Draft Environmental Assessment

Detroit Lakes Wetland Management District and Glacial Ridge National Wildlife Refuge Complex Continued Aerial Herbicide Application

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Prepared by

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Environmental Assessment for Continued Aerial Herbicide Application on Detroit Lakes Wetland Management District and Glacial Ridge National Wildlife Refuge Complex

Date: August 15, 2022

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.

Proposed Action

The U.S. Fish and Wildlife Service (Service) is proposing to continue the use of aerially applied herbicides for vegetation management on Detroit Lakes Wetland Management District (WMD, District), Glacial Ridge National Wildlife Refuge (NWR), Rydell NWR, and Hamden Slough NWR. Combined, the WMD and three NWRs form the Detroit Lakes WMD and Glacial Ridge NWR Complex (Complex). Aerial herbicide applications would continue to control, prevent, and limit the spread of invasive species, narrow-leaved cattail (*Typha angustifolia*) and hybrid cattail (*Typha x glauca*), and undesirable woody plant species within all habitat management units. The aerial application of herbicides is used as a habitat management strategy in accordance with the Comprehensive Conservation Plans (CCP) for the WMD and NWRs and is often the most cost-effective management tool to control vast expanses of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species, located in remote areas of the Complex. These areas are often inaccessible by any other means and other methods have proved inefficient in controlling the targeted species.

A different proposed action may evolve during the NEPA process as the agency refines its proposal and gathers feedback from the public, Federally Recognized Tribes and tribal entities, 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 EA.

Background

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 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.

The following provides information for the enabling legislation and habitat management goals for the Complex. Habitat management goals were established in individual CCPs for each station in the Complex.

Detroit Lakes WMD

Detroit Lakes WMD was established in 1962 to manage waterfowl production areas (WPA). As of 2022, WPAs on the District total 49,893 acres spread throughout five counties (Figure 1). WPAs within the Detroit Lakes WMD are acquired under the establishing authority of the Migratory Bird Hunting Stamp Act of March 16, 1934, as amended in 1958 (16 U.S.C. 718-718h). The Act authorized the "…acquisition by gift, devise, lease, purchase, or exchange of, small wetland pothole areas, interest therein, and right-of-way to provide access thereto. Such small areas, to be designated as 'Waterfowl Production Areas,' may be acquired without regard to the limitations and requirements of the Migratory Bird Conservation Act."

Detroit Lakes WMD's CCP was completed in 2003 (USFWS 2003) and established the following habitat management goal (Goal 2):

> *"Restore native prairie plant communities of the Northern Tallgrass Prairie Ecosystem using local ecotypes of seed and maintain the vigor of these stands through natural processes. Restore functioning wetland complexes and maintain the cyclic productivity of wetlands. Continue efforts for long-term solutions to the problem of invasive species with increased emphasis on biological control to minimize damage to aquatic and terrestrial communities. Continue efforts to better define the role of each District in assisting private landowners with wetland, upland and riparian restorations."*

Glacial Ridge NWR

Glacial Ridge NWR was established in 2004 to restore and preserve the character of the historic prairie and savanna landscape and is currently 23,248 acres. The Refuge was created under the authority of the Migratory Bird Conservation Act, Feb. 18, 1929, 16 U.S.C. 715d and the Emergency Wetland Resources Act of 1986, 16 U.S.C. 3901b. Funds appropriated by Congress and the sale of Federal Duck Stamps were used to acquire land. The lands authorized for acquisition include:

“Sec. 715d. Purchase or rental of approved areas or interests therein; gifts and devises; United States lands. The Secretary of the Interior may –

(2) acquire, by gift or devise, any area or interests therein; which he determines to be suitable for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.”

“The primary purpose for the refuge under the Migratory Bird Conservation Act is ‘for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.’”

Glacial Ridge NWR’s Comprehensive Conservation Plan was completed in 2016 (USFWS 2016) and established the following habitat management goal (Goal 1: Habitat and Wildlife):

> “*Protect, restore, and manage the unique prairie-wetland habitats found within Glacial Ridge NWR using a variety of strategies to emulate the ecological processes and native plant communities that once existed across the Agassiz Beach Ridge landscape. The above conservation actions will result in a diversity of resilient tallgrass prairie and wetland habitats for the benefit of migratory birds, threatened and endangered species, and other native wildlife*.”

Hamden Slough NWR

Hamden Slough NWR currently totals 3,434 acres and was established by the Migratory Bird Conservation Commission on September 19, 1989. It was established to restore and protect prairie pothole habitat for waterfowl production and as an inviolate sanctuary for waterfowl, other migratory birds, and native wildlife. Hamden Slough NWR is near the town of Audubon in Becker County, Minnesota, and its purposes derive from three authorities including:

"…conservation, management, and . . . restoration of the fish, wildlife, and plant resources and their habitats . . . for the benefit of present and future generations of Americans . . . " 16 U.S.C. 668dd(a)(2) (*National Wildlife Refuge System Administration Act*)

“…for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. 715d *(Migratory Bird Conservation Act)*

…as Waterfowl Production Areas subject to “ . . . all the provisions of such Act [Migratory Bird Conservation Act] . . . except the inviolate sanctuary provisions . . . ” 16 U.S.C. 718(c) (*Migratory Bird Hunting and Conservation Stamp Tax*)

Hamden Slough NWR’s Comprehensive Conservation Plan was completed in 2012 (USFWS 2012) and established the following habitat management goal (Wildlife/Habitat Goal):

"Habitats on Hamden Slough NWR will be restored, protected, and actively managed to provide a diversity of native wetland and grassland habitats. These efforts will be further leveraged by partnerships and conservation actions outside the Refuge, resulting in a resilient and balanced landscape, meeting the needs of migratory birds, threatened and endangered species, and other wildlife in an uncertain future."

Rydell NWR

Rydell NWR was established in 1992 under authority of the Fish and Wildlife Act of 1956, as amended, and the Recreational Use of Conservation Areas Act of 1962, as amended. The Refuge totals 2,039 acres. Relevant sections from this legislation that establish the purpose of the Refuge include:

"…for the development, advancement, management, conservation and protection of fish and wildlife resources... 16 U. S. C. 742f (a) (4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U. S. C. 742f(b) (1) (Fish and Wildlife Act of 1956, 16 U. S. C. 742(a) -754, as amended).

Rydell NWR's CCP was completed in 2001 (USFWS 2001) and established the following habitat management goal (1.0 Habitat Restoration and Wildlife Management Goal):

"Restore, preserve and enhance the natural wildlife and plant species diversity within a refuge that is located in the transition zone between the northern tallgrass prairie and the northern hardwood deciduous forest."

National Wildlife Refuge System Mission

The mission of the NWRS, as outlined by the National Wildlife Refuge System Administration Act (NWRSAA), 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.

As part of the CCP development, an Environmental Assessment was completed to identify management strategies to meet the conservation goals of the District and each refuge. Each document outlines the treatment of invasive species as priority management actions; however, this Environmental Assessment further analyzes the continued management of habitat with an aerially applied herbicide or combination of herbicides.

The Complex has long used aerial applications of herbicides to meet the conservation obligations from the establishing authorities and goals detailed above. The Complex is re-evaluating the use of aerially applied herbicides in response to increased pressure from invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species resulting from range expansions and environmental alterations associated with climate change. The threats posed by emerging invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species are expected to continue and potentially increase.

Purpose and Need for the Action

The purpose of this proposed action is to evaluate the use of aerial application of herbicide to control, prevent, and limit the spread of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species on Service-owned lands throughout the Complex.

The need of the proposed action is to meet the Service's priorities and mandates as outlined by the NWRSAA to "provide for the conservation of 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)). The threats posed by invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species have increased

because of range expansions and changing environmental conditions associated with climate change.

