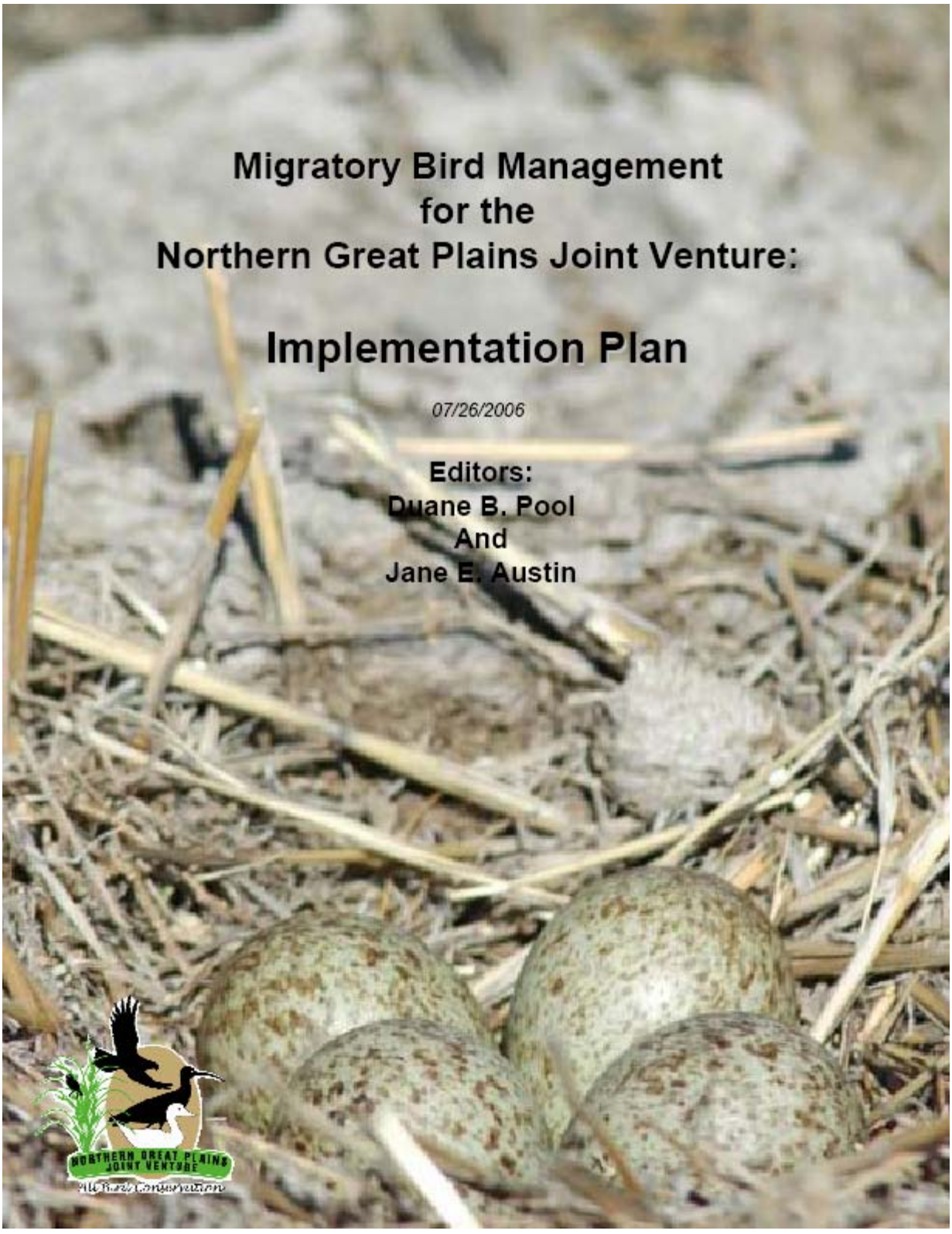

Migratory Bird Management for the Northern Great Plains Joint Venture:

Implementation Plan

07/26/2006

Editors:
Duane B. Pool
And
Jane E. Austin

Mission Statement

The mission of the Northern Great Plains Joint Venture is to seek out new opportunities and foster new partnerships while strengthening existing alliances for the protection, enhancement and restoration of prairie, wetland, riparian and forest ecosystems. These conservation actions will place an emphasis on sustaining and increasing populations of migratory birds, resident birds consistent with bird conservation objectives as expressed in regional, national and international plans.

Goal

Maintain and increase the populations of high priority wetland, grassland, forest and riparian bird species in the Northern Great Plains Joint Venture region.

Suggested citation for the entire document:

Pool, Duane B. and Jane E. Austin Editors. 2006. *Migratory Bird Management for the Northern Great Plains Joint Venture: Implementation Plan*. Gen. Tech. Rep. TC-01. Bismarck, ND: Northern Great Plains Joint Venture. 171 pp.

Suggested citation for individual Chapters of the document: (Example)

Austin, J. E., B. Martin, D. Svingen, and J. Hansen. 2006. *Risks to Wildlife*. Pages 34-43 in: Migratory Bird Management for the Northern Great Plains Joint Venture: Implementation Plan. Pool, D.B. and J.E. Austin ed. Gen. Tech. Rep. TC-01. Bismarck, ND: Northern Great Plains Joint Venture.

Figure 1: Native Prairie in Montana. Marian Atkins

Editors

Duane B. Pool, Ph.D.
Science Coordinator
Northern Great Plains Joint Venture
100 N Bismarck Expressway
Bismarck, ND 58501
dpool@nd.gov

Jane E. Austin, Ph.D.
Research Biologist
USGS – BRD
Northern Prairie Wildlife Research Center
8711 37th St. SE
Jamestown, ND 58401
jane_austin@usgs.gov

NGPJV Management Board

The Management Board of the Northern Great Plains Joint Venture adopts this Implementation Plan under USFWS Policy 721 FW 6.5 C: "*An implementation plan, which the management board develops or adopts, guides joint venture conservation actions. The management board identifies the biological planning, conservation implementation, and evaluation process that will guide the work of the joint venture.*" This Implementation Plan provides the Joint Venture with guidance for developing the science, programs and projects for all bird conservation in the Northern Great Plains (NGP). This document incorporates the guidance found in the continental plans of North American Bird Conservation Initiatives and the relevant State Wildlife Action Plans of the NGP states.

Co-Chairman of the Board, Government
Greg Link - NDGF&D

Co-Chairman of the Board, Private
Rick Warhurst - DUI

Ken Sambor – Coordinator
NGPJV Staff

Duane B. Pool – Science Coordinator
NGPJV Staff

Board Members

Bureau of Land Management

Pheasants Forever

Fidelity Exploration
and Production Company

Montana Fish, Wildlife and Parks

South Dakota Game, Fish & Parks

Natural Resource Conservation Service

National Audubon Society

The Nature Conservancy (Staff)

Bureau of Reclamation

US Forest Service

Wyoming Game and Fish

The Nature Conservancy (Board of Directors)

Ducks Unlimited, Inc.

US Fish and Wildlife Service

Acknowledgements

The Northern Great Plains Joint Venture Management Board and Technical Committee have benefited from the advice and counsel of many individuals and organizations in the preparation of this document. Doug Backlund, Jim Hansen, Bryce Krueger and Dan Svingen of the Technical Committee provided useful comments. I would like to thank Andy Schollett the original Joint Venture Coordinator. Andy was the catalyst that started this entire process. His involvement and early planning documents were the precursors to defining what the JV is today. Rex Johnson, Seth Mott, Steve Dyke provided both conceptual and specific guidance to me and the writing team. Several others provided assistance and feedback during this process. I would like to thank the following individuals for their assistance, reviews, or subject knowledge: Tanya Graham, Patrick Isakson, Connie Schiff, Jennifer Wheeler, Brad Andres, Terry Rich, Neil Neimuth, Genevieve Thompson and Deanna Solhjem. Greg Link of the North Dakota Game and Fish Department (NDGF) was the backbone of this process, providing many hours of encouragement, historic perspective, critiques and serving as a sounding board for my many ponderings.

The people who contributed to this plan were given time away from their busy schedules and for the most part without compensation to the organizations for which they work. Providing staff time to make this plan happen was necessary if this work was to be comprehensive and integrated. The following organizations provide staff and resources for the completion of the plan. The Nature Conservancy through Dr. David Mehlman and Mr. Robert McCready has made the greatest private investments in the creation and continuation of the Northern Great Plains Joint Venture to this point. They have provided me with the latitude to pursue the completion of this document even though it was not my original charge. The Nature Conservancy's Migratory Bird Program and Prairie Wings Programs had the foresight to envision the benefits a science driven and partnership based joint venture can deliver to conservation in one of the most threatened ecosystems in the hemisphere. The NDGF and Northern Prairie Wildlife Research Center have provided significant expertise and staff time to this planning effort. The Conservation Section Leader Mr. Steve Dyke is the progressive conservation entrepreneur who is most responsible for facilitating the resources that made this effort possible. Finally the Rocky Mountain Bird Observatory (RMBO) is a privately funded non-profit that made significant contributions to the design and writing of this plan. The participation of RMBO is of such significance it warrants specific recognition.

If I have forgotten to mention any contributors, I apologize and take sole responsibility. To those mentioned above and the many others with whom I have interacted during this process, the NGPJV and I thank you.

Duane B. Pool
NGPJV Science Coordinator

Executive Summary

The primary purpose of the Northern Great Plains Joint Venture (NGPJV) is to contribute to the attainment of continental population goals, developed under the North American Bird Conservation Initiative (NABCI), by strategically delivering habitat conservation within the NGP ecosystem. The NGPJV partnership embraces the goals of NABCI "to deliver the full spectrum of bird conservation through regionally based, biologically driven, landscape-oriented partnerships."

The NGP Joint Venture Project area lies between the Missouri River on the east and north, the foothills of the Rocky Mountains on the west, and the sand hills and playa lakes of Wyoming and Nebraska on the south. The uniqueness of the NGP is its arid climate and relatively intact, grassland-dominated landscape. Within this greater landscape are habitats that have significant value to NGP species, such as the big sagebrush (*Artemisia tridentata*) areas of Wyoming and Montana, the shortgrass prairie of the Conata Basin in South Dakota and the riparian corridors in the badlands of North and South Dakota, among others. It is this diversity of habitat types within the larger grassland context that supports such a diversity of avifauna from raptors such as the ferruginous hawk (*Buteo regalis*) and golden eagle *(Aquila chrysaetos),* to waterfowl and shorebirds like northern pintail *(Anas acuta)* and piping plover (*Charadrius melodus*), and declining grassland birds such as Baird's sparrow (*Ammodramus bairdii*) and McCown's longspur (*Calcarius mccownii*). This grassland matrix and the associated ecological processes are of critical importance to the region's economy which is dominated by natural resource-based industries such as ranching, farming, recreation, and hunting and fishing. The rugged living conditions of these arid grasslands create the social and cultural structures of the northern Great Plains communities, most notably ranching, which helps to maintain the grassland-dominated landscape.

Due to the variety of species and habitats in the NGP, conservation design will address multiple scales as appropriate to the habitat, species, or general nature of the landscape. In addition, the Implementation Plan calls for research and conservation planning that prioritizes specific geographic areas, species, as well as recommended conservation strategies. Collectively, the many habitats of the NGP are the conservation capital in the wildlife investment portfolio of the Northern Great Plains. Much like a financial portfolio, diversity and fundamentals of the individual investments tend to reduce risk and ensure future performance. The element of diversity is represented by the variety of habitats present or protected. The fundamentals of those habitat investments are based on the biological significance of each habitat type and the quality and quantity required to attain the desired results. The conservation design of the JV could be viewed as the investment guide for a balanced wildlife-habitat portfolio driven by scientific valuation of the ecological components of the system.

This Implementation Plan is the first step in an ongoing process of Adaptive Resource Management (ARM), (FWS Policy: 721FW2.3c3) which has been adopted as the guiding approach to all bird (FWS Policy: 721FW6.5a, 721FW6.5c, 721FW6.10c) management in the JV. "*Planning is an ongoing process. Under the paradigm of ARM, which has been*

adopted by all of the major bird initiatives and is required of Joint Ventures, planning should never stop." (Charles Baxter, USFWS, St Louis, Missouri, Partners in Flight - Conservation Design Workshop, April 2006) To improve planning, the knowledge gained from monitoring, research, and evaluation programs of the JV and other programs must be fully integrated into the business and planning of the JV.

As programs are adapted to make use of the latest available science, the JV goals, objectives, and metrics for measuring the efficacy of program delivery may be revisited. More refined and focused objectives, along with improved mechanisms for measuring performance, will lead to better and more efficient use of conservation resources. This efficiency is an explicit goal of Adaptive Management. "*Critical preconditions for successful adaptive management include stakeholder consensus about objectives and a commitment to manage adaptively. Adaptive management is useful only if partners will respond to new knowledge*." (NAWMP 2004)

The partners of the Management Board will use the best available science and recommendations of the JV Technical Committee to guide and design habitat programs. These programs will then be delivered by partner agencies through all of the various means available to them. Partner agencies bring different resources and authority for implementing programs that lead toward achievement of both agency and JV goals. The coordinated use of agencies, programs, regulation, resources, and expertise is managed by the JV Coordinator to orchestrate the achievement of NGPJV all bird conservation goals. This orchestrated delivery of science based JV goals is the purpose of JV's as the delivery agents for NABCI.

Outline

Preface *(Duane B. Pool)*

Purpose of the Plan

The Northern Great Plains is a large geographic region where large tracts of intact short and mixed-grass prairies are dotted by small forested mountain ranges and divided by several major river systems. This vast and sparsely populated landscape is one of the last remaining strongholds of productive prairie breeding and migration habitat for migratory grassland birds in the United States. It is the relatively intact nature of this region and its location at the heart of the continent that makes its conservation vital to the viability of the many of bird species that use this area during all or a portion of their life cycle. The Northern Great Plains (NGP) Joint Venture (JV) was formed as a partnership of federal, state and private stakeholders in 2002. The primary purpose of the NGPJV is to contribute to the attainment of continental population goals, developed by all major Bird Initiatives, by strategically delivering habitat conservation within the NGP ecosystem.

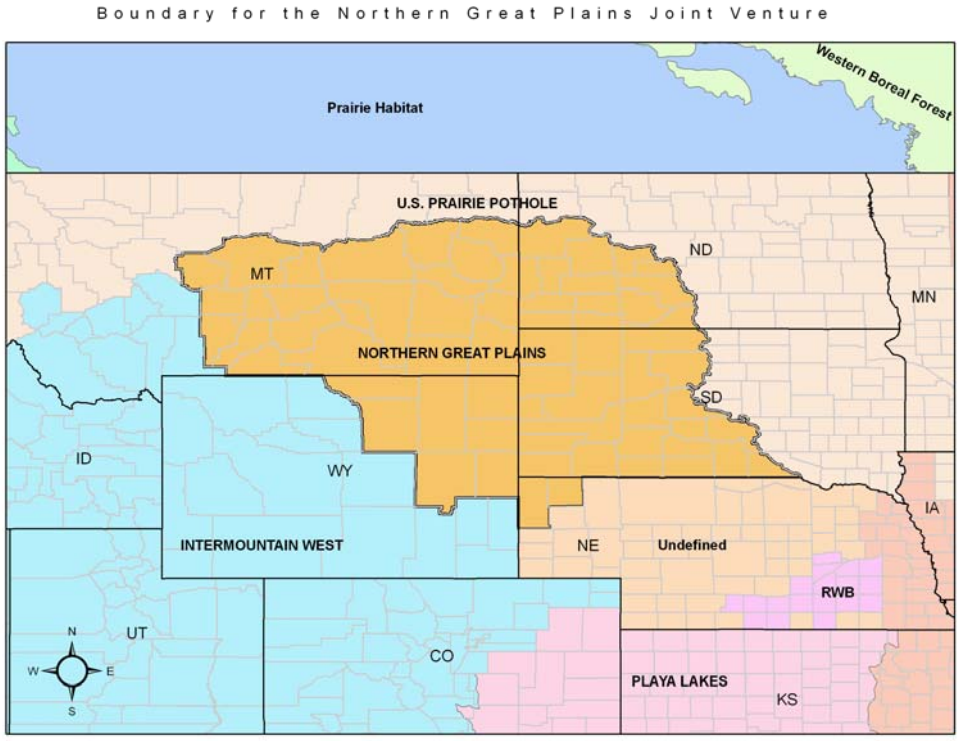

Figure 2: NGPJV Boundary. Undefined areas have been annexed to the RWB and PL JV's but have not been approved by the NAWMP Plan Committee.

The Northern Great Plains Joint Venture is comprised of portions of Montana, Wyoming, North Dakota, South Dakota, and Nebraska. The area makes up the North American Waterfowl Management Plan (NAWMP) *Continentally Significant Waterfowl Conservation Region* 4 and Bird Conservation Region (BCR) 17 of the North American Bird Conservation Initiative (NABCI). The NGPJV is a joint venture created following

U.S. Fish and Wildlife Service (USFWS) policy 721 FW 6. The Joint Venture serves as a leader in the region in promoting bird habitat conservation and providing integrated bird conservation guidance to the larger bird conservation community. As a part of the effort to provide guidance to partners and staff, the NGPJV Management Board has directed the NGPJV Technical Committee to produce an implementation planning document in a manner that coordinates input from relevant participants in the bird conservation community.

Guiding principles

The NGPJV partnership embraces the goals of NABCI "to deliver the full spectrum of bird conservation through regionally based, biologically driven, landscape oriented partnerships." To that end, the partners of the Joint Venture seek to base conservation delivery upon sound science and principles of adaptive management, and to target conservation actions toward landscapes with the greatest ecological and socio-economic potential to support viable populations of birds. This plan will identify mechanisms to establish and refine the biological foundation, develop a conservation design, and meet the conservation delivery needs of the NGPJV.

Integration across taxa is fundamental to coordinated bird conservation. The JV is structured such that partners recognize and work with common priorities and unity of purpose. Combining efforts and resources extends individual abilities of partners' to deliver conservation. It is therefore necessary that the plan integrate and provide a bridge between States, Agencies and other partners where common plan elements exist. Developing a plan with cross-jurisdictional consistency is fundamental to cooperative conservation action. This plan is necessary to either satisfy or provide the guidance to address the Goals and Objectives for the Biological Foundation, Conservation Design and Conservation Delivery of the NGPJV.

The development of this plan serves several purposes. This Plan:

- Is a document that provides guidance to the Management Board for developing programs that deliver integrated bird conservation;
- Includes relevant priorities and strategies identified in national plans for shorebirds, waterbirds, landbirds and waterfowl;
- Fits with State Comprehensive Wildlife Conservation Strategies;
- Incorporates the Functional Elements (duties) of a Joint Venture;
- Provides guidance for setting the JV monitoring, evaluation and research agenda; and
- Addresses USFWS Policy 721 FW 6.5 C:

  "*An implementation plan, which the management board develops or adopts, guides joint venture conservation actions. The management board identifies the biological planning, conservation implementation, and evaluation process that will guide the work of the joint venture*."

Document Structure

This plan is structured to allow ready access to relevant guidance by JV partners and the public at large. In the *Goals and Objectives*, the reader is introduced to the Goals and Objectives of the NGPJV and the functional elements that a JV is mandated to provide the partnership. The layout integrates the functions of a JV with elements of planning and implementation. The northern Great Plains landscapes and major habitats are the focus of the *Introduction* section. It is not sufficient to understand just the habitats within the BCR. The NGPJV recognizes the importance of the larger context of its geography. This section highlights the interdependence among the JVs and Bird Initiatives, both continentally and internationally, in achieving long-term viability of migratory birds using BCR 17. *Geography and Culture* are important backdrops to framing this plan. A formal treatment of the geography, landscape, and the variety of habitats are described and provide the context of the life-cycle requirements of many species. It is the availability of habitat that is the jewel of this landscape, but it is the culture and the people of the northern Great Plains that are key to the acceptance and success of bird conservation programs in the region.

In *Risks to Wildlife and Habitat*, threats to sustainable bird populations and habitats are addressed. The dominance of ranching and mineral extraction as the major economic forces in BRC 17 provides both benefits and concerns for wildlife. Other risks that affect wildlife both directly and indirectly are identified. The subject matter is addressed in an order that reflects the Technical Team's weighting based on the ability of a JV to address the specific risk category.

The *Wildlife* section describes national and continental scale population goals and conservation priorities and how these efforts are translated into planning at the BCR scale for the various Bird Initiatives. Integrating national level priorities and objectives and state Comprehensive Wildlife Conservation Strategies (CWCS) using regional scale biological planning provides strategic direction for habitat conservation and monitoring. Integration brings about opportunities for funding and larger partner involvement. At the regional scale cooperative efforts will accomplish significantly more than disparate individual actions. Cooperative efforts provide ecologically significant quantities of habitat in areas targeted to benefit from the specific activities. This cooperation distributes funding requirements across programs and agencies and focuses actions to attainment of common objectives. Combining resources for habitat and research delivery among organizations with common objectives is increasingly important. Sharing both the costs and the benefits of activities is consistent with the concept of Joint Ventures.

This planning effort and all JV activity must be tied back to the wildlife we steward. It may be habitat that receives treatment, but it is the species that depend on the habitats that are the beneficiaries of these conservation measures. Focus for planning, design, and delivery must always return to the biological needs of wildlife involved.

How can resource managers affect wildlife? Direct population measures, such as propagation and release of birds or harvest management, provide only short-term results and contribute little toward long-term viability of a population on an eco-regional scale.

A more effective approach is to ensure the continued availability of habitat over the long term. Bird abundance and productivity can be highly variable among years because of annual variations in climate. Recruitment during those years when the climate conditions are right, however, can be critical in rebuilding or sustaining a population during periods of poor conditions (Lynch 1985). Hence, maintaining or enhancing habitat availability over the long term is most likely to sustain wildlife populations through natural dynamics of climate. The waterfowl response to Conservation Reserve Program (CRP) (Reynolds et al. 2001) during the return of the wet cycle in the upper Midwest is an oft-used example of how success can be attained when managers provide the habitats and let the climate and birds respond naturally. In the *Habitats* section, each major type of habitat is discussed at length. This section not only covers what that landscape element consists of, but it also details the risks, trends, and strategies to mitigate and protect the important elements of each habitat.

Conservation Design explains how the knowledge of bird habitat associations and spatial modeling can provide guidance to managers for program development and project delivery. The end product of this chapter is a road map on how to target landscapes and how to develop habitat goals. The products that will be developed under *Conservation Design* also are integral to communicating with the public and partners about JV habitat goals and accomplishments. The major components of the design at the landscape scale include habitat inventory, consideration of management conflicts among species, goal setting, and products for targeting and outreach. These processes, and the requirements to achieve these in a biologically sound manner, are the focus of this section.

Conservation design develops the tools to target and quantify habitat goals. *Conservation Delivery* of the actual habitat programs falls on the partner agencies of the NGPJV Management Board. Partners, roles, responsibilities, and outreach are identified and defined in this chapter. Adoption of the joint venture framework by the partners also is a commitment to fulfilling specific roles to deliver habitat program under the guidance of the JV planning efforts.

Finally, under the tenets of adaptive management, the chapter on *Informed Management* identifies how long-term population monitoring and targeted research are used to evaluate the efficacy of JV programs and species response to habitat treatments. In this section the adaptive framework is described and methods for using the results to prioritize future research and habitat activities are outlined. This adaptive framework provides a loop to feed new and improving knowledge back into planning and conservation design. Under this framework, the Implementation Plan will also be subject to revision and improvement.

Goals and Objectives *(Duane B. Pool)*

Biological Foundation Goal

The biological foundations, upon which decisions are based, are the keystones to sound resource management. These foundations are important at multiple levels, from the global population objectives developed by the various bird initiatives, and how they are stepped down to the BCR level, to the species habitat associations that must be identified before habitat requirements to support target populations can be assessed and quantified on a regional basis. Improving information by reducing knowledge gaps and improving the quality of existing information are fundamental to sound, science-based adaptive management.

Goal: The Joint Venture seeks to address the factors limiting bird populations and conservation delivery using sound science that strengthens the Biological Foundations on which planning, evaluation, and conservation delivery is based. Spatially explicit, biologically based planning shall create opportunities for individual partners to contribute to overall regional delivery.

Objective 1. Step-down population and habitat objectives of the bird initiatives (NAWMP [Area of Continental Significance {ACS} 4], USSCP, NAWCP, PIF) to the Joint Venture level.

Where possible, the use of BCR 17 (ACS 4) numbers will be deemed sufficient. The JV boundary closely follows the BCR 17 boundary. Where national plan estimates are not stepped down to the BCR level, a population goal based on the best available scientific opinions will be used to set habitat objectives for several focal species. Research will be designed to validate and refine these objectives. Other species will be assessed as time and partner staff can accommodate. The JV Technical Team will work with the initiatives to insure that population goals and habitat objectives are agreed upon. Where possible, these data will be interpolated from each initiative's population goals. As an example, the interpolation process may use either area or viable habitat proportions of the target species and activity occurring in the JV area.

Objective 2. Develop a document ("NGPJV Biological Needs Assessment") that identifies and articulates the key issues in need of attention to further develop and refine the biological foundations for all-bird implementation in the Northern Great Plains.

This living document will identify focal species, key habitats at risk and their biological significance, and explicitly state the key assumptions of spatial-biological models derived to address the limiting factors affecting these species or habitats.

Objective 3. Review, recommend and develop research and information needs and priorities to improve the biological foundations for the Northern Great Plains.

Emphasis will be placed on tying research to the landscape so that spatial models can be built from existing and future research. This will be accomplished by involving JV members in the planning of research with a focus on the ability to build practical spatial management applications from the results.

Objective 4. Develop geographic information system (GIS), a bird-habitat association database, and other capabilities for information technology and management to meet the needs of the Joint Venture for planning, coordination, implementation, and accomplishment tracking.

Information technology needs will be developed by the Technical Team and brought to the attention of the Management Board.

Objective 5. Develop monitoring and evaluation protocols (Technical Team) and work with appropriate staff from partner agencies to implement efficient evaluation programs.

Conservation Design Goal

Conservation design, in the context of this plan, refers to the science-based process where either areas of high conservation priority (whose habitat characteristics will sustain viable populations of priority bird species at prescribed population levels) or conservation actions (required to improve wildlife responses in a certain area) are identified. Conservation design will be driven by the ecological knowledge of species needs. A portfolio of ecologically important landscape features will be accumulated through the exercise of design across species and. The depth and breadth of habitats represented in the portfolio should address the habitat needs for NGPJV priority species. The targets of habitat acres under various management practices will be adjusted so that population targets are viable for priority species.

Goal: Develop landscape designs that will, based on our current understanding of landscape conditions and bird-habitat relationships, sustain key populations at prescribed levels.

Objective 1: Develop working groups that can contribute to landscape-level design at multiple spatial scales (e.g., eco-region, landscape, project).

Working groups will be encouraged to develop plans that outline the habitat improvements needed in each and to use the acreage objectives to estimate the ability of those improvements to contribute to the BCR's bird population goals.

Objective 2: Develop the technical capabilities to produce spatially-explicit delineation of habitat objectives at multiple scales.

Objective 3: Develop a "blue-print" of future desired conditions within the NGPJV that will sustain priority bird populations at prescribed levels.

As these "Habitat needs are identified", they will satisfy USFWS reporting requirements under JV progress toward identifying the habitat needs for all JV Species of Concern.

Programmatic Goal

Biological planning and prioritization are developed along two lines. The first is done internally by JV partners and is focused by their organizational mission; the second is where the mission and goals of the NGPJV are integrated with those of the partners. The second is the integrated nexus, which creates the necessary conditions for coordination and where NGPJV Partners accept the responsibility of delivering habitat under the guidance of the NGPJV Conservation Design. Joint responsibility for coordinated habitat conservation is the mechanism by which the NGPJV accomplishes its functional mission.

Goal: Bring the combined programmatic capabilities of all partners to bear in a coordinated fashion to effect landscape change and preservation.

Objective 1: Facilitate and enhance the ability of the NGPJV partners to develop and implement projects that fulfill the JV's mission of achieving integrated bird conservation across the landscape.

Objective 2: Develop strategies to weave integrated bird conservation objectives into private lands programs within the NGPJV region and BCR 17.

Objective 3: Develop the technical capabilities with the NGPJV partners to track the progress of delivering habitat objectives at multiple scales.

Objective 4: Develop partnerships with other Bird Conservation Regions that share avifauna with the NGPJV and BCR 17, especially those in countries with limited resources.

Objective 5: Increase funding available to NGPJV partners through a variety of mechanisms.

Objective 6: Develop communications products and plans to attract partners, raise funds, improve internal and external relations, and raise the awareness of the NGPJV partnership among multiple audiences (political, governmental, non-governmental organizations, citizens, etc.).

Objective 7: Implement a system to track performance and develop reporting requirements with NGPJV partners to satisfy the needs of annual and long-term assessments.

This objective is consistent with the USFWS JV programmatic reporting requirement of "Habitat needs met."

Implementation Guide

As a relatively new JV, information will be required to establish baseline conditions for conservation assessments and planning. These assessments will follow 2 parallel tracks. The first is the species monitoring work to identify use and trends in bird numbers using the resources of the region. The second is a landscape-scale assessment of the habitat quantity and conditions in the BCR. This baseline data collection and classification will be described in a companion technical document to be developed following this Plan. The Guide will reflect the current status of knowledge on bird populations and habitat and will be updated as the knowledge and science evolves. This **Implementation Guide** will be a resource for partners to understand resource conditions, associations and trade-offs.

It is the intent of the companion Implementation Guide to:

- Provide a narrative on and documentation for spatial data used to assess habitats
- Estimate acreages of existing habitats as defined by the assessment procedure
- Develop crosswalks between classification schemes for cover type and NGPJV associations for management
- Detail the parameters used to model habitats for individual species and provide references to the literature from which the parameters are drawn
- Document current methodologies used for species monitoring in the BCR
- Accumulate and serve as a source for species monitoring and tracking information
- Guide production of applied management mapping products for the JV partners and outreach
- Provide the mechanism to promote current thought and updated information between revisions of the Implementation Plan

Introduction *(Duane B. Pool and Jane E. Austin)*

A Partnership: The NGPJV

Joint ventures bring together a diverse group of partners that have a common interest. In the NGPJV, these partners all have an interest at some level in land management, waterfowl production, integrated bird conservation, and conservation of native grasslands.

NGPJV Partners include:

1. Private landowners;
2. Non-governmental conservation groups;
3. State fish and wildlife agencies;
4. Tribal governments;
5. Federal land management agencies;
6. Corporate interests;
7. Local governments and communities; and
8. Other agencies, individuals, and groups who have interests in bird conservation.

This diverse group of stakeholders share common goals though frequently with differing purpose. In the diversity of partners lies a breadth of resources and expertise. The combination of these strengths are a significant asset to JV all bird management. Coordinating the activities of such a varied group is one of the major functions of a JV.

Functions of a Joint Venture

A Joint Venture is a self-directed partnership whose members accept responsibility for implementing national and international level bird conservation plans on a regional scale. In order implement these plans, JVs conduct activities that can be allocated into five functions.

- ***Coordination***
- ***Communication and Outreach***
- ***Biological Planning and Prioritization***
- ***Monitoring, Evaluation, and Applied Research***
- ***Project Development and Implementation***

Coordination and Fund Raising are those activities that provide administration and maintain the partnerships of the JV. These activities also include management of the JV and the reporting of partner activities toward the goals of the JV.

Communications and outreach activities inform the public about bird conservation and JV activities. These elements provide for expanded opportunities for project development, partnership expansion, fundraising, and strengthens public acceptance of and support for bird conservation.

Biological planning and prioritization provide the guidance and common objectives for the diverse partnership to deliver bird conservation projects. The coordinated and integrated planning function of the JV is fundamental to addressing the full spectrum of conservation defined in the state, national and international bird plans.

Monitoring, evaluation and applied research are the foundation on which planning and prioritization are based. This area also encompasses an introspective evaluation of the planning, programs, projects and overall effectiveness of the JV. This element is the analytical branch that provides for adaptation in the management process based on biological response to JV activities and directly leads the biological planning and prioritization. The accumulation of baseline information and habitat assessments also fall under this element.

Project development and implementation are the "on the ground" function of the JV and its partners. Coordinating the activities to identify projects, partners, and funding sources are the primary activities under this element. The majority of defined partner roles and responsibilities are intended to achieve this element. This element is directed by the biological planning and prioritization.

The Joint Venture Infrastructure – Roles and Responsibilities

Management Board – This is the governing body of the JV. The role of the Management Board is providing influence to ensure delivery of the habitats necessary to attain the goals of the local, regional, national, and continental wildlife initiatives at the eco-regional scale. The members of this board have two levels of responsibility. The first responsibility is to direct JV activity in a manner that is consistent with federal law and USFWS policy for a habitat joint venture. In doing so the Management Board should provide guidance to the Joint Venture Coordinator. The second responsibility is to convey the message, goals, and intent of JV consensus decisions back to their agencies. Management Board members should be of sufficient stature within their organizations to either make or influence decisions that affect the attainment of JV goals at the eco-regional, state or federal level of organizational structure.

Technical Team – This is an organization of scientists and technical experts with specific knowledge of wildlife, landscapes, or other relevant natural resource issues in the JV area. The Technical Team, chaired by the JV Science Coordinator, provides planning and guidance to the JV Management Board based on current biological understanding. It is the role of the Technical Team to assemble relevant research; prioritize scientific activities; analyze current information in support of decisions, both current and future, facing the Management Board; and provide communications through data, maps and documents. Members of the Technical Team are expected to participate or to provide access to skilled staff within their organizations to assist the JV in planning and targeting conservation delivery.

Working Groups are teams assigned by either the Management Board or Technical Team to address issues of a limited scope or duration. These ad hoc teams are expected to provide the resources necessary to address the nature of the issue at hand and to

accomplish the specified task in the time-frame provided by the overarching Committee that established the working group. Working groups can be staffed by existing JV participants or others provided by their agencies or contracted through the JV or an agency, and serve a term limited to the accomplishment of the tasks mandated by the JV partnership.

How the JV fits with the continental and international initiatives

The partnership recognizes the need to identify and strengthen the biological foundations upon which planning, evaluation and adaptation are based and to initiate projects and fund-raising for habitat and other work that will further the conservation objectives of the various bird initiatives encompassed by NABCI. Communications between the Management Board and the Bird Initiatives, among Management Board partners, and within the conservation community at large will be vital to the success of the bird conservation efforts. The NGPJV partners recognize the need to work with other conservation partnerships both nationally and internationally to insure that the annual life cycle needs of the NGPJV priority species are supported across their entire geographic range.

Overview of the larger landscape

The NGPJV area is an arid to semi-arid landscape of flat to moderately rolling hills intercepted by intermittent streams, river breaks, and expanses of prairie, with some areas of buttes and mountains. The prairies of the NGPJV area are largely treeless, but some woodlands occur in flood plains, woody draws, riparian areas, the Black Hills, forested buttes, and highlands of South Dakota, Nebraska, Wyoming and Montana. Most of the area was unglaciated and hence has well-developed drainages ranging from small, intermittent streams to major river systems. Major watersheds include the Musselshell, Judith, Powder, Tongue, Bighorn, Yellowstone, Belle Fourche, Little Missouri, Cheyenne, Grand, Moreau, Cannonball, Heart, North Platte and Missouri rivers. Much of the JV area is ultimately drained by the Missouri River via its various tributaries.

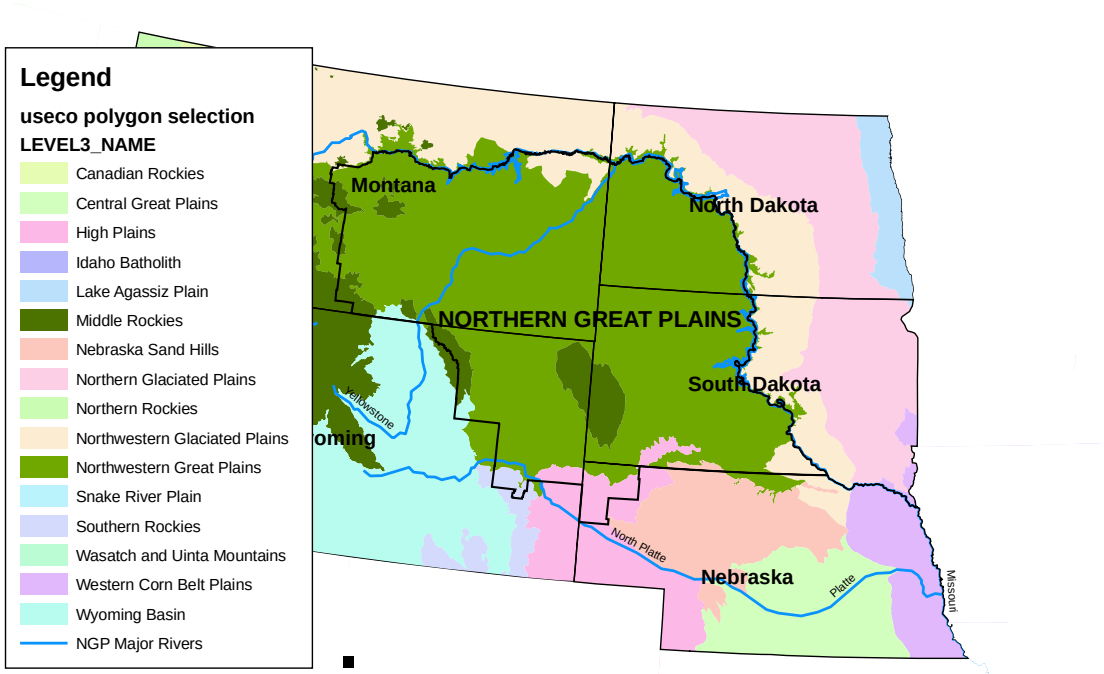

Figure 3. NGP Ecoregions

The area is dominated by two Level III ecoregions (Omernik et al. 1999). Most of the region falls within the Northwestern Great Plains ecoregion, which encompasses the Missouri Plateau section of the Great Plains. It is a semi-arid rolling plain of shale, siltstone, and sandstone punctuated by occasional buttes and badlands. Landscapes range from alluvial plains along rivers and moderately dissected rolling uplands to highly dissected hills, broken terraces, buttes, and badlands. Ranching, crop agriculture, roads and mining are the predominant land uses. The Black Hills in southwestern South Dakota and the eastern edge of Wyoming are an outlier of the Middle Rockies ecoregion and share with other Middle Rockies areas a montane climate, hydrology, and land use pattern. The Black Hills are characterized by individual mountain ranges of mixed geology with high elevation (1006–2207 m / 3300-7242 ft) and grassy parkland. Ranching and woodland grazing, logging, recreation, and mining are common. See Text Box for descriptions of the Level IV ecoregions.

Land ownership is mostly private with significant ownership in some areas by Tribal, and federal agencies with smaller and more fragmented areas owned by state agencies. The largest contiguous tracts of lands are held by Indian tribes (6 reservations), U.S. Forest Service (national grasslands and national forests), Bureau of Land Management, National Park Service (Badlands and Theodore Roosevelt National Parks), and U.S. Fish and Wildlife Service (Charles Russell National Wildlife Refuge). In many areas, ownership

patterns are fragmented. The patterns of land ownership relative to landscape features and habitats reinforces the value of developing partnerships across groups to enhance the planning and delivery of JV programs.

Figure 4: Diverse native grassland. Chris Grondahl.

The main habitats of the Northern Great Plains are native grasslands, cultivated cropland, isolated and riparian wetlands and rivers, woodlands, and tame grasslands. The large expanses of grasslands are the dominant feature of the region. Most of the native grasslands are mixed- and shortgrass prairie, with extensive areas of shrub steppe. Isolated wetlands are patchily distributed within the grasslands and agricultural habitats; they generally occur in low density and often are only temporarily or seasonally flooded unless modified by excavation for livestock watering. Riparian systems are common throughout the region and range from small intermittent streams to major rivers that dominate the landscape, such as the Missouri and Yellowstone rivers. Small pools or impoundments may be distributed along smaller drainages like a beaded chain; these can provide habitat for some waterbirds. Large impoundments (damming) of rivers have resulted in a number of reservoirs, ranging in size from 5 to 10,000s of ha. Some major impoundments such as Ft. Peck, Sakakawea and Oahe on the Missouri River provide flood control, irrigation, drinking water, and recreation. Man-made impoundments with control structures provide more permanent water for breeding and migrant waterbirds than the natural isolated wetlands. Woodland habitat is most commonly associated with

riparian areas but also occurs on buttes and scattered upland areas. The largest expanses of woodlands occur in the Black Hills. Tame grasslands are largely the result of restoration of cultivated lands for grazing or hayland, or conservation programs such as CRP. Substantial portions of what are now the national grasslands in this region were reclaimed from cultivation following the 1930s. Cropland has historically been limited to alluvial plains and more fertile, flat uplands in the eastern portions of the JV. Development of irrigation systems and more drought-tolerant crops has resulted in some westward expansion of cropland agriculture, although it remains limited by soils, topography, and precipitation.

