Draft Environmental Assessment

Sherburne National Wildlife Refuge Evaluation of Aerial Herbicide Application

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Environmental Assessment for Evaluation of Aerial Herbicide Application

Date: January 24, 2023

This draft Environmental Assessment (EA) is being prepared to evaluate the effects associated with the proposed action and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (43 CFR 46; 516 DM 8) and U.S. Fish and Wildlife Service (550 FW 3) regulations and policies. The NEPA requires examination of the effects of proposed actions on the natural and human environment. Appendix A outlines all law and executive orders evaluated through this Environmental Assessment.

Proposed Action:

The U.S. Fish and Wildlife Service (Service) is proposing the continued use of aerial applications as a method/tool for applying herbicides on Sherburne National Wildlife Refuge to augment ground applications. This environmental assessment evaluates the continued use of aerial herbicide application tools for herbicide application as part of the refuge's dynamic integrated pest management of invasive plant species in response to increased invasive species threats and spread and decreased management capacity of refuge resources to utilize other tools (i.e. prescribed fire, water manipulation, ground application equipment) to reduce invasive species threats. The aerial application of herbicides is used as a management strategy and is in accordance with the refuge's Habitat Management Plan (HMP) and Comprehensive Conservation Plan (CCP). In past years, aerial applications of herbicide have been the most cost-effective management tool to control large monotypic stands of invasive, non-native, and undesirable vegetation which can be located in remote or difficult to access areas of the refuge. Some areas are often inaccessible by any other methods of application. For example, ground applications have proven to present multiple risks to refuge personal and equipment, in addition to being inefficient and less cost-effective. This environmental assessment will determine if aerial applications should still be considered as a method to apply herbicides.

In accordance with federal policy, a proposed action may evolve during the NEPA process as the agency refines its proposal and gathers feedback from the public, tribes, and other agencies. Therefore, the final proposed action may be different from the original. The proposed action will be finalized at the conclusion of the public comment period for the Environmental Assessment.

Background

Sherburne National Wildlife Refuge (NWR), located in central Minnesota (see Appendix B, Figure 1), is a 30,700 acre haven for wildlife located in Sherburne County, Minnesota with the communities of Zimmerman, Orrock, Princeton and Santiago located nearby. The refuge contains a variety of habitat types ranging from oak savannas, oak woodlands, upland grasslands, sedge meadows, lowland brush and a mosaic of wetland types along with several lakes, rivers and streams.

Sherburne National Wildlife Refuge was established in 1965 under the general authority of the Migratory Bird Conservation Act of 1929 (16 U.S.C. 715d). That Act states that lands may be acquired "... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." The term "inviolate sanctuary" as interpreted by the Service, means that the Refuge will be managed to promote the health and well-being of migratory birds and their habitats. Other activities may also be accommodated, provided they are compatible with the Refuge purpose (as per Service Compatibility Policy, Federal Register 65 (202): 62484-62496).

The intention of the Migratory Bird Conservation Commission in establishing the Refuge was primarily to provide habitat for migratory waterfowl. Considering the wording of the establishing legislation, along with recent policy and legislation, the Refuge purpose is interpreted to include all migratory birds as identified in the Code of Federal Regulations (50 CFR 10.13).

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act (NWRSAA) of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual. Sherburne National Wildlife Refuge (NWR) was established in 1965 with land being purchased under the authority of the Migratory Bird Conservation Act of 1929 and is now part of the National Wildlife Refuge System.

The mission of the NWRS, as outlined by the National Wildlife Refuge System Administration Act, as amended by the National Wildlife Refuge System Improvement Act (16 U.S.C. 668dd et seq.), is

"... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans"

Additionally, the NWRSAA mandates the Secretary of the Interior in administering the NWRS (16 U.S.C. 668dd(a)(4)) to

- Provide for the conservation of fish, wildlife, and plants, and their habitats within the NWRS;
- Ensure that the biological integrity, diversity, and environmental health of the NWRS are maintained for the benefit of present and future generations of Americans;
- Ensure that the mission of the NWRS described at 16 U.S.C. 668dd(a)(2) and the purposes of each refuge are carried out;
- Ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the states in which the units of the NWRS are located;
- Assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the NWRS and the purposes of each refuge;
- Recognize compatible wildlife-dependent recreational uses as the priority general public uses of the NWRS through which the American public can develop an appreciation for fish and wildlife;
- Ensure that opportunities are provided within the NWRS for compatible wildlife-dependent recreational uses; and monitor the status and trends of fish, wildlife, and plants in each refuge.

An Environmental Assessment was completed to identify management strategies to meet the conservation goals of the refuge identified in the Comprehensive Conservation Plan (CCP). The Preferred Alternative identified in that Environmental Assessment, which was published with the Comprehensive Conservation Plan in 2005 (U.S. Fish and Wildlife Service 2005) is a Migratory Water Bird Emphasis (preferred alternative), that will see: 1) an increase in changes in the water impoundment system and upland management to create a diversity of wetland types and historic upland communities; 2) increased opportunities for all types of wildlife-dependent recreation, and; 3) outreach, private lands, and partnership activities that will emphasize natural processes, including native habitat restoration and protection, to form ecologically functioning connections to and from the refuge.

Purpose and Need for the Action

The purpose of this environmental assessment is to evaluate the continued utilization of aerial application as a method/tool to apply herbicides to control, prevent, and limit the spread of undesirable and/or invasive and non-native plant species across Sherburne National Wildlife

Refuge. Goals, objectives, and strategies identified in the refuge Comprehensive Conservation Plan (CCP) and objectives for high-priority habitats identified in the Habitat Management Plan (HMP) contain specific strategies related to the purpose and need for action which include:

CCP Objective 1.6: Invasive Species Control: Inventory and actively reduce invasive species throughout the Refuge. Reduce invasive species locations by 50% from 2004 levels and eliminate new infestations as they occur.
CCP Objective 2.13: Manage Wetland Diversity: Manage the impoundments to maximize wetland diversity within the capabilities of the system. Create wetlands that vary from temporary to permanent by varying the water regime. Focus on semi-permanent wetlands to provide optimal habitat for water-birds in migration.
CCP Objective 2.2: Sedge Meadow (Reed Canary Grass Conversion): Assess the feasibility of converting reed canary dominated areas to native species. By the end of the 15-year planning period, increase native sedge meadow/lowland graminoids by a minimum of 20 acres.
CCP Objective 2.3: Maintain Lowland Brush: For the benefit of brush-associated marsh birds, maintain a minimum of 1,250 acres of lowland brush.
CCP Objective 2.6: Dynamic Cattail Habitat Management: For the benefit marsh nesting birds annually manage 2,500 acre of cattail marsh in a variety of heights, densities, and water depths. Less than 70% of cattail is desirable on any one basin but this will be achieved through a natural, dynamic target, not as a static target. Maintain 20-40% of the cattail acreage with a VOR (visual obstruction reading) of 50-80 cm.
HMP Objective 1: Management and Restoration of Sedge Meadow: Restore and maintain on Sherburne NWR to achieve the following characteristics: < 25%, shrub cover, < 5% tree cover, vegetation dominated (> 50% cover) by graminoids including sedges and bluejoint, variable (5 – 75%) cover of forbs tufted loosestrife, marsh skullcap, and water smartweed, and invasive species cover < 50%. Wetland degradation (need for restoration) will be determined using the National Wetlands Inventory Data and the presence of invasive species.
HMP Objective 2: Emergent Marsh Management: Over the life of the HMP, maintain emergent marshes on Sherburne NWR with the following characteristics. Hemi-marsh condition with open water cover between 25-75% water depth 20-60 inches most of the year, vegetative cover dominated by a variety of native plants including native cattails, bulrushes, common coontail, milfoil, and pondweeds, duckweeds, broad-leaved arrowhead, and water-lilies, and invasive species plant cover <50%.
HMP Objective 3: Open Water/Mudflat Management: Sherburne NWR as 22 impoundments totaling approximately 3,500 (acreage can fluctuate depending on precipitation/water levels). In accordance with other management actions such a dormant season prescribed fire and conservation grazing, manage impoundments where appropriate with respect to other

management tools, as moist soil units (MSU's). For the other 2/3's of the impoundments annually provide 500-1500 acres of a mixture of mudflat habitat and shallow, open water on Sherburne NWR characterized by unvegetated zones of mud at the leading edge of the water mixed with sparsely distributed (<20% cover) short vegetation (<20 cm) flooded to depths ranging from moist soil to 12cm in a way that encourages high vertebrate densities and <50% invasive species cover. When impoundments are not in drawdown, raise water levels to maximum elevation permissible for deep-water/open water habitat.

HMP Objective 4: Lowland Brush Management: Maintain lowland brush habitat in Sherburne NWR to exhibit the following characteristics: trees (>16 feet tall and dimeter > 6 inches), cover <5% cover >25% and consisting of moderate-to-high density (≥ 10,000 stems per acre) willows, red-osier dogwood, speckled alder and bog birch; ≤ 15% herbaceous plant cover consisting of broad-leaved graminoids such as tussock sedge and bluejoint, and invasive species cover ≤50%.

HMP Objective 5: Oak Savanna Management and Restoration: Maintain tree canopy cover between 10-70%, tree basal area 5-50ft^2 per acre, shrub cover 5-35%, native grass cover ≥25%, native forb cover ≥25%, and invasive species cover <50%. Tree layer mostly consisting of bur oak. Shrub layer includes leadplant, prairie rose, chokecherry, American hazelnut, and smooth sumac. Native grasses include little bluestem, site-oats grama, prairie dropseed, porcupine grass, big bluestem and Indian grass. Forb species include goldenrod spp., asters, hoary vervain, milkweed, vetch, and wild lupine on more sandy sites. The herbaceous payer for savanna's can vary depending on soil nutrients, canopy and available sunlight. Recent studies have described oak savanna herbaceous layers being approximately 60% forb and 40% graminoid (Leach et al. 1999, Meisel et al. 2002). Standing trees are also present (1-6 per acre). Oak savanna is a priority resource of concern.

HMP Objective 12: Upland Prairie: Restore the remaining 8000 acres of upland prairie areas on Sherburne to oak savanna (Objective 5).

