U.S. Fish and Wildlife Service

Recovery Plan
for
Poweshiek Skipperling (*Oarisma poweshiek*)

Photo by Vince Cavalieri/USFWS

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Recovery Plan for Poweshiek Skipperling (*Oarisma poweshiek*)

This recovery plan describes criteria for determining when the Poweshiek skipperling may be considered for downlisting and delisting, as well as the actions necessary to meet those criteria and time and cost estimates for implementing recovery actions. The introduction provides a brief description of the species' habitat requirements, biology, and limiting factors. A more detailed accounting of the species biology, threats, and status is provided in the Poweshiek Skipperling Species Needs Assessment (USFWS 2020). A Recovery Implementation Strategy describing the stepped-down activities to implement the recovery actions is being developed in coordination with recovery partners. The Recovery Implementation Strategy and Species Needs Assessment are developed separately from the Recovery Plan and will be updated as needed.
[Note: Underlined words can be found in the glossary.]

Introduction

The Poweshiek skipperling is a prairie butterfly that has undergone rangewide declines in both number of individuals and in location of populations, leading to its listing as an endangered species under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq; Act) on October 23, 2014 (79 FR 63671). Critical habitat was designated on October 1, 2015 (80 FR 59247). A total of 56 units were designated as critical habitat, 9 of which were occupied at the time of the designation.

The Poweshiek skipperling once ranged throughout the upper Midwest, from Illinois and Iowa in the south, to Michigan in the east, to North Dakota and South Dakota in the west, and southern Manitoba in the north, with the core of its range occurring in Minnesota and South Dakota (USFWS 2014, p. 63688). Poweshiek skipperling habitat includes remnant prairie areas including prairie fens, grassy lake and stream margins, moist meadows, sedge meadows, and wet-to-dry prairie. The species relies on high-quality habitat conditions and on natural or human disturbances that maintain the integrity of the plant communities, while minimizing mortality to vulnerable life stages. During the short time adults are alive (2-4 weeks in summer), they need sufficient high-quality nectar from flowers for feeding and healthy and abundant suitable grasses (host plants) for oviposition (laying eggs). Larvae need sufficient host grasses to feed on throughout the summer, as well as suitable microhabitat (temperature and humidity). The species overwinters as a larvae above ground on the blades or stem of the host plant; thus they also need habitat that provides a suitable microclimate for shelter during winter.

It is not known exactly what led to the precipitous decline in the species, however, populations are likely influenced by degradation and destruction of habitat through conversion of native prairie to cropland or development; ecological succession to woody vegetation; encroachment of invasive species; past and present land management such as incompatible fire, haying, or grazing management that degraded or destroyed the species' habitats; flooding; and, groundwater depletion, alteration, and contamination. Additionally, biocide use, including herbicides, insecticides, fungicides, and their associated additives, may have direct or indirect effects on Poweshiek skipperlings, compounding the effects of habitat curtailment. Herbicide use to control invasive species and woody vegetation encroachment, however, can help maintain prairie habitats and, thus, also be beneficial. Projections of increased variability in weather patterns and greater frequency of severe weather events, as well as warmer average temperatures, may affect

the species' habitat, have direct effects on the survival of larvae, and cause asynchronous timing of adult emersion and plant resources. Finally, the remaining populations of the Poweshiek skipperling are small and isolated and, thus, are vulnerable to the effects of small population dynamics, further compounding the effects of other stressors.

Recovery Vision and Strategy

The recovery vision for the Poweshiek skipperling is to conserve a sufficient number and distribution of populations to ensure the species' long-term viability such that it may be removed from the List of Endangered and Threatened Wildlife. To achieve long-term viability, the species' must endure the pressures of: 1) environmental stochasticity, 2) stressors, 3) catastrophes, and 4) novel changes in its environment. This requires multiple, healthy populations widely distributed across the breadth of adaptive diversity (USFWS 2021 pp. 17-18). By ensuring the species has sufficient resiliency, redundancy, and representation, we are assured that there are a sufficient number and distribution of populations such that the species can withstand these pressures.

Achieving the recovery vision requires a multi-pronged recovery strategy with spatial and temporal components. Spatially, the path to achieving recovery is structured by delineating units that ensure adaptive capacity is sufficient to allow for both near- and long-term adaptation to novel changes in the species' environment. The strategy also includes restoring redundancy and resiliency within these units to ensure the species can withstand natural annual variation, stressors, and catastrophes. Protecting and maintaining the remaining remnant prairie habitat within the range of the Poweshiek skipperling will be fundamental to recovering the species.

