



# **Sherburne National Wildlife Refuge Complex**

**Sherburne, Crane Meadows, Rice Lake & Mille Lacs NWR's**

## **Integrated Pest Management Plan**

**2021-2026**

Prepared by: *Cody Carlstrom*  
Cody Carlstrom, Wildlife Biologist

Date: 2/23/2021

Approved by: \_\_\_\_\_  
Steve Karel, Project Leader

Date: 2/23/2021

<b><u>TABLE OF CONTENTS</u></b>	<b><u>PAGE NUMBER</u></b>
<b>Integrated Pet Management Purpose</b>	<b>1</b>
<b>Introduction</b>	<b>1</b>
<b>Refuge Descriptions</b>	<b>2</b>
<b>Sherburne NWR Complex IPM Goals, Objectives, and Strategies</b>	<b>6</b>
<b>Sensitive Refuge Sites and Species</b>	<b>9</b>
<b>IPM Coordinator and Staff Roles</b>	<b>12</b>
<b>Best Management Practices (BMP's)</b>	<b>12</b>
<b>Priority Management Tools</b>	<b>13</b>
<b>Adaptive Management</b>	<b>18</b>
<b>SMART Objectives</b>	<b>19</b>
<b>Safety</b>	<b>19</b>
<b>Record Keeping and Storage</b>	<b>21</b>
<b>PUPS</b>	<b>22</b>
<b>Training</b>	<b>23</b>
<b>Pesticides</b>	<b>23</b>
<b>Targeted Pest Species</b>	<b>25</b>

<b>Identification and Management of Pest Species</b>	<b>30</b>
<b>Additional Information</b>	<b>45</b>
<b>Literature Cited</b>	<b>46</b>
<b>Attachments</b>	<b>47</b>
*Intra-Service Section 7 Evaluation	
*2014 MN Noxious and Invasive List	
*2014 MN Threatened and Endangered Species List	

## **Integrated Pest Management Purpose**

This plan is designed to meet the purposes for which the Refuges were purchased and established. These purposes gave rise to a vision, and specific IPM management goals for the Sherburne NWR Complex. Establishing and maintaining high quality habitat is critical to fulfilling the purpose and vision of the Sherburne NWR Complex. Understanding the Anoka Sandplain habitats and their alteration since pre-settlement is vital to developing the goals, objectives and strategies for invasive weed control and habitat restoration efforts at the Sherburne NWR Complex.

Sherburne NWR Complex has adopted this IPM Plan for use in the management of its land. The plan outlines procedures to be followed to protect the health and safety of the staff and the public, grazing cooperators, contractors, and all others from pest and pesticide hazards. The plan is designed to voluntarily comply with policies and regulations of the Environmental Protection Agency (EPA), Minnesota Department of Agriculture (MDA), Minnesota Department of Health and Environment, Minnesota Pollution Control Agency and all other agencies regulating pesticide usage. This document will address priorities to control noxious and invasive species on the Sherburne NWR Complex. The IPM plan will support the goals and objectives of the Refuge Complex's Comprehensive Conservation Plan's (CCP), and Habitat Management Plans (HMP's).

## **INTRODUCTION**

### **Definitions**

#### **Integrated Pest Management (IPM) as defined in 569 FW 1:**

- Establishes policy, procedures, and responsibilities for pest management activities on and off U.S. Fish and Wildlife Service (Service) lands. It is consistent with the Department of the Interior (Department) Integrated Pest Management Policy (517 DM 1) and other applicable authorities;
- A sustainable approach to managing pests that uses the following kinds of tools in a way that minimizes health, environmental, and economic risks.
- A science-based, decision-making process that incorporates management goals, consensus building, pest biology, monitoring, environmental factors, and selection of the best available technology to achieve desired outcomes while minimizing effects to non-target species and the environment and preventing unacceptable levels of pest damage.

**Pests:** Pests are living organisms, including invasive plants and introduced or native organisms that may interfere with achieving our management goals and objectives and on or off our lands, or that jeopardize human health or safety.

**Invasive Species:** An invasive species is a native or non-native species (including seeds, eggs, spores, or other propagules) who's introduction or presence causes or is likely to cause economic harm, environmental harm, or harm to human health. The term "invasive" is used for the most aggressive species. These species grow and reproduce rapidly, causing major disturbance to the areas in which they are present (Invasive.org 2012).

## **REFUGE DESCRIPTION**

### **Sherburne National Wildlife Refuge**

The St. Francis River Valley, the basis for the formation of the Sherburne National Wildlife Refuge (SNWR), was originally settled in the 1870s under the Homestead Act, although humans lived in the area for over 10,000 years. American Indian village sites discovered on the Refuge date back to 1300 A.D. Historically the St. Francis River Basin was known as one of the finest wildlife areas in the state. Tremendous numbers of ducks, muskrats, beaver and mink were supported on small lakes, and marshes near the river which were abundant with wild rice and other wetland plants. The surrounding upland was primarily oak savanna which provided habitat for elk, bison, and timber wolves.

By the early 1940s, several developments had severely reduced the value of wildlife habitat in the basin. A ditch system, built in the 1920s, enhanced drainage to increase agricultural acreage. This resulted in fewer wetlands holding water throughout the year. In the early 1940s carp invaded the lakes and streams in the basin. The feeding activities of these fish resulted in the uprooting of submerged vegetation important to aquatic wildlife. In addition, the native oak savanna upland habitat was converted to agriculture or home sites through logging and/or plowing. Protection from fire allowed the oak savanna to convert to dense woodlands.

In the early 1940s, local conservationists and sportsmen became interested in the possibility of restoring the former wildlife values of the St. Francis River Basin. The Minnesota Conservation Department now the Department of Natural Resources, conducted studies with the intention of managing the area as a state wildlife area. By the early 1960s it had become apparent that the magnitude of the project was beyond the funding capabilities of the Minnesota Conservation Department, as over 300 individual land holdings comprising over 30,000 acres would need to be purchased. Therefore, the State of Minnesota formally requested the U.S. Bureau of Sport Fisheries and Wildlife, now known as the U.S. Fish and Wildlife Service, to consider the area for a National Wildlife Refuge.

The Bureau took on the task and began seeking approval for the Refuge from various local, state and federal authorities. Final approval of the Refuge was received from Migratory Bird Conservation Commission on May 18, 1965, and land was purchased with Federal Migratory Bird Hunting Stamp (Duck Stamp) funds. Since that time, Refuge management has been directed towards achieving the following goals:

1. Provide resting, nesting and feeding habitat for waterfowl and other migratory birds.
2. Provide habitat for resident wildlife.
3. Protect endangered and threatened species.
4. Provide for biodiversity through restoration and maintenance of native vegetation and wildlife.
5. Provide the public with wildlife-oriented opportunities in interpretation, recreation and outdoor classrooms when compatible with the resource and other Refuge objectives.

## Crane Meadows National Wildlife Refuge

In pre-colonial times a number of Native American groups including the Dakotah, and later the Ojibwe, inhabited the central region of Minnesota. Their life and culture evidenced by the presence of burial mounds and other artifacts in the area. These Native American groups harvested wild rice (*Zizania spp.*) from the Rice and Skunk Lakes and navigated adjacent creeks and rivers.

Among the first Europeans in the area were English and French fur traders in the 1600's. Methodist missionaries were among the first permanent European settlers, arriving around the middle of the 19<sup>th</sup> century. The Historical Atlas of Minnesota published in 1874 (Andreas) describes stands of 'pine and mixed timber' northeast of the Refuge, 'mostly oak' to the south and east, and 'bur oak and timber' to the west. In the same period as agriculture increased in the region additional mills were built in Little Falls to grind flour.

In 1990, a Regional Wetlands Concept Plan was created by the Service for the Midwest Region (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin) in response to the Emergency Wetlands Resources Act of 1986. Of the six sites identified for potential acquisition in Minnesota, the wetland system at Crane Meadows NWR was among the largest and most intact. The report indicated that this area is: "One of the last undisturbed wetland complexes in Central Minnesota. An important area for waterfowl, Sandhill Cranes, diverse vegetation communities, and nongame species (FWS 1990, p. 36)." The report identified an area of 35,000 acres with conservation potential. Subsequently, an environmental assessment was conducted that, in June of 1992, authorized the acquisition of 13,540 acres for a new refuge, Crane Meadows National Wildlife Refuge.

Established in 1992 to conserve and protect the diminishing number of high quality wetlands that remain on the American landscape, Crane Meadows NWR is not only the location of one of the most intact wetland complexes in the state; it also protects and maintains important wildlife, recreation, and archaeological resources.

Located in central Minnesota, Crane Meadows NWR (CMNWR) falls in a transition zone between the northern forests and the mid-continental prairies and is situated on the Anoka Sandplain only 5 miles from the Mississippi River. The critical and diverse wetland habitat characteristic of the Upper-Midwest provide important habitat for local and migratory wildlife, maintain essential ecological services, provide an elements of water control and flood relief, and offer unique recreation, education, and research opportunities.

Presently, of the 13,540-acre acquisition area, 2,100 acres are owned by the Service, approximately 900 acres are owned and managed by the state, and the remaining land is privately owned. The resulting landscape is a mosaic of land ownership and land-use types surrounded predominantly by agriculture.

Crane Meadows is home to many native species and serves as a nesting ground and stopover location for migratory bird species including the Greater Sandhill Crane. The Refuge also contains relatively rare habitat types including oak savanna, sand prairie and sedge meadow.

The Refuge's establishing authorities and related purposes include:

*Fish and Wildlife Act of 1956*

1. "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." 16 U.S.C 742f(a)(4)
2. "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." 16 U.S.C. 742f(b)(1)

*Emergency Wetlands Resources Act of 1986*

3. "...the conservation of wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions..." 16 U.S.C. 3901(b). 100 Stat.3583

### **Rice Lake National Wildlife Refuge**

Conservationists were concerned about low duck populations during the Dust Bowl years of the 1930's. One strategy to help populations was to provide for and protect ducks on their southern migration. Rice Lake historically, and even during the drought years, had large populations of migrating waterfowl. Thus, the area was identified as one of the first to be purchased in an attempt to stem the decline of waterfowl populations.

Franklin D. Roosevelt established Rice Lake Migratory Waterfowl Refuge by Executive Order in 1935 "as a refuge and breeding ground for migratory birds and other wildlife." Following initial land purchases, using NIR Wildlife Refuge Funds and Ducks Stamp Funds, early development of the Refuge was accomplished using Civilian Conservation Corps labor (Camp BS-3, Company 2705). A Presidential proclamation changed the name of the Refuge to Rice Lake National Wildlife Refuge.

The 18,208-acre Rice Lake NWR (RLNWR) is a mosaic of lakes, marshes, forests, and grasslands that provide a variety of habitats for migrant and resident wildlife. Abundant natural foods, particularly wild rice, have attracted wildlife to the area for centuries. The Refuge is especially noted for its fall concentrations of Ring-neck Ducks, which often number over 150,000 birds. Other important migrants include Mallards, Wood Ducks, Canvasback, Canada Geese, and Woodcock. White-tailed deer, black bear, river-otter, beaver, Sandhill Cranes, Bald Eagles, Ruffed and Sharp-tail Grouse inhabit the Refuge. Songbirds, raptors, and nearly all other species associated with bogs and forests of northern Minnesota, including gray wolves and an occasional moose, are also found on the Refuge.

Service policy states that when refuge land is acquired it takes on the purpose of its acquisition authority plus the purposes outlined in the authorities used to acquire previous land for the same refuge. The Refuge's purposes thus include:

1. "a refuge and breeding ground for migratory birds and other wildlife" (Executive Order 7221).
2. "an inviolate sanctuary, or for any other management purpose, for migrating birds" (Migratory Bird Conservation Act).

3. “(1) incidental fish and wildlife-oriented recreation development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species” (Refuge Recreation Act)
4. “...for the development, advancement, management, conservation, and protection of fish and wildlife resources...” 16 U.S.C. § 742f(a)(4) “...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude...” 16 U.S.C. § 742(b)(1) (Fish and Wildlife Act of 1956).

### **Mille Lacs National Wildlife Refuge**

Mille Lacs NWR is a cornerstone in maintaining the Common Tern population in the Great Lakes Region. The Refuge comprises of two small boulder and pebble islands; Spirit Island and Hennepin Island. Both islands combined are less than .5 acres in size. Caspian Terns, Ruddy Turnstones, Sanderlings, Dunlin, Least Sandpipers, and Semipalmated Sandpipers, use this small but important Refuge for resting and feeding during migrations.

Currently, there are no non-native/invasive plants on Hennepin or Spirit Islands. Both islands are dominated by boulders and pebble rocks and provide little soil for herbaceous plant growth. However, the island could be susceptible to invasive animals. Ring-bill and Herring Gulls have been outcompeting Terns for nesting space and depredation efforts have been conducted for several years with varying success. Gulls are migratory birds and are therefore subject to the protection of the Migratory Bird Treaty Act. If a non-native invasive species were to begin nesting or degrading either of the islands, appropriate measures will be discussed and implemented using BMP's.

