



Credit Rebecca Field

Black Tern Minnesota Conservation Plan

*Audubon Minnesota
Spring 2014*



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Black Tern Conservation Plan

Chlidonias niger

Priority for Minnesota's *Implementation Blueprint for Bird Conservation*

- Prairie Parkland Region (Prairie Parkland Ecological Province): Highest Level Priority
- Boreal Hardwood Transition Region (Laurentian Mixed Forest Ecological Province): Highest Level Priority
- Prairie Hardwood Transition Region (Eastern Broadleaf Forest Ecological Province): High Level Priority
- Tallgrass Aspen Parklands Region (Tallgrass Aspen Parklands Ecological Province): Highest Level Priority

Executive Summary

Audubon Minnesota has selected the Black Tern as one of 24 Target Conservation Species in the state and one of four species selected to represent Minnesota's Prairie Parkland Region (also known as the Prairie Parkland Province by Minnesota's Ecological Classification System and part of Bird Conservation Region 11 (i.e. the Prairie Potholes) by Partners in Flight). The other three Target Conservation Species for the region are the Blue-winged Teal, Upland Sandpiper and Grasshopper Sparrow. All four species are classified as Highest Level Priorities by *Audubon's Implementation Blueprint for Minnesota Bird Conservation*. Conservation plans were only prepared for three of the four highest priority Target Conservation Species in the region. Because it is managed as a harvested waterfowl species by the Minnesota Department of Natural Resources and the U.S. Fish and Wildlife Service, a plan was not prepared for the Blue-winged Teal.

The Black Tern's small size and dark plumage are unmistakable, making it easy to identify in the field. It is broadly distributed throughout Minnesota's former prairie region as well as in the prairie-forest transition zone; it is largely absent from the Arrowhead region of northeastern Minnesota. Considered a 'semi-colonial' nesting species, it nests in loose colonies that average 10-50 nesting pairs. It prefers productive marshes, with adequate emergent vegetation and low wave action, and nests on floating vegetation mats.

Despite its broad distribution, the Black Tern has experienced a large and statistically significant population decline in Minnesota since 1966, declining an average of 5.8% per year for a loss of nearly 94% of the state population over 46 years. Only five other Minnesota breeding species have experienced larger annual declines over the same time period: the Black-crowned Night Heron (-6.52%), Red-headed Woodpecker (-6.31%), Purple Martin (-6.32%), Grasshopper Sparrow (-7.28%) and Western Meadowlark (-8.09%). The loss and degradation of wetlands is considered the primary factor responsible for the tern's decline.

The Conservation Plan that follows is divided into two parts. The first provides background on the Black Tern, including its status, distribution, habitat requirements and management needs. The second is a detailed conservation plan that outlines specific management recommendations. The highest priorities are to collect additional data on the 16 Audubon Minnesota Important Bird Areas where nesting has been documented, assessing whether these colonies remain active, how many nesting pairs they support, and the terns' fidelity to the sites, and to work with conservation partners to protect, restore and manage wetland habitats throughout western and southern Minnesota.

Introduction

The Black Tern was selected as a **Target Conservation Species** for Minnesota's *Implementation Blueprint for Bird Conservation* (<http://mn.audubon.org/>). It is one of four Target Conservation Species selected for the Prairie Parkland Region, one of Minnesota's four ecological regions (also known as the Prairie Parkland Ecological Province by Minnesota's Ecological Classification System and as part of Bird Conservation Region 11 (i.e. the Prairie Potholes) by Partners in Flight). The process for selecting Target Conservation Species is described in the *Blueprint's* conservation recommendations for the Prairie Parklands Region and is available on the Audubon Minnesota website. Briefly, target species are defined as birds' whose status and trends are likely to be responsive to changes in ecological conditions, permit inference to the integrity of the overall ecosystem and provide meaningful information regarding the effectiveness of the plan. This has been broadly adapted from the U.S. Forest Service's definition of Focal Species in the 2012 revisions to the National Forest System Land and Management Planning Rule (U.S. Forest Service 2012). The selection was part of a statewide process initiated by Audubon Minnesota, with input solicited from resource professionals through a series of nine workshops held in the fall of 2011. Similar plans have been developed for a suite of eight other Target Conservation Species as part of the *Implementation Blueprint for Minnesota Bird Conservation* (<http://mn.audubon.org/>).

In the Prairie Parklands Region target species were selected to represent the following habitats as delineated and described by the Minnesota Department of Natural Resources in *Tomorrow's Habitat for the Wild and Rare* (Minnesota Department of Natural Resources 2006):

1. Wetlands
2. Prairies/Grasslands

The Black Tern was selected to represent wetland habitats. A complete list of the other priority birds and conservation targets in the Prairie Parklands Region can be found in the *Implementation Blueprint*. One of the region's four Target Conservation Species is a harvested waterfowl species, the Blue-winged Teal, and receives considerable management attention by state and federal resource agencies so a comprehensive conservation plan was not prepared.

Background

Status

Legal Status: None

Other Status Classifications:

1. National
 - U.S. Fish and Wildlife Service 2005 Focal Species (*U.S. Fish and Wildlife Service 2005*).
 - U.S. Fish and Wildlife Service FY2012-2016 Focal Species (*U.S. Fish and Wildlife Service 2011*).
 - North American Waterbird Conservation Plan: Moderate Concern; population appears stable (i.e. Population Trend = 3) (*Kushlan et al. 2002*).
2. Regional
 - U.S. Fish and Wildlife Service Bird of Management Concern in Region 3 (Midwest) (*U.S. Fish and Wildlife Service 1995*).
 - U.S. Fish and Wildlife Service Bird of Conservation Concern in Bird Conservation Region (BCR) 11 (Prairie Potholes), 12 (Boreal Hardwood Transition), 22 (Eastern Tallgrass Prairie), 23 (Prairie Hardwood Transition) and Region 3 (Midwest) (*U.S. Fish and Wildlife Service 2008*).
 - Focal Species for the Upper Mississippi Valley/Great Lakes Joint Venture (*Soulliere et al. 2007*).

- Focal Species for the U.S. Fish and Wildlife Service’s Plains and Prairie Potholes Landscape Conservation Cooperative (*U.S. Fish and Wildlife Service 2009*).
- Northern Prairie and Parkland Waterbird Region: High Concern (*Beyersbergen et al. 2004*).
- Upper Mississippi Valley and Great Lakes Waterbird Region: High Priority in BCR12 (Boreal Hardwood Transition), BCR22 (Eastern Tallgrass Prairie) and BCR23 (Prairie Hardwood Transition); designated a focal species for Region-wide monitoring because it is a Conservation and Stewardship Priority in the Upper Mississippi Valley/Great Lakes Region (*Wires et al. 2010*).

3. Minnesota

- Minnesota Species of Greatest Conservation Need (*Minnesota Department of Natural Resources 2006*); it is proposed to remain on the list of Species in Greatest Conservation Need in 2013.
- Minnesota Audubon Action List (*Audubon Minnesota 2008*).
- Sensitive Species on the Chippewa National Forest (*U.S. Forest Service 2012*).

Range

Historical Range: The Black Tern was a localized breeder in suitable wetlands throughout the northern half of the United States and the central Canadian Provinces, ranging primarily from Michigan and southern Ontario and Quebec in the east to British Columbia and western Washington and Oregon in the west. The core of its range, where it is most abundant, has always been the Prairie Pothole Region of the U.S. and Canada (*Heath et al. 2009*).

In Minnesota, T.S. Roberts (*1932*) considered the species an abundant summer resident throughout the state.

Current Breeding Range: In North America the species extended its breeding range into the Maritime Provinces and Maine in the 1940s. However, to the south, the southern limit of its range has contracted. Formerly the tern bred as far south as Missouri, Kentucky and south-central Illinois. Today, the southern limit of its range has contracted north to northern Iowa, Illinois, Indiana and Ohio. It has been reported that droughts in the prairie wetlands may temporarily cause the terns to extend their range to wetter areas in the northern prairie provinces and southern Northwest Territories (*Heath et al. 2009*).

