MINNESOTA STATE TACTICAL PLAN

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

March 2017

CONTENTS

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EXECUTIVE SUMMARY

The Prairie Pothole Joint Venture (PPJV) administrative area, including western Minnesota, was established in 1987 as one of the six original priority conservation areas under the North American Waterfowl Management Plan (NAWMP 1986). Using rigorous science and robust spatial planning tools, the PPJV partnership strategically protects, restores and enhances high priority wetland and grassland habitat to maintain and increase priority migratory bird and gamebird populations. The primary focus in the three western states (Montana, North Dakota, South Dakota) is protecting the remaining priority grasslands and wetlands. However, in Minnesota, approximately 99% of the historic grasslands have been plowed under and 50% of the wetland basins drained. While there is an emphasis on protecting the last remaining habitats, to make a difference in this landscape, a significant number of acres will need to be restored. Additionally, active management of remaining wetlands will be required to restore their habitat value.

The PPJV is committed to continually strengthening its science by evaluating its foundational assumptions in different landscapes. A renewed commitment to the idea that the PPJV is a diverse, heterogeneous region requiring multiple conservation approaches, and to the idea that the strength of a partnership lies in individuals looking beyond the issues unique to their state, and lending their expertise and resources to implement strategic conservation elsewhere in the joint venture adds value to partners. This added value will insure that the PPJV remains a vibrant partnership in the future.

In the early years of the PPJV, as the NAWMP rallied supporters and built brand recognition, a focus on the best remaining waterfowl habitat that inspired waterfowl enthusiasts was prudent. Today, in intensively farmed parts of Iowa, southern and western Minnesota, and parts of North and South Dakota, the PPJV faces the challenge of strategic habitat restoration and management for breeding and migration.

The 2012 NAWMP Update embraced the concept of a supportive public that values the ecosystem services of waterfowl and grassland bird habitat, clean water and the socio-economic values of healthy and diverse landscapes to rural economies. The public valuation of migratory birds, including maintaining the tradition of waterfowl hunting, is also an important consideration for public support.

...in Minnesota, approximately 99% of the historic grasslands have been plowed under and 50% of the wetland basins drained.

Each of the bird conservation plans (waterfowl, waterbird, shorebird, and landbird) identifies habitat loss in the North American Prairie Pothole Region (PPR) as a primary cause of population declines for species of concern in that geography. Once a vast grassland ecosystem characterized by millions of glacially formed wetland depressions, the U.S. portion of the PPR (U.S. PPR) is now an agrarian system dominated by cropland. In general, intensive agricultural land use resulting in wetland and grassland conversion to cropland has been detrimental to the bird populations that inhabit the PPR. Greater than 50% of U.S. PPR grasslands and wetlands have been converted to cropland; however, in Minnesota losses have been much more extensive. Approximately 95%-99% of wetlands and grasslands in the Minnesota PPR have been tilled and drained making habitat and species conservation challenging.

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. The purpose of Minnesota's State Tactical Plan (STP) is to provide a cohesive and science-based foundation for conservation actions directed at priority bird species within the timeline of the Implementation Plan. Attainment of the objectives and fulfillment of the responsibilities in each PPJV STP included in the 2017 Implementation Plan is contingent on future funding to state agencies, and unforeseen opportunities to double down on the ecological services

of habitat such as water quality and pollinators, farm commodity prices and ethanol subsidies, and changes in the upcoming 2018 Farm Bill. Nevertheless, restoration and protection targeting strategies will remain valid beyond the life of this implementation plan.

Minnesota conservation partners developed five landscape-level plans that prioritize restoration, protection, and enhancement activities in the Minnesota PPR: the 2011 Minnesota Prairie Conservation Plan (currently in revision), the 2015 Pheasant Summit Action Plan, the 2006 MN DNR Long Range Duck Recovery Plan (currently in revision), the 2010 Shallow Lakes Program Plan, and the 2015 Minnesota Wildlife Action Plan. The plans outline goals, objectives, and strategies to identify priority habitats for conservation actions that allow partners to manage landscapes and complexes to facilitate a working lands approach to conservation. Additionally, the U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuge System has prioritized areas on the landscape for upland nesting duck conservation within wetland management districts. The Minnesota State Tactical Plan adopts many of the strategies outlined in the existing landscape plans to guide conservation activities. Partners are working towards the following 5-year goals and objectives within the MN PPJV.

Five-year Goals and Objectives

Goal 1 – Protect in fee title or easement the remaining native prairie and embedded wetlands.

- » Protect 12,600 acres native prairie and other priority grasslands through perpetual easements
- » Protect 35,300 acres of native prairie and other priority grasslands through fee title acquisition
- » Target all work into priority landscapes

Goal 2 – Restore and protect grasslands and embedded wetlands prioritized but not limited to targeted landscapes

- » Restore and protect 117,000 acres of grassland and wetlands
- » Increase native seed production capacity for grassland and wetland plant species to supply diverse local ecotype seed mixes
- » Continue research on grassland and wetland restoration methods and monitoring of wildlife responses to different treatments
- » Develop a communication plan linking grassland and wetland protection, restoration, and management to water quality issues

Goal 3 - Increase the capacity for enhancement work (i.e., active management) and focus these efforts in priority landscapes

- » Enhance 10,000 acres of acres of priority wetlands and grasslands
- » Stimulate small business creation so there are more contractors able to conduct enhancement and restoration projects
- » Expand the capacity of DNR Roving Crews (DNR staff dedicated and equipped for grassland and wetland habitat management)

Goal 4 - Use a working lands approach to manage landscapes as a whole instead of individual parcels

- » Develop grazing cooperatives
- » Develop Prescription Burn Associations to encourage private lands burning
- » Incorporate haying and other practices into public lands management
- » Provide technical assistance to private landowners, NGOs, and conservation agencies for wetland management (e.g., water level, vegetation, fish, and moist soil management)

Goal 5 – Increase hunter access and retention

- » Maintain the 1994–2015 average annual number of waterfowl hunters in Minnesota
- » Increase the amount of acres open to public hunting through 56,300 acres of fee-title acquisition and the MN DNR Walk in Access Program
- » Manage shallow lakes with public access to enhance migration habitat and hunting opportunities

INTRODUCTION

The Prairie Pothole Joint Venture (PPJV; Figure 1) 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 protects, restores and enhances high priority wetland and grassland habitat to help sustain priority bird populations with additional benefits to other wildlife, ecological services and rural communities.

The PPJV is committed to addressing the conservation needs of all priority bird species that inhabit the U.S. portion of the Prairie Pothole Region (U.S. PPR). This is a formidable task, because each species occupies a unique ecological niche and may be subject to a specific set of limiting factors. Effective conservation requires a strategic, science-based approach. The 2017 PPJV Implementation Plan addresses the conservation needs of four species groups: waterfowl, shorebirds, waterbirds, and landbirds. For waterfowl, planning relies on tenants of the North American Waterfowl Management Plan (NAMWP 2012) and models specific to the Prairie Pothole Region. Shorebird conservation planning is developed from the United States Shorebird Conservation Plan (Brown et al. 2001). Waterbird conservation is stepped down from the North American Waterbird Conservation Plan (Kushlan et al. 2002) and the derivative Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004). Lastly, the North American Landbird Conservation Plan (Rosenburg et al. 2016) was the foundation for conservation planning for upland bird species that includes passerines as well as non-migratory prairie grouse and other gamebird species. Each of these bird conservation plans identifies habitat loss in the PPR as a primary cause of population decline for priority migratory bird and game bird species in the region.

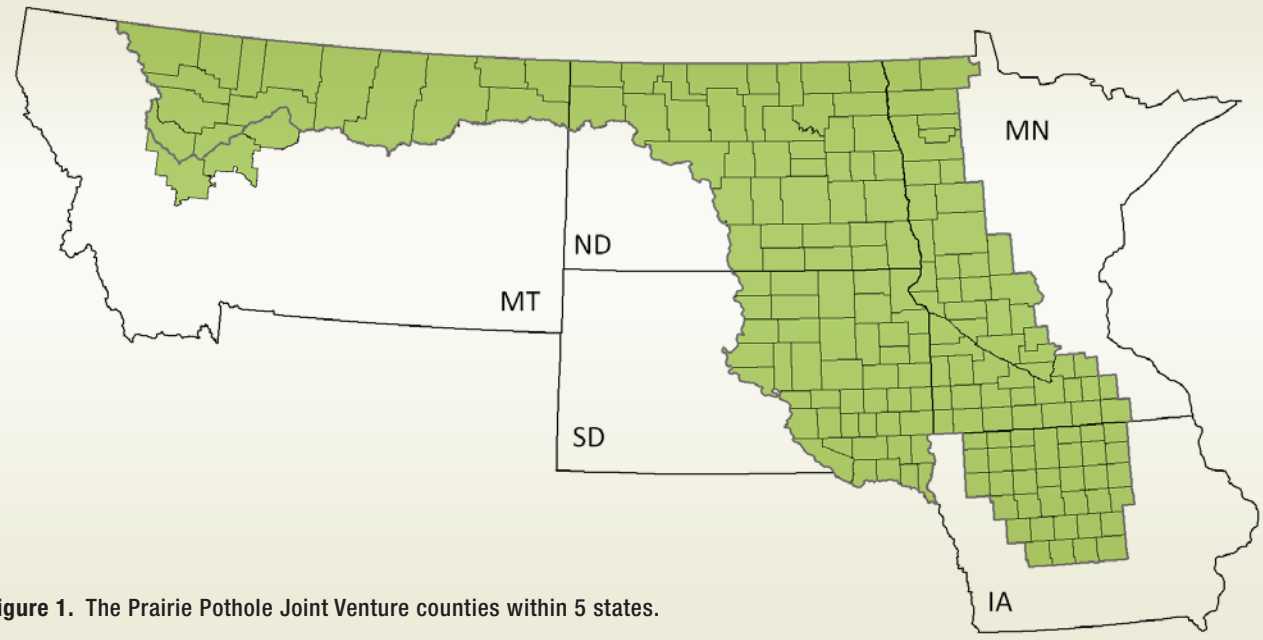

Figure 1. The Prairie Pothole Joint Venture counties within 5 states.