Ecological forces that shape habitats and communities

Climate, grazing, and fire have been the dominant forces shaping the plant and animal communities of the Northern Great Plains. More recently, agriculture and other human development associated with European settlement has increasingly influenced the region's soils, landscape, flora, and fauna (see below). The original forces of climate, grazing, and fire, however, remain critical factors influencing the landscape and communities of the Northern Great Plains because they are intimately linked to the ecology of native communities. Conservation and management efforts must recognize, understand, and work with these forces in order to be effective and successful over the long term.

Because the Northern Great Plains lie west of the 100th meridian, the region experiences a continental climate. From east to west vegetation is influenced by a precipitation gradient created by the rain shadow of the Rocky Mountains. Shorter grasses tolerate more arid conditions than taller species and predominate in the western part of the region. Taller mixed-grass prairie dominates the moister areas to the east. This precipitation gradient has also confined much dryland crop production to eastern portions of the NGPJV. Most of the region receives an average of 30.5–40.6 cm (12–16 in) precipitation annually; 75% of the precipitation falls during spring and summer.

Minimum temperatures in January average −19 to −11º C (-2 to 12º F) and maximum temperatures in July average 26–33º C (80–92º F), with the more extreme range of temperatures occurring to the east (NOAA 1975). In the Black Hills of western South Dakota, topographical influences result in more moderate temperatures and higher precipitation (40.6–61 cm / 16-24 in). Summer precipitation often is patchy and associated with thunderstorms. Snow pack and spring runoff from snowmelt are likely important factor in filling wetlands and flushing intermittent streams, as it is in the PPR (Kantrud et al. 1989). Severe storms in all four seasons (blizzards, thunderstorms, hail, and high winds) can have substantial impacts to vegetation, birds, and their food resources. The often extreme climatic conditions limit both plant and animal communities, particularly those birds that remain as residents year-round. Added to these challenging conditions is the periodic occurrence of severe drought, which that can last multiple years, parching grasslands and wetlands, lowering major rivers and reservoirs, stressing woodlands, and contributing to wildfires. Although the native plant and animal communities are adapted to such droughts, they make planning and

implementation of conservation and management programs extremely difficult, and they cannot be ignored.

The plant and animal communities of the northern grasslands evolved with extensive herbivory by wild ungulates, predominantly bison (*Bison bison*), but also elk (*Cervus elaphus*) and white-tailed deer (*Odeocoileus virginianus*). Herbivory can control encroachment of woody vegetation into prairie grasslands, prevent buildup of litter that can limit germination and growth of some plant species, and recycle nutrients. The vegetative structure resulting from herbivory strongly influences bird communities found in the grasslands (Kantrud and Kologiski 1982). With European settlement, wild herbivores have been largely replaced by domestic livestock, which use the landscape and plant community quite differently. These changes, concomitant with the introduction of exotic species such as smooth brome (*Bromus inermis*), have altered plant communities and their vegetative structure, which in turn affect bird communities. Regardless of the source, herbivory remains an essential ecological factor of, and critical management tool for, northern grasslands.

Wildfires were once a common feature of the prairies, but their frequency declined markedly in the last 100 years with the fragmentation of grasslands by cultivation and fire suppression. Wildfires still commonly occur in dry years and can cause substantial economic losses. In lieu of the frequent wildfires that occurred pre-settlement, land managers have learned to use prescribed burning to manipulate habitats and prevent severe wildfires. Prescribed burning is a critical tool for restoring and maintaining the pine woodlands and savannahs of the Black Hills and Wind Cave National Park and for preventing catastrophic wildfires (Bock and Bock 1984). Prescribed burning also is an important tool used in restoration and maintenance of grasslands (Higgins et al.1989, Collins and Wallace 2000). In 2003, the USFWS ranked second only to the U.S. Forest Service in the area burned (107,166 ha vs. 481,501 ha) by federal agencies (National Interagency Fire Coordination Center, http://www.nifc.gov/news/nicc.html, accessed on 13 November 2003). Developing and implementing fire programs at this scale has required an increase in personnel and infrastructure to develop and implement burn programs. The application of fire continues to evolve as new information is obtained from field experience and research studies

The region in context to flyways

The Northern Great Plains is located at the heart of the North American continent and near the center of the continent's vast grasslands. Hence, it hosts many migrant and breeding birds as well as a small number of residents and a few northern species such as snowy owls *(Bubo scandiacus)* and snow buntings *(Plectrophenax nivalis)* that move down into the Great Plains to winter. The Northern Great Plains is not a major flyway for waterfowl, waterbirds, or shorebirds because it lacks abundant water and high densities of wetlands. In years when water is abundant on the landscape, however, it may attract more migrants westward from the Prairie Pothole Region, which is a major flyway and breeding ground for ducks, waterbirds, and many other bird species. Waterfowl migrating through or breeding in the Northern Great Plains are part of the Central Flyway, funneling birds from their wintering areas in Texas, Louisiana, and Mexico and

their breeding areas in the Northern Great Plains and into western prairie Canada or points north. The small to moderate numbers of shorebirds in the region (<100 per 1˚blocks) suggest the region supports a relatively small proportion of migrating or breeding shorebirds (Skagen et al. 1999). The region's role as a flyway for grassland birds is poorly understood and requires significant study. The Missouri River provides a natural corridor for species like Canada geese, eagles, piping plovers, and warblers. These species benefit from its permanent waters, longer ice-free period, and riparian woodlands. A few birds such as bald eagles, Canada geese, and mallards will winter along the Missouri and take advantage of open water below the dams for feeding and roosting areas. Other mega-fauna have been documented using the habitats of the NGP during migration these have included sandhill cranes, whooping crane, and trumpeter swans.

Cultural, Social, and Economic Aspects of the Northern Great Plains

(Richard Crawford)

The human population of the NGPJV is composed primarily of people of European descent. But, as recently as 140 years ago, non-Indians were an uncommon sight on the prairies of the NGPJV. Historically, the Crow, Cheyenne, Mandan, Hidatsa, Sahnish (Arikara), and Lakota tribes inhabited much of the NGPJV. These plains tribes were very successful at occupying niches that relied primarily on bison and other components of an intact plains ecosystem. Several tribes (especially the Mandan, Hidatsa and Sahnish) also relied heavily on vegetable crops (several varieties of corn, beans, pumpkins, squash and sunflowers) for sustenance. The prairies furnished all of their needs and greatly influenced their culture and religion.

Migration of settlers in search of gold and free land began in the 1850s, and conflicts soon arose. With the discovery of gold in the Black Hills, construction and extension of railroads to the West, and depletion of "free land" in the East, there was intense pressure to acquire large portions of the tribal territories for settlement.

Although tribal landholdings were greatly reduced in the last half of the 1800's, they make up a significant portion of the NGPJV landscape. Today, tribal nations within the NGPJV include the Crow, Northern Cheyenne, Cheyenne River Sioux, Three Affiliated Tribes (Mandan, Arikara and Hidatsa), Standing Rock Sioux, Lower Brule Sioux, Rosebud Sioux, and Oglala Lakota.

Many lands not claimed or offered to settlers remain the property of United States and are managed by the U.S. Forest Service (USFS), Bureau of Land Management (BLM), USFWS, and National Park Service (NPS). Other federal agencies, states, local governments, conservation groups, and industrial corporations also hold lands in the NGPJV.

During the 1930s, many western lands suffered from intense agricultural use and extreme drought. Extensive soil erosion on these lands and the economically depressed state of those who owned the lands prompted enactment of the Bankhead-Jones Farm Tenant Act. Thousands of acres of impacted lands were purchased from ranchers and farmers to restore them and to resettle farm families. Much of this land remains in public ownership and is managed by the USFS, BLM, and USFWS.

Several trends in the U.S. population are indicative of changes that are occurring in the Northern Great Plains. The fraction of Americans living in cities has increased from 40% in 1900 to more than 75% today. Over 50% of the U.S. population now lives on the 17% of land that comprises the coastal zone. With the exception of some American Indian reservations, most rural areas in the NGPJV are losing population to regional cities and other states. Many counties with sparse populations share local and county government facilities and staff. Because of declining enrollment over the years, schools in many rural areas have been consolidated.

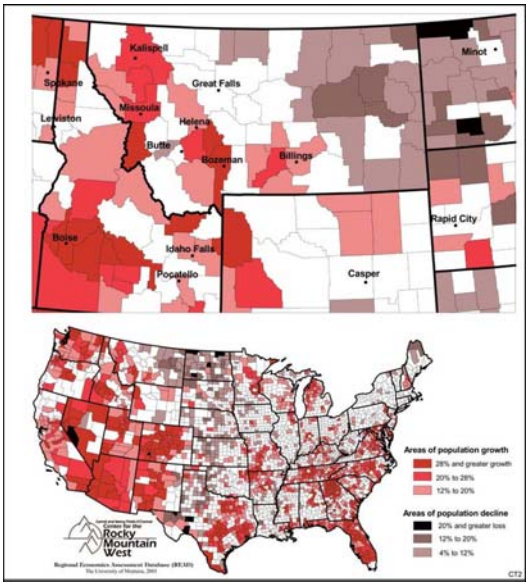

Figure 5: Population Change

Ranching and farming are the major economic activities in the NGPJV, but urban areas provide housing and employment for a significant percentage of the region's population. Livestock production, consisting mostly of cattle, is prevalent on private, tribal, and public lands. Cattle ranching was not always as dominant as it is today in the NGPJV. Not until the 1880's when railroads furnished a means to deliver beef to eastern markets did it become feasible to graze cattle for a profit.

A significant amount of land in the NGPJV is used for production of cash and forage crops. The high natural variability of climate is a characterizing feature of the region. Farmers and ranchers have survived by being adaptive and incorporating new technologies to buffer their production against the variable climate.

Availability of drought-resistant and cold-tolerant varieties of grains and row crops and expansion of irrigation, however, are contributing to an increase in conversion of grasslands for crop production. As annual precipitation amounts decrease from east to west in the NGPJV, so does the density of cultivated croplands. Low amounts of precipitation across the entire NGPJV and frequent droughts require proper range and crop management to maintain the integrity of fragile lands.

Another cultural trend in all of the states that comprise the NGPJV is that the numbers of farms continue to decline and that the average farm size continues to expand. For example, according to the Montana Agricultural Statistics Service, there were 37,200 farms with an average size of 1,747 acres in Montana in 1950; while in 1997, the number of farms declined to 23,000 and the average size increased to 2,591 acres. This trend combined with a rapidly aging rural population favors the transfer of a large number of acres to new owners.

Energy exploration and development have had major impacts on lands within the NGPJV as well. The region is a major supplier of coal for U.S. consumption. As world oil prices have increased recently, more interest in oil and gas development has occurred.

Most residents of the NGPJV rely on resources provided by the land for their livelihood and way of life. Many of those who are not currently engaged in ranching, farming, or oil, gas and coal development most likely are associated with businesses that support these enterprises. As a result, most people who live in the NGPJV remain close to the land and still retain many of the characteristics of early settlers. Self-reliance, independence, and love of open spaces still persist. This closeness to the land and the renewed vigor of native cultures has provided the NGPJV with a unique opportunity. These qualities will lend themselves to the task of restoring grasslands and wetlands for wildlife and people.

Holistic management philosophies are becoming more evident on ranches and farms in the NGPJV. Many ranchers and farmers value the ability of their land to provide a quality landscape in which to live in addition to its ability to provide a livelihood. Some ranchers, recognizing the adaptations of bison to the harsh prairie landscape, are replacing cattle with bison. Still, agriculture is a disruptive influence on native ecosystems. A plethora of invasive plant species is but one outcome of intensive use of lands by grazing animals. Leafy spurge, spotted knapweed, and others have increased markedly in the NGPJV recently within the last century.

Beef production has become the most extensive cultural influence on NGPJV landscapes. Confined cattle operations have replaced the historic grazing regime of unconfined bison, elk, and pronghorn. If not managed properly, this shift in intensity and duration of grazing can irreversibly damage the prairie ecosystem. But, with proper management, the grassland landscape can be maintained in a condition that resembles its historical character, restores its functional values, and provides a livelihood for its inhabitants.

A growing eco-tourism business is providing opportunities to diversify ranching operations to stabilize incomes. Lodging, outfitting, and guiding may provide economic stability where ranching, farming, and energy development has declined. It is expected that tourism and recreational use in the NGPJV will continue to grow. Over the past several years, investment in land by non-ranchers and farmers has grown. This has been the trend in other areas of the West for some time and is expected to spread into the NGPJV. Many areas are already experiencing upward price pressure on land values as more conservation easements are sold and recreational interests based in urban areas acquire available lands. These escalating land values result from the recognition of the quality wildlife experience the lands of the Northern Great Plains can offer. As the NGPJV partners develop and expand habitat, it will provide local managers with more quality recreational areas or bird production to satisfy the demands of both resident and non-resident users.

Key cultural issues and trends in the NGPJV include:

- Nearly 60% of the bird species that breed in the U.S. do so in the entire Great Plains region, of which the NGPJV is part. Large numbers of other plants, insects, mammals and other vertebrate species also call this region home. The role of the NGPJV in offsetting negative impacts to these species is paramount.

- Climate change, precipitating alteration in timing and amount of water use by agriculture and people, will likely impact ecosystems and native species in the region. Agriculture also will likely impact carbon storage within the region. Most agricultural scientists believe that increasing soil carbon will help buffer against climate change impacts. The role of grassland vegetation in maintaining soil carbon is well known. Both grassland vegetation and wetlands are important in conserving ground water systems

- Energy development in the region will likely continue to impact native flora and fauna. The strategic role of the NGPJV in alleviating these impacts should be identified.

- Emigration of people living in the NGPJV will likely continue to influence plant and animal life in the region. As farm size and mechanization increases, the need to implement conservation agriculture procedures often becomes more necessary because of the increasing threat of native grassland conversion.

- Invasive plant species are a result of human habitation, and they already negatively affect large portions of the NGPJV for both agriculture and ecosystem conservation.

- American Indian communities are rapidly gaining in vigor and numbers within the region. These communities should play a significant role in ecosystem conservation in the Joint Venture.

- Ecotourism can be an alternative to intensive agriculture. The role of the NGPJV in promoting ecotourism could be substantial if the market continues to develop.

Risks to Wildlife *(Jane E. Austin, Brian Martin, Dan Svingen, and Jim Hansen)*

The ecosystems of the northern Great Plains are not static; they respond to short- and long-term changes in climate, changes in key species (e.g., buffalo to cattle and sheep), and human development. Although the region has experienced little urbanization compared to other areas, it faces a number of challenges to sustaining viable bird populations and habitats. Societal and economic factors are constantly shifting, affecting agricultural practices for crop farming and ranching, mineral and energy development, and urbanization. Short- and long-term changes in climate affect human activities as well as wildlife and their habitats. New risks, such as West Nile virus, arise which may have unforeseen implications for bird populations and conservation efforts. The effects of these various risks to birds and habitats often are interrelated. Our scientific knowledge also is evolving, improving our understanding of the region's ecosystem and its inhabitants, such as ecosystem functions, migration patterns, and landscape ecology. The Joint Venture must recognize the risks to bird populations and habitats and understand how they affect birds, habitats, and human activities in the region in order to design and effectively implement conservation strategies. This section provides an overview of current challenges and risks facing birds and habitats in the region. The risks are addressed in an order that reflects the Technical Committee's weighting of the ability of conservation actions by a Joint Venture to address them.

Conversion and fragmentation of habitat

Grasslands are among the least protected and most threatened habitats in North America, with less than 2% in some form of conservation status. Across the lower 48 states overall, grasslands declined by about 33 million acres from 1982 to 2002 (USDA 2004). The U.S. Department of Agriculture (2004) estimates suggest around 3.5 million acres of grassland were converted to other uses from 1982 to 2002 in the states of Montana, North Dakota, and South Dakota, or greater than 10% of the entire loss in the United States. The vast majority of this conversion was associated with conversion to cropland, which represents one of the most pervasive threats to grasslands across the Northern Great Plains Joint Venture.

Figure 6: Newly broken native prairie in ND 2001. Andy Schollet.

Extent of grassland loss across the NGPJV area between 1982 and 1997 varied by major river drainages within each state. The Dakotas experienced the greatest percentage loss of grassland, with extensive areas in both states immediately west of the Missouri River experiencing declines of 5 to 10%, as did the southwestern corner of North Dakota and northwestern portion of South Dakota (Conner et al. 2001). The remainder of both states, as well as Montana generally declined about 1 to 5%. Data for Wyoming show an almost 2% decline.

Table 1: Rangeland Trends in the Northern Great Plains Joint Venture Area
(1,000 of Acres)

Area	1982	1987	1992	1997	Total Loss 1982-1997
West River SD	16,977.3	16,728.8	16,520.9	16,403.6	573.7
West River ND	5,282.0	5,127.8	5,134.5	5,097.9	184.1
Eastern Montana	20,948.6	20,701.6	20,605.8	20,468.9	479.7
Eastern Wyoming	10,415.7	10,365.8	10,259.0	10,245.6	170.1
Total.....	53,623.6	52,924.0	52,520.2	52,216.0	1,407.6

Source: USDA Natural Resources Inventory (NRI), National Summary 1982-1997

Fire suppression and grazing

For thousands of years, natural forces molded the Great Plains. Most extensive of these ecological drivers were climate, herbivory, and fire. However, with the advent of European settlement, the key ecological drivers and the grasslands of the NGPJV have changed dramatically. Among the historic assemblage of large herbivores, free-ranging bison are essentially extirpated, elk are mostly restricted to the margin of mountains and a few areas of badlands, and pronghorn numbers have been greatly reduced. Also, many of the significant smaller herbivores have been substantially reduced or extirpated locally (e.g. 99% reduction of black-tailed prairie dog [*Cynomys ludovicianus*]) or, in the case of the Rocky Mountain grasshopper (*Melanoplus spretus*), extinct.

Native herbivores have been largely replaced by domestic livestock (cattle, sheep, and horses) in the northern plains. A detailed discussion of differences between wild and domestic livestock is beyond the scope of this document, but in general domestic livestock have limited ability to move more than a mile from water, are attracted to shade, and require intensive management to optimize production. Livestock also are often confined by fences to relatively small acreages. As a consequence, the composition of many of the major habitats in the northern plains has been substantially altered, especially in areas of naturally occurring water that attract livestock, such as riparian zones. Also, the pattern and size of patches created by herbivory have generally been lost, resulting in more homogenous stand structure. Loss of habitat heterogeneity negatively affects numerous species. This is perhaps most profound where short-statured habitat has been largely eliminated in favor of grazing management that results in more residual vegetation after grazing. Among birds, species substantially impacted by these changes are mountain plover (*Charadrius montanus*), long-billed curlew (*Numenius americanus*), and McCown's longspur.

Concurrent with the introduction of livestock and establishment of permanent settlements was the implementation of fire suppression. Historically, fire return intervals in the JV ranged between 6 and 25 years, dependent upon location and vegetation type. Today, large fires occasionally occur in portions of the JV; however, frequency and overall area burned depart substantial from the historic range of variation. In portions of the JV where habitat has been substantially fragmented by cropland, fire has been essentially eliminated from the landscape.

Implications of fire suppression within the JV have not been widely explored. It is anticipated that exclusion of fire is contributing to the expansion of coniferous woodland into former grassland habitat, and it may also be allowing for the expansion of deciduous vegetation along ephemeral drainages. Within coniferous woodlands, density and volume of trees per area has greatly increased, making these areas more susceptible to stand replacing fires. Increased forest cover also intercepts water, and trees have higher evapotranspiration rates. Together, both of these changes likely decrease water run-off to feed stream flows. In grasslands, lack of fire may be affecting community dynamics, altering cycling of carbon and other nutrients and species composition. Changes in fire frequency and extent in shrub steppe habitats, and consequences to bird communities,

have not been widely studied in the northern plains. Small-scale, patchy fires have little influence on bird communities, but large-scale, severe burns can alter plant and bird communities (see review by Knick et al. 2005).

The rangeland of the NGPJV is vital to the agricultural economy of the people who live there. Domestic livestock grazing is much more compatible with wildlife than other agricultural practices that convert the grasslands to other uses. The challenge is replicating habitat heterogeneity at a scale that will support the full compliment of biodiversity, while meeting the needs of landowners. Traditional management by range land managers has been implementation or recommendation of grazing practices that favor late seral state communities through light to moderate grazing. However, early seral stage conditions are vital for a number of plains species such as Horned Lark (*Eremophila alpestris*), McCown's Longspur, Long-billed Curlew, and Mountain Plover, they are also vital to Upland Sand Pipers during migration. Management paradigms must incorporate the full spectrum of historic grazing intensity.

The coordination and cooperation between wildlife and livestock interests will be critical to maintaining a productive NGPJV ecosystem and desirable wildlife populations. Private and public managers of these lands will be challenged to develop management strategies that incorporate well-managed livestock grazing and fire regimes to produce a landscape that can sustain wildlife and maintain people's livelihoods.

Mineral and energy development

Some forms of mineral and energy development have been occurring in the NGPJV area for many decades, but in just the last five years, a new intensity and some new forms of development have appeared, largely as a result of projected shortages of some forms of energy and the higher prices that accompany them. The higher prices have provided an incentive for the pursuit of some types and areas of development that were not cost-effective before. There are also some new technologies available that encourage the development of some forms of energy. Partners in the NGPJV should be aware of the risks from energy development and should ensure that impacts are evaluated and negative effects minimized. Taking a proactive role to engage energy development companies in conservation planning and prioritization will be a high priority for the JV.

Coal mining has been occurring for many years in southeastern Montana, northeastern Wyoming, and to a lesser extent, in northwestern North Dakota. Surface mining of coal causes fragmentation of the habitat, but sites are to be eventually reclaimed after the mining is completed in a particular area, although that may take decades. Coal mining leads to other developments involved in transporting the coal. In southeastern Montana, for example, a portion of the proposed 17-mi long Tongue River Railroad would go through some excellent riparian habitat. Coal mining also has led to coal-burning power plants that can cause pollution of air and water. Transmission lines and towers associated with power plants can also impact wildlife, by direct mortality (collisions) and fragmentation of habitat.

Oil and gas drilling has been going on for many years in the NGPJV area, and with increasing energy demand leading to rising prices, exploration and drilling are expected to increase. Risks to wildlife from these operations include habitat fragmentation, possible disturbance of wildlife during road construction, drilling, and operation, and direct mortality in pits containing oil at sites if they are not covered with netting.

Coal-bed methane (CBM) production is expanding in some parts of the coal-producing area of the NGPJV, especially in northeastern Wyoming. CBM production has also occurred in southeastern Montana, although Montana has adopted a slower approach to permitting CBM wells until more is known about the possible impacts. Two of the concerns about the wells that could impact wildlife, fish, and farming and ranching operations are the possible lowering of the water table and the large quantity of water of questionable quality that must be discarded in the process (Sterns et al. 2005). There also are concerns over fragmentation of grassland habitats from drilling operations and the accompanying network of roads and trails.

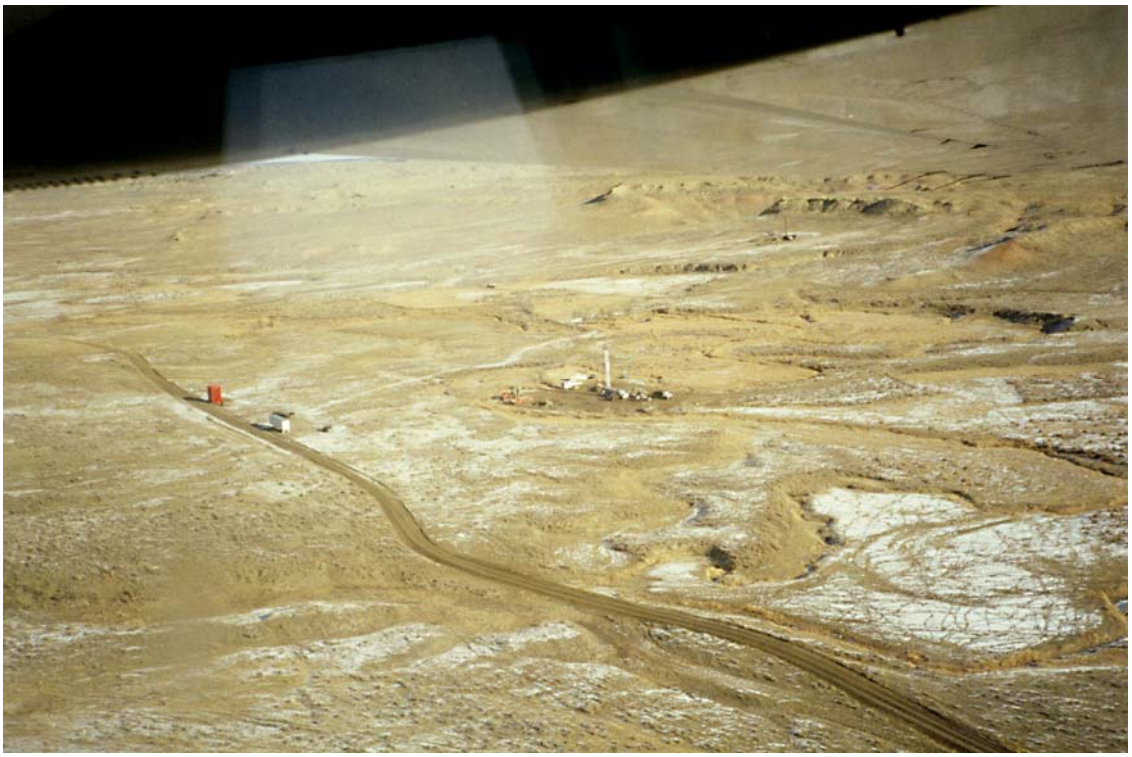

Figure 7: Oil well and service roads. Andy Schollet.

Interest in wind energy from "wind farms" has increased dramatically in the United States in the last few years. Electricity is generated from wind turning groups of large turbines. The NGPJV may be a prime area for future wind farms because of the reliability of mid-continent prevailing wind conditions. In the NGPJV at present, there is an operational wind farm with 90 turbines near Judith Gap, Montana. In the NGPJV portion of the other states, North Dakota has four proposed wind farms, South Dakota has three proposed, and Wyoming has none proposed at present, although there are wind farms in other parts of the state. Wind energy is generally considered one of the cleanest,

most environmentally-friendly forms of electricity generation. However, it still has some impacts that can present risks to wildlife. One potential impact is the possibility of collisions of birds or bats with the turbines or with the associated transmission lines (Johnson et al. 2002). Development of wind farms include erecting turbines and new transmission lines and building service roads, all of which fragment habitat and can cause wildlife to avoid the area. This avoidance can be significant because of the large "footprint" of a wind farm with its roads and transmission lines. The Billings Gazette reported on January 24, 2006, that the 90-turbine wind farm in Wheatland County, Montana, between Judith Gap and Harlowton, covers 8,300 acres. Avoiding sensitive areas such as wetlands and Greater sage-grouse (*Centrocercus urophasianus*) leks would help to reduce impacts, as would making use of existing roads and transmission lines and choosing sites where the vegetation is already altered. Proposed sites should be evaluated on a case-by-case basis. Wind developers and land owners may not be aware of the potential impact of wind farms. South Dakota has compiled "Siting Guidelines for Wind Power Projects in South Dakota" (http://www.sdgfp.info/Wildlife/Diversity/windpower.htm). This document may serve as a useful template for development of similar guidelines in other states. The NGPJV has the opportunity to lead other state efforts and influence guidelines to minimize the impacts of future development.

The increased interest in ethanol and bio-diesel fuels can also present risks to wildlife. As additional plants are built to produce these fuels, more cropland will be needed to provide the raw material for fuel production, adding to the pressure to break up additional native grasslands or to again farm former cropland that has been idled under the Conservation Reserve Program.

Invasive species

The outright loss of habitat due to urban and agricultural conversion has undoubtedly had the greatest impact on bird populations within the NGPJV. Even in the remaining habitats, however, great changes have occurred since Euro-American settlement. The most important of these have been in vegetative composition. These changes include both an overall increase in woody vegetation, and replacement of native grasses and forbs by non-native species.

Historically (i.e. pre Euro-American settlement), woody habitats in the JV area were limited, occupying approximately 1% of the landscape. Coniferous forest, most often dominated by Rocky Mountain juniper (*Juniperus scopulorum*) or ponderosa pine (*Pinus ponderosa*), occurred in isolated and widely separated areas. Examples included mountain ranges, such as the Wyoming's Black Hills; "sky islands" such as South Dakota's Slim Buttes, and extensively eroded arroyos, such as North Dakota's Badlands. Deciduous forests, most often dominated by green ash (*Fraxinus pennsylvanicus*), American elm (*Ulmus americanus*), and/or plains cottonwood (*Populus deltoides*), were largely limited to riparian areas and draws.

Currently, woody habitat occupies approximately 2% of the JV area. Coniferous forest has increased in both stocking density and aerial extent. Changes in deciduous forest

habitat have been more complex. There has been an increase in overall extent due to the establishment of shelterbelts, windrows, fire suppression and urban areas. Some exotic species, such as Chinese elm (*Ulmus pumila*) and Russian olive (*Elaeagnus angustifolia*) often expand beyond where they were planted. In addition, the introduction of salt cedar (*Tamarix ramosissima)* has resulted in many wetland and riparian areas being converted from grass- or shrub-dominated to tree-dominated systems. Conversely, native deciduous tree and shrub density has likely decreased across the joint venture area, as exotic pathogens, domestic livestock grazing, fire suppression, agricultural expansion and beaver removal has hampered the self-perpetuation of several species, including American elm, green ash, willows (*Salix* spp.), red-stem dogwood (*Cornus amomum*), and chokecherry (*Prunus virginiana*).

Figure 8: Mature shelterbelt or tree row. Chris Grondahl.

Non-native grasses and forbs comprise a significant portion of the grassland areas within the NGPJV. Four grasses are particularly important: Kentucky bluegrass (*Poa pratensis*), crested wheatgrass (*Agropyron cristatum*), cheatgrass (*Bromus tectorum*), and smooth brome (*Bromus inermis*). Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), and spotted knapweed (*Centaurea biebersteinii*) are the most abundant exotic forbs.

Kentucky bluegrass is a Eurasian, sod-forming, cool-season grass that has been widely planted in the United States, both as an ornamental, and as a pasture grass. It is an increaser under most grazing regimes. Kentucky bluegrass is also capable of successfully invading idled areas. It prefers relatively mesic sites and is most abundant in areas receiving more than 40.5 cm (16 in) of annual precipitation. Although Kentucky

bluegrass provides excellent ground cover and forage, its tendency to form monotypic sods greatly reduces habitat quality for many birds associated with low basal cover, such as sharp-tailed grouse (*Tympanuchus phasianellus*), Sprague's pipit (*Anthus spragueii*), and Baird's sparrow (*Ammodramus bairdii*).

Crested wheatgrass is an Asian, cool-season bunchgrass, widely planted in the western United States and Canada for erosion control. It is palatable for livestock and big game, particularly early in the growing season. Once its seed head forms after mid-June, it is largely ignored by grazers. Crested wheatgrass stands often offer vegetative structure, but very low vegetative and insect diversity. Although some grassland birds in the JV area, including grasshopper (*Ammodramus savannarum*) and Baird's sparrows will nest in crested wheatgrass, other species, such as Sprague's pipits, avoid it.

Cheatgrass, a Eurasian native, now has the widest range of any New World grass (Manning 1995) Its greatest impacts to bird conservation in the JV area are in shrub-steppe habitats, where cheatgrass is often the most abundant graminoid. Cured cheatgrass carries fire better than the native shrub-steppe vegetation. Consequently, fire frequency often increases where cheatgrass is present, which in turn further reduces the native shrubs, increasing habitat quality for cheatgrass. Bird species that are most impacted by cheatgrass include: Brewer's sparrow (*Spizella breweri*), sage thrasher (*Oreoscoptes montanus*), and greater sage-grouse (*Centrocercus urophasianus*).

Smooth brome, a perennial Old World sod-forming grass is commonly planted for erosion control, pasture, and hay. Because it was widely planted for vegetative cover, it is now the dominant grass species on many wildlife refuges and management areas. Smooth brome is an efficient invader, particularly of idled or hayed areas. Although this species provides good vegetative structure, its tendency to form relatively sterile monocultures greatly reduces its utility to all-bird conservation efforts.

Canada thistle, a Eurasian perennial forb, is troublesome due to its impacts on range forage and crop production. In the joint venture area, it is restricted to more mesic sites. It colonizes both disturbed and idled areas. In terms of wildlife effects, Canada thistle is less of a threat than many of the other exotic plant species discussed herein. Canada thistle seeds are used by a variety of songbirds, whereas the plant's down is used by nesting American goldfinches (*Carduelis tristis*).

Leafy spurge, a hardy, deep-rooted, Eurasian perennial forb that now infests millions of acres in the United States, particularly in the Northern Great Plains. In high density sites, leafy spurge excludes native plants and forbs. Leafy spurge seeds float, and thus the plant spreads quickly along riparian areas, the very habitat that is most critical to dozens of bird species within the JV area.

Spotted knapweed is a biennial or short-lived perennial from Eurasia that is particularly problematic in the western-most portions of the joint venture area. It is most often found in hilly or mountainous terrain, where it infects open and semi open rangeland. It is unpalatable and very effective at suppressing grass growth, and so has greatly decreased

the carrying capacity of many livestock pastures and big-game winter ranges. Its impact on bird populations is little understood. How can the JV address the risks through coordinated programs?

Wildland/urban interface

The wildland-urban interface (WUI) is defined as the area where houses meet or intermingle with undeveloped wildland vegetation (USDA and USDI 2001); this definition was developed to identify communities at risk in the vicinity of public lands, particularly for wildfires. The concept of the WUI, however, has broader implications, as the interface represents a focal area for human-environment conflicts, including habitat fragmentation, introduction of exotic species, and biodiversity decline. Evaluation of housing density in 2000 showed that the NGPJV has a few small areas of WUI. The largest is centered in the Black Hills around Rapid City; smaller areas occur around Gillette, Buffalo, and Sheridan, Wyoming; Spearfish, South Dakota; and Mandan, North Dakota (Radeloff et al. 2005). At the state scale, all states in NGPJV had ≤5% total land area defined as WUI areas.

Although the extent of WUI in the NGPJV area is quite small when viewed on a large landscape scale, the impacts can be substantial to wildland habitats. In the Black Hills, most development is limited by topography to riparian areas; hence, urbanization will disproportionately affect those habitats.

The standard definition of WUI focuses on housing and risks from wildfires in most western states. However, from an ecological perspective, other anthropogenic activities probably should also be included as part of WUI, specifically mineral and energy development. These activities create new interfaces between human activities and structures, resulting in habitat fragmentation, disturbance to soils and vegetation that provide new opportunities for the spread of invasive species, and human disturbance.

Climate change

Temperatures in parts of the northern and central Great Plains have risen more than 3ºC over the past 100 years, while annual precipitation has decreased by 10% in eastern Montana and North Dakota (National Assessment Synthesis Team 2000). Regional models of climate change indicate that the central and northern Great Plains of the United States may experience a 3.6ºC to 6.1ºC increase in mean air temperature over the next 100 years (Ojima and Lackett 2002). Among the likely effects of warmer temperatures are milder winters, longer growing seasons, hotter summers in the south, and more frequent occurrences of extreme drought. These in turn may result in altered hydroperiod for wetlands and rivers, greater evapotranspiration, increased fire frequency, range shifts in plants and animals, and earlier spring phenology for plants and animals (Peterson et al. 2003, Inkley et al. 2005). The models also project that the Great Plains will have greater variability and extremes in temperature and precipitation, including extreme precipitation events and more summer droughts (Covich et al. 1997, Ojima and Lackett 2002, Inkley et al. 2005). Greater spatial and temporal variation in precipitation will likely result in more localized precipitation events or drought conditions. Such changes to basic ecosystem processes and life cycles in the Great Plains will challenge the capabilities of Joint

Venture programs to provide for the conservation of sustained habitat quality and wildlife populations over the long term.

Information to help direct conservation planning and delivery is primarily available for wetland and grassland habitats; less information is available to understand the impact of climate warming on woodland habitats in the Great Plains (Guertin et al. 1997, Bacehelet et al. 2000). Studies that have modeled the effects of climate change on wetlands in the Prairie Pothole Region have consistently predicted declining wetland conditions for waterbirds (Poiani and Johnson 1991, Larson 1995, Sorenson et al. 1998, Carter et al. 2005). Higher summer temperatures result in higher evapotranspiration rates, putting increased demands on groundwater and resulting in earlier drying of wetlands (Winter 2000). Effects modeled include a higher frequency of dry wetlands, more time in dry marsh phase, and more dense emergent cover (Poiani and Johnson 1991, Johnson et al. 2005). Wetlands in the drier regions of the Prairie Pothole Region (northern shortgrass prairie) are most vulnerable to climate warming, even if precipitation were to continue at historic levels (Carter et al. 2005).

Grassland habitats have also received extensive consideration for climate change. Among the likely effects for this habitat are shifting plant distributions, altered composition of the plant community, and increasing shrubland (Burke et al. 1991, Epstein et al. 2002, Ojima and Lackett 2002, Christensen et al. 2004). Agricultural ecosystems – a mosaic of cropland, tame grassland, shelterbelts, and riparian areas – also will be impacted by climate warming (Guo 2000). Grasslands are very sensitive to precipitation patterns; lower precipitation or higher evapotranspiration in grassland habitat will result in reduced primarily productivity and reduction in herbaceous growth (Epstein et al. 2002, Fay et al. 2003, Christiansen et al. 2004). Therefore, any changes in amount or temporal patterns of precipitation will have significant implications for its flora and fauna as well as programs involving grassland management. Christiansen et al. (2004) pointed out that "shifts in temporal productivity patterns due to changed climate have potentially significant implications for grazing management, will need to be altered under changing climate to maintain stability."

Long-term perspectives are needed in conservation planning to work to mitigate potential changes in habitat conditions and distribution of birds. A strong biological foundation, melded with continued monitoring and research, is necessary to allow adaptive management practices to succeed. Joint Venture partners must carefully consider likely effects of climate warming on habitats and wildlife in their conservation planning: what habitats may be most at risk and where, how habitat conditions and ecological process may change, and how those changes may affect plants and wildlife. "Ignoring climate change is likely to increasingly result in failure to reach wildlife management objectives" (Inkley et al. 2005).

Wildlife *(Nancy Drilling, Sandra Hagen, Duane B. Pool, Scott McLeod, David Hanni, Arvind Panjabi and Jane E. Austin)*

The Northern Great Plains has a rich and diverse avifauna. From coveys of sharp-tailed grouse on prairie hilltops, to prairie falcons soaring over rugged buttes, Wilson's phalaropes spinning wetlands, and Lewis's woodpeckers drumming on the pines in the Black Hills, the NGP offers a little of everything. Roughly 260 species of birds have been identified as breeding, migrating, or wintering in the NGP region (see Appendix 1). Of those, 49 were identified by the NGPJV technical committee as priority species (see Appendix 1). The species list was developed using information from the waterfowl, landbird, waterbird, and shorebird conservation plans, USFWS birds of conservation concern, non-governmental species lists, and the state Wildlife Action Plan lists of species of greatest conservation need.

State Wildlife Action Plans

In 1999, historic conservation legislation known as the Conservation and Reinvestment Act (CARA) was introduced in the US House of Representatives. CARA proposed to reinvest a portion of the revenue from federal offshore oil and natural gas leases into a range of state, federal and local conservation programs. For a variety of reasons, Congress has not yet passed CARA. In its place, Congress provided states with supplemental funding through Title IX of the Commerce, Justice, and State Appropriations Act under the Wildlife Conservation and Restoration Program (WCRP) for conservation of species which typically receive no monetary support. These funds were made available in FY2001. This program provided $50 million for distribution among states through a formula based on the states' size and population. In 2002, states received additional funding under a new program, State Wildlife Grants (SWG), for 2002-2003 through the Department of Interior and Related Agencies Appropriations. The SWG program is similar to the WCRP but provided states with increased funding of $85 million. States have continued to receive annual apportionments of roughly $65-70 million through the State Wildlife Grant program. Collectively the 5 states of the NGPJV have received over $21 million dollars since the inception of the WCRP and SWG programs.

By accepting these funds, all 50 states and 6 territories committed to completing a Comprehensive Wildlife Conservation Strategy, now known as Wildlife Action Plans, by October 1, 2005. Congress identified eight required elements to be included in the Wildlife Action Plans. The Wildlife Action Plans must identify and focus on "species in greatest need of conservation," yet still address the "full array of wildlife." The Wildlife Action Plans have many of the same goals and objectives of the NGPJV Implementation Plan. Species of greatest conservation need were identified in the Wildlife Action Plans along with their key habitats, threats, conservation actions, monitoring, and research needs. Due to the similar intents of the state Wildlife Action Plans and the NGPJV Implementation Plan, the states and the JV should collaborate and coordinate bird conservation actions efforts in the NGP.

