CHAPTER 5
Conservation Strategies

This chapter provides an overview of how the District intends to achieve objectives described in Chapter 4. Because wetland management districts (WMDs) administer landscape conservation using conservation easements, enhancement and restoration of habitat on private lands via the Partners for Fish and Wildlife Program, and fee title management of waterfowl production areas (WPAs), this chapter integrates strategies aimed at maximizing the production of waterfowl and other resources of concern (ROC) at multiple scales (landscape to local). Habitat conservation on WMDs must integrate the role of the surrounding landscape to ensure that the establishing purposes of producing waterfowl while benefiting other migratory birds are met. Therefore, staff developed strategies and prescriptions that contribute to these purposes as part of a larger SHC approach outlined in Chapter 4:

- *Strategies* – specific techniques (i.e., prescribed fire or grazing) used to protect, manage, or enhance habitat to achieve objectives.
- *Prescriptions* – specific details describing how strategies will be implemented based on timing, frequency, intensity and location.

Ultimately, the District intends to use the SHC conservation design to target conservation delivery in areas with highest biological potential to contribute to the sustainability of migratory bird populations in the PPR. The strategies and prescriptions included in this HMP are linked to biological potential of different landscapes to achieve the SHC population goals and objectives that were identified by extensive review of relevant scientific literature, consultation with subject matter experts, and from evaluation of individual migratory bird species–habitat population models. Managers may need to modify actual prescriptions on fee title lands based on inter-annual variation in environmental conditions (e.g., precipitation, temperature) that influence changes in migratory bird distribution.

5.1 Conservation Units

The SHC design described in Chapter 4 has identified a range of landscape types (1A to 5; Figure 4-1) that can be used to maximize the contribution of the District to support the carrying capacity and production of waterfowl and other migratory birds with a limited set of resources. Conservation delivery during the next 15 years will follow specific objectives that relate the potential of each landscape type (1A to 5) to contribute to the SHC conservation design. The District's SHC design focuses conservation delivery at landscape and local scales using the following conservation units:

1. landscape types 1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B, 4C, and 5.
2. individual grassland tracts or wetland basins on private lands.
3. waterfowl production areas (N = 201).

At the largest scale, conservation units such as 1A landscapes under the SHC conservation design have the highest potential to support all population objectives (i.e., 15–20% nest success rates required for waterfowl population stability (Cowardin et al. 1985); contribute to waterfowl carrying capacity; high occupancy by waterfowl broods (Walker et al. 2013a); and attract high densities of upland-nesting ROCs. Whereas, landscape type 5 (<25 duck pairs/mi) has the lowest potential to attract and support waterfowl populations because these landscapes have low wetland densities. **The classes do not represent priority order from 1A to 5, rather each class may have a different set of conservation treatments that can be used by managers to contribute to the waterfowl population objectives of the SHC conservation design while benefitting other priority ROC.** Thus, utilization of landscape types as conservation units to target conservation delivery provides an effective, biologically-based means for landscape conservation on WMDs.

The District also has selected objectives and strategies that contribute to the goals of the SHC conservation design on private lands. As a conservation unit, acquiring conservation easements and restoring and enhancing habitat on private lands has the highest potential to support waterfowl and ROC and maintain existing ecosystem services because the majority of wetlands (>50%) and grasslands (>90%) in the District are privately owned. It is essential that the District continue to acquire these habitats under the USFWS easement program and work with private landowners to implement rotational grazing systems or restore wetland basins under the Partners for Fish and Wildlife Program in 1A to 4C landscapes to successfully implement SHC.

Staff decided not to reference individual management units on WPAs in this HMP (i.e., Figure 2-3). Rather, staff will develop individual WPA management plans that utilize the objectives and strategies identified in this HMP to select prescriptions based on habitat conditions occurring on individual WPAs. Management prescriptions will be adjusted as necessary on an annual basis to coincide with changes in environmental conditions.

The potential for fee title WPAs to contribute to the goals and objectives of the SHC conservation design largely depends on landscape type. Staff have intentionally selected strategies that can differ between landscape types to ensure that management of WPAs meets the habitat requirements of ROC. For example, a WPA located in a 4A landscape is highly attractive to waterfowl (Loesch et al. 2012) where production can be high in wet years (Walker et al. 2013b), but grassland-obligate migratory bird densities are low (Unpublished data, USFWS PPJV, Bismarck, North Dakota). Thus, managers in 4A landscapes could focus on wetland protection, maintaining tall, dense cover for waterfowl on WPAs, and restoring wetland basins on private lands. By incorporating realistic and strategic conservation targets, the District has selected appropriate strategies to support migratory bird populations on private lands and fee title WPAs across a range of landscape types.

5.2 Landscape-scale Conservation Strategies and

This section provides a listing of the HMP sub-goals and objectives with selected strategies that managers may use to deliver conservation at landscape scales. These strategies and prescriptions

represent a comprehensive approach to implementation of the landscape conservation approach implemented under the SHC conservation design. For each objective, a list of potential management strategies is listed and these should be considered as treatment options that can be used collectively or individually to achieve or contribute to the objective.

The District will incorporate new strategies as new scientific information is obtained through adaptive management and assumption-based monitoring and research or from relevant research studies conducted in the PPR. This iterative SHC approach is designed as a decision support tool to improve landscape-scale conservation on WMDs during the current climate of lean budgets and rapid conversion of wetland and grassland habitat. Specific prescriptions that coincide with the implementation of inventory and monitoring strategies will be identified in a step down Inventory and Monitoring Plan.

GOAL 1—LANDSCAPE CONSERVATION

Maximize the contribution of the District to the sustainability of waterfowl and other migratory bird populations in the PPR through implementation of strategic habitat conservation that targets conservation delivery within landscapes having the highest biological potential to maximize waterfowl carrying capacity, nest success, and brood occupancy, while sustaining contiguous portions of the mixed-grass prairie ecosystem for the benefit of the ROC and associated native wildlife and plant communities.

OBJECTIVE 1.1 CONSERVATION EASEMENTS

Over the next 9 years, continue to secure protected status on 100% of wetlands offered by willing landowners in wetland priority zones as identified in the North Dakota WMD CCP (USFWS 2008a) in the District that support ≥25 breeding duck pairs per square mile (1A to 4C landscapes) to contribute to maximizing the current carrying capacity for waterfowl and other wetland-dependent migratory bird populations in the Prairie Pothole Region.

Conservation Strategies and Prescriptions

- Utilize the evaluation criteria for wetland easements as identified in the CCP (USFWS 2008a) to determine acquisition priority.
- Ensure that all at-risk wetlands in landscapes having ≥60 breeding duck pairs per square mile (1A, 1B, 4A landscapes) are protected with help from willing landowners because these wetland dense landscapes are critically important to support pulses in waterfowl productivity (Walker et al. 2013b), brood occupancy (Walker et al. 2013a), and brood survival (Krapu et al. 2006, Amundson and Arnold 2011, Amundson et al. 2012).
- Contact landowners who were not interested in the wetland easement program during the initial inventory via mass mailings and phone calls at 5-year intervals or sooner if land use trends change.
- Continue to focus on protecting wetlands located in cropland in 1A to 4C landscapes to protect basins at highest risk of being drained.

- Continue to partner with Ducks Unlimited and other organizations to co-locate staff within the District that work with private landowners to protect, enhance, or restore important wetland habitats.

