U.S. Fish & Wildlife Service

Inventory and Monitoring Plan

Tewaukon National Wildlife Refuge
And
Tewaukon Wetland Management District

September 2017

Tewaukon National Wildlife Refuge

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Tewaukon Wetland Management District

Inventory and Monitoring Plan

Signature Page

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Introduction

The Tewaukon National Wildlife Refuge Complex (Tewaukon Complex) is comprised of Tewaukon National Wildlife Refuge; Tewaukon Wetland Management District (Waterfowl Production Areas and Wetland and Grassland Easements); and Limited Interest Easement Refuges**.**

Tewaukon National Wildlife Refuge was established in 1943 by Executive Order 9337 which initiated land acquisition and defined the Refuge purposes:

- For Refuge lands acquired under the Executive Order 9337, dated April 24, 1943, the purpose of the acquisition is to reserve and set apart certain public lands for the use of the Department of the Interior.

- For Refuge lands acquired under Public Land Order 286, dated June 26, 1945, the purpose of the acquisition is ...as a refuge and breeding ground for migratory birds and other wildlife....

- For Refuge lands acquired under the Migratory Bird Conservation Act, 16 U.S.C. § 715d, as amended, the purpose of acquisition is ... for uses as an inviolate sanctuary, or for any other management purpose, for migratory birds. 16 U.S.C. § 715d (Migratory Bird Conservation Act).

Tewaukon Wetland Management District legislation authorized Waterfowl Production Area and wetland easement acquisition determined the purposes of the District:

- For District lands acquired under the Public Law 85-585, dated August 1, 1958, the purpose of the acquisition is to assure the continued availability of habitat capable of supporting migratory bird populations at desired levels.

- For District lands acquired under the Migratory Bird Hunting and Conservation Stamp Tax, 16 U.S.C. § 718, as amended, for the purpose: "...as Waterfowl Production Areas" subject to "...all of the provisions of such Act [Migratory Bird Conservation Act] ... except the inviolate sanctuary provisions ..." 16 U.S.C. § 718© (Migratory Bird Hunting and Conservation Stamp Tax).

Since March of 1996, North American Wetlands Conservation Act (NAWCA) funds have been used to acquire grassland easements in the three County Tewaukon Wetland Management District. Grassland easements are acquired only with companion wetland easements.

- The North American Wetlands Conservation Act, Public Law 101-233 December 13, 1989, as amended in 1990, 1994, and 1998 is an Act to conserve North American wetland ecosystems and waterfowl and other migratory birds and fish and wildlife that depend upon such habitats.

In 2000, Land and Water Conservation Funds have been used to acquire grassland easements in southeast North Dakota and eastern South Dakota under the Dakota Tallgrass Prairie Wildlife Management Area. Grassland easements are acquired only on native tallgrass prairie sites that have minimal prairie pothole wetlands. In the Tewaukon Complex, the priority areas are in southeastern Sargent County and surrounding the Sheyenne National Grasslands in eastern Ransom and western Richland counties.

- The authority for acquisition is the Fish and Wildlife Act of 1956 (16 U.S.C. 742f(b) (1) as amended. Acquisition funding is made available through the Land and Water Conservation Fund Act of 1965. Additional funds could be available through Congressional appropriations, North American Waterfowl Conservation Act Funds, donations from non-profit organizations or other sources to acquire lands, waters, or interest therein for fish and wildlife conservation purposes.

To meet these and other purposes, Tewaukon Complex managers and biological staff, inventory, monitor, and research aspects of the Complex's natural resources. Due to budget and personnel constraints, it is necessary to prioritize survey and research efforts in light of their relative importance for informing management decisions, addressing policy obligations, and achieving Complex objectives and purposes.

This plan documents and prioritizes inventory and monitoring surveys and research currently conducted, and proposed to be conducted, on the Complex from 2017 to 2027 (this time frame seemed reasonable for planning purposes), or until the Habitat Management Plan is developed, at which point this plan will be revisited. This document was developed in collaboration with the Service's Inventory and Monitoring Initiative, and in accordance with revised Service policy 701 FW 2.

The Tewaukon Complex's surveys address biological objectives identified in the Comprehensive Conservation Plan (CCP), Hydrogeomorphic Evaluation of Ecosystem Restoration (HGM), other Refuge guiding documents, regional and national programs, and large-scale monitoring efforts. The CCP objectives direct application of information to increase knowledge and support decisions regarding wildlife and habitat resource management. Resource information needs identified in the CCP objectives encompass a wide range of resource types, management questions, and spatial scales. To address these needs, the CCP calls for a corresponding diversity of inventory, monitoring, and research surveys. Most of the surveys listed in this Inventory and Management Plan (IMP) correspond to CCP objectives.

This IMP calls for continuation of current, locally developed surveys to improve management through increased understanding of long-term trends in resources. Additionally, several surveys feature Refuge cooperation in regional (e.g., Native Prairie Adaptive Management Project) and national survey efforts (e.g., Breeding Bird Survey). Proposed inventory and monitoring and research surveys also are included in this plan.

Methods

The Tewaukon Complex lands and waters that were considered for this IMP included fee title Refuge and Waterfowl Production units. The two limited-interest easement refuges (Storm Lake and Wild Rice) were also considered: only Storm Lake was included in the prioritization for the Complex because it has a current biological survey. Wetland and grassland easements were not included in the prioritization discussion because there is limited management or opportunities for surveys with these tracts.

In the winter of 2014, Tewaukon Complex staff identified and entered a list of 31 historic, current and anticipated surveys in the Planning and Reporting of Inventory and Monitoring on Refuges (PRIMR) database. In July 2015, Complex staff, the Dakota Zone Biologist and Database Manager met to provide an overview of the Simple Multi-Attribute Ranking Tool (SMART) (https://ecos.fws.gov/ServCat/Reference/Profile/27522) (USFWS 2014), including a description of the 24 criteria used to prioritize surveys. The team selected 14 of 24 criteria to evaluate and calculate individual prioritization scores for each survey. The team discussed the results of the survey prioritization using the SMART tool and determined that the final prioritized list (excluding non-selected surveys) needed modification because of concerns with the ambiguity of the criteria and the lack of separation among the final survey scores.

The team regrouped to develop Conceptual Ecological Models (CEM) and influence diagrams (Appendix G) to identify conservation targets and their associated ecological influences. The CEMs document our assumptions of how grasslands and wetlands are affected by certain components and processes that exist (e.g., nutrients, defoliation, non-native plants, etc.). Influence diagrams are a type of CEM, where we can more specifically visualize how our management actions might affect our objectives. We initially created CEMs to lay out conservation targets, associated attributes, stresses, and threats. This represents the broader view of our conservation targets (see diagrams CEM 1, and CEM 2 in Appendix G). We followed up this effort by creating influence diagrams that provide a more detailed view of how certain factors are affecting our objectives, and where our monitoring can most efficiently and effectively measure the objectives (see diagrams CEM 1A-1D and CEM 2A-2B). The fundamental objective for grasslands is to provide for 'healthy grasslands', the CEM documents conservation targets of tallgrass prairie, invertebrates, and grassland birds (Appendix G). These three targets are broken down in the associated influence diagrams. The wetlands CEM documents conservation targets of wetland, wet meadow, and waterbirds. We considered 'healthy wetlands' as our fundamental objective and developed influence diagrams for the wet meadow and waterbirds. Percentages used to estimate influences are based on current science, and in some cases expert opinion (Appendix G).

Through this process, the team identified the influences that possessed the highest probability to affect the conservation target. These influences should be the priority for monitoring efforts. Several surveys that did not monitor strong influences on our conservation targets were not included in the prioritization tool and process and therefore were excluded from further consideration in this plan. The group utilized the SMART tool again with modifications based on input from the CEM and influence diagrams. Three 'Categories' and our 'Criteria' were selected from the original SMART tool and weighted based on Complex Staff input (Appendix A). The

three ‘Categories’ and associated ‘Criteria’ are: Refuge Priorities and Management Needs (criteria are Comprehensive Conservation Plan and Management Utility); Immediacy of Need (criterion is Threat); and Scope and Scale (criterion is Spatial Scale). Complex staff decided to put the most weight on the ‘Comprehensive Conservation Plan’ because this document includes the legal mandates and direction for management. ‘Management Utility’ was the next highest ranked criterion because of the need for surveys that will inform management. ‘Threat’ was the third highest ranked criterion to document the Complex’s ongoing, and emerging challenges associated with being embedded in a cropland dominated landscape. Finally, ‘Spatial Scale’ which documents the value of surveys that encompass large spatial scales was the lowest ranked criterion. The selected surveys that were identified as a result of this updated process are included in Figure 1.

Results

For the CCP and other Management Plan Objectives criteria, all of the surveys identified using CEMs ranked higher than surveys that were not identified in the CEM which reinforces that the surveys reflect the goals in the CCP (Appendix A). There was greater disparity among surveys under the Management Utility criteria. Four Square Mile (FSM), Native Prairie Adaptive Management (NPAM) and Prairie Reconstruction surveys scored the highest under these criteria because they feed information directly back into annual management decisions. The Shorebird and Grassland Song Bird surveys did not score high. The Shorebird Survey provides population trend information, but cannot be tied directly to annual management decisions and actions at the Refuge scale. This survey will be valuable in evaluating the cumulative effects of habitat management at a landscape scale. The Grassland Song Bird Survey will be discontinued and changed to historic. Although Index of Plant Community Integrity (IPCI) ranked lower under the Management Utility criteria, this survey is gathering baseline data to evaluate new management techniques (wet meadow reconstruction and hydrologic restoration). Water quality surveys ranked low due to lack of control over watershed inputs and limited management options, but they do monitor an important influencer for invertebrate population and vegetation composition.

The two primary threats in the Tewaukon Complex are loss of wetlands and grasslands (Conservation Targets). Both the Four Square Mile (FSM) and Native Prairie Adaptive Management (NPAM) surveys ranked high on the Threat criteria because they provide information to inform management for species and communities directly affected by habitat loss and degradation. Monitoring of Native Prairie and Prairie Reconstruction Monitoring surveys ranked lower than FSM and NPAM because they occur on FWS fee title lands where managers have control over management and protection from outside habitat loss threats. However, those two surveys still ranked fairly high because they monitor vegetative diversity and potential loss of native species. While the threat from nutrient loading in wetlands and the streams and rivers is high due to runoff from privately owned agricultural fields throughout the Complex, the team determined that limited control and management capabilities and opportunities on private land in the watershed made it unrealistic and infeasible to rank this higher under the Threat criteria.

The lowest weighted criterion is Spatial Scale. The team determined this is an important consideration but that management opportunities are limited beyond the boundaries of fee title

lands. FSM and NPAM ranked the highest here, because they are landscape level surveys with multiple sites on public and private land, with large sample sizes across geographic regions. The Shorebird Survey occurs across a broad area, but ranked lower than FSM and NPAM because it only covers one small part of the Tewaukon Complex. The rest of the surveys are more localized and therefore ranked lower.

As a result of the CEM evaluation and the prioritization tool evaluation, the team identified four categories of surveys for the Tewaukon Complex IMP. The four categories are: 1) Current - Surveys Conducted with Current Capacity, 2) Expected - Surveys That Can Be Conducted with Additional Capacity, 3) Expected - Research That Can Be Conducted with Additional Capacity and 4) Surveys Not Selected. These categories and associated surveys are listed below:

<u>Surveys Conducted With Current Capacity (Current)</u>
These surveys can be completed with current Complex resources (e.g., staff, funding) over the time span of the IMP.

- Four-Square-Mile Breeding Waterfowl Survey (FSM)
- Native Prairie Adaptive Management Program Monitoring(NPAM)
- Monitoring of Native Prairie
- Index of Plant Community Integrity (IPCI)
- Prairie Reconstruction Monitoring
- Breeding Shorebird Survey

<u>Surveys That Can Be Conducted with Additional Capacity (Expected)</u>
These surveys can be completed with additional Complex resources (e.g., staff, funding) over the time span of the IMP. The prioritization tool identifies the highest priority surveys that could be conducted in this category.

- Water Quality
- Rare Butterfly Inventory
- Fathead Minnow Inventory

<u>Research That Can Be Conducted with Additional Capacity (Expected)</u>
These research opportunities can be completed with additional Complex resources (e.g., staff, funding) over the time span of the IMP. Research projects would be evaluated based on the developed CEM, and will be short-term efforts to answer specific questions as opposed to long-term survey efforts that allow for state-based management.