Need for Action

The proposed action is needed to meet the Service's priorities and mandates as outlined by the NWRSAA to "provide for the conservation for fish, wildlife, and plants, and their habitats within the System" in addition to "ensuring the biological integrity, diversity, and environmental health of refuges is maintained" (16 U.S.C. 668dd(a)(4)). Action is also needed to evaluate if the method of continued use of aerial application tools offers significant advantages to the Service, can be conducted safely, is cost effective, and if it remains an important tool to be able to control vast expanses of invasive, non-native and undesirable species. This assessment is not to evaluate the use of herbicides but instead to evaluate the utilization of aerial application as a management tool.

As climate change continues to alter the usual balance of nature, it is important to recognize that an increase in temperatures and weather patterns may influence hydrology, soils, and plant communities, therefore causing a potential increase in undesirable invasive or non-native plant communities.

In the past, reducing and preventing the spread of invasive species, non-native species and undesirable vegetation across the refuge wetlands using aerial application methods has provided a higher rate of efficiency, allowed for inaccessible/remote areas of the refuge to be treated, and has been safer than ground application methods in order to restore, enhance and manage critical habitat on the refuge.

Alternatives

Alternative A – No Action. Continued Use of Aerial Application Equipment (Preferred Alternative)

Under this alternative, the refuge would continue the use of aerial applications of herbicides in addition to ground applications to control invasive, non-native, and undesirable vegetation in high priority habitats on the refuge. The refuge uses an integrated pest management approach to manage pest and invasive species based on proven science and principles of species and habitat sustainability to enact safe, effective and efficient management actions. It is anticipated that the spread of invasive species will continue due to many factors such as changing hydrology, climate change, infestations of new non-native, invasive and undesirable species, and from existing populations of invasive, non-native and undesirable species already present on the refuge. Understanding the cause and spread of an invasive species guides our treatment strategies and is adaptable to each location and species being targeted for removal. Within this adaptive and dynamic integrated pest management strategy it is reasonable to assume new species, new habitats and new treatment technologies will evolve into the management regime for invasive and pest species on the refuge. For example, the use of Unmanned Aerial Systems (UAS) as a means of aerial application of herbicides is already being used on agricultural fields in the private sector and may become an effective method of treating and managing invasive species on the refuge. Currently, rotary wing aircraft are used for the aerial application of herbicides on the refuge when deemed appropriate. Fixed wing aircraft may also be used as an aerial application method under this alternative in the future. Areas within the refuge to be considered for aerial treatment include large monotypic stands of non-native, invasive and undesirable species within wetlands, sedge meadows, lowland brushland, emergent marsh, open water/mudflat habitat and upland areas that cannot be effectively accessed from the ground or where aerial herbicide applications would be more effective, to reduce, manage and eliminate non-native, invasive and undesirable vegetation. Timing of aerial herbicide

applications would depend on the species being targeted, as different species have different optimal times of year that make herbicide applications more successful. During the target species optimal growth stage for herbicide application, the plant is actively senescing, in which they are redistributing nutrients to the root system prior to going into dormancy. For most of the invasive plants on the refuge this period is late summer through fall. The refuge would continue with an integrated pest management approach by utilizing other control methods, such as biocontrol, prescribed fire, grazing, mechanical mowing, and water level management to remove biomass and reduce top growth when feasible, in addition to aerial herbicide applications.

The USFWS's Integrated Pest Management (IPM) Policy (569 FW 1) requires a sustainable approach to managing pests that uses the following kinds of tools to minimize health, environmental, and economic risks: (1) **Biological** (e.g., predators, parasites, and pathogens), (2) **Cultural** (e.g., crop rotation, alterations in planting dates, and sanitation), (3) **Physical** (e.g., barriers, traps, hand-pulling, hoeing, mowing, and tilling), and (4) **Chemical** (e.g., pesticides, such as herbicides, insecticides, or fungicides). The IPM Policy also requires review and approval of a pesticide use proposal (PUP) prior to all herbicide applications. All PUPs require a site-specific analysis of protected and sensitive species, soil and water conditions, and an Endangered Species Act (Section 7) consultation. All herbicide applications on Sherburne NWR are required to follow product label restrictions (see below) and regionally approved best management practices (BMPs). These regional BMPs are designed to minimize environmental and safety risks and include:

- **Slopes** - Do not apply pesticides to slopes greater than 5% if significant rainfall is predicted within 24 hours.
- **Wind speed** - Do not apply pesticides when wind velocity exceeds 7 miles per hour or when inversion conditions exist.
- **Buffers** - Use a minimum 25-foot vegetated treatment buffer around all surface water resources.
- **Air temperature** - Do not spray pesticide containing 2, 4-D when air temperatures exceed 85°F.
- **Droplet size** - Select nozzles and operate application equipment with boom pressures such that spray droplets produced medium (236 - 340 microns) or coarser (341 - 403 microns) sized droplets.
- **Boom Height** - Do not allow boom height to exceed 20 inches above target canopy for ground applications.
    - For aerial applications, liquid pesticides are most effective and off-target drift can be minimized when applications are made 8-12 feet above crop or tree canopy.

- **Dye** -Where possible, use a dye for non-crop spot treatment to indicate treated areas.

The Sherburne NWR Integrated Pest Management Plan also lists Best Management Practices (BMP's) that are capable of protecting the environment and wildlife while considering economic factors, availability, technical feasibility, ability to implement, and effectiveness. These BMP's are as follows:

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 gusts no greater than 10 mph.
3. Use anti-drift nozzles with openings not greater than 1/16 inch and boom pressures of not 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 be used to evaluate 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 applications 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 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 "Pesticide 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.

The Federal Insecticide, Fungicide, and Rodenticide Act [7 U.S.C. §136 et seq. (1996)] requires all herbicide applications follow product label restrictions. These restrictions detail measures to minimize the potential for contamination and non-target effects. The Environmental Protection Agency is the lead agency for approving herbicide product labels (40 CFR; 156) and this process includes NEPA analysis and Endangered Species Act (Section 7) consultations with the USFWS Ecological Services. Therefore, all ground and aerial herbicide applications included in this alternative have received prior environmental analysis and review via the NEPA and the Endangered Species Act consultation processes associated with the development of the labelling for each herbicide.

This preferred alternative fulfills the Service's mandate under the NWRSAA. The Service has determined that the ground and aerial herbicide treatment is consistent with the purpose and natural resource goals and objectives of this station (Comprehensive Conservation Plan, U.S. Fish and Wildlife Service 2005), in addition to the mission of the NWRS.

Alternative B –Discontinued Use of Aerial Application Methods

Under the Alternative B, all aerial spraying methods/tools would be discontinued for use to reduce non-native, invasive and undesirable vegetation across the refuge, and only ground application equipment would be utilized. Discontinuing aerial application methods/tools would limit the ability to treat large monotypic stands of invasive, non-native, and undesirable vegetation. Other methods as part of an Integrated Pest Management strategy used to remove biomass and reduce top growth are biocontrol, prescribed fire, grazing, mechanical mowing, and water levels management. Limited, if any, herbicide applications would be applied on large monotypic infestations or in areas with difficult access, resulting in the expansion of non-native, invasive and undesirable species, and further degradation of habitat.

The USFWS's Integrated Pest Management (IPM) Policy (569 FW 1) requires a sustainable approach to managing pests that uses the following kinds of tools to minimize health, environmental, and economic risks: (1) **Biological** (e.g., predators, parasites, and pathogens), (2) **Cultural** (e.g., crop rotation, alterations in planting dates, and sanitation), (3) **Physical** (e.g., barriers, traps, hand-pulling, hoeing, mowing, and tilling), and (4) **Chemical** (e.g., pesticides, such as herbicides, insecticides, or fungicides). The IPM Policy also requires review and approval of a pesticide use proposal (PUP) prior to all herbicide applications. All PUPs require a site-

specific analysis of protected and sensitive species, soil and water conditions, and an Endangered Species Act (Section 7) consultation. All herbicide applications on Sherburne NWR are required to follow product label restrictions (see below) and regionally approved best management practices (BMPs). These regional BMPs are designed to minimize environmental and safety risks and include:

- **Slopes** - Do not apply pesticides to slopes greater than 5% if significant rainfall is predicted within 24 hours.
- **Wind speed** - Do not apply pesticides when wind velocity exceeds 7 miles per hour or when inversion conditions exist.
- **Buffers** - Use a minimum 25-foot vegetated treatment buffer around all surface water resources.
- **Air temperature** - Do not spray pesticide containing 2, 4-D when air temperatures exceed 85°F.
- **Droplet size** - Select nozzles and operate application equipment with boom pressures such that spray droplets produced medium (236 - 340 microns) or coarser (341 - 403 microns) sized droplets.
- **Boom Height** - Do not allow boom height to exceed 20 inches above target canopy for ground applications.
    - For aerial applications, liquid pesticides are most effective and off-target drift can be minimized when applications are made 8-12 feet above crop or tree canopy.
- **Dye** -Where possible, use a dye for non-crop spot treatment to indicate treated areas.

The Sherburne NWR Integrated Pest Management Plan also lists Best Management Practices (BMP's) that are capable of protecting the environment and wildlife while considering economic factors, availability, technical feasibility, ability to implement, and effectiveness. These BMP's are as follows:

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 gusts no greater than 10 mph.
3. Use anti-drift nozzles with openings not greater than 1/16 inch and boom pressures of not 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 be used to evaluate 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 applications 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 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 "Pesticide 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.

The Federal Insecticide, Fungicide, and Rodenticide Act [7 U.S.C. §136 et seq. (1996)] requires all herbicide applications follow product label restrictions. These restrictions detail measures to minimize the potential for contamination and non-target effects. The Environmental Protection Agency is the lead agency for approving herbicide product labels (40 CFR; 156) and this process includes NEPA analysis and Endangered Species Act (Section 7) consultations with the USFWS. Therefore, all ground and aerial herbicide applications included in this alternative have received prior environmental analysis and review via the NEPA and the Endangered Species Act consultation processes associated with the development of the labelling for each herbicide.

This alternative fulfills the Service's mandate under the NWRSAA. The Service has determined that the ground and aerial herbicide treatment is consistent with the purpose and natural

resource goals and objectives of this station (Comprehensive Conservation Plan, U.S. Fish and Wildlife Service 2005), in addition to the mission of the NWRS.