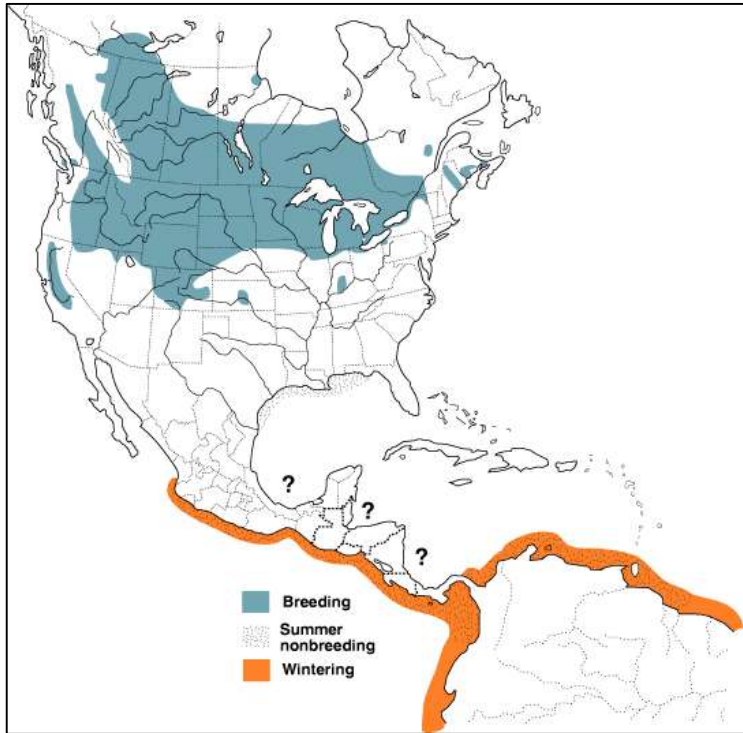
In Minnesota, the species is now present in all but the northeast and north central regions, the southeast region west of the Mississippi River, and the heavily agricultural Red River Valley (*Janssen 1987*).

Summary of Presence on Minnesota’s Important Bird Areas (IBA): Black Terns have been observed during the migration and breeding season on all but two of Minnesota’s 54 Important Bird Areas (North Shore Peregrine Falcon Eyries IBA and Pigeon Lake IBA). They have been documented nesting at 16 IBAs listed in the table below:

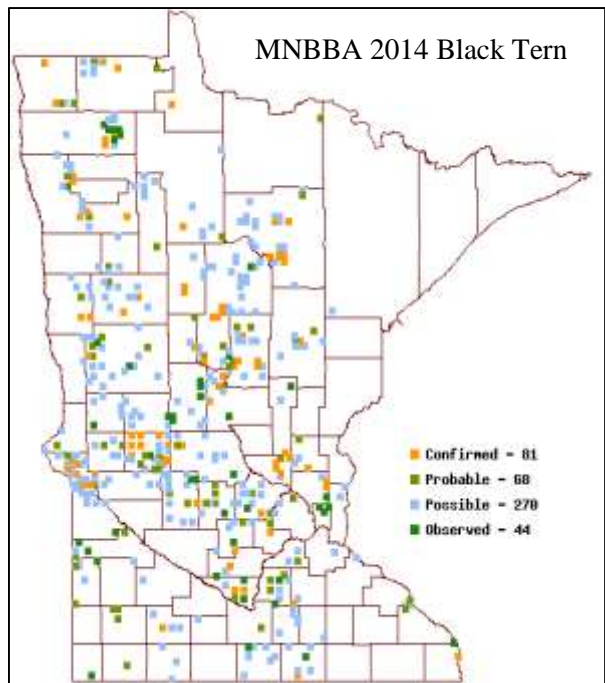
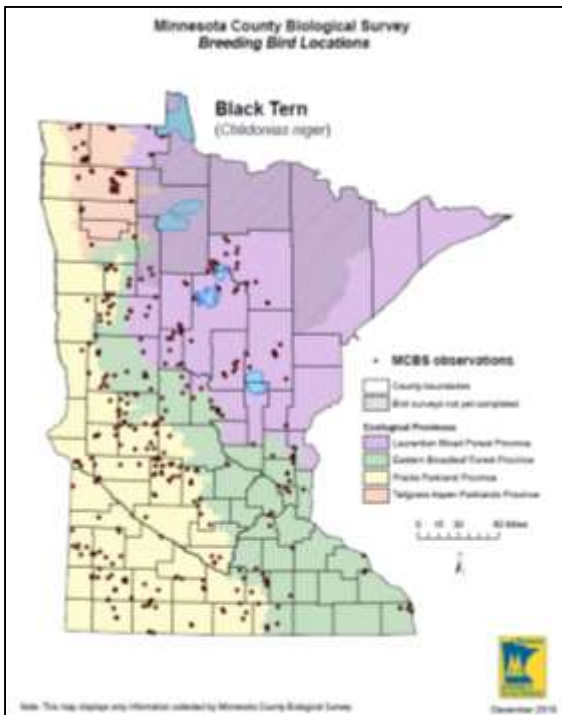
Table 1. Audubon Minnesota Important Bird Areas with Nesting Black Terns

Agassiz	Kettle River-Banning State Park	Upper Minnesota River Valley
Chippewa Plains	Kittson-Roseau-Aspen Parklands	Upper Mississippi River
Goose Lake Swamp	Sherburne National Wildlife Refuge	Voyager’s-Kabetogama
Hamden Slough National Wildlife Refuge	St. Croix-Greater Wild River	Whitewater Valleys
Lac Qui Parle-Big Stone	Swan Lake	
Lake Osakis	Thief Lake	

Figure 1. Black Tern Distribution Maps



Birds of North America - <http://bna.birds.cornell.edu/bna/>



Population Numbers

National

- Estimated North American population: 100,000 – 500,000 breeders (*Kushlan et al. 2002*).

Regional

- Estimated population in the Upper Mississippi Valley/Great Lakes Waterbird Conservation Plan Region: >15,200 pairs (a 1990s number and is considered an incomplete estimate) (*Wires et al. 2010*).
- Population goal in the Upper Mississippi Valley/Great Lakes Joint Venture region is 28,400; the current estimate is 18,900; the projected deficit is 9,500 (numbers are individual birds) (*Soulliere et al. 2007*).
- More than 50% of the Black Tern's global breeding population occurs in the Prairie Pothole Joint Venture Region (*Beyersbergen et al. 2004*).

Minnesota

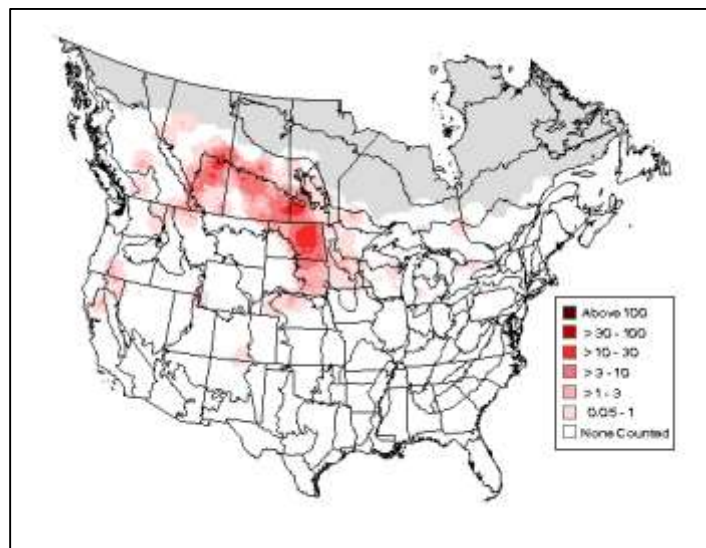
- In Minnesota, nesting was confirmed at 63 locations in Minnesota over a 5 year period (1990-1995) when observations were actively solicited by the Minnesota Department of Natural Resources (*Baker and Hines 1996*).
- Minnesota does not have one of the highest centers of the species abundance; it supports about 4.39% of the species North American breeding range. The highest centers of abundance are further west in the Great Plains states and provinces.

Population Trends

National Breeding Bird Survey (BBS) Data (*U.S. and Canada, Sauer et al. 2014*)

- Red level of credibility (i.e. the U.S. Geological Survey has classified the BBS data for the Black Tern at the national level as data with an important deficiency; <http://www.mbr-pwrc.usgs.gov/bbs/credhm09.html>).
- Given this limitation of the data, between 1966-2012 the Breeding Bird Survey documented a decreasing trend (not statistically significant) of -2.39% per year; from 2002-2012, the trend has been increasing at an average rate of 6.31% per year.
- The relative breeding density of Black Terns from 2008-2012 is demonstrated on the following map.

Figure 2. Relative Abundance of the Black Tern in North America (2008-2012).



Regional BBS Data (Sauer et al. 2014)

- The Great Lakes Marsh Monitoring Program reports a statistically significant declining trend (10.5% annual change) in the Great Lakes basin from 1995-2012; this is the largest decline of any marsh bird monitored by the program (Tozer 2013).
- Regionally, the Black Tern demonstrates annual population trends displayed in Table 2.

