Sheboygan and Ozaukee Counties, Wisconsin
Phragmites and Japanese Knotweed
Management Plan

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INTRODUCTION

On behalf of the Ozaukee Washington Land Trust, Inc. (OWLT) and Southeast Wisconsin Invasive Species Consortium, Inc. (SEWISC), Stantec Consulting Services Inc. (Stantec) has drafted this Management Plan detailing proposed treatment strategies to control non-native invasive species along the Lake Michigan shoreline, connected wetlands and riparian area and select inland areas within Sheboygan and Ozaukee Counties, Wisconsin. OWLT and SEWISC intend to apply for Wisconsin Department of Natural Resources (WDNR) Aquatic Invasive Species (AIS) Control Grant funding to fulfill the goals and objective set forth in this plan.

OWLT is a local, non-profit conservation land trust whose mission is to preserve the water resources, natural areas and working lands of Ozaukee and Washington counties and the surrounding region. SEWISC is a broad-based coalition that promotes efficient and effective management of invasive species throughout Kenosha, Ozaukee, Milwaukee, Racine, Sheboygan, Walworth, Washington and Waukesha counties. Together, the project partners promote efficient and effective management of invasive plant and animal species, in order to improve the quality of lakes, streams, rivers and wetlands, protect and enhance wildlife habitat, and preserve scenic and open spaces throughout the region. Both organizations foster strong conservation relationships, in order to share and leverage limited resources, raise public awareness about invasive species problems, and collaboratively reduce the impact of invasive species on both public and private lands.

The project partners have identified goals for invasive plant species control across Sheboygan and Ozaukee Counties. Specific goals will address the challenges presented by invasive species: preventing their introduction and spread through early detection and rapid response; addressing known populations of invasive species utilizing Integrated Invasive Species Management methods; considering invasive species during restoration projects; and continually working to enhance collaboration among all stakeholders.

Possible partners and affiliates that will advance the proposed activities set forth in this Management Plan, include, but are not limited to:

- Ozaukee Washington Land Trust, Inc.
- Southeast Wisconsin Invasive Species Consortium, Inc.
- Sheboygan River Basin Partnership
- Sheboygan Ozaukee Shoreline Homeowners Association
- Sheboygan County
- Ozaukee County
- Stantec Consulting Services, Inc.
As part of this project, the partners intend to target the invasive common reed grass (*Phragmites australis* subsp. *australis*), commonly referred to as *Phragmites* and *Japanese knotweed* (*Fallopia japonica*; synonyms: *Reynoutria japonica*, or *Polygonum cuspidatum*). While *Phragmites* and *Japanese knotweed* are the target invasive species, this Plan applies to other aquatic invasive species that are currently known or have potential to occur within Sheboygan and Ozaukee counties in the near future.

Although there is a native variety of *Phragmites* that occurs naturally within Wisconsin wetlands, this management plan focuses on the extremely aggressive non-native subspecies of *Phragmites* that has begun to colonize roadsides, wetlands, and shorelines throughout the Great Lakes region. The spread and colonization of this species has severe consequences to native ecosystems, reduces access to recreational opportunities, degrades view sheds and aesthetic appeal of beaches and shorelines, and has negative economic impacts including reduced property values, with an associated reduction in property tax revenues. Japanese knotweed is also a highly aggressive, invasive species that typically colonizes roadsides, railroad and other embankments, riverbanks, woodland edges, and wetlands throughout the region. Japanese knotweed forms extensive colonies of shrub-like stems up to 10 ft. tall, and can aggressively outcompete native vegetation.

The objectives of this Management Plan are to: 1) update and improve the monitoring and mapping of established *Phragmites* and *Japanese knotweed* (and other invasive species) populations within Sheboygan and Ozaukee Counties; 2) establish a rapid response reporting and treatment protocol to address emergent infestations, reduce the established populations of *Phragmites* and *Japanese knotweed* (and other invasive species) along the Lake Michigan shoreline and inland populations within Sheboygan and Ozaukee Counties (where treatment practices are not currently in place); 3) minimize the spread to uninfested areas; and 4) to educate and provide private landowners with the ability to control the target invasive species on their respective properties.

**BIOLOGY AND ECOLOGICAL THREAT**

Invasive *Phragmites* is a perennial wetland grass introduced from Europe that grows 12—15, occasionally to 20 feet tall. It has dull, slightly ridged, stiff, and hollow stems and has a distinct purple-brown seed head with feathery plumes. *Phragmites* colonies expand via underground rhizomes and above ground runners or stolons, and can spread quickly to new areas by various means of natural and human transport: rhizome fragments, in contaminated soil on construction and agricultural equipment; stem
fragments (from mowing, often along highway ditches); seeds, transported by wind or in contaminated soil, that germinate readily in disturbed ground or exposed lakebeds; and via stolon or rhizome fragments, transported on water by wave action, currents, or boats. Phragmites has spread rapidly throughout coastal and interior wetlands, riparian corridors, roadside ditches and other disturbed areas within the Great Lakes basin.

