United States Department of the Interior

FISH AND WILDLIFE SERVICE

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May 2, 2016

IN REFERENCE REFER TO:
03E19000-2016-F-0088 Dakota Skipper/Poweshiek Skipperling Recovery Permit and Related Actions

Memorandum

To: Assistant Regional Director, Ecological Services, Midwest Region (Region 3), Bloomington, MN

Assistant Regional Director, Ecological Services, Mountain-Prairie Region (Region 6), Lakewood, Colorado

From: Field Supervisor, Twin Cities Ecological Services Field Office, Bloomington, MN

Field Supervisor, South Dakota Ecological Services Field Office, Pierre, SD

Subject: Intra-Service Section 7 Consultation on Region 3's and Region 6's Section 10(a)(1)(A) Permitting Program for the Dakota skipper and Poweshiek skipperling

This document transmits the U.S. Fish and Wildlife Service's (Service) revised Intra-Service biological opinion on the effects of issuing section 10(a)(1)(A) scientific research permits to personnel conducting surveys for the Dakota skipper (*Hesperia dacotae*) and Poweshiek skipperling (*Oarisma poweshiek*) in Iowa, Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin and for captive rearing. This biological opinion was prepared in accordance with section 7 of the Endangered Species Act, 1973, as amended (16USC 1531 et seq.) (ESA), and replaces the original opinion for the subject actions, which was signed on June 12, 2015.

At issue is the take of the Dakota skipper and Poweshiek skipperling for scientific and conservation purposes by biologists via the capture and handling of these butterfly species to document occupied habitats and to facilitate captive rearing. Take would occur through the issuance of section 10(a)(1)(A) permits by the Regional Offices. This activity will improve our scientific knowledge of the species and promote their conservation. Critical habitat has been designated for these species in Regions 3 and 6.

For reasons discussed within, it is our biological opinion that the proposed actions carried out pursuant to section 10(a)(1)(A) are not likely to jeopardize the continued existence of the Dakota skipper or the Poweshiek skipperling. Further, the proposed actions would not affect any

physical or biological features of designated critical habitat for the Dakota skipper or Poweshiek skipperling. As such, effects to designated critical habitat will not be analyzed in this biological opinion.

Further, the proposed actions would not affect any physical or biological features of proposed critical habitat for the Dakota skipper or Poweshiek skipperling. The actions addressed in this biological opinion are not expected to affect habitat features. As such, effects to proposed critical habitat impacts will not be further analyzed in this biological opinion.

cc: FWS R6, ES, Doug Laye
FWS R6, ES, Kathy Konishi
FWS R3, ES, Karen Herrington
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Table of Contents

BIOLOGICAL OPINION

Section 10(a)(1)(A) permits for the
Dakota skipper and the Poweshiek skipperling

CONSULTATION HISTORY

U.S. Fish and Wildlife Service (Service) must consult under section 7(a)(2) of the ESA when an action we permit, fund, or carry out may affect a federally listed species. This consultation programmatically covers section 10(a)(1)(A) permits issued to individuals working in Iowa, Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin to conduct surveys for the Dakota skipper and Poweshiek skipperling and to conduct captive rearing. This biological opinion considers the effects of the issuance of these permits on these butterfly species. Section 10(a)(1)(A) permits are referred to as 'recovery permits' and are used to authorize take for the purposes of carrying out actions that will contribute to the recovery of the species in Regions 3 and 6.

A biological opinion was first issued on June 16, 2015 to cover the subject activities. This document replaces that biological opinion.

PROGRAMMATIC CONSULTATION APPROACH

In accordance with section 7 of the ESA the , the Service must ensure that its proposed actions do not jeopardize the continued existence of any federally listed species or result in the adverse modification of any proposed or designated critical habitat. This mandate also dictates that each proposed action must undergo a section 7(a)(2) review. Thus, to efficiently address our section 7(a)(2) mandate, we are conducting a section 7 programmatic consultation for the Service's Region 3 and 6 section 10(a)(1)(A) scientific and recovery permit programs specifically to benefit the conservation of the Dakota skipper and Poweshiek skipperling. Our approach is to analyze the effects of the actions we anticipate permitting, funding, or carrying out for the conservation of these butterfly species and to identify conservation measures that we will incorporate into each section 10 scientific and recovery permit issued.

Each section 10(a)(1)(A) permit will be reviewed to ensure that:

(1) the actions to be permitted, funded, or carried-out were contemplated in this programmatic biological opinion;

(2) the appropriate conservation measures have been incorporated into each permit;

(3) the anticipated effects of the permit are commensurate to what was anticipated in the biological opinion; and,

(4) the level of incidental take that is anticipated to occur as a result of the proposed activities will not exceed the level anticipated in this biological opinion.

DESCRIPTION OF THE PROPOSED ACTION

Action Area

The action area is not only the immediate area involved in the action, but also includes all areas to be affected directly or indirectly by the Federal action (50 CFR § 402.02). The action area contains the most far-reaching potential effects of the Federal and non-Federal actions on the species being discussed. The action area is defined as "…all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." In other words, the action area is not limited to the "footprint" of the action, but rather encompasses the biotic, chemical, and physical impacts to the environment resulting directly or indirectly from the action.

For this programmatic consultation, the action area includes any area within Iowa, Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin that is in the current range of the Dakota skipper or the Poweshiek skipperling (Figs. 1 and 2) and that contains suitable habitat for one or both species (see **Status of the Species** and **Habitat Characteristics** section below). Surveys will be conducted in locations where the species has been previously recorded (Figs. 1 and 2) and in the general range of either species, where habitat conditions indicate that one or both species may be present.

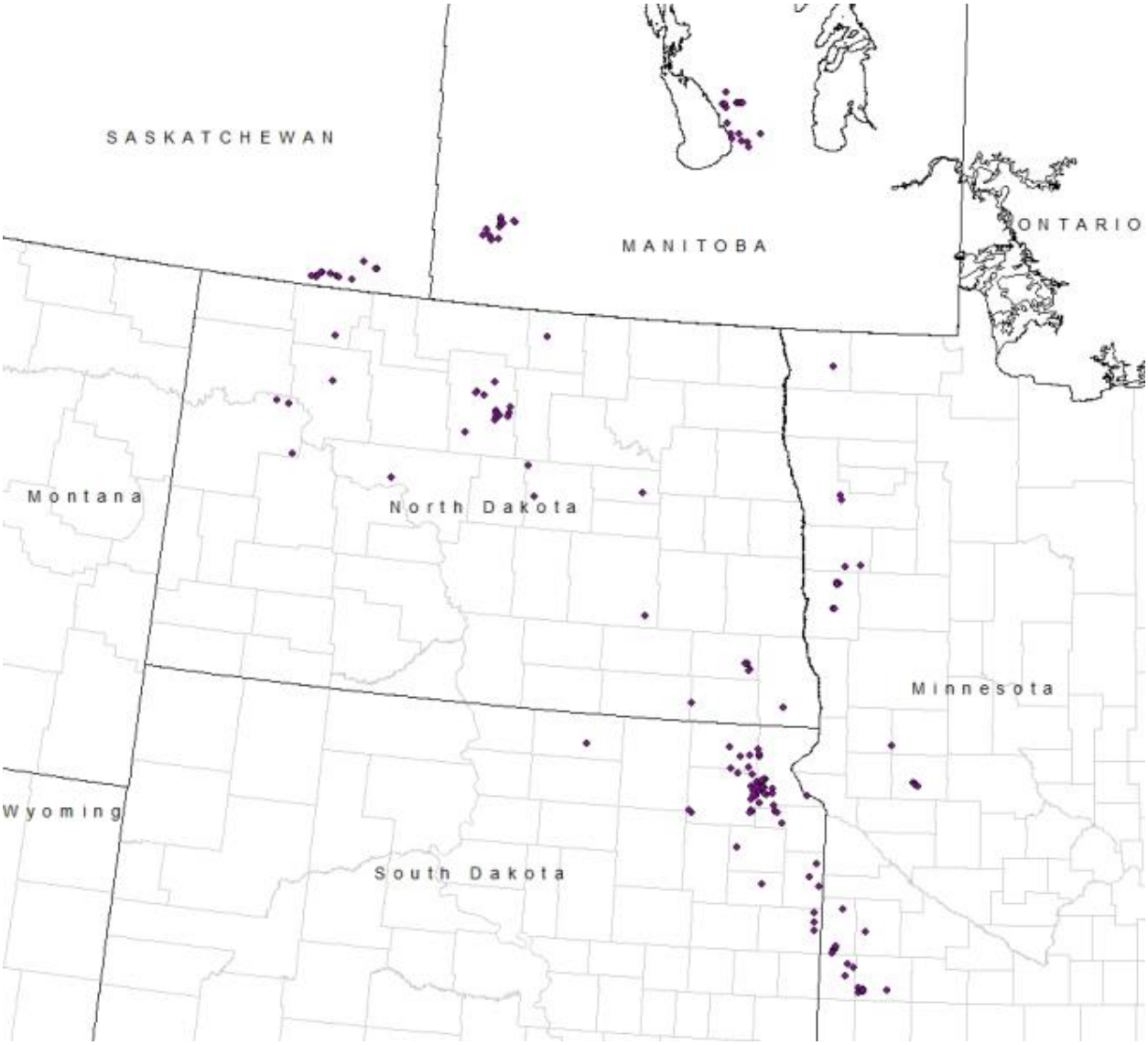

Figure 1. Locations in the United States and Canada where the Dakota skipper has been recorded and may still be present. The actions that would be permitted under section 10(a)(1)(A) for the Dakota skipper – surveys and captive rearing – will affect areas where Dakota skipper is known to occur and where its presence is suspected in this general area.