Temporally, the recovery strategy focuses on a sequence of first halting any further declines in numbers or distribution, then reversing declines and increasing numbers and distribution, and, ultimately, securing the long-term viability of the species. This phased approach involves emphasizing different objectives as recovery proceeds, thereby focusing initially on preventing extinction by enhancing and preserving existing populations before moving toward broader, more proactive conservation objectives. Determining the causes of decline and ameliorating primary pervasive threats, including habitat loss and degradation, small population dynamics, pesticides, disease, and effects of climate change is a fundamental and integral component of each of these phases.

The specific objectives include:

1. Preventing further loss of populations by (a) increasing the size and health of existing populations through augmentations, (b) improving the quality and quantity of habitat at occupied sites, and (c) ensuring appropriate connectivity between existing metapopulations.
2. Increasing the number of genetically and demographically healthy populations and the spatial distribution of those populations to buffer against catastrophes and environmental stochasticity. This will likely require reintroduction into unoccupied areas within the historical range.
3. Restoring populations across the breadth of its natural adaptive diversity to buffer against novel changes in its physical and biological environment. This will likely require reintroduction into unoccupied areas within the historical range.

4. Protecting populations and their habitats and abating threats into the foreseeable future.

Involvement and support from partners and the public is integral to Poweshiek skipperling conservation. The cornerstone of this strategy is sustaining and expanding conservation partnerships and general public support by implementing recovery through collaborative efforts. This collaboration is fundamental in shaping and coordinating short-term recovery efforts within the context of a cohesive, long-term approach. Planning and coordination among recovery partners will be integrated throughout the recovery process.

This recovery plan identifies the principal uncertainties and assumptions underlying the initial stage of the Poweshiek skipperling recovery effort. Adaptive management, using the Recovery Implementation Strategy, is key to resolving uncertainties. The key uncertainties include:

- What is needed to maintain a healthy population of Poweshiek skipperling? Specifically:
    - What is the number of individuals needed to support a healthy population?
    - What are the physical requirements throughout the annual life cycle (for example, key host plant species)?
    - What are the habitat requisites to maintain healthy populations?
    - What are the genetic requisites for a healthy population?
    - What is needed for effective dispersal across populations?
    - What is needed to maximize successful captive rearing, breeding, and population restoration?
- What caused the species decline and to what degree are those threats still impacting the recovery of Poweshiek skipperling?
    - What is the relative impact of threats on the Poweshiek skipperling?
    - Where in the life cycle and by what mechanisms are threats impacting populations?
    - How do we most effectively alleviate impacts to the species?
- How do management techniques affect the Poweshiek skipperling and its habitat (for example, mowing, burning, grazing, herbicide use)? What management is best for each of the habitat types across the range?
- How do we maximize success of captive rearing and breeding (for example, hatch rates and overwinter survival)?
- Are there additional as yet undetected populations of Poweshiek skipperling?
- How do we effectively evaluate impacts of conservation efforts?

Recovery Criteria

Recovery criteria provide objective, measurable thresholds used to indicate when the recovery vision has been achieved. These criteria are founded on the most current scientific information available for the species and may require modification as the aforementioned uncertainties are resolved.