Links to the state Wildlife Action Plans in the NGP:

- North Dakota: http://gf.nd.gov/conservation/cwcs.html
- South Dakota: http://www.sdgfp.info/Wildlife/Diversity/Comp_Plan.htm
- Montana: http://fwp.mt.gov/wildthings/cfwcs/strategy.html
- Wyoming: http://gf.state.wy.us/wildlife/CompConvStrategy/index.asp
- Nebraska: http://www.ngpc.state.ne.us/wildlife/programs/legacy/review.asp

Figure 9: Killdeer are common in the NGP. NDGF

Landbirds

Introduction

Approximately 169 (68%) of the bird species that breed within NGPJV are landbirds. Of these, six are not native to North America (Chukar, Gray Partridge, Ring-necked Pheasant, Rock Pigeon, European Starling, and House Sparrow), and one additional non-native species (not included in the 169 breeding landbird species), the Eurasian Collared Dove, is likely to become established in the near future if it has not done so already.

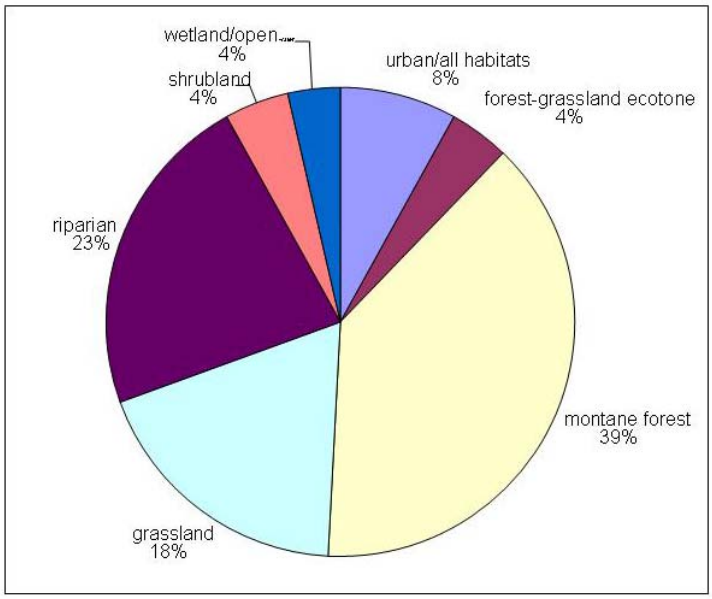

Figure 10. Habitat associations among the 169 breeding landbirds within NGPJV

Although many bird species have strong affinities toward more than one habitat, of the 163 native breeding landbird species NGPJV, roughly 39% are associated primarily with montane habitats (e.g., ponderosa pine, aspen, and spruce forests, juniper woodlands, foothill shrublands, montane riparian areas, mountain meadows, high cliffs, and buttes), 23% are associated primarily with lower-elevation riparian systems (for some species, includes also woodlots, tree rows, and other deciduous woodlands on the Great Plains), 18% are associated primarily with native grasslands, 8% are found widely across multiple habitat types (or are associated largely with human development), 4% are associated primarily with emergent wetlands or water bodies, and 4% are associated primarily with shrublands (mainly sagebrush but also some other arid shrublands) (Figure 10). While most birds have stronger affinities to one habitat or another, some of the aforementioned species are found mainly in the transition zones between habitats. For example, both Vesper Sparrows (*Pooecetes gramineus*) and Mountain Bluebirds (*Sialia currucoides*) are most abundant in the montane-grassland interface, whereas Black-Billed Magpie (*Pica hudsonia*) is most abundant in the riparian woodland-grassland ecotone.

Figure 11: Baird's Sparrow. Chris Grondahl.

Although the NGPJV supports a variety of landbird communities, it is especially important to grassland birds. North America's grassland bird populations have been declining for many decades. In fact, no other birds in North America have exhibited such pronounced and steep long-term population declines as grassland birds (Cunningham and Johnson, 2006). Conversion to cropland, urbanization, alteration of historic disturbance regimes, and other stressors have taken a substantial toll on native grasslands (Johnson 1996, Igl and Johnson 1997). Many grassland bird species have experienced concomitant population declines as these habitat modifications have occurred, and these processes are continuing today. According to the Partners in Flight Species Assessment Database, 55% of grassland breeding birds of regional concern in the NGPJV exhibit declining population trends. The importance of the NGPJV's grasslands is further highlighted by the fact that this region supports at least 10% of the global populations of several species of concern, including Greater Sage-Grouse, Sharp-tailed Grouse, Ferruginous Hawk, Say's Phoebe, Grasshopper Sparrow, McCown's Longspur, Chestnut-collared Longspur and Western Meadowlark. The NGPJV region therefore offers a unique opportunity for grassland bird conservation, as extensive areas of native grassland remain intact.

Landbird Species of Priority

Species of Priority include both species of conservation concern and stewardship species, i.e., those which may not presently be of concern, but for which the region hosts a significant proportion of the global population and thus plays a critical role in the long-term conservation of these species (Rich et al. 2004). For example, approximately 50% of the global population of Lark Buntings breeds in this region. Both types of species'

importance can be regional or continental in scope. Partners in Flight identified species of regional and continental importance using a scientific assessment process that utilizes the most current information on species' population size and trend, distribution, threats, regional density, and percent of population (Panjabi et al. 2005). The process combines global, continental, and regional data on species' vulnerability and abundance, yielding a conservation assessment that highlights vulnerability and global stewardship responsibility. Using a combination of regional threat and population trend assessment scores, PIF has also assigned action levels at both continental and regional scales, which are intended to illustrate the level and urgency of conservation measures recommended for each species of importance (Table 1).

Figure 12: Burrowing Owl (*Athene cunicularia*). Chris Grondahl.

Many landbird species in the NGPJV region are primarily associated with montane habitats, these habitats make up a relatively minor portion of the regional landscape, and thus the region supports only minor populations of these species. More than half of the 31 species considered of regional or continental importance are associated with native grasslands or grassland ecotones (Table 1). All grassland species of importance in BCR17 are assigned an action level of *management*. This designation entails that on-the-ground conservation actions are needed to reverse significant long-term population declines or to sustain vulnerable populations. Although many of these species may still be widespread, actions are needed to prevent these species from becoming in danger of regional extirpation. Because the causes of declines for some species may still not be understood, research may also be an important part of management actions.

Table 1: Partners In Flight species prioritization. **Field descriptions: PS=Population Size, BD=Breeding Distribution, TB=Threats Breeding, PT=Population Trend, RD=Relative Density, %Pop=Percent of Population, RCS=Regional Combined Score, CC=Continental Concern, RC=Regional Concern, CSBCR17=Continental Stewardship Species, RS=Regional Stewardship Species, Action=Action Code *(MA=Management Attention, PR=Planning and Responsibility, IM=Immediate Management, CR=Critical Recovery)*), Habitat=Associated habitat.**

Species	*PS*	*BD*	*TB*	*PT*	*RD*	*%Pop*	*RCS*	*CC*	*RC*	*CSBCR17*	*RS*	*Action*	*Habitat*
Greater Sage-Grouse	4	3	4	3	5	18	19	Y	Y	Y	Y	MA	shrublands
Greater Prairie-Chicken	3	5	4	3	2	1	17	Y	Y	-	-	MA	grassland
Northern Harrier	3	1	4	4	5	4	17	-	Y	-	-	MA	grassland
Northern Goshawk	4	1	4	3	3	1	15	-	Y	-	-	MA	montane
Swainson's Hawk	4	2	3	1	4	6	14	Y	-	-	-	PR	grassland
Ferruginous Hawk	5	2	4	2	5	15	18	-	Y	-	Y	MA	grassland
Golden Eagle	4	1	4	3	5	2	17	-	Y	-	-	MA	grassland
Black-billed Cuckoo	3	2	4	5	3	3	17	-	Y	-	-	IM	low-elevation riparian
Burrowing Owl	3	1	4	4	4	2	16	-	Y	-	-	MA	grassland
Short-eared Owl	3	1	4	4	5	3	17	Y	Y	-	-	MA	grassland
White-throated Swift	4	2	2	4	4	7	16	Y	-	-	-	PR	montane
Lewis's Woodpecker	4	3	4	3	3	3	17	Y	Y	-	-	MA	montane
Red-headed Woodpecker	3	2	4	4	2	1	15	Y	Y	-	-	MA	low-elevation riparian
Black-backed Woodpecker	3	2	4	3	2	0	14	-	Y	-	-	MA	montane
Willow Flycatcher	3	1	3	2	2	1	11	Y	-	-	-	PR	low-elevation riparian
Loggerhead Shrike	3	1	4	3	3	6	14	-	Y	-	-	MA	grassland
Pinyon Jay	3	3	4	3	2	1	15	Y	Y	-	-	MA	montane
Black-billed Magpie	3	2	3	4	3	1	15	-	Y	-	-	MA	low-elevation riparian
Northern Rough-winged Swallow	2	1	3	4	4	1	14	-	Y	-	-	MA	low-elevation riparian
Mountain Bluebird	2	2	3	5	4	7	16	-	Y	-	-	MA	montane
Sage Thrasher	2	3	4	3	3	1	15	-	Y	-	-	MA	shrublands
Sprague's Pipit	3	4	4	3	4	9	18	Y	Y	-	-	MA	grassland
Brewer's Sparrow	2	3	4	5	3	4	17	Y	Y	-	-	IM	shrublands
Vesper Sparrow	2	1	3	4	5	11	15	-	Y	-	Y	MA	montane
Lark Bunting	2	3	3	4	5	48	17	-	Y	Y	Y	MA	grassland
Grasshopper Sparrow	2	1	3	5	5	14	16	-	Y	Y	Y	MA	grassland
Baird's Sparrow	3	4	4	4	3	9	18	Y	Y	-	-	MA	grassland
Le Conte's Sparrow	3	2	4	3	2	0	14	-	Y	-	-	MA	grassland
McCown's Longspur	3	5	4	3	5	13	20	Y	Y	Y	Y	MA	grassland
Chestnut-collared Longspur	2	4	3	5	5	26	19	-	Y	Y	Y	MA	grassland
Dickcissel	2	2	3	5	2	1	14	Y	Y	-	-	MA	grassland

Some species such as the Brewer's Sparrow (*Spizella breweri*) have been designated species in need of *immediate management*. This ranking within the PIF database signals immediate action is needed to prevent extirpation. The Brewer's Sparrow is a sagebrush obligate, which may indicate that there is a decline in the amount of suitable habitat. Given current concerns about declining quality and availability of sagebrush habitat, other birds that are closely affiliated with sagebrush may also need to have this designation. However, action levels rely on BBS population trend data (which have little precision for birds like Greater Sage-grouse [*Centrocercus urophasianus*]), and several

sagebrush species don't currently meet the criteria of decreasing population trend. Species like Greater Sage-grouse and Sage Thrasher (*Oreoscoptes montanus*) have population trend values of 3, which indicate either no change or change for the species is unknown. Decisions based on metrics where the values are "unknown" must be addressed through supplemental research and monitoring.

The Black-billed Cuckoo (C*occyzus erythropthalmus*) also has action level *immediate management* because of significant recent declines in population. The population trend from BBS over the last 30 years indicates a greater than 50% decline for Black-billed Cuckoos. Cuckoos are most likely present in brushy wetland margins or openings of woodlands and thickets of small trees and prairie shrubs. Key habitats for cuckoos will include native riparian habitats and river corridors. Maintaining under story and limiting grazing impacts in native riparian areas are key management recommendations for cuckoos.

Population Status and Trends

Global population sizes of species occurring within the NGPJV have been estimated using count data from Breeding Bird Survey routes conducted during the 1990s, and corrected for detection area, time of day, and undetected mates (Rosenberg and Blancher 2005). Estimates were also calculated for the portion of BCR17 (i.e. NGPJV) within each of the states.

Table 2 - Breeding Bird Survey Estimates of abundance by state within the NGPJV.

Species	*Global Population*	*MT*	*ND*	*NE*	*SD*	*WY*	*NGPJV*	**%Global Population**
Greater Sage-Grouse	150,000	43,971	10,030		Not 0	32,259	86,260	18%
Sharp-tailed Grouse	1,200,000	86,804	191,395	2,980	63,219	1,253	345,651	29%
Greater Prairie-Chicken	690,000			459	9,736		10,195	1%
Northern Harrier	1,300,000	21,177	14,345	306	6,501	3,469	45,798	4%
Northern Goshawk	490,000	817		181	3,841	832	5,671	1%
Swainson's Hawk	490,000	9,856	8,455	337	7,147	2,905	28,700	6%
Ferruginous Hawk	23,000	1,692	207	21	439	952	3,310	14%
Golden Eagle	170,000		125	14	303	1,375	1,817	1%
Black-billed Cuckoo	1,100,000	8,883	15,933	443	9,399	1,804	36,461	3%
Burrowing Owl	2,000,000	7,949	3,748	1,082	22,964	828	36,572	2%
Short-eared Owl	2,400,000	40,776	8,723	394	8,368	6,669	64,930	3%
White-throated Swift	410,000			688	14,595	12,737	28,020	7%
Lewis's Woodpecker	130,000			10	219	3,527	3,756	3%
Red-headed Woodpecker	2,500,000	2,881	5,621	318	6,739	3,921	19,481	1%
Black-backed Woodpecker*	1,300,000				4,000			0%
Willow Flycatcher	3,300,000	10,220	14,250	75	1,596	3,640	29,781	1%
Say's Phoebe	3,700,000	163,892	75,120	2,924	62,034	65,310	369,280	10%
Loggerhead Shrike	4,200,000	83,690	42,559	2,717	57,654	47,049	233,669	6%
Pinyon Jay	4,100,000	27,111		840	17,813	5,047	50,811	1%
Black-billed Magpie	3,400,000	29,611	2,049	161	3,423	7,219	42,463	1%
Northern Rough-winged Swallow	15,000,000	34,343	35,670	2,282	48,417	41,419	162,130	1%
Mountain Bluebird	5,200,000	146,093	38,816	4,416	93,693	55,774	338,792	7%

Sage Thrasher	7,900,000	14,217		15	314	35,005	49,551	1%
Sprague's Pipit	870,000	63,663	12,575	138	2,922		79,298	9%
Brewer's Sparrow	16,000,000	415,602	252	92	1,962		417,908	3%
Vesper Sparrow	300,000,000	2,343,706	338,944	8,357	177,307	436,544	3,304,858	1%
Lark Bunting	27,000,000	5,310,194	2,715,541	119,336	2,531,968	2,509,583	13,186,622	49%
Grasshopper Sparrow	15,000,000	203,226	504,913	54,211	1,150,213	229,482	2,142,045	14%
Baird's Sparrow	1,200,000	17,783	79,684	550	11,675	661	110,353	9%
Le Conte's Sparrow	2,900,000		8,783				8,783	0%
McCown's Longspur	1,100,000	39,733	1,161			104,781	145,675	13%
Chestnut-collared Longspur	5,600,000	357,419	711,565	16,762	355,640	35,502	1,476,888	26%
Dickcissel	22,000,000	2,451	11,038	7,668	162,685	917	184,758	1%
Western Meadowlark	32,000,000	2,245,033	1,129,438	96,666	2,050,979	1,178,126	6,700,242	21%

Table 3 - Breeding Bird Survey Trends and Objectives.

Species	*BBS Trend*	*P-Value*	*n*	*MoN*	**Pop Objective**
Greater Sage-Grouse	-2.8	0.13	21	Mo2	Increase 100%
Sharp-tailed Grouse	-0.9	0.62	48	Mo2	Maintain
Greater Prairie-Chicken				Mo2	Increase 100%
Northern Harrier	1.6	0.36	73	Mo3	
Northern Goshawk	3.8	0.53	5	Mo2,3	
Swainson's Hawk	2.3	0	64	Mo2a	Maintain/increase
Ferruginous Hawk	3.1	0.51	48		
Golden Eagle	0	0.99	37	Mo3	
Black-billed Cuckoo	-7.9	0	35		
Burrowing Owl	-11.7	0.1	33	Mo4	
Short-eared Owl	-4.7	0.39	34	Mo3	Increase 100%
White-throated Swift	-2.5	0.16	14	Mo2	Increase 100%
Lewis's Woodpecker	5	0.7	3	Mo2	Maintain/increase
Red-headed Woodpecker	-8.6	0.12	32		Increase 100%
black-backed woodpecker	67	0.54	3	Mo2,3	
Willow Flycatcher	3.2	0.26	22		Increase 50%
Say's Phoebe	1.4	0.31	74		
Loggerhead Shrike	-0.5	0.62	78		
Pinyon Jay	-3.3	0.35	9		Increase 50%
Black-billed Magpie	-3.4	0.05	6		
Northern Rough-winged Swallow	-12.2	0.12	54	Mo2a	
Mountain Bluebird	-1.4	0.27	50		Maintain
Sage Thrasher	-0.4	0.91	22		Maintain
Sprague's Pipit	3.7	0.66	21		Increase 100%
Brewer's Sparrow	-4.6	0	45		Increase 100%
Vesper Sparrow	-2.3	0.01	90		
Lark Bunting	-1	0	91		Maintain
Grasshopper Sparrow	-4.8	0	86		Maintain
Baird's Sparrow	-3.4	0.15	29		Increase 100%
Le Conte's Sparrow	38.5	0.57	2	Mo3	
McCown's Longspur	10.3	0.47	12	Mo2a	Maintain/increase
Chestnut-collared Longspur	-3.6	0.05	46		Maintain
Dickcissel	-12.8	0.03	38		Increase 50%
Western Meadowlark	0	1	101		

BCR17 is also an important area for wintering raptors, including Golden Eagle, Rough-legged Hawk, Ferruginous Hawk, Red-tailed Hawk, Gyrfalcon, among others Monitoring prey bases and impacts to prey bases may be necessary to identify limiting factors for over-wintering birds and some breeding raptors such as burrowing owls. Prairie dog colonies are a significant food resource for Ferruginous Hawks and are also a species of concern for each State's SWG Wildlife Implementation Plan. Monitoring the sizes, health and number of colonies may give an indication of the capacity for the NGP to provide for Ferruginous Hawks both over-winter and during the breeding season. These colonies also provide critical habitat for breeding burrowing owls.

GOAL

Maintain or increase current populations of all species by:

1. Implementing statistically rigorous survey designs to estimate population sizes,
2. Identifying and protecting large intact blocks of suitable grassland, in conjunction with other grassland bird initiatives
3. Identifying important riparian areas and implementing strategies for their protection, and
4. Identifying and managing habitat-related threats to breeding success

*Critical Habitat*s: The shrub steppe is home to several species of concern. These species require these habitats in a variety of seral stages adding to the complexity of managing these landscapes for different species. Late seral stage sagebrush is the preferred habitat for Sage Thrashers, Sage Sparrows (*Amphispiza belli*), and Brewer's Sparrows (*Spizella breweri*). Mid-early and Mid-Late seral sagebrush are the habitats for Greater Sage Grouse and Lark Bunting (Paige and Ritter. 1999). This dichotomy illustrates the need for breadth of information when contemplating habitat management decisions not just between guilds but often within. Local, regional and continental priorities will be use to develop a balanced conservation design to assist in guiding implementation of habitat manipulations when these conflicts arise.

Prairie grasslands are the most abundant feature of the NGP landscape. These varied grasslands are the preferred habitats of short grass obligates such as McCown's Longspur, Burrowing Owls and Ferruginous Hawks. The somewhat more vigorous mixed grass prairies are habitat for Sprague's Pipits (*Anthus spragueii*), Chestnut Collared Longspurs, the popular game species the Sharp-tailed Grouse, and the widely recognizable Western Meadowlark.

The prairie dominated landscape is ribboned with deciduous riparian corridors and forests. These are some of the highest concern habitats because of loss to development, altered hydrology and agriculture. Old growth cottonwood forests are decreasing and cottonwood regeneration is a concern for resource managers. Deciduous riparian habitat harbors two species of concern in the NGPJV, the Black-billed Cuckoo and the Red-headed Woodpecker (*Melanerpes erythrocephalus*). Both are obligates of this declining habitat for which partner state agencies have attributed specific management attention.

The isolated mountain ranges referred to as the sky islands are the preferred habitat for a myriad of bird species. These includes species like Say's Phoebe (*Sayornis saya*), Dusky Flycatcher (*Empidonax oberholseri*), Canyon Wren (*Catherpes mexicanus*), Pygmy Nuthatch (*Sitta pygmaea*), and Ruby-Throated Hummingbird (*Archilocus colubris*).

The wetland habitats of the NGP and the wetland fringe are important for many landbirds, for example Short-eared Owls (*Asio flammeus*), Marsh Wrens (*Cistithorus palustris*), Common Yellow Throats (*Geothlypis trichas*), Savannah Sparrow (*Passerculus sandwichensis*), Red-Winged Black Birds (*Agelaius pheoniceus*) and Brown-headed Cowbirds (*Molothrus ater*) are all species associate with ephemeral wetlands and their surrounding habitats. Wetlands are covered in the other bird sections with emphasis placed on waterfowl, shorebirds and waterbirds, but their management and conservation should also take into consideration the needs of landbirds.

Monitoring: The primary sources of population monitoring for landbirds in the NGPJV are the Breeding Bird Survey routes and Christmas bird counts, which are sparsely distributed across the region. However, the BBS is a limited survey method because, among other reasons, these species breed at low densities relative to the huge area to be surveyed. Properly designed monitoring programs are critical for estimating population sizes and trends, creating population and habitat objectives, identifying new sites, and evaluating conservation actions. However, much research still needs to be completed on the best designs for many low-density species that are distributed over very large areas.

Resident game birds such as the various grouse species are monitored by state agencies. The Western Sage Grouse Working Group has provided a detailed grouse management plan and the plan will be used as the guide for NGPJV implementation of conservation activities for these birds. The NGPJV is and will remain engaged in this and future species-specific conservation planning and implementation efforts. Monitoring and management effort on the state level will be encouraged and supported by the JV for all resident game birds actively managed by the partner agencies.

Research: The landbird community in the NGP has not been well studied relative to other, adjacent regions such as the Prairie Pothole Region. Many of the land use issues in this region are common to other adjacent regions. These common issues include: grazing, habitat fragmentation, energy development, and prescribed burning. However, responses of landbirds to land use practices in this region may differ from those in other regions (e.g., Prairie Potholes) because of lower population densities and differing climate and plant communities. Moreover, there is little knowledge of how land use practices influence reproductive success or survival of landbirds. While studies on the National Grasslands provide good information for selected areas, there are extensive areas of public and private lands where much less is known about the bird communities, their vital rates, or habitat use patterns. There is a need for research on the development, applicability, and feasibility of different grazing and fire management strategies specific to the NGP, especially in the context of integrated management for wetland- or riparian-related species. Information is also needed on the impacts of changing climate and agricultural practices (e.g., Conservation Reserve Program, crop types, irrigation) and

invasive plant species on landbird distribution, abundance, reproductive success and survival. The increasing presence of energy developments, and resulting habitat fragmentation, disturbance, and potential pollutants on the landscape also will demand more information in order for JV partners to deal with those impacts. In the Black Hills, research is needed to understand the role of fire and logging in landbird communities of forest, savannah, and shrub habitats, and the potential application of these disturbances as management tools. The management of prairie dog communities remains a contentious issue in the region, and managers would benefit from better knowledge of the prairie dog-bird community and impacts of control efforts.

The extensive grasslands and riparian corridors may provide important habitats for migrants through the region. However, very little is known about landbird migration through this region. Data on the spatial and temporal distribution and dispersion of migrants across the landscape relative to habitat quality would be valuable to guide protection and restoration of important habitats. In addition, Research is needed on habitat utilization and requirements of these migrants. Wintering landbirds, such as raptors, also suffer from limited data on their distribution, abundance, and habitat needs.

The Western Sage Grouse Working group is currently coordinating research for sage-grouse through local universities. The University of Montana is evaluating the response of greater sage-grouse to energy development. Two projects are underway at South Dakota State University. The first is to describe seasonal habitat use by North Dakota's greater sage-grouse. The second project will document greater sage-grouse hen and brood movement in North Dakota.

Greater sage-grouse are also being intensively studied elsewhere in their global range. Colorado State is currently developing a range wide population estimate for greater sage grouse. The University of Idaho is researching techniques to monitor sage grouse populations and habitats. Greater sage-grouse responses to land use changes and habitat use are to be investigated by Utah and Oregon State Universities respectively. Greater sage-grouse have benefited from their recently elevated national profile, their game bird status and the fact they are an identifiable species obligate of the sagebrush steppes. The NGPJV will continue to monitor the results of sage-grouse research, remain engaged in the working group and incorporate information into NGP planning and implementation as appropriate.

Shorebirds

Thirty-five species of shorebirds either breed (11 species) or migrate (24 species) through the Northern Great Plains. Although species differ somewhat in habitat use and requirements, shorebirds in general are associated with the shallows of wetlands on gently sloping or flat bottoms with sparse to no vegetation. Suitable habitats include mudflats, wetland margins, ephemerally flooded cropland, short- to mid-grass pastures, and riverine edges and sandbars; water can range from alkaline to fresh. Many shorebirds forage for invertebrate prey in these shallows, while some species strongly associated with short-grass habitats forage almost exclusively in adjacent or more distant upland areas. Optimal water depth is related to leg length of individual species (i.e., shorter species forage in shallower water) but generally is in the range of 2-10 cm. Shorebirds require good visibility for predator detection and thus avoid areas with tall vegetation (taller than their heads) that obstruct views. Many migrants are highly gregarious, foraging in flocks of up to hundreds or thousands of individuals, while some breeding species are solitary.

Figure 13: Upland Sandpiper. File photo NDGF.

The primary initiatives focused on shorebird conservation on international and national scales are the Western Hemisphere Shorebird Reserve Network (WHSRN) and its associated programs, and the U.S. Shorebird Conservation Plan (Brown et al. 2001). WHSRN designates sites judged internationally important to shorebirds, especially during migration, based on percentages of the population that utilize a site and other

criteria. Currently, no site within the Northern Great Plains Joint Venture has been designated a WHSRN site although Montana's Lake Mason National Wildlife Refuge meets the criteria for several nesting species (Skagen and Thompson 2000). The U.S. Shorebird Plan enumerates current population levels on a national level, population goals, and general strategies to achieve those goals.

Regionally, two efforts have assigned area importance and priority scores for every shorebird species occurring regularly in the Northern Great Plains region: one associated with the U.S. Shorebird Plan, and one associated with the Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan (NORPLPP) (Skagen and Thompson 2000). For shorebirds breeding in the NGP, there are some data on population sizes and qualitative assessments of population trends, based on state heritage and ornithological databases, academic research, Breeding Bird Surveys, and surveys conducted on federal lands. The lists of breeding species of special concern produced from all of these sources essentially are identical and these are followed in the Northern Great Plains JV (Table 2).

Unfortunately, the list of priority species generated by all of these efforts differs considerably for migrants. The reason for the differences most probably is because there essentially are no data for overall migrant shorebird population sizes in the NGP. Besides the Shorebird Plan rankings, individual states within the NGP, as well as local regions of federal agencies such as Fish and Wildlife Service, Bureau of Land Management, and the Forest Service, have identified shorebird species of concern, including migrants, within their respective borders. However, because most of these entities include areas with much greater extents of wetlands (either the Prairie Pothole or Intermountain West regions), some migrants identified as special concern for the entire region only occur peripherally in the much more arid NGP. These species are not included on the list of priority species for the NGP. The NGP priority migrant shorebird list is derived from an analysis of the migratory pathways and expected distributions of each species (Skagen et al. 1999) (Table 4). This analysis was based on International Shorebird Surveys (ISS), which depend heavily on surveys on federal lands or at known migratory shorebird 'hotspots' rather than broad scale coverage of a region. The NGP priority migrant shorebird list may need to be adjusted as more comprehensive data are collected within the NGP.

Because habitat and monitoring requirements of breeding versus migrant shorebirds differ in important ways, the remaining discussion will address these two groups separately.

Breeding Shorebirds

Eight of the 11 shorebird species that breed in the NGP are priority species of concern (Table 2). The Great Plains population of Piping Plover is classified as 'threatened'; breeding population size is well established, population objectives have been set and each state has a Piping Plover management team. As a result of a literature review related to a proposal for federal listing, the population distribution and size of Mountain Plover is relatively well-known (Dinsmore 2003). There currently are no reliable population estimates for any of the other Priority species. Two recently-established initiatives will focus on Long-billed Curlew. The species is a USFWS Focal species for 2006, which will

result in a species action plan concerning monitoring, research, assessment, habitat and population management, and outreach, and statement of responsibilities for actions within and outside the U.S. FWS. Independently, a Long-billed Curlew Working Group is addressing conservation and management issues, especially developing monitoring protocols. In addition, a draft of a technical assessment for Marbled Godwit is being reviewed by experts in spring 2006 (C. Melcher, pers. comm.).

Table 2: Breeding Shorebird Priority Species in Northern Great Plains Joint Venture.

Species	**Global Population**	**Breeding Population in NGP**	**Population Objectives for NGP**	**Distribution in NGP**
Piping Plover	U.S. Great Plains: 2,953	2001 census - MT:6, ND:~600, SD:90 (2004: 280)	MT:600 (entire state), ND:300, SD:200	Missouri River, Cheyenne River
Mountain Plover	12,500	Very Few – MT (entire state): 1,500, SD: extirpated, WY (entire state):3,400	maintain or increase current population	Wyoming, Montana
Long-billed Curlew	55,000 – 123,500	unknown?	maintain or increase current population	throughout
Upland Sandpiper	350,000	unknown	maintain or increase current population	throughout but more east
Marbled Godwit	170,000	unknown?	maintain or increase current population	throughout
American Avocet	450,000	unknown	maintain or increase current population	throughout
Willet	160,000	unknown	maintain or increase current population	throughout
Wilson's Phalarope	1,500,000	unknown	maintain or increase current population	throughout but more east

For all species but Piping Plover, the main threat appears to be fragmentation of their grassland breeding habitat and grassland conversion to row crop agriculture or urban expansion. Wetland drainage also is a threat for species more closely tied to wetlands (Marbled Godwit, American Avocet, Willet, and Wilson's Phalarope). The reduction or elimination of natural grassland disturbances by fire, bison, and prairie dogs has further reduced preferred nesting habitat for Mountain Plovers.

Breeding Shorebird Goals

Maintain or increase current populations of all species (increase Piping Plover populations) by:

1. Implementing statistically rigorous survey designs to estimate population sizes,
2. Identifying and protecting large intact blocks of suitable grassland or grassland-wetland mosaics, in conjunction with other grassland bird initiatives, and
3. Identifying and managing habitat-related threats to breeding success

Critical Habitat

Except for Piping Plover, all NGP priority species are associated with grassland habitats, ranging from disturbed short grass (Mountain Plover) to tall grass (Upland Sandpiper) (Table 3). These habitats still occur widely throughout the Northern Great Plains on federal, state, tribal, and private lands, primarily in the form of grazed rangeland. However, privately-owned rangeland increasingly is being fragmented and converted into row crop agriculture because of the advance of large-scale irrigation systems and development of more arid-tolerant row crop hybrids (Higgins et al. 2002). There is a need to identify potential blocks of high-quality habitat on privately-owned land that currently is not protected. Because preliminary studies indicate that many of these species occur in higher densities and possibly experience higher reproductive success on larger grasslands, the aim should be to create as much contiguous habitat as possible. Once these areas are identified, tools such as land acquisition, landowner incentives, easements, etc. and established grassland protection programs, such as those with NRCS, USFWS, TNC, land trusts, Ducks Unlimited, and the IBA program should be used to preserve these areas. Literature reviews of species-specific habitat requirements and management recommendations have been collated by Northern Prairie Wildlife Research Center and are available on the internet. Preserving and managing these grasslands for breeding shorebirds also will benefit grassland-dependent passerines, raptors, grouse and pheasants, and waterfowl. One caveat is that many CRP fields planted with taller grasses and DNC planted for nesting waterfowl are not suitable for the priority shorebird species except possibly Upland Sandpiper. Preserving large prairie dog towns not only will protect Mountain Plovers, but will help several other birds, mammals, and reptiles of conservation concern.

Four of the priority species, Marbled Godwit, American Avocet, Willet, and Wilson's Phalarope, are wetland-dependent species, utilizing the margins of shallow ponds, stock ponds, drainages and small creeks, and larger lakes and reservoirs (Table 3). Preliminary research suggests that these species occur at higher densities in wetlands surrounded by grassland than those surrounded by cropland (e.g., May et al. 2002). Combining this information with species-specific habitat requirements will help to locate areas that can be targeted for management and conservation actions. Although these species are widely distributed throughout the NGP, the concern is they are being impacted by wetland degradation and loss. Thus, a conservation objective for this group of species is to sustain the shallow wetlands upon which they depend, preferably in a grassland-landscape matrix.

For Piping Plovers, the U.S. FWS has designated two areas of Critical Habitat within the NGP: the Missouri River from Oahe Dam, South Dakota through North Dakota to River Mile 1712 in Montana (near Wolf Point), and Dry Arm of Fort Peck Reservoir, also part of the Missouri River. Sandbar nesting habitat within this region is owned and managed by a variety of federal, state, tribal, and private interests; however, the ephemeral nature of suitable sandbars complicates the effort for permanent protection of particular land parcels. In the Prairie Potholes, most Piping Plovers nest on the edges of alkali lakes. Alkali lakes in the Northern Great Plains JV need to be surveyed for breeding Piping Plovers; a few in southwest North Dakota already are covered during the International Surveys. As this species shares the sandbar nesting habitat with the endangered Least Tern, conservation actions for one benefits the other.

Table 3: Habitat associations of NGP breeding shorebird priority species. Details of habitat requirements and management recommendations are available on the Northern Prairie Wildlife Research Center web site (Johnson and Dechant-Shaffer 2002).

Species	**Foraging Habitat**	**Nesting Habitat**	**Chick-rearing Habitat**
Piping Plover	dry to 3 cm water, bare to sparse vegetation	riverine or reservoir sandbars and banks, edges of alkali lakes	same as nesting habitat
Mountain Plover	dry to 2 cm water, bare to sparse vegetation	often far from water, disturbed short-grass with bare ground, especially in prairie dog towns, also occasionally plowed fields	same as nesting habitat
Long-billed Curlew	dry to 9 cm water, bare to dense vegetation	often far from water, short grass	usually slightly taller vegetation than nesting
Upland Sandpiper	dry to 4 cm water, bare to dense vegetation	often far from water, mid- to tall grasslands	short to medium vegetation
Marbled Godwit	wet to 12 cm water, bare to sparse vegetation	wetland margin or nearby upland	same as nesting habitat
American Avocet	dry to 12 cm water, bare to sparse vegetation	wetland margin or nearby upland	same as nesting habitat
Willet	dry to 10 cm water, bare to sparse vegetation	wetland margin or nearby upland	same as nesting habitat
Wilson's Phalarope	wet to deep water, bare to sparse vegetation	wetland margin or nearby upland	same as nesting habitat

Monitoring

Currently, Piping Plovers are the most frequently monitored species. The Army Corps of Engineers and other federal agencies survey most of the Missouri River every year. A complete international survey occurs every five years; the next is scheduled for 2006. The Breeding Bird Survey (BBS) is the only systematic region-wide monitoring program for the other breeding shorebirds. However, the BBS is a poor survey method because, among other reasons, these species breed at low densities relative to the huge area to be surveyed. Until now, a survey method to overcome the problem of low densities has not been developed. Preliminary data on survey design (road transect, random transect, or quadrat design) for wetland-dependant species in the Prairie Potholes may not be applicable to the more arid NGP. Research currently underway is exploring the best survey designs for Long-billed Curlews. A properly designed monitoring program is critical for estimating population sizes and trends, creating population and habitat objectives, identifying new sites, and evaluating conservation actions. However, much research still needs to be completed on the best designs for these low-density species distributed over very large areas.

Random surveys or surveys in suitable habitat, identified from GIS maps, may locate new breeding areas. In addition, researchers in Colorado and North Dakota have had success locating new Mountain Plover and Long-billed Curlew sites respectively by soliciting information from the public via posters and announcements targeted towards local landowners.

Research

More research is needed on the impacts of land use on breeding shorebird reproductive success. A related issue is impact of different grazing regimes on reproductive success. Most likely, these species have been impacted by loss of natural wetlands. However, the creation of tens of thousands of stock ponds, reservoirs, and drainages possibly has benefited these species in the relatively arid Northern Great Plains. Research is needed to determine if shorebirds breeding at artificial wetlands achieve comparable breeding success to those breeding in natural wetlands. No information is available on the degree of site fidelity at ephemeral wetlands in the Northern Great Plains or shorebird response to periodic droughts during which many shallow wetlands utilized by breeding shorebirds disappear.

Migrating Shorebirds

Based on their migration pattern and expected distribution, the NGP hosts significant numbers of three migrant shorebird species of special concern (Stilt Sandpiper, Solitary Sandpiper, and Whimbrel) and Black-bellied Plover (Table 4). The region possibly hosts substantial numbers of Long-billed Dowitcher (3 – 400,000 mid-continent), Red-necked Phalarope, and Semipalmated Sandpiper, and these species are possible candidates as Priority species. The NGP seems to be peripheral to the migratory pathways of the remaining 28 species that may occur in the region (Skagen et al. 1999). All four species of ‘Jump’ migrants (Ruddy Turnstone, Red Knot, Sanderling, and Dunlin) are listed on state or federal concern lists but appears to skip over the Northern Great Plains during migration. Over 90% of individuals of 11 ‘Narrow’ band migrant species migrate to the

east of the NGP, while Western Sandpiper, a 'Crossband' migrant, primarily migrates to the south and west of the NGP. Some of these species may have a wider distribution than currently is known, especially during certain years or water conditions. As more data are collected across the mid-continental U.S. and the NGP, these categories may need to be revisited. Nonetheless, survey and monitoring, habitat management, and conservation actions essentially are the same for all migrant shorebirds in the NGP, and these activities can proceed despite our limited knowledge of the numbers of particular species moving through the region.

Table 4: Migrant Shorebird Priority species in Northern Great Plains Joint Venture.

Species	**Global Population**	**% migrating through NGP**	**Migration Pattern**	**Foraging Habitat**
Stilt Sandpiper	820,000	~ 100%	narrow band, moderately dispersed	wet to 8 cm water, bare to sparse vegetation
Solitary Sandpiper	150,000	80%	widespread	wet to 5 cm water, bare to dense vegetation
Whimbrel	66,000	30%	widespread	dry to 12 cm water, bare to sparse vegetation
Black-bellied Plover	150,000	47%	widespread	wet to 10 cm water, bare to dense vegetation

Migrating Shorebird Goals

Identify priority species, establish population and habitat goals, and ensure that migrating shorebirds are not limited by lack of habitat. This should be met by:

1. Implementing broad-scale surveys to
    a. Estimate population sizes,
    b. Identify important sites or regions,
    c. Determine where, when, and if enough suitable habitat is available during migration;
2. Providing mosaics and complexes of habitats across the landscape during migration season;
3. Increasing understanding of migrant shorebird habitat use in different types of wetlands under different management regimes in a range of climatic conditions at broad-scales; and
4. Developing monitoring protocols and instituting long-term monitoring of migratory shorebirds and their habitats.

Critical Habitat

Because of wet/drought climatic cycles throughout the mid-continent, including the NGP, shallow wetlands and their invertebrate fauna tend to be ephemeral and unpredictable spatially and temporally. Migrant shorebirds have adapted to this dynamic landscape by having the capability to rapidly shift sites to exploit new food sources, resulting in low site fidelity (Skagen and Knopf 1994). Many species migrating through the mid-continent may rely on a multitude of wetlands dispersed throughout the landscape rather than particular stopover sites. Thus the optimal conservation strategy would be to ensure that foraging habitat is available somewhere in the landscape (Skagen and Knopf 1993, Farmer and Parent 1997). Managers in more stable climate regions (e.g., California, Midwest) have developed guidelines and methods for regulating water levels in wetlands for migrant shorebirds. Some of these methods may work in the NGP but there is a need is to develop and test different water management regimes in different types of wetlands during a range of wet and dry conditions. Managing water levels for migrating shorebirds may be complicated in areas that also are being managed for migrating waterfowl and other wetland-dependant migrants because the two groups may require different timing and water regimes, an issue addressed in several publications.

Preliminary research from the Prairie Pothole region suggests that migrant shorebirds not only select particular types of wetlands with certain water depths but also are responding positively to greater amounts of grassland versus cropland in the area (summarized in Granfors and Neimuth 2005).

Figure 14: Long-billed Curlew on her nest. Sandra Hagen.

Monitoring

Broad-scale surveys and monitoring are needed to: 1) estimate population sizes and trends, 2) assess responses to management actions, and 3) determine where, when, and if enough suitable stopover habitat exists across the region during any given migration

season. As presented in the NORPLPP Plan (Skagen and Thompson 2000), this could be accomplished via two approaches: by monitoring 'important areas' through programs such as ISS, and by creating a regional network comprised of land managers and biologists that communicates habitat availability and generalized shorebird movements across the region on a weekly basis. The latter "migration habitat monitoring" effort would be especially important for identifying areas with a lack of suitable habitat; these areas then could be targeted for immediate or long-term management actions. Known current monitoring efforts in the NGP are the ISS, primarily at national wildlife refuges and other federal and state protected areas. To broaden the scope of migratory shorebird monitoring, the ISS project has proposed a three-year test program to collate data gathered from state bird chat lines, beginning spring 2006.