Table 2. Black Tern Regional Population Trends

Region	Credibility Level ¹	1966-2012	Statistically Significant	2002-2012	Statistically Significant
Prairie Potholes	Moderate ²	-1.15% per year	No	+6.98% per year	No
Prairie Hardwood Transition	Moderate	-6.86% per year	Yes	-7.18% per year	Yes
Boreal Hardwood Transition	Some Deficiency ³	-2.67% per year	No	-1.85% per year	No

¹ Precise definition for each credibility level can be found at: <http://www.mbr-pwrc.usgs.gov/bbs/credhm09.html>.

² Reflects data of moderate precision

³ Reflects data with a deficiency because species has a low abundance, small sample size, and/or the results cannot detect a 3% per year change in population.

Minnesota BBS Data (Sauer et al. 2014)

- Blue level of credibility (i.e. the U.S. Geological Survey has classified the Black Tern BBS data in Minnesota as data with moderate precision; <http://www.mbr-pwrc.usgs.gov/bbs/credhm09.html>).
- The BBS data document a statistically significant decline of -5.82% per year from 1966-2012 as well as a decreasing trend of -4.92% per year from 2002-2012.

Life History Characteristics Relevant to Recovery

Migration: Neotropical migrant; winters primarily in marine coastal areas of Central America and northern South America, along both the Pacific and Caribbean coast lines (Heath et al. 2009).

Climate Change Vulnerability: Medium (3) (Butcher 2010); climate change models predict that the Black Tern will decrease in distribution and abundance in Minnesota (Matthews et al. 2004).

Home Range and Territoriality: Black Terns are considered a semi-colonial nesting species. They usually nest together in clusters of approximately 10-50 nesting pairs (range is 2-100 nesting pairs), with nests from 5-20 meters apart. Many birds (25-30%) within the wetland will actually nest some distance from the others (anywhere from 20-600 meters further away). Nesting birds may travel up to 4 km away from the nesting marsh to forage (Heath et al. 2009).

Age at First Reproduction: Black Terns do not breed until they are at least two years old, coinciding with when they attain their full black plumage, usually spending their first full summer on their winter range. Some birds delay breeding even beyond their second year. Some 2-3 year old birds may actually visit the nesting site without breeding (Heath et al. 2009).

Nesting Dates: Late May to early July (Heath et al. 2009).

Clutch Size: Usually from 1-3; rarely 4-6; average is 2.6 (Heath et al. 2009). A study at Agassiz National Wildlife Refuge during 1992-1994 found that nest success was higher for nests with larger clutch sizes

and for nests located farther away from other nests. Nests with 3 egg clutches were 2.8 times as likely to hatch as 2 egg nests. The odds of a nest being successful increased by 25% for each 5 m increase in distance to the nearest nest. Earlier nests were also more successful (*Maxson et al. 2007*).

Longevity of Adults: One banded bird survived 8 years, 5 months (*Heath et al. 2009*); longevity of 17 years has been assumed by Servello (*2000*).

Food: Breeding grounds: insects and freshwater fish; proportions vary with availability. Rest of year: mainly small marine fish; also insects (*Heath et al. 2009*).

Habitat Requirements and Limiting Factors related to Habitats

Habitat Categorization: Marsh

Limiting Factors during the Breeding Season (*Soulliere et al. 2007*):

- Adequate productive wetlands with native emergent plants in association with open water (0.5 – 1.5 m water depth) and relatively low wave action at nest sites.
- Wetland loss and degradation (largely due to dense growths of invasive plants such as giant reed canary/*Phragmites*, purple loosestrife and hybrid cattail) are considered primary reasons for the Black Terns' decline.

General Habitat Descriptions:

- Shallow marshes with emergent vegetation, including prairie sloughs, margins of lakes and occasionally river or island edges. The tern is more likely to select wetlands within landscapes where less than 50% of upland habitat was tilled, suggesting negative correlation with agricultural activities and less likely to occur in wetlands surrounded by woody vegetation. The species forages in wetlands and fields (*Heath et al. 2009*).
- Nests in shallow, productive wetlands with emergent vegetation (25-75% cover), semi-permanent ponds, prairie sloughs, margins of lakes and river edges. Sometimes nests in cultivated rice fields, open or forested country. Commonly occupies wetlands within complexes; wetlands >20 ha in size preferred, but has been observed on wetlands < 6 ha. Within suitable wetlands, nesting occurs in sparse or moderately dense stands of emergent vegetation or in open water with no emergent cover, where nests are placed on floating mats of vegetation. Nests are generally 2-20 cm above water, placed in water 0.05 -1.2 m deep, located in stands of emergent vegetation either adjacent to or within 0.5-2 m of open water, and are rarely placed near shore. Commonly uses large areas of open water for foraging. (See *Zimmerman et al. 2002* for summary of specific habitat characteristics at multiple sites in the Upper Mississippi Valley/Great Lakes Region). First year birds summer south of breeding range on open ocean/Gulf of Mexico (*Wires et al. 2010*).
- Nests in shallow, highly productive wetlands with emergent vegetation in freshwater (sometimes brackish or alkaline) marshes, along prairie sloughs, lake margins, edges of islands or slow-moving rivers, wet meadows, bogs, shrub-swamps and occasionally large stock ponds. Prefers wetlands surrounded by grassland rather than agricultural fields (*Beyersbergen et al. 2004*).
- Nests semi-colonially in loose groups, typically about 20 pairs (40 individuals) but also singly or in groups as high as 200 pairs. Prefers native-plant marsh complexes ≥ 20 ha in size, and will use smaller marshes (10 ha) when in close proximity (1-4 km) to other quality habitat (marsh/open water complexes > 10 ha in size). Readily selects new nest sites each year in response to water-levels and

other factors that influence vegetation conditions and the vegetation/open-water mosaic (*Soulliere et al. 2007*).

- Locations closer to open water and in deeper water were more likely to be associated with nest sites. Locations in bulrush (*Scirpus acutus*) and sedge/grass were preferred, although 68% of nests were in cattail (*Typha* spp.) reflecting the greater availability of that habitat in the study area (*Maxson et al. 2007*).
- During wetland succession, the hemi-marsh stage (roughly 50:50 open water and vegetation) is ideal for most marsh-nesting birds, including the Black Tern. The interspersed water and vegetation and the size of water areas may be of greater importance than the ratio of water to cover. Black Terns can rapidly colonize restored marshes or ones rejuvenated after drought; numbers may initially build up as vegetative conditions improve and later decline as they deteriorate (*Shuford 1999*).

From Effects of Management Practices on Wetland Birds: Black Tern (Zimmerman et al. 2002):

- Large areas of open water commonly are used for foraging. For example, in Minnesota, adults and fledglings moved from nest sites to open, sandy points on the edge of a nearby impoundment where fledglings were fed by the adults.
- Black terns commonly occupy wetlands that are within wetland complexes.
- In the Dakotas terns were more common in wetlands that had semi-permanent wetlands within 0.4 km than in wetlands without semi-permanent wetlands nearby.
- The terns' presence is negatively affected by percent woody vegetation along the wetland margins.
- They need a roughly equal proportion of well-interspersed emergent vegetation with open water.
- Sites with >70% vegetation are probably too dense to allow access to the surface of the water and sites with <10% vegetation are probably too sparse to provide cover from wind and wave action or from predators.
- Black terns prefer wetlands >20 ha although they have been observed on wetlands < 6 ha. Smaller wetlands may be more readily occupied when they are part of larger wetland complexes.

Threats

From Upper Mississippi Valley/Great Lakes Waterbird Conservation Plan (Wires et al. 2010):

- Loss and degradation of wetlands.
- Increased predator populations.
- Contaminants.
- Possible factors on wintering ground resulting in poor survival.

From Northern Prairie and Parklands Waterbird Conservation Plan (Beyersbergen et al. 2004):

- Declining throughout much of range, likely due to habitat loss.
- Maintenance of stable water levels in wetlands used for recreation.
- Cattail encroachment on prairie wetlands.
- Contaminants may be an issue given the Black Tern's insectivorous feeding habits.

From Black Tern: A Technical Conservation Assessment (Naugle 2004):

- Loss of remaining grassland and wetland habitats to agriculture and other development.
- Cumulative impacts of drainage might degrade the natural heterogeneity of wetland landscapes to the point that Black Terns no longer use the remaining wetlands.

Best Management Practices

From Upper Mississippi Valley/Great Lakes Waterbird Conservation Plan (Wires et al. 2010):

- Manage wetland flooding/drawdown regimes to preserve appropriate emergent vegetation and nesting substrates and provide stable water levels throughout nesting season.
- Consider use of water-level control measures, disking, and prescribed burning to control dense cattail stands and promote interspersion of vegetative cover and open water preferred by this species.
- Consider use of artificial nest platforms to enhance productivity in suitable wetlands, but evaluate limiting factors before platforms are provided.