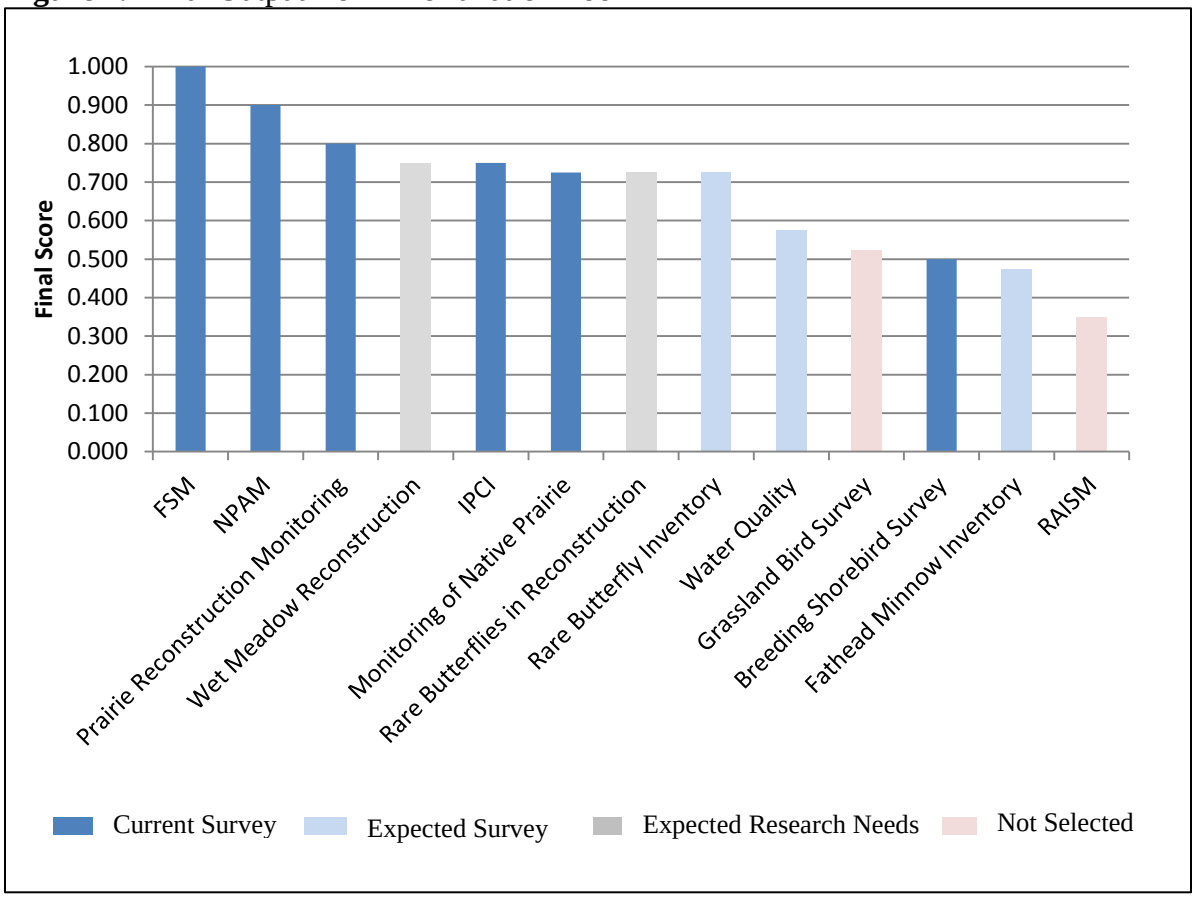
- Rare Prairie Butterflies in Reconstruction
- Wet Meadow Reconstruction

<u>Surveys Not Selected (or discontinued)</u>
These surveys include *current, historic and future* surveys that ranked low in priority, were low influencers in the CEM, would require additional internal and external resources for completion, would be used for HMP preplanning as needed in the future, or were not a biological survey. The Baseline Fauna survey was included in the prioritization tool exercise and assigned Future status. The remaining surveys were not selected due to the limited value they provide to inform management or address priorities.

- Midwinter Waterfowl Survey

    - Requires minimal staff time/effort and doesn't conflict with other priority workload (this is listed as 'current' in PRIMR, but not listed as a 'current' survey in the IMP)
- Midcontinent Sandhill Crane Survey
    - Requires minimal staff time/effort and doesn't conflict with other priority workload (this is listed as 'current' in PRIMR, but not listed as a 'current' survey in the IMP)
- Baseline Reptile, Amphibian and Small Mammal surveys (RAISM)
    - Low influencers in the CEM and would be needed primarily for HMP/CCP preplanning efforts
- Spurge Beetle Monitoring (Historic and discontinued)
    - Only measures presence/absence and is not tied to relative abundance/density or effects on vegetation. Low priority, rarely conducted (Historic)
- Weed Mapping
    - Not a high priority biological survey, used to direct Early Detection Rapid Response to nonnative invasions (Historic)
- Spike
    - Research project has been completed, published results (Historic)
- Grassland Song Bird Survey(Historic and discontinued)

Figure 1. Final Output from Prioritization Tool



Estimating Capacity

Capacity (staff time and funds needed to conduct a survey annually) was estimated for each survey by quantifying the time needed to complete all aspects of each survey including planning, field work, analysis, and reporting (Appendix D, E). Total hours and annual costs were summarized in Table 1.1. Monthly estimates of staff time to complete survey-specific planning, field work, analysis, and reporting were generated to inform annual work planning (Figure 2). These estimates are considered draft, as capacity changes from year to year due to changes in staff availability and budgets. Survey capacity was used to determine if surveys were selected as *current* (can be completed with existing resources), or *expected* (need additional capacity that will likely be acquired during the span of the IMP) based on staff hours needed to conduct the surveys. Minimum staffing to complete current surveys will include 1 biologist, 2 other permanent staff, 1 other staff (Term Biological Technician), and 1 seasonal biological technician each year. Completion of expected surveys would require additional contracts or cooperative agreements with university or other contractors (i.e. USGS).

Figure 2. Staff hours needed to complete planning, field work, analysis, and reporting annually for all surveys.

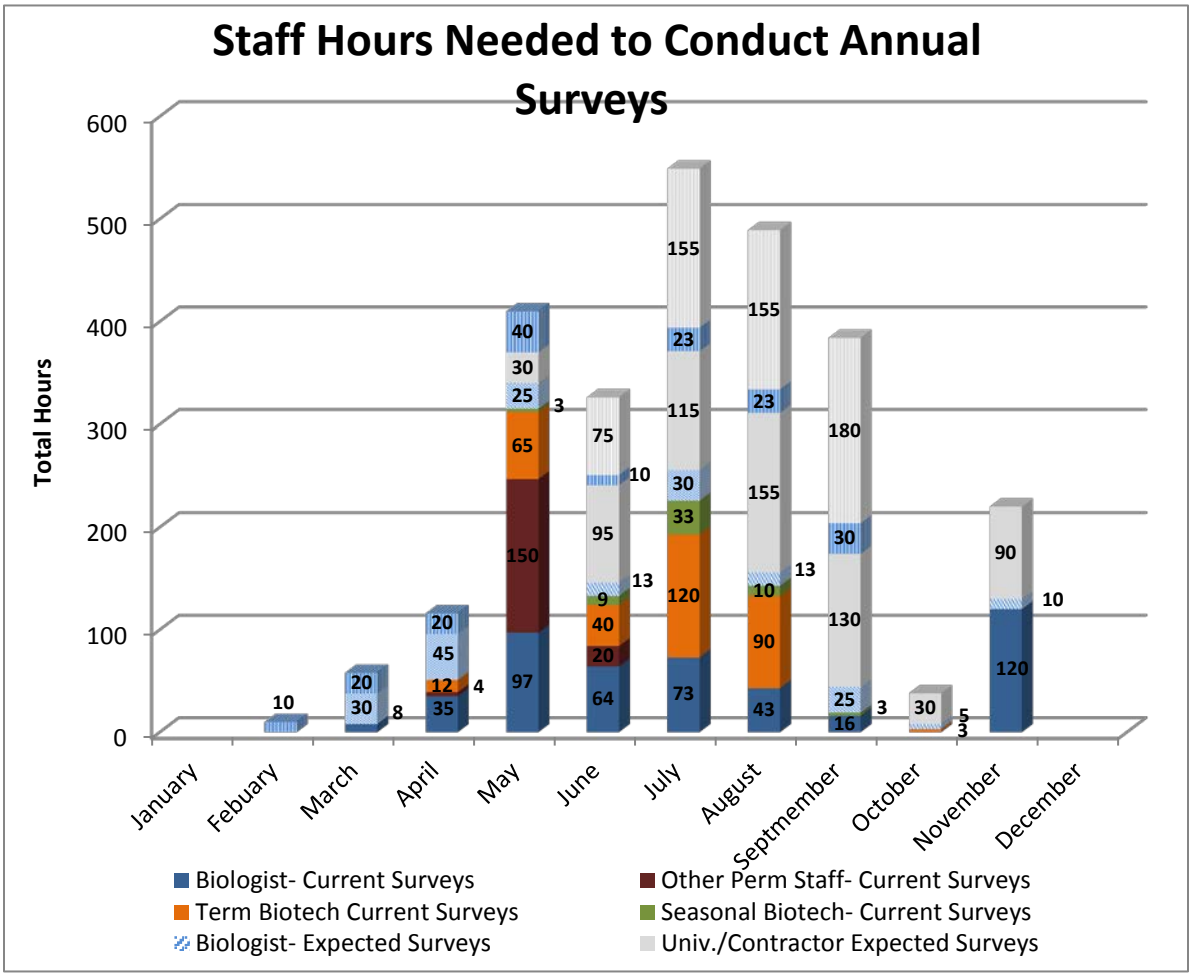


Table 1.1 Summary of Selected Surveys for Tewaukon National Wildlife Refuge

Survey Priority [1]	***Survey ID No.*** [2]	***Survey Name / (Type)*** [3]	***Survey Status*** [4]	***Mgmt. Objective ID*** [5]	***Survey Area*** [6]	***Staff Time (FTE)*** [7]	***Avg. Ann Cost (OPR)*** [8]	***Survey Timing*** [9]	***Survey Length*** [10]	***Survey Coord.*** [11]	***Protocol Citation*** [12]	***Protocol Status*** [13]
1.1	FF06RTWK00-001	Four-Square-Mile Breeding Waterfowl Survey (CB)	Current	CCP / R2.1 and D1.9-1.11 Obj.	National	FWS: 0.06	$4,150.00	May 1-15th, May 20-June 5/ Recurring -- every year	1987- 2025	Ned Wright, HAPET - Wildlife Biologist	(none)	Initial Survey Instructions
1.2	FF06RTWK00-002	Native Prairie Adaptive Management Program (CM)	Current	CCP / R1.1, 1.2 and D1.1, D1.2 Obj..	National	FWS: 0.07	$281.00	June-August/ Recurring -- every year	2009- 2025	Cami Dixon, R6 Division of Biological Resource Zone Biologist (ND/SD)	Gannon et. al. 2013	National (approved)
1.3	FF06RTWK00-027	Prairie Reconstruction Monitoring (M)	Current	CCP / R1.1, 1.2, 1.4 and D1.1, 1.2 1.6 Obj.	Entire station	FWS: 0.09	$971.00	August - September/ Recurring -- every year	2008- 2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
1.4	FF06RTWK00-017	Index of Plant Community Integrity - IPCI (M)	Current	CCP / R1.5, 1.8, 1.11 and R1.12 Obj. and HGM recommendations	Multiple management units	FWS: 0.05, Other: 0.001	$292.00	June - September/ Recurring -- every two years	2015- Indefinite	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
1.5	FF06RTWK00-026	Monitoring of Native Prairie (M)	Current	CCP / R1.1, 1.2, 1.10 and D1.1, 1.2 Obj.	Entire station	FWS: 0.06	$877.00	July - September/ Recurring -- every year	2008- 2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
2.1	FF06RTWK00-020	Rare Butterfly Inventory (CI)	Expected	CPP/R3.1, D3.3, 3.5 Obj.	Multiple management units	FWS: 0.04	$20,000.00	Summer/ Recurring -- every year	2020-2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
2.2	FF06RTWK00-013	Water Quality Monitoring (CM)	Expected	CCP / R1.7, 1.8 and D1.3, 1.4,1.7, 1.9, 1.10, 1.12 Obj.	Multiple management units	FWS: 0.03	$20000.00	Monthly/ Recurring -- every year	2020- 2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
2.3	FF06RTWK00-006	Fathead Minnow Inventory (CI)	Expected	CCP/R2,1, 2.11 and D2.1 Obj. HGM recommendations	Multiple management units	FWS: 0.02	$20000.00	Summer /Recurring – every year	2020-2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions

3.1	FF06RTWK00-063	Wet Meadow Reconstruction (R)	Expected Research	CCP R1.8 and D1.8 Obj.	Multiple management units	FWS: 0.05	$20000.00	Spring, Summer /Recurring – every year	2020-2020	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
3.2	FF06RTWK00-014	Rare Prairie Butterflies in Reconstructions (CR)	Expected Research	CCP / R3.1 and D3.3 and 3.5 Obj.	Multiple management units	FWS: 0.04	$20000.00	Summer /Recurring – every year	2020-2020	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions

[1] The rank for each survey listed in order of priority (e.g., numeric, tiered, alpha-numeric, or combination of these).
[2] A unique identification number consisting of refuge code-computer assigned sequential number. Refuge code comes from the FBMS cost center identifier.
[3] Short titles for the survey name, preferably the same name used in refuge work plans. Also include the PRIMR code for survey type in parentheses. These are: Inventory (I), Cooperative Inventory (CI), Baseline Monitoring (BM), Cooperative Baseline Monitoring (CB), Monitoring to Inform Management (M), Cooperative Monitoring to Inform Management (CM), Research (R), and Cooperative Research (CR).
[4] Surveys selected for the time of this IMP (i.e., Current, Expected).
[5] The management plan and objectives that justify the selected survey.
[6] Refuge management unit names, entire refuge, or names of other landscape units included in survey.
[7] Estimates of Service (FWS) and non-Service (Other) staff time needed to complete the survey (1 work year = 2080 hours = 1 FTE).
[8] Estimates of average annual operations cost for conducting the survey during the years it is conducted (e.g., equipment, contracts, travel) but not including staff time.
[9] Timing and frequency of survey field activities.
[10] The years during which the survey is conducted.
[11] The name and position of the survey coordinator (the Refuge Biologist or other designated Service employee) for each survey.
[12] Title, author, and version of the survey protocol (if there is no protocol to cite, enter None).
[13] Scale of intended use (Site-specific, Regional, or National) and stage of approval (Initial Survey Instructions, Complete Draft, In Review, or Approved) of the survey protocol.