Japanese knotweed has hollow, smooth, purple to green colored stems up to 2.5 cm (1”) in diameter. The hollow jointed stems have reddish-brown solid nodes surrounded by a papery sheath (stipule). The stems die back each fall and the dead stalks remain standing over the winter. Numerous new stems emerge in the spring from the over-wintering root system. Japanese knotweed grows rapidly; stems can grow up to 8 cm (3”) per day. The plant can grow 1 m (3.2 ft) in height in three weeks, with the mature plant reaching full height by the end of July. Japanese Knotweed quickly develops large underground root systems (rhizomes) which account for two thirds of its total mass. The rhizomes can extend more than 2 m (6 ft) deep and 14-18 m (45-59 ft) in length, and can spread outwards at a rate of about 50 cm/year (19”) in optimal conditions. Due to this extensive underground biomass, Japanese knotweed is a very persistent plant. Stem or rhizome fragments can produce new plants within six days if they are submerged in water.

Japanese knotweed forms dense thickets of bamboo-like vegetation that aggressively outcompete native plants, and negatively impacts wetland and riparian areas. Japanese knotweed grows in a wide range of habitats including riparian areas, wetlands, roadsides, ditches, utility right of ways and fence lines. It is often found around old homesteads where it may have been originally planted as an ornamental. It spreads primarily along riparian areas or ditches where plant and rhizome fragments can be dispersed in moving water (i.e. along canals, beaches, streams and rivers). It can also be spread by moving machinery or equipment with soil containing plant parts. Seeds (if produced) are spread mainly by wind.

Phragmites and Japanese knotweed forms dense stands that will crowd out native vegetation, resulting in reduced plant species diversity and wildlife habitat quality. Dense stands are inhospitable to native birds, have lowered invertebrate densities and reduce the ecological value of shorelines. Infested stands have reduced populations of native amphibians, reptile, bird and animal species. Dense stands can also impact the hydrologic regime of wetlands by increasing evaporation and trapping sediment. Following treatment, areas occupied by invasive species can return to an increased level of ecological function, and will typically be rapidly recolonized by native plants when the target species has been reduced.
SOCIAL, RECREATIONAL, AND FISCAL THREAT

The spread of Phragmites and Japanese knotweed in Sheboygan and Ozaukee counties, and throughout the region, has reduced access to beaches and riverfronts for recreational activities such as swimming and fishing, restricted lakefront views, and caused damages to walkways and structures along the beach front. The density of the infestations, which extend to the waterline, make that portion of the beach in the Public Domain through Wisconsin’s Public Trust Doctrine, inaccessible. Likewise, riparian access along streams and tributaries is precluded by inaccessible infestations, rendering these public waters unusable by fishermen and the general public.

Lake access is a prime contributor to the value of shoreline properties, and when denied, reduces the values substantially. While such losses are obviously difficult for the individual homeowner, since lakefront property contributes an inordinate share to local taxes, these devaluations negatively affect all county residents.

Currently, scattered populations exist on road sides, shorelines and wetlands across Sheboygan and Ozaukee Counties; however, if left untreated, scattered small populations can develop into dense stands (Figures 1a and 1b). Lake Michigan water levels have rebounded from a 14-year low period, exceeding long term average levels since 2014. Storm events can break apart rhizome masses and redistribute them along the shoreline. New colonies are likely to propagate at increasing distances from existing infestations, and over time, current populations may expand and increase in density, if left unchecked.

HISTORICAL CONTROL ACTIONS

Several small scale efforts have been implemented to treat Phragmites and Japanese knotweed across Sheboygan and Ozaukee counties. There is currently no broad-based recording system to monitor the location and success of these historic treatment efforts, resulting in scattered data across multiple parties. To date, there has been no large-scale, county-wide initiative to strategically control Phragmites and Japanese knotweed across a two-county area.

ECOSYSTEM CONDITION (HISTORICAL AND CURRENT)

Sheboygan and Ozaukee counties are located on the western shore of Lake Michigan. The two counties cover a combined area of 740 square miles (473,792 acres). At the time of the first European settlement, the area was essentially a forested landscape. Original vegetation maps prepared from survey notes indicate that both counties were occupied primarily by a forest of beech, sugar maple, basswood and red oak. Western
portions of Sheboygan County (within the Kettle Moraine region) had a composition of sugar maple, basswood, red oak, white oak and black oak, suggesting a greater frequency of fire farther inland from Lake Michigan. A large wetland complex located near the northwest corner of Sheboygan County (Sheboygan Marsh), was occupied by a coniferous swamp, probably the largest of its type in southeastern Wisconsin.

