

1. **FWS ORGANIZATION CODE: 62515**
2. **TITLE: Revisiting Stewart and Kantrud (1971) prairie wetlands: Changes in wetland plant communities and wetland conditions**
3. **FWS PROJECT OFFICER:** Neil Shook, Refuge and District Manager, Chase Lake National Refuge and Wetland Management District, 5924 19th Street SE, Woodworth, ND 58496, Tel: (701) 662-8611 x330, Fax: (701) 662-XXXX, Email: Neil_Shook@fws.gov.
4. **USGS PRINCIPAL INVESTIGATORS:** Jane Austin, Research Wildlife Biologist, USGS Northern Prairie Wildlife Research Center, 8711 37th Street Southeast, Jamestown, North Dakota 58401. TEL: (701) 253-5510. FAX: (701) 253-5553. Email: JAustin@usgs.gov
5. **FWS RESEARCH COORDINATOR:** Gary Watson, USFWS Research Coordinator, Region 6, PO Box 25486, Denver Federal Center, Denver, CO 80225. TEL: (303) 236-4402. FAX: (303) 276-4792. Gary_Watson@fws.gov
6. **PARTNERSHIPS AND ROLES:** Austin will lead field work and analyses, and supervise a Masters graduate student. H. A. Kantrud, one of the two biologists on the original study, will contribute to field work and information on data collection methods. Neil Shook and Cami Dixon, Dakota Zone Wildlife Biologist (cami_dixon@fws.gov), will contribute data, GIS resources, and logistical assistance. Partners also contribute critical historic and ecological knowledge of these areas and their management.
7. **TYPE OF SUPPORT REQUESTED: Research**
8. **PROBLEM DESCRIPTION AND IMPLICATIONS:** Over the past 50 years, prairie pothole wetlands have experienced a wide range of climatic conditions (severe drought to extreme wet), expansion of invasive species such as hybrid cattail and Canada thistle, and disturbances (e.g., grazing, burning, flooding, fragmentation, cultivation, sedimentation). Many investigations into the effects of land management on wetland systems and their plant communities rely on contemporary data that cover relatively few years and limited sample sizes or treatments. Interpretation of results from short-term studies can be influenced by the stage of wetland cycling during their study, and hence may not fully capture factors influencing biotic responses to management or climate.

The wetland plant community is one of the most significant factors influencing a wetland's other biotic components. The importance of the vegetative community is recognized in the goals of national wildlife refuges and waterfowl management areas to conserve, restore, and enhance the ecological diversity of grasslands and wetlands of the North Dakota prairie. Wetland objectives address improvements to wetland function, emergent cover, and restoration. To track change and progress in meeting objectives, land managers need to monitor changes in the wetland plant community and control invasive plants.

Wetland data collected by R. A. Stewart and H. A. Kantrud 45–50 years ago provide a unique opportunity to evaluate long-term changes in the plant community and wetland conditions relative to land use practices, climate, and invasive species. In this study, the original wetlands studied by R. Stewart and H. Kantrud during 1961–1966 will be resurveyed for wetland plant community and water quality for comparison with their original findings. Changes in wetlands, landscape, and land use will be investigated using historic and current aerial imagery and land-management histories. Those wetlands provided the foundation for the Stewart and Kantrud (1971: U.S. Fish and Wildlife Service Resource Publication 92) wetland classification system for the glaciated prairie and also were the site of early investigations of prairie wetland hydrology. Although of limited spatial scale, the Stewart and Kantrud study areas encompassed fresh to saline wetland systems and are considered

representative of wetlands throughout the U.S. portion of the Prairie Pothole Region. The lands have been owned and managed by the U.S. Fish and Wildlife (FWS) since the start of Stewart and Kantrud's data collection in 1961 and hence provide a complete record of management activities. The study wetlands fall within three Waterfowl Production Areas (WPAs), which are managed by the Chase Lake Wetland Management District (WMD). Conservation, restoration, and enhancement of the ecological diversity and integrity of wetlands are key habitat goals for Chase Lake WMD and other WMDs and NWRs in the region. Management strategies, activities, and decisions include vegetation monitoring; use of livestock grazing, prescribed fire, mowing to mimic natural disturbance regimes; water management of developed wetlands; and integrated pest management to control invasive species. Hence, this study will directly addresses issues important to the long-term management of wetlands in FWS lands in the Dakotas. Study results will provide a foundation for the development of adaptive management and decision support systems. Applicable across a broader scale of wetland landscape of the Prairie Pothole Region, results will expand the Service's understanding of changing conditions of prairie wetlands over 50 years and how wetland systems and their plant communities respond to interactions of land use and climate. Products from this study will include expanded geodatabases for the study WPAs (1960s and current plant data, aerial and ground imagery, remote sensing imagery), current and historic data on plant communities including invasive species, several peer-reviewed publications, and presentations to FWS and at professional meetings. Hence, this study directly addresses issues important to the long-term management of wetlands by USFWS. We will assess changes in the wetland plant communities and wetland conditions in the context of management activities, invasive species, and climate.