Table 1.2 Summary of Selected Surveys for Tewaukon Wetland Management District

Survey Priority[1]	Survey ID No.[2]	Survey Name / (Type)[3]	Survey Status[4]	Mgmt. Objective ID[5]	Survey Area[6]	Staff Time (FTE)[7]	Avg. Ann Cost (OPR)[8]	Survey Timing[9]	Survey Length[10]	Survey Coord.[11]	Protocol Citation[12]	Protocol Status[13]
1.1	FF06RETE00-001	Four-Square-Mile Breeding Waterfowl Survey (CB)	Current	CCP / R2.1 and D1.9-1.11 Obj.	National	FWS: 0.06	$4,150.00	May 1-15th, May 20-June 5/ Recurring -- every year	1987- 2025	Ned Wright, HAPET - Wildlife Biologist	(none)	Initial Survey Instructions
1.2	FF06RETE00-002	Native Prairie Adaptive Management Program Monitoring (CM)	Current	CCP / R1.1, 1.2 and D1.1, D1.2 Obj..	National	FWS: 0.07	$281.00	June-August/ Recurring -- every year	2009- 2025	Cami Dixon, R6 Division of Biological Resource Zone Biologist (ND/SD)	Gannon et. al. 2013	National (approved)
1.3	FF06RETE00-005	Prairie Reconstruction Monitoring (M)	Current	CCP / R1.1, 1.2, 1.4 and D1.1, 1.2 1.6 Obj.	Entire station	FWS: 0.09	$971.00	August - September/ Recurring -- every year	2008- 2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
1.5	FF06RETE00-004	Monitoring of Native Prairie (M)	Current	CCP / R1.1, 1.2, 1.10 and D1.1, 1.2 Obj.	Entire station	FWS: 0.06	$877.00	July - September/ Recurring -- every year	2008- 2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
1.6	FF06RETE00-003	Breeding Shorebird Survey (CB)	Current	CCP/ R2.4 and D2.2, 2.2 Obj.	Regional	FWS: 0.01	$68.00	First two weeks of May, First two weeks of June/ Recurring every year	2004- 2025	Neil Niemuth, HAPET - Wildlife Biologist	(none)	Initial Survey Instructions
2.1	FF06RETE00-012	Rare Butterfly Inventory (CI)	Expected	CPP/R3.1, D3.3, 3.5 Obj.	Multiple management units	FWS: 0.04	$20,000.00	Summer/ Recurring -- every year	2020-2025	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions
3.2	FF06RETE00-028	Rare Prairie Butterflies in Reconstructions (CR)	Expected Research	CCP / R3.1 and D3.3 and 3.5 Obj.	Multiple management units	FWS: 0.04	$20000.00	Summer /Recurring – every year	2020-2020	Kristine Askerooth, Wildlife Biologist	(none)	Initial Survey Instructions

[1] The rank for each survey listed in order of priority (e.g., numeric, tiered, alpha-numeric, or combination of these).
[2] A unique identification number consisting of refuge code-computer assigned sequential number. Refuge code comes from the FBMS cost center identifier.
[3] Short titles for the survey name, preferably the same name used in refuge work plans. Also include the PRIMR code for survey type in parentheses. These are: Inventory (I), Cooperative Inventory (CI), Baseline Monitoring (BM), Cooperative Baseline Monitoring (CB), Monitoring to Inform Management (M), Cooperative Monitoring to Inform Management (CM), Research (R), and Cooperative Research (CR).
[4] Surveys selected for the time of this IMP (i.e., Current, Expected).
[5] The management plan and objectives that justify the selected survey.
[6] Refuge management unit names, entire refuge, or names of other landscape units included in survey.
[7] Estimates of Service (FWS) and non-Service (Other) staff time needed to complete the survey (1 work year = 2080 hours = 1 FTE).

[8] Estimates of average annual operations cost for conducting the survey during the years it is conducted (e.g., equipment, contracts, travel) but not including staff time.
[9] Timing and frequency of survey field activities.
[10] The years during which the survey is conducted.
[11] The name and position of the survey coordinator (the Refuge Biologist or other designated Service employee) for each survey.
[12] Title, author, and version of the survey protocol (if there is no protocol to cite, enter None).
[13] Scale of intended use (Site-specific, Regional, or National) and stage of approval (Initial Survey Instructions, Complete Draft, In Review, or Approved) of the survey protocol.

Surveys Conducted With Current Capacity

Tewaukon National Wildlife Refuge and Tewaukon Wetland Management District

1.1 Four-Square-Mile Breeding Waterfowl Survey (CB); (FF06RTWK00-001, FF06RETE00-001)

1) What is the population or attribute of interest, what will be measured, and when?

This survey monitors trends in waterfowl population abundance (number of breeding pairs) and production (number of recruits) for waterfowl population objectives. Numbers of breeding pairs for all waterfowl species are counted twice annually (May 1–15 and May 20–June 5).

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

The survey supports multiple CCP Objectives including those for grassland and wetland easement acquisition, management of habitat on fee-title lands, and partnerships with private landowners. The CCP objectives addressed include D1.9 – 1.11 (Appendix F). Information will be used in a future HMP.

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

The survey is the main source of annual trends in waterfowl abundance and production for the U.S. Prairie Pothole Region (USPPR). Annual estimates of waterfowl abundance and recruitment are generated for each Wetland Management District from 4-square mile survey data. The breeding pair density maps produced from survey results determine where the District should prioritize purchase of conservation easements and fee title lands, and is used to prioritize units for management treatments. It is also used to assess contributions of the District to continental waterfowl populations. Data collected from this survey will be used to develop the SHC conservation design in a future HMP.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

The USFWS Habitat and Population Evaluation Team (HAPET) coordinate the survey across the USPPR. HAPET is responsible for providing survey instructions including maps and data forms and data analysis. Tewaukon Complex staff is responsible for gaining access to survey ponds on private land, training new staff, conducting the surveys, and submitting completed data forms to HAPET. Private landowners who allow access to survey areas on their property are also important partners.

5) Protocol status?

The HAPET office has well-developed design for this survey based on information in Hammond (1969); [ServCat] Protocol Narrative 2923. Survey methodology also utilizes Dzubin (1969) and Cowardin et al. (1995).

1.2 Native Prairie Adaptive Management Program Monitoring (CM); (FF06RTWK00-002, FF06RETE00-002)

1) What is the population or attribute of interest, what will be measured, and when?

This survey measures frequency of occurrence of various plant functional groups as defined by Grant et al. (2004) on native prairie on the Refuge and WPA's. The survey is conducted annually when both cool- and warm-season vegetation can be observed in mid- to late summer.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

This survey contributes to several CCP objectives that specify the maintenance, enhancement, and restoration of native prairie plant communities. These objectives include R1.1, 1.2 and D1.1, 1.2 (Appendix F). Results of this survey will inform development of a station HMP.

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

The survey is conducted as part of the Native Prairie Adaptive Management (NPAM) decision support program which is a large-scale, long-term adaptive management effort aimed at restoring native prairie on Refuges and WPAs in the PPR. The Service has collaborated with the U.S. Geological Survey (USGS) to develop a Decision Tool to guide the adaptive restoration process through NPAM (Gannon et al. 2013, USFWS 2013). The District annually implements specific defoliation management treatments that are recommended by the NPAM program during the annual management window occurring from 1 September to 31 August.

The survey is conducted annually and provides the current condition of each enrolled management unit (Tewaukon includes one Refuge and six WPA units), as well as the vegetative response of each unit to the management that was applied that year on each unit. These survey data are annually used to serve three purposes at two different spatial scales: the regional scale and the unit-level scale. At the regional scale, the survey data are used to update the weights (i.e., confidence) on the competing predictive models. These models are the scientific basis of the decision tool that delivers the annual management recommendations for all units enrolled in NPAM; these units include not only the seven management units of the Tewaukon Complex, but also the 40 or so other FWS NWRS units within the tallgrass prairie of the USPPR. At the unit-level scale, the survey data are used to provide the current vegetation state of each unit, which allows for state-based management, and to assess progress towards the management objective of increasing cover of native grasses and forbs. The decision tool takes into account the current vegetation state (as defined by cover of native grasses and forbs, cool-season invasive grasses smooth brome and Kentucky bluegrass, and other non-native cover), and the current defoliation state (as defined by the recency and frequency of non-rest actions over a 7-year timeframe) of each management unit. When providing recommendations regarding the management action most likely to improve the vegetation state of a prairie unit, the tool incorporates science, values, and logistics. The science portion is represented by the competing predictive models; these models, and the

current weights on these models, capture the current understanding of how the native tallgrass prairie vegetation responds to the management applied, and the level of uncertainty in that understanding. Beyond the science, the tool incorporates values of the Refuge system; it does so by representing the balance between gaining native cover and the cost or effort invested to achieve that gain. Lastly, the tool takes into account the logistics and reality of carrying out management; it does this by recognizing the likelihood of management implementation when generating recommendations. Results from this survey document changes in plant communities through time in relation to previous management treatments and provide management recommendations most likely to improve management of native prairie tracts on the Refuge and WPAs.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

Yes. The NPAM project is led by USFWS Biologists and Managers at 20 refuge complexes and wetland management districts in Regions 3 and 6. External partners include: USGS, North Dakota State University, South Dakota State University, Natural Resources Conservation Service, and Agriculture Research Service. Operation and maintenance of NPAM requires the effort of the Project Coordinator, the Database Coordinator, the network of partners, and the NPAM advisory team. Non-FWS units were added in 2016; these are managed by the Audubon Society–Dakota.

5) Protocol status?

NPAM is an official protocol framework, housed in ServCat (61144).
https://ecos.fws.gov/ServCat/Reference/Profile/61144

1.3 Prairie Reconstruction Monitoring (M); (FF06RTWK00-027, FF06RETE00-005)

1) What is the population or attribute of interest, what will be measured, and when?

This survey monitors changes in native plant community composition and diversity on formerly plowed land through time that were seeded with native species on the Refuge and the District. The Complex CCP has a strategy of monitoring the composition and diversity of established reconstructed prairies a minimum of once every 5 years to determine the retention of native plant species from the original seed mix and evaluate infestation by exotic cool-season grasses. Vegetation composition and diversity is monitored from mid-July through August each year when both cool- and warm-season grasses can be observed. The District typically monitors 20% of all reconstructed grasslands in the District on an annual basis.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

The CCP has established targets for reconstructing former cropland to diverse stands of native vegetation to support grassland nesting birds and native fauna (e.g., pollinators). These grassland habitat objectives are identified in CCP objective R 1.1, 1.2,1.4 & D1.1, 1.2,1.6 (Appendix F).

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

The results of this survey allows managers to know if they are achieving both R1.2/1.4 and D1.2/1.6 which aims to maintain ≥75% of native plant composition and diversity (based on the original seed mix) on all established reconstructions. Following establishment, reconstructions are managed similar to native sod prairies (CCP objectives R1.2 and D1.2) under specific management thresholds that are based on plant community composition. Results from this survey will be used by managers to adapt the timing, frequency, duration, and intensity of management treatments to maintain the desired plant community state on reconstructed grasslands. Monitoring results are also used to identify when a defoliation treatment is needed and if the diversity is sustainable over time.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

No.

5) Protocol status?

The initial survey instructions were developed for the Complex and housed in ServCat (64243). The Complex will work with the Dakota Zone Biologist and ND State University staff to develop the protocol and submit to I&M for review in the future.
https://ecos.fws.gov/ServCat/Reference/Profile/64243

1.4 Index of Plant Community Integrity (M); (FF06RTWK00-017)

1) What is the population or attribute of interest, what will be measured, and when?

The IPCI (Index of Plant Community Integrity) is used to categorize wetlands through a multi-metric approach (Karr 1981, Karr and Chu 1999). The survey measures vegetative composition in response to disturbance. Data collected includes differences in community structure including species richness of native perennials, number of genera of native perennials and number of introduced and annual species. The survey is conducted during the peak of the growing season usually between July and early August to increase the likelihood of identification of both cool and warm season plants. This survey will be conducted annually for the next 5-7 years on seasonal or semipermanent wetlands that have received a major disturbance or restoration including removal of water control structures.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

The survey is important to provide information on vegetative responses over time to wetland restoration efforts on the Refuge. The results help managers evaluate progress and help define whether we are meeting CCP objectives R1.5, R1.8 R1.11, and R1.12. A 2014 Hydrogeomorphic (HGM) evaluation of the Tewaukon Complex recommended annual monitoring of wetlands where management was conducted to restore the natural water regime and water flow patterns (Appendix F HGM). The HGM also recommended annual monitoring to document distribution, composition of major plant communities including expansion or contraction rates of introduced and invasive species, and response of wetland vegetative communities to changes in water management.

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

The IPCI has been developed by the Natural Resources Management Department of North Dakota State University and the North Dakota Department of Health (NDDH) to assess temporary, seasonal and semi-permanent wetland plant communities within the Prairie Pothole Region (PPR). The IPCI assessment method was developed by quantitatively measuring wetland plant community characteristics and comparing the results to a range of anthropogenic disturbance and disturbance intensity (DeKeyser 2000, DeKeyser et al. 2003, Hargiss 2005, Hargiss et al. 2008). The purpose of an IPCI is to have a classification system that will categorize wetlands by vegetative composition in response to disturbance type and degree. Tracking the progress of the vegetation community will inform future decisions about the effectiveness of this restoration method (water structure removal). The data gathered will allow us to compare the vegetative response in this restored wetland to reference wetlands in the surrounding landscape.

