Management of *Phragmites Australis*

Phragmites australis, also known as the common reed, is a perennial grass that often reaches heights up to eighteen feet and forms dense stands in sunny wetlands and marshes as well as other riparian zones. The only limiting factor of *Phragmites* is salinity, as it is unable to thrive in salt levels over 26,000 ppm. Once established in an area, it can persist in water depths up to six feet. Its rhizomes can extend up to sixty feet and grow six feet in a year.

Through genetic analysis, three distinct lineages have been identified: the North American lineage, the Gulf Coast lineage, and the other, more aggressive invasive lineage that was introduced from Europe in the late 1800s, most likely from ballast water. This strain has been able to spread very rapidly because of its ability to fill niches in disturbed areas that overlap with native strains. Because of its resilience, the invasive strain is also able to spread to disturbed areas such as roadsides, construction sites, and shoreline developments. This means that *Phragmites* can be considered both a pioneer and climax species. It will establish on bare sites as well as spread to sites already populated with secondary successional plants.

Phragmites reproduces sexually by seeds dispersed by wind and water. It can also reproduce vegetatively from rhizome expansion and the movement of rhizome fragments. Each plant can produce hundreds to thousands of seeds per year to compensate for the high variability in seed viability. Germination occurs in the spring. The invasive strain grows as a monoculture,

decreasing biodiversity of native plants. There is also interference competition between *Phragmites* and other plants, as it can release toxins from its roots to hinder the growth of other plant species. It degrades habitat by increasing marsh elevation and filling in open water areas that are home to many fish.

As mentioned before there are mainly two types of *Phragmites*; Native and the kind that is discussed here (Invasive kind). The native *Phragmites* grows in low density stands together with other native plants compare to the invasive *Phragmites* that grows densely in an area without giving other plant species a chance to grow. The native species typically possess leaves that are thin and light in color (usually yellow-green). The leaves contain no center ridge and there are few of them on a single culm while the invasive has extensive leaves with center ridge. Another difference between the two is that the native species develop spots on its culms (stems) that are caused by fungus that has not adapted to the invasive one. To put it simply, the invasive kind is sturdy, dense, dark in color and leafy while the native one is less dense, light in color, spotted and weak compare to the invasive species.

Stands of *Phragmites* are very dense and can reach heights of up to eighteen feet. This ruins the aesthetics of otherwise valuable property near water. Large amounts of cellulose and silica in the leaves and shoots of *Phragmites* creates a sharp surface that often deters nesting birds. The monotypic stands are often impenetrable and therefore prevent the movement of large birds. Fish have rarely been observed spawning where *Phragmites* meets the water's edge. Populations of the willet and marsh wren are less abundant in areas overcome with *Phragmites*,

Cite all these studies in text

as well as species of special concern such as the seaside sparrow, salt marsh sharp-tailed sparrow.

The best way to control *Phragmites* is through an integrated management approach including the application of an herbicide followed by controlled burning one year later to rid of dead biomass. 80% of *Phragmites* biomass is underground as extensive root systems are developed to access water that other plants are not able to, so herbicide use is critical as other control methods due not destroy the rhizomes where nutrients and hormones are stored. Two broad spectrum herbicides have been proven effective against *Phragmites*: glyphosate and imazapyr, both with advantages and disadvantages. Both chemicals are approved for use in wetlands by the Environmental Protection Agency and does not bio accumulate in organisms.

Glyphosate is the preferred herbicide, as it does not persist in the soil as long as imazapyr, and thus is not as likely to prevent the growth of native plants following treatment. It binds strongly to soil, so contamination of groundwater is not likely and is broken down by microorganisms after only four hours into natural substances such as carbon dioxide, nitrogen, phosphate, and water. It is non-toxic to humans, fish, birds, and honeybees.

The most common brand of glyphosate is Rodeo™, and has been proven to be up to 90% effective in killing plants. It works by blocking enzyme pathways and preventing protein production. It is best absorbed by *Phragmites* in midsummer when each plant is translocating sugars from leaves to rhizomes. Prior to application, it should be mixed at the recommended concentration as per the label with an aquatic surfactant so it sticks to leaves better. Application

should be done with backpack spraying equipment by trained professionals. The *Phragmites* will die within 6-8 weeks.

← Completely?

Aerial spraying is not recommended at this site because it is not large enough to warrant the use of a helicopter. Cost is also a factor. At the recommended dose of five pints of glyphosate per acre, a two and a half gallon container of 41% solution of glyphosate costing $45 will treat 4 acres. This puts the cost at $11.45 per acre.

Following the initial herbicide treatment, a controlled fire should be arranged a year later in late summer to burn away the dead biomass that remains. The fire will also kill any Phragmites or seed heads that survived the initial treatment, as seeds can remain dormant for many years. The release of nutrients due to the fire can stimulate growth of native vegetation prior to the first frost.

Treatment will likely need to be repeated as rhizome fragments not connected to a sprayed plant can regenerate. A second herbicide treatment and controlled burning will probably be necessary the next year, and spot treatment can be done for the third year if there is any invasive Phragmites remaining. It is possible that a biological means of control will be developed in this time, which will have to be considered if need be. Herbicide use is definitely not recommended in any scenario other than with invasive or other harmful species. It is not of the opinion of the town that aesthetics alone justifies the use of herbicides. In the case of *Phragmites*, it is the lesser of two evils.

↑ So why can you suggest the use of this? I thought aesthetics was a major part of why you suggest the use of herbicides!

If additional funding is needed to complete this project, a parking fee to access the lake can be implemented to gain revenue. Parking is currently free of charge. Only the swimming areas cost money to access.

Resources should be devoted to educate the public on the issues surrounding the invasion of *Phragmites*, as well as ways they can help to prevent its spread. Any equipment or material that has been potentially exposed to fragments of *Phragmites* should be properly cleaned or disposed of. If *Phragmites* is found on their own property, cutting off new sprigs or spreading runners can delay growth. Hiring a professional and obtaining a permit for herbicide use may be appropriate. ← By private property owners? What would the role of the "professional" be?

Residents that welcome *Phragmites* should be made aware of these negative impacts it may have on the lake and its biodiversity. It may prevent erosion short term, but this benefit does not outweigh the other possible consequences. In addition to decreased biodiversity, *Phragmites* has been observed to accelerate aquatic succession. Because of the density and size of its stomata, transpiration rates are much higher than that of native plants, leading to more water loss. Stomata are left open even on very hot days if water levels are not low to power photosynthesis. In addition, detritus from *Phragmites* is slower to degrade, and thus accumulates faster as compared to detritus of native plant species. Because this is a long term issue, it may not be an immediate concern for local residents, yet it does make swimming less pleasurable, and swimming is a main attraction of the lake. Infestation of invasive *Phragmites* also reduces the recreational values for birdwatchers, boaters, and naturalists.

Good point!

Residents concerned about flooding of their basements should consider planting native plants that absorb a lot of water, such as *Salix pedisellaris*, also known as the bog willow. It is endangered in Connecticut and native to Fairfield, Litchfield, New Haven, and Hartford counties. Other willows to consider are Salix petiolaris, the meadow willow, and Salix serrisima, the autumn willow, as they are both species of special concern.

Did you find anything about how effective Phrag. is at purifying floods? Or is this an unsupported hypothesis?

Check on limiting factors → some studies could suggest N or sunlight as limiting factors for Phrag. growth. Salt water might also be — but there could be multiple, & of which is the predominant limiting factor at a given moment in time!

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Miga Otgonbayar

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