From Upper Mississippi Valley/Great Lakes Joint Venture Waterbird Plan: Black Tern Species Account (Soulliere et al. 2007):

- Maintain (protect) existing habitat area and quality, and add (restore/enhance) breeding habitat at multiple sites within primary current or historic breeding range.
- Large drained wetlands should be restored and/or existing degraded sites should be managed to restore required native plant and open-water characteristics.

From Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004):

- Open cattail-choked wetlands to provide appropriate interspersion of water and emergent vegetation.
- Prevent encroachment of woody vegetation around wetlands.
- Prevent residential development around and recreational use within wetlands.

From Birds of North America (Heath et al. 2009):

- Land acquisition programs should target primarily large (>18.9 ha) wetlands within high-density wetland complexes with appropriate habitat (<50% tilled grassland) with an emphasis on connectivity among regional wetland landscapes.
- Black Terns readily accept artificial wetlands. Wetlands managed for waterfowl are attractive if flooding/drawdown regimes protect appropriate emergent vegetation, nesting substrate and stable water levels throughout the nesting season.
- Removal of cattails using glyphosate-based herbicides and reduction of encroaching woody vegetation at wetlands may result in increased numbers.
- Muskrat herbivory should be encouraged as a means to modify ratios of vegetation cover to open water, providing additional nesting substrate and foraging habitat.
- Nesting platforms are often accepted; attractiveness increased when decayed vegetation is piled on (see *Faber 1992* for specific recommendations on size and construction).
- Black Terns change colony locations frequently so managers should consider the characteristics of the entire landscape when determining priority areas for conservation as Black Terns prefer landscapes with a high density of wetlands.

From Effects of Management Practices on Wetland Birds: Black Tern (Zimmerman et al. 2002):

- Keys to management include: maintaining wetlands within large wetland complexes that contain nearly equal proportions of well-interspersed emergent vegetation and open water, maintaining stable water levels of > 30 cm throughout the breeding season, and providing abundant nest substrates.
- Maintain stable water levels of wetlands or wetland complexes through the use of water control structures.
- Open dense, monotypic stands of cattails.
- If feasible, manage wetland flooding/drawdown regimes to preserve appropriate emergent vegetation coverages and nesting substrates, and to provide stable water levels throughout the nesting season. Maintaining stable water levels decreases the probability of nest destruction due to rapidly rising water levels and decreases the probability of nest predation. During the nesting season, maintain

water levels >30 cm and use a 4 to 6 year cycle of drawdown, with reflooding occurring during years 2 – 5. Water levels should be maintained higher than normal in the first year following reflooding in order to allow muskrat populations to recover. Removal of vegetation by muskrat herbivory benefits Black Terns by improving the interspersion of vegetation cover and open water and by increasing the availability of nest substrates.

- Water-level control measures, disking, prescribed burning, and good muskrat populations may be used to control dense cattail stands and promote good interspersion of vegetative cover and open water.
- Placing artificial nest platforms in a wetland may enhance Black Tern productivity; they might be used the first year following a drawdown cycle when natural substrates are lacking.
- Platforms are used more often if dead vegetation is piled on, if platforms are placed in areas of emergent vegetation interspersed with open water, and if platforms are the right size (at least 12 cm by 20 cm).
- Avoid further wetland loss and degradation.
- Provide areas of habitat >10 ha in size.
- Utility wires should be placed several kilometers away from wetlands.

From A Status Assessment and Conservation Plan for the Black Tern in North America (Shuford 1999):

- Elevated perches, used by Black Terns for copulation, resting, and sites for feeding recently fledged young, should be created in potential tern habitat.
- Day use and roost sites should be within 2 km of nesting marshes and preferably within 0.8 km.

Gaps in Knowledge

From Northern Prairie and Parkland Waterbird Conservation Plan (Beyersbergen et al. 2004):

- Determine habitat selection, particularly role of wetland complexes.
- Determine effective ways to control cattail encroachment on prairie wetlands.
- Determine site fidelity and how it is influenced by water conditions.

From Upper Mississippi Valley/Great Lakes Joint Venture Waterbird Plan: Black Tern Species Account (Soulliere et al. 2007):

- Better data to assess numbers, trends, and causes of population change are needed.
- Influence of human disturbance at nest colonies needs further study.
- Little is known about production, recruitment and survival.
- Further study is needed on the tern's foraging range and about those characteristics that influence nest site selection at the landscape level.

From Birds of North America (Heath et al. 2009):

- Improve knowledge and understanding of chick and adult survival rates and factors limiting nest success and chick survival.
- Quantify re-nesting rates in different regions to improve knowledge of breeding productivity.
- Increase knowledge of ecology on the wintering grounds to improve knowledge of population dynamics and help delineate conservation goals.
- Because birds do not nest during their first summer, it is important to improve understanding of changes in the first year, adult annual survival, age of first breeding, and how often birds may not breed the summer following their first attempt.
- Better data are also needed on migration and wintering ecology.
- Most management has been piecemeal, with unpublished results. There is a need for controlled tests of management techniques and for publication of recommendations for management of wetlands both on the breeding and migration range.

- Establishing a black tern survey, using a stratified random design, that yields population and habitat information across the species' range would be highly beneficial.
- Nothing is known of physiological changes accompanying the shift of this species between freshwater and marine habitats.

From Upper Mississippi Valley/Great Lakes Waterbird Conservation Plan (Wires et al. 2010):

- Understand colony site use in relation to water level changes, especially in the Great Lakes.
- Determine minimum number of suitable marshes needed per Bird Conservation Region, and how each state and province can contribute.
- Monitor demographic parameters such as reproductive success and survival to help assess population viability, habitat quality and stage of lifecycle at which population change is affected.
- Increase intensity of efforts to locate and inventory nesting areas in locations with potential habitat.
- Understand pattern of inter- and intra-seasonal colony site movement in relation to water levels.

From Black Tern: A Technical Conservation Assessment (Naugle 2007):

- Formation of an effective long-term monitoring program designed to enhance our knowledge of the population status of black terns should reflect inherent variability in water levels, number of wetlands, and changing landscape patterns that influence black tern habitat use in space and time.
- Habitat models constructed using monitoring data should be based on multiple years of data and provide some indication of how frequently potential black tern habitat may be suitable.
- Furthering our understanding of black tern ecology may require research on the wintering grounds because we do not know whether population declines are solely the result of issues on the breeding grounds.

MINNESOTA CONSERVATION PLAN

Conservation Goal

Halt the decline of Minnesota's Black Tern population and aim to increase population levels by 100%.

Background: The North American Waterbird Conservation Plan (*Kushlan et al. 2002*) has not established a population target or goal for the Black Tern. Among the two Joint Ventures that cover Minnesota, only one, the Upper Mississippi Valley/Great Lakes Joint Venture, has established the population target of increasing population levels by 50% for the entire Joint Venture Region (*Soulliere et al. 2007*).

Although the Breeding Bird Survey data collected for Black Terns throughout their North American range is of poor quality (Red credibility level) it demonstrates a declining population trend. The quality of the data is better for the regional populations (Boreal Hardwood Transition, Prairie Potholes and Prairie Hardwood Transition), all of which demonstrate declining population trends. In Minnesota, the documentation for a significant population decline is even more compelling. The Minnesota Breeding Bird Survey data, which has the highest level of credibility (Blue), has documented a statistically significant population decline of 5.82% per year since 1966, for a cumulative decline of over 93%. Although its rate of decline has slowed somewhat in the ten year period from 2002-2012, the Black Tern continues to decline at a rate of 4.92% per year. Black Terns are among ten species reporting statistically significant population declines in Minnesota of 4% or higher per year.

This document proposes to use the same criteria that Partners in Flight (PIF) used at the national level for landbirds to delineate a population objective for the Black Tern in Minnesota. The PIF population objective for species that have declined by 50% or more over 30 years is to double the current population over the next 30 years.

Conservation Objective

Implement conservation actions that increase Black Tern population levels in Minnesota an average of 2.5% per year over 30 years.

Background: Given its current annual rate of decline, doubling Minnesota's Black Tern population in 30 years would require an average annual increase of approximately 2.5% per year.

Actions Needed for Conservation

Inventory and Assessment Needs

- Identify and target high priority landscapes and habitats for conservation action.

Action: Assess the status of Black Terns on the 16 Important Bird Areas where they have been reported nesting in the past (see Table 1).

Background: Among the 54 IBAs designated to date (March 2014), Black Terns have been reported during the summer or migration seasons from all but two and are known to have nested on sixteen. These sites are a priority for further investigation to assess the number of breeding birds and their fidelity to the site.

Action: Conduct a one-time assessment of the remaining IBAs where Black Terns have been reported in the past to assess their breeding status.