The IPCI approach is a tool for identifying and/or assessing wetland plant communities that may have potential for restoration or continued management. Plant communities of a wetland

are important measurable variables that can give an indication of the overall condition of a wetland. The use of the IPCI system for the evaluation of wetland plant communities can be beneficial by itself or in combination with the Hydrogeomorphic (HGM) Model. The IPCI can be a useful tool to track the progress of management efforts on restored or reclaimed wetlands.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

No.

5) Protocol status?

The initial survey instructions were developed for the Complex in conjunction with the Dakotas Zone Biologist and ND State University staff and housed in ServCat (64130). The protocol is being pilot tested and will be submitted to I&M for review in future.
https://ecos.fws.gov/ServCat/Reference/Profile/64130

1.5 Monitoring of Native Prairie (M); (FF06RTWK00-026, FF06RETE00-004)

1) What is the population or attribute of interest, what will be measured, and when?

This survey measures frequency of occurrence of various plant functional groups as defined by Grant et al. (2004) on native prairie on the Refuge and WPAs. Surveys are conducted annually in mid-July to mid- August when both cool- and warm-season vegetation can be identified. Native prairie sites that are part of the NPAM (see 1.2 Native Prairie Adaptive Management Monitoring) sites are not included under this monitoring effort.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

Results from this survey document changes in plant communities through time in relation to management treatments on native prairie tracts. Baseline surveys of all the sites were done in 2009 as part of a project to assess the vegetative state (status) of Service owned native prairie in North and South Dakota. This survey contributes to several CCP objectives that specify the maintenance, enhancement, and restoration of native prairie plant communities. These objectives include R1.1, 1.2, R1.10 and D1.1, 1.2 (Appendix F).

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

The survey informs management efforts to restore native prairie habitats on the Refuge and certain WPA's. The Complex implements specific defoliation treatments determined by the station biologist after evaluation of the monitoring data. The survey is conducted annually on high priority sites defined as sites with active defoliation management treatments (5 units on the Refuge and 12 units on eight WPAs) and biannually on sites that are not high priority and are not receiving defoliation treatments (8 units on 7 WPAs). When there is a 2-5% increase in either or both smooth brome and Kentucky bluegrass, we will initiate a defoliation treatment based on the dominant invasive species.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

No.

5) Protocol status?

Methods in Grant et al (2004) are utilized which is housed in ServCat (45318), however there is not an official protocol at this time. https://ecos.fws.gov/ServCat/Reference/Profile/45318

1.6 Breeding Shorebird Survey (CB); (FF06RETE00-003)

1) What is the population or attribute of interest, what will be measured, and when?

This survey documents landscape-level species-habitat relationships for five upland breeding shorebirds including American avocet (*Recurvirostra americana*), willet (*Tringa semipalmata*), marbled godwit (*Limosa fedoa*), upland sandpiper (*Bartramia longicauda*), and Wilson's phalarope (*Phalaropus tricolor*). Roadside surveys are conducted annually during the first two weeks of May and first two weeks of June.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

Results from this survey are used by HAPET to build habitat relationship models to target habitat conservation in the PPR for these species. Information collected during this survey also supports CCP Objectives R2.4 and D2.2 (Appendix F) which aims to monitor indicator bird species including upland sandpiper populations. The information also supports District CCP objective 1.9 for wetland and grassland easement protection.

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

Relatively little information exists regarding species-habitat relationships for breeding shorebirds in the PPR. This survey contributes to a larger geographic survey of breeding shorebirds that occurs across the PPR portions of Montana, North Dakota and South Dakota. Results from this survey are used by staff at HAPET to develop spatial models describing species-habitat relationships that can be used by various state and federal agencies to target conservation delivery for these species. The District also uses these spatial models to identify important conservation areas for wetland and grassland easement purchase in the District.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

Yes. HAPET coordinates the survey across the PPR. They provide maps, data forms, protocols, and analyze the data. District staff is responsible for conducting the survey and submitting the completed data forms to HAPET.

5) Protocol status?

The HAPET office developed a methodology for this survey that is based on Niemuth et al. (2012) which is housed in ServCat (75797). Complex staff will look to HAPET and I&M staff to develop an official protocol framework.
https://ecos.fws.gov/ServCat/Reference/Profile/75794

Surveys Expected to Be Conducted With Additional Capacity

Tewaukon National Wildlife Refuge and Tewaukon Wetland Management District

2.1 Rare Butterfly Inventory (CI); (FF06RTWK00-020, FF06RETE00-012)

1) What is the population or attribute of interest, what will be measured, and when?

Surveys would be conducted on priority native prairie areas to assess the diversity and relative abundance of rare prairie butterfly species found on the Refuge and high priority WPAs. Baseline surveys can be conducted to determine high priority rare butterfly areas, presence of rare species, and diversity of other butterfly species using native prairie.

A baseline survey would be conducted over at least three years from May through September to account for variation in weather, habitat conditions, and flight times of different butterfly species. A final monitoring survey protocol would be developed following the collection of baseline data. Monitoring would occur on high priority native prairie sites identified from baseline surveys and evaluation of historical butterfly occurrences and surveys. Qualified surveyors would need to be identified and contracted to conduct these surveys.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

The CCP identifies the importance of conserving and managing Refuge and District habitats for a variety of species including butterflies. The information garnered from the surveys would address CCP Objectives R3.1, D3.3, and D3.5 (Appendix F).

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

Information regarding the presence, absence, and relative abundance of rare butterflies utilizing Refuge and District habitats could dictate the type, timing and intensity of management actions for the species identified (i.e., Endangered Species Act candidate, listed species or identified species of concern). Specifically, there are historical records of Dakota skippers on WPAs within the WMD, and in the event that this species is identified, staff is required to follow the protocols in the 'Dakota Skipper Conservation Guidelines' document established by Ecological Services. This survey could potentially gather presence/absence and relative abundance data for other declining butterfly species utilizing native prairie.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

Potentially yes. ND State University, ND Game & Fish Department, Natural Resource Conservation Service, The Nature Conservancy, and U.S. Forest Service could be potential partners as land management organizations, research institutes and/or agency specific programs that benefit pollinators.

5) Protocol status?

Development or use of an existing protocol would be determined by the objectives of the survey.

2.2 Water Quality Monitoring (CM); (FF06RTWK00-013)

1) What is the population or attribute of interest, what will be measured, and when?

Surveys would assess and evaluate nutrient loading (phosphorous and nitrogen as ammonia), siltation (total suspended solids), habitat degradation, pathogens (fecal coliform bacteria), organic enrichment (low dissolved oxygen), flow alteration, mercury, metals, and salinity/total dissolved solids (TDS). Water quality monitoring stations could be set up on the Wild Rice River upstream and downstream of the Refuge, and on creeks and streams running through WPAs. Baseline water quality surveys could be done annually in the spring and after significant precipitation events on WPAs and the Refuge to determine levels of nutrients, sediments and heavy metals.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

Water quality questions, issues and concerns are identified in both the Tewaukon CCP (R1.7, 1.8, D1.7 1.12 Appendix F) and the HGM. Results and information gathered on the water quality both in the Wild Rice River and in Complex wetlands can be used to help guide our private land restoration and easement acquisition, upstream and downstream of the Refuge and WPAs identified in the Tewaukon CCP.

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

Agricultural management practices in the Wild Rice River watershed have an effect on the water quality for Service lands. The Wild Rice River runs through both units of Tewaukon Refuge. Over 90% of the Complex is in agricultural production and includes practices that could negatively affect surface and ground water quality including multiple tillage applications of the soil, drainage and burning of wetlands, tile drainage, and fertilization and herbicide applications. It is important to have a baseline and annual monitoring of the water quality as it flows into the Refuge and through some WPAs and flows downstream to assess how management on the Service lands/waters can affect water quality. The information can also assess the quality of water coming into Service lands and target areas for wetland restoration and riparian buffer strips, as well as identify both non-point and point sources pollution.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

Yes. The water quality stations on the Wild Rice River could be coordinated with the ND Department of Health, Division of Water Quality to be incorporated into their statewide water quality database. Results could assist with identification and funding for watershed and water quality improvement projects. Information could also lead to more cooperation with the US Department of Agriculture Natural Resource Conservation Service in wetland, upland and riparian restoration projects through their various programs that could lead to improved water quality.

5) Protocol status?

Development or use of an existing protocol will depend on the different metrics that need to be measured and objectives of the survey.

2.3 Fathead Minnow Inventory (CI); (FF06RTWK00-006, FF06RETE00-019)

1) What is the population or attribute of interest, what will be measured, and when?

This survey would assess populations of fathead minnows in priority non-managed and managed seasonal and semi-permanent wetlands on the Refuge. The relative abundance of fathead minnows would be measured and monitored to get baseline information and then repeated after a management action (i.e. water draw down) is taken. Monitoring for fathead minnows would be conducted in the late spring to determine density and survival after winter.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

Competition between fathead minnows and waterbirds for aquatic invertebrates is well documented. The CCP and HGM acknowledge the primary mission of managing for migratory birds including waterfowl and other waterbirds. Objectives in the CCP address managing for migratory birds during the breeding and migration periods (R2.1 and R2.11) (Appendix F). The HGM recommends assessment of fish populations in both managed and non-managed prairie wetlands to evaluate the potential effect on aquatic invertebrates (Appendix F).

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

Fathead minnow populations can have a dramatic effect on aquatic food resources (i.e. invertebrates) and can be in direct competition with waterbird populations (Zimmer K.D., M.A. Hanson, and M.G. Butler 2000). Reductions in abundance and biomass of insects and crustaceans in wetlands with fathead minnows are significant. High densities of fathead minnows can decrease the abundance, biomass, and taxon richness of aquatic invertebrates in semi-permanent prairie wetlands. (Hanson, M. A., and M.R. Riggs. 1995). The abundance of fathead minnows has the largest effect on zooplankton communities and a large number of invertebrates (Zimmer K.D., M.A. Hanson, and M.G. Butler 2000).

Results from the initial baseline survey would determine frequency and abundance of fathead minnows and in selected wetlands. The information from the baseline survey could trigger an action to remove fathead minnows from wetlands through water management. After the management action, the selected wetland would be surveyed again to determine if the objectives had been met.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

Potentially yes. Potential partners might include the ND Game and Fish Department, Fisheries Division, USGS (Northern Prairie) and universities.

5) Protocol status?

Development or use of an existing protocol will depend on the objectives of the project or management strategy.

Priority Research Identified That Can Be Conducted with Additional Capacity

Tewaukon National Wildlife Refuge and Tewaukon Wetland Management District

3.1 Wet Meadow Reconstruction (R); (FF06RTWK00-063)

1) What is the population or attribute of interest, what will be measured, and when?

This proposed survey is a research project to monitor changes in plant community composition and diversity in the wet meadow zone of prairie pothole wetlands that were reconstructed with native vegetation. The composition and diversity of the wet meadow zone plant community would be monitored prior to reconstruction. They would be monitored every year post reconstruction to determine the retention of native plant species from the original seed mix and evaluate infestation by invasive species. Vegetation composition and diversity would be monitored from mid-July through August each year for easier identification of plant species for up to 5 years. Existing knowledge is limited for wet meadow reconstructions; therefore we see this as a short-term research effort to determine if this action is worth the effort in the future.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

The CCP recognizes the importance of determining the quality and health parameters of non-managed prairie wetlands in order to preserve their natural productivity, longevity, and function (objectives R1.8 and D1.7; Appendix F). The HGM identified the disappearance of the native wet meadow plant community on Complex prairie wetlands as a significant factor affecting the health and function of the wetland and use by native wildlife. The Complex's HGM has a recommendation of reconstructing wet meadow communities that have become invaded with reed canary grass and other invasive plant species. Results from this survey would be used by managers to evaluate the success of wet meadow reconstruction methods, the sustainability of the native species, and rate of invasion of exotic plant species. Survey results would also determine the timing, frequency, duration, and intensity of management treatments to maintain the desired plant community on reconstructed wet meadows.

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

This proposed survey would be important for managers to know if they are achieving CCP goals R1.8 and D1.7 which aim to maintain native plant composition and diversity on all established reconstructions. Also, the techniques involved with reconstructing wet meadows are new, and results are undocumented. Our goal is to survey to see if our wet meadows will improve floristically following reconstruction. Following establishment, reconstructions are managed similar to existing diverse wet meadows and are based on plant community composition. Monitoring results are also used to identify successful reconstruction

techniques, when a defoliation treatment is needed, and if the diversity is sustainable over time.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

Not at this time. Other partners would be beneficial to expanding the scope and scale of the project and could include ND Game and Fish Department, The Nature Conservancy, ND State University, and other FWS stations. Parts of the project (i.e. evaluation of reconstruction techniques) could be contracted with Universities and sites could be used across the Complex and include non-Service wetlands.

5) Protocol status?

Different protocols would be used to answer various questions of the project including seeding technique, sustainability, and success of various species to reconstruction. A site-specific monitoring protocol could be developed for each of the questions. The Complex would work with the Dakotas Zone Biologist and ND State University staff to develop the protocol and submit to I&M for review in FY19. This standardized monitoring protocol would be used for a long term monitoring effort.

