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Advisor Name:

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Major:

Hometown (for press releases):

CurrentStatus:

Expected Month of Graduation:

Expected Month of Graduation:

Natural Area where research will be conducted (can be more than one) :

Title: The ecological effects of timing in control of *Phragmites australis* at Point au Sauble Nature Preserve in Brown County, Wisconsin

Introduction:

Removal or control of invasive species, especially those that have come to dominate local ecosystems, may have numerous unintended or unexpected consequences (Zavaleta et al. 2001). In highly seasonal environments like the Great Lakes region of North America, the timing of invasive species control may further complicate the response of native species due to seasonal differences in the environmental conditions of the treated site (MacDougall and Turkington 2005). Understanding the importance of timing might lead to more cost-effective treatment methods and, more importantly, might provide meaningful insights into the causes and consequences of the invasion process itself.

The Point au Sauble Nature Preserve is located on a peninsula along the eastern shore of lower Green Bay, Lake Michigan. A major portion of the peninsula was transferred to UW-Green Bay from The Nature Conservancy in 1997, after a long history of private ownership as a duck hunting preserve. The outer 93 ha (233 acres) of the point (including both the Point au Sauble Preserve and adjacent private lands) have never been developed for agriculture or permanent residences. However, the site has undergone numerous changes in hydrology and vegetation mainly due to natural disturbances and ecological succession. During periods of high water levels low lying areas have been filled with open water and have served as an important stopping place for migratory birds. When water levels have dropped, mud flats have been colonized by pioneer species, eventually changing to a predominately cattail marsh. In the last decade *Phragmites australis*, a highly invasive grass, has overtaken the cattails and the shoreline. *Phragmites* is a native species throughout North America. However, both the abundance and distribution of *Phragmites* has drastically increased over the last 150 years, from being considered rare in the 1800's, to common and increasing in the 1900's. The introduction of non-native genotypes appears to have resulted in a cryptic invasion, in which native haplotypes (distinct genetic lineages) were displaced and the range of *Phragmites* increased (Saltonstall 2002).

The invasion of *Phragmites* into new areas can displace native vegetation and destroy habitat for invertebrates, fish, and birds. As a result, control of *Phragmites* has become a priority for resource managers in many areas. Common control methods include spraying herbicide (glyphosate or imazapyr), mowing and spraying, and burning. Despite the widespread use of these control techniques, published accounts on the effects of these treatments are limited. Repeated use of these control methods may be costly, time consuming, or even detrimental to other species. Evaluating the various approaches of control and continuing the search for improvements in the way *Phragmites* is managed is necessary to conserving natural areas. In partnership with the Green Bay U.S. Fish and Wildlife Service, this project proposes to analyze the effect of the timing of mowing pretreatments on the ecology of a *Phragmites* dominated wetland. Our goal is to assess whether different mowing schedules (early vs. late) affect the success of herbicide treatment in controlling *Phragmites* and whether timing of treatment affects the capacity of native species to recolonize the wetland.

Methods

During summer 2007 Gary Van Vreede, biologist with the U.S. Fish and Wildlife Service, worked with UW-Green Bay biologists to establish fifteen 28 m wide plots within the *Phragmites*-dominated lagoon at the Pt. au Sauble lagoon. Treatment of these plots is scheduled for fall 2008. Twelve to fourteen transects of these plots will be randomly assigned to one of two different pre-treatment schedules: 1) early mow, during the week of July 15 and 2) late mow, during the week of August 15. Subsequent spraying of all transects sprayed will occur in September when the majority of *Phragmites* seedheads are mature. This will result in 6-7 replicates for each of the two treatment types. Mid June is the current date recommended for *Phragmites* mowing (G. Van Vreede, pers. comm.), but the first mow date for this project has been established later in order to accommodate the nesting cycle of resident birds (L. Athorp, unpublished data). Timing of mowing is important because it affects the vulnerability of *Phragmites* to herbicide treatment. Plants are likely to be especially sensitive when above-ground energy reserves are maximal and when photosynthetic activity is highest. The timing of mowing, for example, affects the amount of time available for above-ground shoots to grow and sequester energy reserves in above ground tissues. Of course, this timing also affects the vulnerability of native species to the same herbicide treatment.

During summer 2008 I will measure physical and biological variables at the experimental plots before and after mowing. Measurements will include *Phragmites* height, density, and time of seed production; humidity, air temperature, soil temperature and soil moisture; and litter depth and volume. Sample quadrats (1m x 1m) will be randomly located within the larger plot. I also will record all identifiable plant species within these plots. Results will provide a comparison of ecological conditions between the early mow vs. late mow pretreatments. Because these pretreatments will take place at the height of the summer growing season, we can expect that the timing will have significant consequences on the regrowth of both *Phragmites* and native wetland plants.

Application of Results

I expect that differences in the time of mowing will affect the amount and decomposition rate of accumulated litter, thus indirectly affecting soil conditions and regrowth of *Phragmites*. Soil conditions are important as they affect the ability of other species to grow and recolonize the area. The responses of wetland plants at Pt. Sauble will provide insights into the effect of

mowing time on *Phragmites* control and should provide specific management recommendations for herbicide treatment of *Phragmites* invasions. The information obtained from this project also will serve as a reference for future studies at Point au Sauble, especially the effects of herbicide treatment on native wetland plant species. A comparison of wetland plant species that emerge after mowing with wetland plant species that are present (later) after herbicide treatment will help identify species that might be vulnerable to the herbicide treatment of *Phragmites* stands. I also hope to provide insights into the more general ecological effects of *Phragmites* invasion, including both the physical changes and biotic effects of dense litter accumulation and vegetative growth. The timing of pretreatment might significantly alter the consequences of these effects on subsequent control measures and native species regeneration.

References

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- MacDougall, A.S. and R. Turkington. (2005) Are invasive species the drivers or passengers of change in degraded ecosystems? Ecology 86:42-55.
- Mook, J.H., & van der Toon, J. (1982) The influence of environmental factors and management on stands of *Phragmites australis*: II. Effects on yield and its relationships with shoot density. Journal of Applied Ecology 19: 501-517.
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Budget

Transects.....\$10 each approximately twelve needed
Travel to meet with DNR staff in Madison 1 trips @ 250 mi / trip @ \$.28/mile\$70
Disposable Supplies (tape, sampling bags, insect repellent).....\$120
Total.....\$310