March 9, 2016

EXECUTIVE SUMMARY

Current Status: Piping plovers were listed under the provisions of the Endangered Species Act on January 10, 1986. The Northern Great Plains population was listed as threatened[1]. Critical habitat was designated on the Northern Great Plains breeding grounds on September 11, 2002. Critical habitat was designated for all populations of piping plovers on the wintering grounds on July 10, 2001, and redesignated in 2008 and 2009. The breeding population of the Northern Great Plains piping plover extends from Nebraska north along the Missouri River through South Dakota, North Dakota, and eastern Montana, and on alkaline (salty) lakes along the Missouri River Coteau (a large plateau extending north and east of the Missouri River) in North Dakota, Montana, and extending into Canada. The majority of piping plovers from Prairie Canada winter along the south Texas coast, while breeding piping plovers from the U.S. are more widely distributed along the Gulf Coast from Florida to Texas.

Habitat Requirements and Limiting Factors: In the Northern Great Plains, piping plovers breed and raise young on sparsely vegetated sandbars and reservoir shorelines on river systems as well as on the shorelines of alkaline lakes. Changes in the quality and quantity of riverine habitat due primarily to damming and water withdrawals are a primary threat to the species. On the wintering grounds, piping plovers forage and roost along barrier and mainland beaches, sand, mud, and algal flats, washover passes, salt marshes, and coastal lagoons. Habitat destruction and degradation are pervasive and have reduced suitable habitat. Human disturbance, predation, and invasive plants further reduce breeding and wintering habitat quality and affect survival.

Recovery Goal: To remove the Northern Great Plains population of piping plovers from the list of federally Threatened and Endangered Species.

Recovery Objective: To restore and maintain a viable population of piping plovers (less than 5 percent likelihood of extinction in the next 50 years) in the Northern Great Plains by 2035.

Recovery Strategy: To restore ecosystem function on both the breeding and wintering grounds so that the population can persist into the foreseeable future without extensive human intervention. Because some human activities are likely to continue to impact piping plover habitat, this task will likely involve developing and maintaining public outreach and education and partnerships for long-term protection and management.

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[1] We have always managed the Northern Great Plains piping plover population as a separate population and intend to eventually delist this population as a stand-alone Distinct Population Segment when the data support such an action. Our 2009 5-year review considered this issue and concluded that this population satisfies the criteria of a Distinct Population Segment and can be delisted separately from the remaining piping plover populations (USFWS 2009).

PART II. RECOVERY

A. Breeding Recovery Criteria for the Northern Great Plains Population

All of the recovery criteria for the Northern Great Plains population of the piping plover can be found in the Executive Summary section. Here, we only present those recovery criteria that relate to the breeding grounds.

Criterion 1: Using the most current estimates of region-specific breeding population and population growth (λ), the NGP plover population model indicates that the upper 95 percent confidence limit on the probability of a regional population going extinct within the next 50 years is < 0.05. This criterion is satisfied for all four regions (Figure 3). In addition, the following are met:

1. **for every region, population growth is stable or increasing (≥ 1.0) over a 10-year average, and is projected to remain steady or increasing over the next 50 years, and**
2. **the population will be distributed so that at least 15 percent of the population is in each of the following regions:**
   a. **Southern Rivers (Missouri River system from Fort Randall Dam, South Dakota to Ponca, Nebraska, the Niobrara River, the Loup River system and the Platte River system)**
   b. **Northern Rivers (Missouri River system from Fort Peck Lake, Montana to Pierre, South Dakota)**
   c. **U.S. Alkaline Lakes**
   d. **Prairie Canada (see discussion on page 60)**

Purpose: 1) To demonstrate that the breeding population is viable and projected to remain viable into the foreseeable future; and 2) to ensure that the breeding population is distributed across the range so that a catastrophic regional event does not negatively impact the entire population.

In order for recovery to be achieved, the breeding population should have been stable or increasing over a ten-year average (this time period can begin prior to the finalization of the recovery plan) and be projected to be stable or increasing into the reasonably foreseeable future. The population should be broadly distributed to reduce the risk of loss of a significant portion of the population. It is important for the population to be distributed throughout the range to maximize viability into the future and to reduce the risk of a stochastic event impacting a large proportion of the population. During the 2001 and the 2006 International Census (Elliott-Smith

et al. 2009), no region contained less than 15 percent of the total number of breeding birds. We did not use the results from the 2011 International Census (Unpublished Data), because bird detection and therefore numbers were believed low throughout the range due to flooded conditions.