Inventory and Monitoring Strategies

- Annually evaluate landownership of unprotected wetlands by monitoring land sales in each county in the District and contacting all new landowners to determine their interest in the wetland easement program.
- By 2015, complete the inventory of potential landowner interest in the wetland easement program in 1A to 4C landscapes in the District.
- Annually monitor all wetland easements in the District to ensure that they are protected under the provisions of the conservation easement contracts (See wetland in easements Objective 2 in North Dakota WMD CCP (USFWS 2008a) (Appendix D).

OBJECTIVE 1.2 CONSERVATION EASEMENTS

Over the next 9 years, as funding sources become available, secure protected status on 100% of grasslands offered by willing landowners in grassland priority zones, as identified in the North Dakota WMD CCP (USFWS 2008a), in the District. Also, focus grassland protection in landscapes that have the highest potential to maximize waterfowl production (1A, 1B, 4A), support high brood occupancy rates for waterfowl, and maintain densities of ROC above mean population levels.

Conservation Strategies and Prescriptions

- Because grassland easement funding resources are limited, initially protect at-risk grasslands in priority 1A zones identified in the grassland easement evaluation criteria (USFWS 2008) and in 1A, 1B, and 4A landscapes identified in the SHC conservation design (Figure 4-1) because these areas have the highest potential to contribute to the SHC waterfowl population objectives.
- Protect all wetlands within the boundaries of any grassland easement purchased from willing landowners in the District.
- Through the Partners for Fish and Wildlife Program, develop partnerships with private landowners who may not be enrolled in the grassland easement program to increase their likelihood of protecting their land from conversion with a perpetual grassland easement.
- Contact landowners who were not interested in the grassland easement program during the initial inventory via mass mailings and phone calls at 5-year intervals or sooner if land use trends change.
- To maintain productivity of fee title WPAs, protect all wetlands and grasslands within a 10.4 km2 area surrounding each WPA in 1A and 1B landscapes because these landscapes have the highest probability of achieving the goals of the SHC approach. In 2014, resources available for grassland easement acquisition are extremely limited in North Dakota. Therefore, the District must strategically purchase grassland easements in landscapes where the biological benefits would be highest to upland nesting migratory

birds. **This strategy does not supersede acquisition of grasslands with higher breeding pairs located independently of WPAs.**

Inventory and Monitoring Strategies

- Annually evaluate landownership of unprotected grasslands by monitoring land sales in each county in the District and contact all new landowners to determine their interest in the grassland easement program.
- By 2017, complete the inventory of potential landowner interest in the grassland easement program in 1A, 1B, and 4A landscapes.

OBJECTIVE 1.3 CONSERVATION EASEMENTS

By 2017, contact 100% of landowners located in 1A to 4C landscapes within the District to determine their interest in obtaining a wetland and grassland conservation easement, conduct 100% of easement evaluations within 6 months of determining individual landowner interest, and submit 100% of completed evaluations within 2 months to the USFWS Region 6 Division of Realty for further evaluation to ensure that all potential conservation easements are purchased from willing landowners in a reasonable amount of time.

Conservation Strategies and Prescriptions

- Allocate all available staff resources to complete this wetland and grassland conservation easement inventory by 2017.
- Contact landowners who were not interested in the wetland and grassland easement program during the initial inventory via mass mailings and phone calls at 5-year intervals or sooner if land use trends change.
- Continue to use the existing system to determine landowner interest in the District until the inventory is completed. Staff will utilize a 3-step process to determine landowner interest: 1) send mass mailings to all landowners having unprotected wetlands, 2) contact each individual landowner by phone to determine their interest, and 3) send final notice letter to landowners who did not respond to the initial letter or to phone calls.
- Conduct easement evaluations immediately after crops are harvested in the fall and after the snow melts in the spring to ensure that all evaluations are completed within 6 months of determining landowner interest in the easement program.
- Continue to work closely with the Region 6 Division of Realty to ensure that all submitted easement evaluations and associated documents are efficiently processed. This strategy is necessary because landowners may change their interest in the easement program if easements are not purchased in a timely manner.

Inventory and Monitoring Strategies

- Annually evaluate landownership of unprotected wetlands and grasslands by monitoring land sales in each county in the District and contact all new landowners to determine their interest in the grassland easement program.
- Annually contact landowners on recently converted grasslands to determine their interest in the wetland easement program. Some landowners may be willing to protect wetlands on their land even if the adjacent uplands were converted for agricultural purposes. This strategy could be the last attempt by the Service to protect wetlands before they are drained.

OBJECTIVE 1.4 FEE-TITLE WATERFOWL PRODUCTION AREAS

During the next 9 years, target 80% of all habitat management activities on 136 WPAs located in 1A [n = 61], 1B [n = 72], 2A [n = 1], 2B [n = 2], 3A, and 3B landscapes that support ≥25 duck pairs per square mile and contain ≥40% grass cover within a 10.4 km^2 area that that yield ≥15-20% waterfowl nest success. Managers aim to provide diverse, heterogeneous nesting habitat that meets the habitat requirements of waterfowl (*Anas* spp.) and other ROC, including grasshopper sparrow, clay-colored sparrow, bobolink, marbled godwit, and northern harrier.

Conservation Strategies and Prescriptions

Staff would use assumption-based research and outcome-based monitoring to measure the biological return achieved from this SHC conservation design. Specific actions include:

- Test assumptions used in the SHC conservation design.
- Evaluate habitat responses to conservation actions.
- Evaluate migratory bird responses to conservation actions.
- Iteratively adapt the SHC conservation design as new scientific information is obtained.
- Develop annual work plans that allocate 80% of all management activities (i.e., native prairie restoration or reconstruction, prescribed fire and grazing) on WPAs in 1A to 3B landscapes.
- Utilize the principles of adaptive management and SHC to integrate new scientific findings into applied habitat management on WPAs located in 1A to 3B landscapes.
- By 2018, develop 5-year individual management plans for all WPAs located in 1A to 3B landscapes to increase the efficiency and continuity of restoration, reconstruction, and enhancement activities in the District.
- Continue to develop partnerships with private landowner cooperators to deliver precisely timed defoliation treatments that meet the goals and objectives outlined in this plan. For example, development of 5-year agreements would likely increase the commitment of cooperators to the terms of individual WPA plans because they could better anticipate their grazing needs within their operations compared to annual agreements.

- Focus the majority of noxious weed control efforts in 1A to 3B landscapes to limit further degradation of grasslands that are actively being enhanced, reconstructed, and/or restored using specific management treatments.