3.2 Rare Prairie Butterflies in Prairie Reconstruction (CR); (FF06RTWK00-014, FF06RETE00-028)

1) What is the population or attribute of interest, what will be measured, and when?

Rare prairie butterflies include Dakota skipper, Poweshiek skipperling, regal fritillary, and other species that are designated as T&E, candidates, petitioned, or identified as a priority in the future. We are looking at monitoring rare butterflies on sites where they could be reintroduced in the future. We expect that this will occur on an annual basis for five years following release.

Surveys would be conducted during the peak flight time of the different species. Annual intensive monitoring would seek to ensure species were identified and counted despite their small size, secretive nature, short flight times and sensitivity to environmental conditions. Qualified surveyors would need to be identified and contracted to conduct these surveys due to the high degree of difficulty in identifying and distinguishing between the skipper species.

2) Which refuge management objective does the survey support? Is the objective derived from the CCP, interim objectives, an HMP, or other?

The CCP identifies the importance of conserving and managing Refuge and District habitats for a variety of species including butterflies. The information garnered from the surveys would address the CCP Objectives R3.1, D3.3, and D3.5 (Appendix F). Due to the special listing status of two of the species these surveys would meet Service Recovery plans and objectives and a CCP Objective that addresses listed, rare prairie butterflies (D3.3 – Appendix F).

3) Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

Tewaukon Complex is embedded in a cropland dominated landscape, and we are striving to create more quality habitat for butterflies. Conservation strategies of the future include releasing butterflies such as Dakota skippers (currently being raised at the MN Zoo) at reconstructed sites that possess potential to support prairie butterflies. This is an important survey to conduct because we are looking to see if we can create habitat for rare butterflies using native plant mixes. If the butterflies are released and persist, we will know we have been successful; conversely, if they are released and disappear, the recovery strategy on reconstructions would not be continued.

4) Is this a cooperative survey? If so, what partners are involved in the survey?

Potentially yes. We anticipate would collaborate with USFWS Ecological Services and potential partners could include ND State University, US Forest Service, The Nature Conservancy, and ND Game and Fish Department.

5) Protocol status?

Development or use of an existing protocol would depend on the different metrics that need to be measured and objectives of the project or management strategy. Coordination with the

Dakota Zone Biologist, USGS, and Universities that are currently working on a protocol to identify and monitor these butterflies will continue in order to develop a station specific protocol.

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Appendix A. Criteria and Weights Used to Prioritize Surveys

Final Criteria Weighting Matrix

Category	Record	Criteria	Scoring Choices	Rating	3 Weights
1. Refuge Priorities and Management Needs	1	*1A. Refuge Purpose*	*scale 1-4*	*0*	*0.00000*
	2	***1B. CCP or Other Management Plan Objectives***	**scale 1-4**	**100**	**0.40000**
	3	*1C. NWRS Objectives*	*scale 1-4*	*0*	*0.00000*
	4	***1D. Management Utility (Decision Support) for the Refuge***	**scale 1-4**	**75**	**0.30000**
2. Partner Priorities and Management Needs	5	*2A. FWS Program Need*	*scale 1-4*	*0*	*0.00000*
	6	*2B. FWS Partner Need*	*scale 1-4*	*0*	*0.00000*
3. Ecological Application	7	*3A. ROC*	*scale 1-4*	*0*	*0.00000*
	8	*3B. Refuge Processes*	*scale 1-3*	*0*	*0.00000*
	9	*3C. Survey Breadth*	*scale 1-4*	*0*	*0.00000*
4. Additional Legal Mandates	10	*4A. Listed Species or Vegetation Communities*	*scale 1-4*	*0*	*0.00000*
	11	*4B. Other Legal Mandates*	*scale 1-3*	*0*	*0.00000*
5. Immediacy of Need	12	*5A. Controversy*	*scale 1-4*	*0*	*0.00000*
	13	***5B. Threat***	**scale 1-4**	**50**	**0.20000**
6. Scope and Scale	14	*6A. Baseline Data*	*No/Yes (1-2)*	*0*	*0.00000*
	15	*6B. Survey Scope*	*scale 1-3*	*0*	*0.00000*
	16	***6C. Spatial Scale***	**scale 1-4**	**25**	**0.10000**
	17	*6D. Integration with Other Survey*	*scale 1-4*	*0*	*0.00000*
	18	*6E. Attribute Quality and Scope*	*scale 1-4*	*0*	*0.00000*
7. Protocol	19	*7A. Sampling Design Stage*	*scale 1-4*	*0*	*0.00000*
	20	*7B. Field Methods Stage*	*scale 1-4*	*0*	*0.00000*
	21	*7C. Data Management, Analysis, and Reporting*	*scale 1-4*	*0*	*0.00000*
8. Cost	22	*8A. Monetary*	*scale 1-4*	*0*	*0.00000*
	23	*8B. Personnel*	*scale 1-4*	*0*	*0.00000*
	24	*8C. Security/Source of Funding*	*scale 1-4*	*0*	*0.00000*

Appendix B. Prioritization Scores and Status of All Ranked Surveys

Prioritization scores were generated for 13 candidate surveys by refuge staff using four criteria for each survey (Appendix A). Scores were then used as a starting reference to assign the surveys into tiers. Finally, survey status was assigned by considering the capacity likely to be available for conducting each survey to completion. Current surveys are most likely to be done within the duration of this IMP based on station funds alone. Expected surveys will possibly be conducted because there is a reasonably high chance that additional capacity will be obtained through non-station funding sources. Future surveys are those not very likely to be conducted because of low priority and the chance of obtaining required capacity is relatively low. Surveys selected for the IMP (status = Current or Expected) are shown in blue. Non-selected surveys (status = Future or Historical) are not included in Table 1.1 – 1.2 of the IMP.

Prioritization scores from the SMART tool for all considered surveys.

No.	Survey Name	Prioritization Score	Tier[a]	Survey Status	IMP Status	Survey Priority
1	Four-Square-Mile Breeding Waterfowl Survey	**1.000**	1	Current	Selected	1.1
2	Native Prairie Adaptive Management Program Monitoring	**0.900**	1	Current	Selected	1.2
3	Prairie Reconstruction Monitoring	**0.800**	1	Current	Selected	1.3
4	Wet Meadow Reconstruction	0.750	3	Expected	Selected	3.1
5	Index of Plant Community Integrity	**0.750**	1	Current	Selected	1.4
6	Monitoring of Native Prairie	**0.725**	1	Current	Selected	1.5
7	Rare Butterflies in Reconstruction Survey	0.725	3	Expected	Selected	3.2
8	Rare Butterfly Inventory	0.725	2	Expected	Selected	2.1
9	Water Quality Monitoring	**0.575**	2	Expected	Selected	2.2
10	Grassland Bird Survey	**0.525**		Historic	Not Selected	
11	Breeding Shorebird Survey	**0.500**	1	Current	Selected	1.6
12	Fathead Minnow Inventory	0.475	2	Expected	Selected	2.3
13	Baseline Reptile, Amphibian and Small Mammal Survey	0.350		Future	Not Selected	

[a] Tier 1--The highest priority surveys that the Project Leader estimates can be conducted with existing staffing and funding.

Tier 2--Surveys that the Project Leader sees as second priority for the station, or high priority surveys that would require an increase in operational capacity.

Tier 3--Lower priority surveys that are currently being conducted or are anticipated but would require the major reallocation of staff and capacity.

Appendix C. Brief Description of Non-selected Surveys

Table C.1. The following surveys will be conducted in the future if new capacity becomes available.

Survey Name	Description	Survey Status
Baseline Reptile, Amphibian and Small Mammal Survey (RAISM)	Baseline inventories for reptiles, amphibians, and small mammals.	Future

Table C.2. Non-selected surveys or non-survey activities excluded from further consideration.

Activity Name	Description	Reason for Exclusion
Mid-Winter Waterfowl Survey	Waterfowl count during December-January. Tewaukon is typically frozen during this time with none to very few waterfowl present.	Not used to inform management.
Mid-Continent Sandhill Crane Survey	Sandhill crane count during late March. Crane migration typically doesn't occur during the count.	Not used to inform management.
Audubon Christmas Bird Count	Bird enthusiasts from the public assist the refuge and record all bird observations in designated areas	Not used to inform management but used more as a public use event.
Spurge Beetle Monitoring	Monitoring the presence of spurge beetles using sweep net method	Low priority and rarely conducted.
Weed Mapping	Mapping non-native invasive plants for future treatment.	Not a high priority biological survey. Only used to direct Early Detection Rapid Response (EDRR) to non-native invasions.
Spike Seeding Research Project	Research to determine the best seed mix to out-compete Canada thistle in reconstructions of prairie.	Research was completed and results were published.
Grassland Song Bird Survey	Grassland song bird survey that provided population and trend information	Not used to inform management

Appendix D. Survey Cost Summary

Survey Name	Survey Priority	Status	Survey Frequency	Staff Hours (total hours required during year of survey)				Annual Operating Cost	Estimated # of Seasonal Positions Needed to Conduct the Survey
				Biologist	Other Perm. Staff	Term Bio Tech	Seasonal BioTech		
Four-Square-Mile Breeding Waterfowl Survey	1.1	Current Survey	Annual	130	174	90	6	4150	1
Native Prairie Adaptive Management Monitoring	1.2	Current Survey	Annual	69		80		281	0
Prairie Reconstruction	1.3	Current Survey	Annual	88		133		971	0
Index of Plant Community Integrity	1.4	Current Survey	Annual	65		23	12	292	1
Monitoring of Native Prairie	1.5	Current Survey	Annual	90		4	40	877	1
Breeding Shorebird Survey	1.6	Current Survey	Annual	14				68	0
Rare Butterfly Inventory	2.1	Expected Survey	Annual	71				0	0
Water Quality Monitoring	2.2	Expected Survey	Annual	65				0	0
Fathead Minnow Inventory	2.3	Expected Survey	Annual	50				0	0
Wet Meadow Reconstruction	3.1	Expected Research	Annual	100				0	0
Rare Prairie Butterflies in Reconstructions	3.2	Expected Research	Annual	76				0	0

Appendix E. Survey Cost Analysis

1.1 Four-Square-Mile Breeding Waterfowl Survey

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist											8					10						72		4			32		4	
Other Permanent Staff																4						150					20			
Seasonal Biotech																											6			
Other																						65					25			

	July					August					September					October					November					December				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																														
Other Permanent Staff																														
Seasonal Biotech																														
Other																														

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
$4,150	0	0

Additional Information:

- Other = Term Biotech and assumes 1 seasonal Biotech is hired to assist with field work but won't be here until June
- Equipment = 5 trucks operating/field day x 100 miles/day = 500 miles/day x 34 vehicle use days = 17,000 total vehicle miles/$15 mpg = 1,133 gall x $3/ gallon =$3400 fuel costs for vehicle + $50 boat motor fuel/oil + $500 miscellaneous equipment maintenance/repair + $200 survey equipment = $4150

1.2 Native Prairie Adaptive Management Program Monitoring

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																4			3					4		16				
Other Permanent Staff																														
Seasonal Biotech																														
Other																										10				
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist		10		8					8				8	8																
Other Permanent Staff																														
Seasonal Biotech																														
Other		60					10																							

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
$281	0	0

Additional Information:

- Other = Term Biotech
- Equipment = 1 truck operating per field day x 50 miles x 8 vehicle use days = 400 total miles/15 mpg= 27 gallons x $3/gallon = $81 in fuel + $100 miscellaneous equipment maintenance/repair + $100 survey equipment = $281

1.3 Prairie Reconstruction Monitoring

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																8										5				
Other Permanent Staff																														
Seasonal Biotech																														
Other																8										5				
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist		10				5	20																20	20						
Other Permanent Staff																														
Seasonal Biotech																														
Other		40					80																							

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
$971	0	0

Additional Information:

- Other = Term Biotech
- Equipment = 1 truck operating per field day x 80 miles x 20 vehicle use days = 1,600 miles/15 mpg = 107 gallons x $3/gal = $321 in fuel +$ 50 UTV fuel + $300 miscellaneous equipment maintenance/repair + 300 survey equipment (monument supplies) =$971

1.4 Index of Plant Community Integrity (IPCI)

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																					10									
Other Permanent Staff																														
Seasonal Biotech																						3					3			
Other																														
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist		20																					20	15						
Other Permanent Staff																														
Seasonal Biotech		3										3																		
Other		20															3						10							

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
$292	0	0

Additional Information:

- Other = Assumes Term Biotech Fieldwork and NDSU partner in analysis
- 1 truck operating per field day x 30 miles/day = 30 miles/day x 7 vehicle use days = 210 total miles/ 15 mpg = 14 gallons x $3/gal = $42 in fuel + $50 in UTV fuel + 100 miscellaneous equipment maintenance/repair + $100 survey equipment = $286

1.5 Monitoring of Native Prairie

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																10														
Other Permanent Staff																														
Seasonal Biotech																														
Other																4														
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist	5	20					10														5		20	20						
Other Permanent Staff																														
Seasonal Biotech		30					10																							
Other																														

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
$877	0	0

Additional Information:

- Other = Assumes Term Biotech
- Equipment = 2 trucks operating per field day x 100 miles/day = 200 miles/day x 10 vehicle use days = 2000 total miles/ 15mpg = 134 gallons x $3/gal = $402 in truck fuel + $75 in UTV fuel + 300 miscellaneous equipment maintenance/repair + $100 survey equipment = $877

1.6 Breeding Shorebird Survey

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																					2	5					5		2	
Other Permanent Staff																														
Seasonal Biotech																														
Other																														
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																														
Other Permanent Staff																														
Seasonal Biotech																														
Other																														

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
$68	0	0

Additional Information:

- Equipment = 1 truck operating per field day x 40 miles/day x 2 vehicle use days = 80 miles/15 mpg = 6 gallons x $3/gallon = $18 fuel + $50 miscellaneous equipment maintenance/repair = $68

2.1 Rare Butterfly Inventory

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist																10					20					5			3	
Other Permanent Staff																														
Seasonal Biotech																														
Other																											75			
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist	5					5			3		20																			
Other Permanent Staff																														
Seasonal Biotech																														
Other		75					75						50	40																

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
0	0	~$20,000

Additional Information:

- Contracts = Assumes contract with university or private company with butterfly identification expertise.