We did not use breeding pair abundance targets as part of this recovery criterion because research evaluating the monitoring program on the Missouri River determined that while trend data was relatively reliable, the population number was missing up to 60 percent of the birds in some areas (Shaffer *et al.* 2013). Improving count accuracy across the range to a level where it could be reliably used as a recovery criterion would be prohibitively expensive. Recovery can be reliably demonstrated without attempting to get a total bird count. Instead, we focus on trend data (which can be obtained through subsampling, see Appendix 3B) and ensuring that there is sufficient habitat (as required in Criterion 2, page 60) to support the population at a population level that is high enough to be resilient over time.

Banding data suggest that there is minimal interchange between the four regions identified above, with most plovers returning to the same general area from which they fledged (Gratto-Trevor *et al.* 2010; Roche *et al.* 2012; Catlin *et al. In review*), albeit a metapopulation study in Northern Rivers began in 2014 (USGS 2014), no major banding effort was ever undertaken in the U.S. alkali lakes region, and efforts to resight birds in the alkali lakes did not begin until 2008. At this time the best available information suggests that if plovers in one region were extirpated, the area would be unlikely to be recolonized successfully with any great number of birds.

We anticipate that as updated population parameter estimates become available (e.g., adult or juvenile survival, survival to fledging, number of individuals etc.) these will be integrated into the model to update estimates of extinction probability. Extinction probability estimates should be updated, at a minimum, every five years as part of the five-year review process. We also anticipate that the model will likely be updated and improved in the future as new information and modeling techniques become available. Every five years the USFWS, in coordination with the Piping Plover Recovery Team, will evaluate new information to determine if it is scientifically credible and whether the model should be updated or replaced. Thus, the best available science at the time the species is considered for recovery should be used to demonstrate that Criterion 1 is met.

Canadian Portion of the Range

Piping plover recovery can only be achieved by stable populations in both the U.S. and Canada. There is a Canadian recovery team for the Northern Great Plains portion of the population and biologists regularly coordinate across the border. We anticipate that the Canadian and U.S. biologists will continue to work together towards recovery. If the goals in the current Canadian

Recovery Plan are met (Environment Canada 2006), we anticipate that approximately 15 percent of the population will likely be located in Canada.

Criterion 2: A minimum amount of suitable nesting and foraging habitat is available on a Regional Basis, as described below.

a. **1,630 ha (4,030 ac) in Southern Rivers (Missouri River system from Fort Randall Dam, South Dakota to Ponca, Nebraska, the Niobrara River, the Loup River system and the Platte River system)**
b. **1,320 ha (3,270 ac) in Northern Rivers (Missouri River system on Fort Peck Lake, Montana to Pierre, South Dakota)**
c. **1,460 ha (3,600 ac) in the U.S. Alkaline Lakes**
d. **1,460 ha (3,610 ac) in Prairie Canada (Provided for information only. We defer to the Prairie Canada Recovery Plan. See discussion about Canadian recovery criteria below.)**

Habitat is cyclical on the Northern Great Plains, so the habitat should be available, on average, a minimum of three-out-of-four years. For example, the criteria would be met if there were habitat available for a six year period in a region, followed by two years of high water when most of the habitat was flooded. This criterion should be met for a minimum of 12 years prior to initiating delisting.

Purpose: To ensure that there is sufficient habitat broadly distributed on the breeding grounds to support a stable population.

The major threat facing the species on the breeding grounds is a lack of sufficient habitat available frequently enough to support the population at recovery levels. Many of the other threats facing the species (e.g., increased predation, inadequate forage, human disturbance) are directly or indirectly related to insufficient habitat on the breeding grounds. We recognize that piping plover habitat is by nature ephemeral, with good habitat available for several years after a high water event before becoming vegetated or eroded until it is flooded, starting the cycle again. Using the natural cycle and piping plover life history as a guide, we designed this criterion so that recovery can be achieved even if habitat is available on average in three years out of four. For example, habitat may be available for six years in an eight year period and still meet the recovery criterion even if habitat were limited in the remaining two years. Habitat should be measured on a regional basis; it does not necessarily need to be available in every location within the region at this frequency. For example, as long as there is 1,080 ha (2,670 ac) available overall in three out of four years in the Southern Rivers region, the criterion would still be met even if the Platte River system did not meet the requirement.

Twelve years was selected as the time period for the criterion to be met to encompass approximately three-to-four plover generation times. Also, as discussed below in the *Frequency*

of Habitat Availability Section (page 62), we estimate that a habitat forming event likely occurred historically approximately every six-to-eight years, and the population would remain stable with a flood event (i.e., little to no habitat available during that year) occurring every four-to-eight years. Therefore, a 12 year period is long enough for several habitat forming events and a stationary population over time, albeit with fluctuations within that period as habitat forms and degrades.

Stepping down the habitat goal:
We recognize that the amount of habitat in specific areas will need to be stepped down further to provide local managers with goals specific to their area. We encourage managers within and between regions to start a dialogue to determine how much habitat each area can reasonably provide. We recognize that habitat is closely tied to population abundance, so areas with more habitat can be expected to support a larger percentage of the population.