9. OBJECTIVES

1. Assess changes in the wetland plant community, with a focus on floristic quality, invasive species, and wetland zonation.
2. Assess temporal and spatial changes in wetland and landscape conditions.
3. Evaluate the roles of land use practices and changing climate on wetland conditions and plant community.

- 10. METHODS AND STUDY AREA:** The wetland and plant community work by Stewart and Kantrud in the early 1960s focused on 3 "old study areas": Mt Moriah, Crystal Springs, and Cottonwood Lake. Most of the 136 studied wetlands in these areas fall within the Mt Moriah, Cottonwood Lake, Smith-Bingham, and Zimmerman WPAs, located on the Missouri Coteau in western Stutsman County.

Objective 1. Assess changes in the wetland plant community, with a focus on floristic quality, invasive species, and wetland zonation.

Stewart and Kantrud visited each wetland multiple times each year during 1961–1966 to record wetland plant species (recording abundance and zone), water levels, and periodically, specific conductivity, pH, and cover type. These 6 years of data provide a complete listing of plants present and their relative abundance in different wetland zones, over a range of dry to moderately wet conditions. The original study wetlands will be revisited in 2013 and 2014 to collect data on wetland plant communities and water quality, using a combination of contemporary methods and the original 1960s protocol. Vegetation data will be collected in June and August–September to capture early and late-maturing species. Water quality data (specific conductivity and pH) will be collected in early spring, mid-summer, and fall. Contemporary data (e.g., species richness and diversity, floristic quality scores, and water quality measures) for each wetland and each study area will be compared to the 1960s data. Of specific interest are changes in abundance or dominance of taxa, particularly invasives such as hybrid cattail and reed canary grass. We will also describe and examine changes in wetland zonation and emergent cover by combining plant and photointerpretation of aerial images. Various graphical and statistical methods will be used to describe and analyze changes that have occurred on study wetlands and areas, as appropriate for the data.

Objective 2. Assess temporal and spatial changes in wetland and landscape conditions

Aerial imagery from various sources (USFWS, USDA, NASA) and years, dating back to 1957, will be used in a geographic information system (GIS) to assess changes in wetland extent, type, coverage of emergent vegetation (cover type), and adjacent land uses. Aerial images have been compiled in a GIS for 1957 and 1964 as well as 1980s–2010. Spatial data on land management histories (e.g., grazing, burning, herbicide treatments, wetland modifications) have been obtained from USFWS. Changes in land use in the quarter section or buffer area surrounding each wetland also will be summarized from aerial imagery. We will describe and quantify changes to wetlands and landscape over time, taking into account seasonal changes in areal extent using models relating wetland drawdown related to area weather.

Objective 3. Evaluate the roles of land use practices and changing climate on wetland conditions and plant community.

Historic monthly weather data are available from several nearby stations at Woodworth and Jamestown. Graphical and multivariate techniques, such as ordination, will be used to examine the data for patterns relating climate and land use relative to changes in wetland plant communities, wetland zonation patterns, and invasive species.

11. PROJECT DURATION: January 2013–Dec 2015

- 12. PRIORITY:** The proposed project supports implementation of the Strategic Habitat Conservation (SHC) framework within the FWS Mountain-Prairie Region by improving our understanding of how changing climate and management influence wetland plant communities and biodiversity. The information provided through this study meets recommendations of the *Conserving the Future*, to provide the refuge with resources to implement adaptive management, develop a scientifically sound database, contribute to inventory and monitoring to assess status and trends, and contribute to the scientific community by cooperative research and data sharing.

13. PRODUCTS AND SCHEDULE:

Apr–Sep 2013, 2014	Training and data collection
Sep–Mar 2014, 2015	Data entry, analyses & GIS work
Winter & Summer 2014	Presentations to FWS, NDCTWS & other meetings
31 Dec 2013, 2014	Interim progress report
Mar–Dec 2015	Manuscript and report development
Aug 2015	Final report (thesis) & GIS geodatabases
Dec 2015	Manuscript(s) submitted to peer-reviewed journals

14. BUDGET:

Funds are requested to support a Masters student and related academic expenses, one seasonal field assistant, minor field supplies, vehicle and fuel, field travel, and travel to professional meetings for presentations. In-kind contributions include water meters, laptop, GPS units, and data tablet (NPWRC), periodic assistance by H. A. Kantrud, periodic time contributions of staff at Chase Lake WMD, and seasonal lodging at Chase Lake WMD.

APPROVALS AND SUBMITTAL



FWS Project Officer

Principal Investigator

USGS Center Director