Alternatives

Alternative A – Continued Use of Aerial Herbicide Applications (No Action and Proposed Alternative)

Under the No Action and Proposed Alternative, aerial application of herbicides would continue to be used as a tool to control, prevent, and limit the spread of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species. Aerial applications would be done with fixed-wing aircraft, rotary-winged aircraft, and unmanned aerial vehicles (UAVs). Under the No Action and Proposed Alternative, aerial herbicide applications would continue to be integrated with ground herbicide applications and non-herbicide control methods including mowing, prescribed fire, hand-pulling and biological control when possible.

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 Endangered Species Act (Section 7) consultation. All herbicide applications on the Complex are required to follow product label restrictions (see below) and regionally approved Best Management Practices (BMPs). The 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.
- Dye -Where possible, use a dye for non-crop spot treatment to indicate treated areas.

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 aerial herbicide applications included in this alternative have received prior environmental analysis and review via the NEPA and Endangered Species Act consultation processes.

Areas within the Complex to be considered for aerial treatment include monotypic stands of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species. Given the geographical location of the Complex, aerial applications would typically take place between July and October. During this timeframe, the targeted plant species begin the process of senescence, in which they are re-distributing nutrients to other parts of the plant (typically roots) for winter. This is an effective time to apply herbicides as the plant carries the chemical down into the root system.

Alternative B – Discontinue Aerial Herbicide Applications

Under Alternative B, the Complex would discontinue use of aerial herbicide application and use only ground-based methods to treat invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species. Ground based methods include herbicide application, prescribed fire, mowing, other mechanical disturbance methods, hand-pulling, water level management, and biological control. Limited, if any, ground-based herbicide applications would be applied on large invasive species infestations or remote areas, due to time required to treat these areas and limited access.

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 proposed action and any alternatives on each resource. The effects and impacts of the proposed action 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 proposed action or alternatives. 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.

Direct, indirect, and cumulative impacts are evaluated in this environmental assessment. Direct effects are those which are caused by the action and occur at the same time and place. Indirect

effects are those which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Cumulative impacts result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.

The proposed action would occur on any Service fee-title land (NWRs and WPAs) within the Detroit Lakes WMD's five-county area. The Complex contains approximately 75,487 acres of Service-owned land in Becker, Clay, Mahnomen, Norman, and Polk Counties, Minnesota (Figure 1). The Complex contains a diverse mix of prairie, wetland, and shrubland habitat types and portions of the Complex have been designated Important Bird Areas by the Audubon Society. This includes four globally important bird areas (Twin Valley – Neal Prairie, Felton Prairie, Glacial Ridge, Hamden Slough National Wildlife Refuge) and one state important bird area (Waubon Marsh).

The proposed action would take place across the Complex as part of a multi-faceted management approach to control, contain, or eradicate invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species known for their ability to survive in nutrient poor soils, produce new stems via root suckers and re-sprouting, and their capacity for voluminous seed production and dispersal. Many invasive plants prioritized for control already occur on the Complex and threaten these wetland and grassland habitats (Minnesota Department of Agriculture 2020). Hybrid cattail provides an example as it continues to expand aggressively into open water and reduce the quality of wetlands throughout the WMD and NWRs. Factors such as its ability to grow in deeper water, robust rhizomatous root system, clonal reproduction, and high seed set (20,000-70,000 seeds annually/plant; Yeo 1964), allows it to out-compete native wetland plant species and create its own dense monocultures. Hybrid cattail is also able to store nitrogen and phosphorus in its roots, transferring it to the soil, altering soil chemistry to better support hybrid cattail growth (Newman *et al*. 1996). This positive feedback of cattail invasion and expansion necessitates management intervention.

Prairie and sedge meadow habitats on the Complex continue to be lost by the expansion of undesirable woody vegetation; primarily aspen (*Populus spp*.), cottonwood (*Populus deltoides*), alder (*Alnus spp,*), willow (*Salix spp*.), and dogwood (*Cornus spp*.) species. Historically, wildfire, bison, and the absence of edge habitat limited the expansion of many woody plant species into prairie and meadow habitats, thereby maintaining a more open landscape. The landscape today is severely fragmented, disturbance occurs less frequently, bison have disappeared, and woody seed sources occur at higher frequencies. Many of these woody plants, including species of willow, dogwood, and cottonwood, facilitate rapid growth and expansion due to their ability to survive in moist soils and produce new stems via suckers. Consequently, like hybrid cattails, these species will continue to expand forming dense monocultures

eliminating open landscapes and outcompeting other prairie and sedge meadow species. To effectively control and reduce the cover of these problematic species, a multi-faceted approach must be used as a single disturbance method is not adequate.

For more information regarding and the general characteristics of the Complex's environment, please see Chapter 3 of each station's Comprehensive Conservation Plan and EA, which can be found here:

A link to download the Detroit Lakes WMD Comprehensive Conservation Plan and EA
https://ecos.fws.gov/ServCat/Reference/Profile/1414

A link to download the Glacial Ridge NWR Comprehensive Conservation Plan and EA
https://ecos.fws.gov/ServCat/Reference/Profile/103396

A link to download the Hamden Slough NWR Comprehensive Conservation Plan and EA
https://ecos.fws.gov/ServCat/Reference/Profile/43682

A link to download the Rydell NWR Comprehensive Conservation Plan and EA
https://ecos.fws.gov/ServCat/Reference/Profile/1514

