MINNESOTA AQUATIC INVASIVE SPECIES
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MNPhrag

Minnesota Non-native *Phragmites* Early Detection Project

Guide to Identifying and Reporting Non-native Phragmites australis

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ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

Introduction

Thank you for your contribution to early detection of non-native *Phragmites* or European common reed in Minnesota. Non-native *Phragmites* (*Phragmites australis* ssp. *australis*) is not yet widespread in Minnesota. Effective control can slow the spread and reduce the impacts of this invasive species, and that begins with accurate identification. Native *Phragmites* (*Phragmites australis* ssp. *americanus*) is very common in Minnesota and can be confused with non-native *Phragmites*. Distinguishing native from non-native *Phragmites* can be challenging, so we created the MNPhrag ID Guide to help in that endeavor.

The morphological characters used in the ID Guide are presented in order of stronger to weaker characteristics. Characteristics most readily identifiable in the field are leaf sheath adherence to the stem and stem glossiness or roughness. Ligule height is another strong characteristic, but it takes practice to learn. Stand density, stem height, inflorescences and leaf color are variable characteristics that are not reliable on their own for identification. A solid ID depends on using 3 to 4 different identification characteristics.

If you find a suspected population of non-native *Phragmites* report it in EDDMapS. Along with your report, submit a set of photos including images of 1) lower stems (capturing stem color/texture and leaf sheaths), 2) ligule, 3) whole stand, and 4) inflorescence. Photos of the lower stems and ligule are most informative. See page 12 for details.

More Information

If you'd like more information about the distribution of non-native *Phragmites* in Minnesota or to learn about *Phragmites* control options, check out the MNPhrag webpage: https://z.umn.edu/phragmites

If you have any questions about non-native *Phragmites* in Minnesota please reach out to
Julia Bohnen · bohne001@umn.edu · 952-681-8729 or Dr. Daniel Larkin · djlarkin@umn.edu · 612-625-6350.

Photo Credits

- Bernd Blossey - Cornell University, Ecology and Management of Invasive Plants; Ithaca, NY. Pages 3 and 9.
- Julia Bohnen – University of Minnesota; Department of Fisheries, Wildlife and Conservation Biology; St Paul, MN. Pages 3-10 & 13-14.
- Robert Meadows – North Delaware Wetland Rehabilitation Program; Delaware Mosquito Control Section; Newark, DE. Page 11.
- Kristin Saltonstall – Smithsonian Tropical Research Institute; Panama City, Panama. Pages 3 and 11.

Get acquainted with terms used in this guide

Grass vegetative structures

Leaf blade – the wide flattened part of a grass leaf

Ligule – the area on the upper surface of the leaf (facing the stem) where the leaf blade joins the leaf sheath; usually a membranous tissue, fringe of hairs, or a combination of both