Mille Lacs NWR was established for the purpose of:

1. Preservation of breeding grounds for native birds (Executive Order 2199, and 3340).

### **SHERBURNE NWR COMPLEX IPM GOALS, OBJECTIVES, AND STRATEGIES**

#### **Complex Goal:**

Contribute to the preservation of native habitat and ecotypes within the Complex, and their associated Service priority species. Restored, healthy ecosystems provide habitat necessary for meeting the refuge complexes vision and purpose, that they may also resist encroachment from invasive plants and other weeds.

The following objectives and non-inclusive strategies were developed to guide and implement the Station's IPM program:

#### **Objective 1. Inventory and Mapping**

- Inventory invasive species throughout the entire Refuge Complex by 2036.

- Update the 2002 vegetation map using the Minnesota Native Plant Community Classification System.
- Map treatment areas and input into GIS and ArcCollector.
- Maintain treatment records on station for 5 years.

### **Objective 2. Prevention**

- Ensure that all seed purchased for use on the refuge is either certified, “weed free”, or tested to ensure that invasive weed seeds are not present.
  - Purchase seed from reputable dealers, requiring the disclosure of seed origin and testing.
- Prepare “weed-free”, well packed, seedbeds on all tracts scheduled to be seeded before establishing/re-establishing prairie grasslands.
  - Consider the use of multiple applications of a glyphosate chemical in the year prior to seeding to ensure weeds are “eradicated”.
  - Ensure ground is adequately packed, and that proper grass seed drills/spreaders are utilized.
  - Make sure edges of fields and hard to access areas are treated when noxious weeds are present.
  - Limit site disturbance.
- Follow sanitation procedures for weed-free vehicles and heavy equipment.
  - Wash and/or clean equipment prior to leaving the field.
  - Use an air compressor to clean tractors and other equipment to prevent spread of weed seed to other areas.
  - Utilize car wash in local town when necessary or pressure washer located at Sherburne shop’s designated wash pad to wash and rinse vehicles/equipment.
  - Clean and/or wash vehicles and equipment prior to relocating to another station (i.e., Specialty-tracked vehicles).

### **Objective 3. Control New Infestations**

- Provide 95% control of all newly discovered invasive plant infestations < 1 acre in size and from all locations that present the best opportunities for infestations to spread.
  - Implement control measures on areas such as roadsides, ditches, public use areas; essentially

anywhere vehicles and equipment could transport seeds or plant parts to new locations.

- Spot spray new infestations with high efficacy herbicides.
- Maintain healthy habitats through proper management including early detection of invasive weed infestations.
- Train staff, volunteers, and cooperators to recognize invasive flora and fauna species.
- Monitor neighboring lands and upstream waterways for potential invasives and report or contact as necessary

#### **Objective 4. Containment of Established Invasions**

- Create a “containment buffer” surrounding large (i.e., > 5 acres), established priority invasive plant infestations that propagate via root system spread by providing 95% control of priority weeds within a 100 foot buffer surrounding these infestations.
  - Utilize cooperative pesticide agreements to control established plants.
  - Utilize staff and volunteers to control noxious weeds.
  - Utilize grazing to prevent seed set/dispersal.
- Prevent 95% of seed set and dispersal of invasive weeds to ensure that infestations do not expand.
  - Utilize cooperative pesticide agreements to control established plants.
  - Utilize staff and volunteers to control noxious weeds.
  - Utilize grazing to prevent seed set/dispersal.

#### **Objective 5. Long-term management**

- Reestablish and/or maintain healthy Anoka Sandplain habitats for migratory birds and other wildlife by aggressively planting/managing native grass and forb mixtures.
  - Where appropriate, utilize cooperative agreements and staff/equipment when necessary, to prepare a weed-free seedbed and seed native grass species adapted for onsite soil and climatic conditions.
- Elimination or control of invasive plant infestations will be immediately followed with aggressive management actions to restore native, beneficial grassland plants within 5 years of control.
  - Where appropriate, utilize cooperative agreements and staff/equipment when necessary, to prepare a weed-free seedbed and seed native grass species adapted for onsite soil and climatic conditions.

- Continually research the potential impacts of utilizing grassland management techniques (such as prescribed fire and grazing) on desirable grass species and invasive weed species alike.
  - Design and monitor methods to assure the efficiency of management treatments.

**Objective 6. Protection of Biologically Sensitive Areas and Ground/Surface Water**

- Compare chemical treatments to endangered species and ground/surface water concerns to ensure that herbicide applications pose a minimal risk to these resources.
- Ensure biological control organisms are thoroughly tested by U.S. Department of Animal and Plant Health Inspection Service (APHIS) and are not released until they are found to be species specific in their impact.
- Ensure label directions are carefully followed for herbicide applications, and herbicides are applied in accordance with federal and state laws.

Strategies:

Pest management strategies may include education, exclusion, maintenance, cultural, biological and mechanical controls, and pre-approved, site-appropriate chemicals. Decisions concerning whether or not pesticides should be applied in a given situation will be based on a review of all available options. Efforts will be made to avoid the use of pesticides by considering other alternatives such as, biological, cultural, and mechanical.

An Integrated Pest Management decision at the Sherburne NWR Complex shall consist of the following steps:

1. Identify and research target pest species.
2. Evaluate control methods.
3. Establish goals for the target area.
4. Implement Best Management Practices most effective for the target area.
5. Monitor effectiveness.
6. Keep appropriate records.

Other factors when considering the use of pesticides:

1. Soil type
2. Slope of land (e.g., runoff potential)
3. Endangered species (see Section 7 attachment)
4. Groundwater contamination potential

5. Long term effects
6. Human health hazards
7. Wind drift (e.g., off refuge areas and sensitive areas)

## **SENSITIVE REFUGE SITES AND SPECIES**

### **Threatened and Endangered Species Habitat**

Currently, there are no federally-listed species that have been documented to roost, nest or otherwise occur within Sherburne Refuge Complex, the Northern-Long eared bat has been captured and tracked to roost sites off the Sherburne NWR and the Rusty-Patched bumble bee has been captured in Sand Dunes State Forest which shares a southern border with the Sherburne Refuge. Currently the Anoka Sandplain is known to contain 114 state threatened, endangered species and species of special concern on the Refuge. For a list of these state species refer to the highlighted species in Attachment C. Protecting state-listed species populations is of paramount concern as well, and managers will ensure that any invasive weed treatments do not jeopardize these species or their habitats.

Care will be taken to ensure that any herbicide applications made on the Refuge Complex are done in a manner that minimizes risks to state-listed species. As with any weed treatment site, mechanical, biological, and cultural alternatives will be evaluated as a first means of treatment before using any herbicides. If the use of an herbicide is required to meet treatment objectives, care will be used to select those herbicides that pose the least risk to all species.

The spread of invasive weeds poses a significant threat to many of these species through direct habitat degradation, and the loss of biological diversity. Before an IPM treatment is selected for a particular site, managers will consider potential impacts of this treatment to all species. Examples may include not using an herbicide treatment option where rare plant species may be impacted, or not using a mechanical treatment if rare ground nesting birds may be disrupted during their breeding season. Efforts to control invasive species and restore native habitats in locations where invasive weeds now dominate may benefit many species.

### **Prairie Grassland Sites During the Nesting Season**

Undisturbed grasslands are critical breeding habitat to a variety of ground nesting birds at the Sherburne NWR Complex. Activities that remove vegetative cover during the nesting season (e.g. grazing or mowing), can destroy nests, limit re-nesting opportunities, or possibly kill the species. Repeated, large scale mechanical control treatments which provide short-term control of invasive weeds are discouraged under this plan. These treatments repeatedly remove available habitat for prairie grassland birds, and do not accomplish the stated objective of reducing the spread of the targeted invasive weeds.

Although mowing grassland habitats during the nesting season may be a necessary component to control the spread of invasive weed species, IPM treatments prescribed under this plan will combine other methods. These include biological, cultural, and chemical treatments used alongside mechanical treatments to accomplish long-term control of invasive weeds. Once invasive weeds are controlled, restoration of these sites to healthy native grassland communities will be undertaken for the long-term

benefit of prairie grassland birds and other wildlife.

### **Pollinators Present During Treatment**

Many different species of native pollinators occur on the Sherburne NWR Complex, including native bees, domestic honeybees, butterflies, beetles, and birds. IPM techniques utilized under this plan will consider impacts to these sensitive species. Managers must consider several factors specific to these species when prescribing IPM treatments. Butterflies and other pollinators depend on native plants and forbs for their life history requirements. The spread of invasive species in areas of native prairie reduces the habitat available to rare species. Failure to treat invasive plant species, diminishes the availability of native grasses and forbs, and has a direct negative impact on many native pollinators.

Biological agents may be adequate control measures in some cases where organisms are species-specific in their target. Flea beetles (*Apthona sp.*) can control leafy spurge and are not known to damage other native plants or insects. Conversely, some agents may impact non-target plant species (e.g., Canada thistle weevils). The potential for these introduced organisms to affect native thistle populations is not well documented or understood, but the potential to damage native plant communities is a concern. Large scale grazing or prescribed fire of prairie for weed control, and other management goals, may pose a significant risk to native pollinators. Similarly, broadcast applications of herbicides can also be detrimental to native prairie forbs, or pollinators. While the toxicity of herbicides applied under this plan do not appear to be of concern to native pollinators or domestic honeybees, the impacts to both non-target plant and pollinator species is important.

### **Water Quality Concerns**

When pesticide use is incorporated as the “best management practice” (BMP’s), water quality concerns will be evaluated. Resources exist at the Sherburne NWR Complex and throughout the state to assist staff with this analysis (i.e., groundwater leaching potential, soils survey maps, and public water inventory). Groundwater supplies are used for human drinking water, irrigation, or for domestic animals. If groundwater is contaminated with a pesticide it may be difficult or impossible to reclaim. In order to effectively protect groundwater and other water resources, managers must first know specifically where the groundwater resources are located. Also, it is important to understand the many other factors which affect the potential for herbicide treatments to contaminate known groundwater supplies including: the presence of groundwater recharge sites, percent organic matter, herbicide half-life, solubility, and chemistry, soil permeability, soil adsorption, and depth to groundwater (Seelig 1994). Pesticide use will be limited to areas in which known water resources will not be harmed, and/or pesticides with no known or low toxicity in water will be used in these areas.

The decision to use herbicides will result from an analysis that indicates that herbicide use is the only reasonable alternative to address the particular invasive weed issue, and that other methods of control (biological, mechanical, or cultural) are not an effective alternative. Whenever possible, land managers will avoid the use of herbicides which have higher potential to leach into groundwater.

Factors Affecting the Potential for Translocation of Herbicides into Surface Waters Include:

- Sherburne NWR has four lakes, twenty impoundments, an extensive ditch system, St. Francis River, Battle Brook, and Type I-VII wetlands. The edges of these areas provide an excellent conduit for weed species to become established as receding water levels expose bare soils. Herbicide applications along these edges may enter surface waters and potentially impact non-target organisms. These mitigation strategies can also apply to the CMNWR and RLNWR in order to prevent ground water contamination.

- Understanding the potential for herbicide applications to move in the environment and impact surface waters is critically important to land managers. Herbicides may alter vegetative and aquatic invertebrate populations in wetlands, resulting in direct impacts to waterfowl and other wetland dependent or obligate wildlife. These impacts may be short term or of longer duration depending on the rate and type of the herbicide used and the herbicide's ability to move into wetlands.
- Grassland areas dominate Sherburne NWR providing habitat for many species. Farming the area can provide a clean weed free seedbed prior to re-establishing grassland habitat. In grassland situations there is very little exposed soil; therefore, the potential for erosion (i.e., translocation of herbicide bound to soil particles) and runoff is minimal.
- Application methods will also have different potential impacts to surface water resources. Hand spraying is usually very specific, confined to very small areas and drift is easy to control, as opposed to aerial and/or broadcast spraying, where drift is harder to control and spray is over large areas. Subsequently, hand spraying with an approved pesticide use proposal (PUP) is allowed without any further evaluation. Ground and aerial applications of general use pesticides do not require National IPM Coordinator review/ (dis) approval because Region 3 has implemented documented, quantitative IPM approaches including no-spray buffers around sensitive habitats and non-target organisms.

In addition to land cover, environmental factors that have a major influence on whether applied herbicides will translocate to surface water include temperature, relative humidity, and wind.

- Modeling the potential for surface and groundwater contamination is an important tool to help managers predict potential impacts of herbicide applications. However, it is through the use of BMP's when applying herbicides that will ultimately limit the potential contamination of these sensitive resources.
- When applying chemical herbicides on the Refuge to designated Public Waters, an Aquatic Plant Management Permit must be obtained from the MN DNR prior to a chemical application to those public waters.

## **IPM COORDINATOR AND STAFF ROLES**

The Refuge Manager is responsible for ensuring staff compliance with the refuge policy, IPM plan, and state and federal regulations. The Refuge Project Leader or designee shall be the Sherburne NWR Complex IPM Coordinator and be responsible to implement the IPM plan and to coordinate pest management-related communications between Sherburne NWR staff, cooperators, contractors, and visitors. Sherburne's IPM Coordinator will maintain an IPM program that relies on minimal pesticide use.