Once a vast grassland ecosystem characterized by millions of glacially formed wetlands, the U.S. PPR is now an agrarian system dominated by cropland. Wetlands and grasslands have been converted to intensive agricultural land use, which has been detrimental to the migratory bird populations that inhabit 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. Much of the remaining wetland and grassland habitat quality has been degraded by competing agricultural uses in the landscape. However, these numbers can be easily misinterpreted since habitat loss estimates vary across the U.S. PPR.

Specifically, there is a west-east gradient of land use intensity and grassland loss. Grasslands in the western side of the PPR are relatively intact. In the more humid eastern part of the PPR (Minnesota and Iowa), >99% of the grassland area and >80% of the wetland area have been lost to row crop agriculture. Following this land use gradient, there is still an active livestock ranching economy in the western part of the U.S. PPR. While there are some small clusters of livestock operations in western Minnesota and northwestern Iowa, the grass-based agricultural economy is almost functionally extinct in this part of the PPJV administrative area. Beyond habitat losses to cropland conversion, other anthropogenic disturbances including energy development, urban expansion, pattern tile drainage, road construction, and climate change continue to threaten habitat quality and the breeding and migrating 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.

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 or 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 to the Implementation Plan. The intent of the Minnesota State Tactical Plan (STP) 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.

...an adaptive approach to species conservation characterized by four programmatic elements: biological planning, conservation design, conservation delivery, and research and monitoring.

In addition to stepping down the conservation framework identified in the 2017 PPJV Implementation Plan, this Minnesota 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. Finally, methods for monitoring and evaluating the efficacy of conservation strategies and the resulting effects on priority species are described. This Minnesota 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.

Of the original 18 million acres of prairie in western and southern Minnesota, only 235,000 acres (< 1%) remains.

Shawn May

THE PRAIRIE POTHOLE REGION OF MINNESOTA

Three major biomes meet in Minnesota, contributing to the state's ecological diversity: the northeastern coniferous or mixed forest; the western and south-central tallgrass prairie dotted with tens of thousands of small glacially formed pothole wetlands; and deciduous forest and oak savannas, or barrens, situated between the two (Figure 2). The tallgrass prairie biome encompasses the Minnesota PPR.

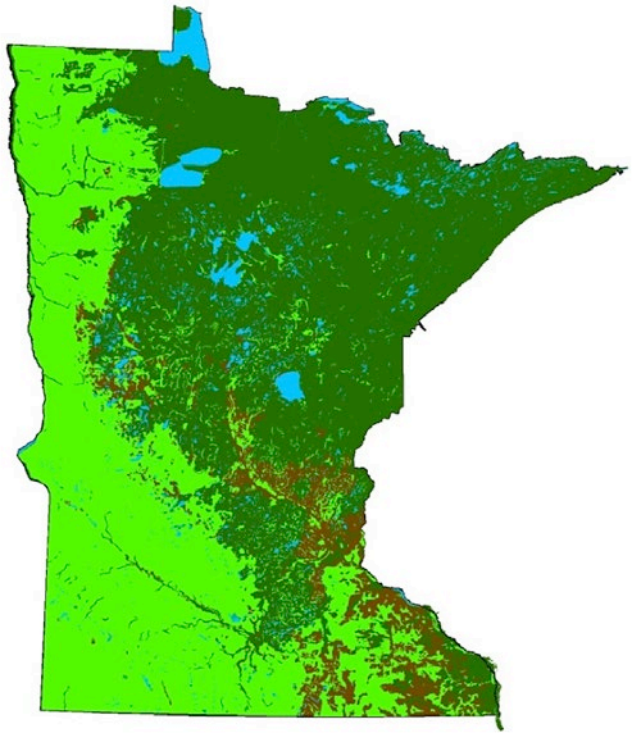

Figure 2. Land Cover in Minnesota before Euro-American settlement. Dark green is forest, light green grassland, and brown savannas. Water bodies are shown in blue.

Once a vast grassland ecosystem characterized by millions of wetland depressions, the Minnesota PPR is now an agrarian system dominated by a two-crop rotation of corn and soybeans. Landscape diversity, including farmland diversity, has steadily declined for at least 75 years. Loss of landscape diversity and intensive agriculture has not only been detrimental to migratory birds and other wildlife, fish, and plants that inhabit the PPR, but also to water quality impacts as far away as Lake Winnipeg (Schindler et al. 2012) and the Gulf of Mexico (Goolsby 1999), and to local rural economies experiencing outmigration (Gascoigne et al. 2013).

Although wildlife habitat is abundant in eastern forested parts of the state, the vast majority of grassland habitat in the Minnesota PPR is relegated to relatively small tracts of habitat such as MN DNR Wildlife Management Areas (WMA), USFWS Waterfowl Production Areas (WPA), and lands enrolled in the U.S. Department of Agriculture (USDA) Conservation Reserve Program (CRP). Together, these cover a relatively small percentage of the counties in western Minnesota in scattered fragments. Positively impacting wildlife populations when the agencies have direct control on only a small proportion of the landscape is a challenge and underscores the importance of working with private landowners. Perpetual conservation easements and term-limited leases administered by the USDA, MN Board or Water Resources (BWSR), MN DNR and USFWS are effective tools for habitat conservation on privately owned lands.

Prairie: Of the original 18 million acres of prairie in western and southern Minnesota, only 235,000 acres (< 1%) remains. The small seasonal and temporary wetlands embedded in grasslands have been lost at a similar rate. Today this landscape is dominated by corn and soybeans, with other row crops and small grains playing a secondary role in the agricultural landscape (Table 1). Livestock, along with the pastures and hayfields they require, have virtually disappeared from the landscape except in a few small areas. Minnesota's remaining livestock industry is largely located in the forested or prairie-forest border areas of the state.

Table 1. Cropland acres of dominant in Minnesota in 2015 (National Agricultural Spatial Statistics 2015).

Crop	2015 MN Acres
Corn	8,100,000
Soybeans	7,600,000
Wheat	3,064,000
Sugarbeets	443,000
Dry Beans	383,700
Oats	280,000
Alfalfa	230,000
Sunflower	202,000

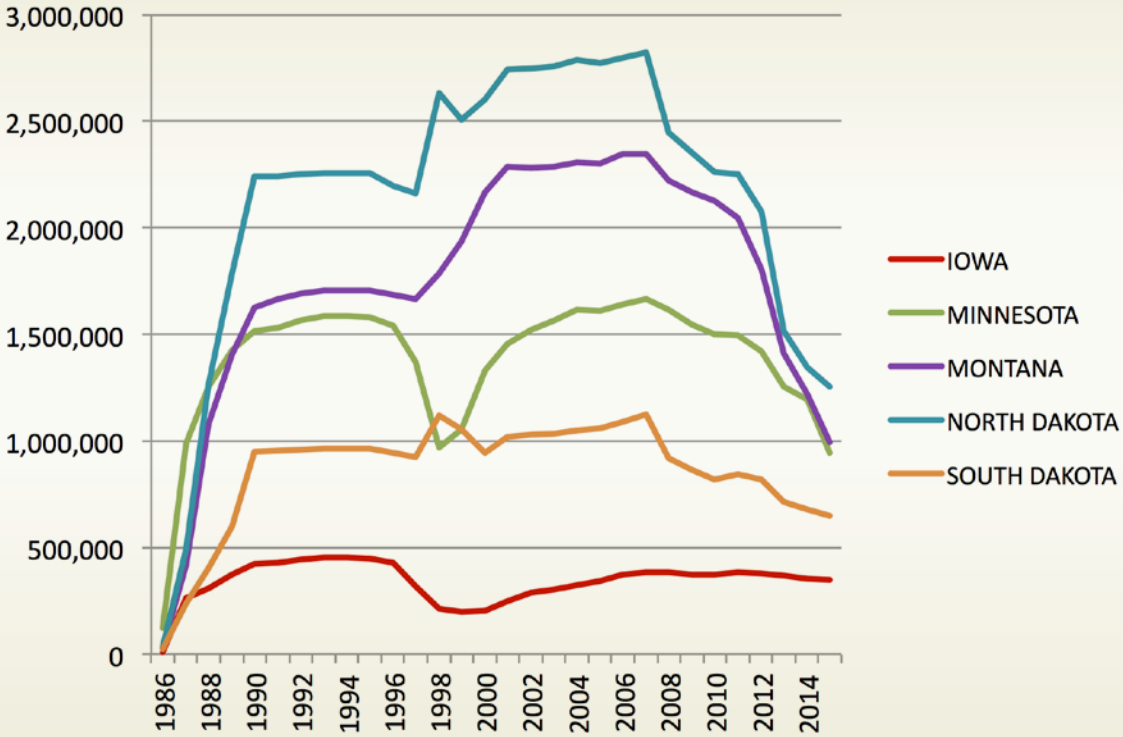

Figure 3. Conservation Reserve Program (CRP) acres for Prairie Pothole Joint Venture counties 1986–2015. Acres include all CRP parcels for all Conservation Practice Types (USDA 2014, FSA unpublished data).

