MONTANA STATE TACTICAL PLAN

A supplement to the 2017 Prairie Pothole Joint Venture **Implementation Plan**

March 2017

CONTENTS

Photo: Neal & MJ Mishler

EXECUTIVE SUMMARY

The Prairie Pothole Joint Venture (PPJV) is a voluntary, non-regulatory, self-directed partnership involving federal and state agencies, non-governmental conservation groups, private landowners, scientists, universities, policy makers, and others interested in prairie habitat conservation. PPJV partners realize they can achieve more through collaboration than by acting alone. The PPJV was established in 1987 as one of the six original priority joint ventures under the North American Waterfowl Management Plan (NAWMP 1986). Using rigorous science and robust spatial planning tools, the PPJV partnership strategically conserves, restores, and enhances high priority wetland and grassland habitat to maintain and increase priority migratory bird populations.

Each of the bird conservation plan initiatives (waterfowl, waterbird, shorebird, and landbird) identifies habitat loss in the U.S. Prairie Pothole Region (U.S. PPR) as a primary cause of population declines for species of concern in that geography. Once a vast grassland ecosystem characterized by millions of wetland depressions, the U.S. PPR is now an agrarian system dominated by cropland across much of the landscape. In general, intensive agricultural land use resulting in wetland and grassland conversion to cropland has been detrimental to the migratory bird populations that use the PPR. In addition to the > 50% of grassland habitats converted to cropland in the U.S. PPR, > 50% of the total wetland area of the U.S. PPR has been lost to agricultural drainage.

The 2017 PPJV Implementation Plan provides a framework for delivering integrated bird conservation, but it does not provide details such as specific tactics to be employed and associated acreage objectives, costs, and partner responsibilities. Historically, PPJV step-down plans have been developed as tactical plans at various geographic scales for specific bird groups. Although these tactical plans provide guidance for conservation actions according to individual programmatic elements (i.e., protection, restoration, and enhancement) in specific PPR landscapes, step-down plans do not exist in all PPJV states. The 2017 PPJV Implementation Plan incorporates step-down plans in the form of state tactical plans for the PPJV area in each of the states as supplements. The intent of the Montana State Tactical Plan is to provide a cohesive and science-based foundation for conservation actions directed at priority bird species within the 5-year timeline of the Implementation Plan.

Kevin Barnes

The Montana State Tactical Plan identifies goals, objectives, and strategies with regard to spatially explicit targeting of habitat conservation for priority bird species. The Plan also addresses priority action items and goals for conservation policy and legislation. Additionally, the Plan explicitly recognizes the human user component of bird conservation. This is demonstrated through objectives and strategies regarding public access to wetland and upland resources as part of an effort to maintain the U.S. PPR migratory bird hunter constituency and their associated financial and political support for bird conservation. Partners are working towards the following 5-year goals and objectives within the MT PPJV (2017-2022).

Five-year Goal and Objectives

HABITAT OBJECTIVES:

Habitat	Perpetual Protection	Term-limited Protection	Restoration	Enhancement
Wetlands	4,900	6,200	250	1,600
Grasslands*	68,800	60,000	5,000	135,500

* Maintain the 1 million acres of restored grassland under the Conservation Reserve Program (CRP) that exists in the MT PPJV in 2015, in addition to the acres of restored grasslands in the table above.

HUNTER RETENTION AND ACCESS OBJECTIVES:

The goal for hunter retention is to maintain the 1995–2015 average annual number of waterfowl hunters in Montana (17,000 according to USFWS Division of Migratory Bird Management data). The primary objectives to achieve this goal are:

- Maintain 1.6 million acres of private land for public hunting through the Block Management Area and Upland Game Bird Programs in the MT PPR;
- Maintain 550,000 acres of public grasslands and wetlands for public hunting as part of the National Wildlife Refuge System;
- Maintain 65,000 acres of state lands as Wildlife Management Areas for public hunting administered by MT FWP

PRIORITY ACTIONS FOR POLICY AND LEGISLATION:

- Maintain the conservation compliance provisions in the next Farm Bill;
- Seek increases of the CRP acreage cap in the next Farm Bill and address structural impediments that exist in the Ecological Benefits Index (EBI) for Montana and the PPJV as a whole;
- Promote new programing via NRCS/FSA to conserve priority wetlands and grasslands as working lands;
- Explore new mechanisms via NRCS/FSA that help agricultural producers transition marginal cropland and/or expiring CRP lands to grass-based agriculture;
- Maintain LWCF, NAWCA, and MBCF funding;
- Support the continuation of private landowners' rights to sell perpetual conservation easements as part of private property management and continue to allow state conservation funds to be used to support private landowners' decisions;
- Support the recommendations of the Blue Ribbon Panel on Sustaining America's Diverse Fish & Wildlife Resources;
- Restore FWP's ability to acquire key properties in fee-title to be managed as Wildlife Management Areas;
- State-wide prohibition on sodbusting on state school trust lands that are native grassland-wetlands and marginal cropland.
- Transitioning unproductive cropland on school trust lands back to grass when lessees nominate/petition it and conservation values are potentially high

Casey Stemler

INTRODUCTION

The Prairie Pothole Joint Venture (PPJV) is a voluntary, non-regulatory, self-directed partnership involving federal and state agencies, non-governmental conservation groups, private landowners, scientists, universities, policy makers, and others interested in prairie habitat conservation. PPJV partners realize they can achieve more through collaboration than by acting alone. The PPJV was established in 1987 as one of the six original priority joint ventures under the North American Waterfowl Management Plan (NAWMP 1986). Using rigorous science and robust spatial planning tools, the PPJV partnership strategically conserves, restores and enhances high priority wetland and grassland habitat to maintain and increase priority bird populations.

The PPJV is committed to addressing the conservation needs of all avian species that use the U.S. portion of the Prairie Pothole Region (U.S. PPR). This is a challenging task, because each species occupies a unique ecological niche and may be subject to a unique set of limiting factors. Effective conservation requires a strategic, science-based approach. The PPJV Implementation Plan addresses the conservation needs of four species groups: waterfowl, shorebirds, waterbirds, and landbirds. For waterfowl, planning relies on the North American Waterfowl Management Plan (NAWMP 2012), and its various derivatives specific to the PPR. Shorebird conservation plans are derived from the United States Shorebird Conservation Plan (Brown et al. 2001). Waterbirds are addressed as a component of the North American Waterbird Conservation Plan (Kushlan et al. 2002), and the associated step-down plan for the PPR, the Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004). Last, the Partners in Flight North American Landbird Conservation Plan (Rosenburg et al. 2016) is the foundation for conservation planning for this diverse group of species.

The four bird conservation plans identify habitat loss in the PPR as a primary cause of population declines, although more research on the limiting factors to population size is needed for some species. Once a vast grassland ecosystem characterized by millions of glaciated wetlands, the U.S. PPR is now an agrarian system dominated by cropland through much of the landscape. Intensive agricultural land use resulting in wetland drainage and grassland conversion to cropland has been detrimental to the migratory bird species that spend part of their lifecyles in the PPR. In addition to the >50% of

grassland habitats converted to cropland in the U.S. PPR, >50% of the total wetland area of the U.S. PPR has been lost to agricultural drainage. Further compounding habitat loss, other anthropogenic disturbances, including energy development and climate change, continue to threaten breeding bird populations in the U.S. PPR.

To address the negative effects of habitat loss, the PPJV uses an integrated approach to bird conservation through Strategic Habitat Conservation (SHC). SHC is based on the foundation implemented to conserve continental waterfowl populations using decades of research and planning. The process is an adaptive approach to species conservation characterized by four programmatic elements: biological planning, conservation design, conservation delivery, and research and monitoring. As a whole, the elements are designed to maximize desired biological outcomes resulting from conservation treatments for priority species. The PPJV concept of "separate planning, integrated action" for the different bird groups provides a strategy allowing the best available science to drive habitat and population conservation.

Although the 2017 PPJV Implementation Plan provides the framework for delivering integrated bird conservation, it does not provide details such as specific tactics to be employed. The intent of state tactical plans is to provide a cohesive and science-based foundation for conservation actions directed at priority species of concern within the timeline of the implementation. The Montana State Tactical Plan concisely describes the priority resources and the strategies to conserve those resources over the next five years. Future conservation needs are also identified in the context of research, funding, staff, and public policy at the state level. Additionally, the plan provides a mechanism to track accomplishments at the state level. Finally, methods for monitoring and evaluating the efficacy of conservation strategies and the resulting effects on priority species are described. The Montana State Tactical Plan will complement the adaptive planning framework the PPJV has embraced since its inception and provide a level of partner collaboration for leveraging resources to accomplish the overarching PPJV goals at the state level.

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Kevin Barnes

THE PRAIRIE POTHOLE REGION OF MONTANA

The PPJV area of Montana encompasses over 38,000 square miles (26% of the state; Figure 1) and is bounded on the north by Canada, west by the Rocky Mountain Front, south by the Missouri River, and east by North Dakota. Montana comprises about 21% of the entire PPJV administrative area and is composed almost entirely of the Northwestern Glaciated Plains Ecoregion (Figure 2). Shaped by Pleistocene glaciation, the Montana PPR landscape is characterized by some of the largest expanses of mixed-grass prairie remaining in the U.S. These mixed grasslands are interspersed with cropland and sagebrush steppe and contain a gradient of prairie pothole wetland communities ranging from dense to sparse with rivers and streams distributed throughout the landscape (Figure 3). The diverse, productive habitats of the MT PPR provide breeding habitat for approximately 168 species of wetland and grassland dependent birds as well as significant numbers of spring and fall migrants. Many of these species are PPJV priorities for conservation (Table 1) while others are identified as species of greatest conservation need by the Montana State Wildlife Action Plan (MT SWAP 2015; Table 2).