Affected Environment and Environmental Consequences

This section is organized by affected resource categories and for each affected resource discusses both (1) the existing environmental and socioeconomic baseline in the action area for each resource and (2) the effects and impacts of the Preferred Alternative and any effects on each resource. The effects and impacts of the Preferred Alternative considered here are changes to the human environment, whether adverse or beneficial, that are reasonably foreseeable and have a reasonably close causal relationship to the Preferred Alternative or Alternative B. This EA includes the written analyses of the environmental consequences on a resource only when the impacts on that resource could be more than negligible and therefore considered an "affected resource." Any resources that will not be more than negligibly impacted by the action have been dismissed from further analyses.

Sherburne National Wildlife Refuge consists of approximately 30,700 acres in Sherburne County, Minnesota. (See Figure 1. for location)

The refuge contains a diverse mix of habitat types; wetlands, lowland brush, cattail marsh, lowland grass/reed canary/sedge meadows when combined encompass 10,500 acres. The Preferred Alternative would take place primarily across these habitat types and others as needed.

For more information regarding and the general characteristics of the refuge's environment, please see Chapter 3 of the Refuge's Comprehensive Conservation Plan which can be found here: https://ecos.fws.gov/ServCat/Reference/Profile/1498 or the Refuge's Habitat Management Plan at: https://ecos.fws.gov/ServCat/Reference/Profile/115937. The associated Environmental Assessment that was completed in conjunction with the CCP can be found here: https:// https://ecos.fws.gov/ServCat/Reference/Profile/1498

The following resources either (1) do not exist within the project area or (2) would either not be affected or only negligibly affected by the proposed action:

- Floodplains
- Cultural Resources
- Environmental Justice
- Geology and Soils
- Air Quality

The Environmental Protection Agency conducts specimen label reviews and approval of pesticide products that undergo NEPA review. The Environmental Hazards statement provides the precautionary language informing users of the potential hazards to the environment from transport, use, storage, or spill of an herbicide product. These hazards may be to water, soil, air, beneficial insects, plants, and/or wildlife as identified in risk assessments performed by the Environmental Fate and Effects Division. Generally, the information contained in this section is based upon the results of eight basic acute toxicity studies performed on the technical grade of the active ingredient(s) in the formulation. These eight studies are: (1) avian oral LD_{50} (with mallard *or* bobwhite quail), (2) avian dietary LC_{50} (mallards), (3) avian dietary LC_{50} (bluegill sunfish), (6) ACUTE LC_{50}, freshwater invertebrates (*Daphnia magna* or water flea), and (7) honeybee contact LD_{50}, and (8) mammalian acute oral LD_{50}. For specific data requirements see: *40 CFR Part 158.*

In addition, data concerning a product's potential to be transported to groundwater, surface water, aquatic sediment, to drift, to adversely affect non-target plants and bees provide important information. Data include, but are not limited to, results from hydrolysis, batch equilibrium, aerobic soil metabolism, field dissipation, and prospective groundwater studies.

The data generated from all of these studies support the language used for the environmental hazards statements. Review of the data is performed by the Environmental Fate and Effects Division (EFED). This information provides detailed guidance on the use of herbicides to mitigate drift, overspray, volatilization, and other potential negative effects of applying herbicides, both on the ground and aerially.

Natural Resources

Terrestrial Wildlife and Aquatic Species

Affected Environment

Description of Cumulative Effects of Affected Environment for the Affected Resource

The refuge, with its diverse mix of habitat types supports a wide variety of wildlife species native to Minnesota. Many species of birds, fish, mammals, reptiles, and amphibians inhabit the refuge. Non-native, invasive and undesirable vegetation has the potential to spread aggressively across open water, mudflats, and sedge meadows, and other communities and outcompetes native vegetation and reduces habitat for migratory birds and other wildlife. An overall reduction in biodiversity results from non-native and/or invasive plant species and undesirable vegetation monocultures.

Reflecting the local physiography, Sherburne NWR lies within the Partners in Flight (PIF) Physiogeographic Area 40. The refuge is very important for migratory birds, both during the nesting/breeding season and migration. The refuge attracts over 230 species of birds each year to its diverse habitats. Of these, over 120 are known to nest in the area.

The refuge also lies within the known breeding range of 54 mammal species. A few of the larger more iconic species include gray wolves, coyote, white-tailed deer, and black bear. Mammal populations have remained consistent, with short term fluctuations for most species on the refuge.

The refuge also contains 23 species of reptiles and amphibians, and approximately 42 species of fish, along with several Minnesota state threatened and endangered species. Comprehensive species lists can be found in the refuge's Habitat Management Plan (U.S. Fish and Wildlife Service 2020) and Comprehensive Conservation Plan (U.S. Fish and Wildlife Service 2005).

Description of Environmental Trends and Planned Actions

Invasive species are a constant threat to native plants and wildlife. Sherburne NWR has numerous invasive species present on the refuge, and without constant management they will continue to spread across their respective habitats and degrade native habitat. As native habitat degrades from invasive species, native wildlife populations will decline as well, as resources become scarcer in order to support their, breeding, nesting, and migration requirements. Minnesota Statute 84D outlines a statewide program to prevent and curb the spread of invasive species. The effects of invasive species and other undesirable vegetation are expected to be amplified in the future because of shifting precipitation patterns, altered disturbance regimes and increased frequency of late-growing season moisture stress, which are associated with climate change (Angel et al. 2018). Population growth and urbanization around Sherburne NWR will likely increase anthropogenic threats to the refuge associated with invasive species introductions.

Impacts on Affected Resource

Alternative A

Under this alternative, aerial and ground herbicide application methods would continue being used on the refuge. Continued use of aerial application tools for applying herbicides to invasive, non-native and undesirable vegetation could be accomplished across the refuge in all habitat types. Areas that cannot be accessed by ground or amphibious vehicles could be reached with aerial application methods.

Wildlife health issues associated with pesticides in general is a serious concern that needs to be considered at all times regardless of whether the pesticide is applied by ground or aerial

application tools under the Alternative A or Alternative B. Considerations include the effect of direct contact at the time of application, as well as the lasting effects within the environment. Wildlife can be exposed in a number of ways including direct spray and drift, direct exposure to contaminated water or vegetation, or ingestion of contaminated water, vegetation or prey animals.

The Environmental Protection Agency conducts specimen label reviews and approval of pesticide products that undergo NEPA review. The Environmental Hazards statement provides the precautionary language informing users of the potential hazards to the environment from transport, use, storage, or spill of an herbicide product. These hazards may be to water, soil, air, beneficial insects, plants, and/or wildlife as identified in risk assessments performed by the Environmental Fate and Effects Division. Generally, the information contained in this section is based upon the results of eight basic acute toxicity studies performed on the technical grade of the active ingredient(s) in the formulation. These eight studies are: (1) avian oral LD_{50} (with mallard *or* bobwhite quail), (2) avian dietary LC_{50} (mallards), (3) avian dietary LC_{50} (bluegill sunfish), (6) ACUTE lc_{50}, freshwater invertebrates (*Daphnia magna* or water flea), and (7) honeybee contact LD_{50}, and (8) mammalian acute oral LD_{50}. For specific data requirements see: *40 CFR Part 158.*

In addition, data concerning a product's potential to be transported to groundwater, surface water, aquatic sediment, to drift, to adversely affect non-target plants and bees provide important information. Data include, but are not limited to, results from hydrolysis, batch equilibrium, aerobic soil metabolism, field dissipation, and prospective groundwater studies.

The data generated from all of these studies support the language used for the Environmental hazards statements. Review of the data is performed by the Environmental Fate and Effects Division (EFED). This information provides detailed guidance on the use of herbicides to mitigate drift, overspray, volatilization, and other potential negative effects of applying herbicides aerially.

Direct spray contact with wildlife is more likely when using aerial application considering the speed that aerial tools can apply at. However, the engine sound coming from certain aerial application equipment, such as larger fixed-wing or rotary-wing manned aircraft may give highly mobile wildlife species advance warning to move out of the area and not be subjected to direct spray contact. Aerial applications also pose less risk of spreading invasive species by not transporting seed to and from application sites.

Disturbance to wildlife and short-term displacement would likely occur during aerial application. Given that aerial application would allow for larger remote areas to be treated,

potential exists for a higher number of wildlife species to be disturbed in a short period. The duration of the disturbance would most likely be shorter and less impact would be observed to soil and desirable vegetation due the absence of tires or tracks required to traverse the site. Timing of aerial application can reduce disturbance to nesting migratory birds including bald eagles or roosting bat species. Each pesticide use proposal determines timing of application to mitigate any impacts to migratory bird species to prevent take under the Migratory Bird Treaty act or the Gold and Bald Eagle Protection Act.

Herbicide spray drift can occur from both ground and aerial application of herbicides that could negatively affect terrestrial and aquatic wildlife. Minnesota herbicide applicator laws prohibit pesticide applications from being applied when specific environmental criteria are not met and applicators must follow all regulations according to the herbicide product label, along with Minnesota Department of Agriculture (MDA) applicator regulations, and FWS policies. Nevertheless, spray drift could potentially impact terrestrial wildlife and aquatic species in non-target areas if regulations and label directions are not followed.

Alternative B

Under Alternative B, aerial application of herbicides would not be utilized to control invasive, non-native and undesirable vegetation. Only ground application methods of applying herbicides with truck, tractor, ATV/UTV, amphibious vehicle, airboat, or backpack sprayers would be allowed. Treatments would be primarily limited to the drier, smoother terrain and easily accessible portions of the refuge. Large monotypic stands of invasive, non-native, and undesirable vegetation located in difficult to access or inaccessible portions of the refuge would remain largely untreated and continue to expand their presence across their respective habitats. Large monotypic stands of invasive species such as hybrid cattail would continue to decrease open water habitat, reduce native plant communities, reduce water quality, and negatively impact wetland dependent wildlife species due to the extensive time and cost commitment of hand or boom spraying from amphibious vehicles. Undesirable woody vegetation would continue to expand in both presence and size, outcompeting native sedge meadow plant communities and plant communities of native habitat types, which many wildlife species depend on. Ultimately, desirable native habitat would continue to degrade, leading to a decline in wildlife use and abundance across the refuge, while providing seed bank sources for invasive, non-native, and undesirable vegetation to continue to persist on multiple habitat types within the refuge.