The conversion of remaining prairie and pasture in Minnesota persists today. Wright and Wimberly (2013) reported that Minnesota lost 196,000 acres of grass statewide from 2006-2011. Between 2007 and 2015, Minnesota lost 859,239 acres of CRP (Figure 3). The majority of these acres were in PPJV counties in the northwestern corner of the state. Much harder to track, Minnesota has also lost a significant amount of native prairie in recent years due to conversion to row crops, especially corn (Lark et al. 2015). Much of our remaining native prairies are on sand and gravel, which are unsuitable for growing crops. For these native prairie remnants, aggregate extraction is probably a greater threat than the expansion of row crops.

Wetlands: Minnesota has lost approximately 50% of its original wetland basins due to draining and filling for agriculture and development, with the prairie region having lost 80% of its original wetland area (Redelfs 1980). Many of the wetlands that historically comprised the Minnesota PPR were small and only held water temporarily or seasonally. For breeding waterfowl returning to the breeding grounds on their spring migration, these small wetlands can be very productive for the high protein invertebrates egg-laying hens need in their diet. Larger, more permanent shallow and deep water lakes were also historically scattered across the landscape. Many of these larger bodies of water are the only remaining wetlands on the landscape today. However, due to sedimentation and nutrient inputs from the surrounding agricultural lands, 80% or more of these shallow lakes and other water bodies are degraded according to the Minnesota Pollution Control Agency (MPCA; 2014). Elevated nutrient concentrations can negatively impact emergent wetland plant communities by allowing invasive species such as reed canary grass and hybrid cattail to proliferate and out-compete native species (Woo and Zedler 2002, Kercher and Zedler 2004), reducing the wildlife habitat value and emphasizing the need for intensive wetland management.

Historic wetland drainage was widespread and intensive in the Minnesota PPR, and there has been another boom in recent years - pattern-tile drainage. Between 1997 and 2009, Minnesota lost an estimated 28,320 wetlands basins (Dahl 2014). At 18.1%, this was a greater percentage loss than any other PPJV state. The majority of the 136,000 acres of wetland converted to cropland from 2008-2012

in the U.S. were concentrated in Minnesota and the Dakotas (Lark et al. 2015). Oslund et al. (2010) estimated that 4.3% of remaining wetland habitats disappeared between 1980 and 2007 from the Minnesota PPJV, likely as a result of improved tile drainage. Tile drainage has increased at dramatic rates in the last decade. According to wetland drainage permits in the Bois De Sioux watershed in west-central Minnesota, 162 miles of drain tile were documented in 2005 compared to 3,156 miles in 2013 (Table 2). Presumably the rate of tile installation is similar across the PPJV region of the state. The loss of wetlands and loss of water storage capacity within the watershed, contributes significantly to downstream flooding and resulting flood damage. Schlotter et al. (2014) found that rivers have become more erosive which adds even more sediment to streams and rivers. They correlated artificial drainage and loss of depressional wetlands to the increase in bank erosion. Further, increased wetland connectivity by drainage networks has exacerbated the immigration of invasive fish, a major contributor to habitat degradation to prairie wetlands in Minnesota (Zimmer et al. 2001).

Table 2. Miles of permitted drainage tile in the Bois de Sioux watershed in west-central Minnesota

Year	Miles of Permitted Tile
1999	2.9
2000	65.3
2001	59.4
2002	97.4
2003	49.2
2004	100
2005	162.1
2006	281.5
2007	374.7
2008	390.6
2009	740.9
2010	599.3
2011	1612.9
2012	3023.9
2013	3156.5
2014	2462
2015	1923.7

Although negative impacts to Minnesota PPR wetlands are extensive, conservation partners are investing considerable resources resulting in some positive impacts. Kloiber and Norris (2013) reported a small but significant net gain (0.02%) in Minnesota wetlands from 2009-2011, about half of which occurred on agricultural lands. Minnesota PPJV partners must continue to make strides in wetland restoration and management to regain the lost wildlife habitat values from decades of drainage and degradation.


Chuck Loesch

Impacts on Wildlife: Grassland dependent wildlife populations have declined dramatically over the last 50 years and breeding songbird population trends have received considerable attention recently. Some of the first wildlife surveys (e.g., North American Breeding Bird Survey [BBS]) did not start until the mid-1960s. By that time, much of the Minnesota prairie had already been converted to row crops, making it difficult to determine pre-agriculture wildlife population levels. However, recent BBS trends in Minnesota reveal that from 2007-2015, Western Kingbirds have declined 37%, Clay-colored Sparrows 15%, Grasshopper Sparrows 50%, Dickcissels by 72%, Bobolinks by 45%, and Western Meadowlarks declined by 24% across the Minnesota breeding range.

Ring-necked pheasants are one of the more closely monitored bird species in the Minnesota PPR because of its popularity as a gamebird. Since 1955, the MN DNR has conducted an August Roadside Survey (ARS) during the first two weeks of the month for several species of small game in the MN PPR. The ARS data provide an index of relative abundance

that is used to monitor annual changes and long-term trends in regional and range-wide populations. Additionally, an annual small game hunter survey is conducted to estimate harvest. In 2007, the ARS index and hunter harvest index was 106.0 and 587,580, respectively. By 2014, they had declined to 28.7 and 152,800. Recent harvests are only 8.5% of the historic record harvest of 1,790,000 roosters in 1941.

Waterfowl survey numbers have been better in recent years compared to pheasant surveys. The number of breeding waterfowl in Minnesota, including a portion of the PPR, has been estimated annually since 1968 as a part of the overall inventory of North American breeding waterfowl. In contrast to the decline observed in pheasant indices since 2007, population estimates for blue-winged teal, gadwall, wood duck, and mallard have been relatively stable during this 10-year period. Most years during this period have had above average pond counts in the surveyed area. U.S. PPR breeding waterfowl populations have historically increased during wet periods and declined during dry years.

Ongoing wetland drainage and degradation has negatively impacted spring migrating waterfowl. Anteau and Afton (2004, 2008) investigated the diets of spring migrating lesser scaup throughout the upper-Midwest as they migrated up the Mississippi Flyway. Although female scaup contained plenty of nutrient reserves at the onset of spring migration, body condition declined as migration proceeded through Minnesota. The *Spring Condition Hypothesis* suggested that Minnesota wetlands provided poor diets, lacking protein rich invertebrates, for migrating ducks. The authors hypothesized that the lack of nutrients could be traced to poor water quality due to agricultural inputs and contamination of the wetlands by fish that stir up bottom sediment and negatively impact the trophic structure resulting in low invertebrate densities (Hanson and Butler 1994, Hanson and Riggs 1995).

Impacts on Waterfowl Hunting: Although the breeding population numbers of the state's most common dabbling duck species have been relatively stable (Figure 4), harvest has not. Between 2007 and 2014, harvest increased by 36% and 42% for blue-winged teal and wood ducks, respectively. Beginning in 2011, the hunting season opened a week earlier which probably influenced the higher harvest for these two species. However, harvest declined by 10% for mallards and 50% for gadwalls over the same time period (Figure 5). Further, hunting participation continues to decline despite record continental waterfowl populations in recent years. Since 2002, numbers of duck and goose hunters declined by 32.7% and 38.6%, respectively. Minnesota continues to remain near the top of PPJV states when it comes to the number of duck hunters and the overall duck harvest (Figure 6). The mallard continues to lead the harvest among dabbling ducks. Wood ducks, blue-winged teal, ring-necked ducks, and American green-winged teal comprise the five most commonly harvested species along with the mallard. Among Minnesota's diving ducks, ring-necked ducks almost surpass the next four most common diving ducks combined.

Chuck Loesch

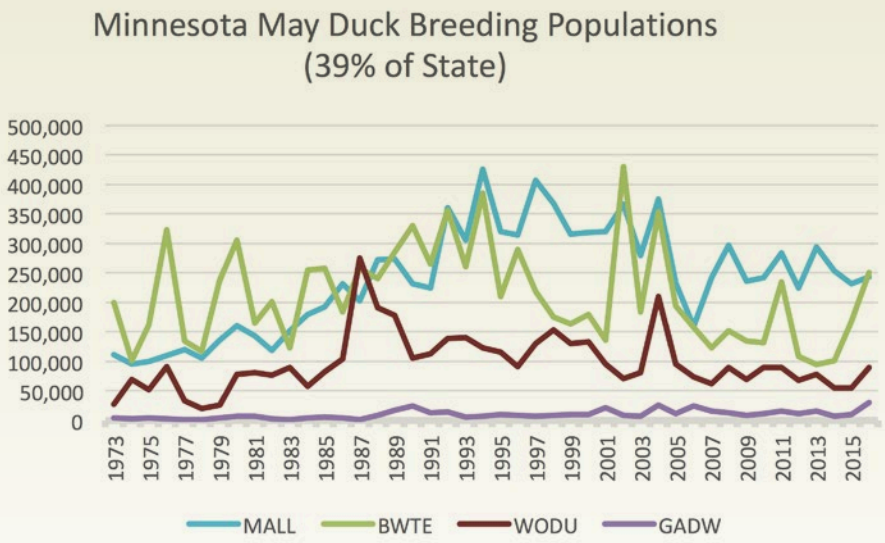

Figure 4. Minnesota breeding duck population numbers for the 39% of the state surveyed annually, 1973-2016 (MN DNR, unpubl. Data).