## **BEST MANAGEMENT PRACTICES (BMP'S)**

1. All chemical applications will be planned and conducted with the coordination and under the supervision of a licensed applicator, certified in the appropriate State category that covers the application.
2. Boom spraying will only be conducted when wind speeds average 7 miles per hour (mph) or less, and preferably in the 3 to 5 mph range, with no gusts greater than 10 mph.
3. Use anti-drift nozzles with openings of not greater than 1/16 inch and boom pressures of no more than 30 psi. Use only 20 psi adjacent to sensitive sites not in the treatment area.
4. Inversion conditions will be avoided since these conditions can facilitate large-scale herbicide drift.
5. Boom spraying will not be conducted on days when there is a 30% or higher forecast for rain within 6 hours.
6. Applications of herbicides prone to leaching will also not be made within 24-48 hours of (greater than 50% chance of) moderate to heavy rainfall. Certain herbicides are less likely to leach and more effective following a light rainfall that moistens the soil, and these conditions are usually indicated as optimal on the label.
7. Spot spraying operations will be conducted with fewer restrictions on wind speed due to the fact of less spray drift and spray being pointed directly at the pest.
8. A hand held wind meter will be used to determine wind speed at the application site, and wind direction will also be evaluated relative to any sensitive sites. If the wind temporarily increases during boom spraying, lowering the nozzle pressure, thereby increasing droplet size, can reduce drift. If wind speeds stay above operating speeds, the operation will be shut down.
9. A nontoxic anti-drift agent will also be used when allowed by the label, especially adjacent to sensitive sites.
10. Equipment will be calibrated as necessary to ensure that herbicide application rates are accurate and that rough terrain features calculated. When boom spraying, it is desirable to maintain the same combination of gear and rpm's used in calibrating the boom sprayer. A chart of speed and gear ratios will be available for staff to use to determine appropriate rate of speed/gear.

11. To aid staff involved in mixing, a conversion table is posted inside the pesticide storage building stating the amount of product needed for any given percentage of tank mix for each size of tank used on the refuge. Also, each tank will be clearly labeled "Pesticides Only."
12. Daily herbicide applications information (i.e. wind/weather, chemical type, application method, operator(s), acres sprayed, and location) should be recorded before and/or after each herbicide application.

## **PRIORITY MANAGEMENT TOOLS**

A first step in prioritizing areas for management is to define the areas of your Plan's spatial scope that are under management consideration. Over the long term, the intent may be to manage invasive plants across all areas within the Plan's spatial scope, but when resources are limited, area priorities help inform where to use those resources. Areas should have clear boundaries defined by one or a combination of features such as jurisdictional management boundaries, ecosystem types, soils, or topography. Several criteria can be used to help decide which areas within the Plan's spatial scope are a priority for managing invasive plants. These include the current level of infestation, risk of invasion, and important to high value conservation resources.

Each Refuge in the complex is divided up into management units. Each management unit can be analyzed using a Priority Management Tool to better inform Refuge staff when prioritizing invasive species management. Criteria commonly used to prioritize species for invasive plant management includes;

- Larger Landscape Invasiveness
  - The degree to which a species is likely to cause harm to wildlands or overall biodiversity.
- Status and Habitat Suitability
  - Characteristics of the species within the Plan's spatial scope.
- Ecological Impacts
  - The severity of current or potential impacts the plant causes (or could cause) on conservation targets within the Plan's spatial scope.
- Difficulty of Control
  - The difficulty of managing the species within the Plan's spatial scope.
- Larger Landscape Importance
  - The degree to which the species is a priority for management on adjacent lands or in the larger landscape.
- Other
  - The degree to which a species is important or management because of political, public, cultural, or other reasons.

As there are criteria that can be used to prioritize species for invasive plant management, there are criteria commonly used to prioritize areas for invasive plant management. Those criteria include;

- Importance to conservation targets
  - The importance of the area to natural resources of priority conservation concern as it relates to the presence or proximity of a natural, cultural, or other important resources.
- Integrity or "Intactness" of resources

- The degree to which an area is believed to be healthy, intact, or unimpaired, with major ecological (or cultural) attributes functioning within the bounds of natural disturbance regimes.
- Innate resistance to invasion
  - The innate capacity of an ecosystem (or other system) to resist establishment and spread of invasive plant species.
- Risk of Invasion: Invasion pathways and Vectors
  - Invasion pathways and vectors provide the means for invasive plant transport from one location to another.
- Risk of Invasion: Anthropogenic Disturbance
  - Disturbance facilitates invasive plant invasion and can be described as a “relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment”
- Infestation level
  - This category considers the richness and abundance of invasive plant species within an area.
- Investments
  - Degree of previous investment in invasive plant removal efforts.

**Figure 1.** Examples of invasive plant ranking systems and tools for prioritizing invasive plant species and areas for management

<i>System Title</i>	<i>Species Ranking Criteria</i>	<i>Level Of Expertise Required</i>	<i>Web Link</i>
Federal and State Noxious Weed Lists	Criteria vary across states	Low	<a href="https://plants.usda.gov/java/noxComposite">https://plants.usda.gov/java/noxComposite</a>
Invasive Plant Inventory and Early Detection Prioritization Tool (IPIEDPT)	Species and Areas	High	The IPIEDPT is a Microsoft Access tool that integrates larger landscape invasive plant rankings and local knowledge to generate a prioritized list of species and areas for inventory and early detection, and ultimately management. Species criteria include larger landscape invasiveness rankings, impacts (known or probable), proximity, potential for spread, and abundance/distribution. Area criteria include ecological integrity (health), level of infestation, density of vector pathways, frequently and intensity of vector events, and disturbance. Source: USFWS and Utah State University (2018) Web link: <a href="https://ecos.fws.gov/ServCat/Reference/Profile/47680">https://ecos.fws.gov/ServCat/Reference/Profile/47680</a>
NatureServ Invasive Species Assessment Protocol	Species	High	The protocol is multi-criteria tool for assessing, categorizing, and listing non-native invasive vascular plants according to their impact on native species and natural biodiversity in a large geographical area such as a nation, state, province, or ecological region. The tool has typically been used to develop larger landscape invasive plant rankings but can be adapted and used at a local scale. Requires in-depth knowledge about plant ecology

			and impacts or an in-depth literature search. Web link: <a href="https://explorer.natureserve.org/servlet/NatureServ?init=Species">https://explorer.natureserve.org/servlet/NatureServ?init=Species</a>
--	--	--	--

### IPIEDTPT Prioritization Tool per Refuge Species Prioritization Scores

The following Tables are examples of the IPIEDPT Prioritization tool, when used can provide quantitative results on how to prioritize invasive species management.

**Table 1: Sherburne NWR Invasive Species Prioritization Scores**

<i>Scientific Name ITIS</i>	<i>Common Name</i>	<i>Invasiveness Score</i>	<i>Status Score</i>	<i>Impacts Score</i>	<i>Legal Score</i>	<i>Total Score</i>
<i>Cirsium arvense</i>	Canada thistle	2.1	3.6	2.1	1	8.8
<i>Rhamnus cathartica</i>	European buckthorn	2.1	4	2.1	1	9.2
<i>Tanacetum vulgare</i>	Common Tansy	2.1	3.6	2.1	1	8.8
<i>Phragmites australis</i>	Common Reed	1.5	4	2.1	1	8.6
<i>Poa pratensis</i>	Kentucky bluegrass	0.9	3.2	0.9	0	5
<i>Lotus corniculatus</i>	Bird's-foot Trefoil	0.3	3.07	0.9	0	4.27
<i>Euphorbia esula</i>	Leafy Spurge	2.1	3.07	2.1	1	8.27
<i>Lythrum salicaria</i>	Purple loosestrife	2.1	4	2.1	1	9.2
<i>Centaurea stoebe ssp. micranthos</i>	Spotted Knapweed	2.1	4	2.1	1	9.2
<i>Phalaris arundinacea</i>	Reed Canary grass	2.1	3.6	2.1	1	8.8
<i>Robinia pseudoacacia</i>	Black Locust	1.5	3.6	0.9	1	7
<i>Securigera varia</i>	Crown vetch	2.1	3.6	2.1	1	8.8
<i>Hesperis matronalis</i>	Dame's Rocket	0.3	3.07	0.9	0	4.27
<i>Ulmus pumila</i>	Siberian elm	0.9	3.6	0.9	0	5.4

**Table 2: Sherburne NWR Habitat-Species Prioritization Score**

<i>Scientific Name ITIS</i>	<i>Common Name</i>	<i>Presence Score</i>	<i>Status Score</i>	<i>Habitat Score</i>	<i>Total Score</i>	<i>Species Score</i>	<i>Overall Score</i>
<i>Cirsium arvense</i>	Canada thistle	10	7	5	22	8.8	30.8
<i>Rhamnus cathartica</i>	European buckthorn	10	1	10	21	9.2	30.2
<i>Tanacetum vulgare</i>	Common Tansy	10	10	1	21	8.8	29.8
<i>Phragmites australis</i>	Common Reed	10	1	10	21	8.6	29.6
<i>Poa pratensis</i>	Kentucky bluegrass	10	1	5	16	5	21
<i>Lotus corniculatus</i>	Bird's-foot trefoil	10	10	1	21	4.27	25.27
<i>Euphorbia esula</i>	Leafy Spurge	10	7	1	18	8.27	26.27
<i>Lythrum salicaria</i>	Purple loosestrife	10	7	10	27	9.2	36.2
<i>Centaurea stoebe ssp. micranthos</i>	Spotted Knapweed	10	10	5	25	9.2	34.2
<i>Phalaris arundinacea</i>	Reed Canary Grass	10	5	10	25	8.8	33.8
<i>Robinia pseudoacacia</i>	Black Locust	10	7	5	22	7	29
<i>Securigera varia</i>	Crown vetch	10	7	5	22	8.8	30.8
<i>Hesperis matronalis</i>	Dame's Rocket	5	0	1	6	4.27	10.27
<i>Ulmus pumila</i>	Siberian elm	10	7	1	18	5.4	23.4

**Table 3: Crane Meadows NWR Invasive Species Prioritization Scores**

<i>Scientific Name ITIS</i>	<i>Common Name</i>	<i>Invasiveness Score</i>	<i>Status Score</i>	<i>Impacts Score</i>	<i>Legal Score</i>	<i>Total Score</i>
<i>Robinia pseudoacacia</i>	Black locust	1.4	3.07	0.9	1	6.37
<i>Ulmus pumila</i>	Siberian elm	0.6	3.07	0.3	0	3.97
<i>Euphorbia esula</i>	Leafy spurge	1.4	3.6	2.1	1	8.1
<i>Phragmites australis</i>	common reed	1.4	3.6	2.1	1	8.1
<i>Cirsium arvense</i>	Canada thistle	1.4	3.07	0.9	1	6.37
<i>Linaria vulgaris</i>	Butter and Eggs	0.6	3.6	0.9	0	5.1

<i>Poa pratensis</i>	Kentucky bluegrass	1	4	2.1	0	7.1
<i>Tanacetum vulgare</i>	Common Tansy	1.4	3.6	0.9	1	6.9
<i>Centaurea stoebe ssp. micranthos</i>	Spotted Knapweed	0.2	3.6	2.1	1	6.9

**Table 4: Crane Meadows NWR Habitat-Species Prioritization Score**

<i>Scientific Name ITIS</i>	<i>Common Name</i>	<i>Presence Score</i>	<i>Status Score</i>	<i>Habitat Score</i>	<i>Total Score</i>	<i>Species Score</i>	<i>Overall Score</i>
<i>Robinia pseudoacacia</i>	Black locust	10	0	1	11	6.37	17.37
<i>Ulmus pumila</i>	Siberian elm	10	10	1	21	3.97	24.97
<i>Euphorbia esula</i>	Leafy spurge	10	7	10	27	8.1	35.1
<i>Phragmites australis</i>	Common Reed	10	5	10	25	8.1	33.1
<i>Cirsium arvense</i>	Canada thistle	10	7	10	27	6.37	33.37
<i>Linaria vulgaris</i>	Butter and Eggs	10	10	5	25	5.1	30.1
<i>Poa pratensis</i>	Kentucky bluegrass	10	1	10	21	7.1	28.1
<i>Tanacetum vulgare</i>	Common Tansy	10	10	5	25	6.9	31.9
<i>Centaurea stoebe ssp. micranthos</i>	Spotted Knapweed	10	7	5	22	6.9	28.9

**Table 5: Rice Lake NWR Invasive Species Prioritization Scores**

<i>Scientific Name ITIS</i>	<i>Common Name</i>	<i>Invasiveness Score</i>	<i>Status Score</i>	<i>Impacts Score</i>	<i>Legal Score</i>	<i>Total Score</i>
<i>Phalaris arundinacea</i>	Reed Canary grass	1.4	3.6	2.1	0	7.1
<i>Cirsium arvense</i>	Canada thistle	1.4	3.6	2.1	1	8.1
<i>Rhamnus cathartica</i>	European buckthorn	1.4	4	2.1	1	8.5
<i>Tanacetum vulgare</i>	Common Tansy	1.4	3.6	2.1	1	8.1
<i>Phragmites australis</i>	Common Reed	1	4	2.1	0	7.1

<i>Poa pratensis</i>	Kentucky bluegrass	0.6	3.2	0.9	0	4.7
<i>Lotus corniculatus</i>	Bird's-foot trefoil	0.2	3.07	0.9	0	4.17
<i>Euphorbia esula</i>	Leafy Spurge	1.4	3.07	2.1	1	7.57
<i>Lythrum salicaria</i>	Purple loosestrife	1.4	4	2.1	1	8.5

**Table 6: Rice Lake NWR Habitat-Species Prioritization Score**

<i>Scientific Name ITIS</i>	<i>Common Name</i>	<i>Presence Score</i>	<i>Status Score</i>	<i>Habitat Score</i>	<i>Total Score</i>	<i>Species Score</i>	<i>Overall Score</i>
<i>Cirsium arvense</i>	Canada thistle	10	7	5	22	8.1	30.1
<i>Rhamnus cathartica</i>	Common buckthorn	10	1	10	21	8.5	29.5
<i>Tanacetum vulgare</i>	common tansy	10	10	1	21	8.1	29.1
<i>Phragmites australis</i>	common reed	10	1	10	21	7.1	28.1
<i>Poa pratensis</i>	Kentucky bluegrass	10	1	5	16	4.7	20.7
<i>Lotus corniculatus</i>	bird's-foot trefoil	10	10	1	21	4.17	25.17
<i>Euphorbia esula</i>	Leafy spurge	10	7	1	18	7.57	25.57
<i>Lythrum salicaria</i>	Purple Loosestrife	10	7	10	27	8.5	35.5

## **ADAPTIVE MANAGEMENT**

- *Adaptive management is a process that promotes flexible, informed decisions that allow us to make adjustments as we better understand outcomes from management actions and other events. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process (USFWS 2013).*

It is important to remember that a Plan is not static-it should set the stage for a dynamic and flexible process of doing, evaluating, learning, and adapting. To be successful, any conservation program or project must evaluate progress and adjust to improve outcomes. The development of annual work plans will necessarily incorporate lessons learned from the previous year's experiences. The key is to provide a mechanism to periodically re-examine assumptions as well as implementation effectiveness.