Approach to the habitat criterion:
We used a model-based approach to determine the amount of breeding habitat necessary for a stable or increasing population in each region of the breeding range with a 95 percent confidence interval (i.e. less than 5 percent risk of extinction over the next 50 years). We used the best available information at the time of writing (2015) as input parameters for the model for life history traits (e.g., juvenile and adult survival). Since we recognize that efforts to estimate the population may not be accurate (Shaffer *et al.* 2013), we included observation error in the model. As additional research is conducted and better information becomes available, the model can be updated in the future and the amount of habitat required for recovery may change accordingly. The Northern Great Plains Piping Plover Recovery Team will evaluate new information and update the model as they deem appropriate. The model is described in detail in Appendix 1B.

Habitat needed per breeding pair:
As discussed in the *Habitat Acreage Requirements* section (page 25) and in Appendix 1B, modeling has found that 0.5 -0.67 ha (1.2-1.7 ac) is needed per breeding pair. From the information currently available, habitat should be available to support a density of no greater than 1.5–2 pairs/ha (0.58-0.61 pairs/acre) during each breeding season over the long term. So for each pair, 0.5-0.67 ha (1.2-1.7 acres) would be needed. Using the higher end of this range, 0.67 ha per pair should account for the fact that not all habitat identified remotely (the only feasible way of quantifying amount of habitat rangewide) will actually be suitable for piping plover breeding and foraging (see Prindiville-Gaines and Ryan 1988 and Anteau *et al.* 2012 for descriptions of piping plover habitat).

Frequency of habitat availability:
There are no historical data about annual habitat availability throughout the range. Therefore, we used proxy measures to estimate how often habitat would have been historically available. We

used two independent approaches to evaluate how often habitat was likely available for piping plovers in the Northern Great Plains.

Recommendations for measuring habitat:
In order to determine how much habitat is necessary to support the population at a stable level into the future, we evaluated how much habitat was available in the various areas in years when reproductive success appeared to be adequate for a stable to increasing population and determined approximately how much habitat was necessary per adult pair (see discussion in the *Habitat Needed per Breeding Pair* section).

Ideally, habitat would be estimated several times throughout the breeding season, in early-to-mid June for peak nest initiation, and again in early July, when most chicks are on the ground. Recognizing that these data can be difficult and expensive to acquire and analyze, the most important data acquisition period is the first two weeks of June, to correspond with the time when habitat is likely most limiting because of the need for chicks to forage on the shoreline near where they hatched. Because both plovers and least terns are monitored in riverine areas, a data acquisition time in the first two weeks of June would provide information suitable for use with both species. Habitat data do not necessarily need to be collected annually, but we encourage entities to collect information on a regular schedule (e.g., every three to five years) so that habitat can be tracked over time and linked to bird numbers. Habitat can be evaluated remotely, using satellite data or other imagery with sufficient ground-truthing to ensure that the remote classifications are sufficiently accurate.

We recognize that not all of the habitat that is mapped as having the features associated with piping plover reproduction (bare, sandy/gravelly lightly vegetated sandbars or shorelines along rivers, reservoirs, or alkaline lakes) will be used by piping plovers for a variety of reasons, so the amount of habitat estimated from imagery will be an overestimate (but see Anteau *et al.* 2014b, 2014c). It is impractical to exclude the unused habitat across the range, but it is likely to be a relatively small subset of the total available habitat, and be roughly proportional to the total amount of habitat available (i.e., when there is a lot of habitat available, there will be more suitable habitat that is not used, when there is less total habitat available, there will be less unused habitat). There is likely some benefit to the birds, i.e., reduced risk of predation and reduced nest density-related issues, when birds are not crowded into limited suitable habitat. Continued study of habitat suitability will improve the definition of 'suitable' habitat and will aid in determining the appropriate amounts and densities needed to achieve recovery.

On rivers that have more naturalized hydrographs (e.g., the lower Platte and Niobrara Rivers in Nebraska), habitat may be estimable through proxy targets such as stream flow and channel width. These relationships need to be established and tested.

With the exception of portions of the Missouri River, the habitat has not been mapped throughout much of the range. For both the Northern and Southern Rivers, the habitat goal has been exceeded three times since 1998, and within 20 percent five times on Southern Rivers and four times on Northern Rivers (USACE 2012, USACE 2013). Note that these figures only represent a portion of the habitat available even in these regions.

Canada:
We are providing habitat goals for Canada here for informational purposes only. Since Canada also actively manages piping plovers and has developed their own recovery plan, we defer to their plan for that portion of the population.