Background: Apart from the 16 IBAs where nesting has been reported, there are an additional 36 sites where they have been reported during the summer nesting season. Because of the species' nearly statewide occurrence it is recommended that each of these sites be inventoried during one year in the next five years using help from Audubon Chapters and former Breeding Bird Atlas surveyors. The sites should be prioritized based on the presence/absence of suitable nesting habitat.

Action: Assess whether flood water retention impoundments in northwestern Minnesota provide adequate nesting habitat for black terns.

Background: As part of its work in northwestern Minnesota, Audubon partnered with the Middle-Snake-Tamarack Watershed District and the Red Lake Watershed District to assess the benefits of large, newly constructed floodwater retention impoundments to migrating and nesting waterbirds, shorebirds and waterfowl. In 2012 and 2013, five new impoundments, totaling nearly 7.5 km², were surveyed with funds provided by the Prairie Pothole Joint Venture. These sites should be further evaluated as well as recently constructed impoundments elsewhere in the Red River Valley. As more federal and state funds become available the number of impoundments in this region is expected to increase so it is important to assess if they provide suitable habitat for black terns.

Monitoring Needs

- Current survey efforts are inadequate to generate an accurate statewide or regional population estimate or to identify significant breeding concentrations.

Action: Investigate the potential development of a more efficient and accurate monitoring program that can adequately assess the distribution and status of major black tern colonies.

Background: The Black Tern has been designated a focal species for monitoring in the Upper Midwest by the Upper Mississippi Valley/Great Lakes Regional Waterbird Conservation Plan. Currently the Federal Breeding Bird Survey does do an adequate job of tracking statewide population trends (Blue Level of Credibility that has allowed the detection of a statistically significant population trend). Region-wide, Black Terns are also included in the Great Lakes Colonial Waterbird Survey (conducted on the Great Lakes every 10 years) and in statewide marsh bird monitoring programs that have been initiated by several states in U.S. Fish and Wildlife Service Region 3 (Midwest).

Although these monitoring efforts provide reasonably good information on the overall trend of statewide and regional populations, they do not delineate the locations, size and stability of nesting colonies, nor have they been used to delineate population estimates. Because the species exhibits semi-colonial nesting behavior that is tightly tied to the availability of wetland habitats, knowing the location of important colonies is essential for conservation purposes. Tern colony numbers, however, are very hard to track. The size of any given colony is frequently confounded by persistent re-nesting following initial failure (often due to changing water levels), an influx of late first-time breeders, and local populations that readily shift colony sites.

Three monitoring options that should be explored further include: 1) developing a monitoring program that tracks the largest and most stable colonies that are located on Important Bird Areas,

following the inventory and assessment actions delineated above; 2) further exploring the feasibility of implementing a marsh bird monitoring program in Minnesota similar to that conducted in other midwestern states (e.g. Wisconsin and Michigan; *Soulliere et al. 2012*); and 3) coordinating with the Minnesota Department of Natural Resources to explore how to integrate a monitoring program for wetland birds with the statewide Wetland Monitoring Program.

Option 3 may be the most statistically robust approach to monitoring wetland birds. In 2006, Minnesota initiated a statewide random survey to track trends in wetland quantity. The DNR Resource Assessment Program and the U.S. Environmental Protection Agency Environmental Monitoring and Assessment Program assisted with the statistical design of the survey which is briefly described below:

The project involves the periodic acquisition and interpretation of aerial photography on nearly 5,000 permanent sample plots scattered around the state. Wetland gain and loss is determined by comparing subsequent photos of each sample plot using GIS technology.

Wetland quantity measurements are made using photo-interpretation of high-resolution natural color stereo-imagery for randomly selected 1-square mile plots, known as primary sampling units (PSU). The survey uses a cyclical, interpenetrating panel structure based on the Generalized Random Tessellation Stratified (GRTS) design to ensure that random samples are spatially distributed across the state. Imagery is acquired and photo-interpretations are performed for 1,830 PSUs each year. Of these, 1580 PSUs are assigned to one of three repeating panels and interpreted every third year and 250 PSUs are interpreted every year (http://www.dnr.state.mn.us/eco/wetlands/wstm_prog.html).

Following completion of the first three-year cycle, wetland quantity results will be reported, establishing “baseline” conditions. Repeating the same sampling every three years will allow comparisons with this baseline to determine whether wetland quantity in the state is changing. A companion survey program to assess regional trends in wetland quality or “health” began in 2007.

Minnesota is one of the few states in the nation to initiate such a comprehensive wetland monitoring program. Audubon staff should work with DNR staff to investigate the opportunities to integrate this excellent and robust data source on the status of Minnesota wetlands with the status and distribution of Minnesota’s important wetland bird species.

Action: Coordinate efforts among states and provinces to track regional population trends.

Background: Current survey efforts are inadequate to generate an accurate population estimate for the region. One advantage of implementing a marsh bird monitoring program in Minnesota that is modelled after programs established in other Midwestern states is that it would more easily allow the development of a regional population estimate.

It is also thought that because Black Terns are so ephemeral in their habitat selection that it may be more important to focus on understanding the regional scale at which the species operates when selecting a breeding site. For example, in some areas there are apparently suitable marshes but breeding Black Terns no longer occur there.

Research Needs

- Improve understanding of the species ecology on its wintering grounds, particularly for the first year birds that remain on the wintering grounds until their second year, and its' influence on overall population dynamics.

Action: Encourage funding for and initiation of Black Tern wintering ecology studies.

Habitat Protection Needs

- Insure opportunities to protect deep water marshes and hemi-marshes are maximized.

Action: Work with conservation partners throughout the state to protect and manage approximately 80,000 acres of wetland habitat in Minnesota (Table 3).

Table 3. Wetland Protection Goals for Minnesota Black Terns

Joint Venture Region of Minnesota	Habitat	Minnesota Protection Goal
Upper Mississippi Valley/Great Lakes ¹	Deep Water Marsh	4,070 acres (1,648 ha)
	Shallow, semi-permanent marsh; hemi-marsh	1,415 acres (573 ha) ³
<i>Subtotal</i>		<i>5,485 acres</i>
Prairie Potholes	Wetlands in Prairie Core Areas, and Corridors ²	74,234 acres
Total		79,719 acres

¹ In Minnesota the Upper Mississippi Valley/Great Lakes Joint Venture Region encompasses Audubon Minnesota's Boreal Hardwood Transition Region and most of the Prairie Hardwood Transition Region; this is roughly equivalent to Partners in Flight Bird Conservation Regions 12 (Boreal Hardwood Transition), 22 (Eastern Tallgrass Prairie) and 23 (Prairie Hardwood Transition) in Minnesota.

²The totals above are specifically the goals for the number of acres of permanently protected wetlands needed within core areas and corridors between the cores; see Figure 4 (*Minnesota Prairie Plan Working Group 2010*).

³ This number is incorrectly reported in Soulliere et al. (2007) as 273 ha (there was an addition mistake in the table); all habitat goals in Soulliere et al. (2007) are reported in hectares but have been converted here to acres as well.

Background: Habitat protection goals displayed in Table 3 are drawn from two documents to establish the conservation objectives for Minnesota's Black Tern population. The first document is the Waterbird Habitat Conservation Strategy for the Upper Mississippi Valley/Great Lakes Joint Venture (Soulliere et al. 2007). The Joint Venture established habitat conservation goals for guilds of waterbirds that utilize five different habitats, including wet meadows with open water, islands, and herbaceous wetlands with shrub/forest. The Black Tern is the focal species for one of the five habitats - deep water marsh habitat. However, as Soulliere et al. (2007) notes, Black Terns also utilize hemi-marshes or shallow, semi-permanent marshes. As a result, this document includes the habitat protection goals for both types of wetland habitat. The specific habitat

protection goals for these wetlands in each Minnesota Bird Conservation Region located in the Upper Mississippi Valley/Great Lakes Joint Venture are shown in Table 4.

Table 4. Deep Water Marsh and Hemi-Marsh/Semi-Permanent Wetland Habitat Protection Goals for the Black Tern in the Upper Mississippi Valley/Great Lakes Joint Venture region of Minnesota

Partners in Flight Bird Conservation Region	Wetland Habitat	Protection Goals
Boreal Hardwood Transition (12)	Deep Water Marsh	1,971 acres (798 ha)
	Shallow, semi-permanent marsh; hemi-marsh	133 acres (54 ha)
<i>Subtotal</i>		<i>2,104 acres</i>
Prairie Hardwood Transition (23)*	Deep Water Marsh	2,099 acres (850 ha)
	Shallow, semi-permanent marsh; hemi-marsh	1,282 acres (519 ha)
<i>Subtotal</i>		<i>3,381 acres</i>
Total		5,485 acres

*Includes portions of both BCR22 (Eastern Tallgrass Prairie) and 23 (Prairie Hardwood Transition) in Minnesota

The second document used to establish the recovery criteria is the Minnesota Prairie Landscape Conservation Plan (*Minnesota Prairie Plan Working Group 2010*). Because explicit habitat goals have not been established for the Prairie Potholes Joint Venture region, this document is an excellent surrogate. The area covered by the plan closely corresponds to the boundaries of the Prairie Pothole Joint Venture region in Minnesota. The boundaries of both Joint Ventures and the Minnesota Prairie Region covered by the Prairie Landscape Conservation Plan are shown in Figure 3. Together, the goals established by the Upper Mississippi Valley/Great Lakes Joint Venture and Minnesota’s Prairie Landscape Conservation Plan cover nearly the entire state of Minnesota.