Today's landscape, by contrast, is primarily agricultural, with significant areas of urban and suburban development. Development is centered within the growing Milwaukee suburbs encompassing most of southern Ozaukee County, and in the cities of Port Washington and Sheboygan along the lakeshore. As is common throughout southern Wisconsin, the remaining forested acres are highly fragmented, with most woods in parcels of 40 acres or less, distributed as small woodlots within the agricultural matrix. The Kettle Moraine of western Sheboygan County supports the most extensive areas of upland deciduous forest. Sheboygan Marsh today consists primarily of an open marsh with components of forested wetland. Because Phragmites prefers open wetlands without canopy cover, the existing modified landscape offers ample opportunities for Phragmites to invade agricultural ditches, waterways and connected wetlands.

Sheboygan and Ozaukee Counties share approximately 50 miles of Lake Michigan shoreline. The lakeshore itself varies from wide sand beaches and dunes, as found at Kohler-Andrae State Park in Sheboygan County, to steep wooded bluffs that rise over 100 feet from the lakeshore, as found in southern Ozaukee County. Other portions of the coastline are comprised of low banks, wetlands, artificial waterfront areas such as breakwaters, seawall and riprap, and natural estuaries and wetlands formed at the mouths of the many creeks and rivers discharging into Lake Michigan. Extensive areas of the shoreline have been developed as vacation and year round homes.

Bluffs and beaches are continually molded by wave action, and thus are subjected to more or less ongoing disturbance. Wave action cuts through the slumped material at the base of the bluff, causing undercutting and eventual slumping or slope failure.

The steep bluffs within both counties are interrupted by ravines formed by many waterways draining into Lake Michigan. Low (10 m or less) bluffs erode more rapidly in response to lake level, wave, climate and precipitation patterns than high bluffs such as those found in southern Ozaukee County. Generally, low bluffs that experience erosion at the base support little woody vegetation due to the short “cycle” time of the slope failures. However, where groundwater seeps to the surface on the bluff slopes, ideal conditions for Phragmites and Japanese knotweed establishment may exist; and some bluffs have become infested with populations of these species. The predominant slope processes of low bluffs are shallow slumps, translational slides, and face degradation.
Currently, the target invasive species occur as scattered to dense colonies along the shoreline and adjacent tributaries, as isolated pockets along inland waterways and/or wetlands and along local, county or Interstate roadways. The Interstate 43 corridor is perhaps the most infested road corridor in the two county area. *Phragmites* along the shoreline occurs from the base of the slope (where wave action is present) to the upper seepage zone which occurs where surficial sand contacts less permeable silts and clays below. Downslope of the seepage areas are continually saturated soils from surface water infiltration and outflow towards the lakeshore. These saturated soils provide suitable habitat for *Phragmites*, which can occur from the upper slope down to the base of the bluff. Less commonly, *Phragmites* can occur along the bluff top ridge.

OWLT has received USEPA grant funding under the Great Lakes Restoration Initiative (GLRI) to map and treat *Phragmites* and Japanese knotweed, plus other invasive plant species, in Sheboygan and Ozaukee Counties in 2016. Mapping results obtained from the GLRI funding will be used to inform future WDNR AIS grant applications.

**FISHERY, WILDLIFE, AND AQUATIC PLANT COMMUNITY**

The two-county project area is located entirely within the Lake Michigan basin. It includes portions of three DNR Water Management Units (WMUs): Manitowoc, in the northeast corner of Sheboygan County; Sheboygan, covering the majority of Sheboygan County and northeastern Ozaukee County; and the Milwaukee River, encompassing the western and southern portions of Ozaukee County, and southwestern Sheboygan County. The Manitowoc WMU covers the Sevenmile and Silver Creek watersheds, which flow into Lake Michigan north of the City of Sheboygan. The Sheboygan WMU includes the Sauk and Sucker Creeks, the Black River, the Sheboygan River, the Onion River, the Mullet River, and the Pigeon River watersheds. The Onion and Mullet Rivers are tributary to the Sheboygan River while the remaining streams discharge directly into Lake Michigan. Runoff from point and non-point sources, sedimentation and nutrient-enriched runoff from agricultural and stormwater sources, contaminated lake and river sediments from industry, habitat degradation (e.g., channelization, dams, ditching, tiling and draining of wetlands for cultivation) have degraded water quality throughout much of these watersheds. The lower 14 miles of the Sheboygan River was designated an Area of Concern (AOC) as a result of past industrial contamination, and is a focus of ongoing restoration efforts.

There are a number of trout streams within Sheboygan County, mostly in the western Kettle Moraine region, including seven Class 1 trout waters. There are a number of Lake Michigan tributaries within the two county area with spring and fall runs of stocked steelhead and salmon. Other fishing opportunities exist in rivers and harbors for northern pike, smallmouth bass, and yellow perch. Every two years, WDNR is required to publish
a list of waters that do not meet water quality standards. The following waterbodies within Sheboygan County are listed as Impaired Waters by WDNR under Section 303 (d): Pigeon River, Grandma Creek, Otter Creek, Elkhart Lake, Crystal Lake, Mullet River, Onion River, Sheboygan River, Waldo Impoundment, Black River, Adell Tributary, North Branch Milwaukee River, Batavia Creek, Mink Creek, and Lake Michigan. The following waters in Ozaukee County are 303 (d) listed: Sucker Creek, Sauk Creek, Fredonia Creek, Milwaukee River (mainstem and North Branch), Ula Creek, Cedar Creek, Cedarburg Pond, Little Menomonee River, Nor-X-Way Channel, Trinity Creek, Fish Creek and Lake Michigan. Treatment of invasive Phragmites and Japanese knotweed and restoration of native wetland vegetation communities along these waterways is part of a strategy to improve water quality and habitat within these streams to benefit wildlife and fisheries.