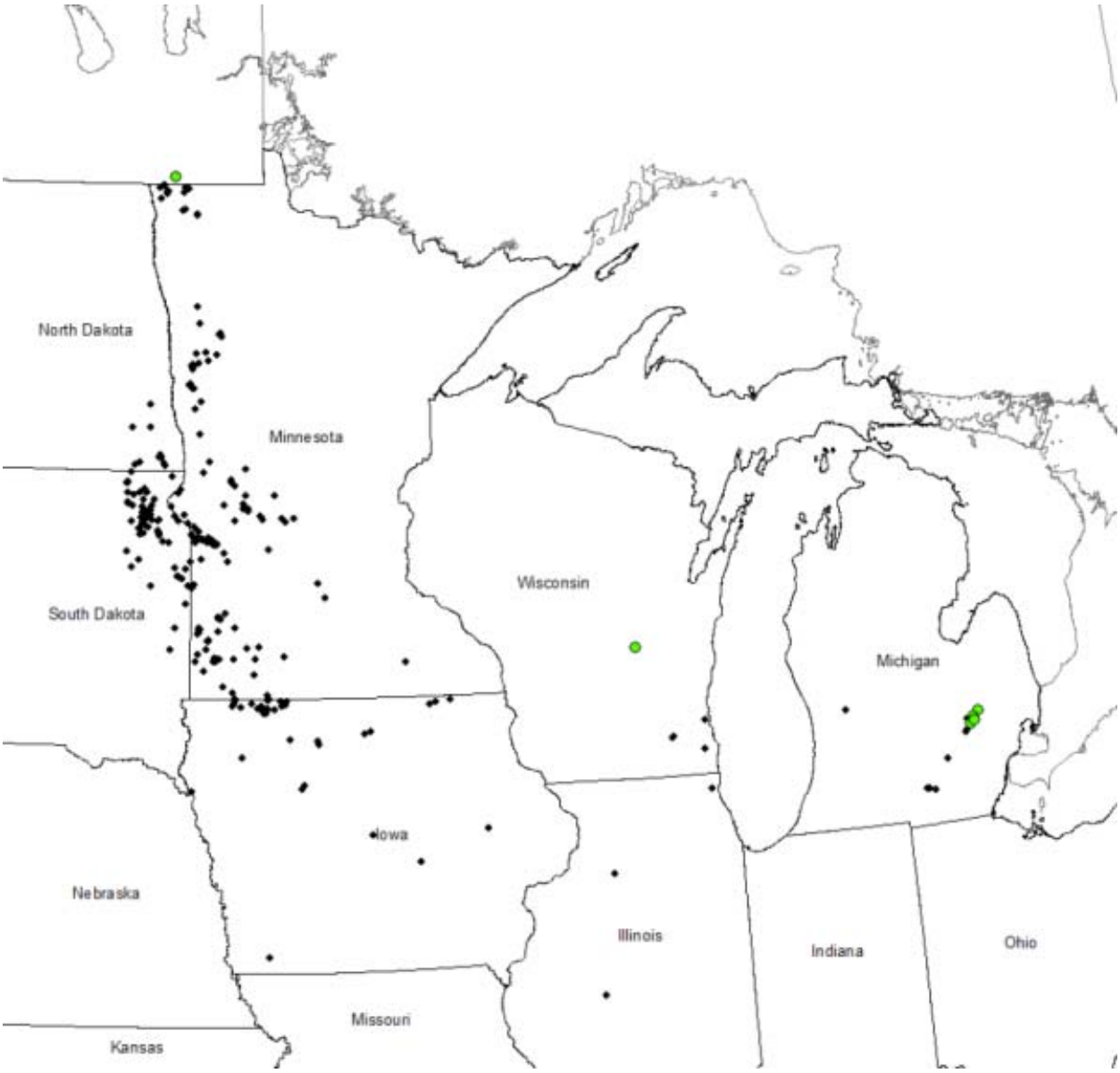

Figure 2. Locations in the United States and Canada where the Poweshiek skipperling has been recorded and may still be present (green dots). The actions that would be permitted under section 10(a)(1)(A) for the Poweshiek skipperling – surveys and captive rearing – will affect areas where the species is known to occur and where its presence is suspected in this general area.

Proposed Action

We propose to issue section 10(a)(1)(A) permits to take the Dakota skipper and Poweshiek skipperling for recovery or scientific purposes or for the enhancement of propagation or survival. Pursuant to section 10 of the ESA, we may authorize otherwise prohibited actions under the ESA for scientific purposes or to enhance the propagation or survival of listed species. All activities we authorize under section 10(a)(1)(A) must meet permit issuance criteria at 50 CFR 17.22, 17.32, or 17.52. Importantly, the ESA and its implementing regulations mandate that such activities be for the purposes of enhancement or conservation of listed species.

In determining whether to issue a section (10)(a)(1)(A) permit, we must consider and understand the following:

(1) whether the purpose for which the permit is required is adequate to justify removing from the wild or otherwise changing the status of the Dakota skipper and/or Poweshiek skipperling;

(2) the probable direct and indirect effects that issuing the permit would have on the wild populations of the Dakota skipper and/or Poweshiek skipperling;

(3) whether the permit, if issued, would conflict with any known programs intended to enhance the survival of the Dakota skipper or Poweshiek skipperling;

(4) whether the purpose for which the permit is required would be likely to reduce the threat of extinction of either species;

(5) the opinions or views of scientists or other persons or organizations who have expertise concerning the species or other matters germane to the application; and,

(6) whether the expertise, facilities, or other resources available to the applicant appear adequate to successfully accomplish the objectives stated in the application.

The Regional Permits Coordinators and appropriate field office will ensure that relevant conservation measures identified in this biological opinion are incorporated into the permit as enforceable terms and conditions. In accordance with the section 10(a)(1)(A) permit process, take will be permitted for only those activities that enhance the conservation and recovery of the Dakota skipper and Poweshiek skipperling. All data collected as a result of these actions will be reported to us on an annual basis to facilitate recovery planning.

The Service proposes to issue permits under section 10(a)(1)(A) of the ESA to allow qualified permittees to capture and to hold temporarily Dakota skippers and Poweshiek skipperlings to conduct research, monitoring, surveys and other activities that would contribute to the recovery of the species in North and South Dakota, in Region 6, and in Iowa, Minnesota, Michigan, and Wisconsin in Region 3. These recovery activities most commonly include: 1) surveys in the wild that may involve pursuit and capture (e.g., netting) of wild Dakota skippers or Poweshiek skipperlings; 2) salvage of dead specimens; 3) activities associated with captive rearing; and, collection of samples for genetic analyses and to test for the presence of *Wolbachia*. We expect captive rearing to consist of 'head starting,' which will consist of *ex situ* rearing of eggs to late-stage larvae or pupal stages for release into the wild. Captive-reared pupae may be placed, for example, in enclosures at augmentation or reintroduction sites for release when they transform to the pupal or adult stage. A small number of pupae – no more than 20 – may be retained at the rearing facility for captive breeding. The Service will ensure that all captive rearing and any ensuing reintroduction or augmentation will adhere to the Service's Policy Regarding Controlled Propagation of Species Listed under the Endangered Species Act (USFWS and NOAA 2000, 65

Federal Register 56916) and the IUCN Technical Guidelines on the Management of Ex-situ populations for Conservation (IUCN/SSC 2014).

Species held in captivity or in a controlled environment on the date of publication in the Federal Register for final species listing are exempt from prohibitions of the ESA, provided such holding or any subsequent holding or use of the specimen was not in the course of a commercial activity (any activity that is intended for profit or gain). Any endangered or threatened specimens born in captivity from pre- ESA parents are fully protected and are not considered pre-ESA. For example, eggs and later life stages derived from any mating that occurs among individuals that are pre-ESA and currently in captivity would require coverage under a section 10(a)(1)(A) permit.

Conservation Measures

Conservation measures are actions to benefit or promote the recovery of listed species that are included by the Federal agency as an integral part of the proposed action. These actions will be taken by the Federal agency or applicant, and serve to minimize or compensate for project effects on the species under review. These may include actions taken prior to the initiation of consultation, or actions which the Federal agency or applicant have committed to complete in a project proposal, permit application, or similar document.

General Conditions of Permits

For all 10(a)(1)(A) permits, the Service would reduce the impacts of the take or adverse effects to the species by issuing permits containing the following measures:

1. All permittees must understand and agree to abide by 50 CFR Part 13 and 50 CFR Part 17.

2. Only qualified individuals shall be authorized to conduct activities pursuant to any permit. The qualified individuals shall be specified on the face of the permit or on a List of Authorized Individuals attached to the back of each permit. The list, printed on Service letterhead, may identify special conditions or circumstances under which individuals are authorized to conduct permitted activities. Each individual shall be responsible for compliance with the terms and conditions of the permit.

   As part of the permit application process, we require that proposed authorized individuals provide the following information for our analysis of their qualifications:

   - A résumé or curriculum vitae;
   - specific information on previous professional training and experience working with the species affected by the permit request, including: the approximate number of hours of focused activity with each species in occupied habitat; approximate number of each species the applicant has worked with at each site (e.g., how many individuals at a specific site); names, dates, and location of areas surveyed; and, experience with similar species;
   - the type of activity for which authorization is requested; and,

- the names and phone numbers of at least two references who can verify experience with the species (reference letters are always appreciated).

3. We require that all handling of listed wildlife shall be done in an efficient and appropriate manner with no or minimal harm to the individuals being handled. Living specimens shall be handled and transported so as to minimize risk of injury, damage to health, or cruel treatment. Our specific terms and conditions on each permit will ensure this.

4. We require permittees to carry a copy of their permit while conducting authorized activities.

5. In the event that more direct or incidental take than is authorized or exempted occurs, all permitted activities must cease immediately. The Project Leader and the Resident Agent in Charge must be contacted within 24 hours. The Project Leader must give approval before permitted activities may resume. An Injury/Mortality Documentation Report must be submitted to the Project Leader. The report shall include the circumstances that led to the unanticipated take and a description of the changes in methods that will be implemented to reduce the likelihood of such injury or mortality in the future. The incident shall also be discussed in the annual report that is subsequently submitted.

6. We require that any specimen incidentally killed during covered activities will be preserved according to standard museum practices for that species. Within seven days, specimens shall be properly labeled and deposited with a designated repository for that species. Complete collecting data must be submitted with each specimen. The permittee shall supply the repository with a copy of the permit to validate that the species supplied to the museum or other repository was taken pursuant to a permit.

7. Permittees must submit annual reports of activities to the appropriate field office and regional office by February 1 (or the date specified in the permit) each year the permit is in effect. Annual reports provide us with information necessary to evaluate the success of permitted activities. If no activities occurred over the course of a year, that information shall be indicated in the annual report. Otherwise, the annual report should include, but not be limited to:
    a. An introduction section addressing reasons and objectives for taking the species;
    b. A methodology section addressing data collection and analysis procedures;
    c. A results section that contains the following information:
        i. Summary presentations and discussions of important research results;
        ii. Maps and descriptions of locations sampled;
        iii. Results of all sampling efforts;
        iv. Numbers of individuals intentionally and incidentally killed, including dates, locations, and circumstances of take; and,
        v. Other pertinent observations made during sampling or research efforts regarding the status or ecology of the species, including observed or perceived threats to the species in research areas.
    d. Planned future activities for the upcoming year if authorized under the permit; and,

e. A conclusion section that specifically provides recommendations for the recovery of the species.

8. We require that all reports or other documents that include information gathered under the authority of Region 3 and Region 6 section 10(a)(1)(A) permits (e.g., reports prepared by consulting firms or their clients) shall reference the permit number under which the information was gathered. Copies of such documents shall be provided to the field office and regional office upon their completion. Draft documents and other information resulting from work conducted under the authority of each permit shall be submitted to the Service upon request.

9. Permittees shall inform the appropriate field office by verbal or email notification of all new localities of any listed species covered by the permit within seven days of their discovery.

10. Permittees shall obtain the required permits and conduct activities in compliance with all applicable laws and regulations of the State(s), Federal, or tribal agencies upon whose lands work is carried out. Permits do not grant the right of trespass. Such permission must be obtained from private landowners or the land management agency. Permittee and designated members of their staff must carry a copy of this permission and all other associated and required permits at all times while exercising the permit's activities.

11. Species and/or parts of species that are taken remain the property of the U.S. Government. Species listed on permits may not be sold, donated, or transferred without written authorization from the Project Leader.

12. To work with threatened or endangered species after expiration of permits, a request for permit renewal must be received by the Permit Coordinator 30 days prior to the expiration date of the permit year. Meeting this requirement allows continuation of authorized activities until the renewal application is acted upon pursuant to 50 CFR Part 13. If this requirement is not met, the permit becomes invalid on the date of expiration. Any new activities or changes in activities with threatened or endangered species will require that the permit be amended. Permittees are not authorized to conduct any new activities or to change any permitted activities until they have requested and have received a new or an amended permit.

Annual reports of all activities conducted under the authority of permits must be submitted to the **Project Leader and Permit Coordinator** by February 1, annually. Failure to submit annual reports will invalidate the permit. Reports should include complete accounts of all activities conducted under the permit including a discussion of any mortality that occurred. A renewal request will not be processed until the annual reports are received.