The Prairie Plan specifically delineates and maps two types of areas for native prairie, grassland and wetland protection and restoration:

- **Core areas** that are “large landscapes (5,000 to 300,000 acres) that retain some features of a functioning prairie landscape and include 71% of Minnesota’s remaining native prairie”; and
- **Corridors** that are “linear stretches of habitat six miles wide that connect the core areas to each other.”

Large habitat complexes (nine square miles) are identified within each corridor and all the land outside of the core areas and corridors is referred to as the agricultural matrix. Figure 4 illustrates the core areas, corridors and larger agricultural matrix.

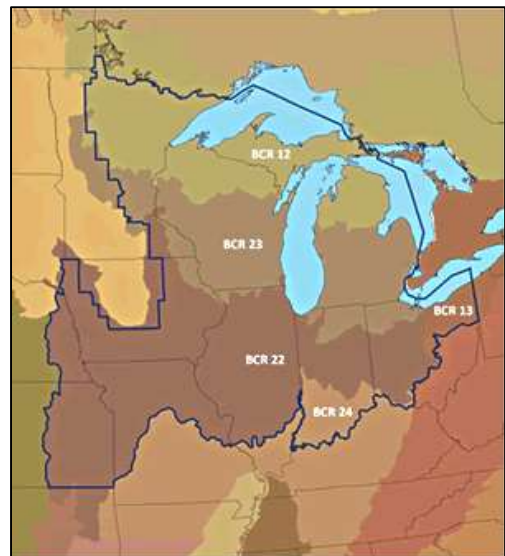
Figure 3. Comparison of the Joint Venture Region Boundaries and Minnesota's Prairie Landscape Region



Area covered by Minnesota's Prairie Landscape Conservation Plan (dark black line)

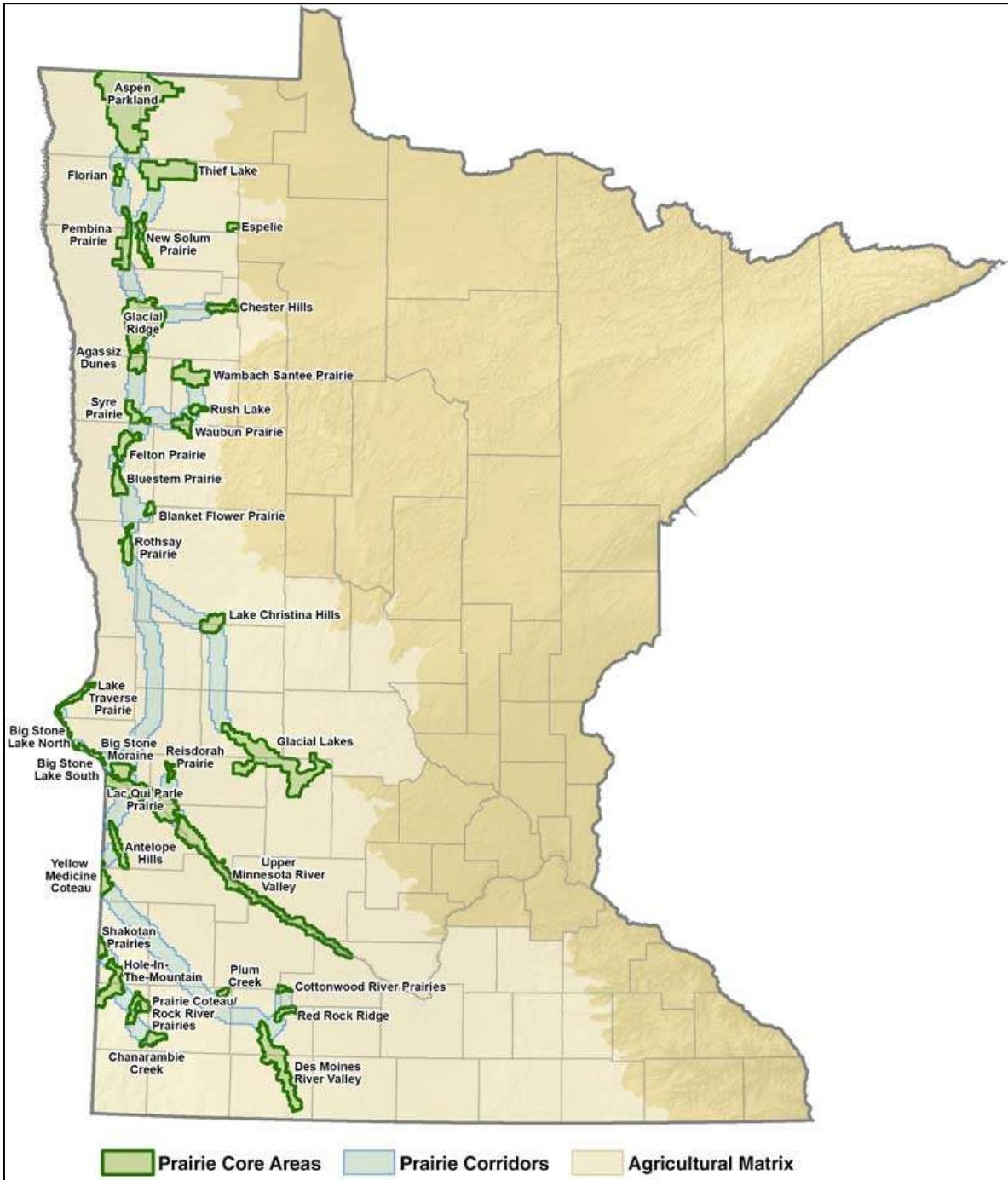


Boundary of the Prairie Joint Venture (PPJV) and Bird Conservation Region 11



Boundary of the Upper Mississippi Valley/Great Lakes Joint Venture Region (dark blue line) with Bird Conservation Regions 12, 13, 22, 23 and 24

Figure 4. Prairie Core Areas, Corridors and Agricultural Matrix from Minnesota's Prairie Landscape Conservation Plan



Minnesota’s Prairie Landscape Conservation Plan also establishes protection acreage goals for the core areas, the corridors and the larger agricultural matrix and specifies what portion of each goal should be attained with acres that are permanently protected versus acres that are voluntarily protected. Ideally, Minnesota’s conservation community will successfully achieve all the goals for each area, thereby benefitting the Black Tern as well as a host of other declining grassland and wetland species. For the purposes of this Conservation Plan, however, we have focused only on the protection goals established for permanently protected (i.e. through fee acquisition or permanent conservation easements) wetlands in the core areas and corridors shown in Table 5 (highlighted in green). The acres that are to be permanently protected within the agricultural matrix and those that are to be voluntarily protected within the core areas, corridors and matrix were not reported separately for grasslands and wetlands but only as a combined total, so they are not included. In addition, although not all wetland types are suitable for Black Terns, the Prairie Plan does not establish goals for different wetland types so, with the caveats stated above, this document adopts the overall wetland protection goals for Minnesota’s Prairie Region.

Table 5. Wetland Protection Goals for the Prairie Pothole Region of Minnesota (from the Minnesota Prairie Landscape Conservation Plan)

Conservation Action	Prairie Landscape Conservation Areas	Specific Conservation Action	Acreage Goals by Habitat ¹	
			Wetlands	Grasslands & Wetlands
Protection	Core Areas	Acquisition/Easements	60,837 acres	
		Voluntary management or conservation contracts		149,022 acres
	Corridor Areas (complexes & general corridors)	Acquisition/Easements	13,397 acres	
		Voluntary management or conservation contracts		39,364 acres
	Matrix Landscape	Acquisition/Easements		523,564 acres
		Voluntary management or conservation contracts		1,221,650 acres
Protection Total			74,234 acres	1,933,600 acres

¹Some subtotals for conservation actions in the Prairie Plan do not reflect the totals reported in the plan; this table uses the totals.

Habitat Restoration and Management Needs

- In addition to protecting deep water marshes and hemi-marshes the conservation community needs to aggressively restore and manage wetland habitats.