Research

Very little information is available to enable conservationists to determine habitat or population objectives for shorebirds migrating through the NGP. Thus, a primary need is to collate data on the location, extent, status, management, and ownership of potential shorebird habitats. This would be most efficiently accomplished with spatial analysis of GIS data. Research is needed to determine habitat requirements and preferences of each migratory species in the NGP, both in terms of wetlands and surrounding land use. This information then could be entered into GIS databases to create spatially-explicit models that would identify potential new areas to be surveyed. Data also are needed on the distribution and dispersion of migrants across the landscape. Issues include the number of stopover sites used and utilization of isolated wetlands versus wetland complexes. There is a need for research on the development, applicability, and feasibility of different water management schemes specific to the NGP, especially in the context of integrated management for other wetland species. In addition, some individuals of all the breeding priority shorebird species migrate through the NGP to nest farther north. Research is needed on habitat utilization and requirements of these migrants, and possible competition with resident conspecifics. Finally, an assumption is that shorebird abundance or shorebird habitat abundance reflects the NGP's contribution to conserving each species. Research is needed to determine if migrant shorebirds are able to meet their nutritional needs while in the NGP, which is the ultimate determinate of shorebird survival and reproductive success.

Waterbirds

Waterbirds are an extremely diverse group of species that include any aquatic-dependent species besides waterfowl and shorebirds. In the Northern Great Plains, the major waterbird groups are herons, gulls, terns, cormorants, pelicans, grebes, rails, and bitterns. Waterbirds often are classified according to their primary nesting substrate (tree, ground, or marsh vegetation) and gregariousness (nest in colonies, semi-colonial, solitary). No matter their classification, waterbirds require nest sites safe from mammalian predators and usually nest over water or on islands. Sites protected by water also are required for rearing chicks. Waterbirds primarily eat aquatic vertebrates and invertebrates, especially fish, amphibians, and crustaceans; smaller species also eat smaller prey such as leeches and aquatic insects. Many waterbird species have similar habitat requirements as waterfowl and may benefit from habitat management actions aimed at waterfowl.

Of the approximately 20 species that breed in the Northern Great Plains, eight regularly-breeding species were identified as priority species for the region (Table 5) (for colonial-breeding species, Kushlan et al. 2002; for solitary-breeding species, unpublished assessment available www.waterbirdconservation.org). This list was derived from the continental-scale assessments conducted in association with the North American Waterbird Conservation Plan and tailored to BCR 17 using draft area importance scores from the waterbird assessment database held at Manomet Center for Conservation Sciences as well as expert opinion.

Priority species are those species of moderate or high concern based on habitat threats, declining abundance, and/or limited distribution as well as currently occurring in manageable numbers within the region. In addition, priority species were considered habitat limited with needs as strict or more strict than other waterbird species; therefore, meeting the needs of the set of priority species should meet the needs of others dependent on a given habitat type.

Of the colonial species, the 'Interior' Least Tern (*Sterna antillarum*) is federally endangered, while the remaining species are of moderate concern in North America (Kushlan et al. 2002). Two solitary-breeding species, Pied-billed Grebe (*Podilymbus podiceps)* and American Bittern *(Botaurus lentiginosus)*, are of high concern in North America. For all of these species, except the pelican, the NGP is well within their breeding ranges. Although the number of American White Pelicans (*Pelecanus erythrorhynchos*) breeding within the NGP is relatively small, the area probably is very important to migrants and non-breeding birds. The NGP possibly is moderately important to breeding California Gulls (*Larus californicus*) and Forster's Terns (*Sterna forsteri*) however, these species were not added to the NGP Priority list at this time because the region is on the periphery of their breeding ranges.

None of the species occurring only as migrants are currently on the priority list because nothing is known of the importance of the region to these species. Thayer's Gull (*Larus thayeri*), Franklin's Gull (*Larus pipixcan*), Horned Grebe (*Podiceps auritus*), and Red-

necked Grebe (*Podiceps grisegena*) are migrants that are Priority species in their Prairie Pothole breeding area and may be candidates to be added to the NGP list when more data are obtained.

Figure 15: Least Tern. File photo NDGF.

In general, very little is known about the distributions, population sizes, or population trends of most waterbird species in the NGP region, and most have received little attention or resources for research, monitoring, and management. The exception is Least Tern, which receives some management and monitoring resources, especially in conjunction with Piping Plovers that occur in the same habitats.

Waterbird Goals

The overall goal is healthy sustainable breeding populations of waterbirds in the Northern Great Plains. Because this bird group is so little known, the JV will need to start at the beginning of the conservation process. Actions required are:

1. Assess distribution, location, and population sizes of priority species, reevaluate Priority Species list if necessary
2. Assess distribution, quality, and amount of suitable breeding habitat
3. Set objectives for populations and habitat preservation; define measures of success
4. Implement projects to protect, restore, and enhance suitable habitat

5. Measure success of projects to meet objectives, adapt if necessary
6. Conduct research to fill information gaps
7. Monitor populations and habitat.

The first three items could be part of a Waterbird Conservation Plan for the JV. Ideally, all of these actions will be part of a multi-species landscape-level framework for wetlands and wetlands-dependent wildlife management and conservation in the Northern Great Plains. Given the dearth of information, but the knowledge that wetland habitat is diminished from historical times, population objectives for all priority species, with the exception o Interior Least Tern is to maintain or increase current populations. Specific population objectives have been developed for the endangered Interior Least Tern.

Table 5: Waterbird Priority species of Northern Great Plains JV.

Species	**North American Population**[1]	**Estimated Breeding NGP Population**	**Population Objectives for NGP**	**Nesting Substrate; Habit**
American White Pelican	>120,000 breeders	2,000-5,000	maintain or increase current population	ground; colonial
Black-crowned Night-heron	>50,000 breeders	unknown	maintain or increase current population	tree, marsh; colonial
Black Tern	100,000-500,000 breeders	unknown	maintain or increase current population	marsh; colonial, semi-colonial
Interior Least Tern	5,000	ND: 200 SD: 90 MT: 100-175	ND: 250 SD: 120-200 MT: 100	ground; colonial, solitary
Eared Grebe	3,500,000-4,100,000 individuals	unknown	maintain or increase current population	marsh, submergent veg; colonial
Western Grebe	>110,000 breeders	unknown	maintain or increase current population	marsh; colonial
Pied-billed Grebe	100,000 individuals	unknown	maintain or increase current population	marsh; solitary, semi-colonial
American Bittern	2,976,000 individuals	unknown	maintain or increase current population	marsh; solitary

[1] For colonial-breeding species, Kushlan et al. 2002; for solitary-breeding species, unpublished assessment available www.waterbirdconservation.org.

Critical Habitat

In the NGP, waterbirds use both permanent and ephemeral wetlands. Though managed marshes with permanent water are more likely to host waterbirds on a more consistent basis, waterbird species in the NGP differ in their fidelity to particular wetlands. Some, such as pelicans, use traditional sites repeatedly while others, such as Least Terns and Eared Grebes, nest in ephemeral habitats and readily change breeding sites in response to water conditions. Most other marsh-nesting species also shift sites in response to wetland conditions. Because of the NGP's extreme wet-drought weather cycles and semi-arid climate, an understanding of species-specific responses to water level and other changes is necessary for the preservation and management of critical habitat. National wildlife refuges within the NGP have reasonably permanent wetlands and marshes, and relatively large wetland complexes, making them very suitable waterbird sites. For example, 10 – 20 waterbird species regularly breed at LaCreek NWR in South Dakota, including the only traditional pelican colony in the NGP. If they have not already done so, every wildlife refuge should be inventoried for both migrant and breeding waterbird use. Waterbirds and waterfowl share many of the same habitats in the NGP (e.g., Lokemoen 1971, Lokemoen and Woodward 1992). Thus, wetlands known to support high waterfowl use, such as Waterfowl Production Areas, Game Production Areas, and wetlands constructed or maintained for the purpose of attracting waterfowl, are excellent possibilities for designation as waterbird critical habitat.

The first step needed to identify new sites, including wetlands on private lands and man-made wetlands, is to classify and map all wetlands and riverine habitats in the NGP. Combining this classification with species-specific habitat and nesting requirements will allow the selection of potential important sites. Through either modeling or field research, each candidate site should be assessed for suitability under various climate regimes and then prioritized by other criteria such as ownership, ability to meet objectives, efficiency of enacting conservation actions, etc.

The Least Tern is the only obligate riverine species; the other Priority species only rarely breed along rivers in backwater marshes and reed beds. The Army Corps of Engineers (ACOE) is responsible for identifying and maintaining Least Tern breeding habitat along the Missouri River. This is accomplished through regulating water flows and creating artificial islands and sandbars for nesting. Habitat along the Cheyenne and Yellowstone Rivers is not under the ACOE's purview but may be important in years when high water eliminates Missouri River habitat. The importance of these other rivers and feasibility of Least Tern-Piping Plover joint habitat conservation needs to be studied.

Monitoring

Currently, a hodgepodge of monitoring efforts of varying intensity and scope are conducted in the NGP. Breeding Least Terns are monitored along large sections of the Missouri River in most years, but monitoring and counting protocols differ among observers and years (Guilfoyle et al. 2004). A comprehensive Least Tern Monitoring Plan is scheduled to be finished in spring 2006. Managers at some wildlife refuges, tribal lands, and state lands monitor colonies of the most conspicuous species, such as American White Pelicans or tree-nesting species. A range-wide survey of all breeding

pelican colonies was recommended in 2006; the previous survey was conducted in 1991. Monitoring of wetlands for non-breeding pelicans and other waterbirds would enhance our understanding of the importance of the NGP to this class of birds. Secretive marshbirds (including Pied-billed Grebe and American Bittern) are monitored yearly at two wildlife refuges in the NGP utilizing standardized marshbird monitoring protocols. This monitoring program should be expanded to many more locations through the region. The Breeding Bird Survey is the only broad-scale, regular monitoring effort for the other waterbird species. However, the BBS is an inadequate monitoring method because, among other reasons, many waterbirds are difficult to detect from roadside counts, and the method does not provide population size estimates or reliable trend assessments. A statistically-rigorous monitoring plan needs to be developed; following guidelines issued in standardized waterbird and secretive marshbird protocols (Steinkamp et al. 2002, Conway 2004). The survey design must be rigorous enough to allow estimation of population sizes and detection of population trends, and flexible enough to meet other objectives, such as measuring success of management actions. Such a monitoring plan will be completed in 2007 for the state of South Dakota. Choosing the best design would be helped if the region's wetlands are classified and mapped in a GIS database.

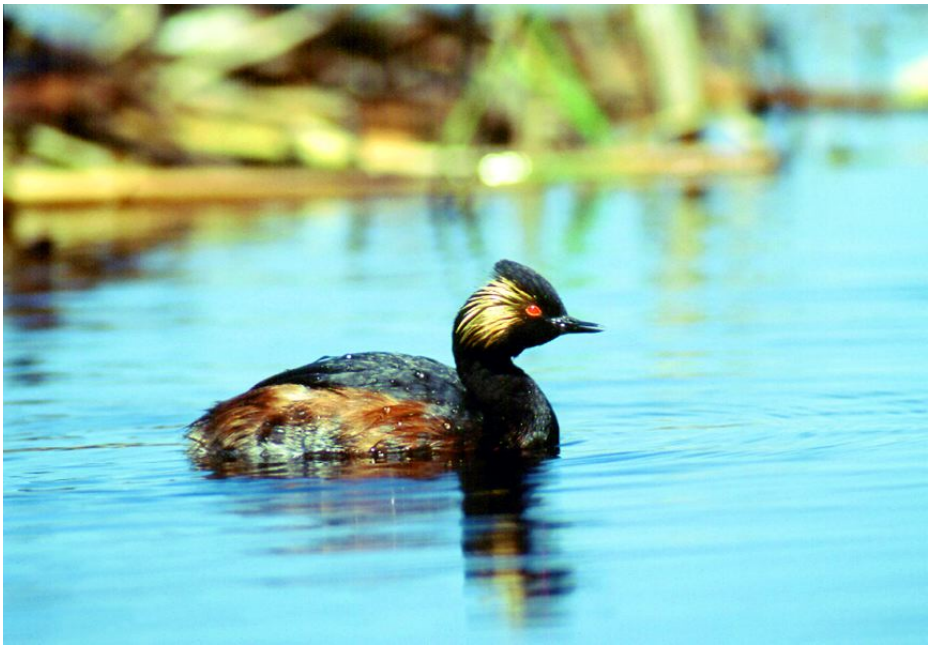

Figure 16: Eared Grebe. Chris Grondahl.

Research

Little waterbird research has been conducted in the NGP beyond small-scale surveys or local studies of breeding biology. Much research is needed on larger-scale issues. Although general breeding habitat and nest-site selection is well-known, there is a need to understand landscape-level habitat requirements, such as wetland type, size, and density, in the relatively arid NGP. For example, what are the impacts of different land uses around wetlands on breeding waterbird densities and breeding success? Do the results of landscape ecology studies conducted in other areas apply to the NGP? For example, Black Terns in eastern South Dakota breed in semipermanent wetlands in larger wetland

complexes (Naugle 2004); is this also true in the NGP? Where do waterbirds breed during drought periods and what is the impact of wet-drought climatic cycles on population trends? Answers to these types of questions would enhance the JV's ability to target habitat protection and management efforts more effectively.

Because they share many of the same habitat requirements, results from waterfowl research may be applicable to waterbirds. For example, suggestions that the NGP serves as an important waterfowl breeding area when the adjacent Prairie Pothole region is dry also may apply to breeding waterbirds. To enhance multi-species wetland bird management, research is needed on the impacts of various waterfowl management techniques on waterbirds. Some waterbird species breed at stock ponds and other man-made wetlands (Evans and Kerbs 1977, May et al. 2002), especially species that do not require large wetlands or large expanses of marsh. Data are needed on the types of man-made or restored wetlands utilized by different waterbird species and waterbird reproductive success relative to natural wetlands. Finally, migrant waterbirds pass through the NGP and non-breeding subadults or post-breeding dispersers utilize wetlands in the NGP. Research is needed on the habitat requirements, locations of critical habitat, and management issues of non-breeding waterbirds.

Waterfowl

The NGP is considered one of 67 areas of continental significance to North American waterfowl in the North American Waterfowl Management Plan (NAWMP). A significant portion of North America's continental waterfowl population either breeds or migrates through the NGPJV area. While the NGPJV provides important spring and fall migration habitat for waterfowl, it is most significant as a breeding area. The vast expanses of relatively unfragmented grassland in much of this region enable ducks to disperse their nests over a much larger landscape, making them less vulnerable to mammalian predators. Therefore, duck nest success in the NGPJV area should be quite high due to the combination of vast expanses of grassland and a predator community that is primarily dominated by coyotes. Moreover, such a landscape supports much smaller numbers of other mammalian predators such as red fox, raccoon, and skunk, and few avian predators compared to the Prairie Pothole Region.

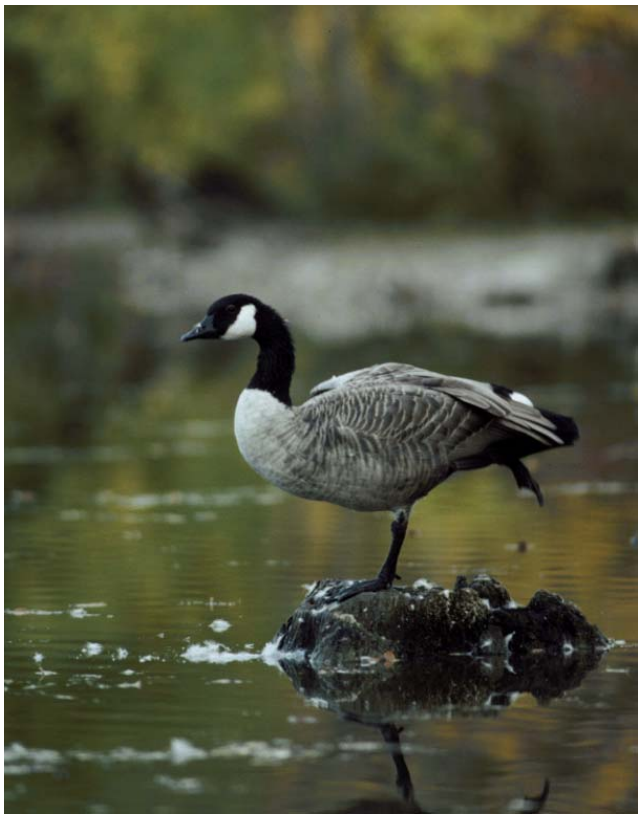

Figure 17. Canada Goose (Branta canadensis). NDGF.

Breeding Waterfowl

Over the course of time, many wetlands have been created by conservation agencies and private landowners on public and private land throughout the NGP to provide water sources for cattle. Most seasonal and semi-permanent wetlands have been created by constructing earthen embankments across waterways while others were created or deepened by excavation. Not only does this practice provide tremendous support to the

ranching industry but many of these wetlands are also very attractive to breeding waterfowl. Estimates from the U. S. Fish and Wildlife Service breeding pair surveys during 1989-1998 indicate that the number of breeding ducks in the NGP averaged 21% of the total ducks in the U.S. surveyed area. According to the U. S. Fish and Wildlife Service, breeding population estimates for survey strata 42-44 (western Dakotas and southern Montana) from 1986-2005 averaged 1,296,427 breeding ducks. Brewster et al. (1976) found that the NGP portion of South Dakota accounted for 21% and 31% of the state's breeding duck pairs in 1973 and 1974, respectively. Stewart and Kantrud (1974) suggested that 16% of the breeding ducks in North Dakota in 1967 were in the NGP portion of the state. Breeding duck populations in Lokemoen's (1973) study areas in western North Dakota were dominated by mallards (50%), wigeon (15%), northern pintails (13%), and blue-winged teal (12%). Ruwaldt et al. (1979) noted that stock ponds in western South Dakota supported more mallard pairs than any other single wetland class across the state and more American wigeon pairs than all other wetland classes combined, including prairie pothole wetlands. Ruwaldt et al. (1979) also found that stock ponds in western South Dakota are even more important to breeding duck populations when drought conditions affect the Prairie Pothole Region of eastern South Dakota. Austin and Buhl (2005) reported duck densities of 2.69 to 3.96 ducks per ha basin area for Grand River National Grassland in north-central South Dakota and the northern portion of the Little Missouri National Grassland in western North Dakota. Generally, a larger percentage of the breeding population of dabbling ducks in the state is found using stock ponds in western South Dakota rather than glaciated wetlands in eastern South Dakota when drought conditions are present. This reinforces the belief that the relatively stable water levels of wetlands in the NGP can provide ducks with a refuge during drought periods.

In addition to breeding pair habitat, many of these created wetlands also provide critical brood habitat for waterfowl in the NGP area. Most waterfowl recruitment studies in the NGPJV have relied on brood surveys to index recruitment. Lokemoen (1973) found 32 broods/100 wetland hectares in western North Dakota, which was less than the 61 broods/100 wetland hectares observed on stock ponds by Bue et al. (1952) in western South Dakota. Austin and Buhl (2005) reported brood densities of 0.93 to 1.36 broods per ha basin area at Grand River National Grassland and the Little Missouri National Grassland. Brood surveys conducted on wetland projects constructed by Ducks Unlimited in the western Dakotas from 1986-1998 indicated that blue-winged teal were the most common species (28%), followed by mallards (22%), gadwall (19%), northern pintail (8%), American wigeon (7%) and northern shoveler (6%). Estimations using the Mallard Model (Johnson et al 1987) indicate that waterfowl recruitment in the vicinity of created wetlands in the NGP is quite high which provides justification for the continuation of these types of wetland projects in the NGP area. As wetlands continue to be added to the landscape, it is expected that they will continue to contribute to continental recruitment at a positive rate based on models created in the Prairie Pothole JV and Prairie Habitat JV.

Table 6: Breeding Waterfowl Priority species in Northern Great Plains Joint Venture (MBMO 2005).

Species	Population Est. Mid-Continent May Survey 2005	Breeding Population in NGP (May Survey Avg. 1986 – 2005 Strata 42 – 44)	Population Objectives for NGP	Distribution in NGP
American Wigeon	2,225,000	70,120	maintain or increase current population	Throughout
Blue-winged Teal	4,586,000	272,504	maintain or increase current population	Throughout
Mallard	6,755,000	427,495	maintain or increase current population	Throughout
Northern Pintail	2,561,000	113,690	Increase current population	Throughout
Canvasback	521,000	4,522	maintain current population	Throughout
Redhead	592,000	7,486	maintain current population	Throughout
Total Breeding Priority Ducks	17,240,000	1,296,437	maintain or increase current population	

Breeding Waterfowl Goals

Maintain or increase current populations of all species by:

4. Identifying and protecting large, intact blocks of suitable grassland in relative proximity to wetland habitats, in conjunction with other grassland bird initiatives, and
5. Identifying and managing threats to grassland and wetland habitats that may lead to declines in breeding populations and breeding success.
6. Continuing to target creation of suitable wetland habitats within large blocks of grassland habitat.
7. Formulating Farm Bill policy that encourages the conservation of grassland habitats and discourages the conversion of these vital habitats to other uses.

Critical Breeding Habitat:

Much like the Prairie Pothole Region, the NGP is characterized by large expanses of grassland habitat, both native and planted. However, the NGP lacks the wetland densities of the PPR and water is generally a limiting factor for breeding waterfowl in this region. However, like the PPR, the grassland habitats of the NGP are under mounting pressure for conversion to production agriculture. Genetically modified crops along with current Farm Policy that provides a substantial "safety net" to producers is fueling the destruction of native grassland habitats at an alarming rate. In addition, the current rush to increase ethanol and biodiesel production and reduce the United State's dependence on foreign oil poses another significant threat to grassland habitats. As these grassland habitats are

converted, the landscape will become increasingly fragmented and nesting success will decline. The Conservation Reserve Program grasslands in proximity to wetlands also provide important nesting habitat for waterfowl in the NGP. As land prices and rental rates continue to escalate, the CRP loses its attractiveness to producers. As their contracts expire and they choose not to re-enroll or extend existing contracts, these grasslands will also be converted back to cropland, further fragmenting the landscape and impacting nesting success.

In order for the NGP to maintain its importance as a waterfowl breeding area, both water and nesting cover are needed. Although the area has a limited number of isolated wetlands, these wetlands provide critical habitat for both breeding and migrating waterfowl. Some of the largest of these wetlands, such as those in south central Montana, are in public ownership as national wildlife refuges, national grasslands or state wildlife areas and are therefore, perpetually protected. However, many of these are large, shallow, closed basins in areas with lower precipitation and high evapotranspiration rates, meaning that they may be dry or nearly so for several years in a row. Over the long term these wetlands may be at greater risk than some other areas because of global climate change. However, when wet, these wetlands provide excellent habitat for waterfowl, waterbirds and shorebirds.

Other significant habitats for waterfowl in the NGP include stock ponds, reservoirs, several major river systems, intermittent streams, and seasonally flooded areas. There are few "managed" wetlands in the NGP, so competing management between species groups, such as waterfowl and shorebirds, is not much of an issue. Major river systems and their backwaters provide habitat for migrating and wintering waterfowl, with some value for production, mainly for Canada geese. The stock ponds of various sizes and the reservoirs provide a more stable water supply than do the isolated wetlands and can often provide habitat for both breeding pairs and broods. They also help to keep ranchers and livestock on the land, which is critical for the well-being of all priority bird species in the NGP. Many of the ponds and reservoirs are located in gently sloping areas so that ample shallow water habitat is available for waterfowl and other species. The shallow zones undergo frequent water-level fluctuations which stimulate the germination and growth of diverse stands of emergent vegetation as well as submergent vegetation. The presence of aquatic vegetation provides habitat for a variety of aquatic invertebrates which are the critical food resources for nesting hens and ducklings. Some older reservoirs and stock ponds that provide excellent habitat are at risk because they are in need of repair. The risk is that there may not be the funds or the intent to repair them either before or after they breach. The lack of appreciation for the habitat provided by stock ponds and reservoirs also may put them at risk. Stock ponds and reservoirs are also at risk of sedimentation and degradation of water quality if more land within the watershed is converted to cropland. Coal bed methane extraction also poses a potential threat to water quality in some parts of the NGP.

Table 7: Habitat associations of NGP breeding waterfowl priority species.

Species	Foraging Habitat	Nesting Habitat	Brood-rearing Habitat
American Wigeon	Primarily submergent and some emergent vegetation; Palustrine Wetlands; Seasonal and Semi-permanent	Grassland habitats generally within ¼ mile of water	Palustrine Wetlands: Seasonal and Semi-permanent
Blue-winged Teal	Shallow water zones (< 15 cm) of temporary, seasonal and semi-permanent palustrine wetlands	Grassland habitats generally within 200 m of water	Palustrine Wetlands: Seasonal and Semi-permanent
Mallard	Emergent zones of palustrine wetlands (generally <20 cm); cropland	Grassland habitats generally within ½ mile of water but occasionally up to 1 mile; wetland margins and occasionally over water in dense emergent vegetation	Palustrine Wetlands: Seasonal and Semi-permanent
Northern Pintail	Shallow water zones (<15 cm) of temporary, seasonal and semi-permanent palustrine wetlands	Grassland habitats typically within 1/8 mile of water but occasionally as far as 2 miles.	Palustrine Wetlands: Seasonal and Semi-permanent
Canvasback	Submergent vegetation located in semi-permanent palustrine wetlands	Over water in emergent vegetation of seasonal and semi-permanent palustrine wetlands	Semi-permanent palustrine wetlands:
Redhead	Submergent vegetation located in semi-permanent palustrine wetlands	Over water in emergent vegetation of seasonal and semi-permanent palustrine wetlands; occasionally in grassland habitats	Semi-permanent palustrine wetlands:

Monitoring:

The U.S. Fish and Wildlife Service conducts waterfowl breeding population and habitat surveys each May across much of the mid-continent, including much of the JV area. Within the JV area, surveys are conducted along east-west transects in three survey strata: Stratum 42 (Montana South River), Stratum 43 (North Dakota West River), and Stratum 44 (South Dakota West River) (Smith 1995). Waterfowl and ponds are counted from an airplane along the length of each segment to species, sex, and social grouping; waterfowl are also counted on 2-4, 16-mi segments to provide a visibility correction factor for each stratum each year. The surveys are designed to monitor ducks but also count Canada geese (*Branta canadensis*) on their nesting grounds and American coots (*Fulica americana*). These surveys have been conducted since 1955 and provide the longest,

most consistent data on wildlife populations in the world (Nichols 1991). Pond counts (i.e., counts of the number of wet basins) have been conducted in Strata 42-43 since 1975 and provide an index of water conditions. July surveys of waterfowl and broods also were conducted up to 2005; broods, however, were not enumerated to species. Data are reported annually and are readily accessible for immediate or historical assessment. Procedures are described in the *Standard Operating Procedures for Aerial Breeding Ground and Habitat Surveys in North America,* Section III, revised 1987.

Wyoming conducts an aerial survey of breeding Canada geese. The North Dakota Game and Fish Department has conducted annual surveys of breeding waterfowl since 1948. Ground surveys are conducted in May along transects oriented north-south along roads. The southern portions of transects I, II, and III are located in the JV area. Waterfowl observed are enumerated by species, sex, and social groups and mile; wetland data is also recorded, although recording of wetland data was less consistent in the earlier years.

Migrating and Wintering Waterfowl

Significant numbers of some waterfowl species migrate through the NGPJV area during both spring and fall. Mallards, American wigeon, northern pintail, blue-winged teal, gadwall and green-winged teal are all known to migrate through the NGP in significant numbers either during the spring and/or fall. In addition the Great Plains Prairie population, Western Prairie population, Hi-line population and Shortgrass Prairie populations of Canada geese also migrate through the NGP on their way to northerly breeding grounds in the spring and southerly wintering grounds in the fall. The Western Prairie population is known to winter occasionally on Lake Oahe and/or Lake Sakakawea, which are mainstem reservoirs of the Missouri River, during mild winters. Trumpeter swans also winter annually on LaCreek National Wildlife Refuge located in SW South Dakota.

Table 8: Migrant waterfowl priority species in the Northern Great Plains Joint Venture (MBMO 2005).

Species	**Continental Population (Breeding Pop. 2005)**	**Migratory Densities (Spring/Fall) H,M,L**	**Migration Pattern**	**Foraging Habitat**
American Wigeon	2,225,000	M/L	Central America, Mexico and the Gulf Coast to the prairies of Saskatchewan and Alberta	Primarily submergent and some emergent vegetation; Palustrine Wetlands; Seasonal and Semi-permanent
Blue-winged Teal	4,586,000	H/H	South America, Central America, Mexico and the Gulf Coast to the NGP and prairies	Shallow water zones (< 15 cm) of temporary, seasonal and semi-permanent palustrine wetlands

			of Saskatchewan and Alberta	
Mallard	8,697,000	M/L	Southern and central regions of the U. S. to the NGP, prairies and parklands of Saskatchewan and Alberta and the Boreal Forest of the NWT	Emergent zones of palustrine wetlands (generally <20 cm); cropland
Northern Pintail	2,561,000	M/M	Central America, Mexico, Gulf Coast and California to the NGP, prairies of Saskatchewan and Alberta, the NWT and Alaska	Shallow water zones (<15 cm) of temporary, seasonal and semi-permanent palustrine wetlands
Canvasback	521,000	L/L	Mexico and Gulf Coast to the prairies of Saskatchewan and Alberta	Submergent vegetation located in semi-permanent palustrine wetlands
Redhead	592,000	L/L	Gulf Coast to the prairies of Saskatchewan and Alberta	Submergent vegetation located in semi-permanent palustrine wetlands

Migrating and Wintering Goals

Providing habitat for migratory waterfowl is a secondary goal for the NGPJV. The primary focus of the NGPJV for waterfowl is to establish wetland habitats that attract breeding waterfowl to the landscape and provide brood-rearing habitat for hens and broods. Therefore, resource allocations for waterfowl should stress the creation of breeding habitat with secondary benefits for migratory waterfowl and goals are not needed for migratory waterfowl.

Critical Breeding Habitat:

Migratory and wintering habitat in the NGP is considered limiting to populations of any of the priority species within the NGP. The establishment of new wetlands and protection of existing wetlands will ensure that migratory populations of waterfowl have places to stop for rest and/or food resources as they continue their journey to northerly breeding grounds or southerly wintering grounds.

Migrating and Wintering Waterfowl Monitoring:

The Mid-winter Waterfowl Survey has been done since 1948 as a coordinated effort among state wildlife agencies. State personnel conduct aerial counts of ducks and geese in early to mid-January along the major river systems or other areas having open water. In Montana, surveys are conducted along the Yellowstone River from Billings to the North Dakota border and along the Bighorn River from Yellowtail Dam near Fort Smith to where the Bighorn empties into the Yellowstone River near Custer. In North Dakota, the survey is conducted along the Missouri River from South Dakota border to Garrison Dam, the east end Lake Sakakawea, parts of Little Missouri River, the Missouri River around Williston where open, and Nelson Lake in Oliver county. In South Dakota, the January surveys are conducted along the Missouri and Cheyenne rivers and LaCreek NWR. This coordinated January survey is especially important for Canada geese; results are combined with those from other states to become the official estimate for Canada goose populations. South Dakota also conducts weekly aerial surveys for ducks and geese from early November through December on the Missouri River.

Research

While a number of studies have provided information on waterfowl distribution and densities relative to wetland types (primarily impoundments), there remain major gaps in our knowledge about waterfowl in the NGP. These include:

- *Nesting*: landscape perspective of nest distribution; nest survival rates; relationships of environmental factors to nest site selection and nest survival. Although it is apparent that the predator community is very different from the PPR, we have very little understanding of how the predator community relates to waterfowl productivity or how alternate prey (e.g., rodents, rabbits) might influence predation rates on waterfowl.
- *Brood ecology and recruitment data:* More research is needed to quantify brood habitat use and survival to determine whether impoundments are performing as expected or whether further management is needed.
- *Habitat:* National Wetlands Inventories need to be completed for the entire BCR. Wintering surveys need to be extended and consistency between methods needs to be addressed so that regional analyses may be conducted.

In the Prairie Pothole Region, the USFWS conducts 4-mi^2 surveys (Cowardin et al. 1995) to monitor waterfowl populations relative to water and upland habitat conditions. These annual surveys provide valuable information for monitoring, conservation of breeding waterfowl habitat, and evaluation of management actions. Waterfowl management in the NGPJV would greatly benefit from a similar program. However, wetlands and other factors in the NGP are very different from the PPR. Models used for management planning likely would need substantial adaptation to be applicable to this region. Model adaptation will require extensive data collection and research.

Figure 18: Northern Pintail hen with brood. File photo NDGF.

Activities within the NGPJV area will be focused on helping to achieve the population objectives of dabbling ducks as set forth in the North American Waterfowl Management Plan through protection, restoration and enhancement of breeding habitat. The mallard, northern pintail, blue-winged teal, American wigeon, gadwall, and northern shoveler will be the primary beneficiaries of these efforts. Protection of existing wetlands and grasslands as well as targeted creation and enhancement of wetlands will be a major focus within the NGPJV. Protection efforts will be focused in areas where wetlands are currently interspersed within large expanses of grassland. Similarly, grassland restoration efforts will be focused in areas that connect larger tracts of existing grassland in order to maximize waterfowl nesting success. Wetland creations will be targeted to areas containing large expanses of gently rolling grassland habitat to optimize use by breeding waterfowl. In addition, efforts will be made to focus a large percentage of wetland creations in locations within the watershed that will minimize impacts on amphibians and other wildlife that depend upon intermittent wetland habitats for a portion of their life-cycle. Conflicting demands of other species will be mitigated through application of spatial models depicting sensitive areas and buffers.

Table 9: Waterfowl (North American Waterfowl Management Plan 2003 update)

Species:	Continental Priority	Importance Breeding	Need Breeding	Importance Nonbreed	Need Nonbreed	NGP Priority
Mallard	**High**	**Mod High**	**High**	**Mod Low**	**Mod**	**Yes**
Northern Pintail	**High**	**Mod High**	**High**	**Mod Low**	**Mod**	**Yes**
American Wigeon	**Mod High**	**Mod High**	**Mod High**	**Mod Low**	**Mod Low**	**Yes**
Blue-Winged Teal	**Mod High**	**Mod High**	**Mod High**	**Mod Low**	**Mod Low**	**Yes**
Canvasback	**Mod High**	**Mod Low**	**Mod Low**			**Yes**
Redhead	**Mod High**	**Mod Low**	**Mod Low**			**Yes**
Common Goldeneye	Mod High			Mod Low	Mod Low	No
Bufflehead	Moderate	Mod Low	Mod Low			No
Gadwall	Moderate	Mod High	Mod High	Mod Low	Mod Low	No
Green-winged Teal	Moderate	Mod Low	Mod Low	Mod Low	Mod Low	No
Northern Shoveler	Moderate	Mod High	Mod High	Mod Low	Mod Low	No
Ring-necked Duck	Moderate	Mod Low	Mod Low			No

NABCI Species Initiatives and Joint Ventures

Joint Ventures and Species Initiatives have been highly successful in focusing efforts, garnering support and communicating ecological needs for habitats and species. The successful record of achievement, under these approaches to conservation, has led to them being a preferred mechanism for addressing conservation issues. The NGPJV will work with and incorporate the needs, knowledge and priorities of other and new JV's and Initiatives into the planning and operational programs of the NGP as appropriate to the goals and objectives of the NGPJV.

Pintail Action Group

The northern pintail has become a focal species for the NAWMP because of the decline in the continental population since the 1980s. Principal reasons for the decline and their lack of response to improved prairie water conditions during the 1990s and 2000s are attributed to the loss of grassland and summer-fallowed nesting habitat. The extensive grasslands and shallow wetlands of the NGPJV provides valuable habitat for breeding pintails. Indeed, the NGPJV area (Waterfowl Conservation Area 4) is ranked as moderately high for breeding importance (based on Percent of the surveyed population and the relative density of a species breeding in a WCR). Moreover, threats to habitats for the region are ranked as high priority, due to "extreme past or expected future deterioration or decline in habitat quality or availability."

The Pintail Action Group (PAG) functions as part of the NAWMP Science Support Team (NSST) and networks with Plan habitat Joint Ventures, agencies, and nongovernmental organizations throughout the continent. Its mission is to "to advocate and support planning, coordination and evaluation of northern pintail management and research actions among the NAWMP Joint Ventures, Flyways, government agencies, and other organizations." The objectives of PAG are closely focused on supporting Joint Venture activities; therefore, PAG provides a valuable resource for the NGPJV to ensure that scientific products and expertise are fully integrated into JV planning and programs. PAG provides seven major services to NSST and JVs: 1) identify and advocate needed conservation actions that can support JV implementation strategies, and the research required to evaluate performance of these programs; 2) serve as a forum for the exchange of technical information about pintail biology and conservation, and focus on the development of new research and improved analytical methods to enhance studies of pintail demography; 3) synthesize new information, and facilitate directed, retrospective analyses of existing data; 5) work through JVs and other partners to develop and promote science and communication plans for pintail conservation; 5) aid the NSST, JVs and other agencies in developing general approaches for planning, monitoring, and assessing pintail management issues at multiple spatial scales; and 7) recommend key initiatives to NSST for review and consideration, and provide progress reports as needed to the NSST for submission to the Plan Committee.

Habitats *(Jane E. Austin, Brian Martin, Chad Lehman, Steve Fairbairn, Boyd Schulz, Dave Dewald, and Sandra Hagen)*

The diverse avifauna of the northern Great Plains is supported by a range of habitats: native prairies, isolated and riparian wetlands, woodlands, tame grasslands, and cropland. These habitats are interconnected by geography and ecosystem processes into a larger landscape. Indeed, this landscape orientation is at the heart of the JV's goals and objectives for sustaining avian populations. However, designing conservation strategies or monitoring programs at a landscape scale is daunting because of the complexity of the systems. Management actions can only be applied and habitat change accomplished at the habitat level. It is at the habitat level that conservation strategies are designed and delivered to address habitat-specific risks and goals, and the results monitored. Therefore, by focusing on the key components of the landscape – habitats – partners can manage at multiple scales while maintaining a feasible scale for project delivery and monitoring.

Habitats are intimately connected to the wildlife they support. Although relatively few bird species winter in the northern Great Plains, many breed here and many more migrate through the region in spring and fall. Hence, it is important to recognize the value of habitats to avifauna during all four seasons in their annual cycle: spring migration, breeding, fall migration, and winter. For example, food resources needed by waterfowl shift from high-protein aquatic invertebrates in spring to support reproduction, to high-energy foods such as grains in fall and winter to support the energy demands of migration and wintering. Conservation design and delivery must therefore provide for the differing biological needs across seasons and species. To facilitate the JV's work, information on each species' habitat associations, status within BCR17 (breeding, wintering, migratory, year-round), and rankings in various plans have been compiled in Appendix 1.

This section describes the landscape elements of each habitat, provides examples of the avian communities associated with them, identifies special areas of significance, and discusses challenges and risks to maintaining quality habitat conditions. These aspects then provide the basis for identification of conservation strategies by which to address the threats facing each habitat.

Native Grasslands and Shrub Steppe

The NGPJV encompasses examples of tall-, short-, and mixed-grass prairie, with extensive areas of shrub steppe. Grasslands in the JV consist primarily of mixed-height grasses and forbs, with limited cover of shrubs or trees. While stature of the vegetation in portions of the JV may be shorter in stature than typical further east, mid grass species still dominate. Common dominant and co-dominant graminoids include wheatgrasses (*Agropyron* spp.), needlegrasses (*Stipa* spp.), prairie sandreed (*Calamovilfa longifolia*), and blue grama (*Bouteloua gracilis*). Tallgrass prairie is generally restricted to drainage bottoms and other areas of enhanced moisture in the eastern portion of the JV, and as a result typically occurs as small patches of only a few acres in size. As with tallgrass prairie to the east, common dominant species include big bluestem (*Andropogon gerardii*) and switchgrass (*Panicum virgatum*). Shortgrass prairie is restricted to small

portions of southeastern Montana, southwestern South Dakota, and eastern Wyoming. Blue grama is the dominant graminoid in these areas. Buffalograss (*Buchloe dactyloides*) is present but does not attain the same degree of importance as the shortgrass prairie of Colorado and further south.

Figure 19: Blue Grama. Chris Grondahl.

Some of the largest remaining areas of mixed-grass prairie in North America are found within the NGPJV. These grasslands are host to a rich diversity of bird species, supporting some of the most intact animal assemblages in the Great Plains. Among the notable species are a suite of endemic grassland birds, including mountain plover, long-billed curlew, ferruginous hawk, chestnut-collared longspur, and McCown's longspur. Endemic grassland birds have shown steeper and more consistent declines than any other species assemblage on the continent. This region of the country also hosts some of the largest remaining black-tailed prairie dog (*Cynomys ludovicianus*) complexes. These complexes provide habitat for several rare or declining avian species such as the burrowing owl and mountain plover(*Charadruis montanus*) and other species of management concern to partner agencies including the black-footed ferret (*Mustela nigripes*) (the world's largest population is found in the Conata Basin of South Dakota), and swift fox (*Vulpes velox*).