Species-Specific Conservation Measures

All activities proposed to be conducted for the Dakota skipper and/or Poweshiek skipperling fall into the categories described above under Description of the Proposed Action. In addition to the general conservation measures described above, recovery permits issued for these butterfly species will contain the following specific measures (any deviation from these measures requires

approval from the Ecological Services Project Leader(s) for the state(s) in which the activities will occur):

1. Capture, pursuit, or harassing of Dakota skippers and/or Poweshiek skipperlings for the purposes of conducting surveys:
   1.1. Before conducting surveys, contact the appropriate Ecological Services (ESFO) Field Office to ensure that survey methods are conducted according to established protocols; if Service-approved protocols are not established, the ESFO will ensure that surveys are conducted according to accepted methodologies and are appropriate for their stated purpose.
   1.2. To the extent practicable, identification of Dakota skippers and Poweshiek skipperlings shall be done in a manner that avoids capture. When capture of an individual is necessary to confirm identification, the following conditions will apply:
      1.2.1. Any Dakota skipper or Poweshiek skipperling captured shall be released as near to the capture site as soon as is practicable;
      1.2.2. The geographic coordinates of all capture and release sites shall be reported to the Service no later than February 1 of the following year.
      1.2.3. Unless otherwise stated in the permit conditions, captured individuals must be released as soon as is practicable to avoid injury and may be held for a maximum of five minutes to facilitate specific identification. Any permit issued for activities that would require longer holding times (e.g., collection of eggs for captive rearing), will include specific limits on holding times.
      1.2.4. Any captured Dakota skippers or Poweshiek skipperlings shall be handled in a manner that minimizes the likelihood of injury.
         1.2.4.1. If captured in a net, all reasonable efforts must be made to allow the butterfly to walk freely inside the net and to avoid direct contact with the butterfly while confirming its specific identity. This may be done, for example, by holding the net upside down and holding the bottom of the net upwards to allow the butterfly to walk up into the net – a pouch may be created in the upside-down net to facilitate close inspection by pinching the net below the butterfly while ensuring its free movement inside the net.
         1.2.4.2. Captured butterflies may also be placed inside plastic jars by carefully coaxing them from the net into the jar. The jar must contain some type of tissue (preferred), paper towel, or soft cloth that the butterfly may stand or walk on while in the jar to facilitate visual inspection.
   1.3. Handling affects the behavior of some butterflies after their release (Mallet et al. 1987, p. 328). Therefore, we are seeking information with respect to the post-release behavior of any Dakota skippers or Poweshiek skipperlings that are captured and released. The behavior of each captured and released butterfly will be noted and reported annually as follows:
      1.3.1. Flew to and perched on herbaceous vegetation, low shrubs, or to out-of-sight location in herbaceous vegetation (e.g., into plant litter or duff layer or into bases of grasses);
      1.3.2. Flew into tall shrubs or trees and out-of-sight;
      1.3.3. Flew away – did not see butterfly perch or fly into vegetation; or,

1.3.4. Post-release behavior unknown.

1.4. If either species is found in a location where it was not been recorded previously or in a location where the species was thought to have been extirpated, contact the Project Leader within 24 hours. For each new location record, take a photograph that shows diagnostic features for the species, if feasible. Only take a photograph if it may be done while avoiding injury to the butterfly.

1.5. A qualified biologist, as specified in the permit, will be present in the field to supervise all survey activities.

1.6. No mutilation (e.g., leg removal) or marking schemes are authorized.

1.7. Any incidental injury (e.g., removal of labial palps or legs during netting) must be described in annual reports.

2. Captive rearing

2.1. Unless otherwise stated in specific permits, Dakota skippers may be captured for collection of eggs to facilitate captive rearing only after at least 25 adults have been observed and recorded within at least one 24-hour period at a site in the year of the egg collection. For example, if at least 25 adults are recorded within a 24-hour period, adults may be captured for egg collection until the end of the flight period in the same year. Eggs may be collected from no more than ten females of the species from any site.

2.2. Unless otherwise stated in specific permits eggs may be collected from no more than ten females from any site each year; no more than 25% of the total Poweshiek skipperlings observed each day may be held for egg collection.

2.3. Neither species may be taken for captive rearing unless that activity is specifically authorized in the permit.

2.4. Each female held for egg collection must be provisioned with nectar, water, and/or an artificial nectar solution.

2.5. Females must be returned to point of capture no later than 72 hours after initial capture. Eggs may only be collected by passively allowing females to oviposit. All eggs laid before release may be retained for captive rearing. During capture and placement into oviposition containers, all effort must be made to avoid handling the butterflies.

2.6. Collection of eggs for captive rearing may occur only at ten sites each year for each species.

3. If any individual dies or suffers an injury that may be lethal (e.g., a puncture or compression injury), the permitted activity must cease until the Service is contacted and has allowed the activity to resume. Initial contact should be the Service Ecological Services Field Office in the state where the death or injury occurred.

4. Collection of voucher specimens may occur only when either species is encountered in a county where it has not been previously recorded. In addition, dead or dying specimens may be collected for voucher specimens regardless of geographic area. The latter may include specimens held in captivity. Specimens held in captive environments that exhibit signs or symptoms of potentially infectious diseases may be killed and disposed of or preserved to prevent spread of diseases to other animals. Upon approval and review by the Service, any individuals accidentally killed or lethally injured may also be collected as voucher specimens. The number, location, cause of death (if known), sex, and any other information relevant to specimens vouchered must be reported to the Service by February 1 of the year following their collection.

5. Designated repositories – the Service is in the process of identifying appropriate repositories in each state for any dead specimens of either species collected by permittees. Until the repositories are identified, contact the ESFO to determine the appropriate repository.

Minimum Qualifications for Surveyors

Dakota skipper and Poweshiek skipperling (target species) – may not be readily identified in the field without specialized training and experience. Therefore, agencies and others who want to determine whether or not these species are present in an area must secure the assistance of individuals who are qualified to carry out scientifically credible surveys.

The Service adapted the following qualifications from criteria developed for a variety of animal surveys by Minnesota Department of Natural Resources (MDNR). Similar to MDNR, FWS will use these qualifications to evaluate individuals, not firms. To meet the minimum qualifications for the target species, individuals must meet the following criteria:

1. Demonstrated ability to complete surveys for target species or similar species and prepare technical reports based on those surveys; and,
2. Previous experience surveying for and identifying target species. Exceptions may be made for persons with prior experience with similar species and/or extensive experience with other butterfly species – e.g., extensive experience conducting surveys for rare butterfly species outside the range of the two target species.

STATUS OF THE DAKOTA SKIPPER AND POWESHIEK SKIPPERLING

Detailed information may be obtained on the Dakota skipper and Poweshiek skipperling, including species descriptions, habitats, and life histories, by accessing the following proposed and final listing rules in the Federal Register: October 24, 2013, 78 FR 63574-63625; October 24, 2014, 79 FR 63672-63748. A summary of each species' life history, ecology, and current status is provided below.

Regulatory Status

The Dakota skipper and Poweshiek skipperling were listed under a single final under the ESA on October 24, 2014; the Dakota skipper is threatened, the Poweshiek skipperling is endangered (79 FR 63672-63748). The proposed rule to list the two species was published October 24, 2013, and critical habitat for each of them was proposed at the same time (78 FR 63574-63625), Critical habitat for both species was designated on October 1, 2015 (FR 80:59248-59384). A special rule was also issued under the authority of section 4(d) of the ESA for the Dakota skipper with the final listing designation (79 FR 63672-63748). The special rule exempted take that occurred on non-federal lands and that was incidental to livestock grazing and associated activities and maintenance of recreational trails.

Species Descriptions/Life Histories

Dakota Skipper

The Dakota skipper is a small to medium-sized butterfly with a wingspan of 2.4–3.2 centimeters (cm) [0.9–1.3 inches (in)] and hooked antennae (Royer and Marrone 1992a, p. 3). Like other Hesperiidae species, Dakota skippers have a faster and more powerful flight than most butterflies because of a thick, well-muscled thorax (Scott 1986, p. 415).

Adult Dakota skippers have variable markings. The dorsal surface of adult male wings ranges in color from tawny-orange to brown and has a prominent mark on the forewing; the ventral surface is dusty yellow-orange (Royer and Marrone 1992a, p. 3). The dorsal surface of adult females is darker brown with diffused tawny orange spots and a few diffused white spots restricted to the margin of the forewing (Fig. 3); the ventral surfaces are dusty gray-brown with a faint white spot band across the middle of the wing (Royer and Marrone 1992a, p. 3). Adult Dakota skippers may be confused with the Ottoe skipper (*H. ottoe*), which is somewhat larger with slightly longer wings (Royer and Marrone 1992a, p. 3). Dakota skipper pupae are reddish-brown, and the larvae are light brown with a black collar and dark brown head (McCabe 1981, p. 181).

Figure 3. Adult male – stigma on upper side of wing not visible in this photo (upper left); adult female (upper right); larva emerging from egg; and, later stage larva. All photos courtesy of Minnesota Zoo except for adult male (upper left).

Eggs are laid on native grasses in early summer, hatching after about 7-20 days. For the majority of its lifespan, the Dakota skipper is in the larval stage. Dakota skipper larvae are light brown with a black collar and dark brown head (Fig. 3). The larvae form shelters of silk and vegetation near the base of native grass species, emerging at night to feed. They grow and molt several times before overwintering in ground-level or subsurface shelters. In the spring, the larvae emerge to resume feeding on native grasses, molt two more times, and then pupate. Finally, they emerge as adults and begin their short flight period (lasting only 2-3 weeks), that may occur from the middle of June through the end of July. During this time they utilize native prairie nectar sources, mate, and the females lay eggs. Adults may fly and reproduce only a few days, up to about 3 weeks, and then die, thus completing their annual life cycle.

The species has low mobility; it may be incapable of moving more than 1 kilometer (km) (0.6 miles). Its short adult life span and single annual flight are factors in this limitation. Concentrated activity areas shift annually in response to local nectar sources and disturbance. If the species is extirpated from a site, that extirpation may be permanent unless its location is near a site that generates a sufficient number of emigrants.

Poweshiek Skipperling

The Poweshiek skipperling is a small, slender-bodied butterfly, with a wingspan similar to the Dakota skipper, generally ranging from 2.3 to 3.0 cm (0.9 to 1.2 in). Like the Dakota skipper, this species spends the majority of its life cycle as a larva. Its upper wing surface is dark brown with a band of orange along the leading edge of the forewing (Fig. 4). Ground color of the lower surface is also dark brown, but the veins of all but the anal third of the hindwing are outlined in hoary white, giving an overall white appearance to the undersurface.

Figure 4. Adult Poweshiek skipperling (left, Minnesota Zoo) and larva in early winter attached to prairie dropseed (*Sporobolus heterolepis*) (right, Susan Borkin, Milwaukee Public Museum).

Poweshiek skipperlings lay their eggs near the tips of leaf blades and the larvae hatch after about nine days. The overall color of the head and body of the larvae is pale grass-green, with a distinctive darker green mid-dorsal stripe and seven cream-colored stripes on each side (Fig. 5). The larvae feed on native prairie grasses, crawling out to the outer, thinner tips of the grasses to

feed, with later movements down and among blades. They have also been reported to feed on sedges and bulrushes. They overwinter as larvae on the host plants, but do not form shelters underground like Dakota skippers; rather they overwinter on the grass blades and stems near the plant base. Poweshiek skipperling larvae undergo at least 7 instars before pupating and emerging as adults. They may range in size from approximately 22 to 25 mm (0.9 to 1 inch) in length just prior to pupation.

Like the Dakota skipper, the adults have a short annual life phase when they reproduce. The flight period is from late June to early July typically; the initiation of the flight period may vary by several days from one year to the next based on prevailing weather conditions. Where the species co-occurred formerly, the flight period of the Poweshiek skipperling overlapped almost complete with that of the Dakota skipper.

Figure 5. Poweshiek skipperling larva – Minnesota Zoo photo.