Under Alternative B, wildlife exposure to pesticides applied by ground application methods needs to be considered. Wildlife can be exposed in a number of ways including direct spray and drift, direct exposure to contaminated water or vegetation, or ingestion of contaminated water, vegetation or prey animals. Direct spray contact of larger wildlife species is less likely to occur

using ground applications given the slower application rate, however indirect contact by wildlife entering a treated area during the restricted entry interval is still possible. Ground application of herbicides poses a greater risk of transporting invasive species to and from sites by picking up seed in tires, tracks and other parts of the equipment.

Disturbance to wildlife and long-term displacement could occur for greater durations while applying herbicides using ground and amphibious applications tools and while traveling to and from application sites. Disturbance would be temporary, lasting approximately the amount of time it would take to treat the desired site. As mentioned in the previous section, broadcast spraying using ground and amphibious application methods under most circumstances would take significantly more time to treat an area compared to aerial application methods, lengthening the amount of time disturbance that would deter wildlife from returning to an area. Threats to wildlife, and sensitive plant species from trampling or crushing from ground application equipment is also possible when conducting these types of herbicide applications.

Threatened and Endangered Species, and Other Special Status Species

Affected Environment

Description of Cumulative Effects of Affected Environment for the Affected Resource

Currently there are is one federally listed threatened, one federally listed endangered species, one federally proposed endangered species and one federal candidate species that may or do occur on the refuge as defined by the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531-1544; 36 CFR Part 13; 50 CFR Parts 10, 17, 23, 81, 217, 222, 225, 402, and 450.

- Northern long-eared bat (NLEB), *Myotis septentrionalis* (Federally Endangered-FE)
- Rusty-patched bumble bee (RPBB), *Bombus affinis* (Federally Endangered-FE)
- Tricolored bat (TCB), *Perimyotis subflavus* (Federally proposed Endangered-FPE)
- Monarch butterfly, *Danaus plexippus* (Federal Candidate-FC)

The Endangered Species Act (ESA) of 1973, aims to conserve species listed as endangered or threatened. Under the ESA, all federal agencies seek to conserve threatened and endangered species, use their authorities in furtherance of the ESA, and cooperate with state and local agencies to resolve water resource issues associated with invasive, non-native and undesirable vegetation in concert with conserving endangered species.

Appendix A cites multiple laws and regulations pertaining to species afforded protections under federal law. The analysis below and in the impacts on affected resources section for threatened and endangered wildlife meets the compliance requirements for the listed laws in Appendix A.

Description of Environmental Trends and Planned Actions

Habitat loss is the largest contributor to the decline of the above federally listed threatened and endangered species, with the exception of the Northern long-eared bat and the Tricolored bat. Its decline is associated with white-nose syndrome. White-nose syndrome, a disease that impacts bats, is caused by a fungal pathogen. It has led to 90 to 100% declines in tricolored bat winter colony abundance at sites impacted by the disease. Since white-nose syndrome was first observed in New York in 2006, it has spread rapidly across the majority of the tricolored bat range.

As residential development continues to increase around the refuge, habitat outside of the refuge boundary will continue to decline, eventually adding carrying capacity challenges for the available resources to wildlife. The refuge continuously strives to restore, enhance and conserve habitat so that wildlife have the resources needed to increase their populations and sustain them into the future. Non-native and undesirable vegetation reduces the quality of habitat on the refuge, resulting in reduced resources for wildlife, including federally listed species.

Impacts on Affected Resource

Alternative A

Under Alternative A herbicide application would continue to be conducted using aerial application methods/tools when appropriate, along with ground application equipment. With herbicide drift and collision with aircraft being the main concerns for the use of aerial application methods/tools on threatened and endangered species, this alternative may have the potential for incidental take of protected species.

Rusty-patched bumble bee

The Rusty-patched bumble bee (RPBB) has declined by 87% in the last 20 years. The species is likely present in only 0.1% of its historic range. There are several factors that have caused the decline in RPBB populations; including habitat loss, intensive farming practices, disease, pesticide use and climate change. Although there has not been any confirmed RPBB populations in Sherburne NWR, there was a confirmed capture of a RPBB on Sand Dunes State Forest located directly to the south of the refuge. Also, Sherburne NWR is located within the RPBB's historic range and most of the refuge is designated as "Hi-Potential Zone" by the Region 3 Ecological Services. However, rusty-patched bumble bees have not been observed or captured on Sherburne NWR, so presently there is no known risk of incidental take of RPBB's.

Highly degraded habitat that would meet the criteria for a broadcast aerial herbicide application would more than likely not contain any RPBB's. Invasive, and non-native forbs

provide little if any resources to pollinators which is one of the causes of their decline due to habitat degradation. Also, RPBB's are small, flying insects that would be easily displaced by the thrust/prop wash generated by fixed or rotary wing aircraft, reducing and potentially eliminating any incidental take. The sound generated, and the disturbance created by aircraft would also potentially displace RPBB's from a project site reducing incidental take. Ground application equipment poses the threat of crushing ground nests or causing incidental take via crushing by machine. Ground application equipment does generate significant sound levels capable of disturbing and displacing RPBB's as the equipment approaches. Sherburne NWR staff have observed bumble bees that remained foraging on native flowers while nearby ATV spot-spraying activities for invasive vegetation took place. RPBB queens emerge in the spring and establish a colony typically in rodent burrows, and "a continuous supply of floral resources is required to support the nest founding stage" (Lanternman, 2019). Fall herbicide applications either from aerial or ground application tools reduces the risk of incidental take of RPBB queens as they are not actively foraging to establish their colonies but does expose RPBB male and female workers to incidental take via application equipment. Engine ingestion of RPBB's is not capable of causing aerial herbicide application equipment engine failures and has potentially less chance of incidental take of RPBB's than ground application equipment regardless of herbicide application timing. The potential for drift to non-target species is greater with aerial equipment applications than with ground equipment applications, but the same BMP's to reduce to drift from ground application equipment are the same BMP's to reduce drift from aerial applications. The potential for volatilization to non-target species of herbicides from aerial application equipment is essentially the same as with ground application equipment, so following BMP's will reduce and eliminate that potential from both methods.

Northern Long-eared bats

The northern-long eared bat (NLEB) is a wide ranging, federally endangered species, found in 37 states and eight provinces in North America. In summer, NLEB's bats are often associated with forested habitats, especially around wetlands. Summer roosts are believed to include separate day and night roost locations. The species typically overwinters in caves or mines and spends the remainder of the year in forested habitats. As its name suggests, the northern-long eared bat is distinguished by its long ears, particularly as compared to other bats in the genus *Myotis*.

Although there are many threats to the species, the predominant threat by far is white-nose syndrome. If this disease had not emerged, it is unlikely the northern long-eared bat would be experiencing such a dramatic population decline. White-nose syndrome was the main reason for reclassifying the species as endangered under the Endangered Species Act in 2022. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly throughout the species' range in the United States. Numbers of northern-long eared bats, gathered from hibernacula counts, have declined by 97% to 100% across the species' range.

During summer and portions of the fall and spring, NLEB's may be found roosting singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags, or dead trees. Males and non-reproductive females may roost in cooler places, like caves and mines. NLEB's seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. The species has also been found, although less commonly, roosting in structures such as barns and sheds. NLEB's use forested areas not only for roosting, but also for foraging and commuting between summer and winter habitat.

Sherburne NWR has mist-netted, and radio collared NLEB's on the refuge and tracked them to roost sites off the refuge. The Big Woods section of the refuge contains the best available habitat for nesting and roosting NLEB's. Bats are most active at dusk or at night, when no aerial herbicide applications would take place, preventing any incidental take of NLEB by aerial or ground application equipment during that activity. Sound disturbance by aerial herbicide application methods could disturb roosting NLEB's, but the disturbance would be of a much shorter duration than ground application equipment. The risk of drift affecting NLEB's is also minimal as bats would be roosting in shelter and not be exposed to drift at the time of the herbicide application.

Tricolored bat

The Tricolored bat (TCB) is one of the smallest bats in North America. The once common species is wide ranging across the eastern and central United States and portions of southern Canada, Mexico, and Central America. During the winter, tricolored bats are found in caves and mines, although in the southern United States, where caves are sparse, tricolored bats are often found roosting in road-associated culverts. During the spring, summer and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves. As its name suggests, the tricolored bat is distinguished by its unique tricolored fur that appears dark at the base, lighter in the middle and dark at the tip.

White-nose syndrome, a disease that impacts bats, is caused by a fungal pathogen. It has led to 90 to 100% declines in tricolored bat winter colony abundance at sites impacted by the disease. Since white-nose syndrome was first observed in New York in 2006, it has spread rapidly across the majority of the TCB's range. Although habitat loss is pervasive across tricolored bats range, severity has likely been low given historical abundance and spatial extent; however, as tricolored spatial extent is projected to decline in the future, negative impacts may be significant. Lastly, although challenging to describe for such wide-ranging species, climate change will continue and negative impacts are anticipated in the future.

No tricolored bats have been confirmed to roost on Sherburne NWR. The big woods habitat in the refuge would be the most appropriate habitat for nesting and roosting TCB's. Bats in general are most active at dusk or night, when no aerial herbicide applications would be conducted preventing any potential unintentional take, or direct exposure to herbicides. Bats would be sheltered during daylight hours preventing direct exposure to herbicide. Sound disturbance could occur from aerial herbicide applications but the duration would be brief during daylight hours, minimizing any negative effects to any TCB's.

Monarch butterfly

With its iconic orange and black markings, the monarch butterfly is one of the most recognizable species in North America. The monarch's phenomenal transcontinental migrations inspire awe among scientists and citizens alike. But over the past two-decades, monarch numbers in North America have declined prompting the U.S. Fish and Wildlife Service to join state agencies, tribes, other federal agencies, and non-governmental groups to identify threats to the monarch and take steps to conserve monarchs throughout their range.

Due to monarchs decline, the U.S. Fish and Wildlife Service has completed a status review under the Endangered Species Act. In December 2020, after an extensive status assessment of the monarch butterfly, it was determined that listing the monarch under the Endangered Species Act is warranted but precluded at this time by higher priority listing actions. With this finding, the monarch butterfly becomes a candidate for listing. In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites. In early spring (February-March), surviving monarchs break diapause (suspended reproduction) and mate at the overwintering sites before dispersing.