Figure 20: Native prairie. Paul Coughlin.

In the more arid portions of Montana, Wyoming, and limited portions of the Dakotas, prairie gives way to shrub steppe. These natural communities are typically characterized by a shrub overstory and an understory with grass species dominants found in other mixed-grass associations noted above. Communities dominated by big sagebrush (*Artemisia tridentata*) are the most extensive of the shrub types, but shrub communities with silver sage (*Artemisia cana*), greasewood (*Sarcobatus vermiculatus*), and Nuttall's saltbush (*Atriplex nuttallii*) may also be locally important. Big sagebrush communities in the northern plains support some of the largest and healthiest greater sage grouse populations found across the species range.

Figure 21: Sagebrush Steppe with male sage grouse on lek site. Chad Lehman.

Embedded within the grasslands of North Dakota and portions of South Dakota and Montana is a highly dissected erosional landscape called the badlands. This rugged landscape is formed and continues to be altered by wind and water erosion of the soft silt or clay soil. Badly eroded clay-scoria slopes, buttes, and steep canyons are scattered throughout. Western wheatgrass, blue grama, little bluestem, buffalograss, silver sagebrush, and yucca are common vegetative components. Thickets of small trees and shrubs or woody draws of cottonwood and green ash naturally occur on north or east facing escarpments in North Dakota but the lack of recent fire has allowed the expansion and overgrowth of juniper in some areas. Cattle grazing is prevalent and the most common land use of the badlands, although recreation, oil and gas activity is intensifying. The badlands are unique formations in the grasslands that provide high rocky outcrops and cliffs for golden eagles and prairie falcons to nest. Other commonly occurring species of the badlands include rock wren, red-shafted flicker, Townsend's solitaire, black-billed magpie, and mountain bluebird.

Perhaps the greatest threat to grassland and shrub steppe is fragmentation and destruction of habitat as the result of conversion to cropland and oil, coal and coal-bed methane gas development. Invasive species, primarily tame grasses but also an extensive list of noxious weeds, fire suppression, and inappropriate grazing management also threaten the integrity of NGPJV grasslands and shrub steppe.

Several strategies exist that can abate these threats. Conversion of native prairie to cropland is best addressed by eliminating incentives for conversion that currently exist in farm bill programs, such as allowance of expanded base acreage and price supports and crop insurance on lands recently converted to cropland. Conservation easements, which reward landowners while maintaining property in private ownership, may serve as a financial incentive to maintain grasslands, as could other governmental and non-governmental incentive programs. Energy development presents many difficulties in development of solutions. Better management of development through location and intensity of infrastructure development can help reduce impacts, as can developing minerals in a sequenced pattern that includes non-development, development and recovery, and restoration of explored areas. Numerous efforts exist at the county and state level to control of noxious weeds, and strategies should look at supporting these efforts. Perhaps the biggest impediment toward success in these efforts is funding and time to locate and treat noxious weeds. In terms of invasive grasses, priority should be given to eliminating the continued introduction of these species in road right-of-ways and subsidized planting as part of programs such as the Conservation Reserve Program.

Current program designs for grazing management and fire suppression that reduce habitat diversity are a threat to ecosystem health (Fuhlendorf and Engle 2001). Several incentive-based programs are available through NRCS and other federal agencies for private landowners. These programs need to be supported and changes need to be implemented that will favor the use of livestock grazing that addresses the full-range of habitat variability required to support the bird and other wildlife diversity. Cooperative management of private and public grasslands is one of many ways that needed prairie characteristics can be restored. Conservation of the native grassland

landscape will be perhaps the most important and productive challenge for NGPJV partners.

Riparian wetlands

True riparian areas are places where land and water meet and the vegetation is influenced by perennial or intermittent watercourses. In the case of intermittent streams, the groundwater needs to be sufficiently close to the surface so that the roots of the riparian vegetation can reach it. Many, more ephemeral watercourses show some aspect of riparian vegetation, but usually don't fully function as a riparian area. Riparian wetlands include riverine (rivers and streams), palustrine (still-water wetlands), and lacustrine (here, reservoir) systems (Cowardin et al. 1979). They include naturally formed riverine pools or palustrine wetlands along intermittent streams that may be temporarily to semi permanently flooded, impounded palustrine wetlands that are seasonally to semi permanently flooded, and reservoirs that are permanently flooded. In the NGPJV, characteristic vegetation of riparian wetlands range from grasses, sedges, and willow along edges to submerged aquatic plants in deeper areas of still water. Plant species are similar to those found in the Prairie Pothole Region (Stewart and Kantrud 1971). Vegetation bordering riparian areas typically has higher root and plant densities than upland vegetation, which serves to maintain streambank stability, reduce erosion, trap sediments and provide valuable wildlife habitat.

The main perennial rivers of the NGPJV include the Missouri, Yellowstone, Powder, Tongue, Bighorn, North Platte, Musselshell, Belle Fourche, Cheyenne, White, Grand, Knife, Cannonball, and Heart. The main ecosystem process sustaining these riparian habitats is the spring flood from snow melt. Spring floods can restore sandbar habitat within the flood plain of the riparian areas by scouring away vegetation and redistributing sediments; create soil conditions for regeneration of cottonwoods, willow, and other species characteristic of riparian woodlands; provide a flush of organic material for aquatic life, and reflood oxbows and other adjacent palustrine wetlands. On intermittent streams, periodic floods during spring runoff or heavy rain events in summer can reflood and reconnect small pools, redistributing native fauna such as fish and aquatic invertebrates and flush salts. Flows of most of the rivers, streams, and creeks of the NGPJV have their entire watershed within the region and therefore are influenced entirely by precipitation. The Missouri, Yellowstone, Powder, Tongue, Bighorn, North Platte, and Musselshell, however, have their headwaters in the Rocky Mountains; their flows are strongly influenced by runoff from snowmelt from the mountains, with lesser, local influence from area precipitation.

Figure 22: Little Missouri River riparian corridor. Chris Grondahl.

Riparian systems in the NGPVJ enhance the region's biodiversity by providing habitat to a large number of birds and other wildlife. Federally listed endangered or threatened species that nest along one or more of these major river systems include the bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*) and least tern. Colonies of great blue herons (*Ardea herodias*) can be found along many of these rivers. Smaller impoundments and reservoirs provide breeding, brood rearing and migration habitat for waterfowl (primarily mallards, blue-winged teal, gadwall, and American wigeon) and other waterbirds; in landscapes where semipermanent or permanent waters are uncommon or absent, these wetlands can be particularly important in providing habitat for brood-rearing [Austin and Buhl 2005]. Larger reservoirs and river areas provide open water into fall or winter for migrant or wintering mallards, common goldeneye (*Bucephala clangula*), and bald eagles. Also, in many areas of the region, the additional soil moisture along riparian areas support the only woody or brushy habitat where species such as the spotted towhee (*Pipilo maculates*) and lazuli bunting (*Passerina amoena*) thrive.

There are three primary risks to riparian habitat in the NGPJV: direct loss of vegetation, changes in hydrology, and invasive species. Riparian areas have been extensively altered by human presence because they provided abundant water and forage for livestock. Intensive, season-long grazing by domestic livestock along and in riparian wetlands has probably had a larger impact on riparian ecosystems than any other land-use in the NGPJV. Because of water availability, greater abundance of high quality forage, and the presence of shade and cover, livestock spend a disproportionate amount of their time in these areas. This commonly results in direct trampling of the streambank and a degradation of the health of the riparian vegetation that holds the bank. This in turn

contributes to increased rates of erosion and leads to channel widening, lower water quality, and sedimentation.

Impounding riparian areas has been the primary approach to utilizing the scarce waters of the northern Great Plains. Impoundments have been constructed to alter an existing wetland (e.g., change from slope wetlands or temporarily flooded wetland to semipermanently flooded wetland) or to create a new one where a simple riverine corridor occurred. The natural hydroperiod of many riparian systems has thus been altered by damming and water control for livestock watering, flood control, municipal water sources, power generation, navigation, recreational fishing, or waterfowl production. The hydroperiod of the Missouri River has been most noticeably altered, resulting in the absence of flood pulses that flush the system and restore sandbar and cottonwood habitats (National Research Council 2002). In contrast, the Yellowstone River has thus far escaped establishment of significant impoundments along its length. Although irrigation withdrawals and tributary dams have affected its hydrology, the Yellowstone has retained much of its original ecological character (Jackson 1994). The margins of some larger systems have been stabilized with riprap or other materials, preventing natural sediment redistribution and dynamic movements of the river bed over time. On larger reservoirs, water release schedules for power generation, navigation needs, or flood control can result in extreme fluctuations in water levels and severe disturbance to aquatic habitats both above and below the dam. Many smaller rivers and streams in the NGPJV also have been impounded for various purposes, most commonly for livestock watering. These impoundments have created new habitats, most notably palustrine wetlands and reservoirs that have more permanent water regimes than the original riparian systems of the region. Alternation of the hydroperiod and creation of a more permanent water regime can alter the wetland processes, and change the communities of plants, aquatic invertebrates, amphibians, and birds present (Walker et al. 1995, Anderson et al. 1996). Some species such as waterfowl (Ball *et al.* 1995, Bue *et al*. 1952) and other wetland birds (May 2001) benefit from impoundments within the NGPJV. These changes have been shown to impact some species of native amphibians (Euliss and Mushet 2004) and fish species (Schrank *et al.* 2001). Altered hydrology also can directly influence the vegetation in the riparian corridors by changing nutrient deposition, soil moisture regimes, or seed bed conditions. Planning and design of impoundments therefore must be carefully considered, with an understanding of the impacts to ecosystem functions and balancing of the benefits and impacts to the plant and animal communities.

The vast majority of impoundments in the NGPJV are small in size and located in the upper reaches of watersheds. These can capture some of the unnaturally high run-off resulting from anthropogenic land use changes, thus moderating flood events. Several public and private programs currently provide technical assistance and cost-share opportunities for landowners in the NGPJV to create or enhance riparian wetland habitats. For example, the USFWS Partners for Fish and Wildlife Program has cooperated with landowners in the North Dakota portion of the NGPJV to create over 650 shallow water impoundments totaling 2,500-acres over the last decade. A careful analysis of the size of the impoundment with the hydrology of the watershed is important

so as to not deprive the receiving riparian area from adequate water flow. Factors that influence the hydrology are the size, length, slope, soils, land-use, and precipitation within the watershed.

Figure 23: Wetland. Paul Coughlin.

Invasive species are a secondary risk to the riparian habitat within the NGPJV, but they are of increasing concern. Saltcedar (*Tamarisk* spp.) and to a lesser extent Russian olive (*Elaeagnus angustifolia*) have changed the vegetative composition of riparian communities. These species tend to displace native vegetation and limit the natural diversity of the community along riparian edge. Saltcedar can impact riparian wetlands in three ways (Carpenter 1998). First, it generally has lower wildlife value than the species it replaces. Second, because it consumes large quantities of water, it can affect soil moisture and ground water levels. Finally, saltcedar is tolerant of highly saline habitats, and it concentrates salts in its leaves; over time, as leaf litter accumulates under tamarisk plants, the surface soil can become highly saline, thus impeding future colonization by many native plant species.

Along major rivers, sizable areas are owned or managed by Indian tribes and federal and state agencies. However, much of the riparian area in the NGPJV is in private ownership. Regardless of ownership, most of these riparian areas are bordered by grazed rangeland. Every effort should be made to keep as much of the landscape in native grass cover. Additionally, efforts should be made to encourage improved rangeland condition by rotational grazing systems and improved livestock distribution. Converting high quality, native grassland to lower quality grassland, cropland or development land has the effect of increasing the rate of water run-off and thus degrading the quality of the riparian ecosystem. Wetland quality also can be protected or improved by assisting ranchers with alternative watering systems that keep livestock away from wetlands.

If the goal is to restore riparian areas to their historic condition, marginal cropland should be encouraged to be seeded back to native grass, and all grasslands should be properly managed. Proper management in the NGPJV primarily means proper livestock management both in the riparian area itself and in the upper reaches of their watershed.

Grazing of the riparian area itself is not a risk to the proper functioning of the riparian ecosystem. Appropriate grazing management and livestock exclusion have both been shown to improve riparian condition (Borman *et al*. 1999). Watershed management that encourages overall rangeland improvement should be encouraged throughout the NGPJV. Not only will this provide improved upland habitat, but it will slow run-off rates to the point where the waterways can accommodate them. In the larger view, programs that help to maintain a ranching economy are very important to the health of the riparian systems. Partners in Flight's conservation recommendations for Physiographic Area 38 (West River Dakotas) include this statement: "Maintenance of a ranching economy here is compatible with the needs of grassland birds and should be the highest conservation priority." While this statement is referring to grassland birds, it is equally true for riparian areas.

Woodlands

Riparian Woodlands

Riparian woodland habitats (Boldt et al. 1978, Uresk and Boldt 1986) only occur on roughly 1% of the northern Great Plains (Bjugstad 1978, Girard et al. 1989). Riparian vegetation in the NGPJV can range from expansive gallery woodlands along major waterways to beaded streams comprised of small depressional wetland basins along intermittent waterways. Flood plain and riparian woodlands along rivers and streams in the NGPJV commonly contain mature stands of green ash (*Fraxinus pennslyvanica*) and plains cottonwood (*Populus deltoides*) habitat types (Hansen et al. 1984, Hansen and Hoffman 1988, Girard et al. 1989). Woody draws and the margins of smaller waterways are characterized by green ash/American elm (*Ulmus americana*) communities with boxelder (*Acer negundo*) representing later successional stages (Hansen and Hoffman 1988, Girard et al. 1989). In the understory, sufficient soil moisture supports the growth of common shrubs such as western snowberry (*Symphoricarpos occidentalis*), American plum (*Prunus americana*), silver buffaloberry (*Shepherdia argentea*), and chokecherry (*Prunus virginiana*) (Girard et al. 1989). Fire suppression has contributed to the maintenance and expansion of woody riparian species in much of the NGPJV. Prior to settlement, woody vegetation was common only in the larger river floodplains and isolated wetlands on the prairies.

Riparian woodlands supply food, cover, and water for a large diversity of animals, and serve as migration routes and travel corridors between habitats for a variety of wildlife (Manci 1989). Although riparian woodlands are rare in the northern Great Plains, the vegetation structure supports a richer bird community than the surrounding grassland habitats (Faanes 1984, Knopf and Samson 1994, Rumble and Gobeille 1998). Riparian woodlands in the prairie provide important migratory and breeding habitat for many neotropical migratory birds (Moore et al. 1995, Rodenhouse et al. 1995). Species such as gray catbirds (*Dumetalla carolinensis*), brown thrashers (*Toxostoma rufum*), Bell's vireos (*Vireo bellii*), rufous-sided towhees (*Pipilo erythrophtalmus*), and yellow warblers (*Dendroica petechia*) are more abundant in late seral-stage woodlands (Rumble and Gobeilee 1998) whereas ground-nesting birds such as field sparrows (*Spizella pussila*) and vesper sparrows (*Poocetes gramineus*) prefer early seral-stage woodlands (Rumble and Gobeilee 1998). Major rivers in the NGPJV area such as the Missouri, Yellowstone,

White, Grand, Powder, Belle Fourche, North Platte, Bighorn, Tongue, and the Musselshell provide very important habitats for many bird species. Most of these riverine systems have nesting bald eagles (*Haliaeetus leucocephalus*), and some have nesting colonies of great blue herons (*Ardea herodias*). Wood ducks (*Aix sponsa*) have expanded their range as a nesting species on or adjacent to all of these rivers (Skaar et al. 1985).

In addition to the wildlife values, riparian woodlands directly influence the structure and functioning of riparian aquatic systems. The robust vegetation along streambanks stabilizes channels from erosion and limits sediments and pollutants from entering waterways (Parsons 1963). Shade from woodland vegetation along streambanks reduces water temperatures, which in turn can increase a stream's oxygen-carrying capacity and reduce nutrient availability. Leaves and other organic material falling into the water also provide valuable food and energy sources for aquatic organisms (Cummins 1974, Meehan et al. 1977).

Settlement patterns of Native Americans and others indicate that water and woodland resources provided by riparian areas was critical to human survival. Riparian areas in the NGPJV have been heavily modified for human needs over the last 100 years. Many riparian woodlands were harvested for lumber or fuel early during settlement or cleared for other land uses. These areas have been developed for livestock watering and grazing, crop irrigation, and recreation use and have generally been protected from the effects of fire. At the same time, livestock grazing in certain areas often reduces woody vegetation and prevents regeneration (Uresk 1982, Bjugstad and Girard 1984).

Altered hydrology, particularly the loss of flood pulses due to dams and flow regulation, can prevent regeneration by key riparian species such as willow and cottonwoods. This can result in declines in productivity and diversity of the riparian ecosystem. In the Missouri River system, the loss of meandering and flood pulses has resulted in a simplification of riparian habitats (National Research Council 2002). Johnson (1992) predicted that, without changes to the current river management regime, cottonwood forests will essentially be lost in less than 100 years.

Riparian ecosystems within the NGPJV have changed as the result of water development and flood control. Dams and reservoirs constructed between the 1930's and 1950's along the Missouri River have altered the magnitude and frequency of flood flows that formerly promoted regeneration and maintenance of cottonwood woodlands (Johnson et al. 1976, Johnson 1992). Cottonwood expansion in other dam-regulated riparian ecosystems provides evidence that the interrelationships between plant communities and hydrogeomorphic processes are complex (Johnson 1994). Rapid drawdowns of river stage during spring have prevented the recruitment of young trees in some instances (Rood and Mahoney 1990). However, restoration of a more natural, slow recession of water can successfully establish new generations of cottonwood trees (Klotz and Swanson 1997).

More recently, the rapid growth of coal-bed methane (CBM) extraction may threaten riparian woodlands. Waste water from CBM wells, which often carry high salt loads, when discharged into riparian systems may substantially increase salt levels in water and soils. This unaltered groundwater in many cases is acceptable to drink or water wildlife/livestock even though it exhibits a slightly high salinity level and a relatively high sodicity level as measured by the sodium adsorption ration (SAR). The SAR is an irrigation suitability criterion that measures the sodicity hazard on soil infiltration and permeability. Little if any research has been conducted on the relationship between CBM produced water, SAR, and riparian plant communities.

Indicators of watershed health such as surveys of water quality or riparian vegetation sampling can be used to evaluate the effects of CBM produced water. Some native plant species may be sensitive to high salinity or change in SAR in the soils, particularly riparian and wetland plants. The effects of changing SAR ratios on cottonwood trees (*Populus deltoides*), the dominant riparian tree for the NGPVJ region, could be an indicator of riparian ecosystem health. These and other issues affecting the water quality and habitats along these corridors have far reaching impacts on area wildlife. Properly managed riparian areas, however, can support the needs of both wildlife and people.

The conservation and management of riparian woodland habitats in the NGPJV has been neglected until recently. Government programs, such as the NRCS's continuous CRP, can help restore native tree and shrub communities along riparian corridors on private lands that have been previously degraded. Management activities such as mechanical removal or burning of non-native plant species to benefit native species and control of invasive species will be important future management tools. Fencing of riparian areas and properly managed rotational grazing systems can prevent over-grazing of riparian vegetation and enhance regeneration; further research of cattle grazing in riparian zones is needed. With the expansion of the CBM industry in Wyoming and Montana, research on the effects of CBM-produced water on riparian ecosystems also is needed. Through this research, future conservation strategies and management plans can be developed and implemented.

Upland Forests

Outside of riparian areas, the Black Hills and other isolated mountain ranges, upland forests are uncommon in the NGPJV because of the arid climate and historically-frequent occurrence of fire. Upland forests in the NGPJV contain aspen (*Populus tremuloides*)/paper birch (*Betula papyrifera*) stands in the Killdeer Mountains of North Dakota, green ash/American elm in bottoms and ravines, and bur oak (*Quercus macrocarpa*) communities in and around the Killdeer Mountains and other highlands (Girard et al. 1989). Rare stands of Rocky Mountain juniper (*Juniperus scopulorum*) can be found on northern aspects of slopes and draws (Girard et al. 1989). Ponderosa pine (*Pinus ponderosa*) is the dominant tree species found on many scattered ridges, buttes, and highlands throughout the NGPJV, such as in eastern Montana, the Black Hills of Wyoming and South Dakota, and Custer National Forest in western South Dakota (Hoffman and Alexander 1987, Hansen and Hoffman 1988). Common shrubs in these pine habitats include silver sagebrush (*Artemisia cana*), western snowberry, chokecherry,

plum, common juniper (*Juniperus communis*), and silver buffaloberry. Within the larger pine communities, drainages, waterways, and mesic slopes may contain stands of green ash, plains cottonwoods, bur oak, and other hardwood species (Hoffman and Alexander 1987, Hansen and Hoffman 1988)

Figure 24: Black Hills hogback area. Chad Lehman.

Woody vegetation in these areas serves as critical habitat for migratory birds and resident wildlife. Within the ponderosa-pine matrix, aspen/birch habitats that occur in drainages or on mesic slopes exhibit similar ecosystem characteristics to riparian habitats and such habitats tend to be centers of biological diversity (Knopf et al. 1988). Because deciduous forests provide more invertebrate food sources than adjacent pine forests, greater species richness of birds occurs within these aspen/birch habitats (Schimpf and MacMahon 1985, Mills et al. 2000). Thus, species such as Dusky flycatchers (*Empidonax oberholseri*), Warbling vireos (*Vireo gilvus*), MacGillivray's Warblers (*Oporornis tolmiei*), and ovenbirds (*Seiurus aurocapillus*) select such habitats in the Black Hills (Mills et al. 2000). Within the pine forest, mature multi-storied stands were selected by gray jays (*Perisoreus canadensis*), red-breasted nuthatches (*Sitta canadensis*), brown creepers (*Certhia americana*), Swainson's thrushes (*Catharus ustulatus*), and western tanagers (*Piranga ludoviciana*) (Mills et al. 2000). The pygmy nuthatch (*Sitta pygmaea*) serves as an indicator of forest health of ponderosa pine forests, and is listed in several states as a species of special concern (Szaro and Balda 1982, Hall et al. 1997). The pygmy nuthatch prefers undisturbed or only lightly thinned mature ponderosa pine forest based on a study of various seral stages (Szaro and Balda 1982, Szaro and Balda 1986, Szaro et al. 1990). Mature ponderosa pine forests also produce seeds for several birds species, and ponderosa pine seed production is variable from year to year and good mast crops occur one in three years (Bolt and Deusen 1974). Resident species such as Merriam's turkeys (*Meleagris gallopavo merriami*) and migrating species such as red crossbills (*Loxia curvirostra*) rely on pine seed crops for winter food and survival (Benkman 1989, Rumble and Anderson 1996, Lehman 2005). The crossbill is a nomadic species, and

follows sporadic, scattered pine seed crops (Gill 1995). Ponderosa pine forests in the NGPJV area also provide habitats for woodpeckers, which use the wildfire burned and unburned pine forest to feed on pine beetles (bark and wood-boring beetles). Abundant and large pine snags, in conjunction with recent wildfires, are important habitats for imperiled species such as black-backed (*Picoides arcticus*) and three-toed woodpeckers (*Picoides tridactylus*) (Hutto 1995, Caton 1996, Kreisel and Stein 1999). Also within the NGPJV, quality pine snags are important roosting habitats used by pygmy nuthatches (Hay and Guntert 1983). Bur oak woodlands in the NGPJV area provide important acorn mast crops for many resident and migratory wildlife species (Hoffman and Alexander 1987, Girard et al. 1989).

Most of the Black Hills National Forest is managed for timber production (Black Hills National Forest 1996). Logging changes the composition and structure of the forest. Structural changes in the forest as a result of logging can change patterns of habitat selection, foraging behavior, and reproductive success for several bird species (James and Warner 1982, Hansen et al. 1995). Fragmentation and removal of wildlife habitat due to development of homes and businesses is also a conservation concern. Two high-risk areas within this region include the Bear Lodge Mountains of Wyoming and the Black Hills of South Dakota adjacent to larger towns and cities. These areas have the greatest risk for urban sprawl and subdivision. The Rocky Mountain Elk Foundation (RMEF) estimates that nearly 14 acres of upland forest and meadow habitat is lost per day to subdevelopment and changing land use activities in the Black Hills (Rocky Mountain Elk Foundation 2005).

Figure 25: A meadow in the Black Hills of South Dakota. Marian Atkins

Conservation and management of upland forest habitats in the NGPJV should focus on creating a mosaic of habitats to maintain bird diversity through sound silvicultural practices and protection of habitats. The logging industry is an important economy for several towns and cities within the NGPJV area. Harvesting of pine trees can alter the

habitats for several bird species, and managers should maintain within and between stand diversity to provide a diverse habitat for many bird species (Hansen et al. 1995, Mills et al. 2000). Prescribed fire should be used to maintain open pine-savanna habitats, creating habitat for fire dependent species, and to prevent large catastrophic wildfires (Pollet and Omi 2002). Land protection through conservation easements will protect habitats from being removed or altered due to human development of lands. Research on the habitat needs of species of concern is needed; particularly related to logging practices and fragmentation of habitats. Wise management of timber resources and habitat protection from human land development should be primary conservation priorities for upland forest habitats in the NGPJV.

Other Woodlands

Early pioneers planted trees as windbreaks and shelterbelts in the NGPJV. Cottonwood, boxelder (*Acer negundo*), caragana (*Caragana korshinskii*), Siberian peashrub (*Caragana arborescens*), Siberian elm (*Ulmus pumila*), and green ash (*Fraxinus pennsylvanica*) were most commonly planted. Many windbreaks established during the 1930s-1960s are now declining due to senescence or weather damage; others are being removed to increase field sizes. Establishment of windbreaks and shelterbelts continue today with an emphasis on stabilizing highly erodible soils. Through the continuous CRP program shelterbelts or living snow fences are belts of trees or shrubs planted in single or multiple rows to reduce wind erosion, improve air, and provide food and shelter for wildlife. The practice of planting shelterbelts is declining because of the economics associated with large-scale mechanized agriculture, crop residue management, and population emigration.

Tame grasslands

Tame grassland is land that currently exists as grassland comprised mainly of introduced cool season grass and/or forb species but has previously been disturbed by some sort of tillage. This is not to be confused with native grassland that does not have a history of tillage yet may be heavily invaded by tame vegetation species. Tame grassland within the NGPJV can be separated into three categories, tame pasture, hayland, and Conservation Reserve Program (CRP).

Tame pasture typically consists of crested wheatgrass (*Agropyron cristatum*) and to a lesser degree smooth brome (*Bromus inermis*) and other similar introduced cool-season grasses. Tame pasture does not provide the vegetative species richness that native grassland affords and much is comprised of monotypic stands. Grass species such as crested wheatgrass are used for livestock pasture because of the relative ease to establish, drought tolerance, and palatability and nutrition during growth. These types of grasses also were favored as a soil holder during the drought of the 1930s. As indicated by their description, these grasses grow during the cool seasons of spring and fall and are therefore utilized for grazing during this timeframe. There is currently no data set to determine amount or ownership of tame pasture within the NGPJV. Species such as Upland Sandpiper, Grasshopper Sparrow (*Ammodramus savannarum*), Chestnut-collard Longspur, Blue-winged Teal, and Northern Pintail will utilize tame grassland during the breeding season.

Figure 26: Ringnecked Pheasants feeding in a hayfield. NDGF

Hayland typically consists of alfalfa (*Medicogo falcate*) or a mixture of alfalfa and one or more cool-season tame grass species and can be either irrigated or non-irrigated; the majority of hayland in the NGPJV is non-irrigated. As with tame pasture, this habitat does not provide the vegetative species richness that a native grassland community affords. Hayland is managed to capture maximum forage production at the highest nutrient value for livestock and is primarily in private ownership. Although a data set does exist for hayland, the different types of hayland (tame grass, native grass, alfalfa, grain, CRP) cannot be separated with the exception of alfalfa. Using the most recent U.S. Department of Agriculture National Agricultural Statistics Service (NASS) data, there are over 2.5 million acres of alfalfa in the NGPJV (MT: 921,000; NE: 74,000; ND: 497,000; SD: 948,000; and WY: 148,000). With the addition of an unknown amount of tame grass hayland, this habitat type represents a notable grassland component of the NGPJV. Species such as Upland Sandpiper, Grasshopper Sparrow, Blue-winged Teal, Northern Pintail, Sharp-tailed Grouse, and Greater Prairie Chicken (*Tympanuchus cupido)* will use hayland at different stages of the breeding season.

The CRP, initiated by the 1985 Food Security Act and administered by USDA, provides financial incentives to re-establish grassland cover on cropland. Plantings usually consist of tame wheatgrasses (*Agropyron spp.*), alfalfa, and clover (*Trifolium spp.*). CRP provides idled grassland, a state of grassland that is generally lacking in the NGPJV. Most of the grassland enrolled in the CRP is owned by private individuals. Some of the species that utilize CRP in the breeding season include Upland Sandpiper, Grasshopper Sparrow, Blue-winged Teal, Mallard, Sharp-tailed Grouse, and Greater Prairie Chicken. CRP also is valuable to sharp-tailed grouse and ring-necked pheasants (*Phasianus colchicus*) during the non-breeding season.

Tame grassland should be viewed as a positive addition to the NGPJV. Although it is not a native grassland community, it does provide additional grassland cover that can be utilized by different bird guilds at different life stages and is a far better alternative than cropland (Johnson and Igl 1995). Reynolds et al (2001) illustrated that the daily survival rate of nests for five species of ducks in CRP increased as percent of perennial cover on

the landscape increased. The addition of tame grass increases the overall patch size of the grassland community.

Ownership of tame grassland is predominately private, and distribution in turn follows landowner distribution. There are two primary risks to tame grassland. Livestock ranchers will continue to use tame grass pastures for grazing early and late in the growing season and will have a continual need for hayland for winter livestock forage. Therefore, the threat to sustaining tame pastures and hayland ultimately rest on the ability of the ranching community to remain economically viable. As long as the number of ranchers and, more importantly the number of livestock remain stable, the relative amount of tame pasture and hayland will remain intact. The CRP has entirely different risks. The CRP is a government program that is subject to various political and social forces. The NGPJV has over 1.1 million acres of land enrolled in CRP that expire in 2007 and nearly 400 thousand acres that expire in 2008.

The keys to maintaining tame pasture and hayland rest in the ability to maintain a viable economic ranching community. Educating political appointees and the general public regarding the importance of the CRP to all bird guilds is imperative towards maintaining this program. Enhancement and management of existing tame pastures and hayland will need to be addressed by providing technical assistance to landowners about proper grazing management. The enhancement of the CRP needs to be address at state and national technical management levels.

Cropland

The NGPJV area is a semi-arid region, a factor limiting its potential to support a strong cropland based economy. Less than 1% of the land within the NGPJV is considered prime farmland. Natural Resources Conservation Service (NRCS) National Resource Inventory (NRI) data (1997) indicates only 11% of the region is currently in cropland use. CRP, hayland and tame pasture total 10% of the land use base. CRP was cropland prior to being planted to herbaceous cover. The conversion of rangeland to hayland and tame pasture, more than likely, included cropland as an intermittent land use. Depending on types of grass/legume species used for hayland and tame pasture, these acres could be rotated back to cropland.

NRI data (1982 – 1997) indicate continued pressure to convert rangeland to cropland. The conversion of rangeland to cropland has a significant impact to wildlife, especially grassland nesting birds. The greatest cropland acreage increase is occurring in northwestern South Dakota. While southwestern North Dakota is showing a decrease in rangeland acres, this area is also showing a decrease in cropland acreage. The area contained in the NGPJV has some of the higher enrollment percentages nationwide for CRP, which has likely impacted total acres of cropland converted back to grass. This is likely due to the large amount of CRP acreage that converted cropland to grassland. While the overall trend from 1982 to 1997 appears to be a slight decrease in cropland acres, this trend is not likely to continue with potential changes in CRP acreage beginning in 2007.

Recent trends in cropland agriculture toward conservation tillage and no-till crop production increase the amount of residual cover left on the soil surface. This coupled with reduction or even elimination of summer fallow in the cropping rotation increases cropland value to most wildlife. Some species, like mountain plover, have found summer fallow crop fields to be suitable habitat for nesting. From 1990 to 2004 no-till acreage in the United States increased from 6% of the crops being planted with no-till equipment to 22.6% in 2004 (CTIC data). The three major cropland states in the *NGPJV area averaged 3% in 1990 and 29.4% in 2004. (1990: MT 4.6%, ND 3.3%, SD 2.5, 2004: MT 27.9%, ND 23%, SD 37.3 %,)* (CTIC data)

The NGPJV area grows a diversity of crops. However, due to the lack of moisture most crops grown continue to be small grains in rotation with row crops such as corn, sunflowers and alfalfa as a rotational crop. With the advent of a new ethanol plant in southwestern North Dakota, corn production will likely increase. Increases in row crop production could also be seen as new drought tolerant varieties of corn and soybeans become available. No-till cropping will also help increase row crop production in the NGPJV area. No-till cropping conserves moisture by decreasing the number of tillage passes, thus retaining more residues on the soil surface. Crops with higher moisture demand can then compete with traditional small grain crops. No-till and minimum tillage cropping systems reduce wind and water erosion below soil loss tolerable limits.

Major crops grown in the NGPJV area are wheat, winter wheat, oats, barley, corn and sunflowers. Other crops grown include soybeans, sorghum, and flaxseed. North Dakota and Montana showed a decrease in corn acres in 2005 while South Dakota had an increase. Montana, Wyoming, North and South Dakota all had an increase in spring and winter wheat in 2005. (NASS)

Historically, cropland has not been recognized as providing the necessary habitat requirements needed to maintain wildlife populations. Conversion of rangeland and forestland to cropland along with urbanization and other industrial development such as oil development has created a fragmented landscape. These disturbance communities do not provide cover needed for many wildlife species. Cropland mainly provides food in the form of waste grain and weed seeds. Management of cropland makes this habitat unattractive to most species especially grassland nesting birds. With the advent of genetically modified crops, weed suppression has been greatly enhanced reducing weed seed availability to birds (Krapu 2004).

Bird species that appear to be capable of satisfying all or most of their essential breeding habitat requirement within a cropland community include horned lark (*Eremophila alpestris*), killdeer (*Charadrius vociferus*), upland sandpiper (*Bartramia longicauda*), bobolink (*Dolichonyx oryzivorus*), western meadowlark, brown-headed cowbird, lark bunting, savannah sparrow, chestnut-collared longspur, and mountain plover (where cover is sparse). Other bird species using cropland, in association with other habitat types include, various dabbling ducks (when wetlands occur within, adjacent, or near to the cropland) red-tailed hawk (*Buteo jamaicensis*), marsh hawk (northern harrier) (*Circus cyaneus*), sharp-tailed grouse, Greater sage grouse, ring-necked pheasant (*Phasianus*

colchicus), gray partridge (*Perdix perdix*), mourning dove (*Zenaida macroura*), great horned owl (*Bubo virginianus*), short-eared owl (*Asio flammeus*), common nighthawk (*Chordeiles minor*), eastern kingbird (*Tyrannus tyrannus*), western kingbird (*Tyrannus verticalis*), barn swallow (*Hirundo rustica*), common crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), red-winged blackbird (*Agelaius phoeniceus*), yellow-headed black bird (*Xanthocephalus xanthocephalus*), common grackle (*Quiscalus quiscula*) and vesper sparrow (*Pooecetes gramineus*) (Stewart, 1975)

Lokemoen and Beiser (1997) found that cropland treated with minimum tillage had a greater variety and density of birds than did conventional crop fields. Birds appeared to be more attracted to minimum tillage fields because more vegetation, particularly residual cover, was maintained on the surface. CTIC data indicates more farmers are adapting to no-till cropping systems. These types of cropping systems leave residual cover that will attract grassland nesting birds. Although cropland will never support the nesting density or diversity of birds found on undisturbed grassland, the movement to no-till cropping systems will benefit some species of grassland nesting birds.

Adding winter cereal crops such as winter wheat, winter rye, or triticale can further improve cropland for wildlife habitat. In North Dakota, Duebbert (1987) found relatively "good" nest success of 26% and 29% for ducks. Fall-planted crops such as winter wheat reduce the amount of disturbance occurring in cropland fields. Planting disturbance occurs in the fall instead of spring, avoiding activity during nest initiation. In addition to no spring planting disturbance, herbicide application needs may be reduced since fall-seeded crops have a competitive edge over spring seeded crops relative to weed pressure.

Cropland provides a food source for many bird species and mammals. The amount, types and availability of that food will depend on management practices applied to cropland. Unlike conventional tillage, no-till and minimal till does not bury waste grain seeds making it more accessible to wildlife. Approximately three percent of a grain crop is left on the ground after harvest (Sargent and Carter 1999). The type and frequency of tillage after harvest will determine how much is available for wildlife use.

Harvesting operations in small grain fields is the first disturbance operation, reducing the amount of residue on cropland fields. Leaving stubble height as tall as possible provides additional cover for birds and other wildlife. Twelve to 20-in stubble, coupled with no fall tillage or herbicide application, provides a food source (waste grain and weed seeds) beneficial to birds. In addition, Rodgers (2002) showed structural elements as well as possible insect impacts from implementing these practices could have significant impacts on upland birds. Adding no-till winter grains in rotation provides additional winter cover for the limited resident bird species and increased nesting habitat for both resident and migratory bird species. Grain-harvesting equipment fitted with stripper headers only harvests seed heads while leaving grain stubble standing upright. As this new technology is adopted, tall, standing stubble left in the fall will provide increased bird habitat on cropland.

Crop rotation coupled with field size can have an effect on cropland attraction or detraction for birds. Growing the same crop with increasing field size reduces the amount of diversity in cropping rotations and the amount of cropland adjacent to other nesting habitats, such as hayland, native rangeland or pastureland. While no-till and minimum tillage leaves more residual cover on cropland fields, field size is increasing as equipment size increases.

Crop rotations can reduce the need for pesticides and fertilizers. Crop rotations that include cool-season grasses (wheat, winter wheat, barley, oats), warm-season grasses (corn, sorghum, millet), cool-season broadleaf (field peas, canola), and warm-season broadleaf (sunflower, safflower, alfalfa) can help break up pest cycles, reducing the need for insecticides and herbicides. Crop rotations also provide different planting and harvesting dates, providing increased food and cover.

Cropping systems in the NGPJV frequently do not include grass buffers or field borders. Monoculture cropping from fenceline to fenceline or road to road reduces the amount of available bird habitat. Field borders planted to a mixture of grass and legumes provide wildlife cover as well as improving habitat for insect pollinators which are beneficial to all lands while providing a food source for many bird species. Field borders can also provide nesting and brood cover. The quality of field borders will depend on the grass and legume species planted and the width of the field border. The wider the field borders the better with 100 feet optimum to provide bird habitat (Messmer 1992). Field borders and grass buffers adjacent to streams, wetlands, and other water bodies not only provide increased bird habitat but also trap sediments and prevent nutrients from entering these waterbodies.

Cropland provides a limited amount of bird habitat. The quality of that habitat depends on the amount of mechanical disturbance. Reducing disturbance through no-till or minimum till along with planting winter cereals in the cropping rotation will increase the quality of the cropland habitat. Cropland not only can provide a food source for birds but also provides limited nesting habitat if managed to reduce disturbance. Adding buffers along field borders and sensitive areas such as streams, wetlands and other waterbodies provides food and cover for birds. Planting forbs and legumes into field border and buffers provide birds an additional food source through increased insect activity while reducing sediment, nutrients and pesticide loads entering water sources.

Federal programs such as USDA farm programs can help promote these types of cropland management practices. The Environmental Quality Incentives Program, Conservation Security Program, Wildlife Habitat Incentives Program, Wetland Reserve Program, Grassland Reserve Program, and the Conservation Reserve Program can help attain increased habitat on or associated with cropland. State agency sponsored private land programs also promote no-till, minimum till, and conservation buffers. Efforts need to continue to coordinate USDA programs with state wildlife agencies in order to implement conservation practices on cropland that are not only beneficial to soil and water conservation but also have positive effects on bird conservation.

Conservation Design *(Duane B. Pool and Jane E. Austin)*

The uniqueness of the NGP is its relatively intact, grassland-dominated landscape. Within this greater landscape are smaller habitats that have significant value to NGP species, such as the big sagebrush areas of Wyoming and Montana or the riparian corridors in the Badlands. It is this matrix of important habitats embedded within the larger grassland context that supports such a diversity of avifauna. This matrix also is important to the social and economic structures of the northern Great Plains communities, most notably ranching, which help to maintain the grassland-dominated landscape. Therefore, conservation design in the NGP will be delivered on multiple scales as appropriate to the habitat, species, or general nature of a prairie landscape. These many habitats are the conservation capital in the wildlife investment portfolio of the northern Great Plains. Much like a financial portfolio, diversity and fundamentals of the individual investments tend to reduce risk and ensure future performance. The element of diversity is represented by the variety of habitats provided or protected. The fundamentals of those habitat investments are based on the biological significance of each habitat type and the quality and quantity required to attain the desired results. The conservation design is then the investment guide for a balanced wildlife-habitat portfolio driven by scientific valuation of the components of the system.