Action: Work with conservation partners throughout the state to restore approximately 107,000 acres of wetland habitat (Table 6), targeting Priority IBAs and using best management practices summarized in the preceding pages.

Table 6. Wetland Restoration Goals for Minnesota Black Terns

Joint Venture Region of Minnesota	Habitat	Minnesota Restoration Goal
Upper Mississippi Valley/Great Lakes	Deep Water Marsh	2,038 acres (825 ha)
	Shallow, semi-permanent marsh; hemi-marsh	1,415 acres (573 ha) ³
<i>Subtotal</i>		<i>3,453 acres</i>
Prairie Potholes	Wetlands in Prairie Core Areas, and Corridors	103,608 acres
Total		107,061 acres

¹ As noted in Table 4, this number is incorrectly reported in Soulliere et al. (2007) as 273 ha.

Background: The wetland restoration goals are derived from the same documents as the protection goals. The only difference is that the Minnesota Prairie Landscape Conservation Plan does not distinguish between restored wetlands that are permanently protected or voluntarily protected. The plan simply states that if state funds are used for restoration it should take place only on public lands or on private lands subject to a conservation easement, deed restriction or contract.

Table 7 delineates the number of acres of wetland to be restored in Bird Conservation Regions 12 and 23, by wetland type, in Minnesota. Table 8 delineates the number of acres of wetland to be restored in the Core Areas and Corridors within Minnesota’s Prairie Landscape Region; the restoration goal for the agricultural matrix was a combined goal for both wetlands and grasslands.

Table 7. Deep Water Marsh and Hemi-Marsh/Semi-Permanent Wetland Restoration Goals for the Black Tern in the Upper Mississippi Valley/Great Lakes Joint Venture region of Minnesota

Partners in Flight Bird Conservation Region	Wetland Habitat	Restoration & Enhancement
Boreal Hardwood Transition (12)	Deep Water Marsh	986 acres (399 ha)
	Shallow, semi-permanent marsh; hemi-marsh	133 acres (54 ha)
<i>Subtotal</i>		<i>1,119 acres</i>
Prairie Hardwood Transition (23)*	Deep Water Marsh	1,052 acres (426 ha)
	Shallow, semi-permanent marsh; hemi-marsh	1,282 acres (519 ha)
<i>Subtotal</i>		<i>2,334 acres</i>
Total		3,453 acres

*Includes portions of both BCR22 (Eastern Tallgrass Prairie) and 23 (Prairie Hardwood Transition) in Minnesota

Table 8. Wetland Restoration Goals for the Prairie Pothole Region of Minnesota (from the Minnesota Prairie Landscape Conservation Plan)

Conservation Action	Prairie Landscape Conservation Areas	Wetland Restoration Goal
Restoration	Core Areas	83,169 acres
	Corridor Areas (complexes & general corridors)	20,439 acres
Restoration Total		103,608 acres

Action: Assess if any of the IBAs that support small or ephemeral Black Tern colonies would benefit from best management practices that would enhance the breeding habitat.

Action: Audubon Minnesota staff shall lead the technical field team responsible for one of the core areas delineated in the Minnesota Prairie Landscape Conservation Plan, the Tallgrass Aspen Parklands, to insure that conservation actions in the region, especially those focused on wetland restoration and management, are guided by the plan.

Background: Implementation of Minnesota’s Prairie Landscape Conservation Plan focuses on the establishment of technical field teams in the primary core areas. The teams are composed of state, federal and local resource professionals as well as professionals with conservation organizations. Together they are responsible for insuring that the goals of the plan are achieved. Because of its long-standing interest and engagement in northwest Minnesota, Audubon staff has assumed a leadership role for the Aspen Parklands Technical Team shown in Figure 5.

Figure 5. Minnesota’s Prairie Landscape Conservation Plan Technical Teams

- Monitor the amount of wetland that is protected and restored and assess if it is sufficient to provide for a sustainable population of Black Terns in Minnesota.

Action: Document and monitor the amount of habitat that is protected and restored and assess if it is meeting the goals established for protection and restoration of wetland habitat for the Minnesota portion of the Upper Mississippi River Valley/Great Lakes Joint Venture region.

Action: Work with members of the Minnesota Prairie Landscape Conservation Implementation team to insure that actions to protect and restore Minnesota’s wetlands are accurately tracked and monitored.

Action: Because the species for the Upper Lakes (UMVGL) with population Venture science team Wildlife Service’s Falls to determine UMVGL Joint Prairie Landscape supporting a Black Terns.

Specific Actions for in monitoring local IBAs. Additional details are shown in Table 9.



Black Tern is a focal Mississippi Valley/Great Joint Venture, collaborate modelers in the Joint and the U.S. Fish and HAPET office in Fergus whether the actions of the Venture and Minnesota Conservation Team are sustainable population of

Audubon Chapters: Assist colonies within priority for Audubon Minnesota

Table 9. Black Tern Minnesota Conservation Implementation Plan

Conservation Goal: Halt the decline of Minnesota’s Black Tern population and aim to increase population levels by 100%.

Conservation Objective: Implement conservation actions that increase Black Tern population levels in Minnesota an average of 2.5% per year over 30 years.

Actions Needed for Conservation	Priority	Timeline	Responsible Entity	Others Involved
Inventory and Assessment				
<ul style="list-style-type: none"> Assess the status of Black Terns on 16 Important Bird Areas where they have been reported nesting in the past. 	#1	2015-2018	Audubon Minnesota	Local Audubon Chapters
<ul style="list-style-type: none"> Conduct a one-time assessment of the remaining IBAs where Black Terns have been reported in the past to assess their breeding status. 	#5	2018	Audubon Minnesota	Local Audubon Chapters
<ul style="list-style-type: none"> Assess whether flood water retention impoundments in northwestern Minnesota provide adequate nesting habitat. 	#6	2016	Audubon Minnesota	PP Joint Venture Watershed Districts
Monitoring				
<ul style="list-style-type: none"> Investigate the potential development of a more efficient and accurate statewide monitoring program that can adequately assess the distribution and status of major black tern colonies. 	#7	2016	Audubon Minnesota	MN DNR USFWS
<ul style="list-style-type: none"> Coordinate efforts among states and provinces to track regional population trends. 	#11	Future	USFWS	
Research				
<ul style="list-style-type: none"> Encourage funding for and initiation of Black Tern wintering ecology studies. 	#12	On-going	USFWS	MN DNR
Habitat Protection				
<ul style="list-style-type: none"> Work with conservation partners throughout the state to protect and manage approximately 80,000 acres of wetland habitat in Minnesota. 	#2	On-going	Audubon Minnesota	USFWS, MNDNR, BWSR, TNC, Watershed Districts
Habitat Restoration and Management				
<ul style="list-style-type: none"> Work with conservation partners throughout the state to restore approximately 107,000 acres of wetland habitat in Minnesota, targeting Priority IBAs and using best management practices. 	#3	On-going	Audubon Minnesota	USFWS, MNDNR, BWSR, TNC, Watershed Districts
<ul style="list-style-type: none"> Assess if any of the IBAs that support small or ephemeral Black Tern colonies would benefit from best management practices that would enhance the breeding habitat. 	#8	2018	Audubon Minnesota	MNDNR, USFWS
<ul style="list-style-type: none"> Audubon Minnesota staff shall lead the technical field team responsible for one of the core areas delineated in the Minnesota Prairie Landscape Conservation Plan, the Tallgrass Aspen Parklands, to insure that conservation actions in the region, especially those focused on wetland restoration and management, are guided by the plan. 	#4	2016	Audubon Minnesota	PP Joint Venture Watershed Districts
<i>Continued on following page</i>				

Actions Needed for Conservation	Priority	Timeline	Responsible Entity	Others Involved
Habitat Restoration and Management continued				
<ul style="list-style-type: none"> Document and monitor the amount of habitat that is protected and restored and assess if it is meeting the goals established for protection and restoration of wetland habitat for the Minnesota portion of the Upper Mississippi River Valley/Great Lakes Joint Venture region. 	#8	Ongoing	Minnesota Prairie Landscape Implementation Team	Upper Mississippi River Valley/Great Lakes Joint Venture
<ul style="list-style-type: none"> Work with members of the Minnesota Prairie Landscape Conservation Implementation team to insure that actions to restore Minnesota’s wetlands are accurately tracked and monitored. 	#9	Ongoing	Minnesota Prairie Landscape Implementation Team	
<ul style="list-style-type: none"> Work with population modelers in the Upper Mississippi Valley/Great Lakes (UMVGL) Joint Venture science team and the U.S. Fish and Wildlife Service’s HAPET office in Fergus Falls to determine whether the actions of the UMVGL Joint Venture and Minnesota Prairie Landscape Conservation Team are supporting a sustainable population of Black Terns. 	#10	Ongoing	U.S. Fish and Wildlife Service	MN Department of Natural Resources, Audubon Minnesota

Selected Resources for Black Tern Minnesota Conservation Plan

Audubon Minnesota. 2008. Action List: Highlighting Birds at Risk and their Conservation. 8 pp.