Monarch butterflies can be found frequently on Sherburne NWR due to high-quality grasslands, oak savannas, and wetlands that contain high densities of milkweed species and other native forbs that provide resources to monarchs and their larva. The use of aerial herbicide application tools poses a risk of incidental take of adult butterflies from potential collisions with low flying aircraft performing aerial herbicide applications. However, prop wash generated from fixed wing, and especially rotary wing aircraft could cause significant physical disturbance to push adult monarchs out of harm's way and reduce incidental take of the species. Also, Monarch butterflies are not capable of causing aircraft engine damage due to engine ingestion. Sound disturbance generated by aerial applications methods could potentially disburse monarchs from areas where aerial broadcast applications of herbicides are appropriate would generally serve as poor quality habitat for foraging and egg laying monarchs as invasive species would be the dominant plant group, outcompeting native plant species. If monarchs were present, ground application equipment poses a threat to incidental take of Monarchs by potentially crushing them as they feed on forbs, or by crushing milkweed species with larva or eggs

present. Collisions would likely not cause incidental take as ground application equipment needs to be operated slowly in order to properly broadcast and apply herbicides to invasive plants but poses a greater risk of incidental take via crushing foraging Monarchs or crushing of larva on milkweed species. Both ground and aerial herbicide applications pose the risk of drift and overspray to non-target plants, and exposing adult monarchs, larva and eggs to herbicide drift, however the risk can be greater from aerial application equipment. This risk can be mitigated by following product labels, MDA application guidelines and FWS policy.

Alternative B

Under Alternative B, all aerial application methods/tools for applying herbicides would be discontinued on Sherburne NWR and only ground application equipment would be used. Impacts from ground application are the same as those described for ground applications in Alternative A, but occurring at a higher frequency in some wetland edges that can be accessed by ground application equipment. Alternative B would eliminate overspray and drift from aerial herbicide applications but not eliminate overspray or drift from ground application of herbicides. Alternative B would also limit the ability of FWS to access remote locations of the refuge and increase response time for new invasive species threats in difficult to access locations, serving as seed sources for populations to persist on the refuge. Only areas that can be accessed by foot or ground application equipment would be able to have herbicides applied to them. The lack of aerial application of herbicides increases the amount of habitat that must be treated through ground application. Therefore, the duration of sound disturbance would be greater with the additional ground application equipment than Alternative A that utilizes both aerial and ground applications. This would also result in increased physical disturbance to the landscape from the increased tracks or tires of ground application equipment, potentially transporting invasive, non-native and undesirable vegetation seed to new locations.

Rusty-patched bumble bee

The potential for incidental take of RPBB's is greater with ground application equipment than aerial application equipment and under this alternative more ground application would be required to reduce invasive, non-native, and undesirable vegetation. All of the impacts of ground application listed below would increase under this alternative as compared to Alternative A. Ground application equipment does not generate the same level of physical disturbance from prop wash as aerial application does in regards to displacing an RPBB from an area in order to reduce or eliminate incidental take. Both application tools generate sound disturbance, but as mentioned earlier, bumble bees have been observed foraging within feet of ATV operated herbicide spot spraying, indicating sound disturbance is not always a factor for displacing them. Also, the duration of sound disturbance would be significantly longer from ground application equipment than from aerial application equipment due to the speed in which aerial equipment can conduct herbicide applications when compared to ground application equipment. Ground application equipment poses the greater threat from crushing

foraging RPBB's on plants in route to project areas, while also potentially crushing ground nests. Also, the impacts to the landscape from ground application equipment is greater as the tire and tracks can cause ruts, crush native plants and slow moving wildlife obscured from view.

Northern-long eared bats

The use of ground application equipment poses little threat for the incidental take of NLEB's. NLEB's are mostly active at dusk and night when no ground based herbicide applications would take place. Also, NLEB's are trees cavity nesters, so ground application equipment would be highly unlikely to cause incidental take. Sound disturbance from the ground application equipment would be of a longer duration than aerial application equipment, potentially disturbing breeding, or roosting bats longer than an aerial herbicide application would.

Tricolored bat

The use of ground application equipment poses little threat for the incidental take of TCB's. TCB's are mostly active at dusk and night when no ground based herbicide applications would take place. Also, TCB's primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. Native hardwood trees would not be a target for ground based herbicide applications. Sound disturbance from ground applications equipment would be of a longer duration than aerial application equipment, potentially disturbing breeding, or roosting bats than an aerial herbicide application would.

Monarch butterfly

Under Alternative B, only ground application equipment would be used for invasive species control. Invasive species in difficult to access areas may remain untreated to new or existing infestation, degrading Monarch habitat. Ground applications potentially exposes Monarch butterflies to incidental take via crushing from ground application equipment. It also can crush larva on milkweeds species operating in, and transporting to and from a project site whether spot spraying or broadcast spraying is being conducted. Spray drift can be controlled following herbicide label guidelines and MDA application guidelines (https://www.mda.state.mn.us/pesticide-application-how), regional BMPs, Refuge BMPS referenced in the Sherburne NWR IPM and FWS policy.

Habitat and Vegetation (including vegetation of special management concern)

Affected Environment

Description of Cumulative Effects of Affected Environment for the Affected Resource

The refuge lies within the deciduous forest-woodland zone of Minnesota on the Anoka Sandplain, a large flat sandy outwash area now thought to be lacustrine in origin, with small dune features and low moraines exposed above the outwash (Write, 1972.) This zone in Minnesota is transitional between the tallgrass prairie and deciduous hardwood forest. The

uplands within the refuge consist of these flat sandy areas with some rolling small sand dune areas, interspersed with oak savannas, oak woodlands, upland prairies, sedge meadows, lowland brush, upland brush, multiple wetland types and four natural lakes.

The habitats that aerial herbicide applications are most applicable to on Sherburne NWR are listed below. The area's most suitable for aerial applications are typically aquatic in nature and present access challenges using ground application equipment along with treating the scope of invasive, non-native and undesirable vegetation. In rare cases, upland areas that cannot be accessed by ground application equipment could also receive aerial herbicide applications.

Emergent marsh and Open Water/mudflats – This includes cattail/mixed emergent marsh, bulrush emergent, and open water/mudflats. Wetlands and open water are crucial to many of the migratory birds found on Sherburne NWR, either during the nesting season or in transit during migration. Ducks, geese, shorebirds, swans, wading waterbirds and some songbirds and raptors are all heavily dependent on various wetland types, and Sherburne NWR has the ability to provide a mosaic of wetlands for various wildlife species.

Lowland brush – This early successional habitat is used by nesting and migrating woodcock, and sandhill cranes, both of which are Sherburne NWR priority resources of concern (PROC). This plant community is dominated by willows, speckled alder, and dogwoods and bog birch. Other species that commonly utilize lowland shrub habitat are the golden-winged warbler, blue-winged warbler, olive-sided flycatcher, and the willow flycatcher. Certain migratory birds and waterfowl also use this habitat for nesting and cover.

Sedge Meadow-The large and relatively intact sedge meadows found on Sherburne NWR are recognized for their high-quality condition, and warrant protection and, where appropriate, restoration. The Nature Conservancy has identified Sherburne NWR as important regionally because the refuge retains some of the few remaining sedge meadows in the Midwest. Protecting, managing, and restoring sedge meadow habitat on the refuge will preserve some of Minnesota's best remaining large, high-quality examples of this habitat type.

Oak Savanna- The uplands of Sherburne were predominantly oak openings. The Nature Conservancy has identified oak savanna as a globally endangered habitat type. In the past 150 years, most oak savanna was converted to agriculture but the open appeal of the landscape and the surrounding beauty of the tees stimulated housing developments as urban areas moved into the surrounding country.

Upland Grassland- Many of farm fields were converted to grasslands, some of the non-local ecotypes and southern grasses. These will eventually be a part of the oak savanna restoration, but this will take many years to complete. Grasslands are characterized by less than 10% canopy closure, less than 5% shrub cover, and a diverse native grass and forb species mix.

Impacts on Affected Resource

Alternative A

Under the Alternative A the continued use of aerial herbicide application tools will allow for larger, more remote areas in priority habitats to be treated resulting in greater reduction and control of invasive, non-native, and undesirable vegetation across the refuge. Aerial application will allow for timelier applications, more even distribution of the herbicide on the leaf portion of the plant, lower levels of overspray, and minimize the potential spread of invasive species.

Using aerial application tools to apply aquatically approved herbicides would allow for larger aquatic sites to be treated more efficiently which should result in less chemical being used over time and therefore less exposure to non-target plants and wildlife over time. All herbicides applied would be approved using the FWS Pesticide Use Proposal System (PUPS), and would not include the use of a restricted use pesticide. Damage to non-target plant species may occur using aerial applications, but areas containing sensitive and diverse native plant communities would be targeted for ground applications rather than aerial herbicide applications. Disturbance to the vegetation from ground application equipment that would include rutting from equipment in wet areas would not occur if these areas were treated by aerial application.

The use of aerial application methods over these habitats (rather than through them with ground application methods) does not cause physical disturbance to the habitat. Prop wash does not trample, rut-up, crush or create physical paths through vegetation like ground application equipment does. Nor does it potentially transport invasive, non-native, or undesirable vegetation seed to new locations.

Positive effects for flora and fauna associated with healthy wetlands, emergent marshes, lowland brush, sedge meadows and other upland habitats like oak savannas and grasslands should restore faster under an aerial spraying scenario since less physical damage would occur, and invasive species would be reduced at a greater rate.

Alternative B

Under Alternative B only ground application of herbicides with truck, tractor, ATV/UTV, amphibious vehicle, airboat, or backpack sprayers would be allowed. Treatments would be primarily limited to the drier, smoother terrain portions of the refuge. Invasive species, non-native and undesirable vegetation located in the inaccessible portions of the refuge would remain largely untreated, continuing to provide a seed source and expand across the refuge. Sedge meadows that contain woody vegetation that is too dense, tall, or large to treat with ground equipment would remain largely untreated. Disturbance from ground application equipment such as creating ruts in marginal dry areas, soil compaction, and soil disturbance could encourage weed and invasive species establishment along the tire path and create hazards for future management activities. Herbicide can be applied in some areas using an airboat; however this method requires deeper water and is not a preferred method. The most

effective method is to use aerial applications to treat in areas where the water has been drained in order to stress water dependent invasive, non-native and undesirable species, and ensure the majority of the plant is exposed for maximum exposure to the herbicide.