We are following the goals set out in the Canadian Recovery Plan (Goosen *et al.* 2002):

- Increase piping plover populations to at least 1,626 adults (813 pairs) and maintain this population average over two additional consecutive international censuses with no net loss of habitat due to human action.
- Increase and maintain a median chick fledging rate of greater than 1.25 chicks/pair/year (based on population simulations, M.A. Larson, pers. comm.).
- Achieve minimum provincial population targets as follows: Alberta 300; Saskatchewan 1,200; Manitoba 120; Ontario (Lake of the Woods) 6.

Criterion 3 relates to coastal migration and wintering habitat. It can be found in detail in Volume II.

Criterion 4: Ensure commitments are in place and functioning as anticipated to provide long-term funding, protection, and conservation management activities in essential breeding and wintering grounds.

a. **Southern Rivers (Missouri River system from Fort Randall Dam, South Dakota to Ponca, Nebraska, the Niobrara River, the Loup River system and the Platte River system)**
b. **Northern Rivers (Missouri River system from Fort Peck Lake, Montana to Pierre, South Dakota)**
c. **in U.S. Alkaline Lakes**
d. **U.S. Wintering Grounds**

Purpose: To make sure that management commitments necessary for piping plovers' continued persistence are in place and functioning, and will continue to operate after the species is recovered.

In order for piping plover recovery to be assured into the future it is important for management entities to have commitments to provide habitat and to have demonstrated that they can and will implement these commitments into the future. In the breeding range, the flow and sediment dynamics on most of the river systems have been altered such that habitat has been eliminated or the quantity and quality has been drastically reduced.

Focused management efforts have attempted to recreate habitat lost by human alterations of river systems. However, some of these efforts have been unsuccessful. Those actions that are most likely to succeed are those actions that increase the dynamic function and capacity of river systems where breeding habitat is created and maintained by natural riverine processes. For river systems to be able to be run to approximate their natural processes, changes to floodplain management and, in some cases water allocation, would need to be addressed so that flows can occur without negative impacts on human infrastructure.

Changes in water timing and volume in riverine systems as a result of climate change may also require alterations in water resources and socioeconomic response to river management, requiring novel cooperative solutions.

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We recommend that surveys be conducted to determine if plovers are present prior to constructing new projects, or modifying or protecting existing projects that may impact piping plovers or coastal habitat function. We recommend following the protocol laid out in Appendix 2W.a of the wintering portion of the plan (Volume II), performing multiple surveys over the course of an entire migration and wintering season. If surveys are not possible, plover use should be assumed if the Primary Constituent Elements for wintering habitat are present. If piping plovers may use the area, projects should be designed so that features necessary for plover wintering use are not impacted.

Projects within the wintering grounds should be designed so that the natural dynamic processes of the coastal environment are retained. Overwash events and channel migration should be allowed to create, restore, and enhance piping plover wintering habitat. In general habitat should be protected from new development, or modifications to existing development that stabilize

shorelines and inlets, or that otherwise prevent natural processes from replenishing plover habitat. Human and pet access to roosting and foraging areas should be sufficiently restricted so that birds can feed and rest without being disturbed (activities should not significantly alter or disrupt the birds' behavior). Development and implementation of an outreach strategy that raises public awareness of the presence and foraging/roosting needs of plovers and other shorebirds would help to diminish this disturbance.

While the wintering grounds presumably extend into Mexico, we do not have good information about the percentage of the population that winters in Mexico. If more information becomes available suggesting that the Gulf in Mexico supports a large percentage of the birds, this issue will need to be revisited, in conjunction with Mexican biologists and managers.

At this time, because the USFWS has no authority outside of the U.S., we are not setting targets outside of the U.S., but acknowledge that for recovery, piping plovers and their habitat will likely require protection both in the U.S. and outside the nation's borders where they breed and winter. We encourage international partnerships to be developed and maintained to address piping plover recovery together (e.g., Association of Fish and Wildlife Agencies 2014).

Additional factors beneficial to the species but not known to be critical for recovery at this time:

While the following factors are not necessary for species' recovery, and therefore are not included as recovery criteria, they do represent potentially important considerations from a population dynamics standpoint. We encourage further research and monitoring work.

Additional Factor 1B: Maintaining the breeding population in the outer extents of the range

We recognize the importance of having a geographically dispersed population, and are cognizant of the risks associated with a shrinking range. As such, we encourage continued monitoring and management of the small populations in Colorado and Lake of the Woods, Minnesota to increase and stabilize the populations in these areas.

In particular, Lake of the Woods may have represented a route of interchange between the Northern Great Plains and the Great Lakes piping plover populations based on the presence of a larger population that was documented there as recently as the 1980s. Although an individual banded in the Southern Rivers portion Missouri River was documented attempting to nest in Lake of the Woods, these birds are currently isolated from the rest of the Northern Great Plains population and were not considered essential to the actual recovery of the Northern Great Plains piping plover population as a whole. However, we do encourage continued efforts to restore these populations in the hopes that they will flourish and contribute to the larger Northern Great Plains population in the future.