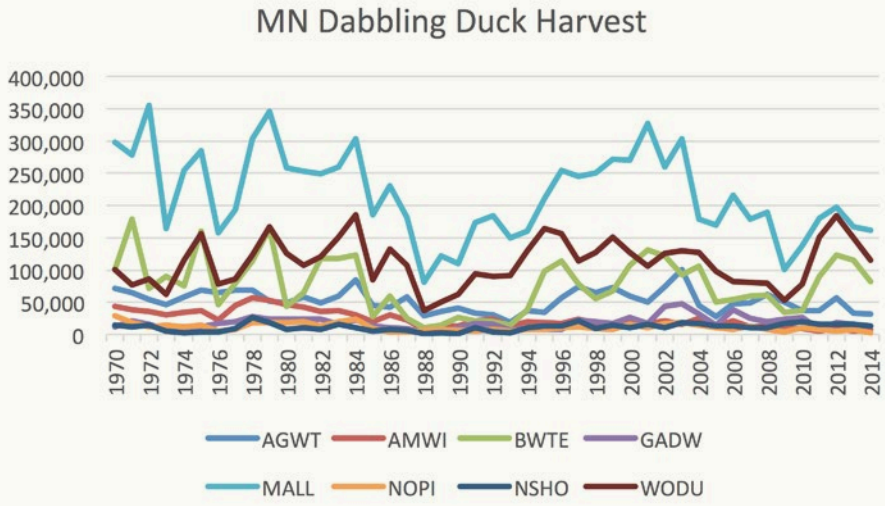

Figure 5. Minnesota dabbling duck harvest from 1970-2014

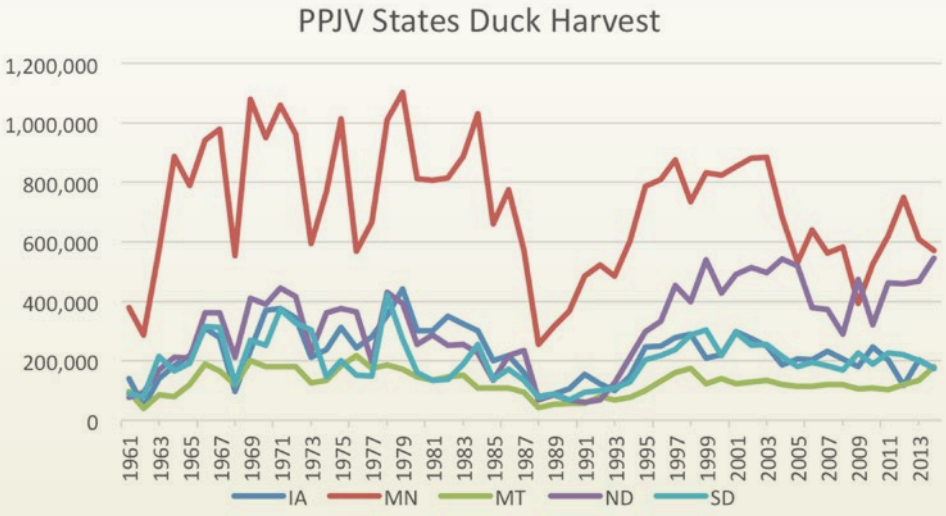

Figure 6. Ducks harvested in PPJV states from 1961-2014

Impacts on Water Quality and Quantity: The changing landscape, with ever increasing grassland loss and wetland drainage, has severe implications for both water quality and water quantity in the Minnesota PPR. The loss of grasslands also means the loss of the water storage and filtration capacity of these grasslands and the soils supporting them. A recent study (Minnesota Pollution Control Agency 2013) found high and very high nitrate levels in surface waters, especially in the south-central part of the state (Figure 7). A large percentage of these nitrates were concluded to originate from agricultural sources. MPCA wetland surveys found that plant communities in 60% of Minnesota PPR wetlands are in poor condition and macroinvertebrate communities were listed as poor in 32% of the wetlands (Figure 8). In southwestern Minnesota none of the lakes in the Missouri River Basin met the aquatic recreation standards in 2014 (Minnesota Pollution Control Agency 2014). The MPCA subsequently recommended against swimming and other recreation uses in those lakes, such as fishing.

Public perception of the results varies throughout the state. A St. Paul Star-Tribune article published on April 2, 2015 interviewed citizens in Adrian, Minnesota, located in the southwest part of the state, who stated that not being able to drink the water was "just part of living in Adrian." However, many Minnesota citizens do not find the high level of nitrates in the water to be as acceptable as the Adrian residents quoted in the article. Excess nitrates in drinking water lead to adverse of health effects, especially in young children and the elderly. When pregnant women drink water with high nitrate levels their children can be born with a condition called blue-baby syndrome, which can lead to birth defects.

Management of shallow lakes for waterfowl and wildlife in Minnesota has waxed and waned depending on funding availability. Since the early 2000s, additional sources of funding have allowed an increase in monitoring and management of many shallow lakes in the state. The efforts to assess and monitor habitat conditions are done for several reasons, including to evaluate habitat conditions around the state, determine if lakes are in need of management, track results of management, and inform future management decisions. Habitat conditions and water quality generally improve after management efforts are implemented on lakes. Total phosphorus (TP) concentrations typically decrease, although individual lakes responses are variable. At some

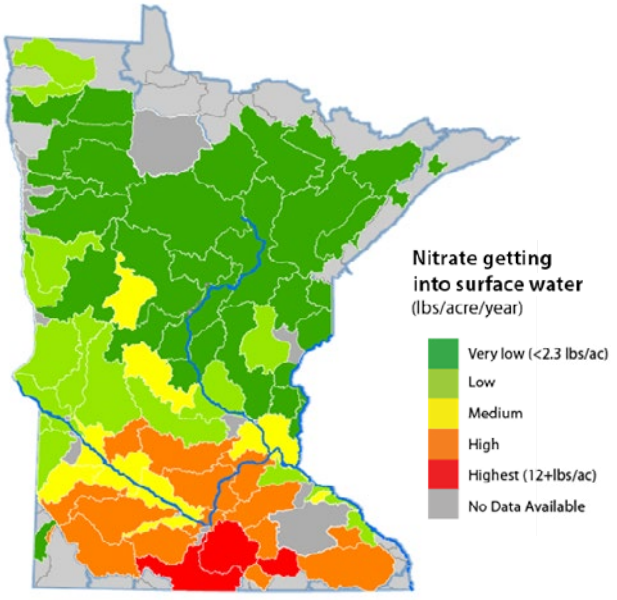

Figure 7. Nitrate Levels in Minnesota surface waters (MPCA 2013)

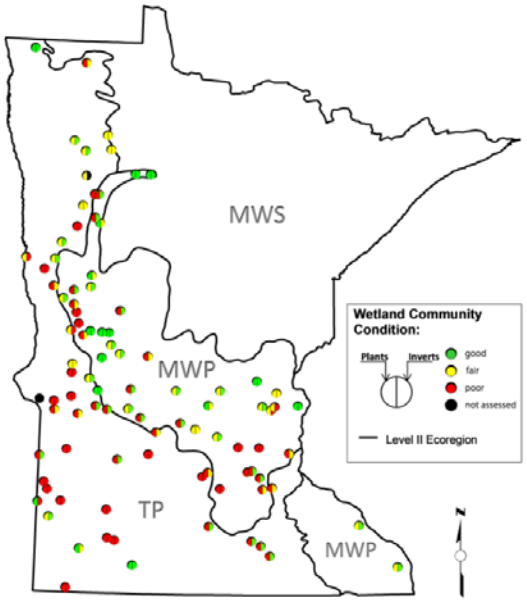

Figure 8. Wetland biological conditions at the Depressional Wetland Quality Assessment survey sites. Ecogregions: MWP – mixed wood plains; MWS – mixed wood shield:. TP – temperate prairies.

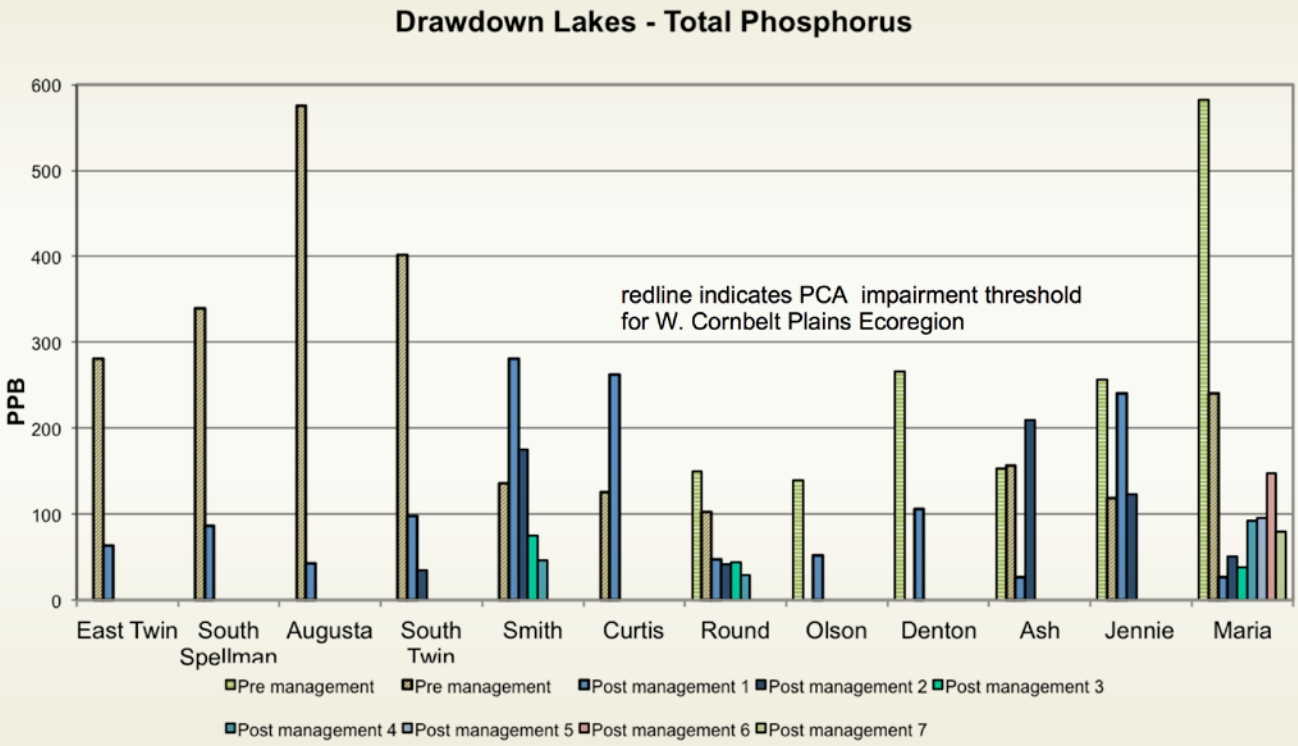

Figure 9. Total phosphorus concentrations in managed lakes prior to and after management. Water samples were taken during vegetation surveys in mid-summer, generally in the middle of the lake, and analyzed by the Minnesota Department of Agriculture. Each bar represents one season pre or post treatment. For example, Lake Maria was sampled each of seven summers after management (data from MN Shallow Lakes Program).