Wildlife occurring within the two counties includes much of the species diversity common to the agricultural, wetland and forested environments of southern Wisconsin. Species to be encountered in Sheboygan and Ozaukee Counties include a wide variety of mammals, avifauna and herpetiles. Common mammals are white-tailed deer, raccoon, red fox, coyote, bobcat mink, several species of bats, opossum, muskrat, groundhog, squirrels and other small rodents. A wide variety of birds are seasonal or year round residents or migrants, including a number of species of greatest conservation need. Among the avifauna that depend on area wetlands and waters are Canada Geese, blue-winged teal, wood duck, woodcock, red-shouldered hawk, bald eagle, osprey, kingfisher and common yellowthroat. Herpetiles likely to be encountered in area wetlands and shorelines include a diversity of amphibians and several reptiles. Many species of frogs and salamanders depend on and can be observed in vernal pools, ponds, small lakes, streams and wetlands along the Lake Michigan shoreline, in the Kettle Moraine, and the agricultural portions of the region. Common species of turtles and snakes include painted and snapping turtles, common garter snake, water snake, and fox snake.

The WDNR Land Legacy Report (2006) identified three legacy places for conservation within the two-county area: Kohler-Andrae Dunes, Onion River Grasslands, and the Milwaukee River. All three of these legacy places are intrinsically linked to and dependent on wetlands and surface waters in Sheboygan and Ozaukee Counties.

**PROJECT PURPOSE AND NEED**

The purpose of treating invasive species, including Phragmites and Japanese knotweed in Sheboygan and Ozaukee Counties is to conserve healthy shorelines and surface waters for the recreational enjoyment of the public; to sustain a thriving regional economy and a quality of life made possible by a clean and healthy environment; and
to protect and enhance waterway, shoreline and wetland habitats for vibrant plant and animal communities.

The non-native subspecies of *Phragmites* and Japanese knotweed are recently established species within the past few decades. Efforts to prevent their establishment and spread within the Lake Michigan basin will help prevent many of our inland lakes and wetlands from encountering the problems related to serious infestations of Great Lakes shorelines, such as those occurring along the shore of Green Bay in Brown County.

The most cost-effective way to address invasive species treatment is to prevent them from spreading and reaching areas of which are beyond established patch infestations. Because invasive species are already establishing within Sheboygan and Ozaukee Counties, management programs to monitor and minimize their spread are necessary. Monitoring and mapping efforts to date by several project partners have increased awareness of the problem and demonstrated the need for coordinated, large scale-treatment initiatives. Through EPA grant funding in 2016, OWLT has initiated an effort to map and treat *Phragmites* and Japanese knotweed in Sheboygan County using remote sensing technology. This effort will supplement, and further refine existing mapping data which is outdated in many regards. OWLT will develop a five year invasive species plan with the goal of reducing the environmental and economic impacts of invasive species in Sheboygan and Ozaukee Counties through increasing public awareness, mapping extent of invasive species on the landscape, rapid response to new invasive species threats and sustained treatment of existing infestations. Achievement of the goals put forth in this plan is dependent on obtaining and maintaining adequate funding and volunteer resources.

To date, there has been no large-sale, county-wide initiative to strategically control *Phragmites* and Japanese knotweed across Sheboygan and Ozaukee counties. Scattered treatments have made progress in localized areas, and these efforts have largely been focused on only select waterways or adjacent to areas of high conservation value (i.e., State Natural Areas, State Parks). This project aims to expand these initial efforts to include a much broader project area; thereby significantly reducing the footprint and expansion potential of these aggressive non-native species. OWLT and SEWISC intend to work closely with partners who are currently undergoing treatments so that County-wide efforts can be expanded, not duplicated. The initial phase of this project will focus on treating *Phragmites* and Japanese knotweed along the Lake Michigan shoreline. Subsequent phases will focus treatments within and adjacent to tributaries of Lake Michigan and other isolated inland pockets where landowner approvals and funding allow. OWLT and SEWISC intend to allocate resources as needed to provide long term management of invasive species in areas
under long-term protection, where treatment can fit into a long-term land management strategy.