An adaptive management approach helps teams plan their projects such that they will be able to trace their failures back to poor assumptions, poor implementation, or a combination of the two (Salafsky et al.

2001). Otherwise, when projects do not produce desired results, the conclusion is often that strategies were not implemented year after year without anyone questioning whether it is achieving the intended result.

### **S.M.A.R.T. OBJECTIVES**

1. Treat 50% of the top 3 scoring invasive species new (discovered within the current season) infestations within 1 month of discovery.
2. Provide follow up treatment to 50% of all previous years' herbicide treatment areas greater than 1 acre in size.
3. Treat 50% of known existing infestations of the top 3 highest prioritized invasive species in a field season.
4. Eradicate 2 invasive species from the refuge over the life of this Integrated Pest Management Plan.

### **SAFETY**

#### **Personal Protective Equipment (PPE)**

Applicators will wear PPE in accordance with the specific labeling requirements for each product, and the refuge, will supply all PPE. The required PPE, as specified by the label, will be worn at all times during handling, mixing, application, and clean-up. Fresh clean clothing laundered after each use will be put on daily before handling pesticides used in application and removed before engaging in other duties unrelated to the application. Tyvek® coveralls, shirts, pants, and boot covers will be provided as an option for applicators for personal protection. Mixers and applicators will wear a pair of footwear specially designated for herbicide use and will not wear the designated footwear for other operations to minimize contamination.

Exposure to concentrated product is usually greatest during mixing; extra caution will be taken during the mixing period. Persons involved in mixing will be best protected if they wear long nitrile gloves, an apron, and designated footwear and face shield throughout the mixing process, in addition to the protective clothing required by the label.

The Refuge has purchased a wash machine to clean clothing after each use. Clothing used in an application will be laundered separately from other laundry items. Laundry machines are located in the shop facilities.

Currently, there are no products requiring the use of a respirator proposed in this plan. Should changes occur, any respirator use by Service personnel will take place following establishment of a written Respirator Program, fit testing, physical examination (including pulmonary function and blood work for contaminants), and proper storage of the respirator. Alternatively, the refuge may contract with a commercial certified pesticide applicator in the area for these applications.

Further pesticide safety information can be found at S: Drive, > Integrated Pest Management, > Invasive's Information, > Pest. Safety USFWS. [USFWS Pesticide Safety Resource](#).

## **Notification of Pesticide Applications**

When pesticide applications are scheduled at Sherburne NWR Complex, staff will be informed of the location, chemical, and restricted entry interval of the area. If necessary, signs will be posted on all corners and trailheads for staff and visitors stating, "DO NOT ENTER" or "AREA CLOSED." Prior to pesticide use in buildings, staff will be notified, and if necessary, buildings will be closed temporarily. Sherburne NWR staff will also notify any adjacent property owners of an intended application, if private individuals have requested notification.

## **Application, Storage, and Disposal**

No person shall apply, store, or dispose of any pesticide on Sherburne NWR Complex without an appropriate pesticide applicator license obtained from the state of Minnesota or be under direct supervision of a licensed pesticide applicator. Pesticide applicators will be trained in the principles and practices of IPM and the use of pesticides approved for use at the Sherburne NWR Complex, and they must comply with the IPM policy, follow appropriate federal and state regulations, and follow label requirements when using pesticides in or around Sherburne NWR Complex facilities and land. When it is determined that a pesticide must be used in order to meet pest management objectives, the least-hazardous pesticide and lowest dose most effective for the job, will be chosen.

Pesticide storage, transportation, and application will be conducted in accordance with the requirement of the Federal Insecticide, Fungicide, and Rodenticide Act (7 United States Code 136 et seq.), Environmental Protection Agency regulations in 40 CFR (<http://www.epa.gov/compliance/civil/fifra/fifraenfstareq.html>), Occupational Safety and Health Administration regulations, Minnesota Department of Health and Environment, Minnesota Department of Agriculture, Service policy, Sherburne NWR Complex policies and procedures, and local ordinances. .

Pesticide containers shall be triple rinsed, rinse solution poured back into spray tank, stored for later use, or sprayed/spread evenly over a target site listed on the label. Clean, empty containers will be disposed of.

## **Spills**

A spill is any accidental release of a pesticide. The spill may be a minor one involving only a few leaking containers, or it may be a major accident in which a piece of equipment malfunctions and releases its contents. All users of pesticides must be thoroughly familiar with laws and guidelines governing chemical spills. The inability to respond properly to such an emergency, no matter how minor the problem, could seriously endanger public health and environmental quality.

If a spill occurs, the top priority will be the decontamination of any personnel involved. Any gloves, clothing, or other PPE involved in the contamination will be removed as soon as practical and cleaned or discarded appropriately, and the applicator will be provided with the time and opportunity to wash up and

decontaminate as thoroughly as needed. If needed, there is an eyewash station and shower located inside the Shop Building.

A "spill kit" with absorbent material will be kept on hand where the pesticides are stored, mixed, or when transported, and the storage area will provide containment appropriate for the volume of material involved. A tarp will be used to cover any spill site until retrieval of the spilled material or cleanup of the site occurs. If the spill cannot be cleaned up and contained immediately, State spill response personnel will be contacted. Appropriate training will be provided to applicators and handlers for spill kit use and containment.

### **Pesticide labels & material safety data sheets (MSDS)**

Prior to mixing or applying any product for the first time each season, all applicators will review the most current label, SDS, and Pesticide Use Proposal (PUP) for each product to determine the target pest, appropriate mix rate, PPE, and other variables listed on the label. Labels and SDS's will be maintained both in the shop, pesticide storage building, and stored on the S: drive. These documents will be carried by pesticide applicators during applications.

### **Emergency procedures**

Contact supervisor immediately if a spill occurs to personnel, land, or equipment. Decontamination of personnel will be the top priority. If personnel need medical attention, call 911. If determined that the spill can cause harm to human health or environment, report it to the National Response Center.

#### Emergency contact numbers:

- Steve Karel, Project Leader: 763-389-3323 ext 10, Cell 763-244-0060
- Walt Ford, Rice Lake Refuge Manager 2187682402 ext 100, Cell 218-821-6794
- Greg Dehmer, 763-389-3323 ext 102, Cell 763-244-0062
- Tyler Paulson, Sherburne/Crane Meadows Collateral Duty Safety Officer (CDSO)-Tyler Paulson-Shop 763-662-2624, Cell 763-244-0209
- Roger Marks, Rice Lake CDSO-Shop/Cell 218-768-7028
- Pollution Spills: 1-800-422-0798
- Poison Control: 1-800-222-1222
- MN Duty Officer: 1-800-422-0798 or (651) 649-5451
- National Response Center: 1-800-424-8802

### **RECORD KEEPING AND STORAGE**

Pesticide application records are kept for each location treated in the Refuge Complex. It is the responsibility of the applicator to maintain records of that individuals herbicide applications. Records will need to be produced for annual reporting. The records contain the following information: location, applicator name, pest being controlled, chemical, adjuvants, application rate, method used, date, temperature (start/finish), wind direction, and wind speed. The records will be stored in the following locations: S:\Pesticide\Integrated Pest Management\Records\Pesticide Records\_master.xlsx ,

O:\Inventory\_Monitoring\_Biology\Invasives\_Diseases, and file cabinet in Wildlife biologist's office. Sherburne NWR Complex will maintain records of all pesticide treatments for at least 3 years.

Field data sheets will be completed the day of application documenting the name(s) of the applicator(s), the location of the pesticide application, the species targets, weather conditions, brand name of pesticide EPA Regulation number, and mixing rate. Field data sheets can be located on the S: Drive>, Integrated Pest Management>, Data Sheets >, [Natural Areas, Forestry, and Rights-of-way](#).

Record of all herbicide treatments will be recorded in the ArcCollector R3 Management Actions Chemical Map as well. All drop-down information menus in the chemical map layer will be completed by the applicator in order to create electronic records of applications. Training to use ArcCollector is offered digitally through the Regional Office GIS branch. There are also instructions for downloading and using the R3 Management Actions Database located in S: Drive, > R3 Management Actions Database.

The IPM plan will be stored in the central file room in the main office under Refuge Management Programs and Plans (800.097) and in S:\Plans\IPM Plan. PUP's will be stored in the central file room in the main office under Refuge Management Programs and Plans\Pesticide Use Proposals (800.097c) and in the PUPS database (<https://systems.fws.gov/pups/jsp/index.jsp?menu=home&pupId=23735>).

Pesticide applicator licenses will be kept in a folder at the refuge headquarters. Also, a copy of current employee's licenses will be kept in the pesticide storage room. Pocket cards are issued by the State of Minnesota, and it is the responsibility of the applicator to carry the card on them at all times.

### **PESTICIDE USE PROPOSAL SYSTEM (PUPS)**

A Pesticide Use Proposal (PUP) is information required by the U.S. Fish and Wildlife Service (Service) before an application of a pesticide on Service property. It is a protective measure to ensure the proper use of pesticides on Service lands. The form asks for a variety of information including where the pesticide will be applied, what pesticide will be used, what species will be managed with the pesticide, and whether or not there are any endangered species in the pesticide application area.

Many authorities relate to pesticides and PUP's. Some of them include the:

- Federal Insecticide, Fungicide, Rodenticide Act
- Endangered Species Act
- National Environmental Policy Act
- Department of Interior, Pesticide Use Policy (517 DM 1)
- Service Pest Management Policy and Responsibilities (30 AM 12)
- National Wildlife Refuge System Pest Control Policy (7RM 14)

There are multiple benefits the Service gains from PUP's, they include:

- Pesticides are used safely
- Pesticides are used effectively
- The lowest risk products are selected
- Pesticides label instructions are followed
- The best products are selected for the target pests

- Adequate pesticide application buffers are maintained
- Protection of groundwater and surface water
- Compliance with the Endangered Species Act and other applicable laws and regulations
- Reductions or eliminations of unnecessary pesticide use

A PUP must be completed and approved before any herbicide can be applied on Refuge lands. PUPs are usually approved by the Service Environmental Contaminant or National Wildlife Refuge staff at the field, regional, and national levels, depending on the pesticide being proposed for use.

Service policy (*i.e.*, 569 FW 1.4H(2)) requires that all pesticide use be reported annually using the Pesticide Use Proposal System. When a PUP is approved, PUPS will auto-create a corresponding Usage Report for that specific PUP number. This pesticide Usage Report should be reviewed by the Primary Contact Person, or their designated representative. Any data fields should be manually edited to reflect changes in pesticide use (*e.g.*, acres treated, pesticide use, etc.) since the PUP was approved. PUPS will notify PUP Primary Care Contacts in December and February that a Usage Report needs to be completed. All Usage Reports in PUPS are to be completed by the last day of February, unless a region has imposed an earlier compliance date. PUPS Users are encouraged to complete Usage Reporting by the end of each calendar year. This will facilitate end-of-year reporting and will allow PUPS Users to duplicate PUPS that will be submitted for Review (dis)Approval for the upcoming season. Instructions for completing PUPS can be found at [USFWS PUPS 2019 User Guide](#).

The link to the Pesticide Use Proposal System is:  
<https:systems.fws.gov/pups/>

## **TRAINING**

Sherburne NWR Complex staff will be trained on IPM policy and require biennial refresher training. Seasonal hires, upon discretion, will take the State of Minnesota's Non-Commercial Pesticide Applicator Categories A and F certification test at the local county extension office or be directly supervised by a licensed applicator.