Conservation design identifies areas of high conservation priority whose habitat characteristics will sustain viable populations of priority bird species at prescribed population levels. Conservation design will be driven by the ecological needs of species and conceptual models of population-habitat interrelationships. Areas of conservation design in the NGPJV will be centered on the general habitats of wetlands, grasslands, forests, and riparian and riverine systems except where more specific knowledge allows more detailed habitat characterization. Within these general habitat types, focus areas will be centered on landscape-scale areas that offer the greatest potential for conservation and partnership opportunities and that have previously been identified as areas with high biodiversity or importance by Joint Venture partners or are in federal ownership.

Prioritization of species and habitats will be based on the existing science-based programs of partner agencies and the existing literature. This existing knowledge base is a starting point for the new JV. The initial conservation designs will be subject to validation, and the designs will be adjusted as a part of an adaptive management process. Conceptual models linking population and habitat will be developed using the best available science. These models will then be translated into spatially explicit priorities at multiple scales, and into decision-support models that can guide the delivery of conservation programs. The conservation goals of the JV will be met through adjustments to lists of both species and habitats, as defined in the section on prioritization, as they are identified and as the goals set forth by the Major Bird Initiatives and the JV Management Board are refined.

Species goals are tied to landscapes using the best available scientific knowledge. The specific species goals will be those numbers set forth by each of the major bird initiatives

for BCR 17. If the species goals are not stepped down to the BCR level, estimates of the BCR's contribution to continental or flyway goals will be provided by the NGPJV Technical Team and working groups. These contributions may be communicated as either metrics (nest success, recruitment, etc.) or bird numbers. Processes for further refining these estimates will be developed and implemented by the JV and partners with the capacity to address population goals for the species or suite of species. The NGP JV will adopt "The Five Elements Process: Designing Optimal Landscapes to Meet Bird Conservation Objective" (Will et. al. 2005) (Appendix 3).

Several state and other JV partners have put significant resources into identification of the specific landscapes and landscape elements for conservation in the NGP. The JV will assemble these products and use them to develop overall areas of significance and areas where integrated approaches between partners can be promoted. As the JV and partners develop the technical ability and further science, these map products will be revisited and periodically improved to more efficiently reflect species habitat needs and requisite population objectives.

The **Implementation Guide** will provide the framework for delivering conservation design products beginning with a comprehensive habitat inventory. Emphasis will be placed on tying research to the landscape so that spatial models can be built from existing and future research. Ultimately an integrated landscape design will be developed by overlaying priority habitats for focal species

A "*landscape-oriented*" approach to conservation focuses on 1) translating conceptual models of population/habitat relationships into spatially-explicit priorities at multiple scales and 2) developing the decision support models and conservation blue-prints that guide integrated bird conservation.

As a biologically-driven partnership, conservation does not operate on the basis of an opportunistic pursuit of habitat gains; it is driven by specified biological objectives and spatially explicit priorities. A biologically-driven partnership demands a departure from the traditional programmatic, opportunistic approach to conservation in at least three key areas. It requires that habitat objectives be linked to population response at multiple scales. The *unifying biological theme* of integrated bird conservation is population management, without which integrated bird conservation will not work:

- *Site-scale management decisions that address species-specific biological needs at multiple spatial and temporal scales.* The demand is for site-scale decisions that reflect multi-scale considerations. Providing the information necessary for those decisions must be the overriding focus of those that reside within the biological foundation and conservation design spheres.
- *Site-level resolution of inter-specific conflicts.* There is no small number of managers and administrators operating under the misconception that integrated bird conservation requires that the needs of all birds be met on every acre or even every management area. We need to help managers realize that not only is this not so; they are on the front lines of resolving the potentially competing needs of the myriad species using the landscape. They are, however, held to an extremely high

level of accountability - their collective site-specific decisions must contribute to a landscape that sustains all endemic species.

- *Assistance in tracking habitat change and population response.* It is after all the on-the-ground manager that is on the ground, where habitat change and population response are occurring. If given well designed procedures and protocols for tracking and monitoring and the ease of web enabled reporting, they can provide the information critical to a biologically-driven, landscape-oriented partnership.

Conservation Delivery *(Duane B. Pool)*

The NGPJV partnership is built around the fundamental concept that meaningful and effective bird conservation must take place at the landscape scale, based on a scientifically sound biological foundation. To achieve its goals, the partnership brings together the jurisdictional commitment and collective energies, talents, and experience of the state and federal agencies, private individuals and companies, and non-governmental organizations that have management responsibilities within the Joint Venture boundaries.

The implementation of conservation is the fundamental role of the partners in the Joint Venture. The Joint Venture provides the planning and evaluation support to meet national level plan objectives. The on-the-ground delivery or implementation of habitat or conservation programs is coordinated by the Joint Venture but facilitated by the partners. The particular extent and focus of each partner is predicated on the partner's internal mission and program availability. The coordination provided through the NGPJV partnership will facilitate bird conservation planning at the highest level of efficiency and enable the partners to achieve the delivery of conservation in a synergistic and effective manner. The benefits of this partnership include:

1. Shared purpose;
2. Biologically targeted and designed actions;
3. Pooling of diverse expertise and resources;
4. Shared efficiency;
5. Enhanced effectiveness;
6. Innovative solutions;
7. Better communication;
8. Increased public support, and;
9. Increased organization morale, image, and awareness.

Joint Venture Partner Responsibilities and Delivery

"*A Joint Venture should accept the responsibility for delivery of national and international bird conservation plans. Joint ventures should work to develop the capacity to become the delivery agents for all migratory bird habitat conservation priorities in their geographic area*." (6.5.A. FWM 462 08 August 24 2005) In order to meet this responsibility some basic requirements need to be met. These include a broad diversity of interested partners; a common vision of the work to be accomplished; a commitment to bring time, money, and energy to the process; an interest in working from a sound biological foundation that can be expanded and enhanced; an understanding of each partner's responsibility to the joint venture; and a commitment to provide follow-through and full time coordination.

Joint Venture partners, working collectively and independently to conduct activities that support bird conservation, are responsible for the following functions:

1. Biological planning and prioritization;
2. Project development and implementation;
3. Monitoring, evaluation, and research;

4. Communications and outreach; and
5. Fund raising for projects and activities.

Biological planning and prioritization are developed along two complementary lines. The first follows the objectives of each partner's mission. The second is the overlap and melding of those the partner missions and objectives toward the goals of the NGPJV. Identifying and working from within this nexus is where the coordination of the Joint Venture has the greatest impact.

Administrative Structure

Management Board

The Management Board consists of representatives from state and federal agencies, non-profit conservation organizations, corporate business, and a private landowner. Acceptance of a Board position includes a commitment by the individual or agency to promote the goals and philosophies of the NGPJV. To promote the common interests of the NGPJV, the members and their respective organizations shall:

- Advocate for the use of resources of the programs administered by their agency to deliver the JV conservation strategy (in harmony with the legislated goals and priorities of the program); and
- Collectively advocate for delivery of the conservation strategy with public and elected officials as well as conservation program administrators in non-JV agencies.

The Board is currently comprised of representatives from Ducks Unlimited, Inc.; Fidelity Exploration and Production Company; Montana Fish Wildlife and Parks; National Audubon Society; Natural Resources Conservation Service; North Dakota Game and Fish Department; Pheasants Forever; private landowners; South Dakota Game, Fish and Parks; The Nature Conservancy; U.S. Bureau of Reclamation; U.S. Fish and Wildlife Service; Wyoming Game and Fish; and U.S. Forest Service. See Appendix 2 for a list of Management Board members.

The Board is responsible for giving support, guidance, and direction to the Joint Venture Coordinator for overall administration of the Joint Venture, including, but not limited to, finance, project and resource and policy issues. It provides guidance and staff for the assigned Committees and resources to administer their programs or functions. Prioritization of and advocacy for proposed projects and budget requests to the North American Wetlands Conservation Council is also the responsibility of the Board. The NGPJV Management Board operates with a board charter Appendix 2.

JV Staff

In order to deliver the five function elements of a Joint Venture, the NGPJV will require staff dedicated to the coordination of the various elements with partner staff and other interests. The FWS policy on JV's requires the Joint Venture Coordinator to focus on meeting the goals and objectives of the JV plan, to administer the JV and provide support to its Management Board. The Joint Venture Science Coordinator will coordinate the work of the science and technical team and lead in the development of the JV's GIS

capabilities in the future. As the JV develops, other staff may be added to address ongoing needs for support. The JV Coordinator will supervise or delegate the supervision of additional staff.

Science and Technical Team

The Science and Technical Team, and other technical groups or committees as needed, are comprised of staff from JV partner agencies and organizations and other qualified individuals who will work on an ad hoc basis. The teams are charged with addressing issues associated with the biological foundation of the JV. These team members will, where possible, provide information or management products for the purpose of defining, communicating, and evaluating the biological issues of the JV. Issues will include developing population goals and habitat objectives, identifying landscapes of highest conservation potential that will aid in meeting population goals and habitat objectives, and identifying and developing research and monitoring needs. The JV Science Coordinator will coordinate the Science and Technical Team and other technical groups or committees as needed. The members that comprise the Science and Technical Team represent American Bird Conservancy; Ducks Unlimited, Inc.; Montana Fish, Wildlife and Parks; North Dakota Game and Fish Department; South Dakota Game, Fish and Parks; The Nature Conservancy; U.S. Fish and Wildlife Service; U.S. Geological Survey; and Wyoming Game and Fish. Current team members are listed in Appendix 2.

Communications, Outreach and Education

A Committee consisting of JV staff, JV Board members and staff from partner organizations will develop communications, outreach, and education strategies. A communications coordinator may be hired in the future and would be supervised by the JV coordinator. The BCR17 regional shorebird plan provides the following objectives for an outreach program and has been adopted by the NGPJV for all bird communications and outreach.

> *Ultimately, the long-term success at maintaining or enhancing bird populations and their habitat in the NGPJV will require cooperation between a large number of organizations, interest groups, government agencies, and individuals. A key element to fostering and maintaining effective cooperation and collaboration between public and private landowners will be a good understanding about the importance of the lands and habitats within the region for birds and other migratory wildlife. Creating and sustaining an effective communication, outreach and education program will be critical to the overall success of this plan. The following are important communication, outreach and education goals for the region.*
>
> ***Objective 1. Promote further involvement of private landowners in bird conservation initiatives.*** *Private landowners in the NGPJV are essential partners to achieve management goals for birds because a significant portion of bird habitat is on private land. This goal can be approached by providing technical information and assistance through the development and distribution of educational and outreach materials. A variety of media and educational materials, such as brochures, pamphlets, and the Internet, can familiarize landowners with wildlife, including birds,*

and provide general information on species requirements and habitat enhancement techniques. In addition to developing new materials, we need to identify existing educational materials and promote their use and distribution. This will also involve innovate means of outreach to formulate private landowner partnerships that can benefit both birds and farmers.

Objective 2. Enhance/improve communication with public land managers. *Technical information can be conveyed through workshops, the internet and the dissemination of educational materials. There is a need to convey the potential for wetland and upland management techniques to achieve a diversity of wildlife without compromising the original intent of NAWMP.*

Objective 3. Enhance the overall effectiveness of education/outreach efforts by promoting cooperation between state and federal agencies and private organizations. *There are numerous opportunities to achieve this goal, such as formalizing partnerships with Memorandums of Understanding or Cooperative Agreements, and sponsoring demonstration projects and workshops to help reduce barriers to better integrating all bird management into programs. There is a need to take the active and personal approach, to solicit input early in the process, and to have a "bottom up" as well as "top down" approach.*

Objective 4. Develop regional educational/outreach plan with State-specific action items identified. *Due to the size of the NGPJV, there will undoubtedly be a number of education/outreach strategies that will not be applicable in every one of the 5 affected States. A regional education plan should be customized to fit individual state issues and capabilities to implement within their existing delivery systems.*

Objective 5. Integrate all bird conservation into existing appropriate environmental education initiatives and programs. *There are also many opportunities to integrate bird conservation into existing environmental education programs and outreach centers, as well as into nationally recognized programs such as Project WILD and WET.*

Informed Management *(Jane E. Austin and Duane B. Pool)*

Identifying Key Uncertainties

One of the first principles of adaptive management is the establishment of clear, quantifiable objectives, which are based upon specific predicted biological outcomes of alternative management actions. Such predictions must be based on empirical and conceptual models that have been built upon sound science. Often, however, the biological information necessary to the models and predictions are lacking, resulting in uncertainties about whether the management actions will succeed as predicted. The disparity of information is noted in the NAWMP 2004 Implementation Framework – Strengthen the Biological Foundation. It states: *"… as the Plan's geographic reach expands to places where we know less about birds, and as regional conservation programs are developed for multiple suites of wildlife species, a stronger and broader scientific base will be even more important."* Biologists and planners often have an incomplete understanding of ecological processes that determine the influence of habitat, geomorphology, climate, and human disturbance on avian populations. The level of knowledge of species' ecology varies widely among the avifauna in the northern Great Plains. An extensive knowledge base exists for waterfowl species, particularly dabbling ducks, because of long-term, extensive monitoring surveys and many years of both basic and applied studies. The knowledge base for other avifauna is mixed, with good information for some species and nearly none for others. Often a few species are selected to represent the needs of other species, or it is assumed that the species of greatest conservation concern are adequate to represent the needs of others in that taxa group. Lacking for many species are good monitoring programs, studies of foraging ecology or factors influencing vital rates, and assessments of effects of habitat management practices. Methodology for surveying or studying some species, such as secretive marsh birds, is still being tested and refined. Also lacking is an understanding of species capability to accommodate to short- and long-term climate changes, which is especially important in this variable midcontinental climate. Much can be learned about species ecology from studies elsewhere. However, one should not assume that information obtained from studies elsewhere is fully applicable to this region. The myriad of site-specific geomorphologic and climatologic factors that influence the type and quality of habitats, and differing biotic communities, limits our ability to generalize results from one area to another. For example, patterns of nest success likely differ from those in the Prairie Potholes because of different land cover patterns and predator communities. These potential differences contribute further to uncertainties to efforts to conserve avian populations and habitats.

Uncertainties also exist in our ability to measure changes in populations or habitats. Managers often must sample populations and habitat resources indirectly rather than directly measuring these quantities. Uncertainty surrounding parameter estimates can not only hamper the effectiveness of model-based conservation decisions, but it can also impede efforts to reduce structural uncertainties and to improve predictions about the effects of management actions. A key example is population monitoring: metrics of population abundance are generally assumed adequate to monitor population trends and will reflect population status. However, abundance during the breeding season may not

reflect productivity and recruitment. Some areas may be sinks rather than sources for populations, despite the best efforts of managers. Without proven, efficient methods to monitor productivity, and better knowledge about factors influencing productivity, managers operate under great uncertainties about their ultimate contributions to the conservation of the populations.

The Companion Document to the 1998 Update to the NAWMP (Enhancing Delivery of North American Waterfowl Conservation) stated that: *"… uncertainty must itself become a topic of analysis, and assessments must be made of the relative costs and benefits of acquiring new information about management problems."* The role of ARM is to reduce uncertainties through clear thinking, planning, monitoring, and evaluation. Because uncertainties can exist at multiple levels – from broad habitat and population objectives to monitoring programs, management practices, and specific habitat objectives – a suite of planning and decision-making tools need to be developed that helps to articulate uncertainties at each level and their impacts. As uncertainties are articulated, they can then be evaluated relative to their impact on program design or delivery, and means to reducing key uncertainties designed and implemented. As uncertainties are reduced, programs implemented to achieve goals and objectives will become increasingly efficient and targeted.

There are five approaches (Figure 26) to account for uncertainty while implementing conservation programs; each relates directly to JV conservation planning and delivery and hence should be integral to those processes. These approaches range from implementing management decisions when confidence in effectiveness is low but learning has a low value, to conducting formal field experiments when the value of learning is high. This process will not only assist the JV in clearly stating its information and research needs but it also will assist potential researchers who might be able to work on projects giving them a clear understanding of project design needs. Moreover, the process provides a measure of progress – ultimately, tracking the number of planning assumptions and number of management practices that are supported by sound science. Using the collective expertise of the Technical Team or working groups, each population, habitat, and monitoring objective should be evaluated for underlying hypotheses, confidence in current knowledge and management practices, value of learning, and approaches necessary for reducing uncertainty. The process is as follows:

1. *Formulate explicit hypotheses for that objective*. Empirical or conceptual models can be constructed to help guide thinking.

2. *Evaluate the level of confidence in management effectiveness for each practice.* Develop list of assumptions that underpin the biological foundations of each objective. Evaluate assumptions and uncertainties using the best available science. Assess level of uncertainty, examine supporting documentation or information for each assumption (e.g., publications, monitoring data), and identify information gaps. Assess the value of learning and filling information gaps: Prioritize data needs by lowest confidence and greatest learning opportunity – Which assumptions currently have the greatest impact on decisions? Which

uncertainty components have the greatest learning opportunity and probability of impacting the program's ability to achieve the objective? What would be the magnitude of improvement if an uncertainty was reduced?

3. *Determine approaches to reduce uncertainty and their cost-effectiveness.* Adaptive management and traditional research have complementary roles, and different mixes are appropriate in different regions depending upon the state of knowledge and stage of implementation. Three avenues are available: 1) passive ARM, where management is implemented concurrent with monitoring, with learning as byproduct; 2) active ARM, where a management application is designed and applied within a framework to optimize learning; and 3) directed field research. The choice of approach will depend on the priority of the learning need, resources available, and logistical feasibility (e.g., availability of areas to apply replicate treatments).

4. *Periodically revisit objectives (e.g., every 5 years or following substantial new learning) through this process to incorporate new information*.

Progress on reducing uncertainty can be measured directly: 1) cumulative dollars invested in NGPJV active ARM or research, 2) number of active or passive ARM projects completed (data analyzed and evaluated); 3) numbers of ongoing ARM and research projects, and 4) numbers of completed ARM and research studies,. The ultimate measures of progress, however, are 1) number of management practices that are supported by scientific evaluation, and 2) number of planning assumptions that are supported by scientific research.

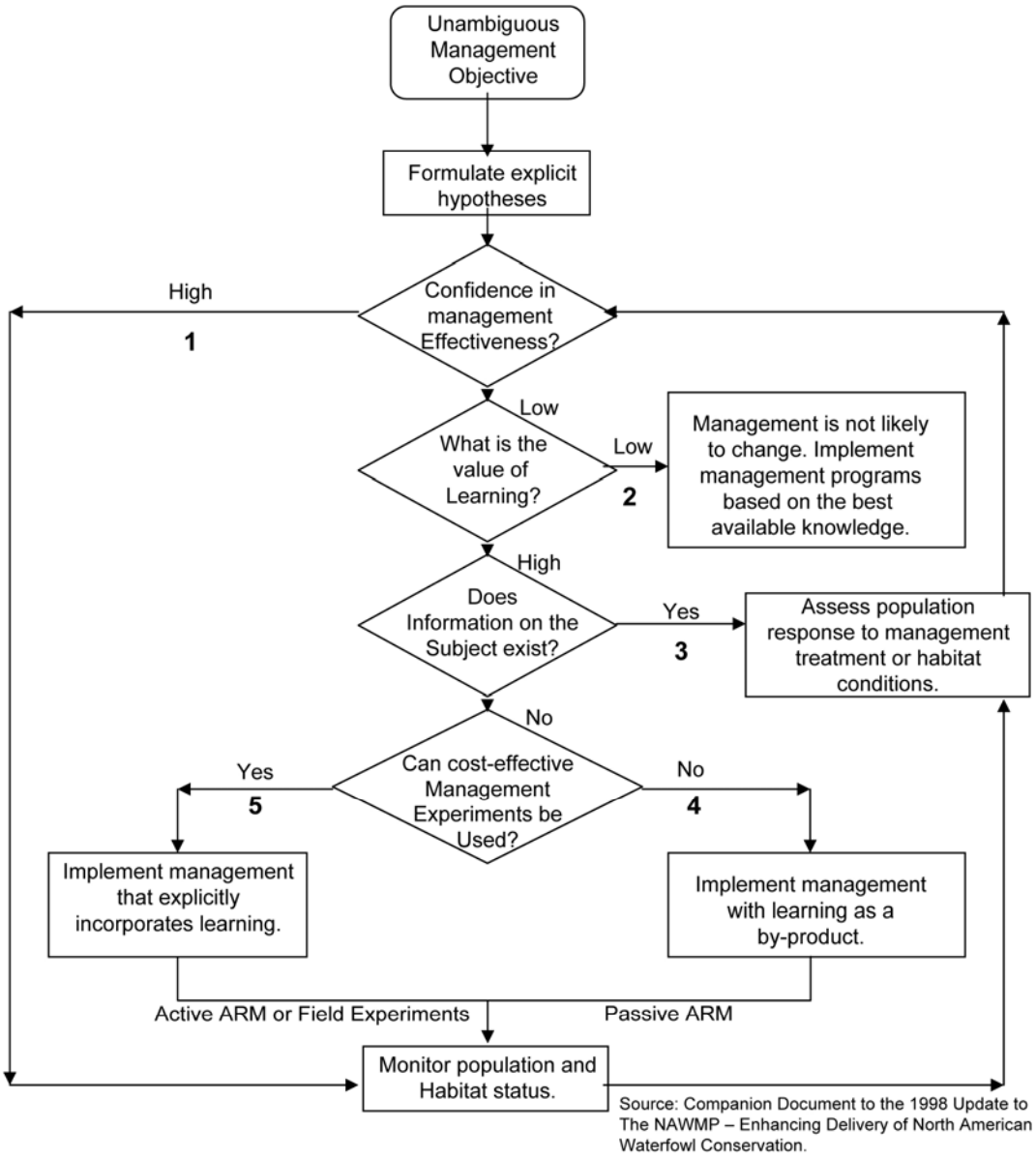

Figure 27 - Five approaches to account for uncertainty in implementation strategies.

Integrating Information Needs and Research Priorities Across Bird Initiatives and Programs

Information needs have already been outlined in national and regional plans to varying levels of detail. For example, Northern Prairie and Parkland Waterbird Conservation Plan delineates information needs, many if not all of which are applicable to all the avifauna in the NGPJV. These include information on life history, sampling and monitoring design, bird-habitat relationships, and bird-human interactions (Beyersbergen et al. 2004). The Science Coordinator will synthesize and disseminate information on

information and research needs identified elsewhere to the Technical Team or working groups. To keep partners informed of the best available science, the JV, via the work of the Science Coordinator, should serve as a clearinghouse for bird and habitat research reports and information from projects conducted within the region or pertinent to the species and issues in the region.

Supporting and Prioritizing Active Adaptive Management and Research Studies

Active ARM will be an important, ongoing component of the JV's effort to reduce uncertainties in conservation planning and delivery. However, as noted above, collecting data without providing the time and resources to evaluate it leads nowhere. The partners implementing active ARM projects must commit to the full circle of design, implementation, data collection, analysis, and reporting. Results from active ARM projects should be documented and reported to the JV Management Board in a timely manner. Sharing results of well-designed and implemented ARM projects will be among the most valuable tools for advancing conservation delivery in the JV.

Targeted field research may be needed to address uncertainties, particularly if the speed of learning via ARM is too slow or imprecise to address critical information needs. The JV should facilitate the development of an active research program that generates projects and information that increases the knowledge of the avifauna and habitats in the JV and improves conservation design and practices. Funding to support research projects should be among the highest priorities in a new JV. Monitoring, evaluation and research are the keystone of biologically driven JVs and the support of these primary products for the partnership should become a focus of annual and long-term budget strategies as identified in the 2004 NAWMP Implementation Framework. The Technical Committee will:

1. Develop and maintain a prioritized list of information and research needs and priorities, based on evaluation of uncertainties as noted above. This list should be periodically reviewed and updated, at least every 3 years, or after substantial new information has been provided. The Technical Team may also need to revisit the priorities to deal with unexpected events or changes, such as disease outbreaks, or new energy or agricultural programs that may have substantial implications to populations and habitats. The first prioritized list should be completed by December 2006.

2. Solicit, evaluate, and fund research projects that address priority research and information needs. Proposals will be reviewed to ensure that best science practices are proposed and the study will address the information need. A standardized proposal and budget format should be developed for consistency. Research can include field studies, development and testing of explicit models, or synthesis of information of a subject. High priority research should contribute to identification of limiting factors, practical and timely solutions, avoid duplication of current research, redirect management strategies quickly, address more costly management strategies, address methods that produce larger numbers of target species, establish time frames and expected products, and maintain reasonable costs.

3. Maintain database on research studies and active ARM projects. The database should include metadata on spatial information and research and monitoring protocols so that studies can be more readily replicated or repeated.

4. Periodically assess the directions and contributions of the research program to bird and habitat conservation in the JV

Integrating Knowledge and Informed Planning as a Process

Planning is an ongoing process. Under the paradigm of ARM, which has been adopted by all of the major bird initiatives and is required of Joint Ventures, planning should never stop (Charles Baxter, USFWS, St Louis, Missouri, Partners in Flight - Conservation Design Workshop, April 2006, personal communication). To improve planning, the knowledge gained from JV and other monitoring and evaluation programs must be integrated into the business and planning of the JV. During regular reviews or when significant research findings warrant, the Technical Committee will amend planning documents and make programmatic reports and recommendations to the Management Board. Once informed of technical recommendations the management board will use the best available science and recommendations of the Technical Committee to guide and design habitat programs. These programs will then be delivered by partner agencies through all of various means available to them.

"*Critical preconditions for successful adaptive management include stakeholder consensus about objectives and a commitment to manage adaptively. Adaptive management is useful only if partners will respond to new knowledge*." (NAWMP 2004 Implementation Guide) When programs are adapted to make use of the latest available science, the JV goals, objectives and metrics for measuring the efficacy of program delivery may be revisited. More refined and better focused objectives, along with improved mechanisms for measuring performance, will lead to better and more efficient use of conservation resources. This efficiency is an explicit goal of Adaptive Management.

Literature Cited

Anonymous. undated. Mixed-Shortgrass Prairie Draft AI Worksheet (Excel file). Manomet Center of Conservation Sciences, Manomet, MA.

Anonymous. 2005. Conservation status and distribution of solitary-nesting waterbirds. Post workshop worksheet-October 25 draft (Excel file). North American Waterbird Conservation Plan. Washington, D.C. http://www.fws.gov/birds/waterbirds/statusassessment/marshprofiles.html (accessed 1/20/06)

Austin, J. E., and D. A. Buhl. Wetlands and use by breeding waterfowl in the national grasslands: Grand River National Grassland and the McKenzie District of the Little Missouri National Grassland, North Dakota. Report to the U.S. Forest Service, Dakota Prairie Grasslands Office, Bismarck, North Dakota. U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, North Dakota, USA.

Bachelet, D., J. M. Lenihan, C. Daly, and R. P. Neilson. 2000. Interactions between fire, grazing and climate change at Wind Cave National Park, SD. Ecological Modeling 134:229-244.

Ball, I.J., Robert L. Eng, and Susan Kraft Ball. 1995. Population density and productivity of ducks on large grassland tracts in northcentral Montana. Wildlife Society Bulletin 23:767-773.

Benkman, C. W. 1989. Food profitability and the foraging ecology of crossbills. Ecological Monographs 57:251-267.

Beyerspergen, G. W., N. D. Niemuth, and M. R. Norton. 2004. Northern Prairie and Parkland Waterbird Conservation Plan. A plan associated with the Waterbird Conservation Plan for the Americas initiative. Prairie Pothole Joint Venture, Denver, CO, USA.

Bjugstad, A. J. 1978. Reestablishment of woody plants on mine spoils and management of mine water impoundments: An overview of Forest Service research on the northern High Plains. Pages 3-12 *in* R. A. Wright, editor. The reclamation of disturbed lands. University of New Mexico, Albuerque, New Mexico, USA.

Bjugstad, A. J, and M. Girard. 1984. Wooded draws in rangelands of the northern Great Plains. Pages 27b-36b *in* R. Henderson, editor. Guidelines for increasing wildlife on farms and ranches. Great Plains Agriculture Council, Wildlife Resources Communication and Cooperative Extension Service, Kansas State University, Manhattan, USA.

Black Hills National Forest. 1996. Land and resource management plan. U. S. Department of Agriculture, Black Hills National Forest, Custer, South Dakota, USA.

Bock, J. H. and C. E. Bock. 1984. Effect of fires on woody vegetation in the pine-grassland ecotone of the southern Black Hills. American Midlands Naturalist 112:35-42.

Boldt, C. E., D. W. Uresk, and K. E. Severson. 1978. Riparian woodlands in jeopardy on the northern high plains. Pages 184-189 *in* R. R. Johnson and J. F. McCormick, editors. Strategies for protection and management of floodplains, wetlands, and other riparian ecosystems. U.S. Forest Service General Technical Report WO-12, Washington, D.C., USA.

Bolt, C. E., and J. L. Deusen. 1974. Silviculture of ponderosa pine in the Black Hills: the status of our knowledge. U.S. Forest Service Research Paper RM-124. U. S. Department of Agriculture, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Borman M., C. Massingill and W. Elmore. 1999. Riparian area responses to changes in management. Rangelands 21:3-7.

Brewster, W. G., J. M. Gates, and L. D. 1976. Breeding waterfowl populations and their distribution in South Dakota Journal of Wildlife Management 40:50-59.

Brown, S., C. Hickey, B. Harrington, and R. Gill, editors. 2001. United States Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA. 61 pp.

Bue, I.B., L.H. Blankenship, and W.H. Marshall. 1952. The relationship of grazing practices to waterfowl breeding populations and production on stock ponds in western South Dakota. Transactions of the North American Wildlife Conference 17:396-414

Burke, I.C., T. G. G. Kittel, W. K. Lauenroth, P. Snook, C. M. Yonker, and W. J. Parton. 1991. Regional analysis of the central Great Plains. Sensitivity to climate variability. Bioscience. 41:685-692.

Carpenter, A. T. 1998. ELEMENT STEWARDSHIP ABSTRACT for *Tamarix ramosissima* Ledebour, *Tamarix pentandra* Pallas, *Tamarix chinensis* Loureiro, *Tamarix parviflora* De Candolle, Saltcedar, Salt cedar, Tamarisk. Nature Conservancy Wildland Weed Management and Research Program. http://tncweeds.ucdavis.edu/esadocs/documnts/tamaram.html.

Caton, E. L. 1996. Effects of fire and salvage logging on the cavity-nesting bird community in northwestern Montana. Dissertation, University of Montana, Missoula, USA.

Christensen, L., M. B. Coughenour, J. E. Ellis, and Z. Z. Chen. 2004. Vulnerability of the Asian Typical Steppe to Grazing and Climate Change Climatic Change 63:351-368.

Conner, R., A. Seidl, L. VanTassell, and N. Wilkins. 2001. United States grasslands and related resources: an economic and biological trends assessment. The Nature Conservancy Unpublished Report. 52 pp.

Conservation Information Technology Center, Purdue University, National Crop Residue Survey (http://www.ctic.purdue.edu/CTIC/crm.html)

Conway, C. J. 2004. Standardized North American marsh bird monitoring protocols. Wildlife Research Report #2004-07. U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.

Cowardin, L.M., T.R. Shaffer, P.N. Arnold. 1995. Evaluations of duck habitat and estimation of duck population sizes with a remote sensing based system. USDI Biological Science Report # 2.

Covich, A. P., S. C. Fritz, P. J. Lamb, R. D. Marzolf, W. J. Matthews, K. A. Poiani, E. E. Prepas, M. B. Richman, and T. C. Winter 1997. Potential Effects Of Climate Change On Aquatic Ecosystems Of The Great Plains Of North America. Hydrological Processes 11:993 – 1021.

Cummins, K.W. 1974. Structure and function of stream ecosystems. BioScience 24:631-641.

Cunningham, M.A., and D Johnson. Proximate and landscape factors influence grassland bird distributions. 2006. Ecological Applications, 16(3), pp.1062-1075.

Day, K. S., L. D. Flake, and W. L. Tucker. 1991. Characteristics of wild turkey nest sites in a mixed-grass prairie-oak-woodland mosaic in the northern Great Plains, South Dakota. Canadian Journal of Zoology 69:2840-2845.

Dinsmore, S.J. 2003. Mountain Plover (*Charadrius montanus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. (http://www.fs.fed.us/r2/projects/scp/assessments/mountainplover.pdf accessed 1/4/06).

Duebbert, H. F. 1987. Conservation tillage and wildlife. North Dakota Farm Research 44:30-31.

Epstein, H. E., R. A. Gill, J. M. Paruelo, W. K. Lauenroth, G. J. Jia, and I. C. Burke. 2002. The relative abundance of three plant functional types in temperate grasslands and shrublands of North and South America: Effects of projected climate change. Journal of Biogeography 29:875-888.

Euliss, N.H., and D.M. Mushet. 2004. Impacts of water developments on aquatic macroinvertebrates, amphibians, and plants in wetlands of a semi-arid landscape. Aquatic Ecosystem Health and Management 7:73-84.

Evans, K.E. and R.R. Kerbs. 1977. Avian use of livestock watering ponds in western South Dakota. U.S. Department of Agriculture Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-35.. 11 pp.

Faanes, C. A. 1984. Wooded islands in a sea of prairie. American Birds 38:3-6.

Farmer, A.H. and A.H. Parent. 1997. Effects of landscape on shorebird movements at spring migration stopovers. *Condor* 99:698-707.

Fay, P. A., J. D. Carlisle, A. K. Knapp, J. M. Blair, and S. L. Collins. 2003. Productivity responses to altered rainfall patterns in a Csub (4)-dominated grassland. Oecologia 137:245-251.

Flake, L. D., and K. S. Day. 1996. Wild turkey reproduction in a prairie-woodland complex in South Dakota. Proceedings of the National Wild Turkey Symposium 7:153–158.

Flake, L. D., R. A. Craft, and W. L. Tucker. 1996. Vegetation characteristics of wild turkey roost sites during summer in south-central South Dakota. Proceedings of the National Wild Turkey Symposium 7:159–164.

Gill, F. B. 1995. Ornithology, second edition. W.H. Freeman and Co., New York, New York, USA.

Girard, M. M., H. Goetz, and A. J. Bjugstad. 1989. Native woodland types of southwestern North Dakota. U. S. Forest Service Research Paper RM-281. Fort Collins, Colorado, USA.

Granfors, D. and N. Niemuth. 2005. 2005 Implementation Plan, Section III-Shorebird Plan. Prairie Pothole Joint Venture. 21 pp.

Guertin, D. S., W. E. Easterling, and J. R. Brandle, Jr. 1997. Climate change and forests in the Great Plains. Bioscience 47:287-296.

Guilfoyle, M. P., R. A. Fischer, D. N. Pashley, and C. Lott. 2004. Summary of Interior Least Tern Research and Monitoring Workshop. DOER Technical Notes Collection (TN-DOER-E17), U.S. Army Engineer Research and Development Center, Vicksburg, MS. www.wes.army.mil/el/dots/doer (accessed 2/6/06).

Guo, Q. 2000. Climate change and biodiversity conservation in Great Plains agroecosystems Global Environmental Change 10:289-298.

Hall, L. S., M. L. Morrison, and W. M. Block. 1997. Songbird status and roles. Pages 69-88 *in*: Songbird ecology in southwestern ponderosa pine forests: a literature review. U.S. Forest Service General Technical Report RM-292. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Hansen, P. L., G. R. Hoffman, and A. J. Bjugstad. 1984. The vegetation of the Theodore Roosevelt National Park, North Dakota: a habitat classification. U.S. Forest Service

General Technical Report RM-113. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Hansen, P. L., and G. R. Hoffman. 1988. The vegetation of the Grand River/Cedar River, Sioux and Ashland Districts of the Custer National Forest: a habitat classification. U.S. Forest Service General Technical Report RM-157. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Hansen, A. J., W. C. McComb, R. Vega, M G. Raphael, and M. Hunter. 1995. Bird habitat relationships in natural and managed forests in the west cascades of Oregon. Ecological Applications 5:555-569.

Hay, D. B., and M. Guntert. 1983. Seasonal selection of tree cavities by pygmy nuthatches based on cavity characteristics. Pages 117-120 *in* Proceedings of the Snag Habitat Management Symposium. U.S. Forest Service General Technical Report RM-99. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, USA.

Higgins, K. F., A. D. Kruse, and J. L. Piehl. 1989. Effect of fire in the Northern Great Plains. U.S. Fish and Wildlife Service and Coop. Extension Service.

Higgins, K.F., D. E. Naugle, and K. J. Forman. 2002. A case study of changing land use practices in the northern Great Plains, U.S.A.: an uncertain future for waterbird conservation. *Waterbirds* 25 (Special Publication 2): 42-50.

Hoffman, G. R., and R. R. Alexander. 1987. Forest vegetation of the Black Hills National Forest of South Dakota and Wyoming: a habitat type classification. U.S. Forest Service Research Paper RM-276. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Denver, Colorado, USA.

Hutto, R. L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (USA) conifer forests. Conservation Biology 9:1041-1058.

Igl, L. D. and Johnson, D. H. 1997. Changes in breeding bird populations in North Dakota: 1967 to 1992-93. Auk 114(1):74-92.

James, F. C., and N. O. Wamer. 1982. Relationships between temperate forest bird communities and vegetation structure. Ecology 63:159-171.

Johnson, D. H., Sparling, D. W., and Cowardin, L. M., 1987. A model of the productivity of the mallard duck. Ecological Modeling 38(3/4):257-275

Johnson, D. H., and L. D**.** Igl. 1995. Contributions of the Conservation Reserve Program to populations of breeding birds in North Dakota. Wilson Bulletin 107:709-718.

Johnson, D. H. 1996. Management of northern prairies and wetlands for the conservation of neotropical migratory birds. Pages 53-67 *in* F. R. Thompson, III ed. Management of midwestern landscapes for the conservation of neotropical migratory birds. U.S. Department of Agriculture, St. Paul, MN. 208 p. U.S.D.A. Forest Service General Technical Report ; NC-187.

Johnson, Douglas H., and Jill A. Dechant-Shaffer (Series Coordinators). 2002. Effects of management practices on wetland birds. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/literatr/wetbird/wetbird.htm (Version 12DEC2003) accessed 2/18/05

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, D. A. Shepherd A., and S. A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind-power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30:879-887.

Johnson, G. D., M. K. Perlik, W. P. Erickson, and M. D. Strickland. 2004. Bat activity, composition, and collision mortality at a large wind plant in Minnesota. Wildlife Society Bulletin 32:1278-1288.

Johnson, W. C., R. L. Burgess, and W. R. Keammerer. 1976. Forest overstory vegetation and environment on the Missouri River floodplain in North Dakota. Ecological Monographs 46:59-84.

Johnson, W. C. 1992. Dams and riparian forests: case study from the Upper Missouri River. Rivers 3(4):229-242.

Johnson, W. C. 1994. Woodland expansion in the Platte River, Nebraska: patterns and causes. Ecological Monographs 64:45-84.

Johnson, W. C., B. V. Millett, T. Gilmanov, R. A. Voldseth, G. R. Guntenspergen, and D. E. Naugle. 2005. Vulnerability of northern prairie wetlands to climate change. Bioscience 65:863-872.

Kantrud, H. A., and R. L. Kologiski. 1982. Effects of soils and grazing on breeding birds of uncultivated upland grasslands of the Northern Great Plains. U.S. Fish and Wildlife Service Wildlife Research Report 15.

Kantrud, H.A, G. A. Krapu, and G. A. Swanson. 1989. Prairie basin wetlands of the Dakotas: a community profile. U.S. Fish and Wildlife Service Biological Report 85(7.28).

Knick, S. T., A. L. Holmes, and R. F. Miller. The role of fire in structuring sagebrush habitats and bird communities. Studies in Avian Biology 30:63-75.

Knopf, F. L., R. R. Johnson, T. Rich, F. B. Samson, and R. C. Szaro. 1988. Conservation of riparian ecosystems in the United States. Wilson Bulletin 100:272-284.

Knopf, F. L., and F. B. Samson. 1994. Scale perspectives on avian diversity in western ecosystems. Conservation Biology 8:669-676.

Klotz J. R., and S. Swanson. 1997. Managed instream flows for woody vegetation recruitment, a case study. Pages 483-489 in Warwick J, ed. Symposium proceedings: water resources education, training, and practice: opportunities for the next century. American Water Resources Association, Universities Council on Water Resources, American Water Works Association; 29 Jun-3 Jul; Keystone, CO.

Krapu, G. L., D. A.Brandt, and R. R. Cox, Jr. 2004. Less waste corn, more land in soybeans, and the switch to genetically modified crops; trends with important implications s to wildlife management. Wildlife Society Bulletin 32:127-126.