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
- Air Quality
- Wilderness

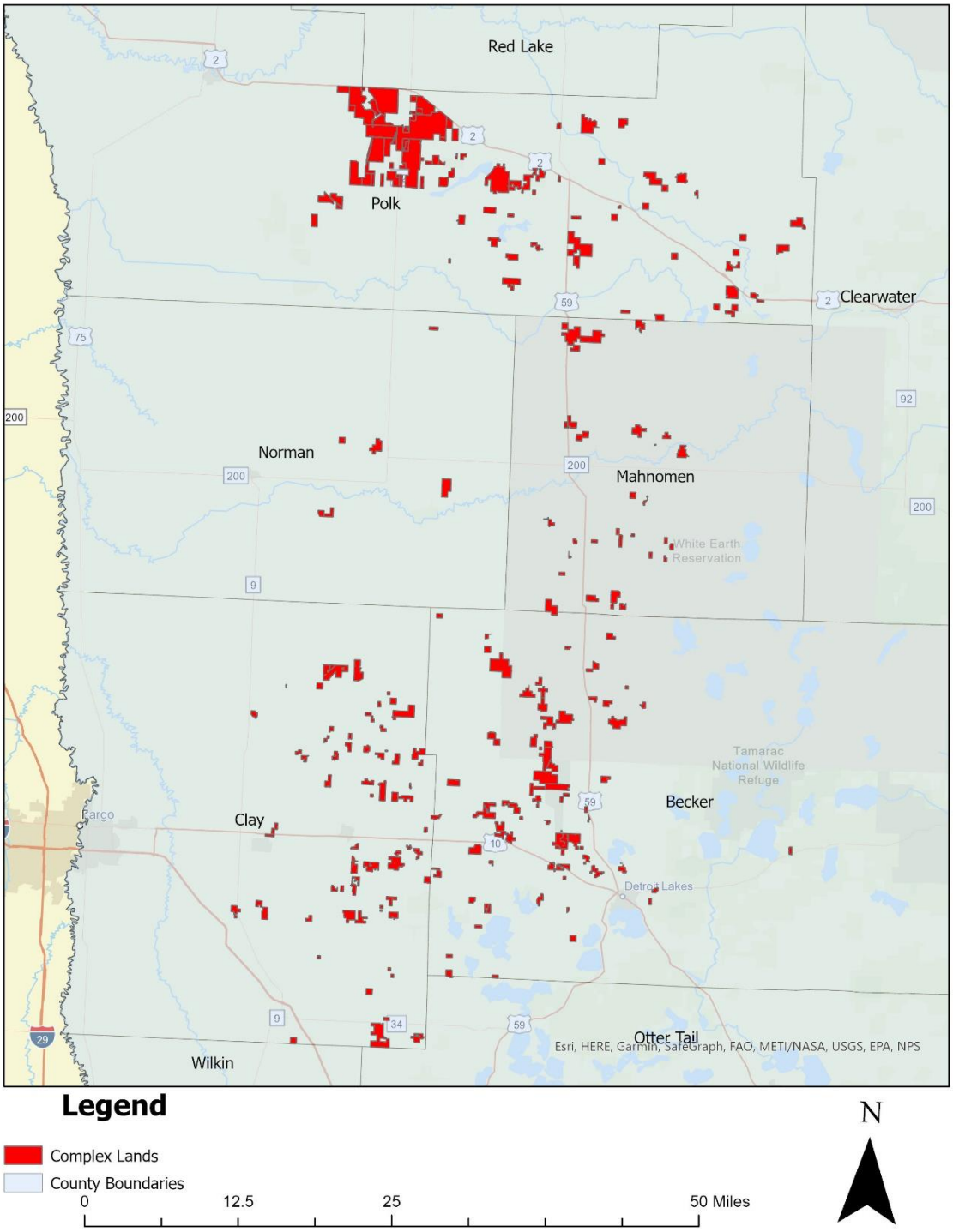

Figure 1. Map of service-owned lands (indicated with red) within the Complex are located in Becker, Clay, Mahnomen, Norman, and Polk counties in northwestern Minnesota. The areas highlighted with light blue and bounded with gray delineate the county boundaries.

Natural Resources

Terrestrial Wildlife and Aquatic Species

Affected Environment

Description of Affected Environment for the Affected Resource

The Complex contains a diverse grouping of habitats that support a wide variety of wildlife species native to northwestern Minnesota. An abundance of birds, mammals, fish, reptiles, and amphibians reside in the Complex or utilize its lands seasonally. Portions of the Complex are designated as Globally Important Bird Areas for their outstanding value to wild birds and their habitats. The Complex contains habitat important to bird species other than waterfowl, including songbirds, marsh and wading birds, shorebirds, raptors, and upland game birds. Approximately 243 species of birds regularly use the Complex at some time during the year, with 152 species nesting there.

The Complex supports a variety of resident mammals that are locally abundant depending on the availability of food sources, loafing areas, and security habitat. White-tailed deer (*Odocoileus virginianus*) are abundant and white-tailed jackrabbits (*Lepus townsendii*) can be common in portions of the Complex. Furbearers, including red fox (*Vulpes vulpes*), coyote (*Canis latrans*), long- (*Mustela frenata*) and short-tailed weasels (*Mustela erminea*), skunk (*Mephitis mephitis*), mink *(Neovison vison*), beaver (*Castor canadensis*) and raccoon (*Procyon lotor*) also are locally common and seen in the area on a regular basis. Mammals tend to be most abundant in "edge" habitats; especially those that border agricultural fields. Agricultural crops are seasonally important food sources to some of the resident mammals, especially deer. However, the availability of natural foods during winter, spring, and early summer places a strict limit on local mammal populations. Moose (*Alces alces*) were common inhabitants in the northern portion of the Complex through the mid-1990s, but they are now uncommon due to a widespread population decline throughout Minnesota.

Streams, ditches and wetland basins provide the aquatic habitat required for a variety of turtles, frogs, toads, salamanders, and snakes. Site-specific abundance data is limited for the Complex; however, at least 18 species of amphibians and reptiles have been documented at Rydell NWR (FWS 2000). These species are important food sources for many mammals, birds and fish. Their numbers and diversity are often indicators of the health of an ecosystem. Many species of reptiles and amphibians are declining on state and national levels.

Description of Environmental Trends and Planned Actions

The effects of invasive species and other undesirable vegetation, which 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 all associated with a changing climate (Angel et al.2018, Briscoe Runquist et al. 2019). Population growth and

urbanization around the Complex will likely increase anthropogenic pressures. This almost guarantees a continual source of new invasive species and other undesirable vegetation for the foreseeable future.

Impacts on Affected Resource
Alternative A
Under the No Action and Proposed Alternative (Alternative A) aerial herbicide applications would continue. Invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species would be treated with aerial herbicide application and ground-based methods as well. Aerial herbicide application enables treatment of remote portions of the Complex that may be inaccessible by other means. This will allow the Complex to control and prevent the expansion of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species and promote desirable habitat for wildlife species. Increasing the quality of habitat across the Complex would lead to increased wildlife use and abundance.

This alternative would result in the direct effect of wildlife disturbance during aerial herbicide applications. 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 for aerial herbicide applications. Timing of aerial applications within the target plant's susceptibility window could also be modified to reduce disturbance issues. Wildlife disturbance would be temporary, lasting approximately the amount of time it would take to treat the desired site.

Wildlife exposure to pesticides needs to be considered, regardless of application methods. Wildlife can be exposed to pesticides through direct spray and drift, direct exposure to contaminated water/vegetation, or ingestion of contaminated water, vegetation, or prey animals. Direct spray contact with larger wildlife species is less likely given the slower application rate while using ground equipment. However, the noise disturbance of certain aerial application equipment, such as fixed-wing aircraft or helicopters may give wildlife advanced warning to move out of the area. This potential non-target effect associated with aerial applications has been analyzed as part of the labeling process for all herbicides and measures to minimize those effects, including restrictions, are listed on the product label. Also as noted above, each pesticide application is individually reviewed and approved prior to treatment as part of the PUP process. This includes regionally approved BMPs. Because all label restrictions and regionally approved BMPs must be followed and because each herbicide application is reviewed and approved, the potential for indirect negative effects to wildlife are expected to be very minimal. Indirectly, herbicide applications through improved habitat diversity and health are expected to benefit many wildlife groups.

Under the No Action and Proposed Alternative, herbicide applications would be combined with ground-based herbicide applications and non-herbicide methods like prescribed fire and could have cumulative effects. Following combined treatments, a reduction in plant and invertebrate abundance and diversity could occur. Such reductions would be localized but could alter the food and cover requirements for wildlife and result in displacement as organisms move to other areas on the Complex to locate necessary habitat requirements. Such cumulative effects are expected to be temporary, lasting no more than one year as the habitat recovers from unaffected perennial root stock, seed bank resources, and immigration from surrounding untreated sites. Cumulative impacts can be negated through timing of management options, amount, and location of treatments to minimize or eliminate the compounding influence of multiple management programs.

Maintaining the Complex's plant and structural diversity maintains its resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of continued herbicide use. Indirectly, maximizing habitat diversity on the Complex maximizes insect diversity including pollinators. Improved pollination directly benefits plants and increased insect diversity has trophic level, cumulative benefits. Continued herbicide use has the potential of contributing to herbicide resistance of target plants. This indirect effect can be minimized using herbicides with different modes of action and/or using tank mixes of different herbicides.

Alternative B

Under Alternative B, only ground application of herbicides and non-herbicide management would be allowed. Treatments would be primarily limited to the drier and more accessible portions of the Complex. Invasive vegetation located in rough-terrain or inaccessible portions of the Complex would remain largely untreated and their populations would continue to expand across their respective habitats throughout the Complex. Cattail expansion would continue to eliminate open water habitat, reduce native plant diversity, and negatively impact wetland dependent wildlife species. Undesirable woody vegetation and other invasive grasses and forbs would continue to expand in both presence and size, outcompeting native grassland and wet meadow communities, and altering the habitat suitability for resources of concern. Ultimately, desirable habitat would continue to be degraded, leading to a decline in wildlife use and abundance across the Complex.

Disturbance to wildlife and short-term displacement would occur while performing non-herbicide management and while applying herbicide from the ground and traveling to and from application sites. Soil and desirable vegetation impacts could be observed on the ground from equipment tires or tracks. The disturbance would be temporary, lasting approximately the

amount of time it would take for treatment application. Under most circumstances, ground-based management will have a longer application timeframe and therefore have a greater disturbance impact, compared to aerial application.

Threatened and Endangered Species, and Other Special Status Species

Affected Environment

Description of Affected Environment for the Affected Resource

Currently there is one federally endangered species, four federally threatened species, and one candidate species that may occur on the Complex 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.