lakes the TP concentrations are lower immediately after refill, other lakes can show a year of increased TP after refill and then concentrations start to fall in later years (Figure 9). Water clarity increases and usually immediately upon refill (Figure10). Aquatic plant abundance increases quickly as well (Figure 11). The longevity of these improvements, however, is variable. Lakes with smaller less impacted watersheds tend to maintain positive improvements for longer durations. Management of these lakes is approached as a long-term, on-going effort rather than a one-time restoration event. Many lakes are in highly impacted watersheds and it is unrealistic to expect them to function without management interventions.

Wetland drainage and consolidation has compounding negative effects on water quality and quantity throughout Minnesota PPR watersheds. Schottler et al. (2014) compared watersheds with and without significant tile drainage. They found watersheds with tile drainage had > 50% yield in water compared to 1940 levels. The increased flow rate has led to extensive streambank erosion resulting in channel widening between 10% and 40%. This erosion adds yet more sediment, which negatively impacts water quality in the state's rivers and lakes.

Hubbard and Linder (1986) measured water holding capacity of small wetlands in the Altamont Moraine of South Dakota. They concluded that many small wetlands located across a large region can store vast amounts of runoff and significantly increase groundwater recharge. Van der Kemp and Hayashi (1998) found similar results from small wetlands in Prairie Canada. At Glacial Ridge National Wildlife Refuge in northwestern Minnesota, Gerla (2007) studied the effects of grassland/wetland restoration and determined that restoration activities can reduce flood run-off by up to 55%. Miller and Nudds (1996) looked at watersheds with and without extensive drainage. They concluded that rivers in watersheds with high levels of drainage had much higher flow rates which increases flood magnitude downstream.

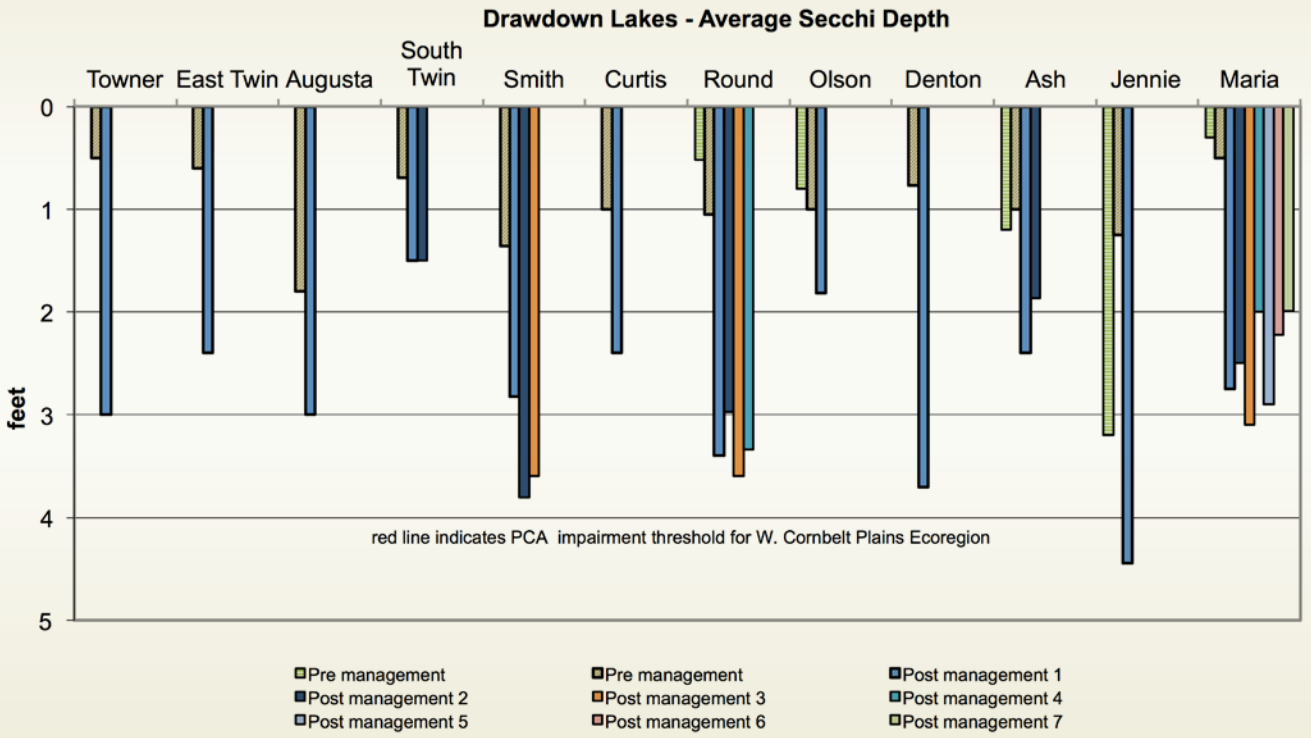

Figure 10. Average Secchi Depth in managed lakes prior to and after management. Secchi depth is measured at a grid of points during the point-intercept vegetation surveys and averaged over the area of the lake. Each bar represents one season pre or post treatment. For example, Lake Maria was surveyed each of seven summers after management (data from MN Shallow Lakes Program).

Strategically restoring grasslands on the landscape can be a cost-effective approach to keeping Minnesota waters clean. Although widespread restoration of native vegetation in agricultural watersheds would decrease soil loss resulting from erosion, this approach is not feasible in communities with crop-based economies. However, strategically placing a small number of vegetative filter strips within agriculture fields for erosion control is an alternative to restoring entire fields. At Neal Smith National Wildlife Refuge in Iowa, the Science-based Trials of Rowcrops Integrated with Prairie Strips (STRIPS) project demonstrated that planting only 10% of a field to native grasses and forbs, soil export can be reduced by 95%, nitrogen and phosphorus loss are reduced by 82% and 89% respectively (Hirsch et al. 2013). Additionally, field trials have shown an estimated 32% reduction in run-off. Models have been developed to help producers locate the grassland strips within crop fields to maximize conservation results while minimizing negative impacts to agricultural operations.

Additional research at Neal Smith National Wildlife Refuge has shown that prairie soils can act as sponges, absorbing large quantities of water during rainfall events and limiting run-off and resulting downstream flooding (Schilling and Drobney 2014). Soils under grasslands are healthier and more porous, which creates room for water between the soil particles. The evapotranspiration of the plants roots and leaves keep these soils 'drier' and able to absorb rain. Conversely, the compacted soils of agricultural fields, largely due to the loss of organic matter, have relatively little infiltration and a high degree of surface run-off. This run-off scours the soil surface, increasing erosion, and potentially adding to downstream flooding issues.

Recently, the city of Worthington in southwest Minnesota faced a reduced water supply crisis. Options included building a pipeline to pump in water from a distance or protecting their wellhead recharge area. City officials determined that protection was the most cost-effective alternative. The local water utility, the city, Pheasants Forever, MN DNR, and USFWS worked together to acquire several thousand acres of land within the wellhead protection area. The acquired properties were transferred to the MN DNR and USFWS to be managed as Wildlife Management