Baker, R. and J. Hines. 1996. Black tern sightings in Minnesota: 1990-1995. Final report submitted to the U.S. Fish and Wildlife Service, Region 3 Nongame Bird Program. 14 pp. [Online version available at: http://files.dnr.state.mn.us/eco/nongame/projects/consgrant_reports/1996/1996_baker_hines.pdf].

Beyersbergen, G.W., N.D. Niemuth, and M.R. Norton, coordinators. 2004. Northern Prairie & Parkland Waterbird Conservation Plan. A plan associated with the Waterbird Conservation for the Americas Initiative. Published by the Prairie Pothole Joint Venture, Denver, Colorado. 183pp. [Online version available at: <http://www.waterbirdconservation.org/pdfs/regional/NPPTText.pdf>].

Brewer, G. L. 1992. 1991 Summary Report: Location of breeding colonies and evaluation of critical nesting habitat for the black tern (*Chlidonias niger*) in northwestern Minnesota: Kittson and Roseau Counties. Report submitted to the Minnesota Department of Natural Resources. 10 pp. [Online Version available at: http://files.dnr.state.mn.us/eco/nongame/projects/consgrant_reports/1992/1992_brewer.pdf].

Butcher, Greg. 2010. Summary of Sotb Climate Vulnerability Matrix. (Note: Climate Change Vulnerability Data for some Minnesota species is presented in the 2010 State of the Birds Report on Climate Change but the complete list of climate change vulnerability scores for all North American birds is available in an excel spreadsheet prepared by Greg Butcher; the spreadsheet is labeled: Summary of Sotb Climate Vulnerability Matrix_26Aug10_for_states(2)).

Faber, R.A. 1992. Incubation behavior and artificial nest structure usage in black terns nesting along the Mississippi River. Final report submitted to Nongame Wildlife Program, Minnesota Department of Natural Resources. 27 pp. [Online version available at: http://files.dnr.state.mn.us/eco/nongame/projects/consgrant_reports/1992/1992_faber.pdf].

Heath, Shane R., Erica H. Dunn and David J. Agro. 2009. Black Tern (*Chlidonias niger*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/147doi:10.2173/bna.147>.

Janssen, R.B. 1987. Birds in Minnesota. University of Minnesota Press. Minneapolis, MN.

Kushlan, James A. , Melanie J. Steinkamp, Katharine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson , Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. 2002. Washington, DC, U.S.A. 78 pp. [Online version available at: http://www.pwrc.usgs.gov/nacwcp/pdfs/plan_files/complete.pdf].

Matthews, S., R. O'Connor, L.Iverson, A. M. Prasad. 2004. Atlas of climate change effects in 150 bird species of the Eastern United States. Gen. Tech. Rep. NE-318. Newtown Square, PA: U.S. Department of Agriculture. Forest Service, Northeastern Research Station. 340 p.

Maxson, S. J., J. R. Fieberg, and M.R. Riggs. 2007. Black tern nest habitat selection and factors affecting nest success in northwestern Minnesota. Waterbirds, Journal of the Waterbird Society, Vol. 30 (1): 1-9.

Minnesota Department of Natural Resources, 2006. Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, Minnesota Department of Natural Resources.

Minnesota Prairie Plan Working Group. 2011. Minnesota Prairie Conservation Plan. Minnesota Prairie Plan Working Group, Minneapolis, MN. 55p.

Naugle, D. E. 2004. Black Tern (*Chlidonias niger surinamensis*): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region. [Online version available at: <http://www.fs.fed.us/r2/projects/scp/assessments/blackter.pdf>].

Naugle, D. E., K. F. Higgins, M. E. Estey, R. R. Johnson, and S. M. Nusser. 2000. Local and landscape-level factors influencing black tern habitat suitability. *Journal of Wildlife Management* 64(1):253-260.

Powell, A.N. 1991. Monitoring Black Tern populations in Minnesota in association with the USFWS waterfowl production survey. Report submitted to the Nongame Wildlife Program, Minnesota Department of Natural Resources. 24 pp. [Online version available at: http://files.dnr.state.mn.us/eco/nongame/projects/congrant_reports/1991/1991_powell.pdf].

Roberts, T.S. 1932. *The Birds of Minnesota*. The University of Minnesota Press. 821 pp.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2012*. Version 02.19.2014 USGS Patuxent Wildlife Research Center, Laurel, MD. [Online at: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>].

Shuford, W. D. 1999. Status assessment and conservation plan for the Black Tern (*Chlidonias niger surinamensis*) in North America. U.S. Department of Interior, Fish and Wildlife Service, Denver, CO.

Servello, F. A. 2000. Population research priorities for Black Terns developed from modeling analyses. *Waterbirds* 23(3):440-448.

Soulliere G.J., B.M. Kahler, M.J. Monfils, K.E. Koch, R. Brady, and T. Cooper. 2012. Coordinated conservation and monitoring of secretive marsh birds in the Midwest – 2012 workshop review and recommendations. Upper Mississippi River and Great Lakes Region Joint Venture Technical Report No. 2012-2, Bloomington MN, USA.

Soulliere, G. J., B. A. Potter, D. J. Holm, D. A. Granfors, M. J. Monfils, S. J. Lewis, and W. E. Thogmartin. 2007. Upper Mississippi River and Great Lakes Region Joint Venture Waterbird Habitat Conservation Strategy. U.S. Fish and Wildlife Service, Fort Snelling, MN. 68pp. [Online version available at: http://uppermissgreatlakesjv.org/docs/UMRGLR_JV_WaterbirdHCS.pdf].

Tozer, D. C. 2013. *The Great Lakes Marsh Monitoring Program 1995-2012: 18 years of surveying birds and frogs as indicators of ecosystem health*. Published by Bird Studies Canada. 10 pp. [Online version available at: <http://www.birdscanada.org/download/GLMMPreport.pdf>].

U.S. Fish and Wildlife Service, Department of the Interior. 1995. USFWS Species Management Concern. http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/specon/SMC_TBL.PDF (Accessed: September 23, 2013).

U.S. Fish and Wildlife Service, Department of the Interior. 2009. Plains and Prairie Potholes Landscape Conservation Cooperative: Preliminary Operations Plan. [Online at: http://www.plainsandprairiepotholeslcc.org/wp-content/uploads/2013/04/PPP_LCC_R3_Op_Plan1.pdf].

U.S. Fish and Wildlife Service, Division of Migratory Bird Management. 2005. The U.S. Fish and Wildlife Service's Focal Species Strategy for Migratory Birds: Measuring success in bird conservation. 2 pp. [Online version available at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/FocalSpecies/The%20Focal%20Species%20Fact%20Sheet%20and%20Table.pdf>].

U.S. Fish and Wildlife Service, Division of Migratory Bird Management. 2008. Birds of Conservation Concern – 2008. . [Online version available at <http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf>].

U.S. Fish and Wildlife Service, Division of Migratory Bird Management. 2011. Migratory Bird Program: Focal Species Strategy. 2 pp. [Online version available at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/FocalSpecies/Plans/focalspecies2012.pdf>].

U.S. Forest Service. 2012. National Forest System Land Management Planning: Final rule and record of decision. Federal Register Vol. 77. No. 68. Pp 21162-21276.

U.S. Forest Service. 2012. Regional Forester Sensitive Animal Species for the Eastern Region. [Online available at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5384459.pdf].

Wires, L.R., S. J. Lewis, G. J. Soulliere, S. W. Matteson, D. V. “Chip” Weseloh, R. P. Russell, and F. J. Cuthbert. 2010. Upper Mississippi Valley / Great Lakes Waterbird Conservation Plan. A plan associated with the Waterbird Conservation for the Americas Initiative. Final Report submitted to the U. S. Fish and Wildlife Service, Fort Snelling, MN. MN Species of Greatest Conservation Need (2006). [Online version available at: http://www.pwrc.usgs.gov/nacwcp/pdfs/regional/UMVGL_Waterbird_Conservation_Plan_No_Attachments_Final.pdf.]

Zimmerman, A.L., J.A. Dechant, D.H. Johnson, C.M. Goldade, B.E. Jamison, and B.R. Euliss. 2002. Effects of management practices on wetland birds: Black Tern Northern Prairie Wildlife Research Center, Jamestown, ND. 37 pages. [Online version available at: <http://www.npwrc.usgs.gov/resource/literatr/wetbird/download/blte.pdf>].