The grasslands, wetlands, and prairie streams that support Montana priority species face ongoing threats from agricultural conversion, energy development, and non-native plant invasion. Although wetland and grassland losses across the MT PPR have been detrimental to migratory bird populations, losses in Montana have been less severe compared to other PPJV states. Dahl (1990) estimated the historic loss of wetlands at about 27% in Montana, most of which occurred during early 1900s as a result of agricultural drainage. In contrast, estimated wetland losses in Iowa (95%; Bishop 1981), Minnesota (85%; Johnson et al. 2008), North Dakota (50%; Dahl 1990), and South Dakota (35%; Dahl 1990) have been much greater. Further, Dahl (2014) estimated wetland basin numbers declined in the PPR region of every state between 1997 and 2009 with the exception of Montana, where there was a small gain in wetland basins (<1%).

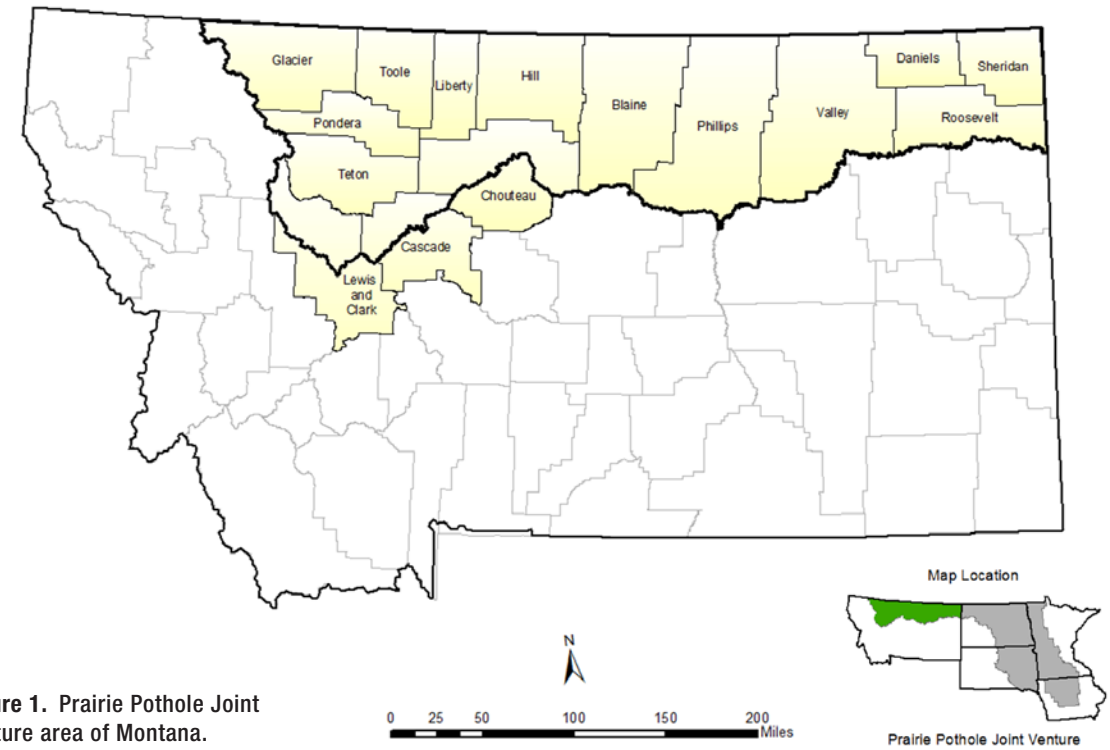

Figure 1. Prairie Pothole Joint Venture area of Montana.

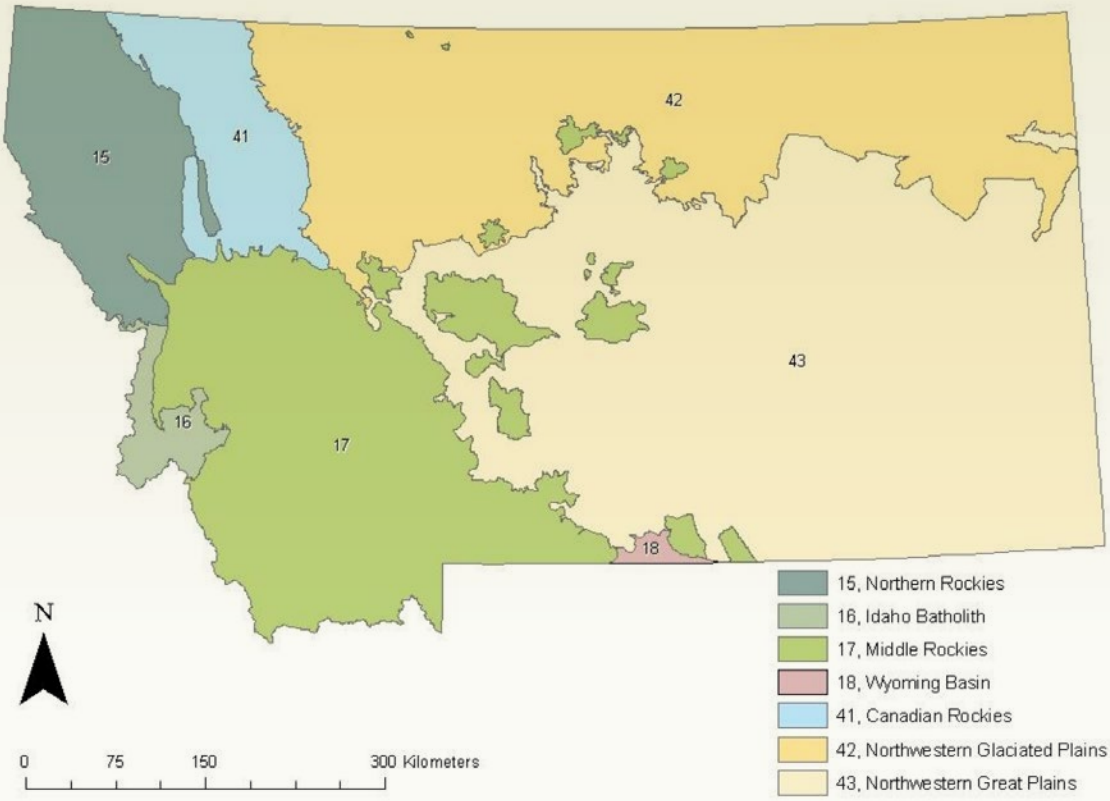

Figure 2. Ecoregions of Montana (Omernick 1987).

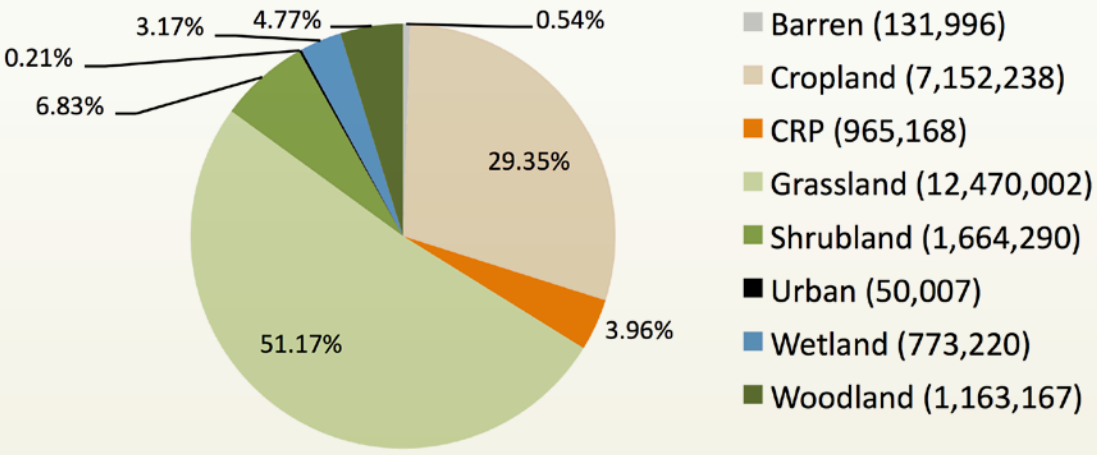

Figure 3. Landcover composition of the MT PPJV area based on 2011 Landsat TM imagery. Acres are in parentheses.

Table 1. Montana PPJV Priority Species, Predictive model sources and types used in the habitat prioritization process

Priority Bird Species	Model Source	Model Type
Grassland & Sagebrush Birds		
Baird's Sparrow	U of MT	Occurrence
Sprague's Pipit	U of MT	Occurrence
McCown's Longspur	U of MT	Occurrence
Chestnut-collared Longspur	U of MT	Occurrence
Lark Bunting	MT NHP	Occurrence
Burrowing Owl	MT NHP	Occurrence
Ferruginous Hawk	MT NHP	Occurrence
Golden Eagle	MT NHP	Occurrence
Sharp-tailed Grouse	MT NHP	Occurrence
Greater Sage-Grouse	MT FWP	Core Areas
Water & Shorebirds		
Marbled Godwit	MT NHP	Occurrence
Black Tern	MT NHP	Occurrence
Wilson's Phalarope	MT NHP	Occurrence
Willet	MT NHP	Occurrence
Long-billed Curlew	MT NHP	Occurrence
Piping Plover	MT NHP	Occurrence
Mountain Plover	MT NHP	Occurrence
Waterfowl		
Mallard	USFWS	Abundance
Gadwall	USFWS	Abundance
Northern Shoveler	USFWS	Abundance
Northern Pintail	USFWS	Abundance
Blue-winged Teal	USFWS	Abundance

Grassland losses in the MT PPR, primarily due to agricultural conversion to cropland, have been estimated at 34% compared to 61%-84% in each of the other PPJV states. Conservation programs have proven critical to mitigating some of these grassland losses across the PPR. Since 1976, 2.4 million acres of land (grassland, wetland, riparian, and forest) have been enrolled in perpetual conservation easements in Montana held by the following organizations: Montana Land Reliance (40%), Montana Fish, Wildlife & Parks (19%), The Nature Conservancy (16%), U.S. Fish and Wildlife Service (14%), and other land trusts (11%). Preserving native mixed-grass prairie for the benefit of breeding grassland birds is the highest priority for Montana conservation partners.