The proposed control efforts are consistent with other management plans adopted for the local region. The following are management plans and/or reports applicable to the project area which address the need for removal of exotic/problem species:

- Wisconsin’s Wildlife Action Plan recommends: management of Great Lakes beach and dune habitat as part of a vegetation mosaic that includes forested ridge and swale, interdunal wetland, shrub-carr, and swamp conifer forest with older age classes. Promote concentrated public access points, limited recreational activities in areas where Species of Greatest Conservation Need (SGCN) are present (particularly during breeding seasons), protecting site hydrology, and early detection and management of invasive exotic species.
- WI DNR “State of the Lakeshore Basin” (2001)
- Environmental Protection Agency (EPA) - Great Lakes Restoration Initiative Action Plan (FY2010 – FY2014)
- Sheboygan County Comprehensive Land Use Plan (2010-2030)
- Ozaukee County Comprehensive Plan (2035)

Additionally, management plans for many State Natural Areas and State Parks, as well as the Kettle Moraine State Forest Northern Unit Master Plan, include specific objectives and goals for removal of exotic/problem species, specifically including Japanese knotweed and *Phragmites*.

**MANAGEMENT OBJECTIVES**

The objective of *Phragmites* and Japanese knotweed management is to reduce populations to manageable levels and to minimize spread to previously uninfested areas. Landowners or property managers (e.g., private owners, local municipalities, land trusts, and WDNR) will be encouraged to fully participate in the treatment of *Phragmites* and Japanese knotweed on their respective properties so that finite resources can be allocated elsewhere. To achieve this goal, all *Phragmites* and Japanese knotweed identified within areas prioritized for management (i.e., lakeshore and select inland waterways and adjacent wetlands) shall be targeted for three
consecutive years of treatment, pending landowner approval. The following sections provide a summary of control options for *Phragmites* and Japanese knotweed.

**Phragmites Control**

**Chemical Control**

There are several methods of chemical (herbicide) control that are label-approved for use in aquatic habitats. Methodologies differ in the mode of application of the chemical agent to the plant, and may require mechanical removal of plant material in preparation for application.

Ultra-low volume cut stump application is an effective method that may be appropriate for small, low density stands. Individual stems are cut and a small amount of herbicide is applied to the cut stems. This chemical method poses one of the lowest levels of risk to non-target plants, but has the highest labor costs per unit area. It is appropriate for use in the most sensitive areas where chemical volume must be minimized, such as near known populations of rare or protected plants or animals.

Foliar application is a highly effective method for controlling invasive *Phragmites*, and is used in a number of different treatment methodologies. Recommended foliar application techniques include low volume spraying using backpack sprayers, UTV (Utility Task Vehicle) mounted boom sprayers, or a UTV- or boat-mounted spray gun; and ultra-low volume wick application using backpack or UTV-mounted wicks.

Low volume spray application via backpack, boom or spray gun poses an increased risk of non-target plant damage and somewhat higher materials costs relative to other methods; however it allows for treatment of large and dense infestations with greatest efficiency and lowest cost per unit area. This method is most appropriate for areas with dense infestations that typically have low plant diversity due to competitive exclusion of native vegetation.

Ultra-low volume wick application via backpack or UTV-mounted wick combines a reduced risk of non-target plant damage with a highly targeted and effective delivery of chemical. Wicking applies chemical directly to the leaves of invasive *Phragmites* through direct contact with the wick, using a higher concentration of chemical than used in spray application. Wicking reduces impacts to non-target native plants that may be damaged by foliar spray application. Wicking can be used effectively in stands of low- to moderate-density *Phragmites*, as is the case in many shoreline populations, and is especially well-suited to use in sensitive areas where off-target damage can be minimized, such as near known populations of rare or protected plants or animals.
**Mechanical Control**

Mechanical control techniques include mowing and burning. Mowing and/or burning alone will not control invasive *Phragmites* which resprouts vigorously after mowing; rather, mechanical control can be an effective preparation for chemical application. Mowing is most effective on large, dense stands in areas that permit access for a UTV- or tractor-mounted deck mower; small areas may be mowed with a handheld brush cutter. Burning may be used to prepare areas of *Phragmites* for chemical application; as well as promote regeneration of native herbaceous vegetation, suppress woody vegetation, and remove thatch and woody debris. Prescribed burning must be carefully planned and conducted by trained professionals. Burning may be advised in certain situations where mowing is impractical, and typically requires higher unit costs. Mechanical control methodologies are an option that may be implemented on a limited basis.

**Biological Control**

There is currently no biological control available for use on *Phragmites*, which appears to be resistant to damage from native fungal pathogens and insects.

**Japanese Knotweed Control**

Control of Japanese knotweed is difficult and typically requires a combination of mechanical and chemical methods over a period of two or more growing seasons of treatment.

**Mechanical Control**

To effectively control established populations, mechanical control should be conducted twice during the growing season: in late spring, when the shoots reach 3 feet in height; and again in late summer, when the plants flower. Mowing of large populations on areas permitting equipment access can be accomplished with a UTV- or tractor-mounted deck mower; small, steep or inaccessible areas may be mowed with a handheld brush cutter. Cut material can be scattered and laid flat onsite. Burning may be utilized in Japanese knotweed control as part of an overall land management approach, but typically requires higher unit costs than mowing.