Habitat Characteristics

Dakota Skipper Habitat Descriptions

'Type A' Habitats

In the United States, Dakota skipper occurs in two general habitat types. The first is a low wet-mesic prairie with little topographic relief that occurs on near-shore glacial lake deposits – Royer et al. (2008, p. 14-16) refer to this as 'Type A' Dakota skipper habitat (Fig. 6). In the United States, 'Type A' Dakota skipper habitat occurs primarily in North Dakota, but it may also

comprise a small amount of the species' habitat in northeastern South Dakota. 'Type A' habitat may be flooded in some years, but has "sufficient relief to provide segments of non-inundated habitat during the spring larval growth period within any single season" (Royer et al. 2008, p. 15; Royer et al. 2014, p. v).

Figure 6. 'Type A' Dakota skipper habitat in McHenry County, North Dakota (Royer et al. 2014). Note the abundant mountain deathcamas (white flowers) and the scattered prairie lilies (orange flowers).

The plant species that are most useful for identifying Dakota skipper 'Type A' habitats vary throughout the growing season (Rigney 2013). During Dakota skipper's flight period in 'Type A' habitats three plant species are almost always present and blooming: prairie lily (*Lilium philadelphicum*), bluebell bellflower (*Campanula rotundifolia*), and mountain deathcamas (smooth camas; *Zigadenus elegans*) – the latter appears to be an especially strong indicator of Dakota skipper 'Type A' habitat in North Dakota (McCabe 1981, p. 190; Royer et al. 2014, p. 1). Later in the season, common forbs in bloom in 'Type A' habitat include Rocky Mountain blazing star (*Liatris ligulistylis*), Canada goldenrod (*Solidago canadensis*), strict blue-eyed grass (*Sisyrinchium montanum*), common goldstar (yellow star grass; *Hypoxis hirsuta*), and blackeyed Susan (*Rudbeckia hirta var. pulcherrima*) (Lenz 1999, p. 6). 'Type A' habitats also contain small patches of dry-mesic prairie inhabited by Dakota skippers. Stiff sunflower (*Helianthus pauciflorus Nutt. ssp. pauciflorus*) and candle anemone (*Anemone cylindrica*) are typical in these dry-mesic habitats; purple coneflower (*Echinacea angustifolia*), an indicator of 'Type B' habitats (see below) may be present, but is rare in these dry-mesic 'inclusions' (Lenz 1999, p. 6-11).

Plants that are important as nectar sources for Dakota skipper 'Type A' habitats appear to vary geographically, but blackeyed Susan is significant throughout the range of this habitat type. In Manitoba most nectaring observed was on blackeyed Susan among 12 species documented as nectar sources (Rigney 2013, p. 59-62; Table 1). McCabe (1981, p. 187) also reported more sightings of nectaring on blackeyed Susan than on any other species in North Dakota 'Type A' habitats. He also reported the use of bluebell bellflower as a nectar source for the Dakota skipper in North Dakota (McCabe 1981, p. 187). Rigney (2013, p. 143) did not report nectaring on bluebell bellflower or prairie lily – two of the three primary indicators of 'Type A' habitat in North Dakota – and she reported only one incidence of nectaring on mountain deathcamas (Table 1). McCabe had earlier reported that "At no stage is the skipper dependent on camas…" (McCabe 1981, p. 190). Habitat value for Dakota skippers may be greater where a variety of species that serve as nectar sources are present because plant species likely vary in their value as nectar sources due to the amount of nectar available during the adult flight period (Dana 1991, p. 48).

Table 1. Plant species reported as nectar sources for Dakota skipper in 'Type A' habitats by Rigney (2013) in Manitoba.

Species	**Common Name**[1]	**No. Nectaring Observations in Manitoba (Rigney 2013, p. 59-62)**	**Nectar Use Reported by McCabe (1981)** in North Dakota?	**Notes**
Rudbeckia hirta	blackeyed Susan	≈112	Yes	
Dalea candida	white prairie clover	7	"Available at most sites, but not used"	
Melilotus officinalis	sweetclover	6	No	Exotic species
Gaillardia aristata	blanketflower	6	Yes	
Lobelia spicata	palespike lobelia	5	No	Described as nectar source for some North Dakota sites by McCabe (1979)
Cirsium flodmanii	Flodman's thistle	3	No	
Crepis runcinata	fiddleleaf hawksbeard	2	No	
Oligoneuron album	prairie goldenrod	2	No	Formerly *Solidago ptarmicoides*; documented in North Dakota 'Type A' habitats (Lenz 1999)
Zigadenus elegans	mountain deathcamas	1	"At no stage is the skipper dependent on camas…" (McCabe 1981, p. 190)	Strong indicator of Dakota skipper' Type A' habitat in North Dakota (McCabe 1981, p. 190)
Dalea purpurea	purple prairie clover	1	No	
Oenothera biennis	common evening primrose	1	No	
Agoseris glauca	pale agoseris	1	No	

Big bluestem (*Andropogon gerardii*) and little bluestem are typically the dominant grasses in North Dakota 'Type A' habitats and indiangrass (*Sorhastrum nutans*) may also be present (Royer et al. 2014, p. 1). Dakota skipper adults are typically encountered in "pre-floral stands" of these grass species where they are associated with the forb species described above and in the following paragraph (Royer et al. 2014, p. 1).

[1] Source for common names and taxonomy – U.S. Department of Agriculture, Natural Resources Conservation Service, PLANTS Database – http://plants.usda.gov/java/.

In northeastern South Dakota, Dakota skippers inhabit primarily 'Type B' habitats with abundant purple coneflower (see below), but have also been observed in wet-mesic prairie that is dominated by big bluestem (Skadsen 1997, p. 4). Where Dakota skipper have been reported from wet-mesic prairie in South Dakota, typical 'Type B' (see below) habitats managed with fall haying were always nearby (Skadsen 2006, p. 2).'Type B' Habitats

'Type B' Habitats

The second Dakota skipper habitat type, referred to as 'Type B' by Royer *et al.* (2008, p. 14), occurs primarily on rolling terrain over gravelly glacial moraine deposits and is dominated by big bluestem, little bluestem, and needle or porcupine grasses (*Hesperostipa spp.*) (Fig. 7). As in 'Type A' habitats, bluebell bellflower and prairie lily are present in 'Type B' habitats, but 'Type B' habitats support more extensive stands of purple coneflower, upright prairie coneflower (*Ratibida columnifera*), and common gaillardia (blanketflower; *Gaillardia aristata*) (Royer et al. 2014, p. 1-2). Each of these is a documented nectar source for the Dakota skipper in 'Type B' habitats (McCabe 1981; Dana 1991). Little bluestem and porcupine grass (*Hesperostipa spartea*) are the predominant grass species in South Dakota 'Type B' habitats, but side oats grama, needle-and-thread grass (*H. comata*), and prairie dropseed are also typical (Skadsen 2006, p. 1-2). In a variant of 'Type B' habitats found in western North Dakota (Fig. 8), western wheatgrass (*Pascopyrum smithii*) is also typical (Royer et al. 2014, p. 1).

Figure 7. 'Type B' Dakota skipper habitats in Minnesota (left) and South Dakota (right). USFWS photos.

Figure 8. Primarily in the foreground, a variant of Dakota skipper 'Type B' habitat in McKenzie County, ND (Royer et al. 2014).

Dakota skipper 'Type B' habitats typically support a high diversity and abundance of native forbs, including purple coneflower, purple prairie clover (*Dalea purpurea*), white prairie clover (*D. candida*), yellow sundrops (*Calylophus serrulatus*), prairie groundsel (*Packera plattensis*), groundplum milkvetch (*Astragalus crassicarpus*), eastern pasqueflower (*Pulsatilla patens*), old man's whiskers (prairie smoke, *Geum triflorum*), western silver aster (*Symphyotrichum sericeum*), dotted blazing star (*Liatris punctata*), tall blazing star (*L. aspera*), meadow zizia (heartleaf golden alexanders; *Zizia aptera*), blanket flower (*Gaillardia sp.),* prairie sagewort (*Artemisia frigida*), and leadplant (*Amorpha canescens*) (Skadsen 2006, p. 1-2). Prairie milkvetch (*Astragalus laxmannii Jacq. var. robustior*) also occurs in 'Type B' habitats in Minnesota (Dana 1997, p. 8).

In the rolling terrain of river valleys and the Missouri Coteau of North Dakota, on the western edge of the species' known range, Dakota skippers inhabit a variant of 'Type B' habitats (Fig. 8). These habitats typically contain an association of little bluestem, big bluestem, and needlegrasses that is often invaded by Kentucky bluegrass (*Poa pratensis*) (Royer and Marrone 1992, p. 22). These prairies, also typically contain prairie lily, bluebell bellflower, coneflowers, and other

asters as nectar sources; in some areas, mountain deathcamas also occurs (Royer and Marrone 1992, p. 22).

Potential Threats and Impacts to Dakota Skipper

Loss of native prairie and the degradation of remaining patches of habitat have led to the decline of Dakota skipper and pose continuing threats to the species' continued existence. Factors responsible for habitat loss and degradation include conversion of native prairie to cropland or for development; ecological succession to habitats dominated by brush or trees; invasive species; flooding; and, grazing, fire, or haying that degrades or destroys the species habitat. In some cases, habitat management that is too intense, widespread, and persistent removes essential habitat features (e.g., nectar plants) and may impede reproduction or cause unsustainable levels of mortality.

Other factors that may have played a role in the decline of the Dakota skipper include adverse impacts of herbicides and, pesticides; and weather patterns, such as drought.

Conservation of the Dakota skipper will rely on effective partnerships between private, tribal, and public landowners who manage the species' habitat and agencies working to recover the species. In the absence of grazing, fire, or haying, Dakota skipper habitat is likely to become too brushy or wooded to support the species (e.g., Rigney 2013, p. 151). Nevertheless, management of Dakota skipper habitat must be implemented carefully to avoid excessive mortality or significant depletion of important nectar and larval food sources. Minimizing adverse effects of management by engaging landowners in conservation is especially important for populations that inhabit small and isolated habitat patches.

Multiple factors require managers to carefully plan and implement habitat management activities to conserve remaining Dakota skipper populations. The litter-dwelling habits of Dakota skipper larvae; the single annual flight period; and, habitat fragmentation all reduce the species' resiliency to the effects of intense management practices. During the vast majority of their annual life cycle Dakota skippers are larvae that occur at the bases of their larval food plants (Fig. 9). Fire is likely to kill some portion of larvae in the burned area and under certain conditions mortality may be high (Dana 1991). Fuel loads, soil temperatures, weather and other factors all likely play a role in the proportion of the larvae that are killed by fire (Dana 1991). Post-fire recovery in the burned area may take years, depending on the proportion of the local population that was killed and the effect of immigration from nearby unburned areas. Immigration may only be effective if a stable or growing population of Dakota skipper is left unburned near the burned area – perhaps less than a kilometer away.

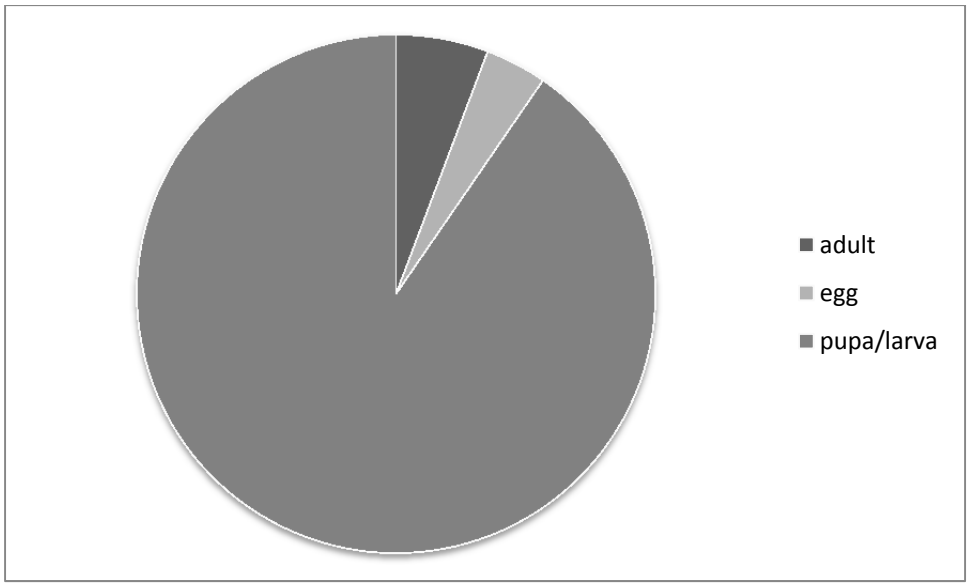

Figure 9. The vast majority of Dakota skipper's life is spent as a larva.