- Dakota Skipper *(Hesperia dacotae)*, Threatened; Clay, Norman, and Polk counties
- Gray Wolf (*Canis lupis*), Threatened; Becker, Mahnomen, and Polk counties
- Northern Long-Eared Bat (*Myotis septentrionalis*), Threatened; Becker, Clay, Norman, Mahnomen, and Polk counties
- Poweshiek Skipperling (*Oarisma poweshiek*), Endangered; Clay, Mahnomen, Norman, and Polk counties; Critical Habitat: Critical Habitat, Minnesota Unit #20
- Western Prairie Fringed Orchid *(Platanthera praeclara)*, Threatened; Clay, Norman, and Polk counties
- Monarch Butterfly (*Danaus plexippus*), Candidate; Clay, Norman, Polk, Becker, Mahnomen

Dakota skipper

The Dakota skipper is listed as a Threatened species in Clay, Norman, and Polk counties within the Complex. The Dakota skipper occurs in two types of habitats; both found on isolated tracts within the Complex. The first is relatively flat and moist native bluestem prairie, in which three species of wildflowers are usually present and in flower when Dakota skippers are in their adult (flight) stage - wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*), and smooth camas (*Zygadenus elegans*). The second habitat type is upland (dry) prairie that is often on ridges and hillsides. Bluestem grasses and needlegrasses dominate these habitats and three wildflowers are typically present in high quality sites that are suitable for Dakota skipper: narrow-leaved purple coneflower (*Echinacea angustifolia*), upright prairie coneflower (*Ratibida columnifera*) and blanketflower (*Gaillardia* sp.).

Gray wolf

The gray wolf has been relisted as Threatened in Becker, Mahnomen, and Polk counties within our Complex. Wolves use mostly forested habitats but may be found in the open areas as well.

Northern long-eared bat
The northern long-eared bat (NLEB) is listed as a Threatened species in Becker, Clay, Mahnomen, Norman, and Polk Counties within the Complex. NLEB winter habitat occurs in locations with underground caves and cave-like structures. Summer roosting and maternity habitat includes live and dead trees >3" dbh, either under bark, in cavities, or crevices and hollows, in a variety of forested habitats. Individual suitable roost trees typically occur within 1000ft of other forested habitat. Over 35 species of trees have been identified as being used by the NLEB. There is logical evidence to suggest that NLEBs are not considered long-distance migrants and typically travel 40-50 miles between winter hibernacula and summer habitat (Interim Conference and Planning Guidance, USFWS 2014); however, they have been known to travel distances of 160 miles or more.

Poweshiek skipperling
The Poweshiek Skipperling is listed as an endangered species in Clay, Mahnomen, Norman, and Polk counties within the Complex. Poweshiek skipperlings prefer high quality mesic to wet prairies, which include the following species: black-eyed Susan (*Rudbeckia hirta*), smooth ox-eye (*Helianthus helianthoides*), stiff tickseed (*Coreopsis palmata*), palespike lobelia (*Lobelia spicata*), sticky tofieldia (*Triantha glutinosa*), or shrubby cinquefoil (*Dasiphora fruiticosa ssp. floribunda*). Graminoid dominants include prairie dropseed (*Sporobolus heterolepis*), little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), and mat muhly (*Muhlenbergia richardsonis*).

Western prairie fringed orchid
The western prairie fringed orchid (WPFO) is listed as Threatened in Clay, Norman, and Polk counties within the Complex. Preferred habitat is unplowed, calcareous prairies and sedge meadows; plants have also been observed in successional communities such as borrow pits, old fields, and roadside ditches. The major historical cause of the species' decline was conversion of habitat to cropland. Hydrologic changes that draw down or contaminate the water table may also adversely affect the species. Other land management practices such as burning, grazing, and mowing may affect the species depending on their timing, frequency, and intensity. However, some disturbance may be important for establishment.

Monarch butterfly
The monarch is a newly designated Candidate Species in Becker, Clay, Norman, Mahnomen, and Polk Counties. It is one of the most distinguishable butterfly species in North America; however, monarch numbers have declined significantly over the past two decades. An extensive status assessment was completed by the Service in 2020, which determined that listing the monarch under the Endangered Species Act is warranted but was precluded at that time. Widespread habitat loss and fragmentation is believed to be one of the contributing factors of the

species' decline. Monarchs rely on milkweed plant species as their obligate host plant to lay eggs on.

Description of Environmental Trends and Planned Actions

Dakota Skipper
To date, no Dakota skippers have been identified on Service-administered lands within the Complex; however, they are present on adjacent state lands/natural areas. There is no Dakota Skipper Critical Habitat directly adjacent to Service-administered lands within the Complex

Gray wolf
Gray wolves have healthy populations throughout the Complex, limited monitoring is conducted by Complex staff, however the Minnesota Department of Natural Resources (MN DNR) reports that populations are increasing, and their range is expanding.

Northern long-eared bat
To date, no known NLEBs have been documented on Service-administered lands in the Complex, and old records of bat surveys conducted by the MN DNR also do not show any occurrences. In addition, as of April 1, 2018, the nearest documented roost tree is in northeast Becker County, > 20 miles away from the nearest WPA in the Complex.

Poweshiek skipperling
The Poweshiek Skipperling has only been found in the southern portion of Fuglie North WPA during a single instance in 1994 and is considered extirpated from this site. Critical Habitat is located on Melvin Slough WPA in Polk County (as part of Critical Habitat Unit #20) and adjacent to Zilmer WPA in Clay County. No other Critical Habitat is found directly adjacent to any Service lands within the Complex.

Western prairie fringed orchid
WPFOs are regularly found in four separate locations within Glacial Ridge NWR. These include the Four Square Mile, Dugdale, Hermann Ridge, and Godfrey units. Known locations of WPFOs at Glacial Ridge NWR are monitored by staff annually. Additionally, areas that support primary and secondary "potential" (habitat) for WPFOs on the Refuge and some WPAs in the District are all monitored on an approximately three-year rotation. Flowering plants fluctuate on an annual basis and are suspected to be correlated with the amount of precipitation from the previous year (Sieg and King 1995) and surface soil moisture from the previous and current year (Pleasants 1995).

Monarch butterfly
Monarchs are found throughout the Complex in a variety of habitats. Limited monitoring has been conducted on this species or the milkweed it requires as a host plant. The monarch is susceptible to loss of milkweed through indiscriminate herbicide use in agriculture and loss of habitat (Thogmartin et al. 2017).

Impacts on Affected Resource
Alternative A
Under the No Action and Proposed Alternative, herbicide application would continue to occur using aerial application equipment in addition to other ground-based methods. Two butterfly species, the Dakota skipper and Poweshiek skipperling, and WPFO typically require unplowed native prairie. When applying herbicides in native prairie, we use caution to spot spray only the target species or we use cultural control (hand-pulling) or biological control to avoid damaging the native plants. The third butterfly species, the monarch butterfly, is more of a generalist as milkweed plants can grow in multiple habitats. Mid-summer treatment of invasive broadleaf weeds is primarily administered via spot-spray using backpacks or all-terrain vehicles and care is taken to only spray target species intermingled with native forbs. Aerial herbicide application via a boom or boomless broadcast system would only be prescribed in situations where large monocultures of a target species exist. The minimal impacts to monarch butterflies are likely to be mediated by increased plant diversity and overall habitat quality improvements. Aerial spraying would allow for more acres of undesirable and invasive species to be controlled across the Complex leading to habitat more suitable for greater suite of species. Therefore, it is not anticipated that these three butterfly species or WPFO would be impacted by this action.

The population of gray wolves within the Complex and surrounding area is healthy. Wolves use mostly forested habitats but may also be found in the open areas where we are applying chemicals within the Complex. Most chemicals are rain-fast in one hour, and reentry for humans is immediately once dry or up to 48 hours. The chemicals are not being applied to any food items that the wolves may eat or ingest. Although wolves may be in the areas where chemicals are being applied, no impacts are expected to a large mammal such as a wolf from these applications.