USDA conservation programs have also been beneficial to breeding grassland birds. Reynolds et al. (2001) estimated that the Conservation Reserve Program (CRP) in the U.S. PPR contributed 2.1 million ducks to the annual fall flight between 1992 and 1997. Additional analysis by Reynolds et al. (2006) estimated that 25.7 million ducks were produced on CRP acres within the PPJV from 1992 to 2003. Unfortunately, as with native grasslands, CRP acres are rapidly disappearing from the U.S. PPR landscape (Figure 4). Acreage in CRP reached its peak across the PPJV administrative area in 2007 with 8.35 million acres (2.4 million in the MT PPR), followed by a decline to 4.19 million acres in 2015 - a reduction of 50%. Montana has suffered the greatest losses of CRP in the PPJV with a 58% reduction since 2007.

Table 2. Montana Species of Greatest Conservation Need associated with prairie grasslands, sagebrush steppe, depressional wetland, herbaceous marsh, and open water community types of Montana's Northwestern Glaciated Plans ecoregion. (MT SWAP 2015).

Alder Flycatcher	Brewer's Sparrow	Ferruginous Hawk	Long-billed Curlew	Sagebrush Sparrow
American Bittern	Brown Creeper	Forster's Tern	McCown's Longspur	Sedge Wren
American White Pelican	Burrowing Owl	Franklin's Gull	Mountain Plover	Sharp-tailed Grouse
Baird's Sparrow	Caspian Tern	Golden Eagle	Nelson's Sharp-tailed Sparrow	Species
Black Swift	Cassin's Finch	Great Blue Heron	Northern Hawk Owl	Sprague's Pipit
Black Tern	Chestnut-collared Longspur	Greater Sage-Grouse	Peregrine Falcon	Trumpeter Swan
Black-billed Cuckoo	Clark's Grebe	Green-tailed Towhee	Pileated Woodpecker	Veery
Black-crowned Night-Heron	Clark's Nutcracker	Horned Grebe	Pinyon Jay	White-faced Ibis
Black-necked Stilt	Common Loon	Le Conte's Sparrow	Piping Plover	Yellow-billed Cuckoo
Bobolink	Common Tern	Least Tern	Red-headed Woodpecker	
Boreal Chickadee	Evening Grosbeak	Loggerhead Shrike	Sage Thrasher	

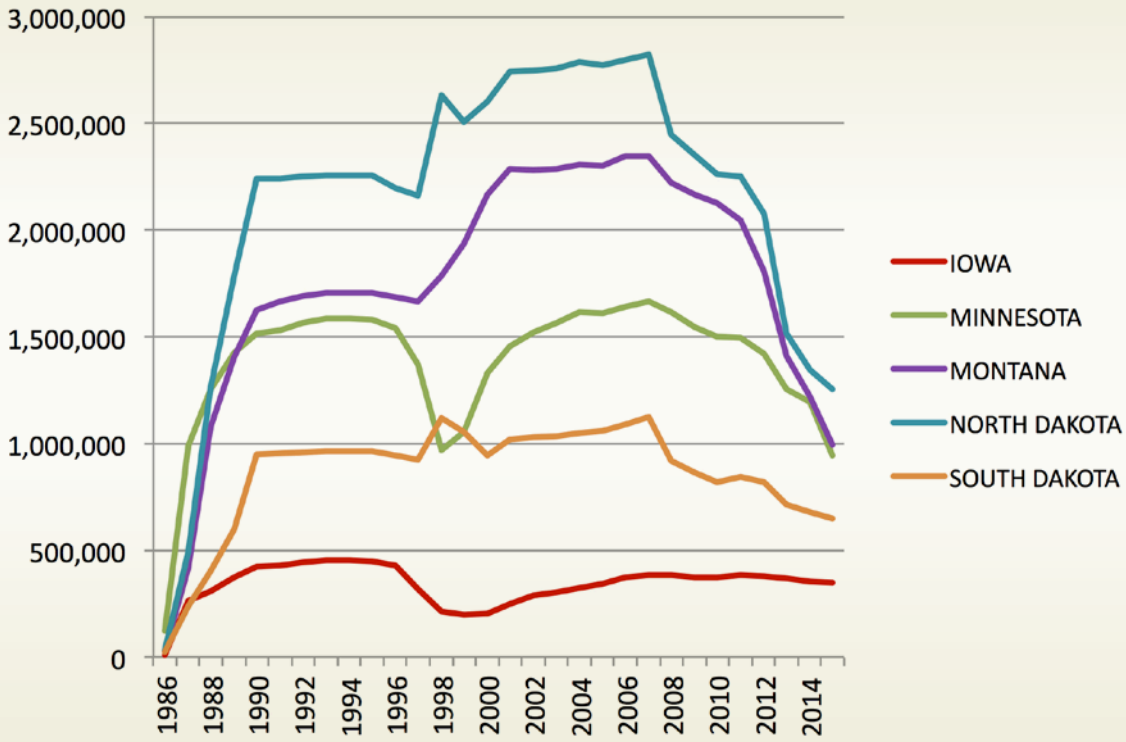

Figure 4. Conservation Reserve Program (CRP) acres for Prairie Pothole Joint Venture counties 1986–2015. Acres include all CRP parcels for all Conservation Practice Types (USDA 2014, FSA unpublished data).

Many studies have also found that CRP supports higher densities of grassland passerines resulting in positive population responses (e.g., Johnson and Schwartz 1993, Johnson and Igl 1995, Best et al. 1997, Herkert 1998, Veech 2006, Niemuth et al. 2007, Drum et al. 2015). However, the biological value of CRP to grassland nesting species preferring sparse vegetation structure may not be as beneficial compared to species preferring the generally dense structure of planted CRP fields. For example, Johnson (2000) concluded that tracts of untilled native prairie are important to grassland birds such as Sprague's Pipit, Baird's Sparrow, and Chestnut-collared Longspur that rarely, if ever, use CRP fields. The PPJV is working with USDA to develop methods to optimize CRP enrollment and management for grassland nesting birds. Although strategically locating planted CRP fields will benefit many species, grassland management (e.g., haying, burning, and grazing) and planted seed mix composition in CRP fields may provide grassland nesting structure that is optimal for different species. Further, subsidizing infrastructure improvements to fences and watering sources may encourage producers to keep planted CRP fields in grass-based agriculture after the CRP enrollment has expired. The joint project is being conducted in 2017 and 2018 in PPJV states.

...CRP supports higher densities of grassland passerines resulting in positive population responses

Recent high commodity prices and biofuel mandates for corn and soybeans have driven a westward surge of grassland loss across the central U.S. PPR (Wright and Wimberly 2013, Lark et al. 2015). However, the relatively dry conditions in Montana (10-15 inches of precipitation annually) are not conducive to growing these row crops. Instead, dryland agriculture in the MT PPR is dominated by small grains such as wheat and barley, with the large expanses of grassland dominated by cattle grazing. These rangelands are critical to maintaining a grass-based agricultural economy, and conservation partners continue to pursue innovative conservation practices to support the ranching community. For example, The Nature

Conservancy manages the 60,000-acre Matador Ranch as a grassbank for surrounding ranches. Under the program, local ranchers pay discounted fees to graze their cattle on the Matador in exchange for instituting or continuing wildlife-friendly practices on their own operations. The result is that participating ranchers, along with the Matador, have improved habitat across more than 250,000 acres in south Phillips County benefiting the majority of the bird species of conservation concern.

Another example of innovative conservation practices on private lands is the Candidate Conservation Agreement with Assurances (CCAA) program, which was created by USFWS and The Nature Conservancy. CCAA provides incentives for private landowners to engage in voluntary conservation activities that benefit priority grassland bird species and reduce the likelihood of them being listed under the Endangered Species Act. More specifically, a CCAA provides participating property owners with a permit containing assurances that, if they engage in certain conservation actions for species included in the agreement, they will not be required to implement additional conservation measures beyond those in the CCAA.

Although many of the factors limiting priority grassland nesting bird populations are unknown, perhaps the single most obvious conservation action for these species is to protect the remaining grasslands in the Montana PPR. Through the duration of this plan, Montana PPJV partners will focus conservation actions on the intact native grasslands and associated wetland complexes identified as priority habitats. Many non-avian species of conservation concern, such as pronghorn, black-footed ferret, grizzly bear, and native fish, rely on the MT PPR wetland, grassland, and riverine habitats and will also benefit from conservation of priority avian habitats.

Although many of the factors limiting grassland nesting bird populations are unknown, perhaps the single most obvious conservation action for these species is to protect the remaining grasslands in the Montana PPR. Through the duration of this plan, Montana PPJV partners will focus conservation actions on the intact native grasslands and the associated wetland complexes identified as priority habitats.

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PRIORITY WETLAND AND GRASSLAND HABITAT

Grasslands

The expansive grasslands in the MT PPR highlight the importance of the state to priority PPJV species. Indeed, Montana has an estimated 14 million acres of grasslands remaining, approximately 41% of all grassland currently in the PPJV (Figure 5). Moreover, the grassland bird populations that rely on these remaining grasslands have been declining faster than any other avian guild over the last 40 years (Knopf 1994, Sauer et al. 2014). According to the North American Breeding Bird Survey (BBS), 98 landbird species breed in the MT PPR. Of those species, four mixed-grass specialist species are of primary conservation concern due to their ongoing population declines (Sauer et al. 2014; Table 3): Sprague's Pipit (*Anthus spragueii*), Baird's Sparrow (*Ammodramus bairdii*), McCown's Longspur (*Rhynchophanes mccownii*) and Chestnut-collared Longspur (*Calcarius ornatus*).

Sagebrush Steppe

An important component of the MT PPR grasslands includes approximately 1.7 million acres of sagebrush steppe habitat. The Greater Sage-Grouse (*Centrocercus urophasianus*) is a PPJV priority species that relies on these sagebrush steppe habitats throughout its annual life-cycle. The Management Plan and Conservation Strategy for Sage Grouse in Montana (Montana Sage Grouse Work Group 2005) is the guiding document to inform management actions by conservation partners in the state. The Montana Greater Sage-Grouse Habitat Conservation Program was established in September 2014 by executive order to provide regulatory protections for the species and establish a mechanism for voluntary habitat conservation actions.