Staff will be trained to identify both federal and state listed invasive species and noxious weeds. If any of these species are identified, the staff is advised to report finding to the Refuge Manager, Refuge Biologist and IPM Coordinator.

## **PESTICIDES**

Restricted use pesticides (RUP) are not planned for use on the refuge, but if determined necessary, all precautions will be taken and label, laws, and regulations will be followed. General Use Pesticides (GUP) are planned for use on the refuge. Pesticide products containing the following active ingredients and surfactants, oils, and dyes may be used:

## **Glyphosate**

Commonly Registered Trade Name: Roundup, Rodeo, and Cornerstone

Concerns: An unlisted ingredient (POEA) present in some formulations and commonly added surfactants appears to be quite harmful to aquatic invertebrate and amphibian populations.

Precautions: Use surfactant free products or products labeled for aquatic use such as Accord, Roundup Custom, Rodeo, Aqua-Master, Aqua-Neat, Eagre, Glypro, Glyphos-Aquatic or equivalent products. If surfactants are added use those that are labeled no more than slightly toxic (LC50>10mg/L) to fish and aquatic invertebrates. Some surfactants to avoid include: Activate Plus, Induce, Timberland90, Aqua King, Aqua King Plus, Optima, Entry II, No Foam A, R-11, Orthox-77, X-77 Spreader, and Cide-Kick.

## **Imidazolinones (other): including Imazapic, Imazaquin, Imazethapyr, Imazamox, Imazapyr and Imazamethabenz**

Commonly Registered Trade Name: Panoramic, Plateau, Habitat, Stalker, Assert, Ecomazapyr 2SL, and Imazapyr 4 SL, NuFarm Polaris.

Concerns: Slow degradation in some soils. Some formulations are highly mobile in water.

Precautions: Maintain adequate buffer around water. Do not apply to gravel, sand, or sandy loam soils.

## **Triclopyr (amine formulation)**

Commonly Registered Trade Name: Garlon 3A and Element 3A

Concerns: Highly mobile in water.

Precautions: Be aware of potential for groundwater contamination in porous soils.

## **Triclopyr (ester formulation)**

Commonly Registered Trade Name: Garlon 4 and Element 4

Concerns: Highly mobile in water. The major metabolite (TCP) is toxic to fish.

Precautions: Do not apply directly to water.

## **Aminopyralid**

Commonly Registered Trade Name: Milestone

Concerns: Highly mobile in water. Hay or manure from animals grazing on treated areas may cause injury to sensitive plants.

Precautions: Maintain adequate buffer around water. Do not treat areas that will be hayed or grazed.

**Non-ionic Surfactants**

Commonly Registered Trade Name: Pro Chem 90 and Class Act NG, Chamaeleon

**Oils**

Commonly Registered Trade Name: Diluent Blue® (Bark Oil) or Destiny (Methylated Seed Oil)

**Dyes**

Commonly Registered Trade Name: Pure Blue

**Table 7: Mixture Rates & Surfactant rates for Herbicides**

Chemical	Ratio	Surfactant	Species	Treatment Method
<b>Milestone (Aminopyralid)</b>	.33oz/gal	.25-50% v/v NIS 1qt/acre MSO	Crow Vetch, Canada thistle, Orange hawkweed, Spotted Knapweed, Purple Loosestrife, Common tansy	Spot spraying
	1.6oz/20 gal	.25-50% v/v NIS 1qt/acre MSO		Broadcast spraying
<b>Panoramic (Imazapic)</b>	1.3oz/gal	.25-50% v/v NIS 1qt/acre MSO	Leafy spurge, garlic mustard, pigweed, bastard toadflax,	Spot spray
	2.0oz/gal	.25% of mix		Broadcast spraying
<b>Plateau (Imazapic)</b>	.5oz/gal	5-20% MSO .25%v/v NIS	Leafy spurge, Garlic mustard,	Spot spraying
	4-8oz/acre	5-20% MSO .25% v/v NIS		Broadcast spraying
<b>Garlon 3A (Triclopyr) amine</b>	1-3oz/gal	.25-50% v/v NIS 1qt/acre MSO	Black locust, Siberian Elm, Buckthorn	Foliar
<b>Garlon 4 (triclopyr) ester</b>	10% of solution	.25-50% v/v NIS 1qt/acre MSO	Black locust, Siberian Elm, Buckthorn	Foliar
	20-30% of mix in oil	Bark oil	Black locust, Siberian Elm, Buckthorn	Basal bark
<b>Element 3A (Triclopyr) amine</b>	30% of mix in bark oil	Bark oil	Black locust, Siberian Elm, Buckthorn	Basal bark

<b>Element 4 (Triclopyr) ester</b>	20-30% in bark oil	Bark oil	Black locust, Siberian Elm, Buckthorn	Basal bark
<b>Rodeo (Glysohate)</b>	.75-2% of mix	0.25-0.50% v/v NIS 1qt/acre MSO	Annual and perennial weeds and woody plants	Broadcast spraying
<b>NuFarm Polaris (Imazapyr)</b>	0.5-5% of spray volume	.25% v/v NIS 1.5-2 pints/acre MSO	Floating and aquatic vegetation	Broadcast spraying

## TARGETED PEST SPECIES

Definitions of the noxious weed categories are from the Minnesota Department of Agriculture web page: <http://www.mda.state.mn.us/plants/badplants/noxiouslist.aspx>.

### State Prohibited Noxious Weeds

Prohibited noxious weeds are annual, biennial, or perennial plants that the commissioner designates as having the potential or are known to be detrimental to human or animal health, the environment, public roads, crops, livestock or other property. There are two regulatory listings for prohibited noxious weeds in Minnesota:

1. **Eradicate List:** Prohibited noxious weeds that are listed to be eradicated are plants that are not currently known to be present in Minnesota or are not widely established. These species must be eradicated, meaning all of the above and below ground parts of the plant must be destroyed, as required by Minnesota Statutes, Section 18.78. Additionally, no transportation, propagation, or sale of these plants is allowed. Measures must also be taken to prevent and exclude these species from being introduced into Minnesota. **In 2021 the species listed for eradication in the following table are not currently known to be present in Sherburne NWR Complex.**

Common Name	Scientific Name	Family
Oriental bittersweet	<i>Celastrus orbiculatus</i> Thunb.	Celastraceae
Japanese hops	<i>Humulus japonicus</i> Siebold & Zucc.	Cannabaceae
Giant hogweed	<i>Heracleum mantegazzianum</i> Sommier & Levier	Apiaceae
Common teasel	<i>Dipsacus fullonum</i> L.	Dipsacaceae
Cutleaf teasel	<i>Dipsacus laciniatus</i> L.	Dipsacaceae
Dalmatian toadflax	<i>Linaria dalmatica</i> (L.) Mill.	Scrophulariaceae
Grecian foxglove	<i>Digitalis lanata</i> Ehrh.	Scrophulariaceae
Black swallow-wort	<i>Cynanchum louiseae</i> Kartesz & Gandhi	Asclepiadaceae
Yellow starthistle	<i>Centaurea solstitialis</i> L.	Asteraceae
Meadow knapweed	<i>Centaurea x moncktonii</i> C.E. Britton	Asteraceae
Brown knapweed	<i>Centaurea jacea</i> L.	Asteraceae
Palmer amaranth	<i>Amarathus palmeri</i>	Amaranthaceae
Black swallow-wort	<i>Cynachum louiseae</i>	Asclepiadaceae

2. **Control List:** Prohibited noxious weeds listed to be controlled are plants established throughout Minnesota or regions of the state. Species on this list must be controlled, meaning efforts must be made to prevent the spread, maturation and dispersal of any propagating parts, thereby reducing established populations and preventing reproduction and spread as required by Minnesota Statutes, Section 18.78. Additionally, transportation, propagation, or sale of these plants is prohibited. **With the exception of Narrowleaf bittercress and Plumeless thistle, the species listed for control in the following table are currently known to be present in the Sherburne NWR Complex in 2021.**

Common Name	Scientific Name	Family
Spotted knapweed	<i>Centaurea stoebe</i> L. ssp. <i>micranthos</i> (Gugler) Hayek	Asteraceae
Narrowleaf bittercress	<i>Cardamine impatiens</i> L.	Brassicaceae
Plumeless thistle	<i>Carduus acanthoides</i> L.	Asteraceae
Canada thistle	<i>Cirsium arvense</i> (L.) Scop.	Asteraceae
Leafy spurge	<i>Euphorbia esula</i> L.	Euphorbiaceae
Purple loosestrife	<i>Lythrum salicaria</i> L. and <i>Lythrum virgatum</i> L.	Lythraceae
Wild parsnip	<i>Pastinaca sativa</i> L.	Apiaceae
Common tansy	<i>Tanacetum vulgare</i> L.	Asteraceae
Common Barberry	<i>Berberis vulgaris</i> L.	Berberidaceae

### Restricted Noxious Weeds

Restricted noxious weeds are plants that are widely distributed in Minnesota and are detrimental to human or animal health, the environment, public roads, crops, livestock or other property, but whose only feasible means of control is to prevent their spread by prohibiting the importation, sale, and transportation of their propagating parts in the state except as allowed by Minnesota Statutes, Section 18.82. Plants designated as Restricted Noxious Weeds may be reclassified if effective means of control are developed. **With the exception of Common Reed and Multiflora rose, the species listed as restricted noxious weeds in the following table are currently known to be present in Sherburne NWR Complex in 2021.**

Common Name	Scientific Name	Family
Garlic mustard	<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	Brassicaceae
Glossy buckthorn	<i>Frangula alnus</i> Mill.	Rhamnaceae
Common buckthorn	<i>Rhamnus cathartica</i> L.	Rhamnaceae
Nonnative phragmites	<i>Phragmites australis</i> (Cav.) Trin. Ex Steud.	Poaceae
Multiflora rose	<i>Rosa multiflora</i> Thunb.	Rosaceae
Crown Vetch	<i>Securigera varia</i> (L.)	Fabaceae
Asian honeysuckles	<i>Lonicera</i> spp.	Caprifoliaceae
Black locust	<i>Robinia pseudoacacia</i>	Fabaceae
Porcelain berry	<i>Ampelopsis brevipedunculata</i> (Maxim) Trautv.	Vitaceae
Wild Carrot	<i>Daucus carota</i> L.	Apiaceae
Tree-of-heaven	<i>Ailanthus altissima</i> (Mill.) Swingle	Simaroubaceae

### Specially Regulated

Specially regulated plants are plants that may be native species or have demonstrated economic value, but also have the potential to cause harm in non-controlled environments. Plants designated as specially

regulated have been determined to pose ecological, economical, or human or animal health concerns. Plant specific management plans and or rules that define the use and management requirements for these plants will be developed by the Minnesota Department of Agriculture for each plant designated as specially regulated. Measures must also be taken to minimize the potential for harm caused by these plants. **Western poison ivy and Japanese knotweed are the only two species listed as specially regulated in the following table which are currently known to be present in Sherburne NWR Complex in 2021.**

**Japanese barberry:** Japanese barberry cultivars that average greater than 600 seeds per plant will begin a three-year phase-out period in Minnesota starting January 1, 2015. At the end of the phase-out period (December 31, 2017), the listed species and cultivars will become Restricted Noxious Weeds in Minnesota and will be illegal to sell and propagate. *Specific Japanese barberry cultivars are listed on page 29 of this document.*

**Knotweeds, giant and Japanese:** Any person, corporation, business or other retail entity distributing Japanese and/or giant knotweeds for sale within the state, must have information directly affixed to the plant or container packaging that it is being sold with, indicating that it is inadvisable to plant this species within 100 feet of a water body or its designated flood plain as defined by Minnesota Statute 103F.111, Subdivision 4.

**Poison ivy:** Must be eradicated or controlled for public safety along rights-of-ways, trails, public accesses, business properties open to the public or on parts of lands where public access for business or commerce is granted. Must also be eradicated or controlled along property borders when requested by adjoining landowners.

Common Name	Scientific Name	Family
Japanese barberry	<i>Berberis thunbergii</i> DC.	Berberidaceae
Japanese knotweed	<i>Polygonum cuspidatum</i> Siebold & Zucc.	Polygonaceae
Giant knotweed	<i>Polygonum sachalinense</i> F. Schmidt ex Maxim.	Polygonaceae
Western poison ivy	<i>Toxicodendron rydbergii</i> (Small) Green	Anacardiaceae
Common poison ivy	<i>T. radicans</i> (L.) Kuntze ssp. <i>negundo</i> (Greene) Gillis	Anacardiaceae

### Other Invasive Plants of Major Concern

These species can cause serious ecological damage because they have clearly demonstrated an ability to spread aggressively in the Upper Midwest. The plants listed in the following table are known to occur in Sherburne NWR Complex in 2021.

Common Name	Scientific Name	Family
Tartarian bush honeysuckle	<i>Lonicera tatarica</i>	Caprifoliaceae
Bird's-Foot Trefoil	<i>Lotus corniculatus</i>	Fabaceae
White sweet clover	<i>Melilotus alba</i>	Fabaceae
Yellow sweet clover	<i>Melilotus officinalis</i>	Fabaceae
Reed canary grass	<i>Phalaris arundinacea</i>	Poaceae
Narrow-leaved cattail	<i>Typha angustifolia</i>	Typhaceae
Hybrid cattail	<i>Typha x glauca</i>	Typhaceae

## Invasive Plants of Lesser Concern

These species have invaded natural areas in various parts of the Upper Midwest. Large populations of these plants sometimes exist at the local level, especially in disturbed areas. The plants do not pose a major threat to well-established native plant communities although they might pose problems for areas being restored. The plants listed in the following table are known to occur in Sherburne NWR Complex in 2021.