No impact to NLEBs is expected from these actions as they are not known to be present in within the Complex. Additionally, the Complex developed a local policy to refrain from cutting or applying herbicides on forested sites (trees greater than3 inch diameter at breast height) from April 15 to August 1, which would prevent the disturbance to any maternity tree on Complex lands.

Under the No Action and Proposed Alternative, aerial herbicide applications would be combined with ground-based methods could have cumulative effects. Following combined treatments, a

reduction in plant and invertebrate abundance and diversity could occur. Such reductions would be localized but could alter the food and cover requirements for threatened and endangered species and result in displacement as organisms move to other areas on the Complex to locate necessary habitat requirements. Such cumulative effects are expected to be temporary, lasting no more than one year as the habitat recovers from unaffected perennial root stock, seed bank resources, and immigration from surrounding untreated sites. As noted above, cumulative impacts can be negated through timing of management options, amount, and location of treatments to minimize or eliminate the compounding influence of multiple management programs.

Maintaining the Complex's plant and structural diversity maintains its resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of continued herbicide use. Indirectly, maximizing habitat diversity on the Complex maximizes insect diversity including pollinators. Improved pollination directly benefits plants and increased insect diversity has trophic level, cumulative benefits. Continued aerial herbicide use has the potential of contributing to herbicide resistance of target plants. This indirect effect can be minimized using herbicides with different modes of action and/or using tank mixes of different herbicides.

Alternative B

Under Alternative B, direct impacts for the Dakota skipper, gray wolf, NLEB, Poweshiek skipperling, and WPFO would be comparable to the Alternative A above. When utilizing ground-based herbicide application equipment and other methods, potential for unintentional damage exists for non-target plant species, such as milkweed species, which may be impacted either by herbicides, incidental take via equipment, or trampling of plants during application. This may further impact monarch butterflies. The minimal impacts to non-target species are likely to be mediated by increased plant diversity and overall habitat quality improvements where treatments could occur.

The effects of discontinuing aerial herbicide use on threatened and endangered species would be mostly indirect. The habitat structural changes and conversions detailed above would be caused by uncontrolled succession, which would be an indirect effect of discontinuing aerial herbicide use in accessible areas. Conversion of habitats to monotypic stands of invasive species would greatly reduce the Complex's diversity. The loss of plant and structural diversity would reduce the Complex's resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of discontinued herbicide use

Habitat and Vegetation (including vegetation of special management concern)

Affected Environment

Description of Affected Environment for the Affected Resource

The Complex is situated within three ecological provinces, the Tallgrass Aspen Parklands, the Prairie Parkland, and the Eastern Broadleaf Forest. Within these provinces, a diversity of habitats is present, including:

Upland Prairie/Wetland Prairie

Upland (Tallgrass) prairie/prairie wetland once covered one-third of Minnesota or nearly 18 million acres (Sampson and Knopf, 1994). It is a fire-maintained system that occupied a variety of landforms from topographic beach ridges and morainal hills to lower lake beds, draws and swales (MN DNR 1988). Along with fire, prairies were also highly influenced by large and small mammals, as well as the climate. The dominant vegetation of the prairie is grasses and forbs. Prairie grasses and forbs separate along soil moisture gradients related to topography. Along the margins of wetlands and in wet-mesic prairies, prairie cordgrass (*Spartina pectinata*) and bluejoint grass (*Calamagrostis canadensis*) are two of the dominant species. Moving to more mesic soils, big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorgastrum nutans)* are the characteristic species. On hilltops or in sandier soils, prairie dropseed (*Sporobolus heterolepis*), little bluestem (*Schizachyrium scoparium*), porcupine grass (*Stipa spartea*) and side oats grama (*Bouteloua curtipendula*) are the most abundant grasses.

The diverse set of prairie forbs is dominated by two families: asters and legumes. These include asters *(Symphyotrichum spp),* blazingstars *(Liatris spp),* sunflowers *(Helianthus spp),* coneflowers *(Ratibida spp),* and goldenrods *(Solidago spp).* Legumes include prairie clovers *(Dalea spp)* and vetches *(Astragalus spp* and *Vicia spp).* Common woody shrubs include western snowberry *(Symphoricarpos occidentalis),* red osier dogwood *(Cornus sericea),* and wild plum *(Prunus spp).* Throughout the prairies of western Minnesota, there is an interspersion of numerous depressional (pothole) wetlands. These wetland communities were historically dominated by sedges and rushes, as opposed to grasses of the uplands.

Aspen Parkland

Aspen Parklands formed the ecotone or transition area between the tallgrass prairies and coniferous forests in the northern portions of the Complex. Vast acres of poorly drained prairies, wet meadows and aspen groves situated between forests and open tallgrass prairies created the ultimate tension zone. Where fire could not reach, shrub thickets and aspen groves - often called brush prairie - persisted. During times of drought coupled with fire, open prairies and meadows won the battle. Even today, this ecotonal habitat type is never static. Many of the same grasses, forbs, sedges and rushes characteristic of the prairie/wetland habitats are also prominent in the Aspen Parkland environment.

Oak Woodland and Brushland

The oak woodland and brushland is the ecotonal type between the tallgrass prairies and deciduous forests in the eastern (and portions of the southern) part of the Complex. The other ultimate tension zone, vegetation communities were highly influenced by fire and soils. They varied from the savanna-like structure of large open-grown oaks (primarily bur oak, *Quercus macrocarpa*) with understory openings of tallgrass prairie to a more chaparral-like scrub forest/dense shrub community (MN DNR 1988). Once again never static, this ecotone shifted during times of climatic events, as well as surges in fires and large and small mammals. Herbaceous vegetation in sun-drenched areas often resembles that of tallgrass prairie. However, important components of the savanna understory include sedges and woodland forbs, as well.

Maple-Basswood Forest

The Maple-Basswood Forest, commonly referred to as the "Big Woods", occurs at the far western edge of the deciduous forest biome of North America (MN DNR 1988). Elm (*Ulmus americana*), basswood, (*Tilia americana*) sugar maple (*Acer saccharum*) and red oak (Quercus rubra) are the dominant tree species and are all highly sensitive to fire. Because fire-maintained habitats (prairies and oak woodland/brushland) formed the western boundary of the Maple-Basswood Forest, natural firebreaks such as rivers, lakes and topography prevented fire's spread from the west allowing the Forest to prevail.

Great Lakes Pine Forest

The Great Lakes Pine Forest typically occurred in areas with gravelly moraines and sandy outwash plains or on thin glacial till over bedrock (MN DNR 1988) in north-central and extreme northern Minnesota, respectively. Two characteristic trees prevail: the eastern white pine (*Pinus strobus*) and the red pine (*Pinus resinosa*). Species and age were defined by the frequency of fire; in times where fire was prevalent, jack pine (*Pinus banksiana*) and young red pine persisted along with old growth white pine. In general, white pine were found on more mesic sites less prone to fire, while red pine was found on dry, more fire-prone sites.

Description of Environmental Trends and Planned Actions

Minnesota has lost most of its prairie/wetland complexes and other associated habitats, largely due to the conversion to row-crop agriculture (Samson and Knopf 1994 and Minnesota Prairie Conservation Plan Working Group 2018). In the future, the primary threats to these habitats include land conversion, development, mining, invasive species, unmanaged grazing practices, energy development, climate change, nutrient overload, and insecticides and herbicides (neonicotinoids, organophosphates, and pyrethroids which are problematic for pollinators) according to the Minnesota Prairie Conservation Plan.

Impacts on Affected Resource

Alternative A

The continuation of aerial herbicide application under the No Action and Proposed Alternative will allow for larger, more remote patches of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species to be treated annually across the Complex. Aerial application will allow for efficient application, more even coverage, reduced levels of overspray, and increased safety for the applicator. This alternative would maximize the Complex's ability to control and prevent the expansion of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species by promoting not only suitable, but desirable habitat for wildlife species. This alternative would be expected to directly benefit the habitats of the Complex.