2.2 Water Quality Monitoring

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist											20					5					5					5				
Other Permanent Staff																														
Seasonal Biotech																														
Other																														
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist	5					5					5					5					10									
Other Permanent Staff																														
Seasonal Biotech																														
Other		40					40					40					30						40	50						

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
0	0	~$20,000

Additional Information:

- Other = Assumes contract with university as a graduate student project or partner with Department of Health to put in water quality monitoring station

2.3 Fathead Minnow Inventory

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist											10					20														
Other Permanent Staff																														
Seasonal Biotech																														
Other																						30					20			
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist			10	10																										
Other Permanent Staff																														
Seasonal Biotech																														
Other								20	20																					

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
0	0	~$20,000

Additional Information:

- Other = Assumes graduate study or partnership with ND Game & Fish Department

3.1 Wet Meadow Reconstruction

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist						10					10					10					20									
Other Permanent Staff																														
Seasonal Biotech																														
Other																														
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist	10					10					20			10																
Other Permanent Staff																														
Seasonal Biotech																														
Other		80					80						100	80																

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
0	0	~$20,000

Additional Information:

- Other = Assumes contract with university as a graduate student project

3.2 Rare Prairie Butterflies in Reconstruction

Estimated # hours needed for the survey based on calendar year.

- **P** = Planning (design, training, and or coordination, **F** =Field Work, **A** =Analysis, **R**= Reporting (includes archiving), **O** =Other

	January					February					March					April					May					June				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist											10					10					20					10				
Other Permanent Staff																														
Seasonal Biotech																														
Other																														
	July					**August**					**September**					**October**					**November**					**December**				
Staff	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**	**P**	**F**	**A**	**R**	**O**
Biologist	10			3		10			3																					
Other Permanent Staff																														
Seasonal Biotech																														
Other		75					75																							

Estimated Annual Cost		
Equipment	**Travel**	**Contracts**
0	0	~$20,000

Additional Information:

- Other = Assumes this would be a FWS multi-station research project with University partnerships and hiring specialty contractors for butterfly identification and field work.

Appendix F. Goals and Objectives from the Tewaukon National Wildlife Refuge and Wetland Management District Comprehensive Conservation Plans (CCP) and Hydrogeomorphic Evaluation of Ecosystem Restoration (HGM)

The following objectives are referenced in this document and provide specific targets for land acquisition and management of fee-title waterfowl production areas until the next comprehensive conservation plan (CCP) is scheduled to be completed and a new habitat management plan (HMP) is developed. The HGM provides suggestions and recommendations for management and monitoring and evaluation for wetland and surrounding upland reconstruction, restoration, management or returning the natural hydrology of the area.

Tewaukon National Wildlife Refuge CCP (2001):

Habitat Management

R1 Goal: Preserve, restore, and enhance the ecological diversity of native flora, other grasslands and wetlands within the tallgrass prairie ecosystem.

R1.1 Objective: Preserve, restore, and enhance the diverse native floral communities on 616 acres of the Refuge's existing native prairie so that greater than 75 percent of the plant community is composed of indicator species that are suitable for each site using Heidel's classification (Heidel 1986).

R1.2 Objective: Manage the six Prairie Focus Areas (South Pool 4, Krause, North Pool 2, Southwest Sprague Lake, NE 1/4 Section 36, and Southeast of Railroad tracks - See Map 7): 1) to achieve an area of contiguous grassland (greater or equal to 160 acres) that is greater than 50 meters from woody vegetation (greater than one meter tall); 2) contain a variety of vegetative heights on the area with 20 percent in each of the following categories: 0 to 10 cm; 10 to 20 cm; 20 to 30 cm; 30 to 60 cm; greater than 60 cm; 3) to increase native floral diversity so that greater than 75 percent of the vegetative composition is composed of indicator species of the dry mesic tallgrass, central mesic tallgrass prairie, wet prairie, mesic tallgrass prairie climax communities (Heidel 1986).

R1.3 Objective: Maintain 80 percent of DNC fields with two decimeters visual observation obscurity to provide optimal nesting habitat for ground nesting ducks (mallards, teal, etc.) until the fields can be seeded back into native plant species.

R1.4 Objective: Over the next 15 years convert 600 acres of planted cover (DNC, introduced grasses, and warm season native grass plantings) to a diverse native floral community composed of 75 percent of the climax species identified in Heidel's Classification (1986).

R1.5 Objective: Annually provide for approximately 20 percent in dry, 20 percent in shallow, 20 percent mid-depth, and 20 percent open water wetland conditions on Refuge managed wetlands and manage the remaining 20 percent as a reserve to adjust to local climatic and habitat conditions.

R1.6 Objective: Protect existing water rights and clarify water rights needs on Refuge wetlands in order to provide long-term protection of water resources.

R1.7 Objective: Reduce annual Wild Rice River watershed nitrate inputs and sediment loads as it comes into the Sprague Lake Unit, and LaBelle Creek as it enters the Tewaukon Refuge Unit by 15 percent.

R1.8 Objective: Determine the quality and health parameters of non-managed prairie wetlands in order to preserve their natural productivity, longevity, and function.

R1.9 Objective: Maintain native woody vegetation on the Lake Tewaukon peninsula, on the shore of Lake Tewaukon, and along LaBelle Creek corridor to provide roosting habitat, food, and cover for migratory and resident birds and other wildlife.

R1.10 Objective: Reduce by 15 percent (measured as canopy cover) nonnative plants on Complex lands and waters.

Wildlife

R.2 Goal: Preserve, restore, and enhance the diversity and abundance of migratory birds and other native wildlife with emphasis on waterfowl, grassland and wetland-dependent birds.

R2.1 Objective: Maintain an average upland duck nesting success of at least 30 percent (Mayfield) to increase waterfowl production on the Refuge.

R2.2 Objective: Maintain no more than 135 acres of cropland as a Refuge share to provide green browse and millet/corn for migratory waterfowl.

R2.3 Objective: Initiate a baseline breeding bird survey on the Refuge to monitor local breeding migratory bird population changes over time.

R2.4 Objective: Monitor relative abundance and breeding status for four tallgrass prairie indicator bird species in the six areas identified for grassland bird management to provide feedback and information on the tallgrass prairie habitat management approach.

R2.5 Objective: Respond to and contain migratory bird disease outbreaks by applying safe and proper procedures as recommended by National Wildlife Health Center protocol.

R2.6 Objective: Maintain an average winter deer population of no more than 250 to minimize vegetative damage on the Refuge and crop damages on adjacent lands.

R2.7 Objective: Develop a specific Monitoring Plan to gather baseline information for small and medium mammal populations on the Refuge.

R2.8 Objective: Develop a specific Monitoring Plan to gather baseline information for amphibian and reptile populations on the Refuge.

R2.9 Objective: Restrict the spread of existing and additional nonnative animal species (carp, house sparrows, feral dogs and cats) that adversely impact native species.

R2.10 Objective: Refrain from carrying out additional management activities that specifically encourage population expansion of existing introductions (pheasants, gray partridge) to the detriment of native species.

R2.11 Objective: Manage the Refuge as a protected resting and feeding area for migratory birds during the spring and fall migration periods.

R2.13 Objective: Manage the Refuge (except for ice fishing on Lake Tewaukon and Sprague Lake) as a closed area from January through March to reduce disturbance to wintering resident wildlife.

Endangered Species

R3 Goal: Contribute to the preservation and restoration of endangered, threatened, rare, and unique flora and fauna that occur, or have historically occurred in the area of Tewaukon National Wildlife Refuge.

R3.1 Objective: Develop a Monitoring Plan to measure relative abundance of three rare butterflies in the six Prairie Focus Areas to provide feedback and information to the tallgrass prairie habitat management approach.

Tewaukon Wetland Management District (2000):

Habitat Management

D1 Goal: Preserve, restore, and enhance the ecological diversity of native flora, other grasslands, and wetlands within the tallgrass prairie wetland ecosystem.

D1.1 Objective: Preserve, restore, and enhance diverse native floral communities so that greater than 75 percent of the plant species composition is composed of climax species on all native tallgrass prairie tracts on WPAs. (Refer to Heidel's Classification 1986 of floral communities of the tallgrass prairie ecosystem and desired indicator species in the Native Prairie Refuge Section.)

D1.2 Objective: Manage three WPAs as Prairie Focus Areas (Hartleben/ Aaser WPA, Gainor WPA, and the Gunness WPA) (Map 14): 1) to achieve an area of contiguous grassland (greater or equal to 160 acres) that is greater than 50 meters from woody vegetation (greater than 1 meter tall); 2) contain a variety of vegetative heights on the area with 20 percent in each of the following categories: 0 to 10 cm; 10 to 20 cm; 20 to 30 cm; 30 to 60 cm; greater than 60 cm; 3) to increase native floral diversity so that greater than 75 percent of the vegetative composition is composed of indicator species of the dry mesic tallgrass, central mesic tallgrass prairie, wet prairie, mesic tallgrass prairie climax communities (Heidel 1986).

D1.3 Objective: Through a combination of voluntary partnerships, easements, and fee title land acquisition, preserve the remaining estimated 60,900 acres of existing native prairie tracts within the tallgrass prairie ecosystem to provide nesting areas for grassland nesting birds and protection for unique and rare plant and animal communities.

D1.4 Objective: Protect all grassland easement real property interests from development or conversion in Ransom, Richland, and Sargent Counties.

D1.5 Objective: Maintain 30 percent of DNC fields on High Management Priority WPAs and 10 percent on Moderate Management Priority WPAs with 7.87 inches (2 decimeters) observation obscurity to provide optimal nesting habitat for waterfowl.

D1.6 Objective: Convert 400 acres of tame grass, cropland, and warm season native grass plantings on High Management Priority WPAs and 150 acres of Moderate Management Priority WPA fields to a diverse native floral community to develop larger contiguous blocks for migratory bird species and other prairie wildlife.

D1.7 Objective: Protect the quality and health of all prairie wetlands to preserve their natural productivity, longevity, and function on WPAs.

D1.8 Objective: Clarify the legal mechanism to acquire water rights on the Gainor WPA.

D1.9 Objective: Protect an average of 100 acres/year of wetland habitat through easements or fee title purchase from willing sellers for waterfowl and other migratory birds.

D1.10 Objective: Protect all wetland easement real property interests from development, draining or conversion in Ransom, Richland, and Sargent Counties.

D1.11 Objective: Identify and protect existing fens in the District through easements, fee title purchases from willing sellers, and cooperative agreements with private landowners.

D1.12 Objective: Improve water quality and native aquatic resources within riparian zones of the Red River of the North Watershed.

Wildlife

D2 Goal: Preserve, restore, and enhance the diversity and abundance of migratory birds and other native wildlife with emphasis on waterfowl, grassland, and wetland-dependent birds.

D2.1 Objective: Maintain an average duck nesting success of at least 30 percent Mayfield on seven WPA complexes in the District (Evanson/ Anderson, Evanson, Nelson/Klefstad, Palensky/Wyum/Kaske, Smith/ Tanner/Buckmiller, Englevale Slough, and Weaver/Coit) for waterfowl production (Map 14).

D2.2 Objective: Monitor relative abundance and breeding status of four tallgrass prairie indicator bird species on the three WPAs as identified for grassland bird management and to provide feedback and information to the tallgrass prairie habitat management approach.

D2.3 Objective: Respond to and contain migratory bird disease outbreaks by applying safe and proper procedures as recommended by National Wildlife Health Center protocol.

D2.4 Objective: Develop a Monitoring Plan to gather baseline data on small mammals on the following high priority WPAs: Hartleben WPA Complex; Gunness WPA; Biggs/Berndt WPA; Weaver/Coit; and Krause WPA (Sargent County) (Map 14).

D2.5 Objective: Develop a Monitoring Plan to gather baseline data on amphibians and reptiles on the following high priority WPAs: Hartleben WPA Complex; Gunness WPA; Biggs/Berndt WPA; Weaver/Coit; and Krause WPA (Sargent County) (Map 14).

D2.6 Objective: Restrict the spread of existing and additional nonnative animal species (carp, house sparrows, feral dogs and cats) that adversely impact native species.

Endangered Species

D3 Goal: Contribute to the preservation and restoration of endangered, threatened, rare, and unique flora and fauna that occur or have historically occurred in the District.

D3.1 Objective: Work with the U.S. Fish and Wildlife Service Ecological Services Division, Forest Service, and private landowners with existing populations of western prairie fringed orchids to protect and enhance orchid habitat.

D3.2 Objective: Evaluate methods to determine habitat suitability and use by these species (black tern, ferruginous hawk, yellow rail, loggerhead shrike, red-headed woodpecker, olive-sided flycatcher, dickcissel, Baird's sparrow, chestnut-collared longspur).