Inventory and Monitoring Strategies

- Test the assumptions of the SHC conservation design using focused research, inventories, or monitoring to adaptively administer conservation within the District. Ensure that all studies are sufficient in time and space to account for variation between landscape types.
- Monitor the effectiveness of management treatments to restore, enhance, or maintain grassland plant communities for the benefit of migratory bird populations. Monitoring should account for inter-annual variation in environmental conditions to determine the appropriate frequency, timing, and intensity of defoliation treatments. Monitoring is aimed at determining increasing or decreasing trends in native plant communities and the degree of invasion by Kentucky bluegrass or smooth brome.
- Monitor the biological response (i.e., reproductive success, density) of waterfowl and other migratory birds (e.g., ROCs) to management treatments aimed at providing suitable nesting habitat across the range of landscape types to determine their effectiveness to contribute to the goals and objectives of the SHC approach.
- By 2015, complete an accurate spatial inventory of individual habitat types (native prairie, reconstructed prairie, or seeded introduced native) to improve the efficiency of management that coincides with habitat types described in this HMP. This information also is important to create an effective biological program centered on these habitat types and to aid the Wildlife Biologist in the development of future research, inventories, and monitoring on WPAs. There are inconsistencies in existing spatial layers. Therefore, a comparative analysis of Resource Inventory Planning (RIP) cards recorded from approximately 1970 to 1985, the national vegetation classification system (NVCS) geospatial layer, evidence from each WPA management file, field verification, and institutional knowledge from managers is needed to create accurate spatial layers that can better inform management.
- By 2018, complete an inventory of native prairie ecological sites on WPAs to determine their plant community state. Variation within ecological sites can be determined using state-and-transition models. Information from these models can be used by managers to select management actions to restore the observed plant community (see Sedivec and Printz 2012).
- Monitor the effectiveness of management treatments to influence change in plant community state on ecological sites (Sedivec and Printz 2012).
- Develop focused research that evaluates potential variation in reproductive success and density of migratory birds that may occur across plant community states (see state-and-transition models; Sedivec and Printz 2012).

OBJECTIVE 1.5 FEE-TITLE WATERFOWL PRODUCTION AREAS

During the next 9 years, target 20% of all habitat management activities on 64 WPAs located in 4A [n = 51], 4B [n = 10], and 4C [n = 3] landscapes that support ≥25 duck pairs per square mile and contain <40% grass cover within a 10.4 km^2 area to maximize upland nesting waterfowl (*Anas* spp.) nest success and benefit other habitat generalist migratory birds such as Savannah sparrow and sedge wren.

Conservation Strategies and Prescriptions

- Focus management on WPAs located in 4A to 4C landscapes on maintaining dense stands of moderate to tall grassland cover through litter reduction management treatments at approximately 4-year intervals to benefit nesting waterfowl (Naugle et al. 2000a, Devries and Armstrong 2011, Bloom et al. 2013). Periodic defoliation and removal of excess litter is important to limit overabundance of prey species that attract nest predators and to maintain grassland stand vigor (Norrdahl and Korpimaki 2000, Higgins et al. 1992, Devries and Armstrong 2011).
- Utilize the principles of adaptive management and SHC to integrate new scientific findings into applied habitat management on WPAs located in 4A to 4C landscapes.
- Develop annual work plans that allocate 20% of all management activities (i.e., native prairie restoration or reconstruction, prescribed fire and grazing) on WPAs in 4A to 4C landscapes.
- By 2020, develop 5-year individual management plans for all WPAs located in 4A to 4C landscapes to increase the efficiency and continuity of restoration, reconstruction, and enhancement activities in the District.
- Conduct litter reduction management treatments (e.g., haying or fall prescribed fires) after August 1 to ensure that nesting migratory birds such as waterfowl, sedge wren, and Savannah sparrow are not adversely affected by management treatments.
- Conduct light to moderate grazing treatments to provide suitable habitat for most upland-nesting migratory birds (Salo et al. 2004) using rotational systems after June 1 to allow 50% of waterfowl to initiate nesting without disturbance by livestock (Barker et al. 1990). Range utilization under rotational grazing systems should not exceed 50% for most grassland birds (Salo et al. 2004) and 50–60% for waterfowl to ensure that suitable residual cover exists the following spring for early nesting ducks (e.g., northern pintail, mallard) (Barker et al. 1990).
- Continue to develop partnerships with private landowner cooperators to deliver precisely timed defoliation treatments such as grazing or haying that meet the objectives identified in this plan.
- Target available staff time and resources for controlling noxious weeds to highly invasive species (e.g., yellow toadflax, leafy spurge) occurring as new or small (<0.5 ac) infestations to prevent further degradation of grasslands. Managers will use their discretion to determine actual impacts to habitat and surrounding lands of limiting weed control on 4A to 4C WPAs.

Inventory and Monitoring Strategies

- Test the assumptions of the SHC conservation design using focused research, inventories, or monitoring to adaptively administer conservation within the District. Ensure that all studies are sufficient in time and space to account for variation between landscape types and years.
- Monitor the effectiveness of management treatments to restore, enhance, or maintain grassland plant communities for the benefit of migratory bird populations.
- Monitor litter accumulation on 4A to 4C WPAs at 4-year intervals to determine if management is required to maintain grassland stand vigor.
- Monitor the effectiveness of different grazing or haying treatments to remove litter and improve grassland vigor on 4A to 4C WPAs.
- By 2015, complete an accurate spatial inventory of individual habitat types (native prairie, reconstructed prairie, or seeded introduced native) to improve the efficiency of management and to aid the Wildlife Biologist in the development of future research, inventories, and monitoring on 4A to 4C WPAs.
- By 2020, complete an inventory of native prairie ecological sites on 4A to 4C WPAs to determine their plant community state. Variation within ecological sites can be determined using state-and-transition models. Information from these models can be used by managers to determine management actions to restore the observed plant community (see Sedivec and Printz 2012).
- Monitor the effects of land use change on migratory bird populations in landscapes that transition from 1B to 4A.

OBJECTIVE 1.6 PARTNERSHIPS ON PRIVATE LANDS

By 2015, partner with private landowners to annually establish a minimum of 20 rotational grazing systems on grassland tracts (≥160 acres) within 1A and 1B landscapes under the Partners for Fish and Wildlife Program to improve nesting conditions for waterfowl (*Anas* sp.) and other ROC such as clay-colored sparrow, bobolink, grasshopper sparrow, and northern harrier.

Conservation Strategies and Prescriptions

- The District will initially target rotational grazing systems on grasslands in 1A or 1B landscapes that meet the following criteria in descending order:
    1. Located on unprotected grasslands at high risk of conversion.
    2. Located on existing grassland easements.
    3. Located adjacent to WPAs or within the 10.4 km2 area surrounding the WPA.
- By 2018, contact all private landowners with grassland easements and develop rotational grazing system agreements with willing landowners through the Partners for Fish and Wildlife Program that improve the habitat structure of grasslands on private lands during the nesting season for waterfowl and other migratory birds.
- Develop similar agreements with private landowners not enrolled in the grassland easement program to maintain grassland status and improve habitat structure for nesting

migratory birds. Progressively contact landowners in 1A to 4C landscapes with unprotected, at-risk grasslands (Figure 4-13).

- Increase the availability of moderate to tall vegetation structure that is preferred by most nesting migratory birds (Barker et al. 1990, Salo et al. 2004, Bloom et al. 2013) within a 10.4 km2 area surrounding each 1A to 3B WPA by developing rotational grazing systems on private lands. Secondary benefits of implementing rotational grazing systems on adjacent private lands also may include decreases in invasion by Kentucky bluegrass or smooth brome (Dekeyser et al. 2013), improved beef production for ranchers compared to rested or overgrazed pastures (Patton et al. 2007), and improved ecological services due to enhanced range condition (Bloom et al. 2013, Werling et al. 2014).
- Inform private landowners interested in obtaining a grassland easement offer of the benefits of the Partners for Fish and Wildlife Program such as increased beef production and higher suitability to wildlife (Barker et al. 1990, Salo et al. 2004).