Greater Sage-Grouse core areas are habitats associated with the highest population densities based on male counts. Two Greater Sage-Grouse Core Areas (Montana Ex. Order 12-2015; also called Priority Areas for Conservation by USFWS 2013) are located in the MT PPR, one of which (South Phillips) contains the highest densities of displaying males in the state. The two core areas are connected by the Montana-Saskatchewan Connectivity Area, a zone that contains vital sagebrush habitats and maintains the ability of Greater Sage-Grouse to move between Canada, North Valley and South Phillips core areas.

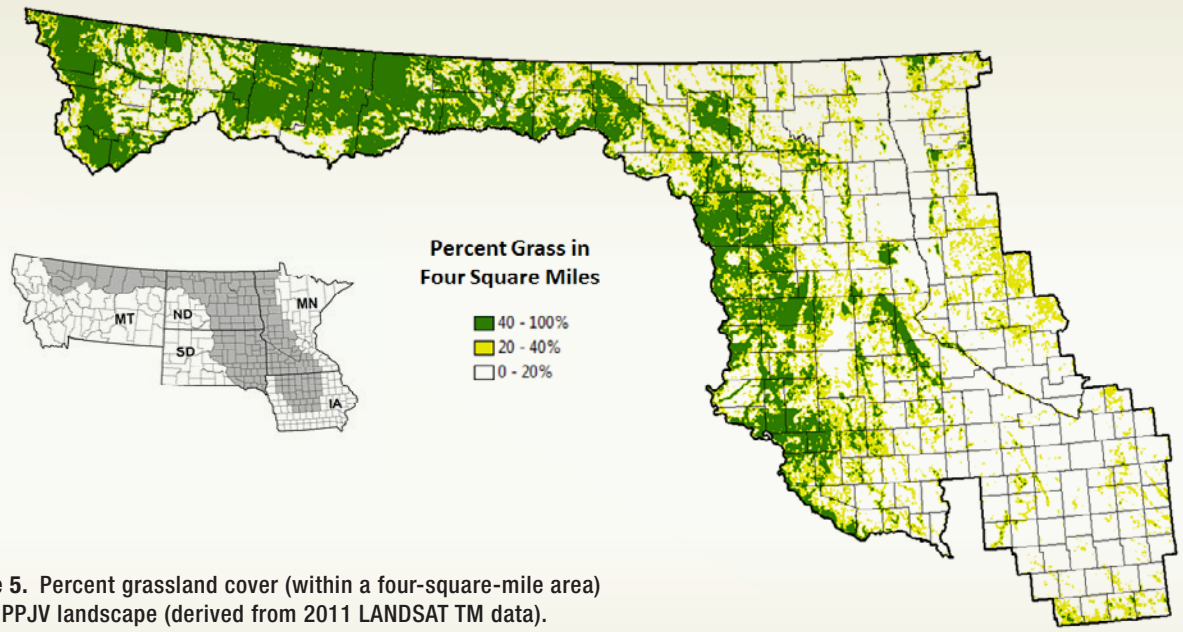

Figure 5. Percent grassland cover (within a four-square-mile area) in the PPJV landscape (derived from 2011 LANDSAT TM data).


Kevin Barnes

Table 3. Population estimates and trends for 4 priority landbird species (Sauer et al. 2014).

Species	Global Population Estimate	Global Population Trend	% Global Population in MT PPR	% U.S. Population in MT PPR
McCown's Longspur	600,000	-6.18 (-8.90, -2.85)	23%	33%
Chestnut-collared Longspur	3,000,000	-4.35 (-5.30, -3.33)	20%	25%
Baird's Sparrow	2,000,000	-2.93 (-4.52, -1.31)	11%	29%
Sprague's Pipit	900,000	-3.51 (-4.83, -2.34)	6%	29%

Wetlands

Although the MT PPR contributes relatively few wetland basins to the overall composition of the U.S. PPR (6% or ~187,000 basins), an estimated 20% of the entire U.S. PPR breeding Mallard and Northern Pintail populations occupy the landscape in wet years when the majority of wetland basins are full (HAPET office, unpublished data; Figure 7). Additionally, Doherty et al. (2015) found that, although the north central portion of Montana contained relatively low average densities of breeding duck pairs between 2002 and 2010, populations increased substantially in wet years following drought. Previous studies in this area also documented higher recruitment rates compared to core waterfowl breeding areas in North Dakota and South Dakota (Ball et al.1995). Further, a recent application of a stochastic Mallard productivity model (Johnson et al. 1987) indicated that the Northeast Montana Wetland Management District contained one of the highest Mallard recruitment rates (0.74) across the U.S. PPR from 2007-2014. These studies underscore the value of the MT PPR to breeding ducks, especially in wet years following drought when landscape primary productivity is high. Montana conservation partners that work in these landscapes have known this for a long time; over 50 years ago, Lynch (1984) and others recognized the boom and bust nature of prairie duck populations. Montana may become even more important to wetland dependent species as future scenarios for climate change predict drying in the Southern Great Plains and increased moisture in the north (Kunkel et al. 2013).

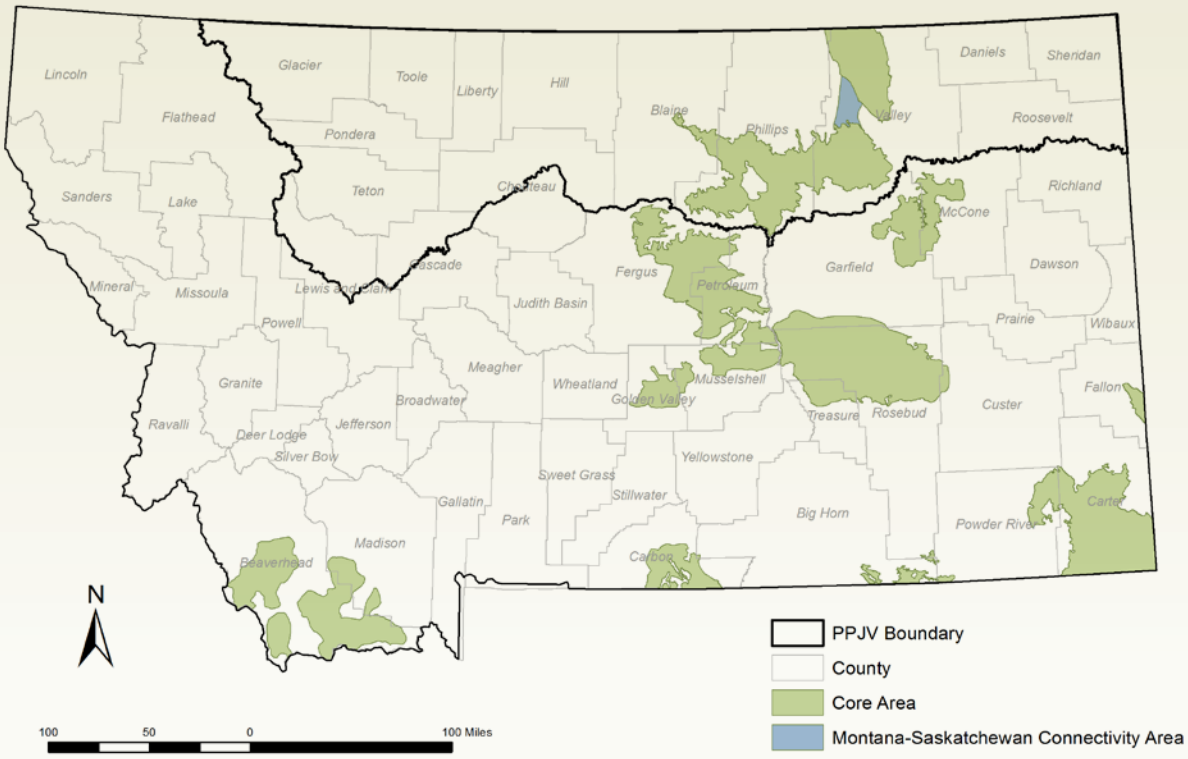

Figure 6. Greater Sage-Grouse core areas in Montana.

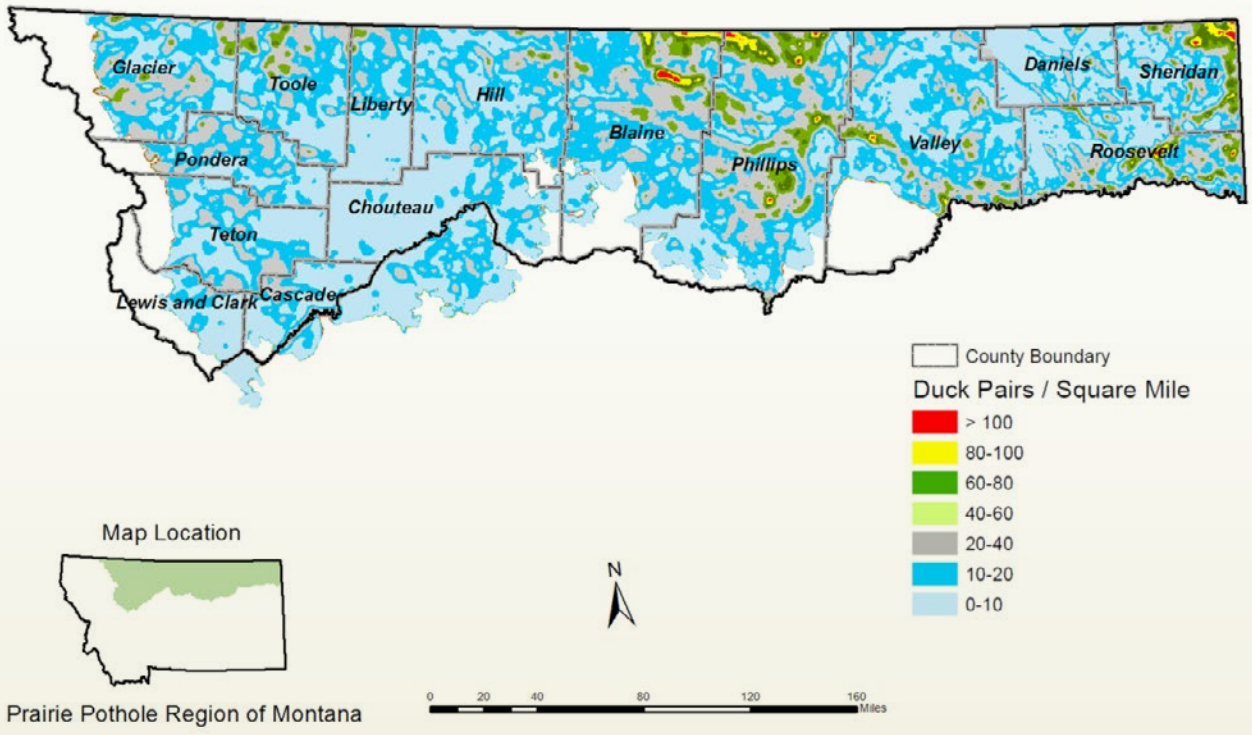

Figure 7. Upland accessibility of breeding duck pairs in the MT PPR (a.k.a."thunderstorm map"). Mallard, northern pintail, gadwall, blue-winged teal and northern shoveler are included in the model.