Common Name	Scientific Name	Family
Norway maple	<i>Acer platanoides</i>	Aceraceae
Smooth brome	<i>Bromus inermis</i>	Poaceae
Dame's rocket	<i>Hesperis matronalis</i>	Brassicaceae
Orange Hawkweed	<i>Hieracium auranticaum</i>	Asteraceae
Yellow Hawkweed	<i>Hieracium caespitosum</i>	Asteraceae
Butter-and-Eggs	<i>Linaria vulgaris</i>	Scrophulariaceae
Kentucky bluegrass	<i>Poa pratensis</i>	Poaceae
White poplar	<i>Populus alba</i>	Salicaceae
Curly-leaf pondweed	<i>Potamogeton crispus</i>	Potamogetonaceae
Siberian elm	<i>Ulmus pumila</i>	Ulmaceae

## Potential Problem Species

Siberian pea-shrub (*Caragana arborescens*) has been escaping cultivation and may pose a future threat to natural areas and restored sites. Before this species becomes a serious problem at Sherburne NWR Complex, steps should be taken to control it.

## Native Plants That Need Control

There are native plants at Sherburne National Wildlife Refuge Complex that have rapidly filled in disturbed areas. In order to promote native plant diversity, these plants will be controlled. The plants listed in the following table are being controlled in Sherburne NWR Complex in 2021.

Common Name	Scientific Name	Family
Box elder	<i>Acer Negundo</i>	Aceraceae
Eastern red cedar	<i>Juniperus virginiana</i>	Cupressaceae
Quaking aspen	<i>Populus tremuloides</i>	Salicaceae
Hairy and Purple Vetch	<i>Vicia villosa Roth &amp; americana Muhl. Ex Willd.</i>	Fabaceae

## IDENTIFICATION AND MANAGEMENT OF PEST SPECIES

### Spotted knapweed

Page 15 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

#### Identification:

Compare to meadow knapweed and brown knapweed. These 3 plants fall in what is often referred to as the knapweed complex. Suggestion is to concentrate on what is spotted knapweed - otherwise leave identification to a botanist.

Plant: Herbaceous, short-lived perennial living 1-4 years. Initial stage is a rosette before the plant produces 1-6 stems ranging from 1-4 feet tall.

Leaves: Simple, alternate, grayish-green basal rosette leaves up to 6 inches long have deep sinuses. Alternate leaves on mature stems vary from smaller, 1-3 inch, versions of the basal leaves to very small linear leaves near the top.

Key difference: meadow / brown knapweed - green leaves, lacking lobes.

Flower: Strongly resemble the flowers of thistles in their pink to purple color (rarely white) and multi-parted texture. Below the petals, flowers are held together by bracts that are stiff and tipped with darkened hairs.

Compare knapweed bract tips; meadow knapweed - long fringe; spotted knapweed - dark tip, short fringe; brown knapweed - brown, tan papery edge.

Bloom time is July to September.

Fruits and Seed: Small ( $\frac{1}{8}$  inch long), brownish, tufted, seeds.

Life History: Allelopathic properties (chemicals exuded by the plant) can suppress the germination of seeds of other plants nearby. Plant removal can lead to bare patches of soil subject to erosion. Seeds are the primary means of reproduction and a mature plant produces thousands of seeds that may remain viable for up to 5 years. Wind disperses seeds short distances while animal and human activity disperses it far and wide.

Habitat: In contrast to meadow knapweed's preference to moist sites, spotted knapweed prefers disturbed sites with gravelly or sandy dry soils. Roadsides, abandoned lots, old fields and gravel pits are habitats that support infestations.

Distribution: Several small infestations occur along roadsides in Sherburne NWR. No known infestations occur at Crane Meadows or Rice Lake NWR's.

#### Management:

**Caution!** Gloves and long sleeves are recommended. Knapweeds are known skin irritants.

**Biological controls** approved for use in Minnesota are seedhead weevils (*Larinus minutus* and *L. obtusus*) and a root-boring weevil (*Cyphocleonus achates*). Weevils are collected July through

September and released on infestation sites larger than 1/3 acre. When a combination of seedhead and root boring weevils work together, infestations can be reduced over a number of years.

While **cutting, mowing** and **prescribed fire** can encourage competition from native grasses and help reduce the extent of an infestation they will likely not eradicate it. Early spring prescribed fire is compatible with biological control.

→**Herbicide** formulations including aminopyralid, clopyralid, glyphosate, imazapyr, aminocyclopyrachlor or picloram have demonstrated control with foliar applications.

## Canada thistle

Page 18 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

### **Identification:**

Compare to Minnesota native swamp thistle (*Cirsium muticum*). See page 39.

Compare to nonnative musk thistle (*Carduus nutans*). See page 34.

Compare flower similarities to spotted knapweed, page 15.

Plant: Herbaceous, perennial with grooved, non-spiny, hairy and typically upright stems to a height of 2-6+ feet tall.

Leaves: Alternate, simple, pinnately lobed leaves that are generally lance-shaped. The leaves are irregularly lobed, with toothed, spiny edges. The leaves are stalkless (sessile) and at maturity are downy or hairy on the underside.

Flower: Male and female (dioecious) 3/4 inch flowers occur singly on the end of branches. The disk or composite inflorescence is comprised of numerous purple to pinkish small florets. Bracts below the inflorescence do not have spines on the tips.

Bloom time is June to October.

Fruit and Seed: Tufted light brown seeds are easily dispersed by wind. Do not mow after seed has developed as this strongly aids seed dispersal.

Life History: Reproduction can occur from seed, root cuttings and from rhizomes. Clonal stands are common and spread can be significant from roots that can grow horizontally 10-12 feet per year.

Habitat: A successful inhabitant of disturbed areas such as roadsides and old fields but will also move into open woodlands and prairies. This species is also found where water levels fluctuate such as in wet meadows, along stream banks and ditches.

Distribution: Small infestations occur along roadsides, grasslands and in wet meadows in Sherburne NWR, Crane Meadows and Rice Lake NWR's.

## Management:

A **biological control** is under investigation, stem-mining weevil (*Ceutorhynchus litura*). This insect is available from commercial vendors and is acceptable for distribution in Minnesota.

→**Cutting** or **mowing** should target plants that are approximately 3 inches tall and the process must be repeated throughout the season to maintain the plants at 3 inches or less in height. Continuing this approach for several years can drain the plants of reserves.

→Repeated **prescribed fire** can be used to encourage stands of native grasses that will outcompete thistle. However, monitoring is needed to check for thistle that germinates in bare soil soon after burns are completed.

→**Herbicide** foliar sprays with formulations of clopyralid, aminopyralid, or metsulfuron-methyl. These foliar applications are made as the plants bolt, prior to flower set, or in late summer/early autumn to rosettes.

## Leafy spurge

Page 19 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

### Identification:

*Similar to invasive cypress spurge (E. cyparissias). Due to bloom period overlap confused with introduced yellow rocket (Barbarea vulgaris). Compare to yellow rocket, page 33.*

Plant: Herbaceous, perennial to 3 feet tall. *Cypress spurge is 8-14 inches tall.* Broken stems of many *Euphorbia* spp. produce a milky sap (latex) that is a good identification characteristic.

Leaves: Alternate, linear to lance-like, bluish-green and 1-4 inches in length. *Cypress spurge leaves are approximately 1 inch in length, alternate or whorled and narrower than leafy spurge leaves.*

Flower: There are no petals or sepals on the small yellowish-green flowers. Upper stem leaves or bracts develop just below flowers and are yellow-green in color providing the appearance of yellowish petaled flowers. The bracts develop before the true flowers.

Bloom time is May to August.

Fruit and Seed: Three-celled capsules that expel seeds up to 20 feet. Each cell contains a seed.

Life History: Leafy and cypress spurge reproduction can be vegetative from buds on roots, rhizomes and root cuttings. The ability to reproduce vegetatively makes these plants difficult to control. Deep roots to 21 feet and extensive horizontal roots allow plants to store vast reserves providing the ability to recover after removal attempts. Seed production is significant with plants producing on average 140 seeds per stem. Seeds can remain viable in the soil up to 8 years.

Habitat: Leafy and cypress spurge readily invade dry sites in full sun, but tolerance of a range of conditions allows them to invade moist, rich soils as well.

**Distribution:** Large, and small infestations (> 5 acres) occur throughout Sherburne Refuge. No known infestations occur at Crane Meadows or Rice Lake NWR's.

**Management:**

**Caution!** Some people are sensitive to the sap of spurges and develop skin rashes after pulling or handling plants, so gloves and long clothing are recommended. The milky sap is toxic to cattle and horses.

→**Biological controls** are available for controlling leafy spurge. Flea beetles (*Aphthona lacertosa*) are widely used in Minnesota. Flea beetles are collected late May to early June and released on infested sites larger than 1/3 acre. Additionally, in Minnesota, stem and root boring beetles (*Oberea erythrocephala*) provide some control. Early spring prescribed fire is compatible with biological control on this plant species.

→**Cutting or mowing** if timed before flower development can reduce or limit seed production. Grazing goats and sheep can effectively limit the spread of infestations.

→**Prescribed fire** is another tool that helps drain plants of reserve energy. Control of spurges typically requires a multi-tactic approach-eliminate or reduce seeding, exhaust seed banks, and drain reserves of existing plants while attempting to encourage native plants for competitive cover. So, consider spring mowing or fire with a fall application of imazapic.

→**Herbicide** controls are applied as foliar applications and usually involve formulations of aminocyclopyrachlor, picloram, 2, 4-D, glyphosate, dicamba, or imazapic. Repeated applications are likely necessary.

**Purple loosestrife**      Page 20 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

**Identification:**

Compare to native fireweed (*Chamerion angustifolium*). See page 38.

Plant: Herbaceous, wetland perennial, 4-7 feet tall with a 4 to 6 sided wood-like stem.

Leaves: Opposite, sometimes whorled, lance-shaped, and downy with a slightly wavy yet smooth edge. Leaf pairs are positioned at right angles to the leaf pairs above and below.

Flower: Each plant can have from one to many spikes of pinkish-purple flowers. Center of the flower is yellowish and surrounded by 5-7 petals that have a wrinkled appearance.

Bloom time is July to September.

Fruit and seed: Tiny seeds are released from 2-parted capsules.

Life History: Reproduction by seeds and rhizomes produce large monoculture infestations.

Habitat: Purple loosestrife can be found on upland sites but is best known as an invader of aquatic habitats such as ditches, wet meadows, ponds, marshes, river and stream banks as well as lake shores. Purple loosestrife disrupts aquatic habitats as it displaces wetland emergent species.

Distribution: Small infestations (< 1/4 acre) occur in aquatic habitats on the west side of the Sherburne NWR. Larger infestations (> 5 acres) occur on the eastern side. No known infestations occur at Crane Meadows.

### **Management:**

→**Biological controls** in the form of two leaf feeding beetles of the same genus (*Galerucella californiensis* and *G. pusilla*) have been very effective in Minnesota.

**Mowing** is seldom an option due to wet environments. **Cutting** of flower spikes can be an effective control of seed production, spikes should be disposed of onsite or contained (e.g., bagged) and removed to an approved facility. **Hand pulling** or **digging** of plants can also be effective, but care should be taken to remove entire root systems if possible. Resprouting can occur from roots and root segments left in the ground or on the site so contain (e.g., bag) and remove to an approved facility.

**Herbicide** formulations labeled for use on rights-of-way and near water; 2, 4-D, glyphosate, imazamox, metsulfuron-methyl+aminopyralid, triclopyr, imazapyr and aminocyclopyrachlor.

### **Wild parsnip**

Page 21 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

### **Identification:**

*Compare to golden alexanders (Zizia aurea) and heart-leaved golden alexanders (Z. aptera), both native. See page 47.*

Plant: Herbaceous, classed as a monocarpic perennial (plant dies after bearing fruit). Early life form is a basal rosette with mature stems developing a hollow, grooved flowering stalk potentially reaching 5 feet.

Leaves: Basal rosette leaves can be 6 inches in height and are pinnately compound with 5-15 leaflets. Flowering stalk leaves are alternate, 2-5 leaflets that become smaller near the top of the stem. Leaflets are coarsely toothed, sinuses cut to varying depths creating lobes of various sizes. The base of the leaf stalk wraps or clasps the grooved stem.

Flower: Many 5-petaled, small yellow flowers on wide, flat umbels of 2 to 6 inches.

Bloom time is June to July.

Fruit and Seed: Flattened, yet ridged, oval seeds.

Life History: Typical life span is two years, first year a basal rosette. At this stage, it is one of the first plants to green up in the spring and one of the last to brown down in autumn providing good opportunities for scouting and treating. Mid to late summer, mature second-year plants will bolt,

flower and set dozens of seed per plant. Seeds are moved off infested sites by animal and human activity or wind and water movement. Seed is reported to be viable in soil for up to 4 years.