D3.3 Objective: Maintain populations of rare prairie butterflies including powesheik skipper, Dakota skipper, and regal fritillary on native prairie sites on the Hartleben, Aaser, and Gunness WPAs.

D3.4 Objective: Develop a Monitoring Plan to gather information on species composition and relative abundance on other known rare butterfly populations within the District on suitable sites every three years.

D3.5 Objective: Evaluate reintroduction of the three rare butterflies on suitable native prairie sites.

D3.6 Objective: Maintain and monitor an average population of 200 to 300 small white lady's slippers on the Hartleben WPA.

Reference:

U.S. Fish and Wildlife Service 2001. Comprehensive Conservation Plan. Tewaukon National Wildlife Refuge Complex. U.S. Department of the Interior, Fish and Wildlife Service, Mountain-Prairie Region.

Hydrogeomorphic Evaluation of Ecosystem Restoration (HGM)

Specific Recommendations for Restoration and Management Options

Improve the Physical and Hydrological Character of the Wild Rice Watershed

1. Slow and reduce surface water, sediment, and nutrient runoff into the Wild Rice River and through Tewaukon NWR.
2. Convert marginal, highly erosive, lands to native vegetation and wetlands

Restore the Physical and Hydrological Integrity of USFWS fee-title and easement lands.

1. Restore the physical and hydrological character of prairie pothole wetlands.
2. Restore the physical and hydrological character of larger relict glacial lakes/larger wetland basins.

Restore Native Vegetation Communities

1. Restore native mesic and wet-mesic tallgrass and mixed-grass prairie on upland moraine hill slopes
2. Restore wet prairie/meadow communities in moraine valleys and drainages and along the edges of wetlands.
3. Restore natural wetland vegetation zones in prairie potholes.
4. Restore natural wetland vegetation zones in larger relict glacial lakes
5. Maintain small bands of riparian woodland around parts of Lake Tewaukon, areas along the Wild Rice River, and along the LaBelle Creek corridor.

Hydrogeomorphic Evaluation of Ecosystem Restoration (HGM) Recommendations for Monitoring and Evaluation

Quantity and Quality of Surface and Groundwater Discharges and Runoff Throughout the Wild Rice River Watershed:

- Develop watershed-scale monitoring and modeling of surface and groundwater discharge and storage amounts including quantifying water use on refuge lands.
- Document and clarify refuge water rights.
- Inventory and monitor agricultural tile drains and ditches including their location, maintenance,
  and discharges.
- Annual monitoring of water quality in the Ditch No. 11 system and Tewaukon NWR drainages and wetlands.
- Conduct bathymetric surveys of impoundments and monitor/document sedimentation amounts and rates.

Restoring Natural Water Regimes and Water Flow Patterns

- Annual monitoring of water management for refuge areas including source, delivery mechanism or infrastructure, extent and duration of flooding/drying, and relationships with non-refuge water and land uses.
- Documentation of how water moves across floodplain areas, especially how surface water moves through the stair-step sequence of higher elevation pothole to lower elevation glacial lake wetlands.
- Evaluation of surface and groundwater interactions and flow across and through moraine hills onto wetland areas.
- Water flow patterns of water diverted from current or modified drainage systems into historic glacial lakes

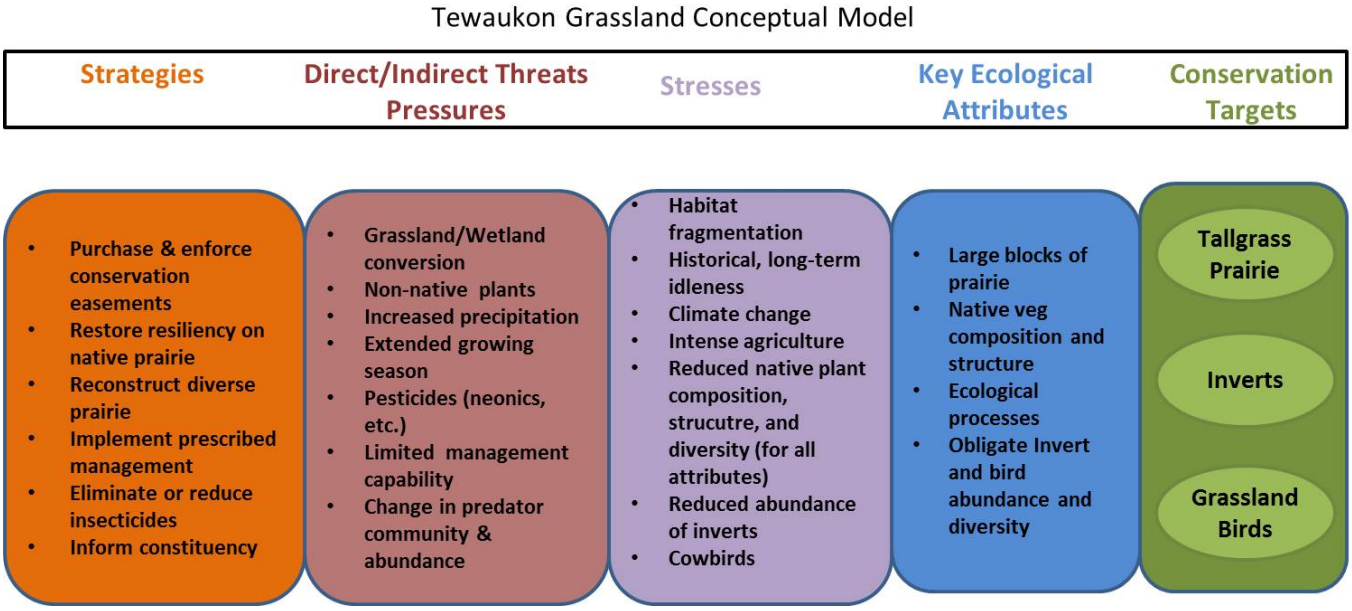
Long-Term Changes in Vegetation and Animal Communities

- Distribution and composition of major plant communities including expansion or contraction rates of introduced and invasive species.
- Responses of restored or enhanced grassland sites to control of introduced species and restoration of native prairie species assemblages.
- Responses of wetland habitats to changes in water management and seasonal distribution of surface water flows.
- Survival, growth, and regeneration rates of reconstructed native prairie habitats.
- Presence and survival of fish in wetlands.
- Abundance, chronology of use, survival, and reproduction of key species such as dabbling ducks, marsh and shorebirds, grassland birds, small mammals, and amphibians and reptiles.

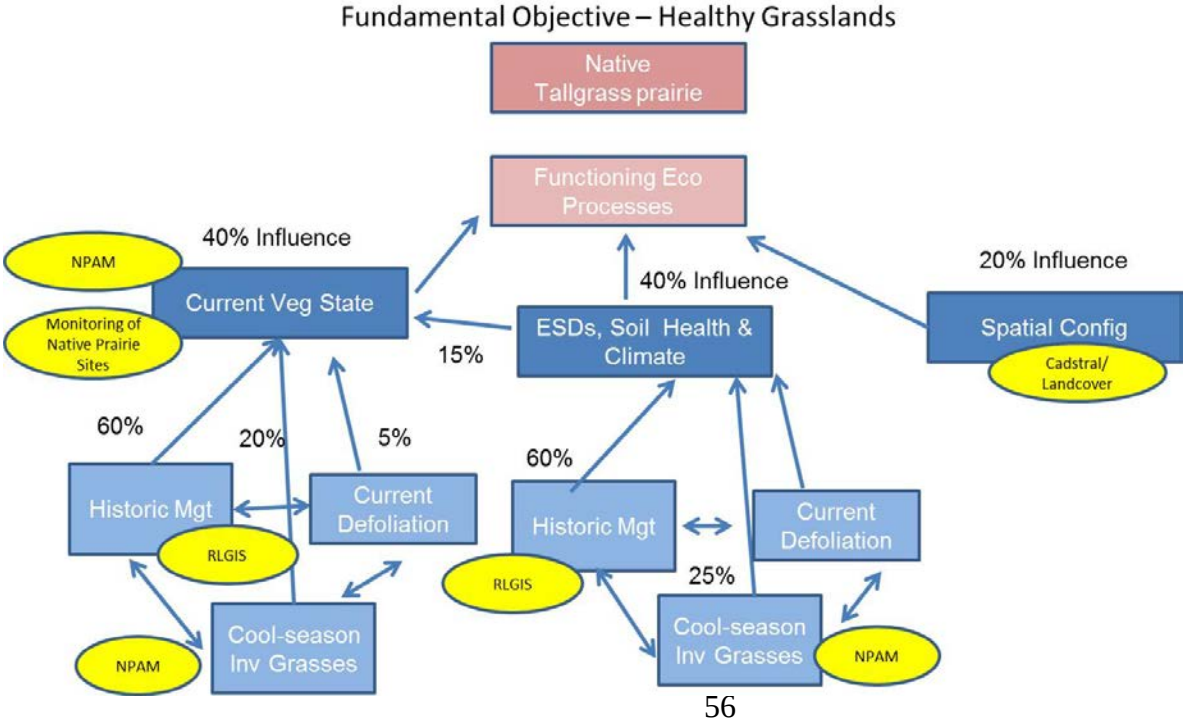
Heitmeyer, M. E., and C. M. Aloia. 2014. Hydrogeomorphic evaluation of ecosystem restoration and management options for Tewaukon National Wildlife Refuge. Prepared for U. S. Fish and Wildlife Service, Region 6, Lakeland, CO. Greenbrier Wetland Services Report 14-05.

Appendix G. Conceptual ecological models (CEM) used to identify conservation targets and associated influence diagrams.

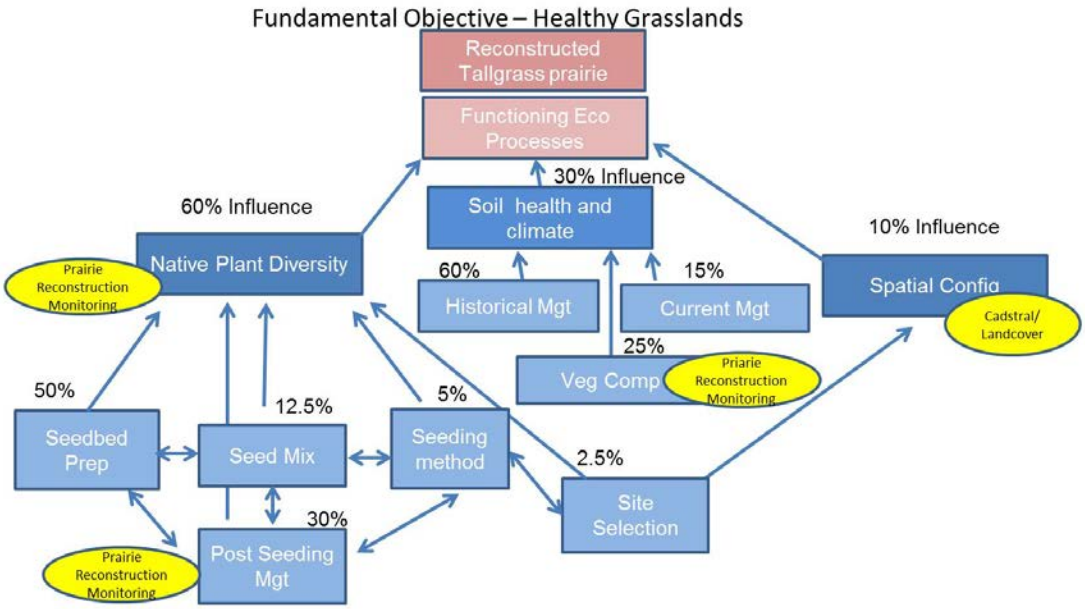
CEM 1. Conceptual Ecological Models for Grassland. Conservation targets are identified along with associated attributes, stressors, threats and strategies.



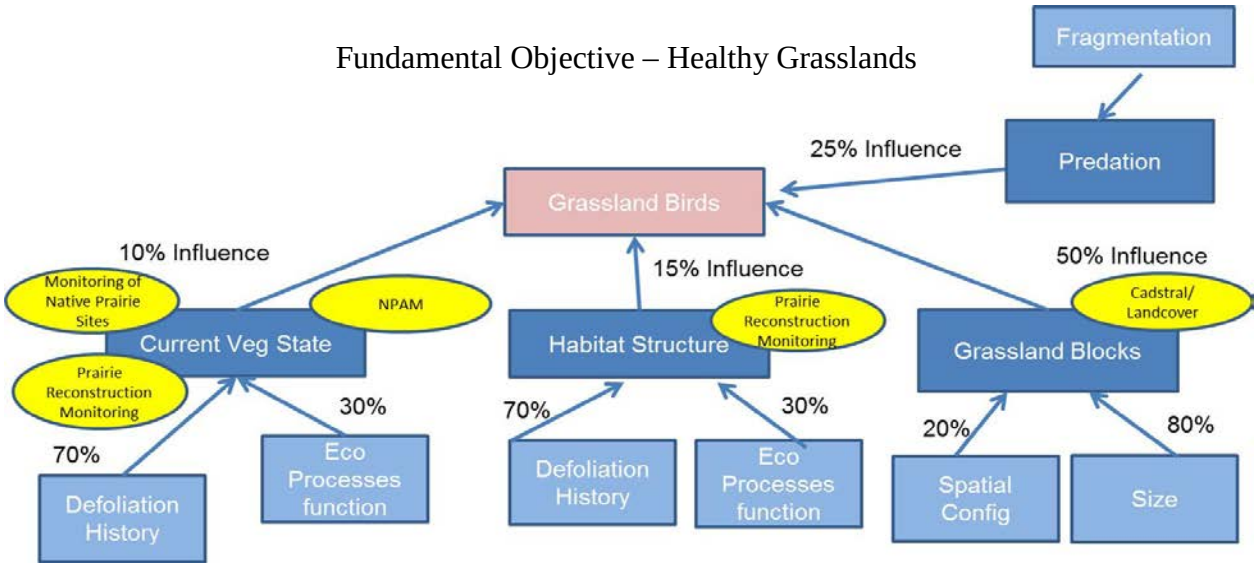
CEM 1A. Influence Diagram for tallgrass prairie, focusing on functioning ecological processes. We are confident that current vegetation state and Ecological Site Descriptions (ESDs), Soil Health, and Climate are approximately equal influence on 'Functioning Ecological Processes'. Spatial Configuration is likely the lowest based on our judgement.