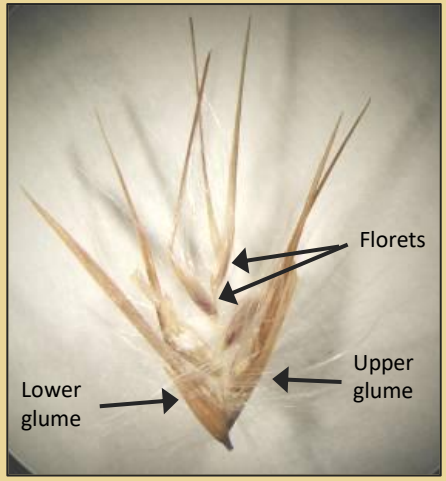
Culm – a grass stem

Leaf sheath – the basal part of a grass leaf which encircles the stem

Grass floral structures

Inflorescence – the collection of flowers or the seedhead of a plant

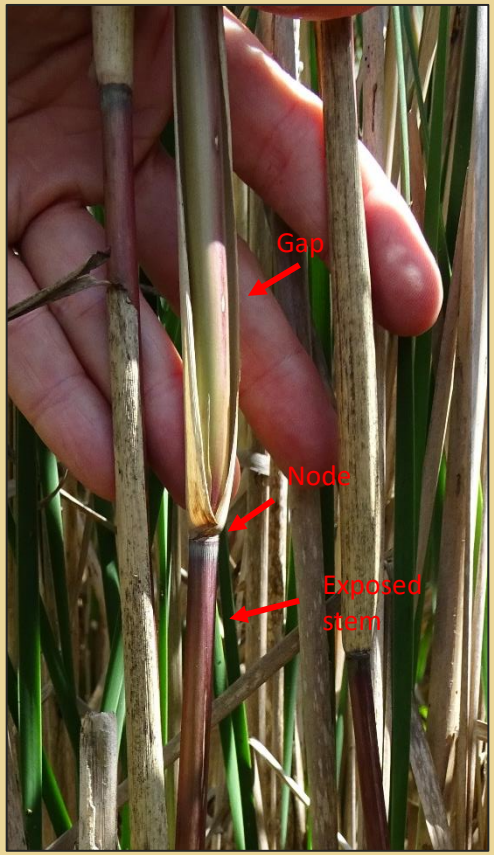
Spikelet – the basic unit of a grass flower



Inflorescence photo courtesy R. Blossey. Spikelet photo courtesy K. Saltonstall.

Leaf Sheath Adherence to Stem

Leaf Sheaths on Current Year's Stems



Native
Sheaths loosely attached, gapping away from the stem; some open down to their attachment at the node; sheaths tend to not overlap along much of the stem.

Non-native
Sheaths closely attached to the stem with no loose edge; sheaths strongly overlapping.

These photos taken in August

ID Tips:
In early to mid summer, the leaf sheaths on the upper stems of **native *Phragmites*** are also tightly adhering. Lower sheaths may be somewhat loose, but may not gap yet. Note that the sheaths of **native *Phragmites***, particularly on the lower stems, do not consistently overlap each other and the stem is exposed in the gap between the two adjacent sheaths. In early summer, the stems will already be red where they are not covered by the sheath and they will be smooth and shiny.

The sheaths of **non-native *Phragmites*** more consistently overlap each other, so the stem appears to be more consistently green. Sometimes on the lower stem, the sheaths do not overlap, and where the stem is exposed, it may have a reddish blush. This seems to be more typical of young stems and stems growing in standing water. Where the stem is exposed, it will be dull, as described on page 5.

Stem Texture and Color

Native
Exposed stem glossy and feels smooth to the touch; typically chestnut-red in the lower part of the plant.

Non-native
Stem feels rough due to ridges on the tightly adhering sheath; typically green, but may be red on the lower stem, especially if growing in standing water.

Stem color with sheaths removed

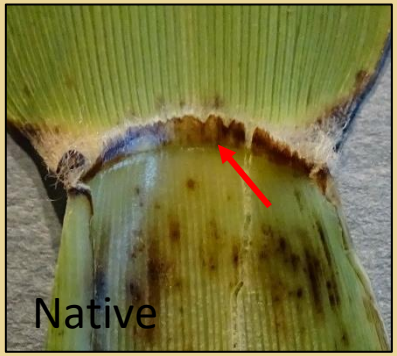
Native
Stems glossy and rosy to chestnut-red in the lower half of the plant, especially where exposed to light; stems green where sheath was removed.

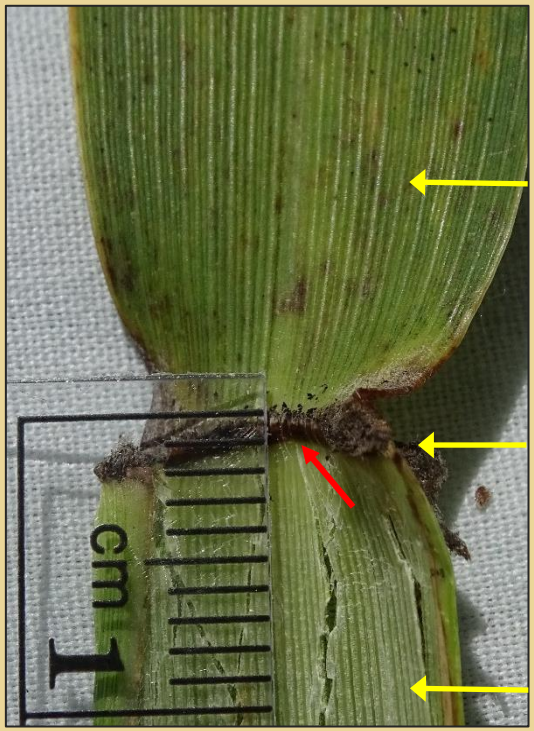
Non-native
Stems dull and typically green throughout, but may be red on the lower stem.