**Chemical Control**

Chemical control is applied in the fall, following the second (late summer) mowing. Several methods of chemical application and several herbicide products may be used effectively. Products effective on Japanese knotweed, available in formulations that are approved for wetland use, include imazapyr, glyphosate, triclopyr and 2, 4-D.
Ultra-low volume cut stump application is an effective method of control that may be appropriate for small, low density stands. A small volume of herbicide with a high concentration of active ingredient is applied to the individual cut stems, directly following mechanical treatment. This chemical method poses one of the lowest levels of risk to non-target plants, but has the highest labor costs per unit area. It is appropriate for use in the most sensitive areas where chemical volume must be minimized, such as near known populations of rare or protected plants or animals.

Foliar application is a highly effective method for controlling Japanese knotweed, and is applied when the resprouts reach 3 feet in height following late summer mechanical treatment. Herbicide is applied to the leaf surfaces until fully wetted. Recommended foliar application techniques include low volume spraying using backpack sprayers, UTV (Utility Task Vehicle) mounted boom sprayers, or a UTV-mounted spray gun.

Low volume spray application via backpack, boom or spray gun poses an increased risk of non-target plant damage and somewhat higher materials costs relative to other methods; however it allows for treatment of large and dense infestations with greatest efficiency and lowest cost per unit area. This method is most appropriate for areas with dense infestations that typically have low plant diversity due to competitive exclusion of native vegetation. Foliar treatment is likely to be the most efficient treatment for most well-established populations of Japanese knotweed.

**Biological Control**

There is no available biological control for Japanese knotweed.

**No Management**

Failing to manage invasive *Phragmites* and Japanese knotweed populations would lead to increased degradation and loss of wetland and shoreline habitat within Sheboygan and Ozaukee Counties, and would create sources for invasion of new areas. Failure to manage invasive species would be inconsistent with the shared interests and values of project partners and the community, to preserve and enhance the aesthetic and functional values of coastal resources, waterways and wetlands of Sheboygan and Ozaukee Counties.

**PROPOSED CONTROL ACTIONS**

The control method selected for a given site will vary depending upon the location, size/stage of the infestation, invasive species present, site dynamics, landowner concerns, presence of rare, threatened, or endangered plant or animal species, and resources available. In general, the proposed control actions for *Phragmites* and Japanese knotweed within Sheboygan and Ozaukee Counties will include one or more
of the approaches outlined above. Identified *Phragmites* and Japanese knotweed populations will be targeted for treatment and monitored for three consecutive years to achieve sustained results and prevent reemergence and spread. This approach has been previously used on *Phragmites* in neighboring Manitowoc County (e.g., Woodland Dunes and Little Manitowoc River) with great success (80% or more reduction in initial infestation from year 1 to year 2 of the rapid response grant) and is the most logical given the status of *Phragmites* in the proposed treatment areas.

Chemical treatment may require a treatment permit and associated fee. All chemical treatments not conducted by individual landowners on their own land will be performed by a certified and licensed pesticide applicator within the state of Wisconsin for aquatic applications. Aquatic approved herbicides will be applied. These will consist of (but are not limited to) the aquatic formulations of glyphosate (example trade names include Aquaneat, Rodeo and Touchdown), imazapyr (trade name Habitat), triclopyr (trade names include Garlon, Element) and 2,4-D in accordance with label application rates and requirements.

Timing of *Phragmites* herbicide applications shall occur when the plants are preparing for dormancy and the herbicide is most likely to be taken into the root systems, typically between August and October. Actual timing shall be based on growing season conditions for that year. Best management practices (BMPs) will be followed and are subject to modifications as continued research on control strategies becomes available.

Wick application via backpack and rubber-tracked, low-ground pressure UTV is an effective method of control for invasive *Phragmites* that delivers a higher concentration of active ingredient directly to the leaf surface while minimizing non-target damage. Wick application typically uses a higher concentration of active ingredient relative to spraying (label-suggested rate: 33% glyphosate) which produces a rapid and effective kill on target *Phragmites* with little to no residual action. Previous experience with wicking on other sites in Wisconsin has shown effective kill of target *Phragmites* with minimal damage to other species. A rubber-tracked UTV with wick may be used where appropriate access exists, such as on sand or rock beach, solid soils, and herbaceous-dominated communities. Rubber tracks allow for very low ground pressures (0.5 lbs/sq. in.) and reduced rutting and soil compaction relative to wheeled vehicles. The wick is mounted on the front of the UTV, and can be manually raised or lowered to the height of the target vegetation. Wicking allows for direct application to invasive *Phragmites* foliage while avoiding shorter-statured native plants.