Inventory and Monitoring Strategies

- Monitor the implementation of rotational grazing systems along with utilization rates on private lands that are intended to improve habitat structure for the benefit of migratory bird populations.
- Conduct research to determine the biological response (i.e., density, nest density, nest success) of waterfowl and other migratory birds to different grazing systems on public and private lands.
- Annually evaluate landownership of unprotected grasslands by monitoring land sales in each county in the District and contact all new landowners to determine their interest in the grassland easement program and the Partners for Fish and Wildlife Program.

OBJECTIVE 1.7 ADAPTIVE LANDSCAPE CONSERVATION

At 5-year intervals, update the District's SHC conservation design to incorporate changes in landscape types that coincide with changes in land use trends and factors influencing the production of waterfowl and other migratory birds as part of an adaptive approach to deliver conservation in areas having the greatest biological potential to benefit resources of concern.

Conservation Strategies and Prescriptions

- Incorporate significant scientific advances in waterfowl ecology into future iterations of the SHC conservation design.
- Collaborate with USFWS HAPET and PPJV staff and other waterfowl ecologists to develop future iterations of the SHC conservation design.

Inventory and Monitoring Strategies

Incorporate findings from assumption-driven research, inventories, and monitoring activities designed to test the assumptions of the SHC conservation design into the goals and objectives in this plan.

5.3 Local-scale Management Strategies and

SUB-GOAL 2—NATIVE OR RECONSTRUCTED PRAIRIE

Maximize native vegetation diversity and composition on individual tracts of native sod and reconstructed native prairie on WPAs using adaptive management to provide heterogeneous vegetation structure required by upland-nesting resources of concern (ROC) and contribute to biological integrity, diversity, and enhancement (BIDEH) within the mixed-grass prairie ecosystem.

OBJECTIVE 2.1 NATIVE PRAIRIE

Over the next 9 years, restore 391 acres of native prairie occurring on 9 Native Prairie Adaptive Management study units using the full adaptive management process to apply appropriate and precise disturbance as recommended in each management year (September 1 to August 31), optimally increasing native plant frequency by an average of ≥1 to 5% during any 5-year interval, to increase resistance to invasion by exotic cool-season grasses, improve habitat condition for migratory birds and other prairie obligate species (e.g., pollinators), and enhance ecological services such as BIDEH on individual WPAs included in the study.

Management Strategies and Prescriptions

- Follow recommended management strategies and prescriptions for the duration of the NPAM effort to ensure that information used to test a priori restoration models is accurate.
- Conduct the majority of management treatments within NPAM-designated spring defoliation window (Table 4-2) (USFWS 2011c).
- Prioritize the limited availability of prescribed fire to NPAM units within the District. Applying prescribed fire on NPAM units is important to determine if restoration efforts are achieving desired results. Because NPAM units are managed using an intense restoration approach under an established adaptive framework, the District has the best opportunity to adapt restoration efforts on the remainder of native prairie tracts on WPAs using information obtained during this study.

Inventory and Monitoring Strategies

- Annually monitor native prairie composition on NPAM units using existing protocols (USFWS 2011c) to inform models designed to improve our understanding of factors influencing native prairie restoration.
- Collect inventories of additional biotic and abiotic datasets to include in NPAM models.

OBJECTIVE 2.2 NATIVE PRAIRIE

Over the next 9 years, restore or maintain native prairie community assemblage on native prairie occurring on WPAs located in 1A to 3B landscapes using appropriate and precise disturbance in each management year (September 1 to August 31) to provide suitable nesting habitat for waterfowl and

other migratory birds while shifting the existing native plant community towards the potential historic climax plant community state for specific ecological sites and enhancing BIDEH on individual WPAs. Specific management thresholds include:

- Intensely manage tracts with 25 to 55% native vegetation remaining to increase native plant vigor, density, and seedling recruitment and prevent further degradation within ecological sites. (Option A);
- Actively manage tracts with >55% native vegetation remaining to maintain or enhance native plant communities on ecological sites. (Option B);
- Manage tracts with <25% native vegetation remaining exclusively as nesting habitat for waterfowl and other ROCs. (Option C).

The following management strategies and prescriptions provide managers with a range of management treatments that are designed to benefit upland nesting migratory birds while attempting to restore native prairie communities. Managers can select the appropriate strategies to manage native prairie based on the amount of native vegetation remaining and community phase on ecological sites under options A, B, or C. Using this approach, managers realize that specific short-term tradeoffs exist when selecting a specific strategy over another because of the need to restore highly degraded native prairie communities (Murphy and Grant 2005, Grant et al. 2009) while providing vegetation structure preferred by most breeding migratory birds (Barker et al. 1990, Salo et al. 2004, Naugle et al. 2000a, Bloom et al. 2013). For example, intensely managing tracts to restore a degraded tract under **Option A** may require defoliation in ≥4 of 5 years and would result in short vegetation structure that is preferred by fewer upland nesting migratory birds (Kirsch et al. 1978, Kantrud and Higgins 1992, Salo et al. 2004, Fuhlendorf et al. 2006). However, there is a dire need to restore highly degraded native prairie (Grant et al. 2009) because exotic cool-season grasses can completely dominate native prairie sites causing restoration to be unlikely (Murphy and Grant 2005). Because restoration of native prairie tracts is a long-term process (i.e., 30–50 years [Grant et al. 2009]), staff have decided to use a hybrid approach for restoring prairie while providing suitable habitat for waterfowl production to meet the establishing purposes of the District. Restoration of native plant communities is important to attract diverse assemblages of birds (Murphy and Sondreal 2003), improve floristic composition (Murphy and Grant 2005), prevent further losses in ecosystem services (Hobbie 1992, Hooper et al. 2005, Jordan et al. 2008, Werling et al. 2014) and best enable mixed-grass prairies to respond to climate change (Craine et al. 2012).

Management Strategies and Prescriptions

- Utilize appropriate defoliation treatments for Options A, B, and C to provide a range of habitat structure to meet the needs for nesting ROC:
    - Waterfowl – provide 20 cm of vegetation density based on visual obstruction and 28 cm in vegetation height by late May to positively influence nest survival (Bloom et al. 2013). Option B, C.