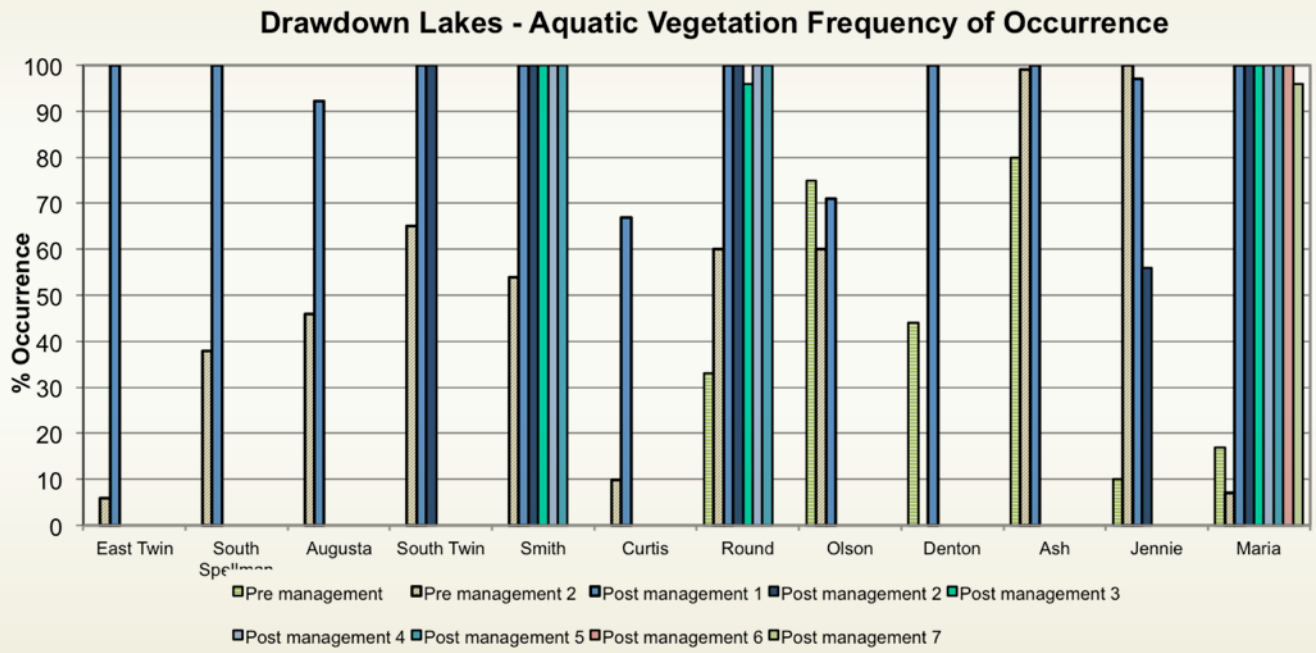

Figure 11. Frequency of occurrence of aquatic plants in lakes prior to and after management. Each bar represents frequency of occurrence of aquatic vegetation in one growing season. Vegetation was sampled from June- August using point-intercept surveys (data from MN Shallow Lakes Program).

Areas (WMA) and Waterfowl Production Areas (WPA), or owned by the utility. All of the property is open to public hunting. The Worthington Wells project has received numerous conservation and partnership awards across Minnesota and the Midwest.

In 2015, Minnesota passed a Buffer Law (Laws of Minnesota 2016, Chapter 85, 103B.101). The law requires a 50' buffer on public ditches across the state. These lands can be enrolled in programs such as USDA Conservation Reserve Enhancement Program (CREP), lessening the impact to the landowner. The law could add as much as 100,000 acres of perennial grasses to the state.

These examples show how wetlands and grasslands can be used to provide ecosystem services for all Minnesotans, not just wildlife habitat for those who like to hunt. PPJV partners must ensure that conservation actions targeted for priority birds are included as solutions to the issues facing the region, most importantly water quality problems. In Minnesota and the rest of the Midwest, water quality issues are probably where PPJV partners will generate the most public support for wildlife conservation actions. By doing so, priority bird populations and PPJV partners will be relevant to a much broader section of Minnesota's society.


Neal & MJ Mishler

GOALS, OBJECTIVES AND STRATEGIES

Goals: The Minnesota PPJV partners interpret goals to be statements of long-term intent, versus objectives which are specific means to achieve goals. Obviously, habitats like grassland and wetland with complimentary functions for priority species will be juxtaposed in the following section despite having separate objectives for each.

Minnesota's PPJV Priorities: 1) increasing populations of migratory and resident grassland birds, 2) improving water quality and quantity, 3) protecting native grasslands and wetlands, and 4) restoring and actively managing grassland and wetland complexes in targeted landscapes.

Minnesota PPJV Goals

1. Protect in fee title or perpetual easement the remaining native prairie and embedded wetlands.
2. Restore and protect grasslands prioritized but not limited to targeted landscapes (see Minnesota PPJV Focal Areas section below).
3. Increase the capacity for enhancement work (i.e. active management) and focus efforts in priority landscapes
4. Use a working lands approach to manage landscapes as a whole instead of individual parcels.
5. Increase hunter access and retention

Objectives

Conservation objectives are often assigned a finite time frame for completion to increase accountability. However, when conservation is opportunistic, either in terms of program funding or landowner willingness to engage in conservation, both of which are essentially uncontrollable variables like the weather, full accountability is difficult to enforce. Conservation organizations face a dilemma in the modern political climate. On one hand, politicians, government regulators, and granting organizations want greater accountability; on the other, annual funding for conservation programs may have never been less certain from year to year. Out of a desire to increase accountability, authors of the 2017 PPJV Implementation Plan state their objectives in terms of what they hope to accomplish in five years.

Goal 1 – Protect in fee title or easement the remaining native prairie and embedded wetlands

Objective 1 – Protect native prairie and other priority grasslands through perpetual easements

Strategy A – Enroll 4,000 acres of native prairie in the DNR Native Prairie Bank easement program

Strategy B – Enroll 8,600 acres of perpetual easements administered through the USFWS National Wildlife Refuge System


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Objective 2 – Protect native prairie and other priority grasslands through fee title acquisition

Strategy A – Acquire 27,000 acres of native prairie and other priority grasslands under the DNR WMA system

Strategy B – Acquire 8,300 acres of native prairie and other priority grasslands administered through the USFWS National Wildlife Refuge System (including National Wildlife Refuge and Waterfowl Production Areas)

Objective 3 – Target all work on priority landscapes

Strategy A – Continue to refine existing models to develop parcel priority lists

Strategy B – Contact and develop relationships with every owner of native prairie in MN

Strategy C – Develop a communication plan for legislators, county commissioners, and townships


Sean Fields

Goal 2 – Restore and protect grasslands and embedded wetlands prioritized but not limited to targeted landscapes

Objective 1 – Restore and protect 117,000 acres of grassland and wetlands

Strategy A – Restore 3,600 acres of wetlands through cooperative Private Landowner Agreements (PLA) administered by the USFWS Partners for Wildlife (PFW) program

Strategy B – Restore 13,400 acres of grasslands through cooperative Private Landowner Agreements (PLA) administered by the USFWS Partners for Wildlife (PFW) program

Strategy C – Enroll 100,000 acres in Conservation Reserve Easement Program (CREP) administered by NRCS

Strategy D – Convert restored acres of wetland and grasslands enrolled in temporary programs (e.g., CRP, CREP, WRP) into permanent protection through fee-title and easement acquisition

Objective 2 – Increase native seed production capacity for grassland and wetland plant species to supply diverse local ecotype seed mixes

Strategy A – Stimulate native seed production business expansion/creation

Objective 3 – Continue research on grassland and wetland restoration methods and monitoring of wildlife responses of different treatments

Strategy A – Increase agency capacity for monitoring and research

Strategy B – Further develop relationships with universities and direct research to management oriented hypotheses

Objective 4 – Develop communication plan linking grassland and wetland protection, restoration, and management to water quality issues

Strategy A – Acquire multiple rainfall simulators and use at public events and demonstrations

Strategy B – Continue to publish articles in the conservation and general press linking grasslands and wetlands to water quality and human health/safety

Strategy C – Develop more public support for grassland and wetland conservation

Goal 3 - Increase the capacity for enhancement work (i.e., active management) and focus these efforts in priority landscapes

Objective 1 - Enhance 10,000 acres of acres of priority wetlands and grasslands

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

Strategy B – Enhance 9,000 acres of high priority grasslands through cooperative Private Landowner Agreements (PLA) administered by the PFW program

Objective 2 – Stimulate small business creation so there are more contractors able to conduct enhancement and restoration projects

Strategy A – Ensure funding for these projects in the long-term to make business development for attractive to entrepreneurs

Objective 3 – Expand the capacity of DNR Roving Crews (DNR staff dedicated and equipped for grassland and wetland habitat management)

Strategy A – Increase both staffing and equipment of existing crews

Strategy B – Develop additional Roving Crews, one in the southern part of DNR Region 1 (Glenwood area or nearby) and one in the middle part of DNR Region 4 (Redwood Falls areas or nearby)

Goal 4 - Use a working lands approach to manage landscapes as a whole instead of individual parcels

Objective 1 – Develop grazing cooperatives

Strategy A – Hire staff dedicated to grazing management within the conservation agencies/NGOs

Strategy B – Identify landscapes to pilot these projects and then expand/replicate across the PPJV area

Objective 2 – Develop Prescription Burn Associations to encourage private lands burning

Strategy A – Work with DNR Forestry to facilitate training and record keeping

Strategy B – Retain more contractors in Minnesota with burning qualifications and fire equipment

Objective 3 – Incorporate haying and other practices into public lands management

Strategy A – Identify factors that make lands suitable for haying and other practices

Objective 4 – Provide technical assistance to private landowners, NGOs, and conservation agencies for wetland management (e.g., water level, vegetation, fish, and moist soil management)

Strategy A – Work with DNR Shallow Lakes Program to recommend lake management strategies and develop management plans

Strategy B – Work with USFWS Partners for Fish and Wildlife Program and DNR Private Land Habitat Program to provide technical assistance to private landowners

Alisha Maves

Goal 5 – Increase hunter access and retention

Objective 1 - Maintain the 1995 – 2015 average annual number of waterfowl hunters in Minnesota

Strategy A – Adopt the recommendations of the MN Commissioner's Council on Hunting and Angling Recruitment and Retention (MN DNR 2013)

Objective 2 - Increase the amount of acres open to public hunting

Strategy A - Purchase 8,300 acres of public grasslands and wetlands as part of the National Wildlife Refuge System (including National Wildlife Refuges and Waterfowl Production Areas; See Goal 2 Objective 1 above)

Strategy B - Purchase 27,000 acres of grasslands and wetlands as Wildlife Management Areas open for public hunting administered by MN DNR (See Goal 2, Objective 1 above).