Foliar spray application is an effective method of control for invasive *Phragmites* that uses a low concentration of active ingredient which is applied to the leaf surface indirectly via airborne droplets, which affect both target and non-target vegetation in
the spray zone. Foliar spray uses a low concentration of active ingredient relative to wicking (suggested rate: 1% imazapyr) at a substantially higher volume. The residual action of imazapyr in the soil aids in control of target *Phragmites* but may also kill non-target vegetation; glyphosate, with no residual activity may also be applied via foliar spray. Foliar spray application is advantageous where invasive *Phragmites* density is high, the target vegetation is greater than 8 ft. in height, and potential to impact sensitive resources is low. Foliar spray may be applied via backpack, UTV-mounted boom, UTV-mounted spray gun, or from a boat-mounted spray gun. Backpack treatments will be used in areas with rough terrain, soft sediments, and wooded/shrubby areas; where UTV access is not permissible.

The approach for treatment of Japanese knotweed, as outlined above, will require two mowing events per growing season followed by a late summer/fall herbicide application. The acreage of Japanese knotweed to be treated is likely to be lower than that for *Phragmites*, but will require a more intensive approach. Thus, planning must allow for the additional mobilizations needed for these treatments.

Care will be taken when using UTVs to minimize rutting and compaction to soils, disturbance of native plant communities, and spread of invasive species. UTVs shall be operated only in areas with safe access, suitable soils and terrain, by an appropriately trained operator. Appropriate spill response equipment shall be on site during applications.

**MINIMIZATION OF ADVERSE IMPACTS**

Potential adverse impacts resulting from chemical treatments include herbicide impacts to non-target plant species and creating temporarily unvegetated areas that could provide a niche for invasion by other invasive species. Herbicide drift will be minimized by utilizing best management practices and following the label instructions for the herbicide. Herbicide applications shall be timed to maximize favorable weather conditions. To mitigate drift and potential non-target impacts, herbicide shall not be applied in high winds, or as deemed unsuitable by a qualified, certified applicator. Other weather conditions that influence herbicide effectiveness include temperature, moisture, and humidity. Warm conditions are usually favorable for chemical application, although hot, dry conditions can slow plant metabolism and can make plants less susceptible to the herbicide. The length of time required between herbicide application and rainfall, referred to as the rainfast period, varies for different herbicides; the qualified applicator will also refer to the product specific label for guidelines.

Seeding native plants subsequent to treatment will be conducted on an as-needed basis. These invasive species are highly aggressive, clonal species with no natural
predators in North America. Removing large monocultures of *Phragmites* and Japanese knotweed in accordance with the proposed control actions listed above could create areas of bare ground that may be prone to erosion. For this reason, the need for native species plantings will be evaluated for larger treatment areas and may depend on factors such as topography, slope, hydrology, susceptibility to erosion, water levels, accessibility, existing plant community, and potential for success. Post treatment management will follow BMPs and adaptive management strategies. Monitoring of the treatment/seeded sites will occur each year to determine progress and adjustments will be made as needed.

**RESTORATION & RECOVERY**

The proposed treatment strategies will result in new areas of exposed substrate that may be recolonized by native vegetation, or return to a more dynamic state of exposure to the physical forces of wind and water. The root structure characteristic of long-established *Phragmites* and Japanese knotweed typically will decay three years after treatment.

The general timeline will include: Year 1 - monitoring and mapping to assess invasive population site characteristic, site preparations, and subsequent treatments during the appropriate time period; Year 2 – monitoring, post-treatment preparations (i.e., mowing, burning) and second year treatments; and Year 3 – monitoring and final treatment. It is anticipated that many areas will have minor regrowth (+/- 10%) following the first treatment period. Therefore, treatments during Years 2 and 3 will include control of minor regrowth, and the level effort is expected to be minor when compared to the first year.

The restoration and recovery phase of the treatment protocol beyond the three year treatment period will be assigned to individual landowners and to partner organizations on their respective properties. Restoration needs will depend upon site characteristic, control actions, control success and landowner preferences. Previous experience has shown a rapid recolonization by native species from existing seedbank, especially in lightly infested areas. As such, the need to purchase and install native seed will be evaluated on an ongoing basis and is expected to vary depending upon the treatment site.

**PREVENTION STRATEGY**

OWLT is currently working with USEPA grant funding and partners across a seven county region of Wisconsin and Illinois on efforts to identify, map and control *Phragmites* and other invasive species. This collaborative effort is designed to build upon the work
already underway to a lesser extent in Sheboygan and Ozaukee counties, by the project partners, other conservation organizations, agencies, municipalities, dedicated volunteers, and individual property owners. The development of this *Phragmites* and *Japanese knotweed* management plan and securing grant funding for its implementation is critical to a successful long term strategy to limit risk and contain the existing damage to beaches, wetlands and waterways from invasive species. The current and proposed control efforts will hopefully attract additional interest within Sheboygan and Ozaukee Counties, and result in broader coordination and greater benefit to the region’s ecological health.

Prevention of spread by invasive *Phragmites* and *Japanese knotweed* is of critical importance to the success of the project. As mentioned previously, landowners will be encouraged to fully participate in the treatment of invasive species on their respective properties so that finite resources can be allocated elsewhere. It is expected that landowners will have varying abilities and interest in participating in this project, but through education, the project partners will work to increase public awareness of the problem and provide the necessary resources for landowners to take responsibility for treating on their property.