        a. Defoliate vegetation using an intense grazing or fire treatment every 3–4 years to remove litter and maintain grassland vigor (Naugle et al. 2000a).
        b. If more frequent defoliation is desired (i.e., Option B), grazing regimes that utilize 50–60% of vegetation should ensure that suitable residual cover exists the following spring for early nesting ducks (e.g., northern pintail, mallard; Barker et al. 1990).
        c. Integrate prescribed fire as resources allow to enhance vegetation structure, but not more than twice during any 5 year period. Option B, C.
    - For marbled godwit, chestnut-collared longspur, willet and other migratory birds that prefer short vegetation structure, provide suitable nesting cover consisting of ~7 to 22 cm vegetation density and 17 to 27 cm in vegetation height (Kantrud and Higgins 1992, Salo et al. 2004) by late May each year. Option A, B, C.
        a. Defoliate vegetation using heavy to extreme grazing intensities utilizing 65–80% of vegetation in any year (Salo et al. 2004).
        b. Integrate prescribed fire as resources allow in ≤3 of 5 years.
    - For clay-colored sparrow, grasshopper sparrow, bobolink, American bittern, northern harrier, and other migratory birds that prefer moderate to tall vegetation structure – provide suitable nesting cover of ≥25 cm vegetation density and ≥28 cm vegetation height (Kantrud and Higgins 1992, Salo et al. 2004) by early June. Option B, C.
        a. Defoliate vegetation using light to moderate grazing intensities that utilize 35–50% of vegetation in any year to provide nesting habitat for most non-game, mixed-grass prairie bird species (Salo et al. 2004).
        b. Integrate prescribed fire as resources allow, but not more than twice during any 5- year period.
- Improve native plant communities within ecological sites towards the historic climax plant community (HCPC) using information derived from state-and-transition [STM] models and appropriate defoliation treatments. Option A, B.
    - By 2018, complete an inventory of native prairie ecological sites on WPAs to determine their plant community state. Variation within ecological sites can be determined using state-and-transition models. Information from these models can be used by managers to select management actions to restore the observed plant community (see Sedivec and Printz 2012).
- Modify the frequency, duration, and intensity of defoliation treatments based on native plant composition, STM of ecological site, and with annual fluctuations in environmental conditions (e.g., temperature, precipitation, soil moisture) that affect plant community phenology and vigor. Option A, B, C.
- Prevent build-up of litter with regular defoliation treatments (primarily grazing and fire) on sites dominated by exotic cool-season grasses to aid restoration efforts (Option A, B) and maintain vigor of grassland structure to benefit nesting migratory birds (Option B, C).

- Prevent litter accumulation on Kentucky bluegrass dominated sites to maintain water movement between the plant community and the soil (Weaver and Rowland 1952) and to maintain soil conditions necessary for seedling germination by native forbs (Bosy and Reader 1995). Option A, B.
- Prevent litter accumulation in smooth brome dominated sites to reduce the rate of smooth brome decomposition that alters soil nitrogen levels and proliferates its persistence (Vinton and Goergen 2006, Jordan et al. 2008). Option A, B.
- Reduce litter accumulation using a defoliation treatment a minimum of once every 3–4 years in mixed-grass prairies to maintain grassland vigor and support the production of waterfowl and other migratory birds (Voorhees and Cassel 1980, Higgins 1986, Higgins et al. 1992, Kruse and Bowen 1996, Naugle et al. 2000a). Option B, C.

- Opportunistically apply prescribed fire to disturb invasive grasses such as Kentucky bluegrass or smooth brome (Option A, B), provide heterogeneous structure (Option B, C), and reduce litter accumulation (Option A, B, C).
    - Annually prioritize fire management on Option A or B native tracts over C tracts. Utilization of fire as a restoration tool is a higher priority than for litter reduction because several options (grazing or haying) exist to reduce litter.
        a. As fire resources allow, maintain a minimum of a 5-year fire interval similar to that which evolved with mixed-grass prairies (Bragg 1995). Option A, B, C.
    - Vary the timing of fires on restored sites (>75% native vegetation composition) to increase plant species richness on native prairie. For example, the use of summer fires on restored sites has been shown to improve species richness and diversity (Towne and Kemp 2008). Improving species richness and diversity should lead to heterogeneous vegetation structure preferred by migratory birds (Salo et al. 2004, Fuhlendorf et al. 2006, Coppedge et al. 2008, Bloom et al. 2013). Option B.
    - Combine spring or fall burning with intensive spring grazing to reduce exotic cool-season grasses (Smart et al. 2010). Option A, B.
    - Utilize prescribed fire as a tool to disturb Kentucky bluegrass: Option A, B.
        a. Conduct prescribed burns during the spring (i.e., late April to mid-May) during tiller elongation (Grace et al. 2001) to reduce the frequency of Kentucky bluegrass (Knops 2006, Engle and Bultsma 1984, Hendrickson and Lund 2010).
            1. Burning may be conducted later in May on dry sites (Zedler and Loucks 1969) or during drought years to damage Kentucky bluegrass (Engle and Bultsma 1984, Nagle et al. 1994).
            2. Conduct burning when Kentucky bluegrass is 4–6 inches of height to reduce its composition in native prairies (Svedarsky et al. 1986).

        b. Conduct annual or biennial spring burning to decrease cover of Kentucky bluegrass (Knops 2006).
    - Utilize prescribed fire as a tool to disturb smooth brome: Option A, B.
        a. Conduct prescribed burns during tiller elongation (i.e., mid-May to early June) during the 4- to 5-leaf stage to reduce the density of smooth brome (Willson 1991, Willson and Stubbendieck 2000).
        b. Conduct repeated spring burns to decrease the presence of smooth brome (Willson and Stubbendieck 1997, 2000, Stacy et al. 2005).
        c. Avoid burning in early spring (April to early May) because smooth brome may increase due to increased light reaching growing leaves when litter is removed from the burn (Higgins et al. 1989, Willson and Stubbendieck 2000).
        d. Avoid burning until the subsequent year if tiller inflorescences are present (Willson and Stubbendieck 2000).
- Apply prescribed grazing on native grassland tracts to disturb invasive grasses such as Kentucky bluegrass or smooth brome (Option A, B), provide heterogeneous structure (Option B, C), or reduce litter accumulation (Option A, B, C).
    - Utilize patch-burn-graze systems as a restoration tool as fire management resources allow. For example, light stocking rates and a 3-year burn rotation can be used to promote structural diversity and increase forb abundance on sites where native composition is high (>60%) because cattle will selectively consume grasses (Helzer 2011). Option A, B.
    - Delay grazing until after June 1 each year using stocking rates that utilize 20–50% of standing forage to reduce litter accumulation and provide a mosaic of intra-field vegetation structure preferred by most migratory birds for nesting (Barker et al. 1990, Salo et al. 2004, Bloom et al. 2013). Option B, C.
    - Utilize grazing as a tool to suppress invasion of Kentucky bluegrass. Option A, B.
        a. Conduct intensive early season grazing to damage Kentucky bluegrass (Hanson et al. 2010). Option A, B.
        b. Avoid the use of summer grazing on sites where Kentucky bluegrass is prevalent to prevent further invasion (Murphy and Grant 2005, Patton et al. 2011). Option A, B.
    - Utilize grazing as a tool to suppress invasion of smooth brome. Option A, B.
        a. Intensely graze pastures from tiller elongation (mid- to late May) through boot stages (early June) to stress growth and development of smooth brome (Helzer 2011, Murphy and Grant 2005, Stacy et al. 2005, Mousel and Smart 2007). Option A, B. This strategy is designed to remove actively growing points (tiller) and leaf material to damage the plant (Mousel and Smart 2007).
        b. Conduct repeated annual spring grazing of smooth brome as this strategy has been shown to be effective at controlling smooth brome without

harming desirable native plants on mixed-grass prairies (Stacy et al. 2005). Option A, B.

  - Maintain idle cover in ≥2 of 4 years on sites dominated by ≥95% exotic grasses to benefit waterfowl as nesting densities have been shown to be 1.6 times greater on idle versus grazed sites during a 7-year study in the Missouri Coteau (Barker et al. 1990). Option C.
- On a limited basis, work with private landowners (cooperators) to remove excessive litter accumulation after August 1 via haying and raking when options for rotational grazing systems may not exist. Haying also can be conducted on sites with excessive noxious weed invasions to suppress further spread on native prairie tracts. Option A, B, C.
- Progressively remove trees from 1A to 4C WPAs to reduce further encroachment and remove raptor perching sites and raccoon den sites that attract predators and negatively affect upland nesting birds. Option A, B, C.