Habitat: Disturbed sites such as roadsides and abandoned fields or lots. Can occur in wet meadows but dry to mesic soils are more typical. Full to partial sun is a must for this species.

Distribution: Two small infestations occur at Sherburne refuge along County Road 3. No known infestation at Crane Meadows or Rice Lake NWR's.

### **Management:**

**Caution!** Use protective clothing, goggles or face mask, contact with the sap of the plant (i.e., phyto) can cause severe blistering and swelling (i.e., dermatitis) when combined with exposure to sunlight (i.e., photo), phytophotodermatitis.

→If **cutting** or **mowing** after seed set, clean equipment to leave seeds on the infested site. A second option if cut after seed-set is to contain (e.g., bag) and remove plant material to an approved facility. If a site is mowed early in the season it must be monitored as plants will likely resprout, bolt and flower. \*\*\***Sherburne County Public Works Department has been mowing the wild parsnip.**

**Prescribed fire** can be used to encourage stands of native grasses for competition. However, follow-up treatments (herbicide or cutting) are still required to prevent seed production.

→**Herbicide** controls include foliar applications of 2, 4-D or metsulfuron-methyl to the rosette stage during May and June and again in September or October. If glyphosate is to be applied to rosettes, it is recommended to hold off until late fall to prevent damage to desirable plants that should then be dormant.

**Common buckthorn** p.24 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

### **Identification:**

Compare to the native cherries and wild plum (*Prunus* spp.). See page 45.

Plant: Shrub or small tree at 20 feet in height, often multi-stemmed with prominent light-colored lenticels on dull grayish to dark brown bark. Heartwood may be orange to pinkish and sapwood may be yellowish, both can facilitate identification.

Leaves: Alternate, glossy, 2-3 inch length with prominent parallel veins terminating near a smooth edge. Undersides are slightly hairy and dull. Leaves will likely persist longer in autumn than native deciduous shrubs, but they will turn yellow and drop.

Flower: Not showy, small, 5-petaled, yellowish and borne in clusters in the leaf axils.

Bloom time is May to July.

**Fruit and Seed:** Clustered in leaf axils along the stem, initially reddish maturing to purplish-black in late summer into autumn. Each fruit contains 2-3 seeds, dispersed by birds.

**Life History:** Reproduction is by seed and while birds disperse the seed, dense thickets suggest many seeds drop close. Shades out native shrubs and forbs creating monocultures in sites that typically support very diverse flora.

**Habitat:** An invader of wetlands, including sedge meadows, sensitive acidic bogs and calcareous fens. Tolerant of shade, yet will perform well in full sun on upland sites.

**Distribution:** Multiple infestations > 5 acres occur on Sherburne, Crane Meadows, and Rice Lake NWR's.

### **Management:**

**Caution** should be exercised to avoid creating large bare patches and/or extensive soil disturbance. Both scenarios lead to soil erosion and create good habitat for glossy buckthorn regeneration.

→**Hand pulling** or the mechanical advantage provided by a weed-wrench can help control small infestations. **Cutting** of stems must be accompanied by herbicide treatments or resprouting will occur. **Mowing** is typically not an option in sensitive wetland areas, but on upland sites may be a useful tool in seedling and small diameter stem control.

→On upland sites **prescribed fire** can be used to control seedlings and small diameter stems and if used consistently can drain larger plants of reserves and provide control. However, sprouting will occur and a follow-up herbicide application should be considered.

→**Herbicide** formulations of triclopyr, imazapyr, metsulfuron-methyl, 2, 4-D, glyphosate or picloram are used as foliar applications. Herbicides include triclopyr or glyphosate for late autumn into winter applications to basal bark, cut stumps or frill cuts.

**Common Reed** Page 26 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

### **Identification:**

Compare to native phragmites (phrag) (*Phragmites australis* ssp. *americanus*). See page 44.

**Plant:** A perennial grass reaching heights of 15 feet. Dense stands develop from rhizomatous root systems with live stems and dead stems inter-mingled. Hollow stems are green in summer and yellow in winter. Physical traits to distinguish native vs. non-native phrag are the native species have a light maroon/purplish tone shading to their stalks, have smaller seed heads and typically grow larger and more robust than native phrag.

**Leaves:** Blueish green, grass-like elongated foliage that is at most 1½ inches wide. Leaf sheaths are typically retained on culms (stems) into winter even if leaves drop from dead culms. Non-native leaves are also larger, and less tapered to native species. *Compare to native phragmites that sheds leaves and leaf sheaths.*

Flower: Bushy panicles of purplish or golden flowers appear in July.  
Bloom time is July to September.

Fruit and Seed: As they mature, large, dense seed heads become gray. Hairy seeds give seed heads a fuzzy, fluffed appearance.

Life History: Rhizomes, rhizome fragments, root runners and copious amounts of seed provides common reed a strong competitive edge. It forms such dense stands and thick root systems that all native plants can be forced out. Rhizome segments can break free and coupled with seed production plants readily move into and take over new areas.

Habitat: Shorelines of lakes and rivers as well as pond edges and freshwater marshes. Disturbed areas and roadsides can support common reed very well.

Distribution: As of 2014 native and non-native phragmites is known to occur on Sherburne NWR.

### **Management:**

Once established, chemical treatments are recommended as a first step in restoration efforts.

**Cutting** or **mowing** will not kill plants or eradicate infestations, but can be effective at slowing the spread.

**Prescribed fire** after the plant has flowered. Used prior to herbicide treatments, fire (or mowing) removes biomass improving herbicide application to regrowth. Do not burn prior to flowering, as this timing may only encourage growth.

**Herbicide** applications, aquatic formulations of imazapyr or glyphosate are effective, even on established stands. Rapid recognition of infestations and treatments soon after recognition increases effectiveness. Late summer/early autumn herbicide applications to foliage or to cut stems are best and repeat treatments in subsequent seasons are likely necessary.

**Japanese Knotweed** Page30 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

### **Identification:**

Compare to larger giant knotweed on page 31.

Plant: Perennial plants with non-woody stems from *5-8 feet (10 feet)*. Stems are smooth, green with *reddish-brown blotches*, hollow between swollen nodes where leaves attach.

Leaves: Alternate, simple, can be 2 to 7 inches long with a truncate base (mostly straight across). The tip of the leaf is acuminate (narrowed to an abrupt point) and the underside of the leaf lacks the hairs found on giant knotweed.

Flower: Protruding from the leaf axils (where the leaf attaches) are branched structures holding many small, creamy white to greenish flowers. Japanese knotweed has a flower structure that is longer than the leaf, while the flower structure of giant knotweed is shorter than the nearby leaf.

Bloom time is August to early October.

Fruit and Seed: Like giant knotweed the seed is small, shiny black and three sided.

Life History: It is believed that seed production is limited and most reproduction is vegetative. Even small root parts will resprout after plants are manually removed. Stem fragments resulting from mowers or other machinery can sprout if in contact with moist soil. Plants uprooted by flooding or digging if in contact with the moist soil will likely reroor. Seeds that are produced are said to be viable four to five years if near the soil surface and up to 15 years if buried.

Habitat: Prefers moist soils in full sun to partial shade. Plants readily inhabit moist roadside ditches, wetlands, and areas along rivers and streams.

Distribution: In 2014 one plant remains at the Josephine site, and several plants still occur at the Orrock Lake site. In addition to these two sites there is another site on private property near the old Papike parking lot. The private landowner is not willing to eradicate this plant.

## **Management:**

Advice is to develop a four to five year plan.

→**Prescribed fire** in spring can set plants back and drain some energy while **mowing** can prevent or delay seed production. However, both can stimulate vegetative reproduction, thus potentially increasing stem counts. Monitor the infestation and utilize follow-up treatments of periodic mowing and/or herbicide.

→Manual methods should not be considered eradication tools. These include **cutting, digging, hand pulling, grazing or tarping** if done repeatedly **and in conjunction** with other treatments may control infestations. Monitor and consider supplemental herbicide treatments. Plants should be disposed of onsite or contained (e.g., bagged) and removed to an approved facility.

→Prior to **foliar herbicide** treatments with aminopyralid, glyphosate, imazapyr, triclopyr, or 2, 4-D it is recommended that the plants be cut twice when 3 feet tall. Follow with a fall **foliar application** when regrowth is 3 feet tall and still actively growing. **Cut stem applications** with glyphosate, triclopyr or triclopyr + 2, 4-D can be made at any time during active growth when the plants are over 3 feet tall. **Stem injection** treatments with glyphosate can be made anytime during active growth periods. See glyphosate's supplemental label for hollow stem injection.

**Identification:**

**Common poison ivy** [*T. radicans* (L.) Kuntze ssp. *negundo* (Greene) Gillis] is potentially a larger shrub (up to 10 feet) and possibly a vine in southeastern Minnesota's riparian areas. While both species are subject to regulation, information provided below focuses on **western poison ivy** [*T. rydbergii* (Small) Green] which is a frequently occurring shrubby plant with an extensive natural range across Minnesota.

Plant: A 1-2 foot **native** shrub with gray to tan bark and little if any branching.

Leaves: Alternate, compound leaves, 3 shiny or dull surfaced leaflets. Leaflet edges are variable from smooth to very coarsely toothed. Lower leaf surfaces are pale and often hairy.

Flower: Small, greenish flowers on erect spikes (panicles). Flower spikes are borne in leaf axils on new or current year's growth with male and female flowers on separate plants (dioecious).

Bloom time is June to July.

Fruit and Seed: Creamy white to tannish berry-like drupes, approximately ¼ inch diameter. Drupes mature in August through September and persist through the winter providing a good identification characteristic on female plants.

Life History: Forms dense colonies by seed and through vegetative reproduction from surface or subsurface rhizomes.

Habitat: Invades disturbed areas such as roadsides, trail sides, fencerows, parks and can also be found in prairie (full sun) and forested settings (partial shade).

Distribution: Poison ivy occurs throughout the Sherburne NWR. Poison ivy is also present at Crane Meadows and Rice Lake NWR's.

*Specialty Regulated is a unique category. Poison ivy, although irritating to humans, is a native plant that benefits wildlife by providing a food source to birds, small mammals and large browsers. See page 55.*

**Management:**

**Caution!** Use protective clothing, rubber gloves and long sleeves, contact with the sap (urushiol) from broken plant parts can cause blistering (dermatitis), even during the winter months. Caution! Smoke from burning poi-son ivy can deliver urushiol to airways and lungs. Do not compost as resprouting can occur and urushiol may persist in compost. Urushiol can stay on pets, tools, toys and other objects for long periods to be effectively transferred and cause irritation at a later date.

→**Grazing, cutting or mowing** can inhibit flowering but must be continued in order to deplete energy reserves in the plants and to deplete the seed bank.

→**Prescribed fire** generates potentially harmful smoke, see cautionary note above. So, while prescribed fire can provide control and often does control infestations of poison ivy, this tool should not be the first choice.

→**Herbicide** formulations of triclopyr, 2,4-D, glyphosate, imazapyr or aminocyclopyrachlor applied to foliage or to cut stems are effective. Repeat applications will be required to exhaust seed banks.

**Vetches** p. 35 <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

### **Identification:**

Plant: Some vetches (annuals / biennials) have a spreading form and may have tendrils to climb nearby plants up to 3 feet. Crown vetch (*C. varia*) is an erect perennial plant at 1-2 feet tall that forms dense tangled colonies.

Leaves: Alternate, compound leaves, pinnately divided, numerous oval leaflets. Hairy vetch (*V. villosa*) - 5-10 pairs with tendrils terminal. Crown vetch - 11-25 leaflets on a stalk-less leaf.

Key difference - Thistles and knapweeds have simple leaves (divided or lobed) not compound.

Flower: Hairy vetch has 5-parted, purple flowers about ¾ inch in length. Typically 10-40 flowers in a one-sided cluster. Crown vetch has a dense cluster (crown-like) of 5-parted, ⅓-½ inch long pinkish flowers.

Key difference - *Thistles and knapweeds are disk flowers with ray flowers on the perimeter. Bloom time is May to September.*

Fruit and Seed: Hairy vetch has a ½-¾ inch long pod while crown vetch has a 4-angled multi-segmented pod.

Habitat: Old fields, pastures and roadsides. Crown vetch has been planted extensively for erosion control due to its dense, colony forming habit.

Distribution: There is small infestation near the Oak Savanna Learning Center, and in the upland grassland on the west side of Otter Pool on Sherburne NWR. No known infestations on Crane Meadows or Rice Lake NWR's.

### **Management:**

→**Hand pulling** entire plants of small populations and **mowing** larger populations in late spring and then multiple times through the growing season for several consecutive years can be effective manual controls.

→**Prescribed fire** can provide control when conducted in late spring and for several consecutive years.

→**Herbicide** formulations of triclopyr, glyphosate, and metasulfuron applied to foliage or to mowed plants are effective. Repeat applications will be required to exhaust seed banks.

## **Black Locust**

### **Identification:**

Plant: A 40 to 100 feet tree with dark brown bark at maturity. Branches are covered in sharp thorns.

Leaves: Alternate, composed of seven to twenty leaflets that are oval to rounded in outline, dark green above and pale beneath.

Flower: White flowers appear in drooping clusters and have a yellow blotch on the uppermost petal.

Bloom time is May and June.