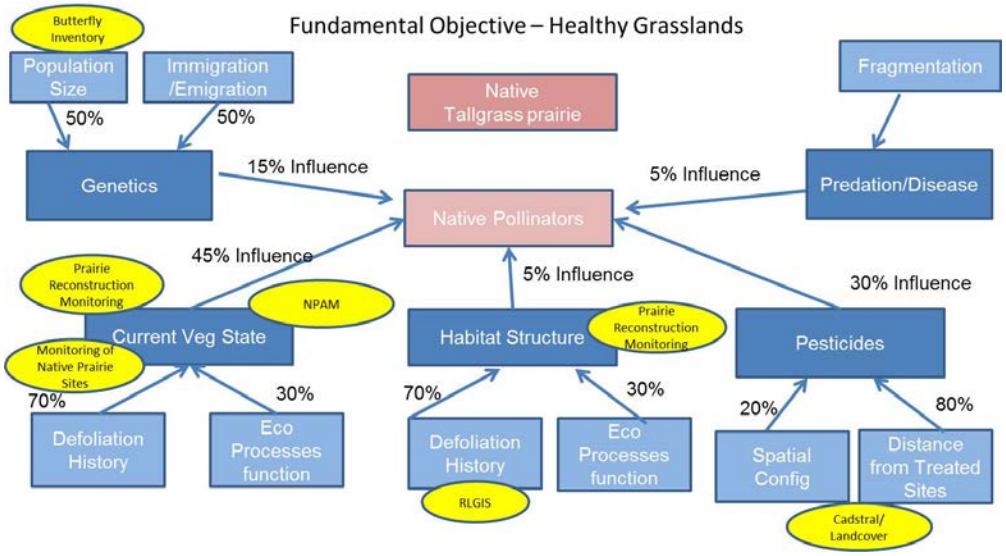
CEM 1B. Influence Diagram for reconstructed tallgrass prairie, focusing on functioning ecological processes. We are confident that native plant diversity is going to be the most prominent influencer for enabling functioning ecological processes. Abiotic factors are not as influential and spatial configuration the least influential based on our estimations.



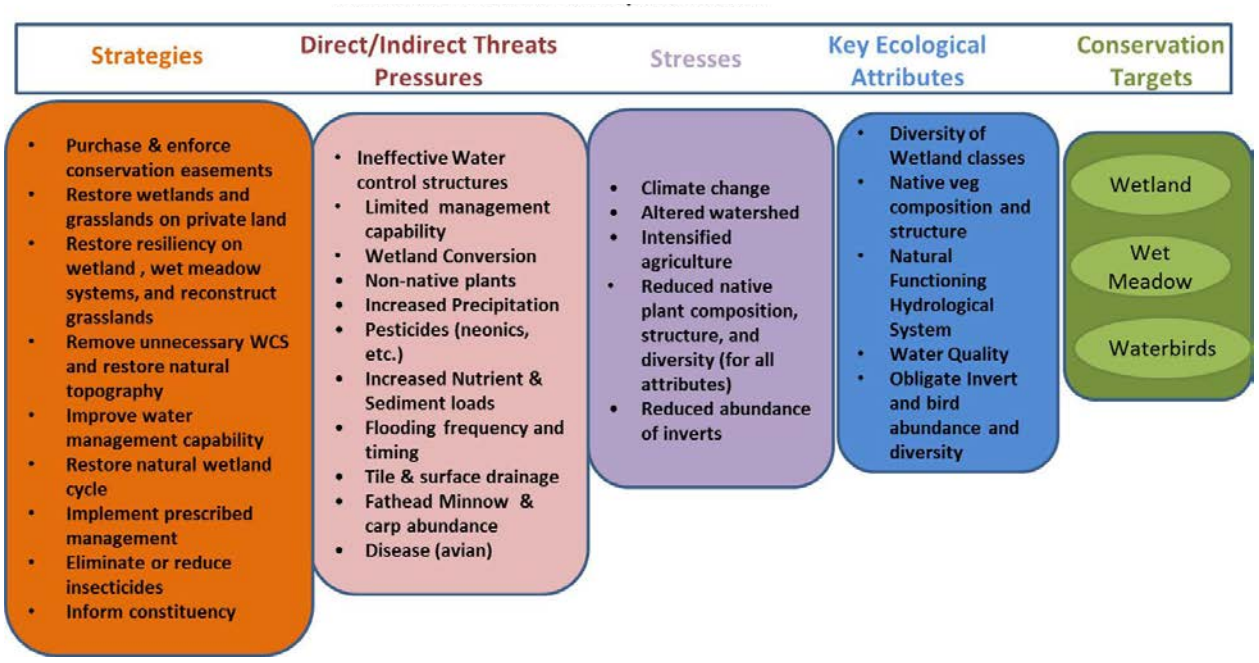
CEM 1C. Influence Diagram for Grassland Birds. The literature provides ample information regarding the importance of the Prairie Pothole Region for recruitment of grassland birds. Most noteworthy is that grassland birds are area sensitive, and therefore require grassland blocks. Nest depredation is known to be one of the primary determents to successful breeding, leading us to place the next highest percentage on that influencer. Most grassland bird experts agree the habitat structure is the most important habitat feature, leading to the percentages that we put on the two habitat variables in the diagram.



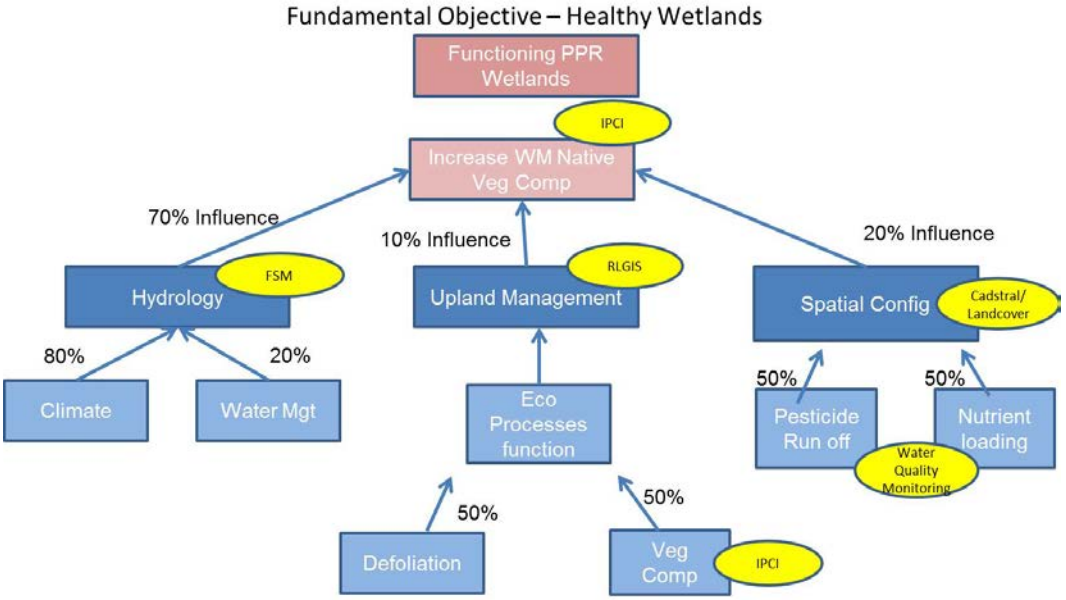
CEM 1D. Influence Diagram for Native Pollinators. The literature states that the quality of the prairie is important for nectar and larval sources, making the current vegetation state as the highest influencer. More data is becoming available on the negative effects of pesticides on pollinators, making it the next highest influencer. The percentages on the final three influencers are based on expert judgement.



CEM 2. Conceptual Ecological Models for Wetlands. Conservation targets are identified along with associated attributes, stressors, threats and strategies.

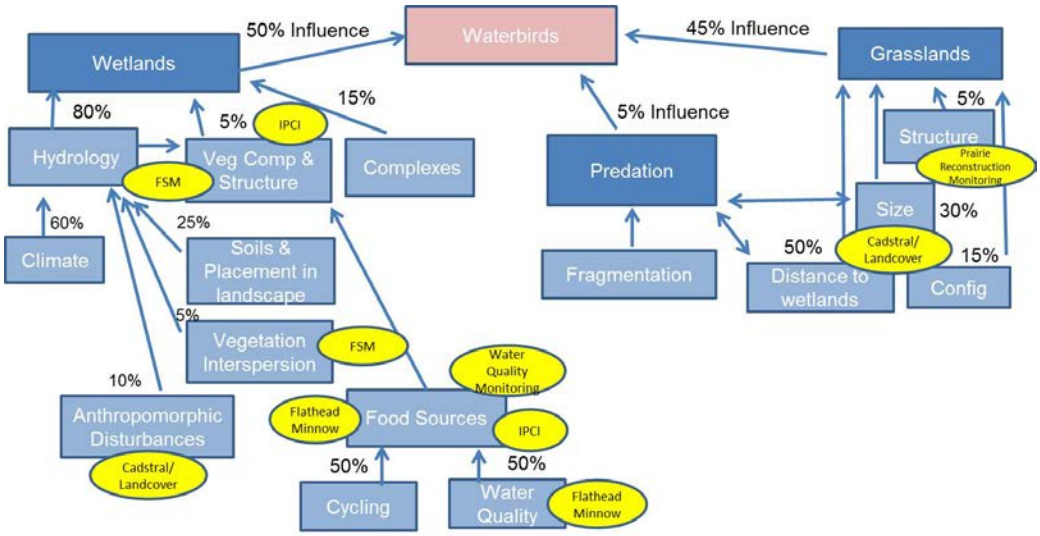


CEM 2A. Influence Diagram for Wetlands and Wet Meadow Zone. The literature states hydrology is the primary driver for wetland state, therefore this is the highest influencer. Spatial configuration and upland management are likely nearly equal influencers, be we estimated that spatial configuration may possess slightly more influence.



CEM 2B. Influence Diagram for Waterbirds. Wetlands and grasslands are necessary for most waterbirds' life cycle, with wetlands providing slightly more influence based on current literature. Predation is an important influencer, but not nearly as much so as wetlands and grasslands.

Fundamental Objective –Healthy Wetlands



Appendix H. Environmental Action Statement (EAS)

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) (40 CFR 1500-1508), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the following proposed action does not require additional NEPA documentation.

Proposed Action, Alternatives, and NEPA Documentation

The proposed action is to implement an Inventory and Monitoring Plan (IMP) for the Tewaukon Wildlife Refuge Complex (Complex). This IMP is a refinement of the 2001 Comprehensive Conservation Plan (CCP) and associated Environmental Assessment (EA) for the Complex. This IMP provides more-specific guidance for surveys of the Complex's fish, wildlife, plant, habitat, and abiotic resources to fulfill the Tewaukon Complex's purposes and help achieve Refuge's goals and objectives.

The EA for the Tewaukon Complex's CCP included goals and objectives for the Complex and assessed the impacts associated with a range of reasonable alternatives to achieve those goals and objectives. The rationale for selection of one specific alternative for implementation is explained in the Finding of No Significant Impact (FONSI) accompanying the final CCP. The goals, objectives, and survey strategies included in this IMP fall within the bounds of those described and assessed in the CCP and EA.

Pursuant to 40 CFR 1502.9, no additional NEPA documentation is required to implement this IMP beyond the EA and FONSI prepared concurrently with the CCP. No substantial changes to the proposed action alternative that was identified, analyzed, and selected for implementation within the CCP, EA, and FONSI are proposed through this IMP. Similarly, no significant new information or circumstances exist relevant to environmental concerns and bearing on the proposed action or its impacts.

In accordance with 43 CRF 46.205 and 40 CFR 1508.4, some surveys within this IMP are covered by the following Departmental categorical exclusion because they would not have significant environmental effects.

"Research, inventory, and information collection activities directly related to the conservation of fish and wildlife resources which involve negligible animal mortality or habitat destruction, no introduction of contaminants, or no introduction of organisms not indigenous to the affected ecosystem." 516 DM 8.5B(1)

Project Leader/Refuge Manager

9/27/2017

Date

Reference:

U.S. Fish and Wildlife Service [USFWS]. 2001. Comprehensive Conservation Plan—Tewaukon National Wildlife Refuge Complex, North Dakota. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Lakewood, Colorado, USA.

IMP Revision Signature Page

IMP Revisions

Tewaukon National Wildlife Refuge
and Tewaukon Wetland Management District

Action	*Signature /Printed Name*	*Date*
Survey list and priority changed:		
Submitted By:	Refuge Manager/Project Leader	
Reviewed By:	Regional I&M Coordinator	
Approved By:	Refuge Supervisor	