When Dakota skipper larvae metamorphose into adults in late June or early July, habitats must provide nectar sources that are sufficient in quality and quantity to meet the butterflies' water and nutritional requirements. Although brief, the adult flight period is crucial – failure to reproduce during this period may result in the species' local extirpation. Extirpation of Dakota skipper from a habitat patch may be permanent if it is too far from another population. Therefore, it is essential that managers consider the likely impacts on both larvae and adults within the management area when planning and implementing management actions. An initial assessment of the site and its Dakota skipper population conducted by a species expert and frequent reevaluation of the population are essential.

Poweshiek Skipperling Habitat

The full range of habitat preferences for Poweshiek skipperling includes high-quality prairie fens, grassy lake and stream margins, remnant moist meadows, and wet-mesic to dry tallgrass remnant (untilled) prairies. These areas are dominated by native-prairie grasses, such as little bluestem and prairie dropseed, but also contain a high diversity of native forbs, including black-eyed Susan and palespike lobelia. The disjunct populations of Poweshiek skipperling in Michigan occur in prairie fens, specifically in peat domes within larger prairie fen complexes in areas codominated by mat muhly (*Muhlenbergia richardsonis*) and prairie dropseed (D. Cuthrell, Michigan Natural Features Inventory, pers. comm., 2011).

An abundant and diverse selection of larval food plants and the microhabitat conditions where they occur may play a key role in determining the abundance and distribution of the Poweshiek skipperling. The presence of larval food plants in the "optimum growth form" and in the microhabitat preferred by larvae has been found to be a primary factor that determines large fluctuations in the density of non-migratory butterflies (Thomas et al. 2011, p. 241). Poweshiek skipperling larval food plants may include several native species of grasses and members of the sedge family, although the value of species may vary depending on the larval stage. In Wisconsin, Borkin (1996, p. 2) observed Poweshiek skipperling larvae feeding on prairie

dropseed, little bluestem (*Schizachyrium scoparium*), and an unidentified sedge. Most of the Poweshiek skipperling eggs that she observed were on the two grass species. Larval food preferences may vary throughout development. Hairs on little bluestem leaves, for example, impeded feeding of just-hatched Poweshiek skipperling larvae at Minnesota Zoo (Runquist 2012, p. 29). In addition to the identity of the species' larval food plants, the microhabitat preferences of the Poweshiek skipperling are not well understood. Trees and shrubs on the periphery of Poweshiek skipperling habitat in Manitoba, for example, could help to ensure a diversity of larval microclimates, as described for other butterfly species (Thomas et al. 2011, p. 246).

At Tall Grass Prairie Preserve (TGPP) in Manitoba, the occurrence and abundance of Poweshiek skipperlings were greater in sites with higher densities of black-eyed Susan (Bleho and Koper 2013, p. 4), which is cited as a preferred nectar species in both Manitoba and Michigan (Summerville and Clampitt 1999, p. 231; Dupont Morozoff 2013, p. 85). Prairie goldenrod and shrubby cinquefoil (*Dasiphora fruticosa*) were also cited as preferred nectar species in Manitoba and Michigan, respectively. In earlier studies, Poweshiek skipperlings were reported to frequently use palespike lobelia (*Lobelia spicata*) as a nectar plant in both Manitoba and Michigan (Holzman 1972, p. 111; Catling and Lafontaine 1986, p. 65). Although the identity of important nectar species may vary among regions and from year to year within habitats, nectar availability plays an important role in the continued occupancy of habitat by the Poweshiek skipperling.

Topographic diversity seems to be typical of Poweshiek skipperling habitats and may allow persistence of the species during climatic fluctuations by ensuring better survival in low places during drought and in high places in years with high precipitation (Swengel and Swengel 2012, p. 3; 2014b, p. 8). Edaphic conditions could hold an important key to understanding what constitutes good Poweshiek skipperling habitat. At the TGPP in Manitoba, for example, soil organic matter content of 13%-16% was "significantly correlated with greater numbers of skipperlings" (Dupont Morozoff 2013, p. 97).

Proximity to trees is an interesting aspect of Poweshiek skipperling habitat quality documented at TGPP in Manitoba and may not be intuitive for a prairie species. Prairie habitat patches occupied by the species in Manitoba were described as "elongate openings more or less separated by groves of bur oak, aspen, and American hazel" (Catling and Lafontaine 1986, p. 64). Shelter from wind has been shown to benefit some grassland butterflies by allowing them to remain active during windy periods relative to more windswept areas (Rosin et al. 2012, p. 326). Treelines could also facilitate dispersal among habitat patches; may diversity microclimates available as larval habitat; and, may provide protection from pesticide drift (Dover et al. 1997, p. 96; Thomas et al. 2011, p. 246-247). In a meta-analysis of 30 butterfly species, shelter was the factor most likely to influence population sizes or trends (Thomas et al. 2011, p. 241). Hamel et al. (2013, p. 17) cite the "untreed" nature of some areas within the TGPP in Manitoba as a reason why they do not contain prairie habitats occupied by Poweshiek skipperling. The presence of trees on the edge of Poweshiek skipperling habitat appears to increase in importance as the size of the habitat patch increases (Bleho and Koper 2013, p. 3). At TGPP, Poweshiek skipperlings forage on nectar flowers in prairie clearings between treed areas that are "less windy" than unoccupied portions of the preserve, but seldom enter or remain in forested edges.

Status and Distribution

Much overlap occurs in the historic ranges of the Dakota skipper and Poweshiek skipperling via the native prairie habitats that extended over five Midwestern and Great Plains states of the United States (Iowa, Illinois, Minnesota, North Dakota, South Dakota), and Canada (Manitoba). The Poweshiek skipperling was also known from three states where the Dakota skipper was not historically documented - Michigan, Wisconsin, and Indiana – but it was not known from Saskatchewan, Canada, which does have Dakota skipper records.

Today, the Dakota skipper is considered extirpated from Illinois and Iowa, but the species is considered present in Minnesota, North Dakota, South Dakota, Manitoba and Saskatchewan. Only 83 of 264 historic sites (32%) are considered extant today.

Poweshiek Skipperling

The Poweshiek skipperling may only occur at a few sites throughout its range and may now be extirpated from Illinois, Indiana, Iowa, Minnesota, North Dakota, and South Dakota. Remaining populations of the Poweshiek skipperling inhabit a small and isolated native-prairie remnant in Wisconsin; four isolated prairie fens in eastern Michigan; and, a tallgrass prairie and prairie/fen complex in southern Manitoba (Fig. 2).

Michigan

In 2014 and 2015, the Poweshiek skipperling was detected during surveys at only four prairie fen sites in Oakland County, Michigan (Cuthrell et al. 2015, p. 3; Michigan Natural Features Inventory, unpubl. data). Recent surveys have included sites where the species was recorded until recently and sites without prior records for the species that contain suitable habitat. These surveys appear to have confirmed the extirpation of the species at a minimum of eight sites and have failed to detect any new localities for the species.

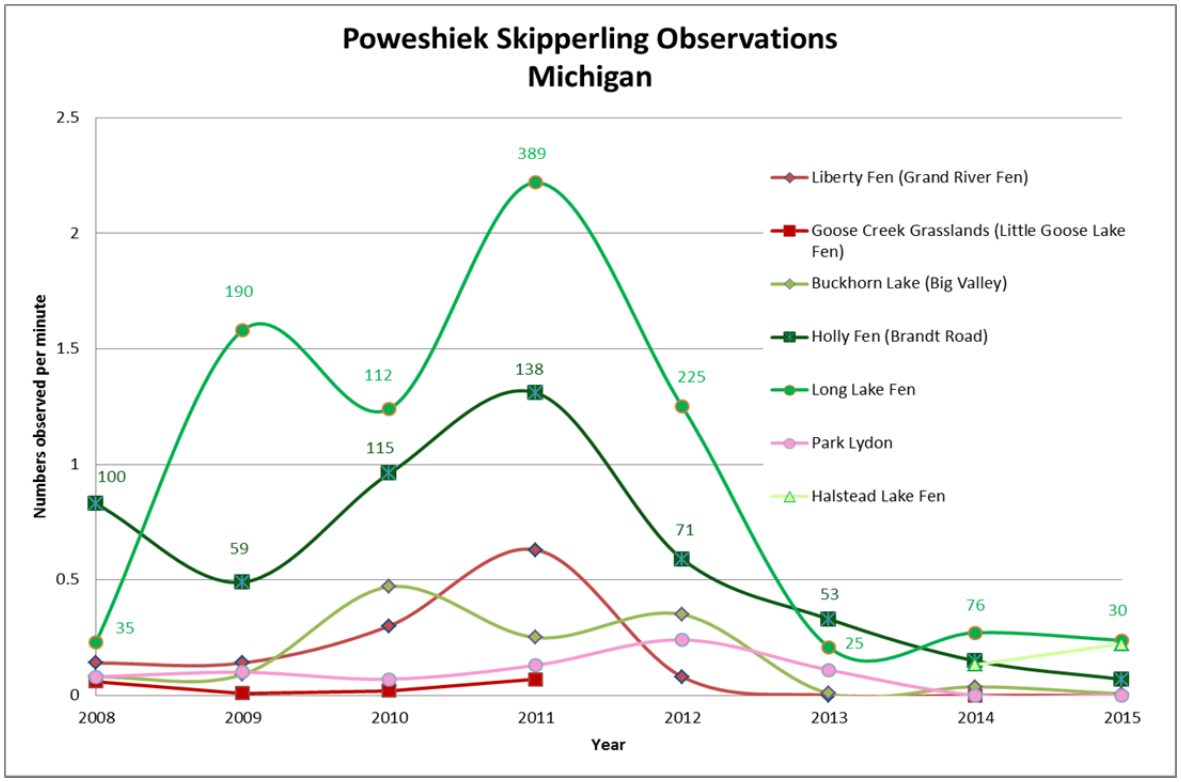

Figure 10. Relative abundance of the Poweshiek skipperling at seven sites in Michigan, 2008-2015, represented by the peak number of observations per minute. The numbers over the data points indicate the high daily count. Sites depicted in shades of green are the four sites where the species occurred in 2015.

Population Viability

Relative abundance of the species at each of the remaining Michigan sites appears to have declined over the last five years and the species appears to face a high risk of extinction in the state (Pogue et al. 2015; Fig. 10).

Wisconsin

Until 2012 the Poweshiek skipperling inhabited at least two sites in Wisconsin – it may now only inhabit Puchyan Prairie, albeit at low numbers (Fig. 11). Scuppernong Prairie in southeast Wisconsin had been the species' relative stronghold in the state, but no Poweshiek skipperlings were found during multiple surveys conducted each year from 2013 through 2015 (S. Borkin, Milwaukee Public Museum, pers. comms. 2013 and 2014; Wisconsin Department of Natural Resources, unpubl. data). Surveys conducted at the nearby Wilton Road and Kettle Moraine Low Prairie have also been negative in recent years (Fig. 11). Surveys in nearby state lands also failed to locate new sites.