Potential negative effects of herbicide treatments would be indirect and include herbicide inadvertently being applied to non-target plants while treating invasive species and other undesirable vegetation. The greatest potential for non-target effects occurs when herbicides are applied aerially. This is because the potential for drift is much higher for aerial herbicide applications. Numerous mitigation strategies for non-target damage will be used during aerial applications, including drift control agents, low wind speeds, and adequate buffers.

The Complex has a long history of aerial herbicide application without incident. Since 2015, over 3,000 acres of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species have been aerially treated throughout the Complex using a variety of herbicides. The potential for non-target effect has been analyzed as part of the labeling process for all herbicides and measures to minimize those effects, including restrictions, are included in the product label. Since pesticide labels are legally enforceable and must be followed, the potential for indirect negative effects on forests, grasslands, and wetlands are expected to be very minimal. This potential negative effect is further minimized by the Complex following regionally approved BMPs and all PUPs being reviewed and approved as detailed above. The indirect benefits of herbicide applications through improved habitat diversity and health are expected to benefit forests, grasslands, and wetlands.

Under the No Action and Proposed Alternative, aerial herbicide applications would be combined with non-herbicide methods like prescribed fire and could have cumulative effects. Following combined treatments, a reduction in plant abundance and diversity could occur. Such reductions would be localized but could result in a reduction in habitat quality. Such cumulative effects are expected to be temporary, lasting no more than one year as the habitat recovers from unaffected perennial root stock, seed bank resources, and immigration from surrounding untreated sites. As noted above, cumulative impacts can be negated through timing of management options, amount,

and location of treatments to minimize or eliminate the compounding influence of multiple management programs.

Maintaining the health and diversity of the habitats within the Complex maintains its resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of continued herbicide use. Continued aerial herbicide use has the potential of contributing to herbicide resistance of target plants, as the aerial application of herbicides would allow for larger areas to be treated more efficiently. This indirect effect can be minimized by using herbicides with different modes of action and/or using tank mixes of different herbicides.

Efficiency gains during application should result in less chemical being used and therefore less exposure to non-target plants and wildlife over time. The risk of damage to non-target plant species may be elevated; however, this can be mitigated with the proper prescription of this method. Disturbance to the ground and vegetation, such as rutting from equipment in wet areas, would not occur. This Alternative will provide the proper tool to meet the habitat goals of the Complex.

Alternative B

Under the Alternative B, only ground application of herbicides with truck, tractor, ATV/UTV, amphibious vehicle or hand sprayers would be allowed in addition to other ground-based methods. Treatments would be primarily limited to the drier, smoother terrain portions of the Complex. Invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species located in the inaccessible portions of the Complex would remain largely untreated, continuing to provide a seed source that will promote expansion to new areas within the Complex. Prairie habitats that contain woody vegetation that is too dense or large to treat with ground equipment would remain largely untreated or would be limited to hand application in small, select areas. Ground pressure from heavy equipment would increase soil compaction and could potentially create ruts in wet areas. In some cases, amphibious tracked vehicles may be used; however, these vehicles are costly to operate and soil compaction and rutting would also occur.

The amount of area treated annually using ground spraying applications is limited due to the time required to treat an area. Additionally, 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 the need to avoid obstacles. There is also chance for overlap due to difficulties in navigating terrain and vegetation features leading to the application of more herbicide than initially planned. Furthermore, the increased duration of application and the increased amount of chemical used, elevates the chemical exposure to the applicator.

Under the Alternative B, wildlife habitat will continue to degrade in some areas with the limited application of ground spraying. The effects to the Complex's habitats would be indirect, more specifically large expanses of monotypic stands would remain untreated and would continue to spread. Hybrid cattail would further decrease the amount of open wetland habitat and the extent of desirable aquatic vegetation would continue to decline. In prairie habitats, undesirable woody vegetation and invasive species in prairie habitats will continue to outcompete native plant species, thus reducing the amount of available habitat to prairie-obligate species. The loss of plant diversity would reduce Complex's resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of discontinued herbicide use.

Geology and Soils

Affected Environment

Description of Affected Environment for the Affected Resource

Minnesota uses a hierarchical ecological classification system (ECS). The ECS "is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features…" and "…uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation" (MN DNR 2005). Using this system, about 2/3 of the Complex is in the Prairie Parkland Province, while the remaining 1/3 lies almost equally divided among the Tallgrass Aspen Parkland, the Eastern Broadleaf Forest, and the Laurentian Mixed Forest Provinces. At the Subsection level, the Laurentian Mixed Forest Province within the Complex gets divided into "Pine Moraines and Outwash Plains" and "Chippewa Plains". A wide variety of soil types are present in these provinces that comprise the Complex, including:

The Tallgrass Aspen Parklands Province - Aspen Parkland Subsection

Soils of the Aspen Parkland Subsection range from loams and silts to sands and gravels. Calcareous fens and saline seeps occur at the base of sand dunes and beach ridges. These soils are classified as Entisols (Psamments and Aquents), Histosols (Hemists), and Mollisols (Aquolls) (Cummins and Grigal 1981). On the water-worked till plain, soils are generally loamy. The till often contains large boulders that restrict land use (Cummins and Grigal 1981). In places, till is partially mantled with lacustrine sands, silts, and clays.

Prairie Parkland (PPA) Province - Red River Prairie Subsection

The soils of the Red River Prairie Subsection are poorly, somewhat poorly, and moderately well-drained lacustrine clays, silts, and sands. They are primarily Mollisols; Cummins and Grigal (1981) mapped most of these soils as Aquolls (wet Mollisols). Borolls (cold, dry Mollisols) are also common. Most of the poorly drained soils have been ditched and drained for agricultural

use. Saline soils are present in localized areas. Dry, sandy and gravelly soils are characteristic of the beach ridges present throughout the subsection.

Eastern Broadleaf Forest Province - Hardwood Hills Subsection
The soils of Hardwood Hills Subsection range from loamy sands and sandy loams on outwash plains to loams and clay loams on moraines. Loamy soils are prevalent. Most are classified as Borolls (cold well drained soils developed under grassland) and Aquolls (wet soils developed under grassland), with some Udolls (dry soils developed under grassland, with soil temperatures warmer than Borolls). There are some Alfisols (soils developed under forested or savanna conditions) (Cummins and Grigal 1981).

Laurentian Mixed Forest Province – Pine Moraines and Outwash Plains and Chippewa Plains
The soils of the Pine Moraines and Outwash Plains and Chippewa Plains range from sandy to clayey, most in the Alfisol, Entisol, or Histosol orders. On the moraines, soils range from sands to loam and tend to be well to moderately well drained and are classified as Boralfs. On the outwash plains, the soils are sandy and excessively well drained. The soils are classified as Psamments and Aquents.

Since the Complex limits soil compaction/disturbance and manages habitats to maximize diversity whenever possible, soil health on Complex lands is expected to be very good. This combined with the soil characteristics noted above, indicates herbicide absorption and decomposition on Complex lands should be very good.

Description of Environmental Trends and Planned Actions
The soils and geology of Complex lands are not expected to change in the future.

Impacts on Affected Resource
Alternative A
Under the No Action and Proposed Alternative, invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species would be treated with herbicide using both aerial and ground-based methods. This alternative would maximize the Complex's ability to control and prevent the expansion of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species on a large scale and in inaccessible areas. Although the differences between this alternative and Alternative B may be negligible, this alternative would be expected to maximize soil health on the Complex. This would be an indirect effect of maximizing plant diversity within the habitats on the Complex. Additionally, invasive plants can have direct negative effects on soil health (Weidenhamer et al. 2010, Gibbons et al. 2017, Teixeira et al. 2020) so efforts to control them would indirectly benefit soils.

Herbicides have the potential to negatively affect the health and diversity of microorganisms, which is directly related to soil health. The effects of pesticides on soil health have been poorly studied and those used for agriculture have received the most study (Gunstone et al. 2021). Although results appear highly variable, depending on the chemical and soil characteristics, what is consistent is healthy soils help with absorption and breakdown of pesticides. Best management practices aimed at minimizing herbicide contact with soil is likely the best tool to mitigate any threats to soil health and include minimizing soil compaction/disturbance, maximizing plant diversity, and maintaining permanent plant cover. Extra precaution is used when applying herbicides to sandy or well drained soils to minimize any herbicide to soil contact that may have detrimental effects to soil health.