Strategy C - Maintain 21,000 acres of private land open to public hunting in the MN PPR through the Walk in Access Program administered by MN DNR

Objective 3 – Manage shallow lakes with public access to enhance migration habitat

Strategy A – Actively manage as many of the shallow lakes completely within WMAs and all the Designated Wildlife Lakes for high quality waterfowl habitat

Strategy B - Work cooperatively with the FWS and other partners to increase active management of shallow lakes and other water bodies within WPAs and NWRs.

Conservation Strategies

Although protection can be the primary focus of grassland and wetland conservation in the western PPJV states where expanses of intact native grasslands still exist, restoration is a primary focus in Minnesota and Iowa where few grasslands and wetlands remain. While MN PPJV partners work to protect the last remaining tracts of native prairie and get permanent protection on other restored grasslands such as CRP, to meet the wildlife population goals and ecosystem services of grasslands, large amounts of grass and water (especially seasonal wetlands) will need to be restored on the landscape. Strategies for fee title and easement acquisition listed above generally include restoration components, but were only listed under protection goals to avoid double counting of acreage objectives. To avoid conflicts with other interests, the best science needs to be used in determining where on the landscape those grasslands and wetlands should be located to have multiple benefits and the greatest return for society's investment.

Minnesota's PPJV Focal Areas: Minnesota conservation partners developed five landscape-level plans that prioritize wetland and grassland restoration, protection, and enhancement activities: the Minnesota Prairie Conservation Plan (Minnesota Prairie Plan Working Group 2011), the Pheasant Summit Action Plan (MN DNR 2015), the Long Range Duck Recovery Plan (MN DNR 2006) the Shallow Lakes Program Plan (MN DNR 2010), and the Minnesota Wildlife Action Plan (MN DNR 2016).

The Minnesota Prairie Conservation Plan identifies Core Areas, Habitat Complexes, and Corridors connecting the Core Areas (Figure 12). These Core Areas are developed around clusters of the last remaining native prairie left in the state. Within these Core areas, there are specific targets for restoring, protecting, and ongoing enhancement of grassland and wetland habitat. There are two basic reasons the remaining Minnesota prairies were never plowed. Either the remnants were too high, dry, rocky, or steep to plow, or they were too wet to drain. With newer drainage technology, this has been changing in recent years. Obviously the wetter sites provide greater waterfowl and wetland dependent bird habitat but the drier sites will provide good habitat for the upland nesting bird species.

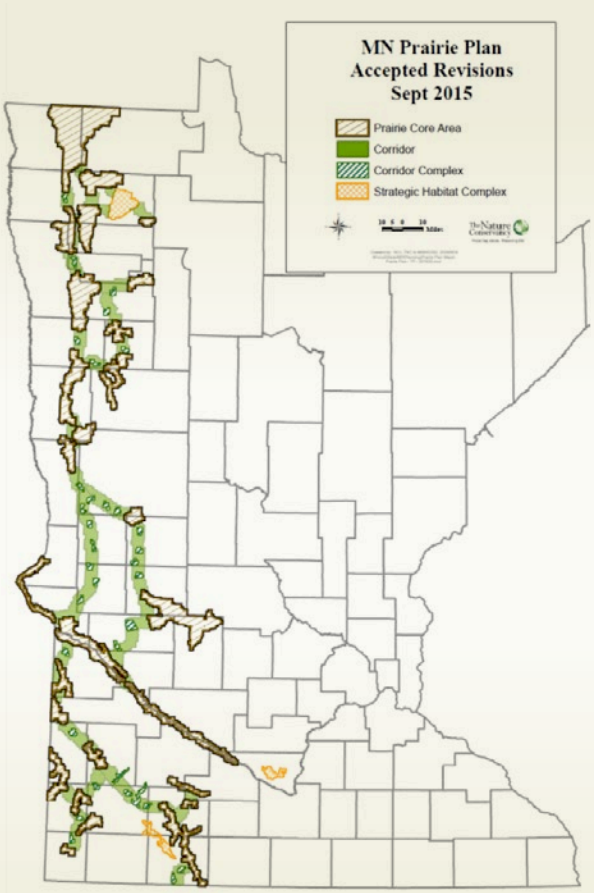

Figure 12. The Minnesota Prairie Conservation Plan Core Areas, Habitat Complexes, and Corridors connecting the Core Areas.

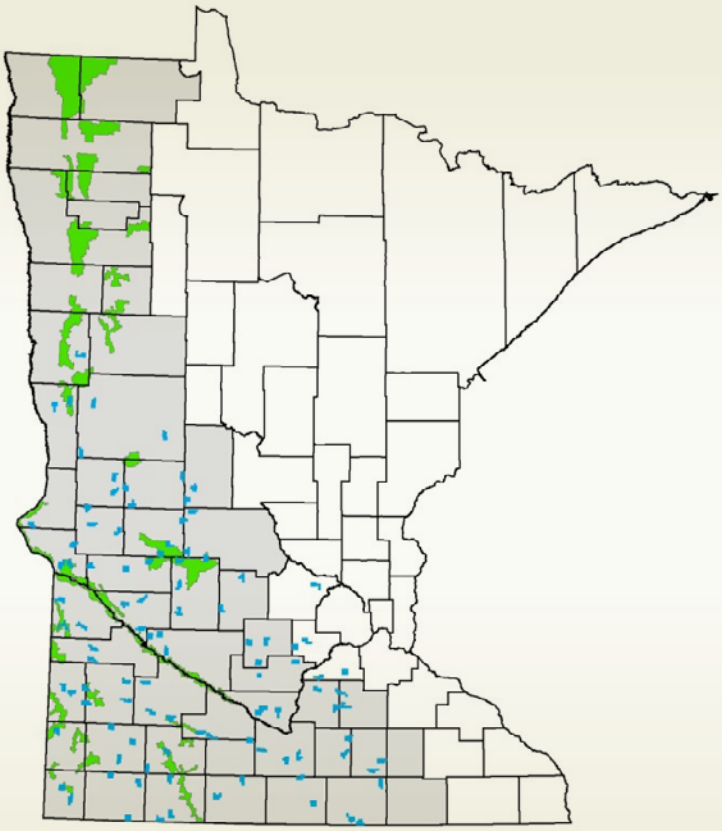

Figure 13. The Minnesota Prairie Conservation Plan Core Areas (shown in green) and Prairie Pheasant Summit Action Plan complexes (shown in blue)

Minnesota recently released the Pheasant Summit Action Plan. Part of this Plan identifies approximately nine square mile habitat complexes across the southern half of the PPJV counties (Figure 13). Each county has 2-3 of these complexes. The complexes were built around existing permanently protected grasslands, most in fee title conservation ownership and private easement. The goal is to get 40% of these nine square mile complexes permanently protected.

The Long Range Duck Recovery Plan provides a strategic vision of supporting a breeding duck population of 1 million birds by 2056. The plan emphasizes the restoration of wetlands and grassland habitat complexes at least 4 square miles in size. Supporting goals and objectives for migrating populations and recreation objectives for waterfowl hunters and watchers are also identified. The Shallow Lakes Program Plan compliments the Duck Recovery Plan by providing focus to shallow lake management efforts. Shallow lakes include Type IV semi-permanent wetlands and Type V permanent wetlands. The Shallow Lakes Program prioritizes 1800 shallow lakes across Minnesota for management and protection to achieve the goals of the Duck Recovery Plan. The highest priority shallow lakes are those within or adjacent to public land.

Minnesota's 2015-2025 Wildlife Action Plan outlines goals, objectives and conservation actions and discusses potential habitat and species changes associated with a changing climate. The plan identifies 346 Species of Greatest Conservation Need (SGCN), which includes all of the PPJV priority bird species found in the tallgrass prairie ecosystem with

the exception of the Ring-necked Pheasant. Minnesota's Wildlife Action Plan takes a three-pronged approach to ensuring the long-term health and viability of Minnesota's wildlife. First, the habitat approach focuses on sustaining and enhancing terrestrial and aquatic habitats for SGCN in the context of the larger landscapes. Next, the species approach identifies a prioritized group of species whose needs cannot be sufficiently addressed by the habitat approach, and suggests specific conservation actions. Finally, the third approach recognizes that providing people with opportunities to enjoy wildlife and habitats and to actively participate in their conservation helps to ensure an engaged conservation community now and into the future that supports conservation funding and contributes to Minnesota's outdoor recreation-based economies.

To further aid planning, the USFWS Wetland Management Districts have identified priority areas for conservation. Additionally, the USFWS Habitat and Population Evaluation Team (HAPET) office has developed the third generation of breeding waterfowl upland accessibility models (a.k.a. Thunderstorm Maps) that identify areas with high value waterfowl breeding pair habitat (Figure 14). There are additional conservation opportunities in the state. Wellhead protection areas have been mapped for Minnesota. As the Worthington Wells project demonstrates, grassland and wetland restoration is one of the best ways to protect wellheads and groundwater recharge areas. These areas provide opportunities for widespread community support for grassland conservation.

Once these landscape conservation complexes are developed, both in the Prairie Plan and Pheasant Plan, it will allow partners to manage landscapes and complexes, not just individual parcels. This will also facilitate a working lands approach to conservation. For instance, cattle could be rotated between private, Federal, and state lands to create a diverse and structurally heterogeneous landscape.