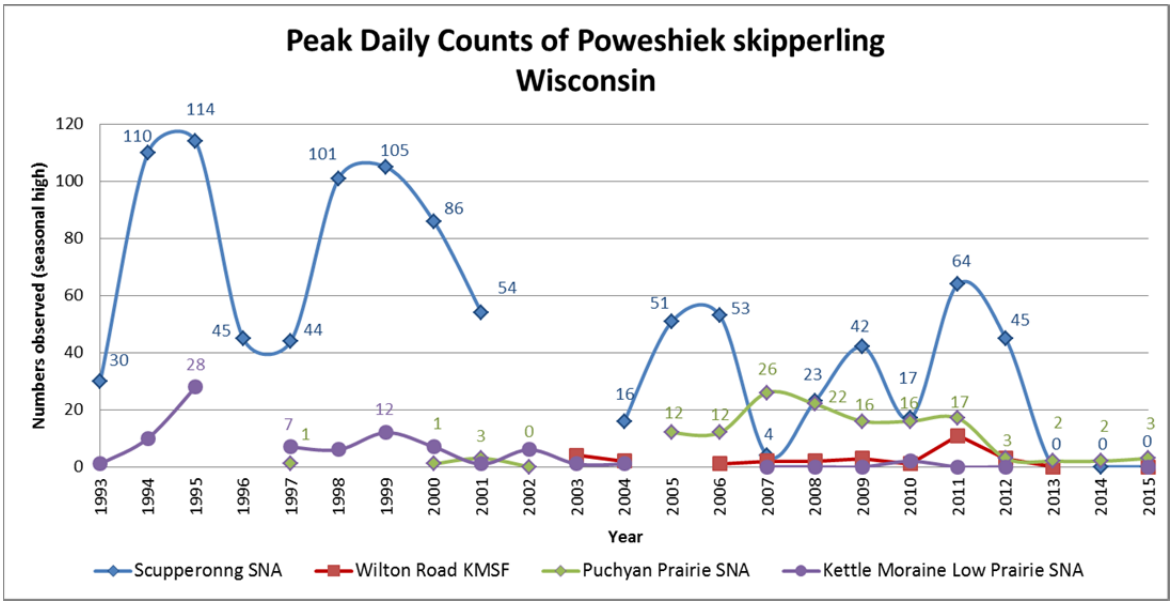

Figure 11. Total annual counts for four Wisconsin populations of the Poweshiek skipperling.

Numbers of the species observed at what appears to be the sole remaining Wisconsin site, Puchyan Prairie, have been low relative to Scuppernong and especially low recently. Poweshiek skipperlings at Puchyan Prairie are known only to inhabit the state preserve, although suitable habitat does occur on private land in the vicinity of the preserve. Surveys on the private land have been negative thus far, but some potential habitat may remain unsurveyed (Bleser 2014, p. 5). In 2012-2015 total counts have ranged from 2-3 despite repeated and intensive surveys during the flight period (Swengel and Swengel 2012, p. 1; Bleser 2014, p. 4; Swengel and Swengel 2014a, p. 1).

The value of Puchyan Prairie to the Poweshiek skipperling may be hindered by its limited topographic diversity. All of the habitat used by the species is wet-mesic and it lacks a significant component of mesic or dry-mesic habitat that might otherwise provide refuge for the Poweshiek skipperling during periods of high precipitation (Swengel and Swengel 2012, p. 4-6).

Manitoba

In Canada the Poweshiek skipperling inhabits a small area of conservation land near Tolstoi and Gardenton in southeastern Manitoba. Occupied habitats are “high quality” or “pristine” prairie that contains key adult and larval food resources and that are bordered by woody vegetation (Hamel et al. 2013, p. 17). The thirteen quarter sections designated as critical habitat for the Poweshiek skipperling by Environment Canada may contain about 99% of the current population in Canada. The species occurs primarily in the ‘south block’ of the Nature Conservancy Canada’s Tall Grass Prairie Preserve (Westwood 2010, p. 2; Environment Canada 2012, p. 3-23; Westwood et al. 2012, p. 1; Hamel et al. 2013, pp. 1 and 4). Fewer numbers of the species also occur about four kilometers away in the preserve’s ‘north block’ (C. Hamel, Nature Conservancy of Canada, pers. comm. 2015). Some habitat in the north block is too wet for the Poweshiek

skipperling, but Hamel et al. (2013, p. 17) also suggested that it may be too "open" and "untreed" relative to habitat occupied by the species in the preserve's south block. Surveys of private lands surrounding the preserve in 2012 and 2015 failed to locate any new populations (Hamel et al. 2013; The Nature Conservancy Canada, unpubl. data).

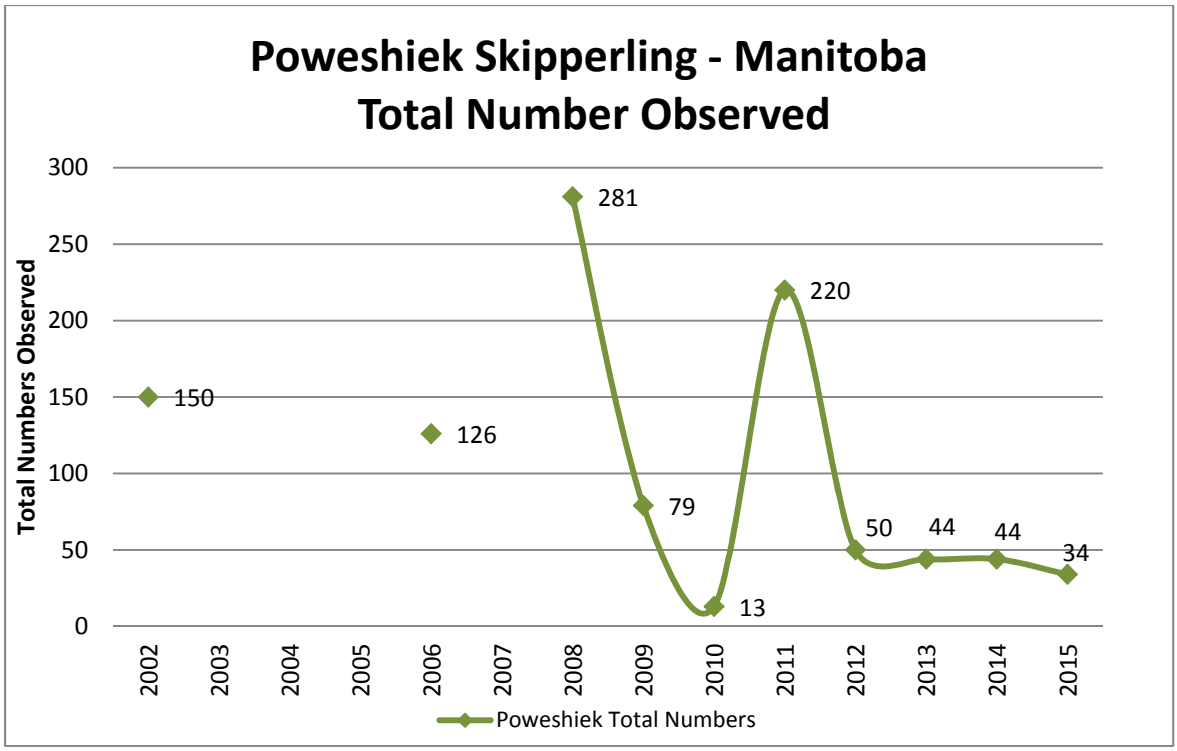

Figure 12. Total number of Poweshiek skipperlings recorded during surveys for the species in Manitoba. Wildfires burned through much of the occupied habitat after the 2009 and 2011 flight periods.

Survey data indicate that the species' abundance has declined and has remained low after unplanned fires in 2009 and 2011 (Fig 12). After the 2009 fire, surveys were expanded in 2011 and the species was detected at 13 of 45 sites surveyed. The species had not been recorded previously at 9 of the 13 survey sites (Dupont 2011, pers. comm.; Westwood et al. 2012, p. 11). Surveys recorded 220 individuals and relative abundance ranged from 10 to 15 per hour, suggesting a recovery from the 2009 fire.

After the 2011 surveys, however, a wildfire "burned extensively into the duff layer" throughout the 'south block' Poweshiek skipperling habitats (Hamel et al. 2013, p. 17). In 2012 only 50 Poweshiek skipperling were detected (Hamel et al. 2013, p. 17). Although indicative of a decline, it indicated that some Poweshiek skipperlings were able to persist and that the population might be poised for a recovery. In 2013 and 2014, however, surveys detected only 44 Poweshiek skipperling each year and only 34 observations were recorded in 2015 (Westwood, pers. comm. 2013; Pearn et al. 2014, p. 1; The Nature Conservancy Canada, unpubl. data).

Survival and Recovery Needs

Poweshiek Skipperling

The Poweshiek skipperling's recovery needs may be broken down into three general categories – 1) maintenance of good habitat conditions in and around occupied patches and the restoration of good habitat where it would benefit the species; 2) identification and protection of populations from threats, such as environmental contaminants, wildfire, climate change, disease, land management that reduces habitat quality or population viability, and certain groundwater manipulations; and, 3) reinforcement and reintroduction of the species through captive rearing.

Population Monitoring

It is essential that the few remaining populations of the Poweshiek skipperling be monitored closely to ensure that land management and other actions are adjusted appropriately; to track population trends and viability; to determine whether populations may sustain removal of eggs for captive rearing; and, to provide data to answer important research questions. Monitoring abundance and distribution of the Poweshiek skipperling is only feasible during the species' flight period. It is needed where the species is known or suspected to be present currently and in areas that hold a high potential for the presence of the Poweshiek skipperling based on habitat models. In Michigan, for example, a habitat model has identified approximately 33 sites that may have significant potential to be inhabited by Poweshiek skipperling.

Restoration and Maintenance of High Quality Habitats

To ensure the persistence of Poweshiek skipperling populations, habitats that are currently occupied by the species must be managed to retain qualities important to the Poweshiek skipperling; moreover, the maintenance and restoration of these characteristics in areas near occupied habitats could allow for expansion from occupied patches. Habitat for the Poweshiek skipperling is undegraded remnant (untilled) prairie and prairie fens that contains larval food plants and abundant nectar plants; and, topographic diversity that includes wet-mesic, mesic, and dry-mesic prairie.

For a description of the species' habitat needs, see **Poweshiek Skipperling Habitat**, above.

Management of Poweshiek skipperling habitat is needed to maintain the basic high quality native prairie conditions on which the species depends. Management is needed to prevent secondary succession to woody habitat types; to control invasive species; and, to ensure sufficient abundance and diversity of nectar plants. Land management activities, including burning and grazing, become threats if they are too extensive, intensive, or frequent (see **Threats Assessment**, above). Control of invasive plants species is required to maintain important qualities of Poweshiek skipperling habitat, but care must be taken to ensure that treatments do not have adverse effects.

Habitat restoration could benefit Poweshiek skipperling populations, but only if the restored habitat was near enough to be reached by butterflies dispersing from occupied habitat or could be reoccupied as a result of captive rearing and if the resulting habitat patch was large enough to sustain a population. At TGPP, Hamel et al. (2013, p. 18) suggested that the Poweshiek skipperling could expand into unoccupied sites if they were burned 'lightly' and if leafy spurge

(*Euphorbia esula*) was removed. Habitat restoration could also benefit Poweshiek skipperling populations by expanding the extent of suitable habitat within patches. Care should be taken, however, to preserve any important shelter provided by existing wooded areas (see discussion in **Restoration and Maintenance of High Quality Habitats**, above). In southern Poland, shelter was only second in importance to patch size of suitable habitat as the primary factors influencing abundance of calcareous grasslands butterflies (Rosin et al. 2012, p. 328).