Conservation Planning

In 2012, Montana PPJV partners initiated a conservation planning process to prioritize existing landscape-scale habitats that have the highest biological value for priority bird species. Partners included NGO's (The Nature Conservancy, Ducks Unlimited), the University of Montana, state agencies (Montana Fish Wildlife & Parks, Montana Natural Heritage Program, Montana Department of Environmental Quality) and federal agencies (Natural Resources Conservation Service, Bureau of Land Management, US Fish and Wildlife Service). The primary goals of planning process were: 1) showcase the biological value of the MT PPJV landscape to the larger joint venture and conservation community, and, 2) strengthen existing conservation efforts in the entire MT PPJV area by integrating efforts between state and federal agencies and conservation organizations towards a common vision and goal of cooperative conservation.

A list of priority bird species was compiled to guide conservation planning efforts (Table 1). Partners combined existing models to identify priority areas for conservation action, specifically protection through perpetual conservation easements and term-limited leases. Partners developed GIS models to identify areas where optimal habitats exist for multiple priority bird species. First, concurrences of optimal habitats for all 22 species were identified, and they included 27% of the Montana PPJV area (Figure 8). We tested the potential for a subset of species to identify conservation focus areas that adequately captured optimal habitat for all 22 species using waterfowl, Greater Sage-Grouse, and Sprague's Pipit (Figure 9). Optimal habitat for these 7 species comprises 74% of the priority areas identified by the total species suite, which includes 20% of the entire PPJV area. However, a small group of priority species including Golden Eagle, Ferruginous Hawk, and Piping Plover did not share similar existing habitats with the 7-species subset. Species, such as these, with unique habitat requirements will require individual attention to ensure that they are not missed by conservation actions targeted to benefit multiple species.

A list of priority bird species was compiled to guide conservation planning efforts

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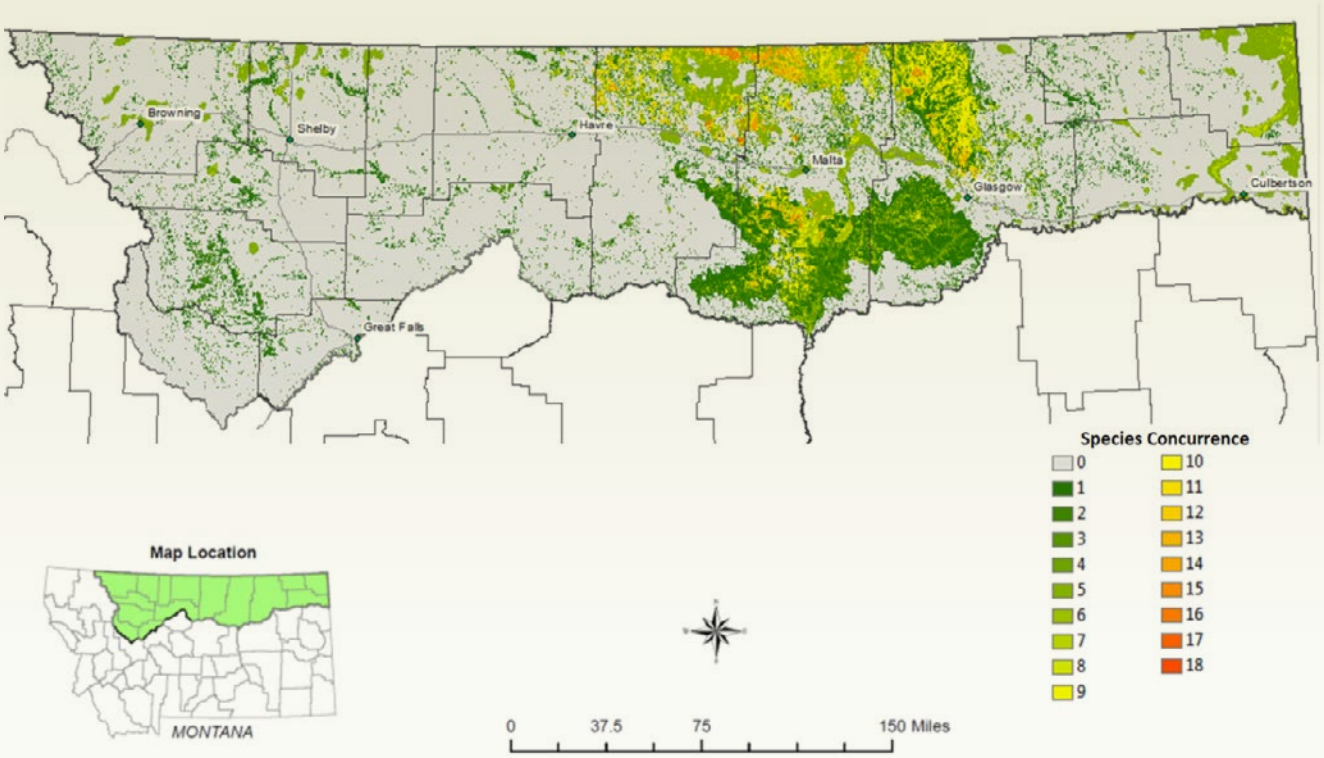
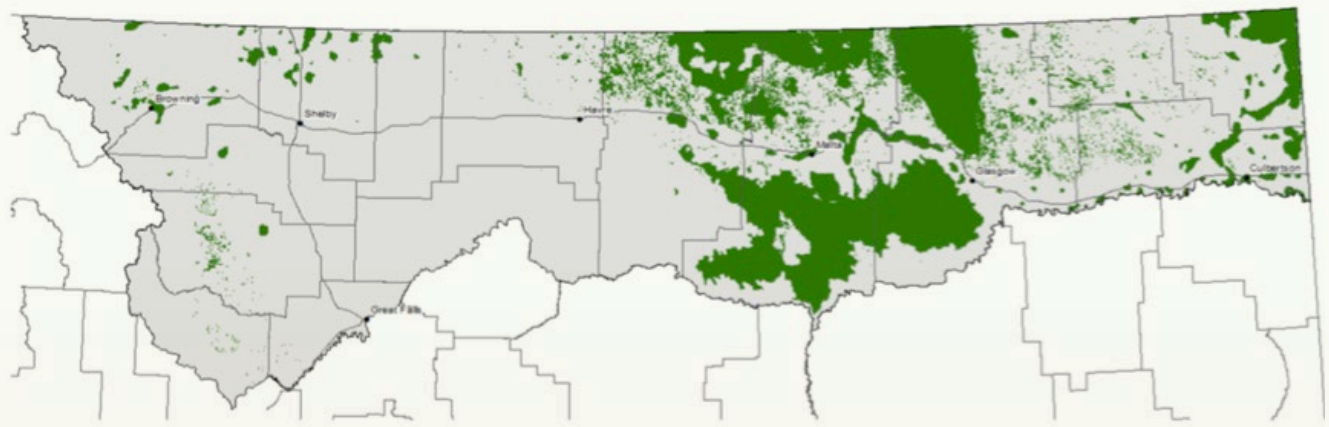


Figure 8. Optimal habitat concurrence for 22 priority bird species



Optimal Habitats

Other Priority Species Optimal Habitats Inclusion

MAGO	94%	MOPL	85%	WIPH	78%
LARB	93%	WILL	85%	BLTE	44%
MCCO	93%	LBCU	82%	PIPL	33%
BAIS	92%	STGR	73%	FEHA	5%
CCLO	89%	BUOW	73%	GOEA	1%

Figure 9. Waterfowl (5 species), Greater Sage-Grouse, and Sprague's Pipit priority areas and the percentage of other species optimal habitats included by these 7 species.

GOALS, OBJECTIVES, AND STRATEGIES

The Montana PPJV partners will focus conservation actions on protecting existing wetland and grassland habitats identified in the conservation planning process described above. To generate wetland and grassland habitat protection objectives for the 5-year duration of this State Tactical Plan, we reviewed past accomplishments and existing partner conservation plans.

Five-year Habitat Objectives – Protection

WETLAND PROTECTION

Protect 11,100 acres of high priority wetlands associated with priority grasslands over the next 5 years.

Sub objective 1: Protect 4,500 acres through perpetual easements.

Strategy A: Enroll 2,900 wetland acres in USFWS perpetual wetland easements.

Strategy B: Enroll 1,500 wetland acres in TNC perpetual easements.

Strategy C: Enroll 100 wetland acres in MT FWP perpetual conservation easements.

Sub objective 2: Protect 400 acres though fee title acquisitions.

Strategy A: Purchase 400 WPA/ NWR wetland acres.

Sub objective 3: Protect 6,200 wetland acres through term-limited programs.

Strategy A: Maintain 6,200 acres of CRP wetland acres across PPJV counties in Montana

Strategy B: Protect 500 wetland acres through 30-year NRCS ACEP WRE easements.


Neal & MJ Mishler

GRASSLAND PROTECTION

Protect 128,800 acres of priority grassland over the next 5 years.

Sub objective 1: Protect 68,400 acres through perpetual easements.

Strategy A: Enroll 48,400 grassland acres in USFWS perpetual easements.

Strategy B: Enroll 13,000 grassland acres in TNC perpetual easements.