A. Downlisting Criteria

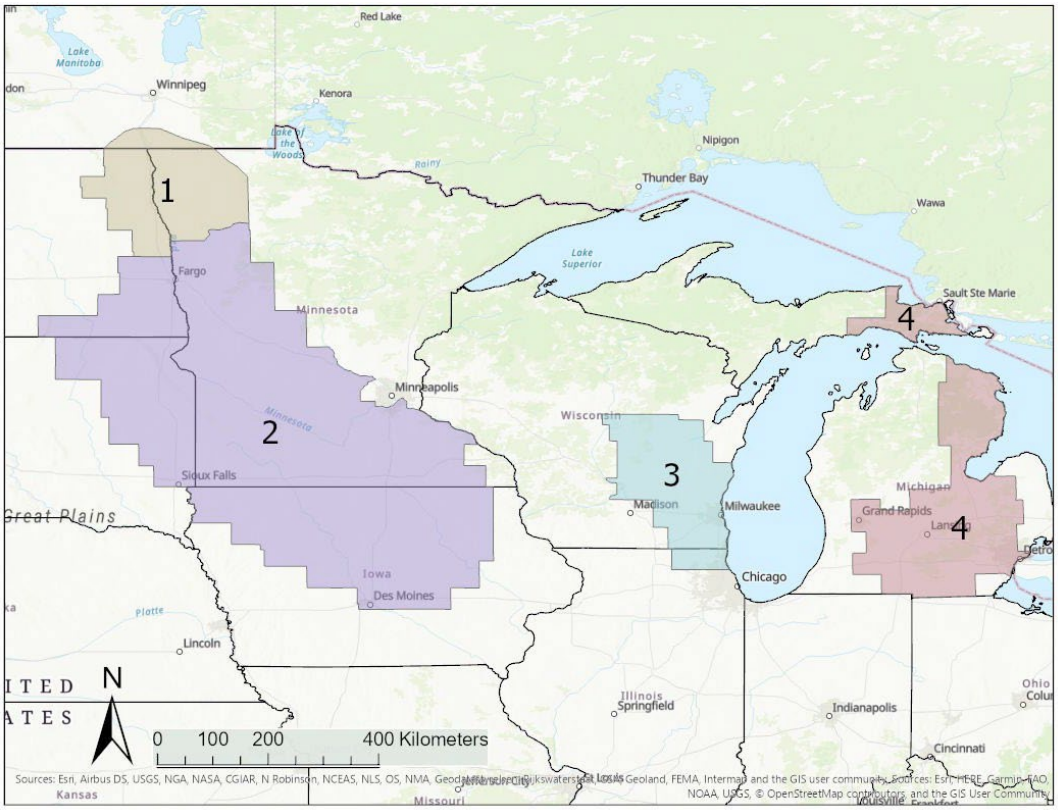

Figure 1. Map of Poweshiek skipperling conservation units (shaded polygons, labeled with respective unit numbers). Conservation unit boundaries encompass unique adaptive diversity of the species, including genetics, habitat, and historical distribution. Boundary lines are generally drawn to county lines for ease of conservation implementation.

Criterion A: A minimum number of healthy populations of Poweshiek skipperling exist in each of the 4 conservation units (Figure 1) as specified in Table 1.

Table 1: Number of healthy populations distributed throughout the unit.

Conservation Unit	Number of Healthy Populations
1: Southeastern Manitoba, Northwestern Minnesota, and Northeastern North Dakota	6 (At least 2 populations in Canada and 2 in the United States)
2: Southeastern North Dakota, Central and Southwestern Minnesota, Northeastern South Dakota, and Central and Northern Iowa	23
3: Southeastern Wisconsin and Northeastern Illinois	2
4: Michigan	5

Assessing whether a population qualifies as a healthy population entails ensuring long-term population persistence given population-specific stressors and environmental variation. A healthy Poweshiek skipperling population is thus one that is demographically, genetically, and physically robust[1] and occupies large areas of high quality remnant prairie habitat, as described below:

a. Demographically robust populations have a stable to increasing growth rate over 5-10 years. The required minimum population growth rate (λ) is dictated by the degree of environmental variability (within and across populations). A stable or increasing trend in abundance (population growth rate >0.0) should be determined using a statistically valid method[2] with an appropriate level of precision. Robust populations also have a sufficiently large population size (N) to withstand periodic population crashes. A metapopulation with multiple sub-populations generally increases population health, and thus is more likely to meet this standard. A single population may meet this standard, however, if it is sufficiently abundant and occupies a sufficiently large site with high habitat heterogeneity.

b. Genetically robust populations have a sufficiently large breeding population size (N_e) such that loss of heterozygosity is minimized. Habitat patches are within dispersal distance and connected via permeable land cover to ensure gene flow.

c. Physically robust populations are comprised of individuals with good body condition and with pesticide and pathogen loads that are below levels that could cause meaningful loss of reproductive capacity of the population.

d. High quality remnant prairie habitat varies geographically, but generally consists of the following (See USFWS 2015 for a more detailed description of habitat features):

- Sufficient quantity and quality of host and nectar plants (native grasses and flowering herbaceous plants and shrubs) available at phenologically appropriate times.
- Natural hydrologic regime that supports prairie fens, grassy lake and stream margins, moist meadows, sedge meadow, or wet- to dry-prairie habitats.

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[1] As the minimum or threshold values for demographic, genetic, and physical determinants are not yet known, a standardized methodology to evaluate population health needs to be developed. Specifically, the analysis should be designed to assess population demographic and genetic health along with incorporating environmental stochasticity, catastrophes, and resilience to stressors (including but not limited to habitat degradation, pathogens, pesticides, and climate change). The analysis should conform to scientific standards and apply the best available data and feasible methodologies.

[2] The specific survey methods and frequency of surveys should be established following a standardized, statistically valid methodology. This protocol will be developed as part of the recovery implementation strategy process.