Research

Completing research focused on several questions related to Poweshiek skipperling habitats and threats are an important component of the species' conservation. The following is adapted from a list developed by Cuthrell et al. (2015, p. 4):

- Determine preferred adult nectar plants, oviposition, and larval host plant species *in situ* for Poweshiek skipperling.
- Determine if neonicotinoids or other pesticides are having an impact on Poweshiek skipperling and if the pesticides have found their way into the species habitats in Michigan fens.
- Compare the flora, abiotic conditions, and surrounding land cover of prairie fens occupied by Poweshiek Skipperling with similar prairie fens not occupied by the species to identify characteristics associated with extant populations.
- Determine what factors influence adult movement and Poweshiek skipperling responses to prairie fen management (burning, herbicide applications to control invasive plants), including what limits dispersal within portions of larger prairie fens.

Captive Rearing

Captive rearing is appropriate for species, including the Poweshiek skipperling, that face an imminent risk of becoming extinct in the wild. To bring the species into captivity, females are captured in the wild and held temporarily in small enclosures to lay eggs on host plants (Runquist 2012, p. 27). The females are then released at the point of capture after about 30 eggs are harvested. The eggs are then reared to a later life stage for release. For the Poweshiek skipperling, rearing in captivity may most likely take place to the late-instar or pupal stage. The 'head-started' pupae would then be placed in or near the release sites (e.g., in enclosures and released when they emerge as adults). Minnesota Zoo was able to rear some Poweshiek skipperlings from eggs to adults in 2012-2013 and 2013-2014, but initial numbers were too low and no mating took place (Runquist 2012;2014).

Dakota Skipper

The Dakota skipper has similar survival and recovery needs, although the species' status is not nearly as dire as that of the Poweshiek skipperling.

Restoration and Maintenance of High Quality Habitats

Recovery of the Dakota skipper will be closely tied to the extent and condition of its native grassland habitat. The species is endemic to North American tallgrass and mixed grass prairie and does not inhabit non-native grasslands, weedy roadsides, tame hayland, or other habitats that are not remnant native prairie. In addition, Dakota skippers have not been recorded in reconstructed prairie – e.g., former cropland that has been replanted to native prairie. Therefore,

conservation of the Dakota skipper is likely to rely on actions by conservation agencies, other state and federal agencies, tribal governments, non-governmental organizations, and private landowners to protect, restore, and maintain high-quality prairie remnants within the species' range (Fig. 1).

The Dakota skipper needs native prairie habitats that are diverse in flowering herbaceous plants and native grasses.[2] Nectar is a critical source of water for adult Dakota skippers during their flight period, which ranges from late June to early or mid-July. Flowering herbaceous plants (forbs) must be present in sufficient quantity and in proximity to suitable larval habitats to provide reliable sources of nectar for adults during their summer flight period.

Larvae rely for growth and survival on mid-height native grasses, such as prairie dropseed (*Sporobolus heterolepis*), little bluestem (*Schizachyrium scoparium*), and sideoats grama (*Bouteloua curtipendula*), which typify the species' habitat along with certain forbs. Some important threats to the species may originate from areas outside of the prairie remnants that they inhabit. Nevertheless, the protection of high-quality remnant prairies that are well distributed throughout the species' range (Fig. 1) will be fundamental to the species' recovery.

Land management actions that affect Dakota skipper habitat will also play a critical role in the species' survival. The intensity, timing, duration, and extent of these activities will all play critical roles in determining the species' persistence within habitat patches. Haying, grazing, and fire are essential management tools to maintain native prairie and the essential features of the Dakota skipper's grassland habitats. Fragmentation of the species' habitat, however, makes it important that these practices are carried out in ways that minimize adverse impacts to early life stages and that facilitate reproduction during the summer flight period.

Research and Captive Rearing

The captive rearing program at Minnesota Zoo is now capable of producing significant numbers of the Dakota skipper ex situ, such that reintroduction of the species may soon be feasible (Runquist 2015). During a workshop facilitated by Conservation Breeding Specialist Group and held at Minnesota Zoo in October 2015, U.S. Fish and Wildlife Service, its partner agencies, and species experts drafted a plan to guide ex situ management of the species. Under that plan, ex situ management would be used to facilitate important research, but could also produce animals for reintroduction. Specifically, the workshop participants set a preliminary goal to restore at least one population in the wild by 2021.

ENVIRONMENTAL BASELINE OF THE ACTION AREA

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Also included in the

[2] For a more thorough description of important features of Dakota skipper habitat, see **Dakota Skipper Habitat Descriptions**, below, and the list of Primary Constituent Elements for the species' proposed critical habitat (**Appendix F).**

environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have already undergone section 7 consultations, and the impacts of state and private actions which are contemporaneous with the consultations in progress.

Conversion of prairie for agriculture may have been the most influential factor in the decline of the Poweshiek skipperling and Dakota skipper since Euro-American settlement, but the impacts of such conversion on extant populations is not well known. By 1994, tallgrass prairie had declined by 99.9 percent in Illinois, Iowa, Indiana, North Dakota, Wisconsin, and Manitoba; and by 99.6 percent in Minnesota; and 85 percent in South Dakota (Samson and Knof 1994, p. 419). Samson and Knof (1994, p. 419) did not provide a figure for the decline of tallgrass prairie in Saskatchewan, but mention an 81.3 percent decline in mixed grasses from historical levels. By 1994, mixed-grass prairie had declined from historical levels by 99.9 percent in Manitoba and 71.9 percent in North Dakota (Samson and Knof 1994, p. 419). Destruction of tallgrass and mixed-grass prairie began in 1830, but significant documentation of the ecosystem's butterfly fauna did not begin until about 1960. Therefore, most of the decline of the Dakota skipper and Poweshiek skipperling probably went unrecorded.

In the final listing rule (79 FR 63672-63748), we identified a number of stressors to the habitat of the Dakota skipper and Poweshiek skipperling that operated in the past, are impacting both species now, and will continue to impact the species in the future. The decline of both species is the result of the long-lasting effects of habitat loss, fragmentation, degradation, and modification from agriculture, development, invasive species, secondary succession, grazing, and haying. Although efforts have been made to effectively manage habitat in some areas, the long-term effects of large-scale and wide-ranging habitat modification, destruction, and curtailment will last into the future. Invasion of the species' habitat by exotic species and woody vegetation, overgrazing, long-lasting or permanent alterations in water levels or hydrology, and too frequent or improperly timed haying remove or significantly reduce the availability of plants that provide nectar for adults and food for larvae. Fire and flooding cause direct mortality or destroy nectar and food plants if the intensity, extent, or timing is not conducive to the species' biology.

Of the 160 Dakota skipper sites for which we evaluated for one or more habitat stressors, at least 131 sites have at least one documented stressor with moderate to high levels of impact to populations – these sites are found across the current range of the species in Minnesota, North Dakota, South Dakota, Manitoba, and Saskatchewan (Service 2012 unpubl. data; Service 2014, unpubl. data). Fifty-eight sites have two or more documented stressors of moderate to high levels of impact to populations and 24 sites have three or more documented stressors of moderate to high level of impact to populations. Sites with three or more stressors are found across most of the current range of the species; these sites occur in Minnesota, North Dakota, South Dakota, and Manitoba (Service 2012 unpubl. data; Service 2014, unpubl. data). Sites with more than one stressor acting on them concurrently may have more intense effects than any one stressor acting independently. Habitat-related stressors occur at sites with Dakota skipper populations within every state and province of occurrence.

In the final listing rule (79 FR 63672-63748) we presented a similar analysis for the Poweshiek skipperling, but the species now is known to occur at only five sites in the U.S. and at two

locations that are near one another in one prairie complex within the Tallgrass Prairie Preserve in Manitoba, Canada. At each U.S. site, populations are small and isolated. Numbers at the primary Manitoba site are also low and the site faces an ongoing threat from wild- or unplanned fire.

A variety of programs and projects have been implemented for many years to conserve the habitats of both species. Since the early 1990s, some actions and efforts have been made to directly benefit the species, but prior to the conservation of the species' habitats were mostly incidental to efforts to protect tallgrass prairie habitats. Our final listing rule contains a detailed description of conservation efforts for each species and is hereby incorporated by reference.

EFFECTS OF THE PROPOSED ACTION

The implementing regulations for section 7 (50 CFR 402.02) define "effects of the action" as "the direct and indirect effects of an action on the species together with the effects of other activities that are interrelated or interdependent with that action, which will be added to the environmental baseline."

Direct and Indirect Effects of the Proposed Action

"Indirect effects" are caused by the proposed action, and are later in time, but still are reasonably certain to occur (50 CFR 402.02). Indirect effects may occur outside of the immediate footprint of the project area, but would occur within the action area as defined. Direct effects are defined as "…the direct or immediate effects of the project on the species or its habitats" (50 CFR 402.02).

Permits issued under section 10(a)(1)(A) allow for actions otherwise prohibited by section 9 of the ESA for scientific purposes or to enhance the propagation or survival of listed species. Although these actions are expected to contribute to the recovery of the species because they are designed to do so, short-term adverse effects are likely to result. Negative effects of any proposed actions will be minimized through implementation of conservation measures and through careful planning. The Service actions being proposed are planned and implemented by professional wildlife biologists familiar with the recovery needs of the species. In addition, all permit actions and permittee qualifications are reviewed by professional Service biologists that have experience with the Dakota skipper or Poweshiek skipperling, as appropriate. In some situations adverse effects result from actions that are necessary for the long term survival of these species. Therefore, given the requirements and issuance criteria for permitting these types of actions, we expect that the action will provide for long-term beneficial effects to the butterflies. The effects associated with the specific activities that are likely to occur under these programs are detailed below.

The proposed conservation measures, designed specifically to promote survival and recovery, as well as scientific research designed to gather critical information necessary to develop recovery goals and criteria, may result in purposeful and/or incidental take of individuals. For example, surveys for the species may include the use of butterfly nets to capture adults during the flight

stage to facilitate identification. Capture of a listed species is prohibited by section 9 of the ESA, but this purposeful take would be permitted through the issuance of the section 10(a)(1)(A) permit. Incidental take could occur, however, as a result of activities that are permitted by 10(a)(1)(A) permits. For example, during the process of capturing and handling either species, an individual may be unintentionally injured. These anticipated effects are described in detail below.

The proposed actions are likely to result in both purposeful and incidental take of the Dakota skipper and Poweshiek skipperling, but we expect them to have a net benefit to the recovery of each species. Surveys may include purposeful take in the form of capture and incidental take in the form of infrequent injury to captured individuals, but are integral to planning and implementing conservation actions and to minimizing adverse effects of development, land management, and other projects. Likewise capture of adults is essential to efforts to conserve the species through captive rearing.

This section assesses the likelihood that adverse effects will occur incidental to the implementation of actions that are implemented with the intent of conserving the species and magnitude of those impacts. We will attempt to describe, based on the best available scientific information, how individuals will respond to stressors that are associated with the proposed actions. We then look at how these individual responses affect the population in which these individuals belong. If population-level effects are anticipated, we analyze the likely effects on the species' survival and recovery.

The analyses below describe how each action is expected to affect the Dakota skipper or Poweshiek skipperling. They identify survival, recovery, and research actions and their associated project elements and the likely responses of individuals exposed to these activities. They also describe the anticipated effects to the affected population and species in terms of reproduction, numbers, and distribution.