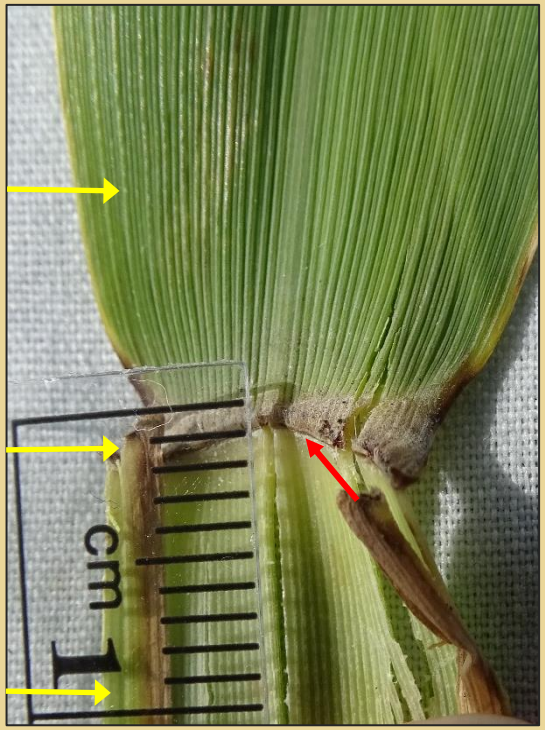
Ligule Height (Thickness)

Ligule height (thickness) is one of the stronger characters for identifying non-native *Phragmites*. Although it may not be easy to measure in the field, it can be visually determined with a little practice using the cues described here.

Measure ligule height on leaves from approximately the middle third of the plant. Ligules on upper, newly emerging leaves are not as well-developed. On lower leaves or in winter, ligules may be degraded.







Native
A flap of tissue or thick smudgy line
Loose flap can be caught with your finger
>1 mm (1.0-1.7 mm)

Non-native
Thin discrete brown to black line
No flap of tissue to catch with your finger
<1 mm (0.4-0.9 mm)

To expose the ligule, hold a leaf blade in one hand and the culm in the other, pull the leaf blade away from the culm. The ligule is found where the bottom of the leaf blade meets the top of the leaf sheath, inside the curve where the leaf was wrapped around the stem. Measure the height of the ligule from the point of attachment as indicated by the red arrows. Include the membranous tissue (native) and the short, stiff fringe of hairs in the measurement. Do not include longer thread-like hairs. A hand lens is helpful to determine the area to measure.

ID Tips: In early to mid summer, the ligule of the native type is clear to reddish brown and does not look smudged. In late summer and fall, the ligule of the native type is described as a thick smudged line as if drawn with a lead pencil. In summer and fall, the ligule of the non-native type can be described as a discrete thin, brown to black line as if drawn by a fine point marker.

Stem Density, Persistence, and Height

Native
Stem density is often low (upper inset), allowing mixed species communities, though high-density monocultures also occur. Dead stems persist through winter, but may not be as abundant the following season as in non-native stands. Plant height is up to 12 feet tall. The stand will be dark green early in the season, but will begin turning yellowish-green as early as mid-August (lower inset), as it senesces earlier than the non-native.

Non-native
Stem density is typically high with live and dead stems forming a dense monoculture; newly established populations may be less dense (inset). Standing dead stems persist into the following season. Plant height is as much as 15-18 feet tall. The stand may appear bluish-green and by late summer is usually darker than most populations of the native form. Stays green after early frosts.

Leaf Blade Color

Native - Leaf blade color is deep green in early summer as the plants emerge. Plants begin to senesce and yellow as early as August and can readily be picked out by their yellow tone by early September (inset).

Non-native - Leaf blade color is typically darker bluish-green. Dark green lasts until after the first hard frost.