Strategy C: Enroll 7,000 grassland and sage-steppe acres in MT FWP perpetual easements.

Sub objective 2: Protect 400 acres through fee title acquisitions.

Strategy A: Purchase 400 WPA/ NWR grassland acres.

Sub objective 3: Protect 60,000 acres through term-limited programs.

Strategy A: Enroll 30,000 acres of expiring CRP to state-based Prairie Pothole Wetland Grassland Retention Project agreements.

Strategy B: Protect 30,000 acres of grassland and sage-steppe habitat through 30-year MT FWP leases

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Five-year Habitat Objectives – Restoration and Enhancement

To generate wetland and grassland habitat restoration and enhancement objectives for the 5-year implementation plan, we reviewed conservation program accomplishments from 2014 and 2015 for USFWS Montana Partner for Fish and Wildlife (PFW), Montana Fish Wildlife and Parks, The Nature Conservancy, and NRCS/FSA. These projects include several PPJV partners that work with the PFW program, such as MTFWP, DU, PF, and USDA. Assuming funding and partnerships continue for the next five years, PPJV partners can restore an estimated 250 acres of wetland acres and 5,000 acres of grassland and enhance an estimated 1,000 acres of wetland and 95,000 acres of grassland. This analysis forms the basis for the following 5-year wetland and grassland restoration and enhancement objectives for the implementation plan.

Enhance 1,600 acres of priority wetlands over the next 5 years.

Strategy A: Enhance 1,000 wetland acres of high priority wetland acres through cooperative Private Landowner Agreements (PLA) administered by the PFW program.

Strategy B: Enhance 100 acres of wetlands through EQIP practices administered by NRCS.

Strategy C: Enhance 500 acres of wetlands through the MT FWP Migratory Bird Wetland Program and other FWP Programs.

Restore 250 acres of priority wetlands over the next 5 years.

Strategy A: Restore 250 wetland acres of wetland through cooperative PLA agreements administered by the PFW program.

Enhance 135,500 acres of priority grasslands over the next 5 years.

Strategy A: Enhance 20,000 grassland acres through cooperative PLA agreements administered by the PFW program.

Strategy B: Enhance 75,000 grassland acres through the TNC Matador Grassbank program.

Strategy C: Enhance 15,000 grassland acres through cooperative agreements administered through the MT FWP Upland Gamebird Program.

Strategy C: Enhance 7,000 grassland acres through management plans attached to Conservation Easements held by FWP.

Strategy D: Enhance 18,500 grassland acres through EQIP practices administered by NRCS.

Restore 5,000 acres of grassland over the next 5 years.

Strategy A: Restore 5,000 grassland acres of through cooperative PLA agreements administered by the PFW program.

Hunter Access and Retention

During the most recent NAWMP revision, it was acknowledged that hunters are a critical component of conservation, equal in importance to habitat and waterfowl. Hunters are sometimes referred to as the "third leg of the stool." The purchase of a migratory bird conservation and hunting stamp (a.k.a. duck stamp) is a requirement of waterfowl hunters over 15 years old in the United States. Sales from duck stamps go directly towards conservation of waterfowl habitats. Ensuring public access to waterfowl hunting opportunities is considered critical to sustaining conservation of the migratory bird public trust.

Determining goals for providing sufficient habitat to sustain waterfowl hunting is difficult. Not every location will be used by large numbers of waterfowl, and not every area used by large numbers of waterfowl can support public access. Access to lands varies across the PPJV administrative area due to different trespass laws and sentiments of private landowners. Over the past 20 years, accessibility to private lands has decreased. Some areas that once were accessible through private lands permissions are now off-limits to hunters. Waterfowl hunting can also vary considerably in the type of hunting undertaken (e.g., diving duck hunting on a large open wetland, a teal hunt in shallow water, or hunting in an agricultural field for geese and Mallards).

Not all areas should be available for public access, as excess hunting pressure can detract from hunter enjoyment and hunting opportunities. For example, hunting some large ponds can be unpopular locally because they may be roosting habitat, which, if disturbed too often, may cause birds to leave the area. Therefore, a certain mix of public access and less disturbed areas are important for maintaining quality hunting opportunities.

The objective for hunter retention and for providing public hunting access for waterfowl hunters is to **maintain the annual, average number of waterfowl hunters in Montana from 1995 –2015.** According to data collected by the USFWS Division of Migratory Bird Management this number is around 17,000. To maintain this number of waterfowl hunters, we intend to maintain and increase the amount of acres open to public hunting via programs such as the Block Management Area Program and FWP conservation easements and leases.

Sub Objective 1: Purchase 800 acres of public grasslands and wetlands as part of the National Wildlife Refuge System

Sub Objective 2: Maintain 550,000 acres of public grasslands and wetlands for public hunting as part of the National Wildlife Refuge System.

Sub Objective 3: Support private landowners in maintaining 1.6 million acres of private land for public hunting in the MT PPR through the Block Management Area and Upland Game Bird Programs.

Sub Objective 4: Maintain 65,000 acres of state lands as Wildlife Management Areas for public hunting administered by MT FWP.

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FUNDING

The majority of funding to accomplish the 5-year protection, restoration, and enhancement of priority habitats outlined in this plan will originate from the following sources:

- Migratory Bird Conservation Fund (MBCF)
  - USFWS Small Wetlands Program
- Land and Water Conservation Fund (LWCF)
  - Rocky Mountain Front Conservation Area
- North American Wetlands Conservation Act (NAWCA) grant program
  - Standard grants (≤ $1,000,000)
  - Small grants (≤ $100,000)
- USDA conservation program funding
- Montana hunter license sales revenue (e.g., Habitat Montana, Upland Game Bird Enhancement Program, Migratory Bird Wetland Program)
- Operational funding from respective conservation partner programs (e.g., USFWS Partners for Fish and Wildlife program, The Nature Conservancy, Ducks Unlimited)
- Pittman-Robertson Federal Aid in Wildlife Restoration funding

The annual funding necessary to accomplish the 5-year wetland and grassland perpetual protection objectives in Montana is estimated to be approximately $8,000,000. The restoration and enhancement objectives will require an estimated additional $1,000,000 annually. Objectives for public policy, outreach, and monitoring will incur additional costs to PPJV partners. Maintaining and advocating for increased funding for conservation actions will be paramount to accomplishing this plan. The following recent conservation successes clearly show the strength of the Montana PPJV partnership.

- From 2013-2015, MBCF funding for the perpetual easement and fee land acquisition authorized by the USFWS Small Wetlands Acquisition Program totaled $3,126,618. Those funds perpetually protected 14,332 acres of priority wetland and grassland habitats. Maintaining and increasing the current annual MBCF allocation for Montana at approximately $1,000,000 will be necessary to accomplish the habitat objectives outlined in this plan.
- From 2013-2015, NAWCA standard grant funding for the Montana PPR totaled $3,938,232 and leveraged $ 6,668,567 of partner matching funds. Maintaining $1,000,000 annual NAWCA funding for the next 5 years will be required for partners to accomplish the habitat objectives outlined in this plan.
- From 2013-2015, LWCF funding for perpetual easements authorized by the USFWS Rocky Mountain Front Conservation Area totaled $11,251,000 invested to protect 27,908 acres of wetland and grassland habitats. Maintaining $4,000,000 annual LWCF funding for the next 5 years will enable PPJV partners to accomplish the habitat objectives outlined in this plan.
- From 2013-2015, Montana FWP program funding averaged approximately $6,500,000 annually for habitat protection, enhancement, and management activities statewide. The proportion invested in the PPR varied among years. Maintaining authorization from the state legislature to spend these funds on habitat projects for the next 5 years is required to accomplish habitat objectives outlined in this plan.

Research and Data Needs

- A rigorous landscape-scale assessment of waterfowl population recruitment in the MT PPR
- Completion of the National Wetland Inventory update (Figure 10)
- A restorable wetland basins inventory
- An evaluation of how wetland degradation may be impacting breeding bird reproduction and survival.
- Quantification of ecosystem services and economic benefits generated by wetland and grassland conservation in Montana.
- Research on what motivates the public and landowner to support wetland and grassland conservation within the PPJV administrative area.
- Grassland bird breeding vital rates, full life-cycle demographics, and habitat quality assessments for targeting management actions. The PPJV is currently funding research projects with Montana State University and Bird Conservancy of the Rockies to investigate grassland bird vital rates and habitat quality.
- An evaluation of the direct and indirect impacts of climate change to ensure conservation delivery has long-term resilience for the PPR.