Kreisel, K. J., and S. J. Stein. 1999. Bird use of burned and unburned coniferous forests during winter. Wilson Bulletin 111:243-250.

Kushlan J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M.A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J.E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Washington, D.C. 78 pp.

Lehman, C. P. 2005. Ecology of Merriam's turkeys in the southern Black Hills, South Dakota. Dissertation, South Dakota State University, Brookings, USA.

Leif, A. P. 1997. Survival, reproduction and home ranges of translocated eastern wild turkeys in eastern South Dakota 1993-95. South Dakota Department of Game, Fish, and Parks. Completion Report, Pierre, South Dakota, USA.

Lokemoen, J.T. 1971. Use of stock ponds by breeding waterfowl and other water birds in Stanley County, South Dakota. *South Dakota Bird Notes* June: 34-36.

Lokemoen, J. T. 1973. Waterfowl production on stock-watering ponds in the northern Great Plains. Journal of Range Management 26:179-184.

Lokemoen, J.T. and R.O. Woodward. 1992. Nesting waterfowl and water birds on natural islands in the Dakotas and Montana. *Wildlife Society Bulletin* 20(2):163-171.

Lokemoen, John T, and Julia A. Beiser. 1997. Bird use and nesting in conventional, minimum-tillage, and organic cropland. Journal of Wildlife Management 61(3):644-655. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/birduse/birduse.htm

Lynch, J. 1985. Escape from mediocrity: a new approach to American waterfowl hunting regulations. Wildfowl 35:5-13.

Manci, K. M. 1989. Riparian ecosystem creation and restoration: a literature summary. U.S. Fish and Wildlife Service Biological Report 89(20).

Manning, R. 1995. Grassland: The history, biology, politics, and promise of the American Prairie. Penguin Books, USA, Inc. New York, NY. 306 pp.

May, S.M. 2001. Landscape characteristics affecting habitat use and productivity of avifauna on stock ponds in western South Dakota. Thesis, South Dakota State University, Brookings, USA.

May, S. M., D. E. Naugle, and K. F. Higgins. 2002. Effects of land use on nongame wetland birds in western South Dakota stock ponds, U.S.A. *Waterbirds* 25 (Special Publication 2): 51-55.

Meehan, W. E., F. R. Swanson, and J. R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. Pages 137-145 *in* R. R. Johnson and D. A. Jones, technical coordinators. Importance, preservation and management of riparian habitat: A symposium. U.S. Forest Service General. Technical Report RM-43.

Messmer, T. 1992. Managing for the Most: Landowners Guide to Conserving North Dakota's Wildlife Legacy, NDSU Extension. WL-1000, http://www.ext.nodak.edu/extpubs/ansci/wildlife/wl1000-1.htm

Mills, T. R., M. A. Rumble, and L. D. Flake. 2000. Habitat of birds in ponderosa pine and aspen/birch forest in the Black Hills, South Dakota. Journal of Field Ornithology 71:187-206.

Moore, F. R., S. A. Gauthreaux, Jr., P. Kerlinger, and T. R. Simmons. 1995. Habitat requirements during migration: important link in conservation. Pages 121-144 *in* T. E. Martin and D. M. Finch, editors. Ecology and management of neotropical migratory birds: a synthesis and review of critical issues. Oxford University Press, New York, New York, USA.

Montana Piping Plover Recovery Committee. 1994. 1993 Surveys for Piping Plover (*Charadrius melodus*) and Least Tern (*Sterna antillarum*) in Montana. Montana Piping Plover Recover Committee, unpublished report.

National Agricultural Statistics Service (NASS), United States Department of Agriculture, Washington, DC., USA

National Oceanographic and Atmospheric Administration (NOAA). 1975. Climate of the United States with current tables of normals 1941-170 and means and extremes to 1975. Gale Research Company, Book Tower, Detroit, Michigan, USA.

Natural Resources Conservation Service. 2000. 1997 national resources inventory, USDA Natural Resources Conservation Service Resource Assessment Division, Washington, DC., USA

Naugle, D.E. 2004. Black Tern (*Chlidonias niger surinamensis*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. http://www.fs.fed.us/r2/projects/scp/assessments/blacktern.pdf (accessed 12/6/05).

Nichols, J. D. 1991. Extensive monitoring programs viewed as long-term population studies: the case of North American Waterfowl. Ibis 133 (Supplement):89-98.

Ojima D. S., and J. M. Lackett. 2002. Preparing for a changing climate: the potential consequences of climate variability and change—central Great Plains. Fort Collins: Central Great Plains Steering Committee and Assessment Team, Colorado State University.

Parsons, D. A. 1963. Vegetative control of streambank erosion. In Proceedings of the Federal inter-agency sedimentation conference. U.S. Department of Agriculture Miscellaneous Publication 970.

Paige, C., and S. A. Ritter. 1999. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Partners in Flight Western Working Group, Boise, Idaho.

Peterson, A. T. 2003. Projected climate change effects on Rocky Mountain and Great Plains birds: generalities of biodiversity consequences. *Global Change Biology 9:647.*

Pollet, J. and P. N. Omi. 2002. Effect of thinning and prescribed burning on wildfire severity in Ponderosa forests. Internat. J. Wildland Fire, Vol 11:1-10.

Radeloff, V. C., Hammer, R. B., S. I Stewart, J. S. Fried, S. S. Holcomb, and J. F. McKeefry. 2005. The wildland-urban interface in the United States. Ecological Applications 15:799-805.

Reynolds, R.E., T.L. Shaffer, R.W. Renner, W.E. Newton, and B.D. Batt. 2001. Impact of the Conservation Reserve Program on Duck Recruitment in the U.S. Prairie Pothole Region. Journal of Wildlife Management 65:765-780.

Rodenhouse, N. L., L. B. Best, R. J. O'Connor, and E. K. Bollinger. 1995. Effects of agriculture practices and farmland structures. Pages 269-293 *in* T. E. Martin and D. M. Finch, editors. Ecology and management of neotropical migratory birds: a synthesis and review of critical issues. Oxford University Press, New York, New York, USA.

Rocky Mountain Elk Foundation. 2005. Black Hills elk habitat data at National Office. Missoula, Montana.

Rainwater Basin Joint Venture. 2000. Evaluation plan. http://www.rwbjv.org/pdf/RWB_JV_Eval_Plan.pdf

Rodgers, Rand D. 2002. Effects of wheat-stubble height and weed control on winter pheasant abundance. Wildlife Society Bulletin 2002, 30(4):1099-1112

Rood, S. B., and J. M. Mahoney. 1990. Collapse of riparian poplar forests downstream from dams in western prairies: probably causes and prospects for mitigation. Environmental Management 14:451-464.

Rumble, M. A. and S. H. Anderson. 1996. Feeding ecology of Merriam's turkeys (*Meleagris gallopavo merriami*) in the Black Hills, South Dakota. American Midland Naturalist 136:157-171.

Rumble, M. A., and J. E. Gobeille. 1998. Bird community relationships to succession in green ash (*Fraxinus pennsylvanica*) woodlands. American Midland Naturalist 140:372-381.
Ruwaldt, J. J., Jr., L. D. Flake and J. M. Gates. 1979. Waterfowl pair use of natural and man-made wetlands in South Dakota. Journal of Wildlife Management 43:375-383.
Sargent, M.S and Carter, K.S., ed. 1999. Managing Michigan Wildlife: A Landowners Guide. Michigan United Conservation Clubs, East Lansing, MI. 297pp.
Skaar, D., D. Flath, and L. S. Thompson. 1985. Montana bird distribution. Monograph 3, Supplement to Proceedings Montana Academy of Sciences 44.
Schimpf, D. J., and J. A. MacMahon. 1985. Insect communities and faunas of a Rocky Mountain subalpine sere. Great Basin Naturalist 45:37-60.
Schrank, S.J., C.S. Guy, M.R. While, and B.L. Brock. 2001. Influence of instream and landscape-level factors on the distribution of Topeka shiners (*Notropis topeka*) in Kansas streams. Copeia 2001 (2):413-421.
Skagen, S. K. and F. L. Knopf. 1993. Towards conservation of midcontinental shorebird migrations. *Conservation Biology* 7:533-541.
Skagen, S. K., and F. L. Knopf. 1994. Migrating shorebirds and habitat dynamics at a prairie wetland complex. *Wilson Bulletin* 106(1):91-105.
Skagen, S. K., P. B. Sharpe, R. G. Waltermire, and M. B. Dillon. 1999. Biogeographical profiles of shorebird migration in midcontinental North America. U.S. Geological Survey, Fort Collins, CO. Biological Science Report USGS/BRD/BSR--2000-0003. 167 pp. (http://www.fort.usgs.gov/products/publications/555/555.asp accessed 1/3/06)
Skagen, S. K. and G. Thompson. 2000. Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan. Version 1.0. U.S. Shorebird Conservation Plan. 33 pp. (http://www.fws.gov/shorebirdplan/RegionalShorebird/downloads/NORPLPP2.doc accessed 12/19/05)
Smith, G. W. 1995. A critical review of the aerial and ground surveys of breeding waterfowl in North America. U.S. Department of Interior, National Biological Service, Biological Science Report 5.
Steinkamp, M., B. Peterjohn, V. Byrd, H. Carter, and R. Lowe. 2003. Breeding season survey techniques for seabirds and colonial waterbirds throughout North America. Waterbird Monitoring Partnership of the Waterbirds for Americas Initiative. http://www.waterbirdconservation.org/pubs/PSGManual03.PDF (assessed 3/2/05)
Sterns, M., J. A. Tindall, G. Cronin, M. J. Friedel, and E. Bergquist. 2005. Effects of coal-bed methane discharge waters on vegetation and soil ecosystem in Powder River Basin, Wyoming. Water, Air, and Soil Pollution 168:33-57.
Stewart, Robert E., and H. A. Kantrud. 1974. Breeding waterfowl populations in the prairie pothole region of North Dakota. Condor 76:70-79.
Stewart, Robert E. 1975. Breeding Birds of North Dakota. Tri-College Center for Environmental Studies, Fargo, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/distr/birds/bb_of_nd/bb_of_nd.htm
Szaro, R. C., and R. J. Balda. 1982. Selection and monitoring of avian indicator species: an example from a ponderosa pine forest in the southwest. USDA Forest Service General Technical Report RM-89.
Szaro, R. C., and R. P. Balda. 1986. Relationships among weather, habitat structure, and ponderosa pine forest birds. Journal of Wildlife Management 50:253-260.

Szaro, R. C., J. D. Brawn, and R. P. Balda. 1990. Yearly variation in resource-use behavior by ponderosa pine forest birds. Studies in Avian Biology 13:226-236.
Uresk, D. W. 1982. Importance of woodlands to wildlife and livestock use on the northern high plains. Pages 7-12 *in* Proceedings of Great Plains Agriculture Council. North Platte, Nebraska, USA.
Uresk, D. W., and C. E. Boldt. 1986. Effect of cultural treatments on regeneration of native woodlands on the northern Great Plains. Prairie Naturalist 18: 193-202.
USDA and USDI. 2001. Urban wildland interface communities within vicinity of Federal lands that are at high risk from wildfire. Federal Register 66: 751–777.
USDA Natural Resource Conservation Service. 2004. Natural Resources Inventory 2002 Annual NRI. http://www.nrcs.usda.gov/technical/land/nri02/nri02lu.html
U.S. FWS. 2004. The U.S. Fish and Wildlife Service Policy on Joint Ventures. http://www.fws.gov/policy/721fw6.html http://www.fws.gov/policy/721fw2.html
U.S. FWS. 2005. The U.S. Fish and Wildlife Service's Focal Species Strategy for Migratory Birds: Measuring success in bird conservation. (http://www.fws.gov/migratorybirds/FocalSpecies/The%20Focal%20Species%20Fact%20Sheet%20and%20Table.pdf accessed 2/3/06)
Voldseth, R. A. W. C. Johnson, T. Gilmanov, G. R. Guntenspergen, and B. V. Millet. 2006. Land use and water levels of northern prairie wetlands. (In review)
Will, T. C, J. M. Ruth, K. V. Rosenberg, D. Krueper, D. Hahn, J. Fitzgerald, R. Dettmers, and C. J. Beardmore. 2005. The five elements process: designing optimal landscapes to meet bird conservation objectives. Partners in Flight Technical Series No. 1. Partners in Flight website: http://www.partnersinflight.org/pubs/01-FiveElements.pdf.

Appendix 1: NGP Species Tables *(Sandra Hagen)*

Intentionally Blank

BOLD	Identified as priority species
B	Breeding
M	Migration
W	Winter
Y	Year-round
WL	WatchList Species
S	Stewardship Species
IA	Immediate Action
MGMT	Management
LPR	Long-term Planning and Responsibility
HC	High Concern
MC	Moderate Concern
LC	Low Concern
NR	Not at Risk
MH	Moderate High Concern
ML	Moderate Low Concern
X	The species was designated on this list
T	Threatened
E	Endangered
Py	Primary
Sy	Secondary

Montana CWCS rankings:

Tier 1: These are Montana's species of greatest SWG conservation need. They have a high level of concern based on the Montana Species of Concern List, low levels of non-SWG funding and low amounts of effort being applied toward their conservation. Montana Fish, Wildlife and Parks has a clear obligation to use future SWG funding to implement conservation actions that will directly benefit these species.

Tier 2: These species have either moderate levels of concern or high levels of concern but are currently receiving some level of funding from non-SWG sources, have efforts already being applied toward their conservation and/or have a limited range in Montana. Montana Fish, Wildlife and Parks could use future SWG funding to implement conservation actions that will benefit these species if the amounts of non-SWG funding are considered inadequate for conservation or if a local concern is not being met by other funding.

Tier 3: Native species important to the vertebrate diversity of Montana but currently have either adequate funding for their conwservation (game species) or are considered common and/or abundant.

Tier 4: Non-native, incidental or on the periphery of their range.

North Dakota CWCS rankings:

Level 1: These are species which are in decline and receive little or no monetary support or conservation efforts. North Dakota Game and Fish Department has a clear obligation to use SWG funding to implement conservation actions that directly benefit these species. Level 1 species are those having a: high level of conservation priority because of declining status either here or across their range or high rate of occurrence in North Dakota constituting the core of the species breeding range (i.e. "responsibility" species) but are at-risk range wide.

Level 2: North Dakota Game and Fish Department will use SWG funding to implement conservation actions to benefit these species if SWG funding for Level 1 species is sufficient or conservation needs have been met. Level 2 species are those having a: moderate level of conservation priority or high level of conservation priority but a substantial level of non-SWG funding is available to them.

Level 3: These are North Dakota's species having a moderate level of conservation priority but are believed to be peripheral or non-breeding in North Dakota.

South Dakota CWCS rankings:

S1 Critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

S2 Imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

S3 Either very rare and local throughout its range, or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 of 100 occurrences.

S4 Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. Cause for long term concern.

S5 Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.

SU Possibly in peril, but status uncertain, more information needed.

SH Historically known, may be rediscovered.

SX Believed extinct, historical records only.

_T Rank of subspecies or variety

_Q Taxonomic status is questionable, rank may change with taxonomy

SZ No definable occurrences for conservation purposes, usually assigned to migrants

SP Potential exists for occurrence in the state, but no occurrences

SR Element reported for the state but no persuasive documentation

SA Accidental or casual

Bird species may have two state ranks, one for breeding (S#B) and one for nonbreeding seasons (S#N). Example: Ferruginous Hawk (S3B,SZN) indicates an S3 rank in breeding season and SZ in nonbreeding season.

Wyoming CWCS rankings:

1. *Rare*. Populations are physically isolated and/or extremely low densities throughout historic range. Expiration appears possible. Habitat declining or vulnerable.

2. *Rare*. Populations are physically isolated and/or extremely low densities throughout historic range. Expiration appears possible. Habitat stable.

3. *Common*. Species is widely distributed throughout its native range and population status is stable. Habitat declining or vulnerable.
4. *Common*. Species is widely distributed throughout its native range and population status is stable. Habitat stable.

2005 Regional Combined Breeding Score for BCR17

Under the PIF Species Assessment process, scores are assigned to species in six biologically based categories. Scores for each factor range from 1 (lowest vulnerability) to 5 (highest vulnerability). Regional Combined Score for the breeding season is the sum of scores for Breeding Distribution, Population Size, regional Population Trend, breeding Relative Density, and regional Threats to Breeding. For more information on Regional Combined Scores, see the Partners in Flight Handbook on Species Assessment, version 2005.

US Shorebird Conservation Plan and Northern Plains/Prairie Pothole Regional Shorebird Conservation Plan

5: Highly Imperiled

All species listed as threatened or endangered nationally, plus all species with significant population declines and either low populations or some other high risk factor.

4: Species of High Concern

Populations of these species are known or thought to be declining, and have some other known or potential threat as well.

3: Species of Moderate Concern

Populations of these species are either: a) declining with moderate threats or distributions; b) stable with known or potential threats and moderate to restricted distributions; c) relatively small; d) relatively restricted; or e) declining but with no other known threats.

2: Species of Low Concern

Populations of these species are either: a) stable with moderate threats and distributions; b) increasing but with known or potential threats and moderate to restricted distributions; or c) of moderate size.

1: Species Not at Risk

All other species where there is apparently no current risk of population decline.

Waterbird Conservation for the Americas and Conservation Status and Distribution of Solitary-Nesting Waterbird Species ("Marshbirds")

Highly Imperiled: Species with significant population declines and either low populations or some other high risk factor

High Concern: Species that are not Highly Imperiled. Populations known or thought to be declining and have some other known or potential threat as well.

Moderate Concern: Species that are not Highly Imperiled or High Concern. Populations are either a) declining with moderate threats or distributions; b) stable with known or potential threats and moderate to restricted distributions; or c) relatively small with relatively restricted distributions.

Low Concern: Species that are not Highly Imperiled, High Concern or Moderate Concern. Populations are either a) stable with moderate threats and distributions; b) increasing but with known or potential threats and moderate to restricted distributions; or c) of moderate size with known or potential threats and moderate to restricted distributions.

Not Currently at Risk: all other species for which information was available.

NAWMP – North American Waterfowl Conservation Plan (Waterfowl Conservation Region or WCR)

Regional Conservation Need				
Geographic Importance	Continental Priority			
	High	*Moderately High*	*Moderate*	*Moderately Low or Above Objective*
High	Highest	High	High	High
Mod. High	High	Mod. High	Mod. High	Moderate
Mod. Low	Moderate	Mod. Low	Mod. Low	Low

NGPJV Priority Species List

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
American Tree Sparrow	*Spizella arborea*	landbird	open woodland, fields		W/M	S	LPR		
Baird's Sparrow	*Ammodramus bairdii*	landbird	open grassland	ND, MT and northwest SD	B	WL	IA	9	18
Bell's Vireo	*Vireo bellii*	landbird	early successional riparian	ND and SD	B	WL	IA	0	14
Black-backed Woodpecker	*Picoides arcticus*	landbird	boreal and montane coniferous forest	Black Hills	Y	S		0	14
Black-billed Cuckoo	*Coccyzus erythropthalmus*	landbird	woodlands, associated with water		B			3	17
Brewer's Sparrow	*Spizella breweri*	landbird	shrubland, big sagebrush	MT and WY	B	WL		4	17
Burrowing Owl	*Athene cunicularia*	landbird	shortgrass, mammal burrows		B			2	16
Chestnut-collared Longspur	*Calcarius ornatus*	landbird	arid, short grassland		B	S	MGMT	26	19
Dickcissel	*Spiza americana*	landbird	grassland, weedy fields	limited range	B	WL	MGMT	1	14
Ferruginous Hawk	*Buteo regalis*	landbird	grassland		B			15	18
Grasshopper Sparrow	*Ammodramus savannarum*	landbird	grassland		B	S	MGMT	14	16
Greater Prairie-Chicken	*Tympanuchus cupido*	landbird	grassland and agricultural fields	rare, SD	Y	WL	IA	1	17
Greater Sage-Grouse	*Centrocercus urophasianus*	landbird	big sagebrush		B	WL	IA	18	19
Harris's Sparrow	*Zonotrichia querula*	landbird	deciduous trees, shrubs	important migrant	M	WL	MGMT		
Lapland Longspur	*Calcarius lapponicus*	landbird	open ground, cropland stubble, grasslands		W	S	LPR		
McCown's Longspur	*Calcarius mccownii*	landbird	semi-arid shortgrass steppe	MT, WY, and southwest ND	B	WL	LPR	13	20
Northern Goshawk	*Accipiter gentilis*	landbird	old growth coniferous forest	Black Hills	Y/W			1	15
Red-headed Woodpecker	*Melanerpes erythrocephalus*	landbird	deciduous woodland		B	WL	MGMT	1	15

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans					Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								3										
								2	1	S2B,S2N		X	X	X			X	Sy
												X		X			X	
								1		S3	4					X		
								2	1			X	X	X				
								2	3		4	X	X	X		X	X	
								1	2	S3S4B,S2N	4	X	X	X		X		Sy
								3	1	S4	4	X	X	X		X		Sy
								3	2		4	X	X	X			X	
								2	1	S4B,S2N	3	X	X	X		X	X	
								2	1		4	X	X	X		X		
									2	S4						X	X	
								1	2	S2	2					X	X	Sy
								3				X					X	
								3										
								2	3		4	X	X	X		X	X	
								2		S3B,S2N						X		
								2	2			X		X			X	

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Sharp-tailed Grouse	*Tympanuchus phasianellus*	landbird	grassland, interspersed shrubs		B	S	LPR	29	16
Short-eared Owl	*Asio flammeus*	landbird	open grassland		B/Y	WL	MGMT	3	17
Smith's Longspur	*Calcarius pictus*	landbird	grassy flats, pastures, stubble fields		M	WL	LPR		
Sprague's Pipit	*Anthus spragueii*	landbird	open grassland	ND, MT and northwest SD	B	WL	MGMT	9	18
Swainson's Hawk	*Buteo swainsoni*	landbird	open areas with scattered trees, agricultural areas		B	WL	MGMT	6	14
Willow Flycatcher	*Empidonax traillii*	landbird	woodland edge, riparian		B	WL	MGMT	1	11
American Avocet	*Recurvirostra americana*	shorebird	alkaline wetlands, islands		B/M				
Black-bellied Plover	*Pluvialis squatarola*	shorebird	large wetlands or lakes, flooded fields		M				
Long-billed Curlew	*Numenius americanus*	shorebird	short grassland		B/M				
Marbled Godwit	*Limosa fedoa*	shorebird	wetlands and grassland		B/M				
Mountain Plover	*Charadrius montanus*	shorebird	short grassland		B/M				
Piping Plover	*Charadrius melodus*	shorebird	sandbars, alkaline wetlands/lakes		B/M				
Solitary Sandpiper	*Tringa solitaria*	shorebird	wetlands		M				
Stilt Sandpiper	*Calidris himantopus*	shorebird	wetlands	long-distance migrant, stops in ND	M				
Upland Sandpiper	*Bartramia longicauda*	shorebird	grassland		B/M				
Whimbrel	*Numenius phaeopus*	shorebird	wetlands, fields		M				
Willet	*Catoptrophorus semipalmatus*	shorebird	grassland and wetlands		B/M				
Wilson's Phalarope	*Phalaropus tricolor*	shorebird	grassland and wetlands		B/M				
American Bittern	*Botaurus lentiginosus*	waterbird	wetlands and grassland		B				
American White Pelican	*Pelecanus erythrorhynchos*	waterbird	large lakes, islands		B				
Black Tern	*Chlidonias niger*	waterbird	wetlands		B				
Black-crowned Night-Heron	*Nycticorax nycticorax*	waterbird	variety of wetlands	ND and SD	B				

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								3	2									
								3	2		4	X	X	X		X	X	
								4				X						
								2	1	S2B,SZN		X	X	X			X	Sy
								2	1		4	X		X			X	
								3			3						X	
	3	4							2									
	3	3																
	5	2						1	1	S3B,SZN	3	X	X	X		X	X	
	4	4						2	1	S5		X	X	X			X	
	5	5						1			4	X	X	X		X	X	Py
	5	5						1	2	S2B,SZN					T		X	Py
	4	3										X		X				
	3	3										X						
	4	4						2	1		4	X	X	X				
	4	4						4									X	
	3	3						3	1	S5								
	4	4						3	1	S4		X	X	X			X	
				HC				2	1		3					X		
			MC					3	1	S3B S2N	3							Py
			MC					1	1	S3B,SZN	3					X		
			MC					2			3							

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Eared Grebe	*Podiceps nigricollis*	waterbird	wetlands		B				
Interior Least Tern	*Sterna antillarum*	waterbird	sandbars, sparsely vegetated	Missouri River	B				
Pied-billed Grebe	*Podilymbus podiceps*	waterbird	wetlands		B				
Western Grebe	*Aechmophorus occidentalis*	waterbird	wetlands and lakes		B				
American Wigeon	*Anas americana*	waterfowl	grassland and wetlands		B/Y				
Blue-winged Teal	*Anas discors*	waterfowl	grassland and wetlands		B				
Canvasback	*Aythya valisineria*	waterfowl	small lakes, wetlands	primarily in western SD	B				
Mallard	*Anas platyrhynchos*	waterfowl	grassland and wetlands		B				
Northern Pintail	*Anas acuta*	waterfowl	grassland and wetlands		B				
Redhead	*Aythya americana*	waterfowl	wetlands		B				

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
			MC					3										
			HC					1	2	S2B,SZN		X			E			Py
				HC				3										
			MC					2			4							
					MH	MH	MH	3										
					MH	MH	MH	3										
					MH	ML	ML	2	2		3							
					H	MH	H	3										
					H	MH	H	3	2		3							
					MH	ML	ML	2	2		3							

NGPJV Species List

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
American Crow	*Corvus brachyrhynchos*	landbird	woodland		B			0	8
American Dipper	*Cinclus mexicanus*	landbird	riparian wetland (streams)		B			0	14
American Goldfinch	*Carduelis tristis*	landbird	early successional woodland		B/Y			2	11
American Kestrel	*Falco sparverius*	landbird	grassland with few trees		B			4	13
American Pipit	*Anthus rubescens*	landbird	subalpine meadows	small range in MT and WY only	B				
American Redstart	*Setophaga ruticilla*	landbird	deciduous woodland		B			0	11
American Robin	*Turdus migratorius*	landbird	woodland		B/Y			1	9
American Three-toed Woodpecker	*Picoides dorsalis*	landbird	old-growth coniferous forest	small range in MT and Black Hills	Y			0	12
American Tree Sparrow	*Spizella arborea*	landbird	open woodland, fields		W/M	S	LPR		
Baird's Sparrow	*Ammodramus bairdii*	landbird	open grassland	ND, MT and northwest SD	B	WL	IA	9	18
Bald Eagle	*Haliaeetus leucocephalus*	landbird	woodland adjacent to water		B/W	S		0	14
Baltimore Oriole	*Icterus galbula*	landbird	deciduous woodland, edge	ND and SD	B			0	12
Bank Swallow	*Riparia riparia*	landbird	vertical banks adjacent to water		B			1	12
Barn Owl	*Tyto alba*	landbird	open habitats	WY and SD	Y			0	12
Barn Swallow	*Hirundo rustica*	landbird	human-modified areas		B			1	9
Bell's Vireo	*Vireo bellii*	landbird	early successional riparian	ND and SD	B	WL	IA	0	14
Belted Kingfisher	*Ceryle alcyon*	landbird	streams, rivers, ponds, lakes		B/Y			0	12
Black Rosy-Finch	*Leucosticte atrata*	landbird	alpine or tundra, above treeline	WY and MT	B/W	WL			
Black-and-white Warbler	*Mniotilta varia*	landbird	deciduous and mixed deciduous/coniferous		B			0	12
Black-backed Woodpecker	*Picoides arcticus*	landbird	boreal and montane coniferous forest	Black Hills	Y	S		0	14

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans					Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								3										
								3		S2								
								3										
								3										
								3										
								2										
								3										
								2		S2	4					X		
								3										
								2	1	S2B,SZN		X	X	X			X	Sy
								1	2	S1B,SZN	2				T			Py
								2										
								3										
								2										
								3										
												X		X			X	
								3										
								2										
								2										
								1		S3	4					X		

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Black-billed Cuckoo	*Coccyzus erythropthalmus*	landbird	woodlands, associated with water		B			3	17
Black-billed Magpie	*Pica hudsonia*	landbird	riparian, open grassland, shrubland		Y			1	15
Black-capped Chickadee	*Poecile atricapillus*	landbird	deciduous and mixed deciduous/coniferous		Y			2	11
Black-headed Grosbeak	*Pheucticus melanocephalus*	landbird	deciduous, variety of woodlands		B				
Blue Grosbeak	*Passerina caerulea*	landbird	woodland edge, old fields	primarily SD	B			0	11
Blue Grouse	*Dendragapus obscurus*	landbird	shrub-steppe, savannah, subalpine	limited range in MT and WY	Y			0	13
Blue Jay	*Cyanocitta cristata*	landbird	deciduous, coniferous, mixed woodlands	primarily SD and ND	Y			0	9
Bobolink	*Dolichonyx oryzivorus*	landbird	grassland		B			3	10
Bohemian Waxwing	*Bombycilla garrulus*	landbird	fruit-laden trees		W				
Boreal Owl	*Aegolius funereus*	landbird	boreal forest	WY and western MT	Y				
Brewer's Blackbird	*Euphagus cyanocephalus*	landbird	variety of habitats		B			5	12
Brewer's Sparrow	*Spizella breweri*	landbird	shrubland, big sagebrush	MT and WY	B	WL		4	17
Broad-tailed Hummingbird	*Selasphorus platycercus*	landbird	boreal, mixed forest	limited range in WY	B			0	
Brown Creeper	*Certhia americana*	landbird	late successional coniferous and mixed forest		B/W			0	12
Brown Thrasher	*Toxostoma rufum*	landbird	riparian, shelterbelt, shrub thickets		B	S		3	11
Brown-headed Cowbird	*Molothrus ater*	landbird	trees among grassland		B			7	9
Bullock's Oriole	*Icterus bullockii*	landbird	open woodland, riparian	MT and WY	B			4	12
Burrowing Owl	*Athene cunicularia*	landbird	shortgrass, mammal burrows		B			2	16
Canyon Wren	*Catherpes mexicanus*	landbird	cliffs, canyons, rocky outcrops	western SD, WY and MT	B			0	12
Cassin's Finch	*Carpodacus cassinii*	landbird	open coniferous forest	MT, WY and Black Hills	Y	S		0	14
Cedar Waxwing	*Bombycilla cedrorum*	landbird	open woodland, old fields, riparian		B			1	11

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans					Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								2	1			X	X	X				
								3										
								3										
								3										
								2									X	
								3										
								3	2		4			X				
								3										
								2			4							
								3										
								2	3		4	X	X	X		X	X	
								2										
								2										
								3										
								3										
								2										
								1	2	S3S4B,SZN	4	X	X	X		X		Sy
								2										
								3										
								3										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Chestnut-collared Longspur	*Calcarius ornatus*	landbird	arid, short grassland		B	S	MGMT	26	19
Chimney Swift	*Chaetura pelagica*	landbird	chimneys or tree cavities	ND and SD	B			0	10
Chipping Sparrow	*Spizella passerina*	landbird	woodland, shrubby vegetation		B			1	10
Chukar	*Alectoris chukar*	landbird	Great Basin	limited range in WY and MT	Y			0	10
Clark's Nutcracker	*Nucifraga columbiana*	landbird	coniferous forest	MT and WY	Y	S		2	13
Clay-colored Sparrow	*Spizella pallida*	landbird	open shrubland	ND and MT, and rare in WY, SD	B			1	12
Cliff Swallow	*Petrochelidon pyrrhonota*	landbird	vertical structures		B			6	11
Columbia Sharp-tailed Grouse	*Tympanuchus p. columbianus*	landbird	aspen-mountain, brush-sagebrush	rare, MT and WY	Y				
Common Grackle	*Quiscalus quiscula*	landbird	variety of habitats		B			2	7
Common Nighthawk	*Chordeiles minor*	landbird	variety of habitats, forest and grasslands		B			5	13
Common Poorwill	*Phalaenoptilus nuttallii*	landbird	open grassland and shrubland		B			0	13
Common Raven	*Corvus corax*	landbird	variety of habitats	MT and WY	Y			0	9
Common Yellowthroat	*Geothlypis trichas*	landbird	wetlands and grassland		B			1	11
Cooper's Hawk	*Accipiter cooperii*	landbird	deciduous, mixed, coniferous forest, riparian		B/Y			1	13
Cordilleran Flycatcher	*Empidonax occidentalis*	landbird	coniferous, mixed, and second-growth forest	MT, WY and Black Hills	B			5	14
Dark-eyed Junco	*Junco hyemalis*	landbird	woodland		B/W			0	8
Dickcissel	*Spiza americana*	landbird	grassland, weedy fields	limited range	B	WL	MGMT	1	14
Downy Woodpecker	*Picoides pubescens*	landbird	deciduous, riparian woodland		Y			0	10
Dusky Flycatcher	*Empidonax oberholseri*	landbird	shrub, thickets, areas with scattered trees	MT, WY and Black Hills	B	S		2	13
Eastern Bluebird	*Sialia sialis*	landbird	grassland, cavities	rare, ND and SD	B			0	11
Eastern Kingbird	*Tyrannus tyrannus*	landbird	variety of open habitats		B			8	11
Eastern Meadowlark	*Sturnella magna*	landbird	open grassland	rare	B/Y			0	10
Eastern Phoebe	*Sayornis phoebe*	landbird	woodlands, associated with water	limited range, SD	B			0	9

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								3	1	S4	4	X	X	X		X		Sy
								3										
								3										
								4										
								3										
								2										
								3										
								1			3							
								3										
								3										
								3										
								3										
								3										
								2										
								3										
								3										
								3	2		4	X	X	X			X	
								3										
								3										
								2										
								3										
								4										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Eastern Screech-Owl	*Megascops asio*	landbird	variety of woodlands		Y			1	13
European Starling	*Sturnus vulgaris*	landbird	human-modified areas		Y			0	8
Evening Grosbeak	*Coccothraustes vespertinus*	landbird	coniferous forest, mixed-conifererous	rare, Black Hills	Y			0	11
Ferruginous Hawk	*Buteo regalis*	landbird	grassland		B			15	18
Field Sparrow	*Spizella pusilla*	landbird	successional old fields, woodlands		B			3	13
Fox Sparrow	*Passerella iliaca*	landbird	variety of woodland habitats		B/M	S			
Golden Eagle	*Aquila chrysaetos*	landbird	open grassland/ shrubland, rugged topo.		B/W			2	17
Golden-crowned Kinglet	*Regulus satrapa*	landbird	mixed coniferous, deciduous forest		W/Y			0	11
Grasshopper Sparrow	*Ammodramus savannarum*	landbird	grassland		B	S	MGMT	14	16
Gray Catbird	*Dumetella carolinensis*	landbird	shrubby, woodland areas		B			1	10
Gray Jay	*Perisoreus canadensis*	landbird	coniferous and mixed coniferous-deciduous	WY, Black Hills	Y	S		0	10
Gray Partridge	*Perdix perdix*	landbird	grassland and agricultural fields		Y			0	12
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	landbird	alpine	MT, WY and Black Hills	W				
Great Crested Flycatcher	*Myiarchus crinitus*	landbird	open deciduous or mixed woodland	limited range, ND and SD	B			0	10
Great Gray Owl	*Strix nebulosa*	landbird	deciduous or coniferous forest	rare	W				
Great Horned Owl	*Bubo virginianus*	landbird	variety of habitats		B			1	11
Greater Prairie-Chicken	*Tympanuchus cupido*	landbird	grassland and agricultural fields	rare, SD	Y	WL	IA	1	17
Greater Sage-Grouse	*Centrocercus urophasianus*	landbird	big sagebrush		B	WL	IA	18	19
Green-tailed Towhee	*Pipilo chlorurus*	landbird	woodland habitats, disturbed	MT, WY and Black Hills	B	S		0	14
Hairy Woodpecker	*Picoides villosus*	landbird	mature woodland		Y			1	12
Hammond's Flycatcher	*Empidonax hammondii*	landbird	mature coniferous or mixed woodland	limited range, MT and WY	B			0	12

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans					Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species ("Marshbirds")	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								3										
								4										
								3										
								2	1	S4B,SZN	3	X	X	X		X	X	
								2										
								3										
								2	2				X	X				
								3										
								2	1		4	X	X	X		X		
								3										
								3										
								4										
								2										
								4										
								2			4							
								3										
									2	S4						X	X	
								1	2	S2	2					X	X	Sy
								2										
								3										
								2										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Harris's Sparrow	*Zonotrichia querula*	landbird	deciduous trees, shrubs	important migrant	M	WL	MGMT		
Hermit Thrush	*Catharus guttatus*	landbird	woodland and edge habitats		B/M			0	9
Horned Lark	*Eremophila alpestris*	landbird	open, barren habitat		Y			6	13
House Finch	*Carpodacus mexicanus*	landbird	variety of habitats		Y			0	8
House Sparrow	*Passer domesticus*	landbird	human-modified areas		Y			0	10
House Wren	*Troglodytes aedon*	landbird	deciduous, open woodland		B			3	10
Indigo Bunting	*Passerina cyanea*	landbird	brushy to forested habitats		B	S		0	10
Lapland Longspur	*Calcarius lapponicus*	landbird	open ground, cropland stubble, grasslands		W	S	LPR		
Lark Bunting	*Calamospiza melanocorys*	landbird	grassland		B	S	MGMT	48	17
Lark Sparrow	*Chondestes grammacus*	landbird	open grassland and shrubland		B			8	13
Lazuli Bunting	*Passerina amoena*	landbird	brushy to forested habitats		B			5	15
Le Conte's Sparrow	*Ammodramus leconteii*	landbird	wet grassland	rare	B/M			0	14
Least Flycatcher	*Empidonax minimus*	landbird	mature deciduous and mixed woodland		B			1	9
Lewis's Woodpecker	*Melanerpes lewis*	landbird	woodland, pine		B	WL		3	17
Lincoln's Sparrow	*Melospiza lincolnii*	landbird	mixed deciduous, willow		B/M	S		0	9
Loggerhead Shrike	*Lanius ludovicianus*	landbird	grassland and shrubby areas, shelterbelts		B			6	14
Long-eared Owl	*Asio otus*	landbird	woodlands, dense or brushy vegetation		Y			0	13
MacGillivray's Warbler	*Oporornis tolmiei*	landbird	coniferous or mixed-deciduous	MT, WY and Black Hills	B			0	13
Marsh Wren	*Cistothorus palustris*	landbird	variety of wetlands	rare	B				
McCown's Longspur	*Calcarius mccownii*	landbird	semi-arid shortgrass steppe	MT, WY, and southwest ND	B	WL	LPR	13	20
Merlin	*Falco columbarius*	landbird	open and wooded areas		B/Y			0	12
Mountain Bluebird	*Sialia currucoides*	landbird	grassland with scattered trees, cavities		B	S		7	16

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon Watchlist 2002	TNC Northern Great Plains Steppe
								3				X					X	
								3										
								3										
								3										
								3										
								2										
								3										
								2	1	S5	4							
								3										
								3										
								2	2	S1S2B,SZN		X	X	X				
								3										
								2		S3B,S3N	3	X	X	X		X	X	
								3										
								2	2			X		X		X		
								3										
								3										
								3										
								2	3		4	X	X	X		X	X	
								2			3							
								3										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Mountain Chickadee	*Poecile gambeli*	landbird	montane coniferous forest	limited range in MT and WY	Y			0	10
Mourning Dove	*Zenaida macroura*	landbird	wooded areas		B			5	10
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*	landbird	wet grassland	rare	B/M	WL	LPR		
Northern Flicker	*Colaptes auratus*	landbird	woodland edge and open woodland		Y			2	13
Northern Goshawk	*Accipiter gentilis*	landbird	woodland		Y/W			1	15
Northern Harrier	*Circus cyaneus*	landbird	open grassland		B/Y			4	17
Northern Mockingbird	*Mimus polyglottos*	landbird	second-growth habitat		Y			0	9
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	landbird	open areas, exposed banks		B			1	14
Northern Saw-whet Owl	*Aegolius acadicus*	landbird	woodland	rare	W			0	13
Northern Waterthrush	*Seiurus noveboracensis*	landbird	wooded wetlands, swamps		B/M			0	10
Olive-sided Flycatcher	*Contopus cooperi*	landbird	montane and coniferous forest	MT and WY	B	WL		0	11
Orange-crowned Warbler	*Vermivora celata*	landbird	woodland, riparian		B/M			0	8
Orchard Oriole	*Icterus spurius*	landbird	woodland		B			2	11
Osprey	*Pandion haliaetus*	landbird	lakes, trees		B/M			0	11
Ovenbird	*Seiurus aurocapilla*	landbird	deciduous and mixed deciduous/coniferous		B			0	13
Peregrine Falcon	*Falco peregrinus*	landbird	variety of habitats		B	S		0	11
Pine Grosbeak	*Pinicola enucleator*	landbird	open coniferous forest		W	S			
Pine Siskin	*Carduelis pinus*	landbird	open coniferous forest		Y/M			2	11
Pinyon Jay	*Gymnorhinus cyanocephalus*	landbird	pinyon-juniper woodland	MT, WY and Black Hills	Y	WL		1	15
Plumbeous Vireo	*Vireo plumbeus*	landbird	montane and mixed forest	limited range, Black Hills	B			5	13
Prairie Falcon	*Falco mexicanus*	landbird	open habitats, cliffs or bluffs		Y/W			7	17
Pygmy Nuthatch	*Sitta pygmaea*	landbird	long-needled pine forest	limited range, Black Hills	Y			0	14
Red Crossbill	*Loxia curvirostra*	landbird	mature coniferous forest		Y			4	12