Inflorescence

The large fluffy inflorescences along with the height of the plants may be the first thing that draw your attention to *Phragmites*. Don't rely on these characteristics alone to make an ID. Confirm the ID using characteristics of the sheath, stem texture, stem color, and ligule.

Native
Emerging inflorescences green to purplish-green; more sparsely branched compared to the invasive form; tend to have an open, flagging character (large image); persist through winter at a lower density.

Non-native
Emerging inflorescences are green to purplish-green; more densely branched compared to the native form; flagging to upright conical shape (inset) in late fall/winter; persist through winter at a higher density.

Inset winter inflorescence photos courtesy B. Blossey.

Late Winter and Spring ID Tips

Inflorescences on Previous Year's Stems

Native
Inflorescence thin and few branched (variable character)

Non-native
Inflorescence full and much branched (variable character)

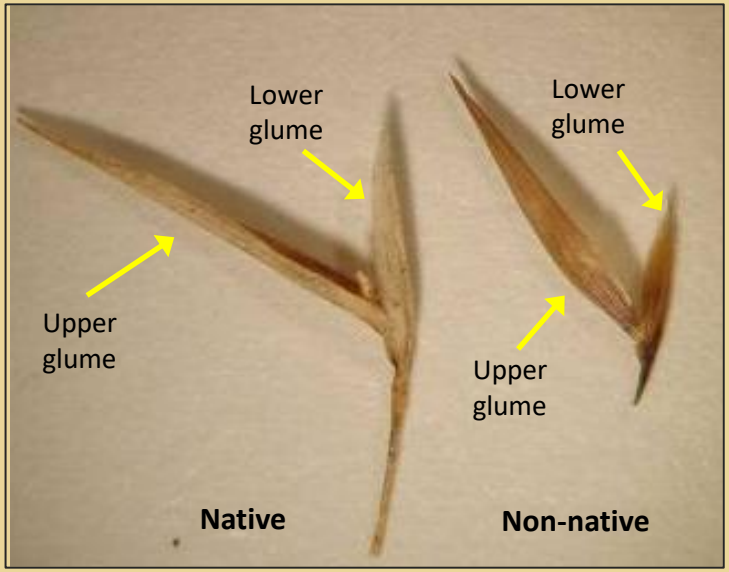
Leaf Sheaths on Previous Year's Stems

Native
Sheaths loosely attached; most readily fall off stem when leaf blades die, leaving smooth glossy bare stems by late winter. Stems may have faded red blush. "Naked = Native"

Non-native
Sheaths tightly attached; wholly or partially intact; more likely to persist on stems in winter and the following season.

More Difficult/Less Reliable Characteristics

Glumes



Native
Lower glume
3.0-6.5 mm,
most >4 mm

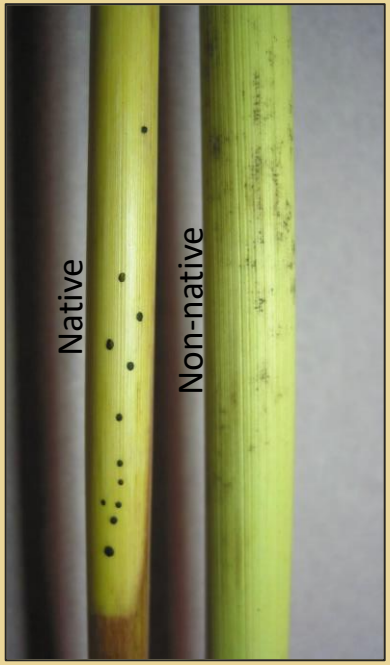
Upper glume
5.5-11.0 mm,
most >6.0 mm

Non-native
Lower glume
2.5-5.0 mm,
most <4 mm

Upper glume
4.5-7.5 mm,
most <6.0 mm

Glume characters are not easy to use in the field. Measurable glumes are not present in every season and measurement requires a microscope.

Spots on Stems



Native
Fungal spots may occur on the stem after mid-summer. Many stands will not have spots.

Non-native
This image shows mildew on the stem. Some non-native stands have now been found with fungal spots as well.

Fungal spots alone should not be relied upon as a diagnostic character.

Glume photo courtesy K. Saltonstall. Spots on culm photo courtesy R. Meadows.

Invasive Phragmites Documentation using Photographs for Verification.