The amount of area treated annually using ground spraying applications is limited due to the time and labor it takes to treat an area. Further, applying herbicides evenly on the landscape can be difficult using ground equipment due to uneven terrain which reduces the operator's ability to maintain a constant speed, and application rate. There is also chance for application overlap due to difficulties in navigating terrain and vegetation features leading to additional herbicide being applied to a previously applied area. Repetitive herbicide applications to the same location can also create visible paths through vegetation, and potentially transport seed to new locations.

Under Alternative B, the quality of wildlife habitat will likely continue to decline in some areas when using only ground application methods/tools. More specifically, large expanses of monotypic invasive, non-native species, and undesirable vegetation may remain untreated and continue to spread. As a result, open wetland habitat could continue to degrade as well as the desired aquatic vegetation many species rely on. Sedge meadow habitat could continue with brush species succession as woody vegetation establishes itself and drives out wildlife dependent on open sedge meadow plant communities. The emergent marsh could degrade from invasive aquatic species as well. Upland areas that cannot be reached by ground equipment would remain untreated and vulnerable to invasive species infestations.

Water Quality

Affected Environment

Description of Cumulative Effects of Affected Environment for the Affected Resource

The majority of the refuge is located within the St. Francis River Watershed. The refuge was established along a portion of the St. Francis River Valley, historically known for its wildlife resources. The St. Francis River begins in Benton County, about 18 miles north from where it enters the northwest corner of the refuge. After traveling through the refuge, the St. Francis River exits the refuge's south spur and drains into the Elk River just north of Big Lake, then drains into the Mississippi River within the city limits of Elk River. The middle one-third of the refuge's western boundary follows the boundary of the Snake River Watershed, which lies to its west. A small portion of the refuge lies within the Snake River watershed, including Johnson Slough and Orrock Lake.

The refuge includes 23 impoundments (referred to as either wetlands, or pools) and four natural lakes. The artificial impoundments vary from 48 acres to 1,436 acres depending on

seasonal precipitation and water management goals. Water is maintained within the impoundments by an extensive network of dikes, and water levels can be raised or lowered in almost all impoundment by adjusting water control structures at pool outlets. Sherburne NWR's impoundments, with their marshes, mudflats, sedge meadows and open water are one of the dominant geographic features of the Refuge.

Description of Cumulative Effects of Environmental Trends and Planned Actions

Invasive, non-native, and undesirable aquatic vegetation can negatively affect water quality in a variety of ways. Hybrid cattail (*Typha x glauca*) for example, has the ability to hold higher concentrations of ammonium, nitrate, and phosphate. Invasive plants can also impact carbon and nitrogen cycles directly, as they typically show increases in net primary productivity and standing stock biomass compared with native plants (Ehrenfeld, 2003). Invasive plants can also impact nutrient cycling indirectly through their influence on microorganisms. Recent studies have shown that microbially driven nitrogen cycling processes in terrestrial soils and freshwater wetlands can be impacted by invasive plants (Kourtev et al., 2003). *Typha spp.* show a constitutive tolerance for soil and water contaminated by heavy metals (McNaughton et al., 1974). Sedimentation from hybrid cattail monocultures is also a concern for water quality in wetlands, as it degrades water quality, lowers dissolved oxygen, and reduces fish and macroinvertebrates populations, both of which serve as food sources for waterfowl and other aquatic species.

Impacts on Affected Resource

Alternative A

Under Alternative A, the continued use of aerial application tools/methods for applying herbicides at augment ground applications will allow for more acres of invasive, non-native, and undesirable vegetation to be treated, aiding in the refuge's ability to control and reduce their spread. The reduction and prevention of further spread of large monotypic stands of invasive, non-native, and undesirable vegetation will allow for greater open water, sedge meadow, lowland brush habitat achieving HMP and CCP goals and increased open water habitat across the refuge. Invasive species such as hybrid cattail store high levels of nitrogen and phosphorus in its rhizomes. By aerially treating these large stands and reducing its coverage, the refuge can reduce the amount of nutrient loading in its impoundment system. A reduction in hybrid cattail can help minimize sedimentation therefore improving water quality. The use of aircraft would have little to no effects on water quality. Ground application would continue with limited herbicide treatments in wet areas to control invasive species where feasible for the ground application equipment.

Negative impacts to water quality from herbicides are a concern with any herbicide application. Aerial herbicide applications would allow for areas to be treated more efficiently which would result in less chemical used over time. However, aerial applications can increase the risk of drift

to non-target areas resulting in unintended effects on non-target plants species. Drift, and more specifically volatilization can occur regardless of the application method used to apply them. As mentioned above, only herbicides approved for aquatic use and registered with the EPA and the State of Minnesota will be used for aquatic applications. All herbicides used will be in accordance with the products approved label, will be approved through the FWS Pesticide Use Proposal System, and align with all FWS policies.

Alternative B

Under Alternative B only limited herbicide treatments using ground application equipment in wet areas to control invasive species would be feasible. Access to wetland habitats can be difficult, even with specialty tracked equipment designed to traverse these habitats. However, these machines crush plants and potential wildlife when navigating to and from an invasive species site. Ground applications equipment can transport seed of invasive, non-native and undesirable brush from a site as well. Repeated trips to and from a site can create a "desire path" that is a consequence of mechanical erosion caused by vehicle traffic. Repeated ground application equipment travel can further erode away both remaining native vegetation and soil quality that allows easy revegetation by invasive, non-native or undesirable vegetation.

Research and Natural Areas

Affected Environment

Description of Cumulative Effects of Affected Environment for the Affected Resource

Definition of:

> An area where natural processes are allowed to predominate, and which is preserved for the primary purpose of research and education. Such may include:
>
> 1. Typical or unusual faunistic and/or floristic type, associations, or other biotic phenomena.
> 2. Characteristic or outstanding geologic or aquatic features and processes.

These administratively designated areas are part of a national network of reserved areas under various ownerships. Research and Natural Areas (RNA's) are intended to assist in the preservation of examples of all significant natural ecosystems for comparison with those influenced by man, to provide educational and research areas for scientists to study the ecology, successful trends, and other aspects of the natural environment, and to serve as gene pools and preserves rare and endangered species of plants and animals.

Sherburne NWR has two Research and Natural Areas (RNA's): the Santiago Oak Savanna RNA and the No Name RNA. The Santiago Oak Savanna RNA was established in 1978 and is 496 acres of high-quality oak savanna containing mixed bur oak and northern pin oak with prairie

understory. The No Name Savanna RNA is 20 acres and contains sand dunes and blowouts that serves as a transition from open sand dunes to grassland and savanna.

Description of Cumulative Effects of Environmental Trends and Planned Actions

These research and natural areas are subject to invasive species infestation. Due to the quality of the habitat and the small size of these areas, ground spot spraying employing early detection, early eradication are the best methods for treating invasive species. Aerial spraying would not be the ideal method because non-target vegetation would be at risk of herbicide exposure.

Impacts and Cumulative Effects on Affected Resource

No impacts are anticipated because ground and aerial applications of herbicides will not take place in either of the RNAs on the refuge. Therefore there will be no difference between the alternatives as related to this resource.

Refuge Management and Operations

Affected Environment

Description of Cumulative Effects of Affected Environment for the Affected Resource

Aerial herbicide applications in priority habitat types provide multiple advantages to the Service, to include; safety for staff, minimize wildlife and habitat impacts from ground equipment, cost effectiveness (i.e. price per acre), accessibility to difficult and remote locations on the refuge, minimize spread of invasive species, and increased efficiency of large scale herbicide applications. Continuing to apply herbicides using aerial methods would ultimately facilitate inaccessible areas being treated, resulting in a time reduction of invasive species control across the refuge. More effective herbicide applications coupled with other management actions such as water management, grazing, and prescribed fire will allow for better control of invasive, non-native, and undesirable species. Utilizing aerial application of herbicides will allow the refuge to aggressively control invasive species in the short and long term, which will help the refuge get closer to achieving the end goal of eliminating invasive, non-native, and undesirable species and no longer needing to apply herbicides on the landscape.

Costs per acre are also significantly higher when comparing the time it takes to treat an area from ground application equipment compared to aerial methods. Ground application equipment poses the greater risk of spreading invasive species to and from sites than aerial application methods since ground application equipment is operated through as opposed to over, infestations of invasive, non-native and undesirable vegetation.

Impacts and Cumulative Effects and Affected Resources

Alternative A

The ability to continue to aerially treat invasive, non-native and undesirable vegetation in addition to ground treatments provides multiple advantages to management and refuge operations. Using aerial methods to apply herbicides provides the lowest cost per acre for treating large monotypic stands of invasive, non-native and undesirable vegetation as opposed to ground applications. This allows management to apply cost savings to other projects that will benefit other habitats on the refuge. The staff time saved from aerial applications of herbicides allows staff to focus on other refuge management operations that will also benefit the refuges other habitats. Aerial applications saves both time and money for the refuge management operations and provides multiple benefits to refuge operations.

Alternative B

Limiting herbicide applications to only ground application equipment would significantly increase the time required to treat large areas. This includes transportation to and from the site, repetitive herbicide refills of ground application equipment, cleaning of equipment after leaving a site, fuel and ground application equipment maintenance requires a significant staff and monetary commitment. By applying herbicides using only ground application equipment, limited refuge resources will be tied up treating large areas infested with invasive, non-native, and undesirable vegetation that could otherwise be treated in a fraction of the time using aerial herbicide application methods. Large areas would take multiple years of application, causing repetitive trips to the same site, potentially spreading seeds from repeat access, increased equipment maintenance, and increased applications of herbicides on a site.

Visitor Use and Experience

Affected Environment

Description of Cumulative Effects of Affected Environment for the Affected Resource

Sherburne NWR is open to wildlife observation, photography, hunting, fishing, environmental education, and interpretation.