**CONTINGENCY STRATEGY**

Monitoring of the treatment areas will be an important component of the long-term management strategy. Monitoring pre and post-treatment will be coordinated and completed by OWLT, with assistance from partner organizations, landowners and volunteers. Monitoring protocols will be established and efforts reported to the appropriate partner organizations to facilitate treatments. Monitoring and mapping may consist of driving, walking, and/or boating along the treatment areas and visually assessing the location, size, and density of invasive *Phragmites* and/or *Japanese knotweed* stands. Mapping efforts already underway will be supplemented by mapping of additional areas, utilizing GPS and GIS to identify the extent of infestation within priority areas. Infestations will be revisited after treatment and a visual inspection will be performed to search for surviving stems. Live stems will be flagged, and the location sketched on a map or documented with GPS for follow-up treatment.

Any new infestations encountered through monitoring efforts will be controlled as soon as possible after discovery. If new infestations are discovered in between treatment periods, treatment will occur during the next treatment window.
PROJECT SUMMARY AND TIMELINE

The following provides a summary of key project components and terms:

- **Proposed Funding Source**: WI DNR Aquatic Invasive Species Control Grant (Established Population Control)
- **Grant Sponsor**: Ozaukee Washington Land Trust
- **Project Partners**: Southeast Wisconsin Invasive Species Consortium, Inc. and Stantec Consulting Services Inc.
- **Treatment Area**: Lake Michigan shoreline properties, permanently protected lands and natural areas throughout Sheboygan and Ozaukee counties and other inland properties as deemed appropriate and pending funding availability and permission.
- **Treatment Action**: Treatments will be completed by qualified and experienced contractor(s) licensed and certified in commercial pesticide application in the State of Wisconsin, with experience in treatment of *Phragmites* and Japanese knotweed, working in natural areas, wetlands, and other sensitive areas. Treatments may be conducted by private landowners on their own property.

The following provides an example timeline for funding allocated in 2017:

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Objective/Goal</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 - Spring</td>
<td>Grant Awarded</td>
<td></td>
</tr>
<tr>
<td>2017 - late-Spring/ Summer</td>
<td>Inform landowners of project and acquire approvals; establish monitoring protocols; monitor and map pre-treatment infestations; discuss/educate treatment options with landowners; site preparation activities</td>
<td>Responsible parties will be a combination of the project partners mentioned above</td>
</tr>
<tr>
<td>2017 - Fall</td>
<td>Year 1 Treatment of mapped infestations</td>
<td>Contractor(s), OWLT Stewardship staff and private landowners</td>
</tr>
<tr>
<td>2018 - Spring/summer</td>
<td>Monitor 2017 treatment success; evaluate need for follow-up treatments based on success and discussions with landowners; continue landowner education efforts</td>
<td>Responsible parties will be a combination of the project partners mentioned above</td>
</tr>
<tr>
<td>2018 - Fall</td>
<td>Year 2 treatment of mapped infestations</td>
<td>Contractor(s) and</td>
</tr>
</tbody>
</table>
### Timeline

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Objective/Goal</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019 – Spring/summer</td>
<td>Monitor 2018 treatment results; evaluate need for follow-up treatments based on observed results; continue landowner education efforts</td>
<td>Responsible parties will be a combination of the project partners mentioned above</td>
</tr>
<tr>
<td>2019 – Fall</td>
<td>Year 3 (final) treatment of mapped infestations; evaluate need for revegetation</td>
<td>Contractor(s) and private landowners</td>
</tr>
</tbody>
</table>

It is expected the project partners will continue to apply for WDNR AIS grant funding beyond the estimated timeline presented above.
ATTACHEMNTS:

Figure 1a – Sheboygan County Invasive Species

Figure 1b - Ozaukee County Invasive Species
Project Overview
Ozaukee County

Client/Project
Ozaukee Washington Land Trust
Southeast Wisconsin Invasive Species Consortium, Inc.

Project Location
Ozaukee County

Figure No.
1b

Legend

- WDNR Boat Access
- WDNR Managed Lands
- USGS GAP Stewardship
- NRCS Conservation Easement
- National Conservation Easement Database
- Protected Areas Database of the US
- Invasive Species Locations

- Treated Areas
  - Japanese Knotweed (Fallopia japonica)
  - Japanese Reeds (Phragmites australis subsp. australis)
  - Purple Loosestrife (Lythrum salicaria)

- Untreated Areas
  - Japanese Knotweed (Fallopia japonica)
  - Japanese Reeds (Phragmites australis subsp. australis)

Note:
1. Coordinate System: NAD 1983 UTM Zone 16N
2. Data Source: Stantec, OWLT, WDOT
3. Background: ESRI

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Project Team
Prepared by JD on 2016-10-05
Technical Review by MP on 2016-10-06
Independent Review by MC on 2014-10-24

Scale: 1:144,000 (At Original document size of 11x17)

1144.000 (At Original document size of 11x17)