Inventory and Monitoring Strategies

- Conduct research on the response of ROCs and other native wildlife species within the hypothesized native prairie plant community thresholds (<25%, 25-45%, >55% native prairie dominated composition [plant groups 41-43, 46, 48, 49, 53, 63, and 76] [Grant et al. 2004]) and across various landscape types (1A to 4C). Option A, B, C.
- Monitor native prairie plant communities to determine if changes occur between plant community phases on ecological sites at a minimum of once every three (Option A, B) to five (C) years to adjust management prescriptions as necessary to maintain desired habitat conditions.
- Monitor the effectiveness of management treatments to influence change in plant community state on ecological sites (Sedivec and Printz 2012). Develop focused research that evaluates potential variation in reproductive success and density of migratory birds that may occur across plant community states (see state-and-transition models). Option A, B, C.
- By 2018, complete an inventory of floristic quality using common metrics (i.e., Shannon-Wiener index of diversity, coefficient of conservatism, floristic quality index, native species composition) on ecological sites to determine if there have been changes in native plant diversity and density over time on actively and intensely managed sites (i.e., Whittaker 1967, Whittaker 1975, Swink and Wilhelm 1994, Taft et al. 2006, Sivicek and Taft 2011). Option A, B.
- Monitor the response of native prairie communities to defoliation treatments (i.e., grazing, fire) and adjust management prescriptions (timing, frequency, and intensity) or identified thresholds using an adaptive management approach (Gannon et al. 2010). Option A, B, C.
  - Monitor grass utilization rates to determine effectiveness of grazing treatments (see Johnson et al. 1994).

    - Monitor the effectiveness of prescribed fires based on area burned, fire intensity, litter consumption and impact to Kentucky bluegrass duff in relation to weather conditions during the fire.
- Evaluate soil moisture prior to conducting prescribed burns because Kentucky bluegrass control is strongly related to soil moisture conditions (Anderson 1965, Zedler and Loucks 1969). Option A, B.
- As resources allow, incorporate monitoring of abiotic variables (soil condition, precipitation, nutrient profile, etc.) on tracts being restored (Option A, B) to investigate causal mechanisms that may influence invasion by exotic grasses.
- Conduct research on the efficacy of over-seeding native grasses and forbs into a range of degraded native prairie sites. Option C.
- Conduct research on the timing of exotic versus native cool-season grass emergence during the spring (late March to May). This information is important to determine if there is a window in early spring when exotic grasses are emerging, but native grasses are still dormant. Option A, B. C.

OBJECTIVE 2.3 NATIVE PRAIRIE

Over the next 9 years, maintain or enhance native prairie community assemblage on native prairie occurring on WPAs located in 4A to 4C landscapes using appropriate and precise disturbance in each management year (September 1 to August 31) to provide nesting habitat for waterfowl and other migratory birds while preventing further degradation within the existing native plant community state for specific ecological sites. Specific management criteria include:

- Intensely manage tracts with 25 to 55% native vegetation remaining to increase native plant vigor, density, and seedling recruitment and prevent further degradation within ecological sites. (Option A).
- Actively manage tracts with >55% native vegetation remaining to maintain or enhance native plant communities on ecological sites. (Option B).
- Manage tracts with <25% native vegetation remaining exclusively as nesting habitat for waterfowl and other generalist migratory birds. (Option C).

Management Strategies and Prescriptions

Opportunistically utilize strategies and prescriptions identified in Objective 2.2 – Options A, B, and C.

Inventory and Monitoring Strategies

- Monitor the response of ROCs and other native wildlife species within the hypothesized native prairie thresholds (<25%, 25-55%, >55% native prairie dominated composition in plant groups 41-43, 46, 48, 49, 53, 63, and 76 [Grant et al. 2004]) and in various landscape types (1A to 4C). Option A, B. C.

- Monitor native prairie plant community phase and litter accumulation on ecological sites at a minimum of once every three years (Option A, B) and as resources allow (C) to adjust management prescriptions as necessary to maintain habitat quality.
- As resources allow, monitor the response of native prairie communities to defoliation treatments (i.e., grazing, fire) and adjust management prescriptions (timing, frequency, and intensity) or identified thresholds using an adaptive management approach (Gannon et al. 2010, USFWS 2011c). Option A, B, C.
    - Monitor grass utilization rates to determine effectiveness of grazing treatments (see Johnson et al. 1994).
    - Monitor the effectiveness of all prescribed fires based on fire coverage, fire intensity, litter consumption, impact to Kentucky bluegrass duff in conjunction with phenological stages of exotic grasses and weather conditions during the fire.
- Conduct research on the efficacy of over-seeding native grasses and forbs into a range of degraded native prairie sites. Option C.
- Conduct research on the timing of exotic versus native cool-season grass emergence during the spring (late March to May). This information is important to determine if there is a window in early spring when exotic grasses are emerging, but native grasses are still dormant. Option A, B. C.
    - Conduct research on the efficacy of different herbicides to restore highly degraded native grasslands. Option C.

OBJECTIVE 2.4 RECONSTRUCTED PRAIRIE

Over the next 9 years, maintain ≥75% native plant composition and diversity representative of stable plant communities on ecological sites on all established (typically 3–7 years after initial seeding) reconstructed prairie tracts on WPAs using active management to provide attractive heterogeneous nesting habitat for waterfowl and other ROCs while contributing to BIDEH within the mixed-grass prairie ecosystem.

Management Strategies and Prescriptions

- Utilize strategies and prescriptions identified under Option A and B in Objective 2.2 when reconstructions become established. Because significant resources are invested in each reconstructed prairie, managers will utilize all available resources to maintain ≥75% native plant composition and diversity on these sites post-establishment.
- Re-initiate reconstruction on ecological sites when ≤30% of the seeded native plant community composition remains because native species on these tracts may not be sustainable if they function similar to degraded native prairies (see rationale for Objective 2.2). Occasionally, reconstructions fail for a variety of reasons (e.g., weather, soil conditions, planting techniques, etc.) and managers will need to start the reconstruction process over in these cases.

Inventory and Monitoring Strategies

- Annually and progressively allocate management to native prairie reconstructions on 1A to 4C WPAs.
- Monitor the response of ROCs and other wildlife species on established reconstructed prairies to estimate trends in reproductive success, species density, and nest density across the range of landscape types (1A to 4C).
- Monitor the state (composition and diversity) of established reconstructed prairies and litter accumulation within ecological sites at a minimum of once every 3 years and adjust management prescriptions as necessary to maintain habitat quality.
- By 2018, develop an inventory of floristic quality using common metrics (i.e., Shannon-Wiener index of diversity, coefficient of conservatism, floristic quality index, native species vs. exotic species density) on reconstruction sites to determine changes in native plant diversity, density, and retention over time (Whittaker 1975, Swink and Wilhelm 1994, Taft et al. 2006, Sivicek and Taft 2011).
- Monitor vegetation structure and composition on reconstructed prairies following defoliation treatments (i.e., grazing, fire, haying) and adjust management prescriptions (timing, frequency, and intensity) to meet the habitat requirements of ROC.
    - Monitor grass utilization rates to determine effectiveness of grazing treatments (see Johnson et al. 1994).
    - Monitor the effectiveness of all prescribed fires based on fire coverage, fire intensity, litter consumption, and weather conditions during the fire.
    - Monitor the effectiveness of haying or haying/raking treatments to remove litter.
- Incorporate monitoring of abiotic variables (soil condition, precipitation, nutrient profile, etc.) on reconstructed grasslands to evaluate causal mechanisms that may influence the potential for invasion by exotic grasses.
- Conduct research on the efficacy of over-seeding native grasses and forbs into reconstructed sites with ≤75% native plant community composition.