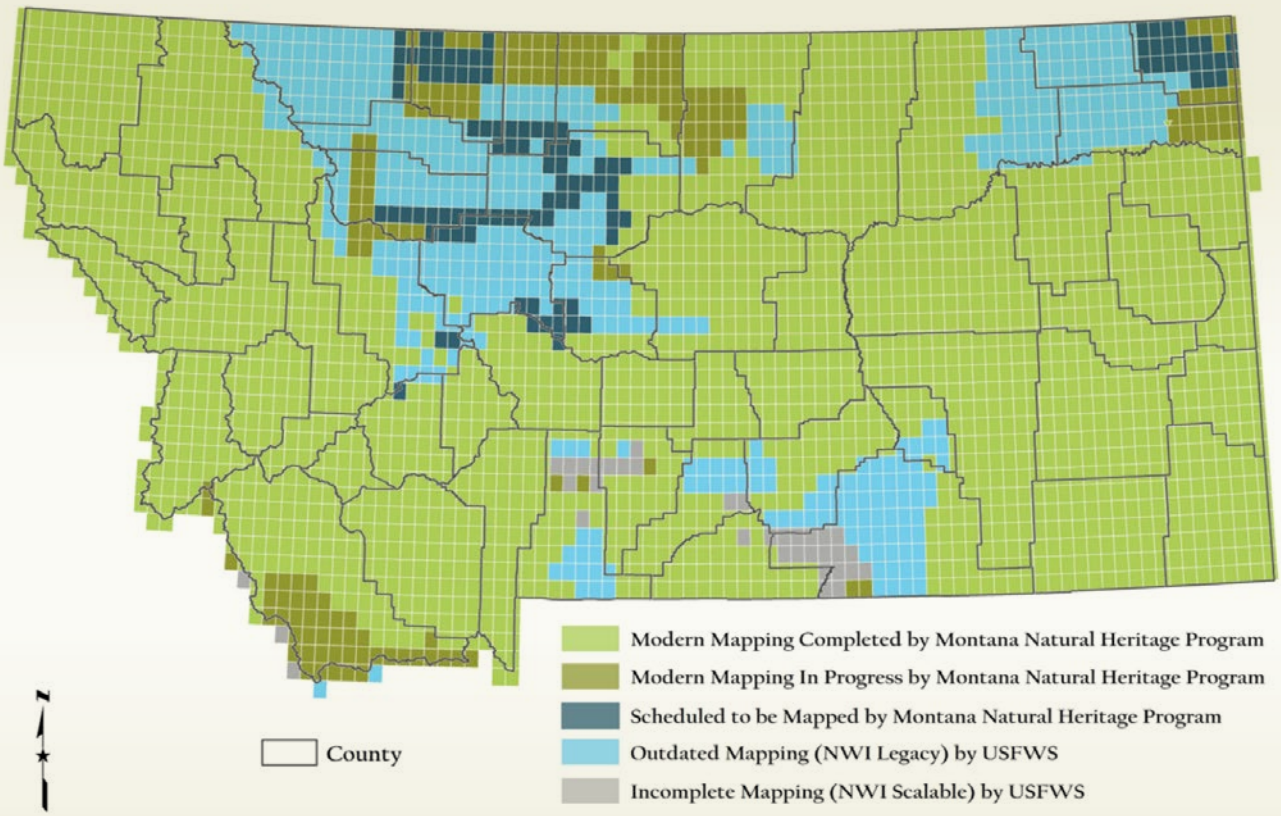

Figure 10. Wetland and riparian mapping status as of 6/21/16 (Montana Natural Heritage Program, Montana Wetland and Riparian Mapping Center).

Future Funding Needs

DEDICATED LONG-TERM FUNDING FOR GRASSLAND BIRD CONSERVATION

North American grassland bird populations have been declining faster than any other avian guild over the last 40 years (Sauer et al. 2014). Large-scale conversion of grassland habitat to landscapes dedicated to producing food and energy are probably the major contributing factor for grassland bird population declines. The Northern Great Plains – including the Montana PPR – contains the highest diversity of grassland bird species on the continent (Peterjohn and Sauer 1999), including several populations of conservation concern. A dedicated funding source for grassland bird conservation will greatly increase the efficiency of Montana PPJV partners in conserving these populations at desired levels.

Staffing Needs

The PPJV, Ducks Unlimited and NRCS are currently cost sharing a Farm Bill biologist working in the Bozeman, MT NRCS office. This biologist has been effectively working with partners to assist agricultural producers in the MT PPR to implement conservation practices targeted to encourage the retention of wetlands and grasslands, improve wildlife habitat for migratory birds, improve water quality and quantity, improve grassland health, and reduce soil erosion and sediment. Continuing to cost share this position will help fulfill the objectives outlined in this State Tactical Plan.

POLICY AND LEGISLATION IN MONTANA[1]

Public policy decisions, legislation, and administrative action can create both opportunities and challenges for PPJV partners attempting to meet population and habitat objectives in Montana. Policy actions in the federal Farm Bill, legislation passed in the State Legislature, and decisions by the county commissioners can aid or impair conservation delivery and impact the condition of the landscape. There is growing awareness that state legislative action has impacts on conservation and PPJV partners are increasingly involved in the state legislature.

We believe these successes can be built upon…We believe this to be a high priority.

The sheer scale of financial resources spent by USDA on conservation actions demonstrates the realized and potential impact of Farm Bill policy. CRP acres in Montana peaked at 2.4 million in 2007, and were coupled with significant investments in Conservation Stewardship Program (CSP), Environmental Quality Incentive Program (EQIP) and Agricultural Conservation Easement Program (ACEP). The accomplishments demonstrate the large scale effect that can be achieved when federal farm programs are congruent with PPJV conservation priorities. Farm Bill funding to Montana has decreased by almost 50% in recent years for programs like EQIP making targeted use of resources more important than ever. In recent years a number of PPJV partners have worked in partnership with NRCS and FSA to provide technical input, spatial planning tools and programmatic design to help guide conservation outcomes to priority landscapes and specific resource concerns of interest to the PPJV. We believe these successes can be built upon to further develop congruence between FSA, NRCS, and the PPJV. We believe this to be a high priority.

Policy priorities for the next five years include:

- Maintain the conservation compliance provisions in the next Farm Bill;
- Seek increases of the CRP acreage cap in the next Farm Bill and address structural impediments that exist in the Ecological Benefits Index (EBI) for Montana and the PPJV administrative are as a whole;
- Promote new programing via NRCS/FSA to conserve priority wetlands and grasslands as working lands;
- Explore new mechanisms via NRCS/FSA that help agricultural producers transition marginal cropland and/or expiring CRP lands to grass-based agriculture;
- Maintain LWCF, NAWCA, and MBCF funding;
- Support the continuation of private landowners' rights to sell perpetual conservation easements as part of private property management and continue to allow state conservation funds to be used to support private landowners' decisions;
- Support the recommendations of the Blue Ribbon Panel on Sustaining America's Diverse Fish & Wildlife Resources;
- Restore FWP's ability to acquire key properties in fee-title to be managed as Wildlife Management Areas;
- State-wide prohibition on sodbusting on state school trust lands that are native grassland-wetlands and marginal cropland.
- Transitioning unproductive cropland on school trust lands back to grass when lessees nominate/petition it and conservation values are potentially high

1 The views and positions of the Prairie Pothole Joint Venture may not represent the official policy of the individual organizations and agencies.

Monitoring is clearly an important aspect to informing conservation for Montana partners. Standardized monitoring for species in each of the bird groups has occurred for several decades. The 2015 Montana State Wildlife Action Plan provides information on species and habitat monitoring programs across the state.

Kevin Barnes

MONITORING AND EVALUATION

PPJV conservation programs will follow the Strategic Habitat Conservation (SHC) described in Section I: Plan Foundation of the PPJV Implementation Plan. Monitoring for priority species across the PPJV administrative area is a fundamental element of SHC that informs the iterative adaptive process whereby conservation partners learn and improve conservation outcomes (i.e., population responses). Through targeted and purposeful monitoring partners evaluate the effectiveness of conservation delivery, gauge progress toward stated objectives, validate assumptions used in conservation design, and incorporate learning into future conservation planning and decision making. Montana partners have identified appropriate monitoring activities to help determine the effectiveness of conservation delivery and whether refinements are necessary.

Monitoring is clearly an important aspect to informing conservation for Montana partners. Standardized monitoring for species in each of the bird groups has occurred for several decades. The 2015 Montana State Wildlife Action Plan provides information on species and habitat monitoring programs across the state. A subset of those ongoing monitoring programs is considered to be the most important for PPJV priority species (Table 4).


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PPJV partners are continuing to invest resources to improve our monitoring capacity to help prioritize efforts that are most likely to give partners the greatest returns on our conservation investments. In 2015, USFWS led the expansion of the BBS routes in Montana. Before then, BBS route densities were

Table 4. Monitoring programs for priority bird species in the Montana PPR.

Bird Group	Monitoring Programs	Primary Agency
Waterfowl	Waterfowl Breeding Population and Habitat Survey	USFWS DMBM[1]
	Four Square Mile Survey	USFWS HAPET[2]
Landbird	North American Breeding Bird Survey	USGS
	Lek surveys (Sharp-tailed Grouse, Greater Sage-grouse)	MT FWP, NWRS[3]
	IMBCR	BCOR[4]
	Species-specific surveys	MT FWP, NHP[5]
	Focal area grassland bird monitoring	PFW[6], MT FWP
Shorebird	Breeding Shorebird Surveys	USFWS HAPET
	North American Breeding Bird Survey	USGS
	Species-specific surveys (e.g., Long-billed Curlews, Mountain Plover)	MT FWP
Waterbird	Colonial Waterbird Inventory and Monitoring Program	MT Audubon, MT FWP
	North American Breeding Bird Survey	USGS
	Local-level NWRS4 Monitoring Programs	USFWS

1 – Division of Migratory Bird Management

2 – Habitat and Population Evaluation Team Office

3 – National Wildlife Refuge System

4 – Bird Conservancy of the Rockies

5 – Montana Natural Heritage Program

6 – USFWS Partners for Fish and Wildlife Program

Kevin Barnes

the lowest in any PPJV state and heightened conservation concern for grassland nesting birds in eastern Montana was the major driver of the expansion. In another example, the USFWS Partners for Fish and Wildlife program, MT FWP, and Montana Bird Conservation Partners are collaborating on the development of methods to monitor grassland bird populations. Although BBS data are appropriate for detecting range wide population trends, local and regional trends may not be adequately reflected by the survey. One of the goals of monitoring is to establish a survey framework that could detect a 5% annual change in abundance of target species in the focal areas over a 5-10 year time period. Another outcome of this monitoring is to link biological outcomes at the landscape scale with habitat conservation accomplishments at the site scale. Establishing a baseline and monitoring trends for the priority species at the appropriate scale will be critical in this assessment. Linking all of the habitat outcomes over that timeline to the biological trend outcomes will be the ultimate evaluation goal.

In addition to priority bird population monitoring, PPJV partners invest resources to monitor landscape habitat features. Upland and wetland habitats are monitored periodically through programs such as the USFWS Four Square Mile Survey, USFWS Waterfowl Breeding Population and Habitat Survey, USFWS Partners for Fish & Wildlife Program, FWP Milk River Initiative, and Sage Grouse Initiative Habitat Assessment. Additionally, research studies (e.g., Dahl 2014, Niemuth et al. 2014, Lark et al. 2015) investigate how landscape changes relate to anthropogenic impacts (e.g., pattern tile drainage, grassland conversion) and climatic changes (e.g., wetland hydro-period). Considering the great amount of uncertainty associated with anthropogenic impacts and climate change, continuing to intensively monitor habitat and populations to detect these changes through time is an approach embraced by PPJV partners.