- A diversity of habitat types with suitable microclimate (temperature and humidity) and microclimate diversity.
- Is of sufficient size to maintain a population.
- Suitable landscape matrix to allow movement between habitat patches, i.e., habitat patches <1 km (0.6 mi) apart, and permeable land cover between patches.

B. Delisting Criteria

Criterion B1: Downlisting criteria have been met. Thirty-six populations distributed among the 4 Conservation Units, as described above.

Criterion B2: Threats and causes of decline have been reduced or eliminated and mechanisms are in place that provide a high level of certainty that the downlisting criteria will continue to be met into the foreseeable future.

In achieving delisting Criterion B2, Conservation Unit-specific mechanisms should ensure:

2.1 Population abundance, numbers, and distribution will be maintained at the levels that meet downlisting criteria,

2.2 Sufficient quality and quantity of suitable habitat will be maintained, with implementation of compatible management regimes, and

2.3 The negative effects of the primary threats (both those that are currently known and those that are identified in the future, including but not limited to, habitat loss and degradation, small population dynamics, pesticides, disease, and effects of climate change) will be eliminated or reduced to a level that the downlisting criteria will be maintained. Maintaining these reduced threat levels may necessitate ongoing management commitments.

Criteria Rationale

***Downlisting Criteria*:** The Poweshiek skipperling was once a fairly common species found throughout the prairies and prairie fens of the upper Midwest (USFWS 2020). While restoring the species to its historical distribution and number of occurrences is unnecessary to prevent its extinction, restoring the natural high abundance and broad distribution to a certain level are needed for the species to withstand environmental stochasticity (for example, annual differences in temperature and precipitation), stressors (for example, pesticides, disease, and incompatible land management regimes), and catastrophes (for example, drought), and adapt to changing environmental conditions over time. The Poweshiek skipperling is adapted to having a high number of individuals in a broad distribution. A broad distribution is necessary because its annual life cycle makes it vulnerable to small environmental changes and stochasticity. Because of this annual life cycle, it is at higher risk when exposed to broader scale catastrophes. Additionally, the species has highly specialized habitat needs, there are a limited number of areas with suitable habitat, and those areas are broadly distributed. The Conservation Units are designed to capture the likely variation in adaptive diversity across the Poweshiek skipperling's range (Figure 1), thereby preserving a wide breadth of genetic and ecological diversity and

maintaining the species' ability to adapt to a changing environment. The number of populations per Conservation Unit helps restore the species distribution (reflecting the historical distribution with more populations in the former core), helps the species withstand catastrophic events, and helps spread the risk across the Unit, thereby reducing the risk that all populations in that Unit will be lost. Ensuring that these populations are healthy also builds the resiliency of the individual populations to withstand environmental stochasticity and variability, stressors, and catastrophes and, thus, reduces the species risk of extinction.

***Delisting Criteria*:** Having healthy populations in each of the four Conservation Units (criterion B1) provides assurance that the Poweshiek skipperling is not in danger of extinction throughout all or a significant portion of its range. Maintaining the downlisting criteria, in conjunction with delisting criterion 2, will ensure the Poweshiek skipperling is not in danger of extinction into the foreseeable future.

Mechanisms (criterion B2) such as agreements, regulations, plans, conservation easements, and land acquisition are needed to ensure the downlisting criteria will continue to be met into the foreseeable future. For example, developing and implementing species-specific management plans and best management practices can be used to maintain sufficient quality and quantity of habitat into the foreseeable future. Similarly, implementing species-specific integrated pest management programs (to manage adverse effects of pesticides) and implementing disease epidemic prevention plans (to reduce disease introduction and spread) may be used to manage threats into the foreseeable future.

Recovery Actions

The recovery actions identified below are those that, based on the best available science, are necessary to bring about the recovery of the Poweshiek skipperling. These actions will be used to develop step-down, recovery implementation strategies and prioritized tasks that are detailed to each Conservation Unit's needs.

The broad categories of actions include:

1. **Manage, protect, and enhance populations** including, but not limited to, the following:
    a. Augment existing populations through captive rearing techniques (for example, headstarting), in accordance with established controlled propagation policy (USFWS 2000), including genetics and disease considerations (for example, Smith et al. 2016).
    b. Restore key historical populations through reintroductions or translocations, (for example, using captive-bred individuals), in accordance with established controlled propagation policy and genetics plans.
    c. Develop and refine captive rearing collection, husbandry, and release techniques.
    d. Conduct research to understand biological and ecological, genetic, and life-history requisites to maintain or restore populations.