SUB-GOAL 3—SEEDED INTRODUCED GRASSLANDS SUB-GOAL

Provide suitable nesting habitat on existing seeded introduced grasslands to maximize waterfowl (*Anas* spp.) nest success and occupancy by ROC on WPAs and reconstruct seeded introduced grasslands on WPAs located in 1A to 3B landscapes throughout the District to diverse native vegetation to benefit upland nesting ROCs and enhance ecological services within the mixed-grass prairie ecosystem.

OBJECTIVE 3.1 SEEDED INTRODUCED GRASSLANDS

Over the next 9 years, reconstruct an average of 1,000 acres of seeded introduced grasslands on 1A to 3C WPAs at 5-year intervals using functionally diverse seed mixtures (approximately 50% grasses [minimum of 9 species] and 50% forbs [minimum of 10 species] by weight) that are

representative of a stable plant community on ecological sites post-establishment (typically 3–7 years) while providing heterogeneous nesting habitat for upland nesting ROC including waterfowl (*Anas* spp.), clay-colored sparrow, grasshopper sparrow, bobolink, and northern harrier.

Management Strategies and Prescriptions

- Progressively reconstruct grasslands beginning with 1A WPAs [N = 81] and then on 1B to 3B WPAs [N = 61] to benefit waterfowl and other migratory birds.
- Review Herbaceous Vegetation Establishment Guidelines (USDA NRCS 2010a) to determine the appropriate reconstruction methods and seeding dates within Major Resource Land Areas
- Ensure that sites targeted for reconstruction undergo adequate seedbed preparation to limit invasion from noxious weeds and/or exotic grasses.
    - Develop 3–5 year cooperative farming agreements with local farmers to prepare the seedbed. The timeline for seedbed preparation typically includes:
        a. In the fall before row crop planting - herbicide and then till the site in the fall to allow frost to kill existing vegetation during the winter (Schramm 1990).
        b. A variable length farming agreement depends on the severity of weed infestation.
        c. Collect soil samples and test for nitrogen and phosphorus levels to ensure that the site is ready for seeding to native plants. If necessary, extend farming agreements to improve soil conditions.
    - On sites with high erosion potential, alternative methods such as no-till or chemical fallow may be required to prepare the seedbed.
- Use a minimum of 9 grasses and 10 forbs in the seed mix on all sites (Larson 2011). This combination has been shown to be effective using broadcast plantings during the dormant period (November to early April) in North Dakota.
    - Use ecological site descriptions (Sedivec and Printz 2012) to determine the appropriate species to include in the seed mix on a particular site.
        a. Utilize sculptured seed mixes when multiple ecological sites occur on individual WPAs (Jacobson et al. 1994, Sedivec and Prinz 2012).
    - Use a 60:40 or 50:50 grass to forb ratio in the seed mix by weight (Smith et al. 2010, Larson 2011).
    - Use local ecotype seeds that are representative of species endemic to the mixed-grass prairie.
    - Increase grass seed by 25% to compensate for seed loss in dormant season plantings (Henderson and Kern 1999).
    - Select individual plant species to include in the seed mix that contribute to heterogeneous vegetation structure required to attract a diverse assemblage of migratory birds by considering plant growth form, height, canopy, and food production potential (Laubhan et al. 2006).

    - Adapt seed mix to capture variation in site topography. For example, seed mixes on sites with south-facing hill slopes should include more xeric species adapted to drier conditions, while low areas (e.g., drainages) should include more mesic species that can tolerate higher soil moisture and lower soil temperatures (Laubhan et al. 2012).
    - As resources allow, increase the number of forb species (~20-30 species [Guo et al. 2006, Larson 2011] in the seed mix to attempt to match variable conditions that occur between years and within sites to increase resistance to invasion by noxious weeds (Sheley and Half 2006).
    - As resources allow, use spiked forb seed mixes (100–300 seeds/ft2) to reduce the invasion of Canada thistle (Norland et al. 2013) and other common weeds post-seeding.
    - Include a minimum of 3-4 functional groups (see Levang-Brilz and Biodini 2002, Piper and Pimm 2002, Biondini 2007) in the seed mix to increase the resistance to invasion by exotic grasses and noxious weeds (Biondini 2007, Biondini et al. 2011).
- Invasive species control should be considered during development of the seed mix by selecting functionally similar, highly competitive native plants (Pokorny et al. 2005, Sheley and Half 2006, Biondini 2007). However, the following strategies may be used:
    - On a case-by-case basis, mowing can be used in the first and second year to reduce annual weeds and allow for sufficient light to increase germination of native forbs (Williams et al. 2007). Mowing is typically conducted before weed seed becomes viable leaving 8–10" of stubble over the course of multiple occasions (USDA NRCS 2010a).
    - On a limited basis, precise spot-treatments of herbicide could be used to remove highly invasive noxious weeds (e.g., yellow toadflax).
    - Biological control agents (i.e., flea beetles Apthona spp. for leafy spurge) should be used over herbicide treatments if available.
- Conduct a prescribed burn during the third or fourth year following seeding (Rowe 2010). Adjust timing of the burn as necessary to improve vigor of the stand. For example, early spring burns encourage cool-season grasses, while late spring burns encourage growth of warm-season grasses (Higgins et al. 1989, Willson and Stubbendieck 2000).
- A graze in year 4 or 5, depending on the condition of stand, can be used to defoliate, reduce litter accumulation and maintain stand vigor.
- Once established, manage reconstructions using similar strategies and prescriptions as identified under Options A and B in Objective 2.2.

Inventory and Monitoring Strategies

- Prior to establishment:
    - Monitor noxious weed infestation until the site is established.
    - Monitor the effectiveness of releases of biological control agents.

    - Monitor the effectiveness of defoliation treatments (burning, grazing, mowing) to maintain grassland stand quality.
- Post-establishment:
    - Utilize inventory and monitoring strategies listed under Options A and B in Objective 2.2 and under Objective 2.4.

OBJECTIVE 3.2 SEEDED INTRODUCED GRASSLANDS

Over the next 9 years, provide moderate to tall nesting habitat consisting of a minimum of ≥20 cm of horizontal vegetation cover density and average vegetation height of ≥28 cm by late May on seeded introduced grasslands in ≥2 of 4 management years prior to initiation of reconstruction to diverse native vegetation on WPAs located in 1A to 3B landscapes. This would be done to maximize nest success of upland nesting waterfowl (*Anas* spp.) and other grassland-obligate migratory birds.