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								3										
								3										
								1	1			X		X			X	
								3										
								2		23B,S2N						X		
								2	2			X		X		X		
								3										
								3										
								2										
								3										
								1				X				X	X	
								3										
								3		S1B,SZN								
								3										
								3										
								2	3	SXB,SZN	3	X	X	X		X		Py
								3										
								3										
								2									X	
								2	2			X	X	X				
								2			4							
								3										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Red-breasted Nuthatch	*Sitta canadensis*	landbird	mature coniferous forest, mixed woodland		Y			4	10
Red-eyed Vireo	*Vireo olivaceus*	landbird	deciduous and mixed deciduous/coniferous		B			0	12
Red-headed Woodpecker	*Melanerpes erythrocephalus*	landbird	deciduous woodland		B	WL	MGMT	1	15
Red-naped Sapsucker	*Sphyrapicus nuchalis*	landbird	coniferous, deciduous and riparian	MT, WY and Black Hills	B	S		4	14
Red-tailed Hawk	*Buteo jamaicensis*	landbird	variety of habitats		B/Y			2	11
Red-winged Blackbird	*Agelaius phoeniceus*	landbird	wetlands and upland habitats		B/Y			4	10
Ring-necked Pheasant	*Phasianus colchicus*	landbird	grassland and agricultural fields		Y			0	13
Rock Dove	*Columba livia*	landbird	human-modified areas		Y			0	8
Rock Wren	*Salpinctes obsoletus*	landbird	arid, semiarid, exposed rock, outcroppings		B			3	14
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	landbird	variety of habitats		M			0	12
Ruby-crowned Kinglet	*Regulus calendula*	landbird	variety of habitats, woodlands		B			1	10
Ruffed Grouse	*Bonasa umbellus*	landbird	aspen woodland, mixed deciduous	limited range, Black Hills	Y			0	12
Rufous Hummingbird	*Selasphorus rufus*	landbird	montane meadows, second growth-mature forest	western WY and MT	B/M	WL			
Rusty Blackbird	*Euphagus carolinus*	landbird	wet coniferous and mixed forest		M	WL	MGMT		
Sage Sparrow	*Amphispiza belli*	landbird	shrubland, big sagebrush	primarily WY	B	S		0	14
Sage Thrasher	*Oreoscoptes montanus*	landbird	big sagebrush, shrub-steppe	MT and WY	B	S		1	15
Savannah Sparrow	*Passerculus sandwichensis*	landbird	open grassland		B			1	10
Say's Phoebe	*Sayornis saya*	landbird	open areas, grassland, badlands		B			10	15
Sedge Wren	*Cistothorus platensis*	landbird	variety of wet habitats	rare	B/M			0	12
Sharp-shinned Hawk	*Accipiter striatus*	landbird	woodland		B/W			1	13

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies						Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species ("Marshbirds")	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2		Audubon WatchList 2002	TNC Northern Great Plains Steppe
								2	2			X		X				X	
								3				X	X	X					
								3											
								3											
								4											
								4											
								3											
								4											
								3											
								3											
								3				X						X	
								3										X	
								3			4					X			
								3			4								
								3											
								3											
								1	2			X							
								2											

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Sharp-tailed Grouse	*Tympanuchus phasianellus*	landbird	grassland, interspersed shrubs		B	S	LPR	29	16
Short-eared Owl	*Asio flammeus*	landbird	open grassland		B/Y	WL	MGMT	3	17
Smith's Longspur	*Calcarius pictus*	landbird	grassy flats, pastures, stubble fields		M	WL	LPR		
Song Sparrow	*Melospiza melodia*	landbird	variety of habitats		B/W			0	8
Spotted Towhee	*Pipilo maculatus*	landbird	dense brush or thickets		B			6	12
Sprague's Pipit	*Anthus spragueii*	landbird	open grassland	ND, MT and northwest SD	B	WL	MGMT	9	18
Steller's Jay	*Cyanocitta stelleri*	landbird	coniferous and mixed coniferous-deciduous	rare	Y	S			
Swainson's Hawk	*Buteo swainsoni*	landbird	open areas with scattered trees, agricultural areas		B	WL	MGMT	6	14
Swainson's Thrush	*Catharus ustulatus*	landbird	coniferous forest	limited range	B			0	10
Townsend's Solitaire	*Myadestes townsendi*	landbird	open to dense forest, juniper		W/Y			6	14
Tree Swallow	*Tachycineta bicolor*	landbird	open areas, cavities		B			0	8
Turkey Vulture	*Cathartes aura*	landbird	mixed farmland and forest		B			0	9
Veery	*Catharus fuscescens*	landbird	damp deciduous forest, riparian	limited range	B			0	12
Vesper Sparrow	*Pooecetes gramineus*	landbird	open habitats, edges		B			11	15
Violet-green Swallow	*Tachycineta thalassina*	landbird	open woodlands	MT and WY	B			1	9
Warbling Vireo	*Vireo gilvus*	landbird	mature mixed deciduous woodland		B			1	11
Western Kingbird	*Tyrannus verticalis*	landbird	variety of habitats		B			6	10
Western Meadowlark	*Sturnella neglecta*	landbird	open grassland		B			21	14
Western Tanager	*Piranga ludoviciana*	landbird	open coniferous and mixed coniferous/ deciduous	MT, WY and Black Hills	B			1	11
Western Wood-Pewee	*Contopus sordidulus*	landbird	woodland and forest edge, riparian		B			3	12
White-breasted Nuthatch	*Sitta carolinensis*	landbird	mature deciduous and mixed woodland		Y			1	11

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marsh birds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList2002	TNC Northern Great Plains Steppe
								3	2									
								3	2		4	X	X	X		X	X	
								4				X						
								3										
								3										
								2	1	S2B,SZN		X	X	X			X	Sy
								3										
								2	1		4	X		X			X	
								3										
								3										
								3										
								2										
								2										
								3										
								3										
								3										
								3										
								3										
								3										
								3										
								2										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
White-crowned Sparrow	*Zonotrichia leucophrys*	landbird	thickets, grass, bare ground		W/Y			0	8
White-throated Swift	*Aeronautes saxatalis*	landbird	cliffs, canyons, human-made structures	MT, WY and Black Hills	B	WL		7	16
Wild Turkey	*Meleagris gallopavo*	landbird	woodland, riparian		Y			8	12
Willow Flycatcher	*Empidonax traillii*	landbird	woodland edge, riparian		B	WL	MGMT	1	11
Yellow Warbler	*Dendroica petechia*	landbird	wet, deciduous woodland		B			2	12
Yellow-billed Cuckoo	*Coccyzus americanus*	landbird	woodlands, associated with water	SD, and small area of MT and WY	B			0	12
Yellow-breasted Chat	*Icteria virens*	landbird	shrubby, woodland areas		B/M			2	12
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	landbird	wetlands		B	S		2	12
Yellow-rumped Warbler	*Dendroica coronata*	landbird	mature coniferous or mixed coniferous/ deciduous	auduboni, limited range	B			1	10
American Avocet	*Recurvirostra americana*	shorebird	alkaline wetlands, islands		B/M				
American Golden-Plover	*Pluvialis dominica*	shorebird	wetlands and grassland		M				
Baird's Sandpiper	*Calidris bairdii*	shorebird	wetland		M				
Black-bellied Plover	*Pluvialis squatarola*	shorebird	large wetlands or lakes, flooded fields		M				
Buff-breasted Sandpiper	*Tryngites subruficollis*	shorebird	shortgrass, wetlands		M				
Dunlin	*Calidris alpina*	shorebird	wetlands		M				
Greater Yellowlegs	*Tringa melanoleuca*	shorebird	wetlands		M				
Hudsonian Godwit	*Limosa haemastica*	shorebird	wetlands		M				
Killdeer	*Charadrius vociferus*	shorebird	sand, gravel areas, wetlands		B/M				
Least Sandpiper	*Calidris minutilla*	shorebird	wetlands		M				
Lesser Yellowlegs	*Tringa flavipes*	shorebird	wetlands		M				
Long-billed Curlew	*Numenius americanus*	shorebird	short grassland		B/M				
Long-billed Dowitcher	*Limnodromus scolopaceus*	shorebird	wetlands		M				
Marbled Godwit	*Limosa fedoa*	shorebird	wetlands and grassland		B/M				
Mountain Plover	*Charadrius montanus*	shorebird	short grassland		B/M				
Pectoral Sandpiper	*Calidris melanotos*	shorebird	wetlands		M				

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans					Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
								3										
								3									X	
								4										
								3			3						X	
								3										
								2			2							
								2										
								3										
								3										
	3	4							2									
	4	4						4				X	X	X			X	
	2	3																
	3	3																
	4	4						4				X		X			X	
	3	4						4										
	3	3																
	4	4						4				X					X	
	3	3						3										
	3	3																
	3	3																
	5	2						1	1	S3B,SZN	3	X	X	X		X	X	
	2	3																
	4	4						2	1	S5		X	X	X			X	
	5	5						1			4	X	X	X		X	X	Py
	2	3																

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Piping Plover	*Charadrius melodus*	shorebird	sandbars, alkaline wetlands/lakes		B/M				
Red Knot	*Calidris canutus*	shorebird	wetlands		M				
Ruddy Turnstone	*Arenaria interpres*	shorebird	wetlands		M				
Semipalmated Plover	*Charadrius semipalmatus*	shorebird	wetlands		M				
Semipalmated Sandpiper	*Calidris pusilla*	shorebird	wetlands		M				
Solitary Sandpiper	*Tringa solitaria*	shorebird	wetlands		M				
Spotted Sandpiper	*Actitis macularia*	shorebird	grassland, sagebrush, woodland		B/M				
Stilt Sandpiper	*Calidris himantopus*	shorebird	wetlands	long-distance migrant, stops in ND	M				
Upland Sandpiper	*Bartramia longicauda*	shorebird	grassland		B/M				
Whimbrel	*Numenius phaeopus*	shorebird	wetlands, fields		M				
White-rumped Sandpiper	*Calidris fuscicollis*	shorebird	wetlands		M				
Willet	*Catoptrophorus semipalmatus*	shorebird	grassland and wetlands		B/M				
Wilson's Phalarope	*Phalaropus tricolor*	shorebird	grassland and wetlands		B/M				
Wilson's Snipe	*Gallinago delicata*	shorebird	wetlands and grassland		B/M				
American Bittern	*Botaurus lentiginosus*	waterbird	wetlands and grassland		B				
American Coot	*Fulica americana*	waterbird	wetland		B				
American White Pelican	*Pelecanus erythrorhynchos*	waterbird	large lakes, islands		B				
Black Tern	*Chlidonias niger*	waterbird	wetlands		B				
Black-crowned Night-Heron	*Nycticorax nycticorax*	waterbird	variety of wetlands	ND and SD	B				
Bonaparte's Gull	*Larus philadelphia*	waterbird	lakes, rivers, wetlands, boreal forest		M				
California Gull	*Larus californicus*	waterbird	lakes, rivers, islands		B/M				
Caspian Tern	*Sterna caspia*	waterbird	isalnds in rivers and lakes	rare	B				
Cattle Egret	*Bubulcus ibis*	waterbird	disrupted habitats, rangeland, woodland		B/M				
Clark's Grebe	*Aechmophorus clarkii*	waterbird	wetlands		B				

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
	5	5						1	2	S2B,SZN					T		X	Py
	4	2						4				X					X	
	4	4						4										
	2	3																
	3	4						4										
	4	3										X		X				
	2	3						3										
	3	3										X						
	4	4						2	1		4	X	X	X				
	4	4						4									X	
	2	4						4										
	3	3						3	1	S5								
	4	4						3	1	S4		X	X	X			X	
	3	3						3										
				HC				2	1		3					X		
				LC				3										
			MC					3	1	S3B,SZN	3							Py
			MC					1	1	S3B,SZN	3					X		
			MC					2			3							
			MC					4										
			MC					3										
			LC					2			3							
			NR					3										
			LC					3										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Common Loon	*Gavia immer*	waterbird	wooded lakes	limited range	B				
Common Tern	*Sterna hirundo*	waterbird	islands	rare	B				
Double-crested Cormorant	*Phalacrocorax auritus*	waterbird	wetlands and lakes		B				
Eared Grebe	*Podiceps nigricollis*	waterbird	wetlands		B				
Forster's Tern	*Sterna forsteri*	waterbird	marshes, wetlands with vegetation	rare	B				
Franklin's Gull	*Larus pipixcan*	waterbird	wetlands and lakes		B				
Great Blue Heron	*Ardea herodias*	waterbird	wetlands, slow-moving water		B				
Horned Grebe	*Podiceps auritus*	waterbird	wetlands		B/M				
Interior Least Tern	*Sterna antillarum*	waterbird	sandbars, sparsely vegetated	Missouri River	B				
Pied-billed Grebe	*Podilymbus podiceps*	waterbird	wetlands		B				
Red-necked Grebe	*Podiceps grisegena*	waterbird	wetlands and lakes	rare	B				
Ring-billed Gull	*Larus delawarensis*	waterbird	lakes, islands		B				
Sandhill Crane	*Grus canadensis*	waterbird	shallow lakes, marshes, crop stubble fields		M				
Snowy Egret	*Egretta thula*	waterbird	trees around wetlands	rare	B				
Sora	*Porzana carolina*	waterbird	wetlands		B				
Virginia Rail	*Rallus limicola*	waterbird	wetlands		B				
Western Grebe	*Aechmophorus occidentalis*	waterbird	wetlands and lakes		B				
White-faced Ibis	*Plegadis chihi*	waterbird	wetlands	rare	B				
Whooping Crane	*Grus americana*	waterbird	shallow lakes, marshes, harvested crop		M				
American Wigeon	*Anas americana*	waterfowl	grassland and wetlands		B/Y				
Blue-winged Teal	*Anas discors*	waterfowl	grassland and wetlands		B				
Bufflehead	*Bucephala albeola*	waterfowl	small lakes, wetlands		W/M				
Canada Goose	*Branta canadensis*	waterfowl	variety of habitats		B/W				
Canvasback	*Aythya valisineria*	waterfowl	small lakes, wetlands	primarily in western SD	B				
Cinnamon Teal	*Anas cyanoptera*	waterfowl	wetlands	MT and WY	B				
Common Goldeneye	*Bucephala clangula*	waterfowl	mature wooded ponds, lakes		W/M				
Common Merganser	*Mergus merganser*	waterfowl	mature wooded ponds, lakes, rivers		B/W				

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species ("Marshbirds")	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
				MC				1			1							
			LC					2				X						
			NR					3										
			MC					3										
			MC					2			3							
			MC					2	1		3							Sy
			NR					3			4							
				HC				2	1									
			HC					1	2	S2B,SZN		X			E			Py
				HC				3										
				MC				2										
			NR					3										
				LC							3							
			HC								3							
				HC				3										
				MC				3			3							
			MC					2			4							
			LC					2			3							
				HC				1	3	SZN					E		X	Py
					MH	MH	MH	3										
					MH	MH	MH	3										
					M	ML	ML	3										
					M			3										
					MH	ML	ML	2	2		3							
								3										
					MH			3										
								3										

						LANDBIRDS			
Common Name	Scientific Name	Group	Habitat	Comments for the NGPJV area or BCR 17	Status in BCR 17	PIF North American Landbird Conservation Plan	PIF Species of Continental Importance - Prairie Avifaunal Biome	2005 Species Assessment - % of Population in BCR 17	2005 Regional Combined Breeding Score for BCR 17
Gadwall	*Anas strepera*	waterfowl	grassland and wetlands		B				
Green-winged Teal	*Anas crecca*	waterfowl	wooded ponds, grasslands, wetlands		B/Y				
Harlequin Duck	*Histrionicus histrionicus*	waterfowl	fast-flowing streams, riparian	very limited in MT and WY	B				
Hooded Merganser	*Lophodytes cucullatus*	waterfowl	wooded wetlands		M				
Lesser Scaup	*Aythya affinis*	waterfowl	wetlands		B/M				
Mallard	*Anas platyrhynchos*	waterfowl	grassland and wetlands		B				
Northern Pintail	*Anas acuta*	waterfowl	grassland and wetlands		B				
Northern Shoveler	*Anas clypeata*	waterfowl	grassland and wetlands		B				
Redhead	*Aythya americana*	waterfowl	wetlands		B				
Ring-necked Duck	*Aythya collaris*	waterfowl	shallow lakes, impoundments	rare	B/M				
Ruddy Duck	*Oxyura jamaicensis*	waterfowl	wetlands		B				
Trumpeter Swan	*Cygnus buccinator*	waterfowl	wetlands and lakes	limited range	B				
Wood Duck	*Aix sponsa*	waterfowl	riparian, wooded ponds, rivers		B				

	SHOREBIRDS		WATERBIRDS		WATERFOWL			Wildlife Action Plans				Federal Agencies					Non-governmental	
	US Shorebird Conservation Plan (USSCP)	Northern Plains/Prairie Potholes Regional Shorebird Conservation Plan	Waterbird Conservation for the Americas (NAWCP)	Conservation Status and Distribution of Solitary-Nesting Waterbird Species (*Marshbirds*)	NAWMP Continental Priority (WCR17)	NAWMP Breeding Importance (WCR17)	NAWMP Breeding Need (WCR17)	Montana	North Dakota	South Dakota	Wyoming	USFWS Birds of Conservation Concern National	USFWS Birds of Conservation Concern - BCR 17	USFWS Birds of Conservation Concern Region 6	Federal Threatened, Endangered or Candidate Species	USFS Sensitive Species Region 2	Audubon WatchList 2002	TNC Northern Great Plains Steppe
					M	MH	MH	3										
					M	ML	ML	3										
								1			3					X		
								2										
					H	ML	M	3			3							
					H	MH	H	3										
					H	MH	H	3	2		3							
					M	MH	MH	3										
					MH	ML	ML	2	2		3							
					M	ML	ML	3										
								3										
					M	H	H	1		S3	2					X	X	
								3										

Appendix 2: NGPJV Charter, Management Board and Technical Committee

Board Charter for the Northern Great Plains Joint Venture

Preamble

The purpose of the Northern Great Plains Joint Venture (NGPJV) is to achieve the habitat objectives for major migratory and resident bird initiatives in the defined areas of Montana, Wyoming, North Dakota, South Dakota and Nebraska. The NGPJV is the first all-bird joint venture, and as such assumes the responsibility of serving as a leader in promoting all-bird conservation projects to the larger bird conservation community. The program includes the identification and implementation of landscape scale and site-specific bird habitat protection, restoration and enhancement projects as well as programs designed to provide support to landowners and resource managers and to influence federal, state and local conservation legislation that promotes policy and resource allocations that lead to the conservation of critical avian habitat. The success of the NGPJV is clearly a vested responsibility of joint venture coordinator and the board.

Charter

The Board is responsible for giving support, guidance and direction to the joint venture coordinator for overall administration of the joint venture, including, but not limited to, finance, project and resource and policy issues: i.e. the Farm Bill and NAWCA. It provides guidance to the state steering committees and technical committees and overview of their programs. Prioritization of and advocacy for proposed projects and budget requests to the North American Wetlands Conservation Council is also the responsibility of the Board.

The Board is co-chaired. An individual from a government agency will fill one chair and the other will be filled by an individual form the private or NGO sector. Co-chairs are responsible for working with the coordinator to develop agendas for meeting and for ensuring that regular and substantive communications with the board are ongoing. The remainder of the Board consists of the directors of the state and fish and wildlife agencies or their designees, directors of federal agencies or their designees and representatives of any organization that can demonstrate the desire and ability to make a significant contribution toward the accomplishment of joint venture objectives.

The Board convenes at least semiannually and meetings will alternate between the representative states. Meetings will be scheduled for appropriate times to approve annual work plans and budget submissions. If Board members are unable to attend, they are encouraged to provide an alternate.

Bylaws

1. Board membership shall not exceed twenty members.
2. The co-chairs shall be nominated and elected by the board with the first election occurring at the May 2002 meeting.

3. Co-chairs will be elected to 2 year staggered terms.
4. A co-chair may not serve more the two consecutive terms.
5. The board, in consultation with the coordinator has the ability to appoint committees to help carry on the work of the joint venture.
6. Committee members do not have to be joint venture board members.
7. Current members of the board approve the addition of new board members.
8. Attendance at meetings is important. The board may remove a member form the board for failure to attend three consecutive meetings.

Northern Great Plains Joint Venture Management Board

Staff

Ken Sambor – Coordinator – Northern Great Plains Joint Venture
ksambor@nd.gov

Duane B. Pool – Science Coordinator – Northern Great Plains Joint Venture
dpool@nd.gov

Chairman of the Board

Greg Link - North Dakota Game and Fish Department
glink@nd.gov

Members

Marian Atkins - US Bureau of Land Management
marian_atkins@blm.gov

Bruce Bigalke - Pheasants Forever
bbigalke@pheasantsforever.org

Mike Caskey - Fidelity Exploration and Production Company
mike.caskey@fidelityepco.com

Bryce Christensen - Montana Fish, Wildlife and Parks
bchristensen@mt.gov

Paul Coughlin - South Dakota Game, Fish & Parks
paul.coughlin@state.sd.us

Dave Dewald - Natural Resources Conservation Service
dave.dewald@usda.gov

Ray Johnson - National Audubon Society
rjohnson@audubon.org

Greg Link - North Dakota Game and Fish Department
glink@nd.gov

Bob McCready - The Nature Conservancy
bmccready@tnc.org

Richard Nelson - Bureau of Reclamation
rnelson@gp.usbr.gov

Dave Pieper - US Forest Service
dpieper@fs.fed.us

Larry Roberts – Wyoming Game and Fish
Larry.roberts@wgf.state.wyo.us

Christine Scott - Board of Governors - The Nature Conservancy
cscott@mcn.net

Rick Warhurst - Ducks Unlimited
rwarhurst@ducks.org

Kevin Willis - US Fish and Wildlife Service
kevin_willis@fws.gov

Northern Great Plains Joint Venture Science and Technical Committee

Committee Chairperson
Duane B. Pool – Science Coordinator – Northern Great Plains Joint Venture
dpool@nd.gov

Members
Jane Austin – USGS Northern Prairie Wildlife Research Center
Jane_austin@usgs.gov

Doug Backlund, South Dakota Game, Fish & Parks
Doug.backlund@state.sd.us

Steve Fairbairn - US Fish and Wildlife Service
Steve_fairbairn@fws.gov

Sandra Hagen - North Dakota Game and Fish Department
shagen@state.nd.us

Dave Hanni – Rocky Mountain Bird Observatory
Dave.hanni@rmbo.org

Jim Hansen - Montana Fish, Wildlife and Parks
jihansen@mt.gov

Bryce Krueger – Wyoming Game and Fish
Bryce.kruege@wgf.state.wy.us

Chad Lehman – National Wild Turkey Federation
turkeys@gwtc.net

Brian Martin – The Nature Conservancy
bmartin@tnc.org

Scott Mcleod - Ducks Unlimited
smcleod@ducks.org

Boyd Schulz – USFWS
Boyd_schulz@fws.gov

Dan Svingen – USFS, Dakota Prairie Grasslands
Dsvingen@fs.fed.us

Appendix 3: PIF Five Elements Process *(Tom C. Will et al.)*

The Five Elements Process:

Designing Optimal Landscapes to Meet Bird Conservation Objectives
Partners in Flight Technical Series No. 1 September 2005
The Five Elements Process: Designing Optimal Landscapes to Meet Bird Conservation Objectives

September 2005

Authors
Tom C. Will – U.S. Fish and Wildlife Service
Janet M. Ruth – Biological Resources Division, U.S. Geological Survey
Kenneth V. Rosenberg – Cornell Laboratory of Ornithology
Dave Krueper – U.S. Fish and Wildlife Service
Deborah Hahn – International Association of Fish and Wildlife Agencies
Jane Fitzgerald – American Bird Conservancy
Randy Dettmers – U.S. Fish and Wildlife Service
Carol J. Beardmore – U.S. Fish and Wildlife Service

Suggested Citation:
Will, T. C, J. M. Ruth, K. V. Rosenberg, D. Krueper, D. Hahn, J. Fitzgerald, R. Dettmers, C. J. Beardmore. 2005. The five elements process: designing optimal landscapes to meet bird conservation objectives. Partners in Flight Technical Series No. 1. Partners in Flight website: http://www.partnersinflight.org/pubs/ts/01-FiveElements.pdf.

Primary contact: Tom_Will@fws.gov

The Five Elements Process: Designing Optimal Landscapes to Meet Bird Conservation Objectives

In February 2004 at Port Aransas, Texas, Partners in Flight (PIF) and representatives from the other NABCI bird initiatives met to discuss the process of stepping down PIF continental population objectives (Rich et al. 2004) to regional and local scales. Participants also discussed rolling up local population estimates and targets to assess the feasibility of the landscape changes necessary to meet continental objectives. Since the process of stepping-down/rolling-up population objectives shifts focus from identifying priority species to formulating quantitative estimates of *how much* habitat was needed, *where*, and *by when*, the Port Aransas group called the stepping-down/rolling-up process "stepping forward."

Participants agreed that stepping forward objectives was the beginning of an inevitably iterative dialog necessary to evaluate the assumptions of PIF population estimates and objectives as well as the methods used to monitor local implementation. To facilitate the translation of continental population objectives into biologically sound, measurable regional and local population-based habitat targets, the Port Aransas group recommended a process now commonly referred to as the ***Five Elements Process***.

In essence, the Five Elements represent components of a process by which biologically-based, spatially explicit, landscape-oriented habitat objectives can be developed for supporting and sustaining bird populations at levels recommended through the objectives set by PIF (or any of the bird conservation initiatives). The Five Elements comprise a conceptual approach through which conservation partner's work together to assess current habitat conditions and ownership patterns, evaluate current species distributions and bird-habitat relationships, and determine where on the landscape sufficient habitat of different types can be delivered for supporting bird population objectives.

The Five Elements Process assumes that population objectives already have been proposed at a regional level (e.g., at a Bird Conservation Region [BCR] or other physiographic area scale) and is intended to facilitate explicit, science-based recommendations on where habitat protection, enhancement, or management would be most efficiently implemented to achieve those population objectives. Thus the stepping down of continental population objectives into regional-scale population targets is a preliminary step that needs to occur prior to the biological planning recommended by the Five Elements.

As suggested by the "stepping forward" concept above, the step-down process should include feedback loops to evaluate the appropriateness of continental population objectives at the regional and local level. Local and regional assessments of population size and population objectives should feed back up to the continental level to help adjust continental objectives to reflect realities on the ground.

The Five Elements Process is not new—it is similar to the implementation planning described by Donovan et al. (2000), is based heavily on the thinking and practice of the biological planners in the Lower Mississippi Valley Joint Venture (JV) and the Habitat and Population Evaluation Teams of the Prairie Pothole JV, and is already being applied in various forms in several other JVs and BCRs across the country. However, by more clearly articulating a process for developing habitat objectives based on current biological thinking, on the best available information on habitats and birds, and on partnerships, PIF hopes this approach to turning bird conservation plans into habitat implementation actions will be more widely and consistently applied by organizations participating in efforts to conserve our North American avifauna.

The Five Elements are presented in a sequential order, but they need not necessarily be undertaken in this sequence, and in some cases it may be most effective to work on several Elements at the same time. In considering each of the Elements, it is important to keep in mind three guiding principles:

► Products are important, but perhaps less so than the process. The actual maps generated by geographic information systems (GIS) are the products of data sets with many limitations and innumerable assumptions, both spatial and biological, and a map isolated from the process can sometimes be more misleading than no map at all. Ideally, decision and policy makers should be as involved in the biological thought process as possible. Even for technical biologists, an interactive workshop that uses tools to evaluate geospatial hypotheses provides a

vastly more productive and valid context than does a non-transparent, "black box" process that transfers habitat objectives from coarser to finer scales.

► Good models are central to the process. We use models in the most generic sense: simplifications of reality that serve first and foremost to add organization, clarity, and transparency to the thought process. Good models need not be complex, nor do they even need to be highly technical or mathematical. Rather, good models should be based on clearly defined objectives, should clearly highlight assumptions, and should be as simple as possible relative to the objectives. Asking the right questions at the outset and keeping models on track with those questions is a better guarantee of success than is high technology—as is continually recognizing the distinction between the model world and the real world. For a good introduction to modeling, see Starfield et al. (1990).

► A consideration of appropriate scale is critical at every step. For example, fine-scale spatial habitat data may be useless and misrepresentative at broad regional scales—and may not even be appropriate at all for linking birds to habitat. On the other hand, the seamless data layers available for assessments at regional scales will not provide the management-focused information needed at local scales. The models we propose and the questions we ask of spatial habitat assessments must be tailored to the scale and resolution of the input data sets. Even the form in which population objectives are expressed is scale-dependent—for example, population objectives for local scales may be more appropriately defined as vital rates or demographic parameters than as numbers of individuals.

THE FIVE ELEMENTS

1. Landscape Characterization and Assessment. A landscape-scale characterization of the current amount and condition of habitat types across an ecoregion and an assessment of their ability to support and sustain bird populations is fundamental to the development of meaningful population based habitat objectives. The characterization should not only describe the current amounts of
different habitat types across an ecoregion but also summarize patch characteristics and landscape configurations that define the ability of a landscape to sustain healthy bird populations. At the ecoregional scale, habitat classification might be limited to remotely-sensed satellite data sets (e.g., the National Land Cover Database or NLCD), but the best available data should be used. A characterization of the historical range of variability in the configuration of habitats, disturbance regimes, and ecological capacity of the region should also be part of Element 1, when feasible (i.e., what do soil, climate, geology, aspect, etc. suggest about a landscape's suitability for a particular habitat?). Ultimately, the landscape characterization should provide the capacity to assess the relative contributions of different land parcels to meet conservation objectives most efficiently. The characterization could be done from the perspective of a PIF priority species, a species suite, a representative focal species, or a habitat/systems approach, depending on what the focus of the conservation objectives are. However, if the ultimate goal is to find optimal solutions for providing habitat for species or species suites with conflicting needs, then the characterization should reflect all of the species/habitats of interest.

The assessment portion of Element 1 should utilize the information from the landscape

characterization, along with the best available knowledge on macro-scale bird-habitat relationships, to describe the current ability of the ecoregion to support priority species. Initial emphasis should be on identifying those patches or areas of high-quality habitat that would be most likely to sustain source populations of priority species at the regional level. Models of macro-scale bird-habitat relationships which deal with the spatial configuration and arrangement of habitats across the landscape (i.e., at the patch size up to regional scale) should enable the identification across the ecoregion of habitat types, patch sizes, and landscape configurations that will provide high quality habitat for priority species or habitat suites. The best available information on landscape-level habitat relationships should always be used, but if detailed information is not yet available, starting with relatively simple assumptions about what the relationships might be still will identify important assumptions about macro-scale bird-habitat relationships that can then be tested. With relatively simple conceptual models of bird-habitat relationships at coarse scales, even NLCD data can be used to develop informative decision-support tools. Micro-scale habitat relationships dealing with the associations of bird abundance or density with vegetation structure and composition are also critically important in assessing the ability of a landscape to support a certain population level: these types of models are incorporated in Element 2 of the overall process.

The goal for Element 1 should be a clear understanding of where priority landscapes for bird conservation might be located, given current amounts and configurations of the different habitat types found across an ecoregion.

2. Bird Population Response Modeling. Incorporated with the macro-scale relationships from Element 1, more sophisticated models relating micro-scale vegetation structure with demographic parameters provide powerful tools for assessing, predicting, and monitoring how bird populations will respond to landscape change and land management activities. Such tools need to be more widely developed and applied, with the recognition that they will require a greater commitment of resources.

The simplest models used to translate population objectives into habitat objectives simply divide a species population objective by its average habitat-specific breeding density in the region to produce a target number of hectares of the given habitat. The more informative response models we recommend are intended to help answer questions such as how species respond to changes in patch size, amounts of edge, interconnectivity of habitat parcels, landscape context, predator density, or specific management practices (silviculture, prescribed burning regimes) that alter vegetation structure or seral stage. These models should help us to evaluate the potential effects of different management alternatives on bird populations within an ecoregion and thereby allow us to develop hypotheses regarding what set of management actions are most likely to result in population responses that will move existing bird populations toward stated population objectives. It is important to remember that such models should be developed to fit conservation objectives, not the other way around. We should build “purposeful” models—models that are sensitive to clearly defined objectives and to the scale of their relevance. Models that evaluate regional environmental sensitivity (macro-scale models incorporating elements of landscape configuration) are different from models that

evaluate management actions (micro-scale models incorporating elements of vegetation response or changes in seral stages), but they both are needed to help us determine "how much is enough" with regard to translating bird population objectives into habitat objectives.

The end product of Element 2 should be spatially-explicit habitat goals for supporting population objectives of priority species. Other things to consider in building population response models to help set habitat objectives:

- For local scales—and perhaps even for some regional scales—population objectives should be expressed in terms consistent with monitoring and evaluation parameters that can provide useful information about the effectiveness of management. These kinds of population objectives are sometimes referred to as "P2 objectives" —objectives expressed in terms of vital rates (e.g., recruitment, reproductive success, survival) rather than population abundance. At the local scale, population size is often influenced by factors outside of the local area, so monitoring vital rates can provide a better indication of how a local area is contributing to population goals at larger scales (see further discussion under Element 5). P2 objectives provide a link between continental and local population objectives and also between regional planning and management.
- These models can be developed for single species, for a suite of priority species, or for other targets appropriate for a given ecoregion. The relative cost of developing more sophisticated models suggests that the most economical and effective approach might be to start with a suite of ***focal species*** that would capture most of the needs of priority species in a habitat class at broad regional scales or which would reflect particular "management opportunities" at finer scales within a habitat class (e.g., early-successional Jack Pine barrens, broadleaf forest thinned to create a well-developed understory, hayed grasslands with embedded small wetlands).
- Relative to the degree a landscape has changed from its historical condition, solutions and the modeling approaches needed to arrive at those solutions can be very different in different systems. In highly degraded systems, models might be needed to target acquisition strategies (e.g., historic wetland basins). At the other end of the spectrum, in less degraded systems (e.g. heavily forested areas), models might focus on management or policy (shifting mosaic strategies).
- Within the adaptive management framework, good models create a connection between management and science in that they articulate the assumptions that generate the hypotheses requiring testing in the next iteration of research.

3. Conservation Opportunities Assessment. Not all patches of similar habitat will have similar futures, depending in part on who owns and manages the land. Models developed in Elements 1 and 2 can be used to quantify the cumulative contributions of current holdings in the traditional conservation estate (mostly public lands) as well as the capacity of (mostly private) lands owned by others to contribute toward population objectives for priority species within an ecoregion. The assessment of conservation opportunity should also include recommendations on how land management activities might be modified to improve both the quantity and quality of priority habitats. Lands

owned by people outside the traditional conservation partnership can contribute substantially to meeting habitat needs for priority species, but practical management opportunities on these lands may be limited. The development of useful strategies to help willing landowners to contribute meaningfully to conservation objectives need to be carefully articulated. A recent example of the application of the concepts of Element 3 is the approach developed for the New England/Mid-Atlantic Coast (BCR 30) by the College of William and Mary Center for Conservation Biology (http://fsweb.wm.edu/ccb/habitat/habitat_home.cfm). The Nature Conservancy, the U.S. Forest Service, and the Bureau of Land Management also have assessed opportunity in their regional land planning processes.

Suggested activities of a patch-based GIS analysis of conservation opportunities include:

- Identification of land ownership, on a parcel by parcel basis, within a region.
- Identification of land managers/contacts for partner-owned lands in order to develop a communications network for distributing information on collective capacity and management recommendations for meeting conservation objectives. To the extent possible, it would be helpful to do the same for lands owned outside of the conservation partnership—especially with regard to recruiting nontraditional partners and for making management guidelines readily available to those who might be interested.
- Using models developed through Elements 1 and 2, an assessment of the cumulative capacity of priority habitats under various ownerships to support population objectives of priority species.
- A status evaluation of partner-owned (and all) lands relative to regional conservation objectives: To what extent do partners contribute toward regional objectives? Across all lands, are the regional objectives being met? Are there shortfalls in reaching regional objectives?
- Development of parcel-specific recommendations to direct local management toward achieving regional conservation objections as well as a strategy to communicate these management recommendations to the specific land managers/contacts for those parcels.
- Consideration of other means for achieving regional conservation objectives, such as bringing additional land-owners into the conservation partnership or otherwise influencing management of lands not already under the influence of the partnership.

4. Optimal Landscape Design. A huge challenge of all-bird conservation planning is the development of synthetic models that bring together conservation strategies and landscape design—models that integrate the needs of priority species, landscape capability, opportunity cost (economics), and partnership potential into proposed optimal solutions for meeting the conservation objectives of the entire set of priority bird/habitat suites within an ecoregion. Landscape designs that accommodate all the needs of all priority birds within a region will inevitably involve mutually exclusive choices at local levels (e.g., managing for forest vs. shrubland vs. grassland). It is important to realize at the outset that resolving opportunity trade-offs will require social resources typically

found outside the purview of biologists—thoughtful meeting management, skillful and flexible facilitation, conflict resolution, decision analysis, and professional communication of transparent decision-making.

Social resource tools need to be included in the conservation toolbox along with the biological models of Elements 1 and 2. For examples of the facilitation of multi-stakeholder collaboration, see the publications page of the U.S. Institute for Environmental Conflict Resolution (http:// www.ecr.gov/s_publications.htm); for an introduction to decision analysis, see Skinner (1999). Implementation of a proposed optimal conservation landscape design requires a shared conservation strategy among entire communities of partners. The development of successful "community-based" conservation strategies will likely require a major paradigm shift in the way we typically practice management. Partners at all local scales need to move from the attempt to attract a hand-picked range of diversity to their parcels toward a perspective that asks the question: How can we best contribute toward overall regional conservation goals? Successful implementation will also require major partnership involvement across spatial and jurisdictional scales throughout the entire process of biological landscape design and conservation strategy development—including Elements 1, 2, 3, and 5.

5. Monitoring and Evaluation. In principle, incorporation of Element 5 into the recommended framework for achieving continental objectives seems self-evident: we need to monitor in order to gauge our progress and success, and we need to evaluate the validity of the assumptions used in meeting the other four Elements. In practice, however, very careful thought needs to go into the selection and design of appropriate monitoring and evaluation tools, and these tools are in turn intimately related to the careful articulation of clear objectives and purposeful models. Good models, with their clear articulation of assumptions, also provide the link between management and research: model assumptions define the research questions that should be incorporated from the very beginning into the adaptive framework leading from population objectives to habitat management and back to population objectives.

If monitoring outcomes are to be used as performance indicators, objectives and monitoring must be explicitly integrated from the outset—objectives must be expressed in terms that match existing or planned monitoring programs, which in turn must match the temporal and spatial scales of the management/conservation actions that are being evaluated. Abundance-based objectives (so-called P1 objectives) are most useful for large spatial extents (continental or ecoregional scales) where they provide a meaningful framework for building consensus among partners and where they can be monitored with some degree of confidence. Performance-based objectives (the so-called P2 objectives mentioned in Element 2—reproductive rates, survival rates, body condition of migrants, recruitment rates—are more relevant for smaller spatial extents (local and landscape scales) where they can be tied to specific management actions and can help identify and catalyze research on potential factors limiting population growth. Under the scenarios of Elements 2 and 3, it is also important that monitoring be closely aligned with the models used to project future management directions in order to facilitate the cumulative accounting of conservation stewardship responsibility among partners and regions.

Literature Cited

Donovan, T.M., K.E. Freemark, B.A. Maurer, L.J. Petit, S.K. Robinson, & V.A. Saab. 2000. Setting local and regional objectives for the persistence of bird populations. *In* Bonney, R., D.N. Pashley, R.J. Cooper, and L. Niles, eds. Strategies for Bird Conservation: the Partners in Flight Planning Process; Proceedings of the 3rd Partners in Flight Workshop; 1995 October 1-5; Cape May, NJ.

Proceedings RMRS-16. USDA Forest Service, Rocky Mountain Research Station, Ogden, Utah. Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Iñigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, & T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology, Ithaca, New York. 84 pp.

Skinner, D.C. 1999. Introduction to Decision Analysis: a Practitioner's Guide to Improving Decision Quality, 2nd Edition. Probabilistic Publishing, Gainesville, Florida. 369 pp.

Starfield, A.M., K.A. Smith, & A.L. Bleloch. 1990. How to Model It: Problem Solving for the Computer Age. McGraw-Hill, New York, New York. 206 pp.