Report suspect *Phragmites* populations in EDDMapS using the EDDMapS Pro app or on your computer (https://www.eddmaps.org/report/).

Alternatively, include the following information along with images in an email to Julia at bohne001@umn.edu to report a suspect population:

- coordinates
- location name or street/road
- date
- county

While at the site, take the 3 images described below to include with your EDDMapS report:

1) Image of the lower stems. See pages 4-5 and 14.
Native: If the stems have glossy smooth reddish areas and the sheaths are loose and don't overlap, then it is likely to be native *Phragmites*. In winter, the stems are more likely to be tan, but will still feel smooth, and may have a faint pinkish blush; the sheaths will have fallen and much of the stem will be bare.
Non-Native: If the lower stems are entirely green (or tan in winter) and the sheaths are wrapped tightly around the stem and overlapping, then it is likely to be invasive *Phragmites*.

2) Image of the ligule. See pages 6 and 13.
How to find the ligule: The ligule is located just where the sheath (the part that wraps around the stem and attaches the leaves to the stem) meets the base of the leaf blade. About midway up a stem cut through the stem an inch or two below a leaf. Slip the leaf sheath off the cut stem. In winter, it works best to find a stem with an attached leaf.
How to take sharp photos of the ligule: Use one to three of these leaf sections to take a close-up photo of the inside area where the sheath meets the leaf blade. Some phone cameras may focus better on three pieces than one. Alternatively, the camera may focus better if the sheaths are placed or taped on a solid surface or if your fingers are in the image. Be sure the image is taken straight on at the ligule, as in the examples in this guide. The image needs to be clear. An accurate ID cannot be made from a fuzzy image.

Save a couple samples of these ligule sections in case new sharp photos are requested by the verifier

3) Image of the whole patch, including the seed heads. See page 7.

4) Optional image of the inflorescence or seedhead that depicts branching density and shape (flagging or conical, etc.). See pages 9 and 10.

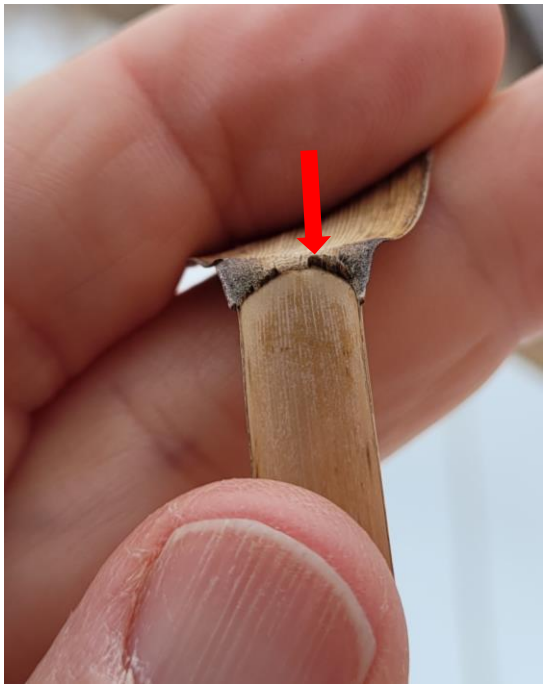
If images are not clear, additional photos may be requested in order to verify the record.

****To reduce the risk of spread by seeds, collect a voucher specimen only if requested by the verifier****

How to find the ligule

Find the ligule here (red arrow) at the junction of the leaf blade and the sheath.

Pull the leaf blade back to expose the ligule (red arrow). Better yet, cut the stem below the junction of the leaf blade and sheath and slip the sheath off the stem to expose the ligule.



Here's a photo of a native *Phragmites* ligule where the fingers helped sharpen the focus.

Here's a photo of non-native *Phragmites* ligules where the group of ligules helped sharpen the focus.

Image of lower stems

Native *Phragmites* in late fall showing glossy bare stems with sections retaining a reddish tinge. Sheaths have largely fallen off, but a few remain.

Non-native *Phragmites* in growing season (above) and in winter (right) showing tightly adhering, overlapping sheaths. In the photo taken in winter, the leaf blades have dropped, but you can see the top of each leaf sheath and how they overlap with each other.