Management Strategies and Prescriptions

- Prior to reconstruction of DNC fields to diverse native stands, utilize appropriate defoliation treatments to provide a range of habitat structure to meet the needs for nesting ROC:
    - Waterfowl – provide 20 cm of vegetation density based on visual obstruction and 28 cm in vegetation height in late May to positively influence nest survival (Bloom et al. 2013).
        a. Maintain idle grasslands in 3 of 4 management years to increase both waterfowl nest survival and nest density (Bloom et al. 2013).
        b. Defoliate vegetation using grazing or fire once every 3–4 years to remove litter and maintain grassland vigor (Naugle et al. 2000a). Removal of litter is important to prevent increases in small mammals that attract nest predators (Voorhees and Cassel (1980) and support the production of waterfowl and other migratory birds (Higgins 1986, Higgins et al. 1992, Kruse and Bowen 1996, Naugle et al. 2000a).
        c. Conduct grazing after the waterfowl breeding season is complete to ensure that suitable nesting habitat exists (Bloom et al. 2013) based on the desired vegetation structure in this objective.
        d. If more frequent defoliation is desired, light to moderate grazing regimes that utilize 20–35% of vegetation could be conducted in any year to provide nesting habitat for most ROC (Salo et al. 2004) and minimize impacts to waterfowl nest survival and nest density (Bloom et al. 2013).
        e. Haying treatments that utilize a rake implement also are effective to remove litter build-up.
        f. Integrate prescribed fire as resources allow to improve habitat condition, but not more than twice during any 5-year period.
    - For marbled godwit, chestnut-collared longspur, willet and other migratory birds that prefer short vegetation structure, provide suitable nesting cover consisting of

~7 to 22 cm vegetation density and 17 to 27 cm in vegetation height by mid-May each year (Kantrud and Higgins 1992, Salo et al. 2004).

    a. Defoliate vegetation using heavy to extreme grazing intensities utilizing 65–80% of vegetation (Salo et al. 2004).
    b. Integrate prescribed fire as resources allow in ≥1 of 4 years.

- For clay-colored sparrow, grasshopper sparrow, bobolink, northern harrier and other migratory birds that also prefer moderate to tall vegetation structure – provide suitable nesting cover of ≥25 cm vegetation density and ≥28 cm vegetation height by June 1 (Kantrud and Higgins 1992, Salo et al. 2004).
    a. Maintain idle grass cover in 3 of 4 management years to provide suitable nesting habitat for these ROC.
    b. Defoliate vegetation using light to moderate grazing intensities that utilize 35–50% of vegetation in any year to provide nesting habitat for most non-game mixed-grass prairie bird species (Salo et al. 2004).
    c. Integrate prescribed fire as resources allow, but not more than once during any 5-year period.

- Progressively reconstruct seeded introduced grasslands using diverse native mixes beginning with 1A WPAs [N = 61] and then on 1B to 3B WPAs [N = 75] to benefit waterfowl and other migratory birds as described in Objective 3.1.

Inventory and Monitoring Strategies

- Annually and progressively allocate management to DNC grasslands on 1A to 3B WPAs.
- Monitor the effectiveness of management treatments to influence desired changes in plant community physiognomy (vegetation structure [based on visual obstruction reading and vegetation height] and litter accumulation) on DNC fields at a minimum of once every four years and adjust management prescriptions (timing, frequency, and intensity) as necessary to maintain habitat quality.
- Monitor the response of ROCs and other wildlife species on DNC fields to estimate trends in reproductive success, species density, and nest density across the range of landscape types (1A to 4C).

OBJECTIVE 3.3 SEEDED INTRODUCED GRASSLANDS

Over the next 9 years, opportunistically manage seeded introduced grasslands on 4A to 4C WPAs to provide moderate to tall vegetation structure consisting of a minimum of ≥20 cm of horizontal vegetation cover density and average vegetation height of ≥28 cm by late-May in 3 of 4 management years to maximize nest success of upland nesting waterfowl (*Anas* spp.) and other grassland-generalist migratory birds such as Savannah sparrow, western meadowlark, and sedge wren.

Management Strategies and Prescriptions

- Opportunistically utilize strategies and prescriptions identified in Objective 3.2 to provide suitable nesting habitat for upland-nesting waterfowl and grassland-generalist migratory bird species.
- Progressively reconstruct grasslands using diverse native mixes following the completion of reconstruction on 1A to 3B WPAs beginning with 4A WPAs and then 4B to 4C WPAs to benefit waterfowl and other migratory birds as described in Objective 3.1.

Inventory and Monitoring Strategies

- Annually and progressively allocate management to DNC grasslands on 4A to 4C WPAs.
- Monitor the effectiveness of management treatments to influence desired changes in plant community physiognomy (vegetation structure [based on visual obstruction reading and vegetation height] and litter accumulation) on DNC fields at a minimum of once every four years and adjust management prescriptions (timing, frequency, and intensity) as necessary to maintain habitat quality.
- Monitor the response of ROCs and other wildlife species on DNC fields to estimate trends in reproductive success, species density, and nest density across the range of landscape types (1A to 4C).

5.4 Adaptive Management

Species–habitat relationships at landscape- and local-levels were used to develop specific goals and habitat objectives for the priority ROCs that are detailed in Chapter 4. Development of these objectives was based on published scientific evidence including a set of assumptions and limitations that may influence the ability of the District to achieve desired biological outcomes. Making informed management decisions also can be difficult without long-term data collection because the desired response may be influenced by natural variability (Lyons et al. 2008). Therefore, the District will use adaptive management practices (Williams et al. 2009) to evaluate and apply findings from research and inventory and monitoring efforts to work towards achieving habitat objectives. Adaptive management is an iterative decision making process associated with actions or decisions that recur over time (i.e., actions taken early on may result in learning that improves the management later). Monitoring is an integral part of adaptive management as it reduces uncertainties and provides feedback as decisions are made or actions are taken (Williams et al. 2009). Adaptive management requires using the current state of knowledge about a system to make predictions on one or more of the possible outcomes resulting from management actions.

Adaptive management is not a “trial and error” process, rather, it is a deliberate process of predicting, monitoring, learning, and adjusting future management actions based on new information. Successful implementation of adaptive management requires three attributes: collaboration with partners, practical and informative decision framework components, and a sustained commitment to the process (Moore et al. 2010). Internal and external partnerships with multiple partners are utilized to

address habitat management issues in the PPR. The District is building the components of science-driven adaptive management through development of this HMP, applying predictive models developed by HAPET and the PPJV, and implementing an inventory and monitoring program, through which data will provide the feedback loop necessary to update and improve management decisions.

5.5 Inventory and Monitoring

A detailed inventory and monitoring plan (IMP) also will step down from the conservation goals and objectives identified in this HMP and the CCP (USFWS 2008). It will focus on measuring the progress of the District's conservation efforts, in conjunction with conservation efforts at larger scales (i.e., USFWS Dakotas Zone), and inform the adaptive management process to ensure that conservation is targeted in landscapes that achieve the greatest biological outcomes for waterfowl and associated ROCs.

Implementation of the IMP will allow the District to evaluate management outcomes and adapt future treatments to achieve higher biological outcomes. Specifically, management activities where we anticipate the strongest ongoing need to integrate new science using adaptive management to improve conservation delivery include:

- smooth brome and Kentucky bluegrass control/eradication on WPAs;
- native prairie reconstruction on WPAs;
- noxious weed species control on WPAs.

Many factors outside of the control of management (i.e., continued conversion of habitat, environmental variation, emergence of new invasive species) could affect the ability of the District to achieve desired goals and objectives. These factors are uncertainties in the adaptive management process that may be able to be addressed and reduced through monitoring to improve management decisions (Williams et al. 2009) or increased conservation action. Nonetheless, this HMP provides a framework for efficient, transparent, and defensible conservation delivery during the next 9 years.