal treatment categories: untreated, recently treated (September 2015 or later) and treated before September 2015.

Transects and quadrats

Within selected patches of *Phragmites*, one to five 10 meter transects, depending on patch size, will be randomly established (using a GIS tool) along a moisture gradient, perpendicular to the lakeshore if a coastal wetland, or a perceived gradient based on Digital Elevation Models. At five random points along a transect, vegetation and moisture status will be assessed in 0.25 square meter quadrats, placed 2 meters north or east of the transect. Surveyors will avoid placing the quadrat where they have been walking or where there is clear disturbance from other factors (e.g., wind damage, muskrat holes). The following parameters will be assessed:

Live Stem count*
At each of the five quadrats, count the number of live *Phragmites* stems within the quadrat. Count the live *Phragmites* stems inside the quadrat. To be counted, a stem must be emerging from the ground on the inside of the quadrat, not leaning over into it.

Dead stem count
At each of the five quadrats count the dead *Phragmites* stems inside the quadrat.

Stem diameter*
At each of the five quadrats, measure the diameter of three live *Phragmites* stems to the nearest millimeter (mm). Measure the live stem closest to each of the two marked corners of your quadrat and the live stem that is closest to the exact middle of the quadrat. The live stem diameter measurements should be taken as close to the ground as possible. Use a digital caliper for measuring stem diameter. Select the lowest, most reachable section of the plant's stem. Clean the stem from any debris. Open the main jaws of the caliper so they fit snuggly around the stem. Readjust the jaws if needed but do not apply pressure on the stem.

Phragmites stress*
Within each of the five monitoring locations where live Phragmites is found, assess the *Phragmites* growing within the quadrat for signs of non-treatment stress. For our purposes (and that of PAMF), there are three categories of non-treatment stress - environmental, pathogen, and insect. If you observe signs of any of these stressors on the majority of live *Phragmites* growing within a quadrat, record "Y" for yes. Otherwise, record "N" for no, or "U" for uncertain. For any quadrats where "Y" is recorded, you will indicate the type(s) of stress observed - "E" for environmental, "P" for pathogen, and/or "I" for insect. If you observe non-treatment stress, we encourage you to take a picture of the stressed *Phragmites* within each quadrat where stress is observed. You will be able to upload these photos to the web hub while reporting monitoring data.

Environmental*
Determine if the majority of live *Phragmites* at your monitoring location (growing inside the quadrat) is showing signs of environmental stress, such as wilting, yellowing, and/or fading leaves. Only record environmental stress if the majority of live *Phragmites* growing inside the quadrat are showing one or more of these signs of environmental stress. If possible, take a picture of the *Phragmites* showing signs of environmental stress within each quadrat where this is observed.

Pathogen*
Determine if the majority of live *Phragmites* at your monitoring location (growing inside the quadrat) show signs of disease, such as dark spots or other indication of fungal growth (Figure 2.2). Only record pathogen stress if the majority of live *Phragmites* growing inside the quadrat are showing these signs of pathogen stress. If possible, take a picture of the *Phragmites* showing signs of pathogen stress within each quadrat where this is observed.

Insect*
Determine if the majority of live *Phragmites* at your monitoring location (growing inside the quadrat) show signs of insect stress. Signs of insect stress include irregular holes on the leaves, torn or missing leaves, holes in the stem, and leaf or stem galls (Figure 2.3). Keep in mind that the presence of insects does not necessarily stress the *Phragmites*-- if there are insects such as aphids or ants present but there are no signs of physical damage to *Phragmites*, do not indicate insect stress. Only record insect stress if the majority of live *Phragmites* growing inside the quadrat are showing one or more of these signs of insect stress. If possible, take a picture of the *Phragmites* showing signs of insect stress within each quadrat where this is observed.

Richness
Count the number of different plant species growing in the quadrat. Make a list of all non-native plant species that are included in the richness count. A checklist of non-native species likely to be encountered will be provided. Attempt to make a list of native species included in the richness count. Surveyors may not necessarily be skilled at plant identification and are not expected to spend an inordinate amount of time identifying plants. Photographs, notes in the 'Notes' section, naming commonly encountered plants (such as unknowns 1-x), and specimen collection are strategies that can be used to attempt to account for native plant presence.

Moisture status
Categorize quadrats by how dry or moist they are. Indicate on the datasheet whether each quadrat is dry, moist (if wearing socks, they would be wet), mucky, or standing water. If a quadrat has standing water, measure the depth using a meter stick allowed to rest at it's natural lowest point, but not inserted into the substrate.

Notes:
Indicate anything else noteworthy that could indicate efficacy of treatment. This could include items such as: amount of bare soil, notes on community type or habitat characteristics, etc.

same attributes measured by the Phragmites Adaptive Management Framework

Equipment needed

Maps of *Phragmites* patches	Measuring tape	GPS unit
extra batteries	compass	pencils
data sheet	calipers	camera
0.25 m² quadrat	meter stick	mud boots waders