Currently, wildlife observation and photography occur within designated areas of the refuge. Opportunities are also available along perimeter and interior public use roads. Both uses are allowed along the 7-mile auto tour route (Wildlife Drive) which is open typically in April through mid-November. No motorized boat use, snowmobiles, or OHV vehicles are allowed within the refuge for this use. The refuge has three foot-trails that are open to the public year-round. (Mahnomen trail-3 miles, Blue Hill trail-5 miles, and the Oak Savanna Learning Center trail-1.6 miles). These trails are open from sunrise to sunset, unless administratively closed for

management purposes such as maintenance or unusual or critical conditions affecting land, water, vegetation, wildlife populations or public safety.

Environmental education and interpretation are carried out within the headquarters, visitor center and outdoors throughout the refuge on designated roads, trails, overlooks and visitor contact facilities.

The refuge also enforces its wildlife sanctuary period, from March 1st to August 31st. During this time, access to areas not designated for public use are restricted to the public, limiting any conflicts with the public use and aerial application methods.

Impacts and Cumulative Effects on Affected Resource

Alternative A

Refuge management often makes the decision to close areas of the refuge for maintenance and management activities that could put visitors in harm's way. Depending on the time of the year, many areas on the refuge where herbicides may be utilized may be open to the public. Areas that are open to the public would be closed and signed accordingly so visitors are not in the area where ground applications are taking place or where aircraft would be flying over at low altitudes, taking off, or landing. Public areas would be closed prior to aerial or ground herbicide application activity being conducted and remained closed until the activity has ceased. For herbicide application, the areas would remain closed for the duration of the restricted entry interval (REI) stated on the herbicide label after treatment is completed to eliminate any conflicts with public use and exposure to herbicide either from direct contact or from drift. A majority of the refuge is closed to the public to observe sanctuary period from March 1st-August 31st. It is during this time frame that most aerial herbicide applications would take place. Any closure of a publicly accessible areas would be temporary and therefore, the impact on public use would be minimal.

Wildlife viewing areas open to the public, such as along the auto tour route, viewing blinds, observation decks, hunt blinds for disabled hunters, or public roadways have become obstructed in areas with dense invasive, non-native, and undesirable vegetation. Invasive, non-native, and undesirable species have reduced open water areas and are obstructing spots to view several wetland dependent birds and other wildlife species. Undesirable vegetation in sedge meadows, emergent marshes and other habitats has also become very dense in areas, eliminating wildlife viewing opportunities. Aerial herbicide treatment will allow for more areas to be treated creating more opportunities for the public to view and photograph wildlife.

Alternative B

Under Alternative B, aircraft would not be utilized. Invasive, non-native, and undesirable vegetation would continue to degrade open water, sedge meadows, emergent marsh, and lowland brush habitat, not only reducing the presence of wildlife for viewing or photographing, but also obstructing the view of visitors, resulting in a diminished visitor experience. With only ground herbicide application methods being used, a reduced number of acres could be treated due to inaccessibility by ground application equipment in order to maintain public viewing areas of wildlife. Risk of herbicide drift would be lower with ground application methods, but the same BMP's for controlling drift can be applied to control drift of aerial applications.

Socioeconomics

Local and Regional Economies

Affected Environment

Description of Cumulative Effects on Affected Environment for the Affected Resource

Sherburne National Wildlife Refuge, located in Sherburne County MN, attracts over 91,124 visitors per year (U.S. Fish and Wildlife Service, 2018, written comm.). Visitors have numerous recreational opportunities that vary with the seasons. Hunting opportunities include those related to ruffed grouse, gray and fox squirrels, pheasants, and hares. Hunting for ducks, coots, geese, rails, woodcock, snipe, and white-tailed deer is also allowed. The most popular area on the refuge is the 7.3 mile auto-tour loop, which visitors use for a variety of activities including wildlife photography, observation, and bird watching. Thirty-two percent of visitors were female with an average age of 54 years, 68% were male with an average age of 57 years. Refuge visitors had a mean income range of $75,000-$99,999. Local visitors traveled an average of 26 minutes to arrive at Sherburne NWR. Nonlocal visitors traveled an average of 3 hours to arrive at the refuge (National Wildlife Refuge Visitor Survey, 2018). Some research shows that rates of participation in outdoor recreation activities have increased (Outdoor Foundation, 2018), while other studies have indicated declines in participation in heritage activities such as hunting (U.S. Fish & Wildlife Service 2016). In light of these trends, it is important to understand recreation participation on refuges to create quality visitor experiences and foster personal and emotional connections to the refuge and it resources (U.S. Fish & Wildlife Service, 2011). The top three activities in which visitors participated during from 2017-2018 were wildlife observation (78%), bird watching (64%), and hiking (61%).

The value of any commodity is comprised of two elements: 1) the amount paid and 2) the additional benefits derived above and beyond what is paid. The first element equates to direct expenditures. Visitors to wildlife refuges pay for a variety of things, including nearby lodging,

gas, food, and other purchases from local businesses. This spending has a significant positive contribution to local economies. The *Banking on Nature* report (Caudill & Carver, 2017) highlights how nearly 54 million visits to wildlife refuges during 2017 generated $3.2 billion of economic output in local communities and supported over 41,000 jobs. The report further indicates that recreational spending for wildlife refuges generated $229 million of tax revenue at the local, county, and state levels. Local visitors (those living ≤ 50 miles from Sherburne NWR; 86%) on average, accounted for 70% of expenditures. Top trip expenditures by locals were for food/drink and transportation. The average amount paid by locals to visit Sherburne NWR was $29 per person, per day. Local visitors were personally willing to pay an additional $41 per day on average to visit this wildlife refuge. Nonlocal visitors (those living 50 > miles from Sherburne NWR) on average, accounted for 30% of expenditures. Top trip expenditures by nonlocals were for lodging and food/drink. The average amount paid by nonlocals to visit Sherburne NWR was $52 per person per day. Nonlocal visitors were personally willing to pay an additional $83 per day on average to visit Sherburne NWR. Nonlocal visitors spent an average of three days in the local community during the visit.

All past aerial herbicide applications have been made by local (located in Minnesota) aerial application contractors. Awarding contracts for aerial herbicide applications to local companies' increases revenue for local economies benefitting the community. Herbicides can be purchased from local companies and can increase revenue for local businesses as well, stimulating local economies from these projects.

By conducting habitat restoration projects that restores and enhances habitat on the refuge that will attract greater numbers of wildlife, this could also increase visitation to the refuge for more opportunities for hunting, wildlife photography and observation. An increase in local visitation could generate increased revenue for local businesses further benefitting the local community.

Impacts and Cumulative Effects on Affected Resource

Alternative A and Alternative B

There will be negligible impacts to the local and regional economies under either alternative.

Monitoring

Sherburne NWR will monitor the effects and successes of the use of application of herbicides to control invasive species to determine how application methods can be most effective and if continued use is necessary. In the past, follow-up monitoring has been conducted on habitat

that has had aerial herbicide applications. This monitoring served to determine the effectiveness of aerial applications and to determine if goals and objectives of the application have/are being met. Monitoring of ground applications are also conducted to determine their effectiveness. Photo points have been established at water control structures to document before and after seasonal changes along with any long term changes that the wetland habitats may undergo after aerial herbicide applications. In addition, the Integrated Waterbird Monitoring and Management protocol will allow for monitoring of vegetation changes to wetland habitat. Other Inventory and Monitoring protocols are under development to provide monitoring to terrestrial habitat post aerial and ground herbicide applications as well.

Summary of Analysis

Alternative A –Continued Use of Aerial Herbicide Application

As described above, under the Alternative A, aerial and ground herbicide applications would continue to be used as a tool to control and prevent the spread of invasive and non-native species and undesirable vegetation. Aerial methods/tools would be used in conjunction with ground herbicide application, biological controls and mechanical control methods, such as prescribed fire, grazing, and water level management. Mechanical methods often can help reduce biomass and cause temporary setbacks in above ground plant structure but rarely reduce plant density or make below ground impacts to invasive, non-native, and undesirable vegetation. Regardless of the alternative, herbicide application is needed to effectively reduce overall invasive species abundance.

Since the 1980's, aircraft have been used on Sherburne NWR for herbicide applications with no known/reported adverse effects to non-target vegetation and wildlife. No incidents of drift from aerial applications have occurred on or off refuge resulting in non-target vegetation or wildlife exposure. No reported conflicts with aircraft and wildlife have occurred from previous aerial herbicide applications from fixed or rotary wing aircraft.

One of the main concerns for environmental impacts under both Alternatives is the application of herbicides and their associated risks. However, several measures are in place to mitigate the negative impacts of herbicides. All herbicides applied are certified and have an approved product label by the Environmental Protection Agency, along with appropriate NEPA and Section 7 consultation review. Herbicides are regulated both by the federal government and individual states to ensure that they do not pose unreasonable risks to human health or the environment. Pesticide use on refuges requires an individual Pesticide Use Proposal (PUP) annually for the active ingredient in herbicide which also specifies the target pest(s), protected and sensitive species, soil and water conditions, the method of application and the timing and location of application. These PUPs can be approved (or disapproved) at the Regional, or

National level depending on the pesticide being proposed and method of application, and other limiting factors in regard to wildlife. Additionally, required regional, state and refuge Best Management Practices are followed during the chemical application to prevent risks to non-target wildlife and habitats. In addition, aquatic herbicide applications require their own specific training and certification. Lastly, an ESA Section 7 analysis is written and approved annually that evaluates the potential impacts and effects that herbicide applications could have on federally threatened and endangered species.

Alternative B –Discontinued Use of All Aerial Herbicide Application Methods

As described above, under Alternative B the refuge would continue using ground application methods only and discontinue the use of aerial methods and tools to apply herbicides for the control of invasive, non-native species, and undesirable vegetation. Due to this, the total habitat area that can be treated would remain relatively small given the difficult terrain, remote locations, size, and the ability to apply herbicides using ground application methods and other limiting factors. The ground application of herbicides would be coupled with biological control and mechanical control methods. However, without the benefits of larger extent efficiency and ability to reach more remote or wet areas afforded by aerial application of herbicides, both invasive, non-native, and undesirable vegetation are likely to continue to expand and spread into other areas, both on and off the refuge. As a result, open water, and sedge meadow, emergent marsh, and lowland brush, and the mosaic of wetland type habitat will become degraded, displacing both wildlife and native plant communities from these habitats.