OUTREACH AND EDUCATION

The 5-year PPJV Strategic Communications Plan (Dayer 2013) was designed to help promote, coordinate and deliver bird habitat conservation. The plan advances the PPJV's efforts to build public and private partnerships for bird conservation by outlining the core components of effective communications campaigns and providing a path for implementation. The plan identified private landowners as being critical to conservation with 85% of the land privately owned in the U.S. PPR. Indeed, private landowners who engage in conservation programs (e.g., sell perpetual easements, participate in Farm Bill programs) are primary constituents supporting PPJV goals and objectives. However, recent analysis by Doherty et al. (2013) suggests the need to maintain this group's interest and acceptance of conservation programs to bridge the gap between habitat loss rates and conservation gains. The communications plan provides a framework to engage diverse supporters, including private landowners. A range of tactics are outlined in the plan, including educational (e.g., workshops, tours, demonstrations) and informational (e.g., newsletters, factsheets, popular magazine articles) product delivery. To increase private landowner participation in conservation programs, PPJV partners must continue to engage this group using all of these tactics.

Montana conservation partners continue to support an array of education and outreach tools to increase interest in conservation activities in the state, from sponsoring outdoor education programs and workshops, such as youth conservation programs, to publishing popular magazines, such as *Montana Outdoors*. The Montana FWP Communication & Education division uses a combination of digital media, video, and print media for public coordination on an array of educational and recreation-safety programs. Similarly, many Montana conservation partners have dedicated communications and public affairs staff, although probably the most effective outreach tool is personal interaction between PPJV partners and the general public.

Interactive outreach programs build trust and credibility between PPJV partners and private landowners…

Technical assistance targeted to agricultural producers through PPJV partners (e.g., FSA, NRCS, Montana State University Extension) provides opportunities to support various conservation programs on working lands. Demonstrations, tours, and workshops designed to improve habitat through agricultural practices directly engage producers and help develop community-based conservation. Interactive outreach programs build trust and credibility between PPJV partners and private landowners and help bridge the gap between habitat loss and conservation gains.

Conservation partners in Montana are also conducting outreach workshops to enhance practitioner and landowner understand of conservation programs. Examples include Conservation Programs Workshops with practitioners and Conservation Easement Workshops for interested landowners.

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LITERATURE CITED

Ball, I. J., R. L. Eng, and S. K. Ball. 1995. Population Density and Productivity of Ducks on Large Grassland Tracts in North Central Montana. Wildlife Society Bulletin 23:767-773.

Best, L. B., H. Campa, K. E. Kemp, R. J. Robel, M. R. Ryan, J. A. Savidge, H. P. Weeks, S. R. Winterstein. 1997. Bird abundance and nesting in CRP fields and cropland in the Midwest: a regional approach. Wildlife Society Bulletin 25:864–877.

Beyersbergen, G. E., N. D. Niemuth, and M. R. Norton. 2004. Northern Prairie & Parkland Waterbird Conservation Plan. Prairie Pothole Joint Venture, Denver, CO, USA.

Bishop, R. A. 1981. Iowa's wetlands. In The Proceedings of the Iowa Academy of Science USA.

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The United States shorebird conservation plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, Massachusetts, USA.

Dahl, T. E. 1990. Wetlands losses in the U.S. 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC, USA.

Dahl, T. E. 2014. Status and trends of prairie wetlands in the United States 1997 to 2009. U.S. Fish and Wildlife Service, Washington, D.C., USA.

Dayer, A. A. 2013. Prairie Pothole Joint Venture Strategic Communications Plan 2013-2017. Communications Report 2013-01. Skaneateles, New York, USA.

Doherty, K. E., A. J. M. Ryba, C. L. Stemler, N. D. Niemuth, and W. A. Meeks. 2013. Conservation Planning in an Era of Change: State of the United States Prairie Pothole Region. Wildlife Society Bulletin. DOI: 10.1002/wsb.284.

Doherty, K. E., J. S. Evans, J. Walker, J. H. Devries, and D. W. Howerter 2015. Building the Foundation for International Conservation Planning for Breeding Ducks across the U.S. and Canadian Border. PLoS ONE 10:e0116735. DOI:10.1371/journal.pone.0116735.

Drum, R. G., C. R. Loesch, K. M. Carlson, K. E. Doherty, and B. C. Fedy. 2015. Assessing the Biological Benefits of the USDA-Conservation Reserve Program (CRP) for Waterfowl and Grassland Passerines in the Prairie Pothole Region. Report prepared for the U.S. Department of Agriculture Farm Service Agency. 12-IA-MRE-CRP-TA.

Herkert, J. R. 1998. The influence of the Conservation Reserve Program on Grasshopper Sparrow Population trends in the Mid-Continental United States. Wildlife Society Bulletin 26:227–231.

Johnson, D. H. 2000. Grassland bird use of Conservation Reserve Program fields in the Great Plains: 2000-2005 Update. Fish and Wildlife Benefits of Farm Bill Programs, 2005, 17-32.

Johnson, D. H., Sparling, D. W., and Cowardin, L. M. 1987. A model of the productivity of the mallard duck. Ecological Modelling, 38:257-275.

Johnson, D. H., and J. W. Grier. 1988. Determinants of breeding distributions of ducks. Wildlife Monographs 1-37.

Johnson, D. H., and L. D. Igl. 1995. Contributions of the Conservation Reserve Program to populations of breeding birds in North Dakota. Wilson Bulletin 17:709–718.

Johnson, R. R., F. T. Oslund, and D. R. Hertel. 2008. The past, present, and future of prairie potholes in the United States. Journal of Soil and Water Conservation 63(3): 84A-87A.

Johnson, R. R., D. A. Granfors, N. D. Niemuth, M. E. Estey, and R. E. Reynolds. 2010. Delineating Grassland Bird Conservation Areas in the U.S. Prairie Pothole Region. Journal of Fish and Wildlife Management 1:38–42. DOI: 10.3996/JFWM-022

Knopf, F. L. 1994 Avian assembles on altered grasslands. Studies in Avian Biology 15:247-257.

Kunkel, K. E, L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, M. C. Kruk, D. P. Thomas, M. Shulski, N. Umphlett, K. Hubbard, K. Robbins, L. Romolo, A. Akyuz, T. Pathak, T. Bergantino, and J. G. Dobson. 2013: Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. Part 4. Climate of the U.S. Great Plains, NOAA Technical Report NESDIS 142-144.

Kushlan, J. A., M. J. Steinkamp, K. C. Parsons, J. Capp, M. Acosta 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. Waterbird Conservation for the Americas, Washington, DC, USA.

Lark, T. J., J. M. Salmon, and H. K. Gibbs. 2015. Cropland expansion outpaces agricultural and biofuel policies in the United States. Environmental Research Letters 10:044003.

Lynch, J. 1984. Escape from mediocrity: a new approach to American waterfowl hunting regulations. Wildfowl 35(35):5-13.

Montana Sage Grouse Work Group. 2005. Management Plan and Conservation Strategy for Sage Grouse in Montana – Final. Helena, Montana, USA.

[MT SWAP] Montana's State Wildlife Action Plan. 2015. Montana Fish, Wildlife & Parks, Helena, Montana, USA.

Niemuth, N. D., F. R. Quamen, D. E. Naugle, R. E. Reynolds, M. E. Estey, T. L. Shaffer. 2007. Benefits of the Conservation Reserve Program to Grassland Bird Populations in the Prairie Pothole Region of North Dakota and South Dakota. US Department of Agriculture RFA OS-IA-04000000-N34, Bismarck, North Dakota, USA.

Niemuth, N. D., K. L. Fleming, and R. R. Reynolds. 2014. Waterfowl conservation in the US Prairie Pothole Region: confronting the complexities of climate change. Public Library of Science One 9(6):e100034. doi:10.1371/journal.pone.0100034.

[NAWMP] North American Waterfowl Management Plan. 2012. North American Waterfowl Management Plan: people conserving waterfowl and wetlands. Canadian Wildlife Service, U.S. Fish and Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales.

Omernik, J. M. 1987. Ecoregions of the conterminous United States. Map (scale 1:7,500,000). Annals of the Association of American Geographers 77(1):118-125.

Peterjohn, B. G., and J. R. Sauer. 1999. Population status of North American grassland birds from the North American Breeding Bird Survey, 1966-1996. Studies in Avian Biology 19:27-44.

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

Reynolds, R. E., T. L. Shaffer, C. R. Loesch, and R. R. Cox. 2006. The Farm Bill and duck production in the Prairie Pothole Region: increasing the benefits. Wildlife Society Bulletin 34:963-974.

Rosenberg, K. V., J. A. Kennedy, R. Dettmers, R. P. Ford, D. Reynolds, J. D. Alexander, C. J. Beardmore, P. J. Blancher, R. E. Bogart, G. S. Butcher, A. F. Camfield, A. Couturier, D. W. Demarest, W. E. Easton, J. J. Giocomo, R. H. Keller, A. E. Mini, A. O. Panjabi, D. N. Pashley, T. D. Rich, J. M. Ruth, H. Stabins, J. Stanton, and T. Will. 2016. Partners in Flight Landbird Conservation Plan: 2016 Revision for Canada and Continental United States. Partners in Flight Science Committee.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. J. Ziolkowski, and W. A. Link. 2014. The North American Breeding Bird Survey, Results and Analysis 1966-2013. Version 01.30.2015. USGS Patuxent Wildlife Research Center, Laurel, Maryland, USA.

[USDA] United State Department of Agriculture- Farm Service Agency. 2014. CRP enrollment and rental payments by county, 1986–2014. *http://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Conservation/Excel/statepymnts8614.xls*

[USFWS] U.S. Fish and Wildlife Service. 2013. Greater Sage-Grouse (Centrocercus urophasianus) Conservation Objectives: Final Report. U.S. Fish and Wildlife Service, Denver, Colorado, USA.

Veech, J. A. 2006. A comparison of landscapes occupied by increasing and decreasing populations of grassland birds. Conservation Biology 20:1422-1432.

Wright, C. K., and M. C. Wimberly. 2013. Recent land use change in the Western Corn Belt threatens grasslands and wetlands. Proceedings of the National Academy of Sciences 110:4134–4139.