    Estimated cost: $19,500,000

2. **Manage, protect, and enhance habitat** including, but not limited to, the following:
    a. Create and implement population-specific adaptive land management and protection plans.
    b. Maintain and enhance habitat at existing populations and at potential reintroduction sites.
    c. Create and implement best management practices across the range.
    d. Conduct land acquisition as needed to maintain or enhance existing and new populations.
    e. Monitor habitat restoration and refine management using adaptive management
    f. Conduct research to understand habitat requisites and management practices to maintain or restore populations.

    Estimated cost: $17,100,000

3. **Assess population and habitat status through monitoring and surveys** including, but not limited to, the following:
    a. Develop and use rigorous standardized protocols to monitor population health, habitat, and threats at existing populations and future new populations.
    b. Conduct surveys at potential Poweshiek skipperling locations to document previously undetected but existing populations.
    c. Conduct research to improve the effectiveness of monitoring techniques.

    Estimated cost: $17,425,000

4. **Increase understanding of threats and alleviate threats into the foreseeable future** including, but not limited to, the following:
    a. Research to determine the pesticide loads at extant sites and potential reintroduction sites and to determine the effects of pesticides on Poweshiek skipperling or an appropriate surrogate species.
    b. Research the effects of climate on the species and determine measures to alleviate those effects.
    c. Research the effects of pests, pathogens, and parasites and determine measures to alleviate those effects.
    d. Research the effects of interacting and emerging threats and determine measures to alleviate those effects.
    e. Implement informed practices to reduce the effects of threats.

    Estimated cost: $2,860,000

5. **Engage the public and partners in Poweshiek skipperling conservation** including, but not limited to, the following:
    a. Develop outreach products to raise awareness and garner support for Poweshiek skipperling conservation at local and regional levels.
    b. Disseminate targeted outreach to relevant partners and communities.
    c. Integrate planning and coordination among recovery partners

    Estimated cost: $295,000

Date of Recovery

If all actions are fully funded and implemented as outlined, including full cooperation of partners needed to achieve recovery, we anticipate delisting could be achieved as soon as 2072. Assuming the declines could be halted within the next 10 years, it would likely take at least another 30 years to reverse the decline and increase the numbers, followed by an additional 10 years to monitor the response of populations. Thus, we estimate that recovery could be accomplished in 50 years. We recognize, however, that it may take longer than this estimate to recover and delist the species.

Estimated Cost of Delisting

The estimated costs associated with implementing rangewide recovery actions for delisting are $57,180,000. Cost estimates reflect costs for species actions needed to achieve Poweshiek skipperling recovery. Some costs for recovery actions are not determinable at this time, therefore, the total cost for recovery may be higher than this estimate.

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Glossary

Adaptive diversity – The range of variation within a species, and the source of species' adaptive capabilities.

Effective population size (N_e) – The size of the ideal, panmictic population that would experience the same loss of genetic variation, through genetic drift, as the observed population. It is often represented by the size of a breeding population or the number of reproducing individuals in a population.

Metapopulation – A collection of sub-populations that have realized (observed) or potential (qualified by distance, being blown by wind over a road) connectivity.

Permeable land cover – Terrain that is structurally similar to native prairie habitat (e.g., grass dominated fields or pastures) that allows movement of Poweshiek skipperling individuals.

Population – Reproductively isolated unit that may or may not have the same structure as a metapopulation. A metapopulation is widely recognized as being more secure over the long term than are several isolated populations that contain the same total number of individuals. A metapopulation is more secure because adverse effects experienced by one of its subpopulations resulting from genetic drift, demographic shifts, and local environmental fluctuations can be countered by occasional influxes of individuals and their genetic diversity from the other subpopulations within the metapopulation.

Redundancy – An indicator of the ability of a species to withstand catastrophic events by spreading risk among multiple populations or across a large area (Smith et al. 2018, p. 304).

Remnant prairie – Native grassland areas that remains unplowed since European settlement.

Representation – An indicator of the ability of a species to adapt to changing environment conditions over time as characterized by the breadth of genetic and environmental diversity within and among populations (Smith et al. 2018, p. 304).

Resiliency – An indicator of the ability of a species to withstand stochastic disturbance; resiliency is positively related to population size and growth rate and may be influenced by connectivity among populations (Smith et al. 2018, p. 304).

Sub-population – The pieces of a metapopulation; smaller cluster of inter-breeding individuals; low rates of dispersal; cannot be a closed population.

Viability – The ability of a species to sustain populations in the wild over time.