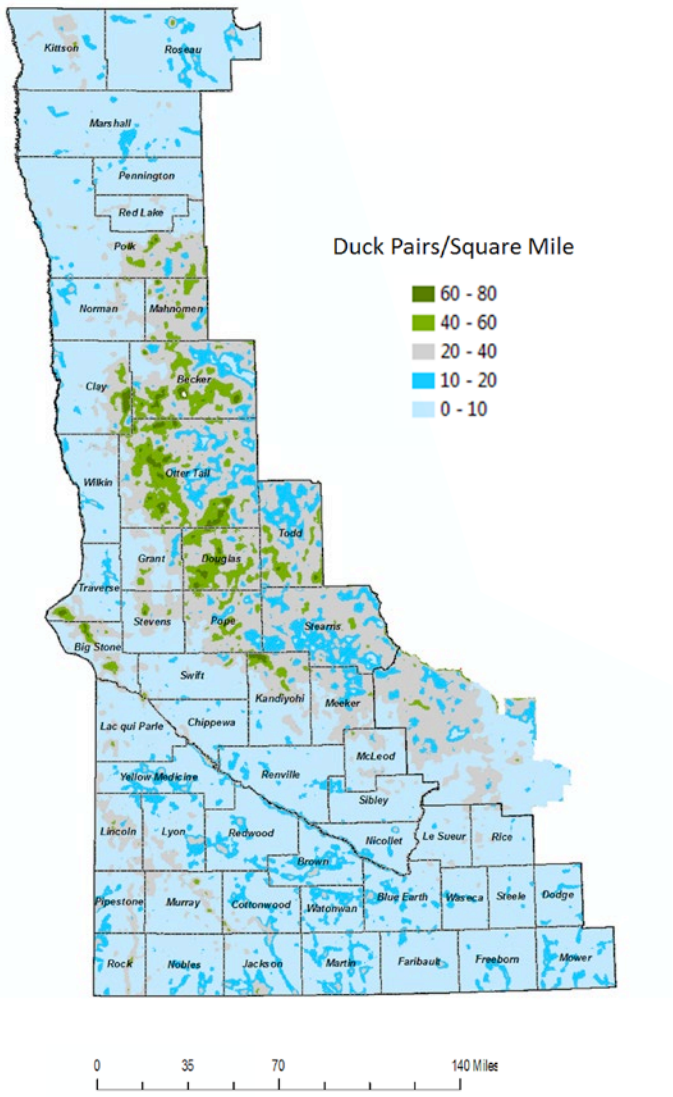

Figure 14. Upland accessibility of breeding duck pairs in the MN PPR (a.k.a.thunderstorm map). Mallard, northern pintail, gadwall, blue-winged teal and northern shoveler are included in the model.

FUNDING NEEDS

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Although Minnesota receives conservation funding provided by the Clean Water & Legacy Amendment and the Environment and Natural Resources Trust Fund (ENRTF), additional needs exist for grassland and wetland restoration, protection, and enhancement. The Legacy Amendment established the Outdoor Heritage Fund which provides approximately $100M per year for statewide restoration, protection, and enhancement works. The prairie region usually receives 50-60% of these funds. The ENRTF revenues are derived from a state lottery. This fund fluctuates from year to year as does the ratio of projects directed at habitat work versus research. While the ENRTF a valuable funding mechanism in Minnesota, it is difficult to estimate or predict the amount of funds dedicated to grasslands. Additional needs related to funding include:

1. In partnership with Iowa, evaluate alternative MBCF allocations to the state based on peer-reviewed methods.
2. Increase USDA conservation funding in the 2018 Farm Bill. Specifically, partners need to tie grasslands to pollinators, grass-based agriculture, and ecosystem services above and beyond the traditional 'grass is habitat' messaging. While temporary conservation programs such as CRP have proven to be valuable at bridging the gap between conservation gains and habitat losses, permanent conservation is the preferred conservation approach to benefit both wildlife as well as the American tax-payer.
3. Minnesota's CREP 3 is already well under way. However, implementing the CREP to maximize the value of those acres will be important.
4. One of the most important methods for implementing CREP and all over farmland conservation programs is the Farm Bill Assistance Program. Secure, long-term funding is critical to having an active program as well as hiring and retaining enthusiastic and dedicated staff.
5. Minnesota recently submitted a request for $1 billion -$100 million annually over ten years - of Deep Water Horizon settlement money from BP. Conservation partners must aggressively pursue this funding opportunity.

FUTURE INFORMATION NEEDS

1. State and federal agencies need to continue to develop and build on existing relationships with university researchers. Many of the management questions we have would make ideal theses or dissertations for graduate students.
2. We need to continue to learn from and refine our modeling and mapping efforts. Taking what we learned in the first years of the Prairie Plan, we were able to modify the Core Areas to better represent the conservation landscape (Figure 7). No map should be seen as set in stone and lines will need to be redrawn as we learn more and the conservation landscape continues to develop.
3. We need better communications strategies with the general public, beyond the hunting and outdoor recreation community, on the importance of grasslands and wetlands to all Minnesotans. The subject of this messaging should be around water issues more than the traditional wildlife habitat issues that conservation programs have been sold on in the past.
4. Evaluate the direct and indirect impacts of climate change to ensure conservation delivery has long term resilience for the PPR.

POLICY AND LEGISLATION PRIORITIES IN MINNESOTA AND THE PPJV[1]

1. Peer review the USFWS MBCF allocation method in the PPR and apply recommendations to the fund allocation method;
2. Recognize Minnesota as one of the most critical national conservation priority areas for USDA and other federal agencies charged with preserving environmental health because of its significance to monarch butterflies, native bees and other pollinators, and critically poor water quality as the leading contributor to nitrogen and phosphorous to hypoxia in the Gulf of Mexico and Lake Winnipeg;
3. Maintain the link between Conservation Compliance and Crop Insurance Premium Subsidies;
4. Fully fund the Minnesota Outdoor Heritage Fund;
5. Minnesota partners should be actively informing national CRP policy:
    A. Raising national CRP acreage caps and allocating the additional acres among these national conservation priority areas where multiple environmental issues may be addressed;
    B. Introduce CRP Policy Changes, including:
        1) Use CRP to encourage greater economic stability through agricultural diversification such as resurgence of cattle production in the Midwest. For example:
            a) Develop better means to target CRP in Minnesota;
            b) Allow producers to graze appropriate CRP grassland and wetland practices to enhance value to wildlife and the producer. A producer would work with NRCS to set a stocking rate that will achieve wildlife management goals.
            c) Allow producers to keep the residue from the management practice of clipping or mowing while taking a 25% reduction in that years payment. On fields 40 acres (16 ha) or larger the activity would be limited to 50% of the field over a 2-year period.
        2) When light disking or harrowing is the selected practice, allow producer to clip or mow the grass without taking the 25% payment reduction;
            a) Light disking or harrowing does little good when there is thick residue covering the soil;
            b) Allows the producer to keep the hay while performing 2 management practices;
            c) Light disking or harrowing is an excellent way to encourage early successional plant growth like milkweed; and
            d) Allow interseeding of forbs as a cost share companion practice to further encourage early successional habitat.
        3) Provide the option to do midterm management practices on CRP wetland acres;
            a) Clipping, mowing, or grazing would benefit most wetlands;
            b) This will provide open water areas for waterfowl in the spring and early successional habitat for pheasants when wetlands do not contain water.


Kevin Barnes

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

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EVALUATION AND MONITORING

Minnesota PPJV partners maintain several monitoring programs, such as the USFWS 4 square mile breeding waterfowl surveys, Breeding Bird Surveys, August Roadside Surveys (pheasants), Native Prairie Adaptive Management (NPAM), Grassland Monitoring Team (GMT) and Shallow Lake Habitat Assessments. The primary monitoring issue is that many of these surveys are designed for coarse scale analysis, perhaps with the exceptions of NPAM and GMT, and are difficult to directly tie to our site scale conservation work. Therefore it makes it difficult to estimate biological outcomes at multiple scales or apply Strategic Habitat Conservation parameters to these efforts.

These monitoring and evaluation scale issues make the Minnesota conservation messaging and outreach challenging. Although Minnesota conservation partners have accomplished good things in grassland conservation, approximately 721,000 acres of CRP has been lost since 2007 as well as undocumented losses of native prairie. At the regional scale most current surveys are conducted (August Roadside Survey, Breeding Bird Survey), we have seen precipitous declines in wildlife since the beginning of the Minnesota Legacy Amendment funding, despite tens of millions of dollars spent on grassland conservation. This invites the question 'we keep spending money, why are things getting worse?' or 'why aren't you spending these funds in productive ways?' The answer to that question is that we are benefitting wildlife, but can only assess those benefits at the scale that we are conducting our work. Unfortunately, we are doing little monitoring at all local, regional, and landscape scales to be able to provide these data to funders, legislators, and other conservation constituents. Minnesota PPJV partners must continue to develop and refine existing monitoring programs so results can inform conservation programs on the effectiveness of delivering desired biological outcomes and multiple scales.

EDUCATION AND OUTREACH

The five-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.

In the Minnesota PPR, greater emphasis must be placed on up to date social messaging about the value of habitat and healthy ecosystems to personal health and fiscal wellbeing using proven marketing techniques and professional marketing consultants to compliment the traditional message outreach by managers and biologists. The elements of a marketing campaign must focus on issues of immediate concern to the public that evoke an emotional response rather than focusing on abstract facts. These elements would include but not be limited to:

- **Human health and safety**
  - Clean water
  - Flood damage
  - Impacts on pollinators and the food supply
  - Impacts on other wildlife
  - Impacts on outdoor recreation
- **Personal fiscal wellbeing**
  - The Farm Bill
  - Contributions of hunting and outdoor recreation to rural economies.
  - Conservation programs evening out fluctuations in commodity markets for producer income
  - Cost to taxpayers of temporary versus permanent conservation

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Pheasant Summit Action Plan (MN DNR 2015)
Minnesota Prairie Conservation Plan (Minnesota Prairie Plan Working Group 2011)
Shallow Lakes Program Plan (MN DNR 2010)
Long Range Duck Recovery Plan (MN DNR 2006)
Minnesota's Wildlife Action Plan (MN DNR 2016)

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