Under the No Action and Proposed Alternative, herbicide applications would be combined with other non-herbicide methods like prescribed fire and could have cumulative effects. Following combined treatments, a reduction in plant abundance and diversity could occur. Such reductions would be localized but could result in a reduction in habitat quality. Such cumulative effects are expected to be temporary, lasting no more than one year as the habitat recovers from unaffected perennial root stock, seed bank resources, and immigration from surrounding untreated sites. The cumulative effect of fire and herbicide to control invasive plants has been shown to increase soil nitrogen and net nitrogen transformation rates, which improves native plant performance and diversity (Rhoades et al. 2002). As noted above, cumulative impacts can be negated through timing of management options, amount, and location of treatments to minimize or eliminate the compounding influence of multiple management programs.

Maintaining the Complex's soil health maintains its resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of continued herbicide use. Continued herbicide use has the potential of contributing to herbicide resistance of target plants. This indirect effect can be minimized using herbicides with different modes of action and/or using tank mixes of different herbicides.

Alternative B

Under this alternative, aerial herbicide application would be discontinued, and only ground-based herbicide application and other management methods would be used. This alternative would result in the direct effect of ground disturbance during ground herbicide applications and is expected to be a short-term effect. Soil health benefits would be observed under this alternative but may be more limited when compared to the No Action and Proposed Alternative, due to the limited scope of treatment in accessible areas. A reduction in application area would result in a conversion of habitats to monotypic stands of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species in remote areas, which would likely

result in a reduction in soil health. Invasive plants alter soil chemistry, microbial, and mycorrhizal fungal communities increasing the difficulty of restoration activities with native plant species (McNeish and McEwan 2016, Rai 2022). Invasive plants tend to have less robust root systems resulting in an increase in soil erosion in areas with heavy infestations (Rai 2022). The effects of limiting herbicide to only ground based equipment on Complex habitats would be mostly indirect with invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species altering soil health. The loss of plant diversity would reduce the Complex's resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks.

Water Quality

Affected Environment

Description of Affected Environment for the Affected Resource

The retreat of the Wisconsin glacier left approximately 25 million depressional wetlands of all shapes and sizes in the Prairie Pothole Region (PPR). A variety of typical wetland types are found throughout the Complex, defined by soil type, duration of standing water, and vegetation communities. Some are fed by groundwater, but most are fed by rain and snowmelt. Temporary and seasonal wetlands, those that hold water for a few days to a couple months after thaw, make up the greatest number but the least acreage of the wetland types. Semi-permanent and permanent wetlands, which typically hold water for an entire growing season or longer, are found at lesser densities but have the most surface acres of water (Stewart and Kantrud 1971; Kantrud and Stewart 1977). The later are considered groundwater discharge wetlands and are fed at least partially by groundwater.

Description of Environmental Trends and Planned Actions

Factors related to water quality are not expected to change in the future. This includes depth to groundwater, location of wetlands, streams, impoundments, soil characteristics, and the influx of agricultural chemicals from offsite agricultural lands.

Impacts on Affected Resource

Alternative A

Under the Alternative A, the aerial application of herbicides will allow for the treatment of more habitat and will help mitigate the degradation that the invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species are causing. The reduction and prevention of further establishment of these species will result in an increase of habitat available for priority resources. Furthermore, maintaining healthy diverse ground cover indirectly benefits water quality because that vegetation filters water before it gets to surface water and/or groundwater.

Potential negative effects of aerial herbicide treatments would be indirect and include herbicide

inadvertently dripping off target plants and leaching through the soil into groundwater and/or running off into nearby surface waters. Large scale aerial application of herbicides could affect water quality, but this can be easily mitigated by applying only those herbicides approved for specific sites. Impacts can be further mitigated by timing of herbicide application. For example, most herbicide applications near temporary or seasonal wetlands would be made from late summer to early fall when the wetlands are dry. When herbicide applications are near or over water, herbicide use would be restricted to those approved for use over or near water. The Complex has a long and diverse history of aerial and ground-based herbicide application, and no groundwater or surface water contamination has been observed.

The potential for groundwater and surface water contamination has been analyzed as part of the labeling process for all herbicides and measures to minimize those effects, including restrictions, are included in the product label. Since pesticide labels are legally enforceable and must be followed, the potential for groundwater or surface water contamination is expected to be very minimal. Additionally, the Complex has healthy soils to absorb and decompose herbicides and extra precaution is taken and alternative treatment methods are analyzed if a site has a shallow depth to groundwater.

Under the No Action and Proposed Alternative, herbicide applications would be combined with non-herbicide methods like prescribed fire and could have cumulative effects. Following combined treatments, a reduction in plant abundance and diversity could occur. Such reductions would be localized but could result in a reduction in habitat quality. Prescribed fire often removes protective vegetation from the soil surface, thus resulting in a potential for increased siltation of water resources. The cumulative effect of using herbicides with prescribed fire could potentially increase both siltation and chemical contamination of water resource. Timing the use of fire to minimize root damage to native vegetation would assure minimal siltation. Furthermore, following herbicide label instruction accordingly would ensure undesirable vegetation control can be achieved through minimal runoff into water resources. Such cumulative effects are expected to be temporary, lasting no more than one year as the habitat recovers from unaffected perennial root stock, seed bank resources, and immigration from surrounding untreated sites. As noted above, cumulative impacts can be negated through timing of management options, amount, and location of treatments to minimize or eliminate the compounding influence of multiple management programs.

Aerial herbicide applications would allow for areas to be treated more efficiently, which would result in less chemical used over time. Maintaining the Complex’s health and diversity of its habitats helps maintain its resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex’s environmental health and would be a cumulative effect of continued herbicide use.

Alternative B

Under the Alternative B, the chemical treatment of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species would be limited, and the Complex would rely on ground-based herbicide application and other non-herbicide methods. This limitation would allow problematic populations to further expand along wetland edges and in the instance of cattail, form large dense mats. Large cattail invasions contain a significant amount of vegetative mass which alters the habitat and lowers the amount of water the wetlands can hold due to displacement. This reduces the capacity of the wetlands within the Complex, affecting not only the ability to capture water during spring snow melt and significant rain events, but also the amount of water available for aquatic plants and wildlife.

Under this alternative, encroachment of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species would likely result in a reduction in plant diversity. The effect of discontinuing aerial herbicide application could result in conversion of habitats to monotypic stands of invasive species, and this could affect water quality through diminished water filtration. The loss of plant diversity would reduce the Complex's resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of discontinued aerial herbicide use.

Visitor Use and Experience

Affected Environment

Description of Affected Environment for the Affected Resource

Complex lands are open to wildlife observation, photography, environmental education, and interpretation. Most of the Complex is open to hunting and fishing with a few exceptions in select areas. These uses occur frequently throughout the Complex and can receive a high amount of visitation during hunting seasons or migration events. The Complex estimates public use via the Refuge Annual Performance Plan report. Based on those data, the Complex typically has around 41,075 annual public use visits across the District and the three refuges. The Complex as a whole, receives a moderate number of annual visitors throughout the year if compared to Refuges in the Midwest that receive a high number of annual visitors, such as Sherburne NWR with 93,542 annual visitors or an urban refuge like Minnesota Valley NWR with 780,000 annual visitors.

Description of Environmental Trends and Planned Actions

Wildlife dependent recreation is expected to increase on the Complex in the future. This trend is not unique to the Complex and is a result of increasing population density and development.

Impacts on Affected Resource
Alternative A
Under the No Action and Proposed Alternative, invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species would be treated using aerial or ground application methods. This alternative would maximize the Complex's ability to control and prevent the expansion of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species.