Fruit and Seed: Fruit pods are smooth, 2 to 4 inches long, and contain 4 to 8 seeds.

Life History: Dense clones of locust create shaded islands with little ground vegetation.

Habitat: Invades disturbed areas such as roadsides, degraded woods, and old fields.

**Distribution:** Multiple small (< 1 acre) and large sites (> 5 acres) occur throughout Sherburne NWR, especially at old home sites where it had been planted by previous residents for its rapid growth. There are a few Black locust sites on Crane Meadows that are <1 acre. No known infestations occur on Rice Lake NWR.

### **Management:**

→**Mowing and prescribed fire** is only effective in reducing the spread of young shoots from a clone or parent tree.

→ **Herbicides** applied to the stems or cut stumps spread into the root system and provide better control. An herbicide formulation of 25% triclopyr solution in basal bark oil applied immediately to cut stumps has been used with success throughout the year. An application of 6.25% glyphosate solution in water to cut stumps is also effective. Repeat applications will be required to exhaust the dense clones.

## **Exotic Bush Honeysuckles**

### **Identification:**

Plant: A 6 – 15 foot upright, generally deciduous shrubs with gray or tan bark. Older stems are hollow and have shaggy bark.

Leaves: Opposite, 1- 2 ½ inch, egg-shaped leaves that are short-stalked.

Flower: Creamy white to pink or crimson pairs of fragrant, tubular flowers less than an inch long. Flowers erupt along the stem in the leaf axils.

Bloom time is May and June.

Fruit and Seed: Red to orange, many-seeded berries.

Life History: Can rapidly invade and overtake a site, forming a dense shrub layer that crowds and shades out native plant. They alter habitat by releasing toxic chemicals that prevent other plant species from growing in the vicinity.

Habitat: Relatively shade-intolerant and most often occur in forest edge, abandoned field, pasture, roadsides and other open, upland habitats. Woodlands, especially those that have been grazed or otherwise disturbed, may also be invaded by exotic bush honeysuckles.

Distribution: A small patch (< 1 acre) occurs in an old home site and fence line on the north loop of Blue Hill Trail on Sherburne NWR, and sporadic locations in woodlands. No known infestations on Crane Meadows and Rice Lakes NWR's.

#### **Management:**

**Hand pull** seedlings in small infestations when soil is moist. **Cutting** of stems must be accompanied by herbicide treatments or resprouting will occur.

→**Prescribed fire** will kill seedlings and top kill mature shrubs, repeated burns may be needed to control infestations.

→**Herbicide** formulations of triclopyr and glyphosate applied to foliage (1 %), cut stems (20 %), and basal bark, are effective. Repeat applications will be required to exhaust seed banks.

#### **Cattail (*Typha spp.*)**

##### **Identification:**

Plant: A 10 foot perennial aquatic plant.

Leaves: Hybrid and narrow-leaved cattail have ¼ - ¾ inch wide leaves; the native cattail leaves are ½ to 1 inch wide. Flat, sheathing, grayish green leaves originate at the base of the stem and spread outward as they rise into the air.

Flower: A velvety brown spike of flowers. The hybrid and narrow-leaved cattail flower spikes have a gap of 1 to 4 inches between the male and female flowers, while there is no gap between the flowers of the native cattail.

Bloom time is June and July.

Fruit and Seed: A minute achene with a long, hairy stalk.

Life History: Seeds are dispersed by wind, animals, and water; germinate on bare mud or in very shallow water (1/2 inch). Once established, the seedlings spread rapidly by rhizomes to form large clones.

Habitat: *Typha* grows in shallow wetlands, lakeshores, river backwaters, ditches; in nutrient rich or slightly saline soil.

Distribution: Hybrid cattail (*Typha x glauca*) is present on Sherburne NWR, it is not known to occur on Crane Meadows and Rice Lake NWR's.

### **Management:**

→**Manipulation of water levels** can kill cattails by inhibiting airflow from the cattail shoots to the roots. Water levels need to be sustained a few inches above the tops of the growing shoots.

**Burning** and **disking** are not effective for these species due to the extensive rhizomes.

→**Grazing** on seedlings and young cattails without extensive rhizomes can reduce the stem density of the colony. For mature plants, grazing combined with water-level management reduces survival rates.

→**Herbicide** formulations of imazapyr and glyphosate applied to foliage can be effective. A non-ionic surfactant should be added to the herbicide in wet areas. Repeat applications are usually necessary due to the extensive rhizome system.

Population levels of ten **muskrats** per acre, combined with high spring-time water levels can nearly eliminate the emergence of cattails within two years. Over trapping of these important animals should be discouraged.

### **Cool Season Grasses (Smooth Brome and Kentucky Blue Grass)**

#### **Identification:**

Plant: Smooth brome is a 1 to 3 ½ ft, rhizomatous, perennial grass.

Leaves: Alternate, smooth, under .5 inch wide and up to 8 inch long.

Flower: Contained in drooping panicles with 4-10 erect branches. Each branch of the inflorescence has several purplish, 1.5 inch long spikelets, each containing 7-10 flowers.

Bloom time is June to July.

Fruit and Seed: 3/8 inch long, narrow and golden or tan.

Life History: Reproduction is by seed and aggressive rhizome growth.

Habitat: Grows in open areas such as roadsides, riverbanks, open fields, prairies, and woodland edges. It can withstand droughts and periodic flooding.

Distribution: Smooth brome occurs throughout the Refuge Complex.

**Management:**

→**Grazing** or **repeated mowing** is usually necessary to deplete the rhizome system. A single, well-timed, low mowing early in the spring may be effective.

→**Prescribed fire** may prevent the grass from spreading if burned in late spring, but will not kill the rhizomes.

→**Herbicide** formulations of glyphosate applied to the foliage in April and May are effective, especially if a penetrating or sticking agent is used with it.

**Reed Canary Grass**

**Identification:**

Plant: A 2 to 7 foot perennial grass.

Leaves: Rough-textured, tapering leaves of 3 ½ to 10 inches long and 1/4 to 3/4 inch wide.

Flower: Occur in dense clusters and change from green to purple to beige over time.

Bloom time is May to mid-June.

Fruit and Seed: Shiny brown seeds ripen in late June.

Life History: Reproduces prolifically vegetatively as well as by seed.

Habitat: Grows best on fertile, moist organic soils in full sun, but it also can grow in standing water by producing special roots along the submersed portion of the stem. It also grows on dry soils in upland sites and under partial shade.

Distribution: Reed canary grass occurs throughout the Refuge Complex.

**Management:**

**Cutting** or **mowing** can be effective if repeated.

**Discing** or **plowing** can be used to control a well-established population, although this method basically reduces the density without killing the plants.

→**Herbicide** formulations of glyphosate applied to foliage in early spring or late fall when other native vegetation is dormant can be effective. The most effective treatment time occurs after

flowering/seed set and before the plant goes dormant for the winter. Removal of the previous year's growth to expose the new green shoots increases the effectiveness of the herbicide.

## **Siberian Elm**

### **Identification:**

Plant: A 50 to 70 foot tree with a round crown of slender, spreading branches and rough, gray or brown bark that is shallowly furrowed at maturity.

Leaves: Alternate, small toothed, leaves about 1-2½ in long and half as wide and pointed at the tip. Leaves are smooth and dark green above, paler and nearly hairless beneath with a symmetrical leaf base.

Flower: Small greenish flowers lacking petals and occurring in drooping clusters of 2 to 5.

Bloom time is April and May.

Fruit and Seed: Smooth, flattened, circular, ½ in wide fruit that forms into a single seed.

Life History: Seeds are produced early in spring and spread by the wind. Germination rate is high and seedlings soon establish in the bare ground found early in the growing season.

Habitat: Invades dry to mesic prairies and stream banks. This tough exotic survives under conditions not easily tolerated by other species, allowing it to take advantage of open ground and resources otherwise used by native plants.

Distribution: Small stands (< 5 acres) of Siberian elm occur on Sherburne and Crane Meadows NWR's, it has not been observed on Rice Lake NWR.

### **Management:**

→ **Hand pulling** small seedlings is effective. **Girdling** trees in mid-May to early July can be effective if trees are cut properly. **Cutting** of stems must be accompanied by herbicide treatments or resprouting will occur.

→ **Prescribed fire** conducted regularly will kill seedlings.

→ A **herbicide** formulation of 20% triclopyr solution in horticultural oil with a penetrant applied in winter, summer, or fall to cut stumps or young bark has been used with success. A 20% glyphosate solution in water with a surfactant is also effective.

## **ADDITIONAL INFORMATION**

### Minnesota websites and contact information

- Dept. of Agriculture and University of MN Extension - Pesticide and Fertilizer Information

- <http://www.extension.umn.edu/Agriculture/pesticide-safety/2010%20PestFert%20Info%20List1.pdf>
- <http://www.mda.state.mn.us> (651) 201 - 6615
- <http://www.extension.umn.edu/pesticides> (612) 625 - 4271
- Pollution Control Agency - Pesticide NPDES Permit Program
  - [http://www.pca.state.mn.us/index.php?option=com\\_k2&Itemid=2886&id=2667&layout=item&view=item](http://www.pca.state.mn.us/index.php?option=com_k2&Itemid=2886&id=2667&layout=item&view=item)
  - [Elise.Doucette@state.mn.us](mailto:Elise.Doucette@state.mn.us) (651) 757 - 2316
- Dept. of Natural Resources - Aquatic Plant Management Program
  - <http://www.dnr.state.mn.us/apm/index.html>
  - Little Falls DNR Office APM Permits  
[Audrey.Kuchinski@state.mn.us](mailto:Audrey.Kuchinski@state.mn.us) (320) 616 - 2450 ext. 235

#### Federal websites and contact information

- Fish & Wildlife Regional IPM Coordinator
  - <http://www.fws.gov/contaminants/IPM/IPMCoordinators.htm>
  - [Richard\\_king@fws.gov](mailto:Richard_king@fws.gov) (608)-344-1995
- Environmental Protection Agency - Pesticides
  - <http://www.epa.gov/pesticides/>
  - <http://www.epa.gov/pesticides/health/spills.htm>
- United States Coast Guard – Reporting Spills
  - [USCG National Response Center Contact Us Page](#) (800) 424 - 8802

#### Sherburne County websites and contact information

#### National Pesticide Information Center

- [npic@ace.orst.edu](mailto:npic@ace.orst.edu) (800) 858 - 7378

### **LITERATURE CITED**

Blossey, Bernd, Cornell University. (2002). Purple loosestrife. Ecology and Management of

- Invasive Plants Program. [Online]. Available:  
<http://www.invasiveplants.net/plants/purpleloosestrife.htm>. [2012, February 21].
- Center for Invasive Species and Ecosystem Health. (2010). Canada Thistle. Invasive.org for Invasive Species and Ecosystem Health. [Online]. Available:  
<http://www.invasive.org/browse/subinfo.cfm?sub=2792>. [2012, February 16].
- Center for Invasive Species and Ecosystem Health. (2010). Common Reed. Invasive.org for Invasive Species and Ecosystem Health. [Online]. Available:  
<http://www.invasive.org/browse/subinfo.cfm?sub=3062>. [2012, February 16].
- Center for Invasive Species and Ecosystem Health. (2010). Smooth Brome. Invasive.org for Invasive Species and Ecosystem Health. [Online]. Available:  
<http://www.invasive.org/browse/subinfo.cfm?sub=5203>. [2012, February 16].
- Center for Invasive Species and Ecosystem Health. (2010). Invasive Species 101 – An Introduction to Invasive Species. Invasive.org for Invasive Species and Ecosystem Health. [Online]. Available: <http://www.invasive.org/101/index.cfm>. [2012, February 16].
- Salafsky, N., Margoluis R., & Redford, K. (2001). Adaptive management. A Tool for Conservation Practitioners. (Washington DC: Biodiversity Support Programme).  
[http://planet.botany.uwc.ac.za/nisl/Conservation%20Biology/Fifth\\_World\\_Parks\\_congress\\_Durban\\_2003/%5Cstream%20outputs%5Csession%202b-3b%20learning%20from%20experience%5CSalafsky%20&%20Margoluis%20paper.pdf](http://planet.botany.uwc.ac.za/nisl/Conservation%20Biology/Fifth_World_Parks_congress_Durban_2003/%5Cstream%20outputs%5Csession%202b-3b%20learning%20from%20experience%5CSalafsky%20&%20Margoluis%20paper.pdf)
- Seelig, B.D. 1994. An Assessment System for Potential Groundwater Contamination from Agricultural Pesticides in North Dakota: Technical Guideline. NDSU Extension Report No. 18, 63
- U.S. Fish and Wildlife Service. 2018. Land Manager’s Guide to Developing in Invasive Plant Management Plan. Available:  
<https://ecos.fws.gov/ServCat/DownloadFile/162024?Reference=109270>
- Wisconsin Department of Natural Resources. (2004). Poison Ivy (*Toxicodendron radicans*). Invasive Species. [Online]. Available: [http://dnr.wi.gov/invasives/fact/ivy\\_poison.htm](http://dnr.wi.gov/invasives/fact/ivy_poison.htm). [2012, February 16].

## **ATTACHMENTS:**

[MN State Threatened and Endangered Species List](#)

[Minnesota Noxious Weeds PDF.](#)

[Herbicide Section 7](#)