List of Sources, Agencies and Persons Consulted

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List of Reviewers

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State Coordination

A formal letter and this environmental assessment will be provided to State of Minnesota partners inviting them to provide comments on the proposed use of aerial application of herbicides when the public comment period commences. Any comments, concerns, suggestions, or other feedback will be included if substantive response is required.

Tribal Consultation

Tribes and tribal members are welcome to provide comment during the public comment period. A formal letter and this environmental assessment will be provided to Refuge tribal partners inviting them to provide comments on the proposed use of aerial application of herbicides when the public comment period commences. Any comments, concerns, suggestions, or other feedback will be included if substantive response is required. Tribes and intertribal agencies contacted include:
Mille Lacs Band of Ojibwe
Shakopee Mdewakanton Sioux Community

Public Outreach

The draft environmental assessment will be made available for public review starting February 27, 2023 for fifteen days on the refuge website https://www.fws.gov/refuge/sherburne/. Members of the public will be notified of the availability of the draft documents through a press release sent to state news media outlets and posted on the refuge website. A hard copy of the environmental assessment will be made available at the refuge visitor center. For access to the document in an alternative format contact the refuge. Comments may be submitted in writing via email or mail. Any comments, concerns, suggestions, or other feedback will be included if substantive response is required.

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Appendix A -

This Appendix lists all applicable statutes, regulations, and executive orders not otherwise addressed specifically within the "Affected Environment and Environmental Consequences" section of this environmental assessment, as well as how the proposed action and environmental assessment analysis comply with each and any additional compliance steps taken by FWS.

Fish and Wildlife

- Bald and Golden Eagle Protection Act, as amended, 16 U.S.C. 668-668c, 50 CFR 22
- Endangered Species Act of 1973, as amended, 16 U.S.C. 1531-1544; 36 CFR Part 13; 50 CFR Parts 10, 17, 23, 81, 217, 222, 225, 402, and 450
- Fish and Wildlife Act of 1956, 16 U.S.C. 742 a-m
- Migratory Bird Treaty Act, as amended, 16 U.S.C. 703-712; 50 CFR Parts 10, 12, 20, and 21
- Executive Order 13186-Responsibilities of Federal Agencies to Protect Migratory Birds, 66 Fed. Reg. 3853 (2001).

Impacts to threatened and endangered species that may occur on the refuge is described in detail on pages 18-25 of this environmental assessment. An ESA Section 7, Intra-Service Consultation analyzing the potential effects herbicide applications, by either ground application equipment, or aerial application equipment has been submitted to the local Ecological Services Field Station for concurrence. The language of potential effects on threatened and endangered species in this Environmental Assessment are the same determination of effects in the herbicide application ESA Section 7 consultation. This analysis and Section 7 consultation meets requirements under the Endangered Species Act.

Impacts to wildlife and aquatic species under the Preferred Alternative is described in detail on pages 15-18 of this environmental assessment. As indicated in the Preferred Alternative section of this document (pages 10-11), Federal law requires all herbicide applications follow product label restrictions to minimize the potential contamination of air, soil, and water and effects on non-target organisms. Additionally, Best Management Practices identified in the Sherburne NWR Integrated Pest Management Plan employ herbicide application methods that protect wildlife and the resources on which they rely, while also controlling non-native, invasive or undesirable plant species. Service policy also requires review and approval of a Pesticide Use Proposal (PUP) prior to the application of any herbicide. These PUP's must consider potential impacts to protected resources and environmental quality and implement mitigation measures such as restricting timing of application to assure no take of migratory birds or eagles and ensure compliance with the Gold and Bald Eagle Protection Act and the Migratory Bird Treaty Act The approval of PUP's ensures compliance with the laws and Executive orders listed above not specifically mentioned in this more detailed description.

Cultural Resources

- Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa-470mm; 18 CFR Part 1312; 32 CFR Part 229; 36 CFR Part 296; 43 CFR Part 7
- National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470x-6; 36 CFR Parts 60, 63, 78, 79, 800, 801, and 810

The only physical disturbance to the ground would occur using specialty tracked equipment when conducting ground applications or traveling through areas with hydric soil, are frequently wet, or are seasonally flooded. If a known or suspected cultural site is in the application area and ground disturbance could occur, the Regional Historic Preservation Office will be contacted for a determination for specific application projects. This will ensure compliance with the Archaeological Resources Protection Act and National Historic Preservation Act. No ground applications with tracked equipment will occur in areas with known cultural resources to avoid any adverse effects. It is determined there would be no adverse effects to cultural resources as the Preferred Alternative is described given the site-specific compliance that will take place if cultural resources are present in the application area.

Natural Resources

- Clean Water Act, as amended, 33 U.S.C. §1251 et seq.
- Clean Air Act, as amended, 42 U.S.C. 7401-7671q; 40 CFR Parts 23, 50, 51, 52, 58, 60, 61, 82, and 93; 48 CFR Part 23
- Wetlands Protection Executive Order 11990
- Floodplain Management Executive Order 11988

The Clean Air Act does not apply to this action as emissions of hazardous air pollutants will not occur. Air quality will not be affected by this action.

Clean Water Act compliance is not specifically required for this action as there is no discharge of a pollutant from a point source. Herbicide application is considered a non-point source for introducing a pollutant into the environment. As indicated in the Preferred Alternative section of this document (pages 10-11), Federal law requires all herbicide applications follow product label restrictions to minimize the potential contamination of air, soil, and water and effects on non-target organisms. Additionally, Best Management Practices identified in the Sherburne NWR Integrated Pest Management Plan employ herbicide application methods that protect wildlife and the resources on which they rely, while also controlling non-native, invasive or undesirable plant species. Service policy also requires review and approval of a Pesticide Use Proposal (PUP) prior to the application of any herbicide. These PUP's must consider potential impacts to protected resources and environmental quality. The approval of PUP's ensures compliance with the laws and Executive orders listed above.

The executive orders for wetland and floodplain management do not apply to this action as there will not be adverse effects to floodplains or wetlands and no loss or degradation of wetlands.

- Wilderness Act, 16 U.S.C. 1131 et seq.
- Wild and Scenic Rivers Act, 16 U.S.C. 1271 et seq.

The refuge does not have any designated wilderness or wild and scenic rivers and as such there would be no effect to these resources and is in compliance with these laws.

Appendix B

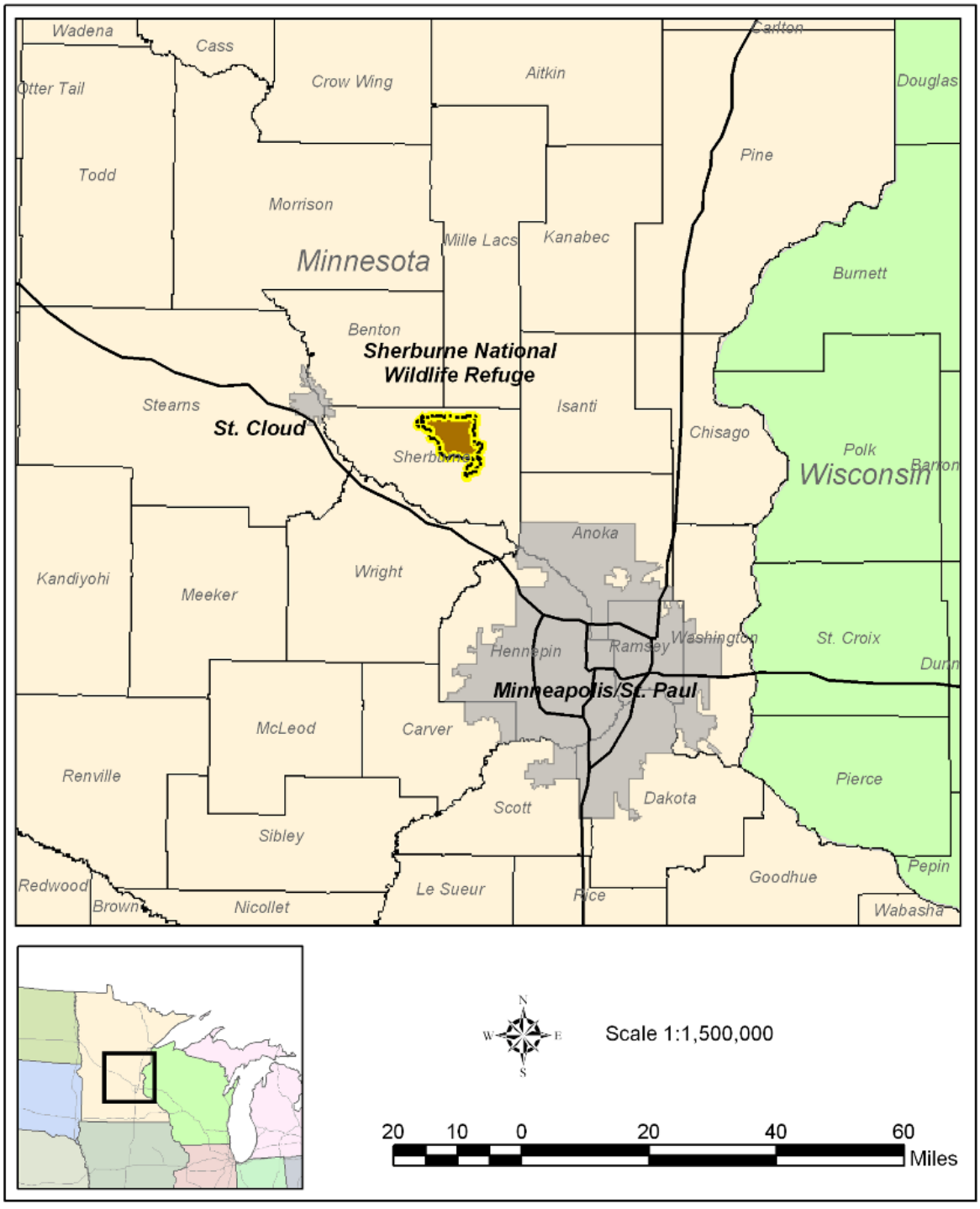

Figure 1. Location of Sherburne NWR

Sherburne NWR is located in Sherburne County, in central Minnesota, about 25 miles northeast of Minneapolis along Sherburne County Road 9 (17076 293rd, Zimmerman, MN 55398