Aerial application and ground-based application of herbicide will result in a temporary closure of the treatment areas when that area would otherwise be open for public use. The length of closure is dependent on the herbicide being applied and is detailed as the "*Restricted Entry Interval*" on the product label. Because the restricted entry interval is detailed in the product label, it is a requirement. The restricted entry interval for most herbicides is "Until Dry," but some are as restrictive as 48 hours. Areas would be closed where needed at least 24 hours prior to treatment and remain closed for the restricted entry interval. The preferred timing of aerial herbicide treatment typically falls outside of peak public use. All closures would be posted with signs indicating ongoing herbicide treatment.

Under the No Action and Proposed Alternative, herbicide applications would be combined with non-herbicide methods like prescribed fire and could have cumulative effects. Following combined treatments, a reduction in plant abundance and diversity could occur. Such cumulative effects are expected to be temporary, lasting no more than one year as the habitat recovers from unaffected perennial root stock, seed bank resources, and immigration from surrounding untreated sites. As noted above, cumulative impacts can be negated through timing of management options, amount, and location of treatments to minimize or eliminate the compounding influence of multiple management programs.

The cumulative effects could both positively and negatively impact wildlife viewers and hunters. Treatments to monotypic cattail stands will promote hemi-marsh conditions and provide an increase in hunting opportunities for wildlife viewers and duck hunters. However, the reduction of trees and shrubs would reduce the amount of screening structure in the treatment areas. Wildlife viewers and hunters could potentially find fewer locations in which to conceal themselves.

This alternative would result in the desired habitat diversity and structural conditions detailed above, which would improve conditions for wildlife and therefore wildlife-dependent recreation. Maintaining the Complex's health and diversity of its habitats helps maintain its resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect

of continued herbicide use, both aerially and ground-based application methods. Continued herbicide use has the potential of contributing to herbicide resistance of target plants. This indirect effect can be minimized using herbicides with different modes of action and/or using tank mixes of different herbicides.

Alternative B

Under this alternative, only ground based herbicide applications would occur. The same entry restrictions and area closures would occur as described above in the No Action and Proposed Alternative. Herbicide treatment would likely only occur in accessible areas and on a small scale. The encroachment of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species would likely result in a reduction in plant diversity. The effects of discontinuing aerial herbicide use on the habitats of the Complex would be mostly indirect with invasive species and other undesirable vegetation out-competing native vegetation. Conversion of habitats to monotypic stands of invasive species would greatly reduce the Complex's diversity, which would be a direct effect of discontinuing aerial herbicide applications. The loss of plant and diversity would lead to a reduction in wildlife diversity and wildlife-dependent recreation. The loss of diversity would also reduce the Complex's resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks. This would directly affect the Complex's environmental health and would be a cumulative effect of discontinued herbicide use.

Socioeconomics

Local and Regional Economies

Affected Environment

Description of Affected Environment for the Affected Resource

Equipment manufacturing, crop farming, and wholesale trade are the major industries within the five-county boundary of the Complex. The five-county area is highly ranked within the state of Minnesota in terms of total value of agricultural goods sold. The major crops of the area include oilseed, sunflowers, small grains, sugar beet, corn, and soybean.

Description of Environmental Trends and Planned Actions

Development and industry growth is expected to remain stable or slightly increase in the future throughout the Complex. This is a result of the increasing population density around cities and towns and the popularity of aquatic recreation areas.

Impacts on Affected Resource

Alternative A and Alternative B

Treatment by either alternative, by aerial or ground application, will have little if any effect on the local and regional economies. Small businesses that supply herbicide or offer treatment will benefit from federal contracts if we require services. Potential negative effects of herbicide

treatments would be indirect and include herbicide inadvertently being applied to non-target plants while treating invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species. Care is taken during the planning process to ensure that herbicide is only applied to targeted areas and adequate buffers are in place around any boundary where ownership changes to ensure private property is not damaged. However, spray drift can occur from both ground and aerial application of herbicides. 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 Pollution Control Agency (MPCA) applicator regulations, and Service policies. Nevertheless, spray drift could potentially impact non-target areas if regulations and label directions are not followed.

Summary of Analysis

Alternative A – Continued use of Aerial Application Equipment

Under the No Action and Preferred Alternative (Alternative A), aerial herbicide application would continue to be used as another tool to control and prevent the spread of invasive cattails, undesirable woody vegetation, and other invasive species. This would be used in conjunction with other mechanical methods, prescribed fire, and water level management. Given the challenges in managing a heavily altered and fragmented landscape, aerial herbicide application is needed to effectively reduce populations of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species.

One of the main concerns for environmental impact under both alternatives is the application of herbicides and their associated risks. 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. Herbicides are regulated both by the federal government and individual states to ensure that that unreasonable risks to human health or the environment are not present. Pesticide use on Service lands requires an individual Pesticide Use Proposal (PUP) for each chemical, which specifies the target pest(s), the method of application and the timing and location of application. These PUPs can be approved (or disapproved) at the Refuge, Regional, or National level, depending on the pesticide being proposed, method of application, and site conditions. Additionally, Best Management Practices are followed during the chemical application and the application is part of an overarching pest management framework, where multiple management actions are used together to reduce and eliminate populations of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species.

Aerial herbicide application on lands within the Complex is often more efficient in both effectiveness and associated costs when compared to ground applications. This would ultimately

facilitate the treatment of larger areas on an annual basis, promoting the desired habitat conditions on Service-owned lands within the Complex.

This alternative fulfills the Service's mandate under the NWRSAA. This alternative also fulfills the purpose and mission of the District and the refuges as well as the mission of the NWRS.

Alternative B – No Aerial Spraying

Under Alternative B, only ground application of herbicide and other non-herbicide management methods would be allowed on lands within the Complex for the control of invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species. The total habitat treated under this alternative would remain small given the difficult terrain, remote locations, size, and other limiting factors. Costs per acre are also significantly more when compared to the efficiency of aerial application methods. Invasive species, narrow-leaved cattail and hybrid cattail, and undesirable woody plant species populations will continue to expand and will likely move to other areas of the Complex and adjacent private lands. As a result, more open wetland and grassland habitat will be lost, resulting in the displacement of both wildlife and native plant communities.

With this alternative the District and refuges within the Complex would not be expected to meet their purpose or mission, as habitats would eventually be degraded with invasive species and other undesirable vegetation. This would negatively affect Complex resources like migratory birds, resident wildlife, and threatened and endangered species. The loss of habitat diversity would negatively affect wildlife-dependent recreation and the Complex's environmental health. This would then limit the Complex's resilience in the face of stressors like climate change, new invasive species introductions, and disease outbreaks.

List of Sources, Agencies and Persons Consulted

Tribes, other federal agencies, state, county, and local agencies, non-governmental organizations, and other Service personnel have been invited to review the draft for this EA. Their comments will be included when provided.

List of Preparers

Benjamin Walker, Wildlife Biologist, Glacial Ridge and Rydell NWRs
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Public Outreach

This draft Environmental Assessment will be available for public review and comment for 15 days from August 15 to August 30, 2022. The draft document will be available at the Rydell NWR office (17788 349th St SE, Erskine, MN 56535) or the Detroit Lakes WMD office (1732 North Tower Road, Detroit Lakes, MN 56501), via email (rydell@fws.gov), and can be downloaded from the refuge website (https://www.fws.gov/refuge/glacial-ridge or https://www.fws.gov/refuge/detroit-lakes-wetland-management-district). Comments can be sent by email to rydell@fws.gov or to the Refuge or District office.

Determination

This section will be filled out upon completion of the public comment period and at the time of finalization of the Environmental Assessment.

- ☐ The Service's action will not result in a significant impact on the quality of the human environment. See the attached **"Finding of No Significant Impact".**
- ☐ The Service's action **may significantly affect** the quality of the human environment and the Service will prepare an Environmental Impact Statement.

Signatures

Submitted By:

Project Leader Signature

Date:

Concurrence:

Refuge Supervisor Signature

Date:

Approved:

Regional Chief, National Wildlife Refuge System Signature

Date:

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