Effects of Research & Monitoring Actions

Actions designed to conduct scientific research to gather critical information are necessary to develop recovery goals and criteria and to evaluate when those criteria are met. These actions include, but are not limited to, the following: surveys conducted in areas where the species has been recorded previously or in areas where its presence is suspected; and, research designed to develop inferences with regard to habitat requirements, effects of land management or other potential stressors, or to refine survey methodologies. Surveys and monitoring may be implemented to simply determine whether either species is present in an area or may be carried out to estimate and track trends in the species' relative abundance or density in specific areas. The effects of most of these actions would be limited to short-term disturbance of individuals. However, as stated above, the handling of individuals always poses some risk of injury or death and there may be more subtle effects of capture and handling of individuals, as described below (see **Survey and Monitoring**, below). Precautions will be required to avoid adverse effects, but some individuals may be harmed or killed. These actions are designed to provide critical information necessary to implement the recovery of species. Therefore, the benefits to the population should outweigh the adverse effects to individuals as described in more detail below.

Survey and Monitoring
Some surveys will include pursuit and capture of Dakota skippers or Poweshiek skipperlings with the use of butterfly nets. During surveys, biologists may only net butterflies to confirm specific identification in cases when the presence of the species at a site is especially significant or if it may not be identified otherwise (e.g., when individuals are extremely worn and distinguishing marks are reduce or no longer present). Close-up examination – with or without binoculars – visual confirmation of specific behavioral and diagnostic markings, and photography are typically sufficient to identify both species (Royer and Royer 2012R. Royer, Minot State University, pers. comm. 2015; E. Runquist, Minnesota Zoo, pers. comm. 2015). The need to net to confirm identification increases when similar species are present. Poweshiek skipperling have distinctive markings that reduce the need to net and netting may only occur when capture is essential to activities like captive rearing. Other skippers, such as long dash (*Polites mystic*), however are similar in appearance to Dakota skipper. At sites where they are present netting to confirm identification of Dakota skipper may occur more frequently. Even in those situations, however, only a maximum of about 10% of Dakota skippers that are observed are typically netted (R. Dana, Minnesota Department of Natural Resources, pers. comm. 2015).

Although not common, netting may result in injury. One species expert estimated the incidence of injury as a result of netting for Poweshiek skipperling as about 1% (R. Dana, Minnesota Department of Natural Resources, pers. comm. 2015). Dakota skippers are more aggressive fliers, however, and up to 25% of netted Dakota skippers may experience the loss of one or more labial palps. Loss of a labial palp, which is a sensory organ, does not appear to cause the skippers any obvious immediate problems and some individuals damaged in this manner have been recaptured in apparently good condition up to several days later (R. Dana, pers. comm. 2015). Loss of a leg also occurs on occasion with Dakota skippers as a result of tangling the leg in the net mesh. Dakota skippers are strong enough to break off the entangled leg while attempting to fly away (R. Dana, pers. comm. 2015). The proportion of Dakota skippers that lose legs during netting is unknown.

Most of the netting of Poweshiek skipperlings would result from attempts to capture females for egg collection in support of captive rearing. Due to the distinctive behavior and markings of the Poweshiek skipperling, we expect netting to be rare for surveys. Netting for surveys may only occur where the species has not been recorded or where it has not been observed recently and was thought to be extirpated. Surveys of areas where the species occurred formerly and surveys at sites without prior records for the species have all been negative in recent years. We will assume that one Poweshiek skipperling would be netted at a maximum of four sites per year. The Poweshiek skipperling is a less aggressive flyer than Dakota skipper and is probably less likely to be injured during capture and release. Nevertheless, we will assume that the likelihood of injury is 12.5% per capture – midway between that predicted by one species expert (1%, see above) and that assumed in this biological opinion for the Dakota skipper (25%). Therefore, only one of those four Poweshiek skipperlings may be injured and we would expect this injury to be non-lethal.

Anticipated effects of accidental leg removal on Dakota skippers and Poweshiek skipperlings are uncertain. Leg removal from cabbage whites (*Pieris rapae*) did not significantly affect male or

female mating success, egg production, or the location of egg-laying on leaves (Crawford et al. 2013). The authors cautioned that their study "was sufficiently powerful to detect large and moderate effects of the treatments", but had limited ability to detect small effects. They also pointed out that effects of leg removal could have greater effects on species that have only four functional legs and "in species where females have a strong tendency to oviposit on only one particular side of the leaf." Neither of these are true for the Dakota skipper or the Poweshiek skipperling although it could affect their ability to grasp and hold onto vegetation under windy conditions. Dakota skippers may otherwise seek shelter during periods of high wind by, for example, moving into the plant litter or deeply into plant structures (P. Delphey, U.S. Fish and Wildlife Service, pers. obs.) and Poweshiek skipperling may exhibit similar behavior.

The Conservation Measured listed above (see **DESCRIPTION OF THE PROPOSED ACTION**, above) that will be part included in permits will reduce the likelihood of these kinds of injuries or death. Permits will only be issued for surveys to persons who have significant expertise in butterfly identification and most permittees are likely to have substantial experience with the Dakota skipper, Poweshiek skipperling, or both. This will minimize the number of individuals that will be captured because the expertise of surveyors will allow them to frequently identify the species without handling. Moreover, when handling does occur persons with significant expertise may be more likely to have mastered techniques of capture and release that minimize the likelihood of injury.

Netting may result in changes in the behavior of butterflies after release, but it is unclear whether this would be significant for either species considered here. *Heliconius* butterflies, for example, avoided the specific sites where they were handled, but handling did not cause a complete change of home range or reduced survival of individuals (Mallet et al. 1987). In that study, butterflies were also marked. Mark-recapture techniques to estimate population size and to test hypotheses are useful, but must be used only very cautiously with endangered and threatened butterflies (Murphy 1988) and will not be allowed under the permits considered here. In another study with a conservation priority species in England, most netted individuals did not exhibit any rapid flight ''escape'' reaction on release, suggesting that marking did not substantially interfere with their subsequent behaviour" (Clarke et al. 2011). The following conservation measures are likely to minimize the occurrence of any adverse behavioral responses to netting:

- Only qualified individuals shall be authorized to conduct activities pursuant to any permit.
- Any Dakota skipper or Poweshiek skipperling captured shall be released as near to the capture site as is practicable.
- Unless otherwise stated in the permit conditions (e.g., for captive rearing), captured individuals must be released as soon as is practicable to avoid injury and may be held for a maximum of five minutes to facilitate specific identification.
- No mutilation (e.g., leg removal) or marking schemes are authorized.

In summary for Dakota skipper, we expect that no more than 10% of Dakota skippers observed during surveys would be netted and that, on average 25% of those netted would suffer sub-lethal injuries. In 2014 and 2015, the Dakota skipper was recorded at 37 and 23 sites, respectively. To

ensure that we do not underestimate the potential effects to the Dakota skipper, we will assume that the species will be detected during surveys each year at 60 sites. If, on average, 25 Dakota skippers are observed at each site during surveys, no more than 10% are netted, and 25% of the netted butterflies are injured, then we would expect that each year surveys would result in injuries to about 38 Dakota skippers (Table 2). These injuries are expected to not be lethal and to consist primarily of loss of a labial palp and, in a few cases, the loss of a leg. As stated above, adverse effects as a result of the loss of a labial palp or of a leg in a net are typically not apparent to surveyors. Although we require the reporting of any observed injuries by permittees, we will not require permittees to inspect netted butterflies for injury. This would increase handling time and may further increase the risk for injury. Instead, quick and careful release is most prudent.

Table 2. Summary of anticipated direct indirect effects likely to occur annually as a result of netting either species for captive rearing or during surveys.

Anticipated Direct Effects – Annually	Estimated Number of Individuals Affected Annually	
	Poweshiek Skipperling	Dakota Skipper
No. Netted for Captive Rearing[3]	60	100
No. Netted for Surveys	4[4]	150[5]
Total Individuals Netted	70	250
No. of Sublethal Injuries Due to Netting[6]		
For Captive Rearing	8	25
For Surveys	1	38
Total Sub-Lethal Injuries Due to Netting	9	63
Total Number Collected as Vouchers	1	1

[3] Based on assumptions that 20 Poweshiek skipperlings will be captured per year for captive rearing at each of three sites and that 10 Dakota skippers will be captured at ten sites.
[4] Assumes that one Poweshiek skipperling will be netted at each of four sites per year.
[5] Assumes that 25 Dakota skippers will be detected each year at 60 sites and that 10% will be captured.
[6] Assumes that 12.5% of Poweshiek skipperlings and 25% of Dakota skippers that are captured will be injured.

Based on 2015 survey results, our estimates of the number of Dakota skippers likely to be netted annually for surveys and to suffer injuries is high. In 2015, only 14 Dakota skippers were netted during surveys – far lower than the 150 per year that we anticipate based on our assumptions described above. We had anticipated that 10% of Dakota skippers observed would be netted whereas in 2015 it was about 5%. Surveyors reported no injuries to netted Dakota skippers in 2015 and none of the 26 Dakota skippers that were captured for captive rearing in 2015 were injured before release – one died in captivity, but likely due to old age (Table 4). Therefore, there were zero injuries in 2015 among the 42 Dakota skipper that were captured (Tables 3 and 4). We will wait to adjust our anticipated capture and injury rates until we have three years of data for each species.

Table 3. Summary of 2015 survey results for the Dakota skipper.

No. Locations Surveyed	No. Locations Dakota Skipper Detected	Total Number Dakota Skipper Detections	Total Number Netted for Surveys	Number Injuries	Survey Dates	Dates Dakota Skippers Detected	Source
57	4	32	0	0	28 June – 15 July	30 June-9 July	R. Dana, pers. comm. 2016; Dana (2016)
29	8	93	0	0	24 June – 10 July	26 June-9 July	Skadsen and Backlund (2015)
13	8	29	13	0	2-16 July	3-8 July	Selby (2016)
12	0	0	0	0	1-18 July	n/a	Selby (2015)
8	0	0	0	0	12-17 July	n/a	Dankert & Reiser (2015)
5	1	1	1	0	30 June – 2 July	1 July	Stegeman (2016)
8	5	139	0	0	30June-12 July	30 June-11 July	Runquist (2015)
129	**23**	**294**	**14**	**0**			

Data from 2015 is not conclusive, but does not suggest any significant effects to behavior of Dakota skippers related to netting and release (Table 4). We will continue to compile data on the initial post-release behavior of any Dakota skippers netted and released.

Table 4. Post release behavior of Dakota skippers captured and released in 2015. Surveyors were asked to report post-release behavior as follows: 1) Flew to and perched on herbaceous vegetation, low shrubs, or to out-of-sight location in herbaceous vegetation (e.g., into plant litter or duff layer or into bases of grasses); 2) Flew into tall shrubs or trees and out-of-sight; 3) Flew away – did not see butterfly perch or fly into vegetation; or, 4) Post-release behavior unknown.

Source	Number Netted & Released	Post-Release Behavior					Comments
		Flew to Perch	Flew Into Tall Shrubs or Trees	Flew Away	Did Not Disperse	Unknown	
Stegeman (2016)	1	1	0	0	0	0	
Selby (2016)	13	2	0	11	0	0	Two that flew away first perched on the net and/or a finger.
E. Runquist, pers. comm. 2016	20	7	0	0	13	0	All individuals were released gently from tubes directly onto *Echinacea* in the cool morning hours. Thirteen stayed directly on the *Echinacea* flower to nectar and did not fly away. This non-dispersal behavior is not a category in this table. The remaining 7 flew a short distance (≈10 m) into grass or to another *Echinacea*.
C. Nordmeyer, Minnesota Zoo, pers. comm. 2016	7	0	0	0	3	2	All individuals were released gently from their tubes directly onto *Echinacea*. Three stayed on the *Echinacea* flowers; two flew away to an unknown location; one died before release that was "quite old" when captured, with faded ragged wings and a skinny abdomen. She did not lay any eggs in captivity and likely died of old age, not due to any causes directly related to handling.

Collection of voucher specimens from the wild is likely to have only minimal effects to the species because it will be limited to counties with no prior records for the species. Surveys for

the Dakota skipper and Poweshiek skipperling in counties with no prior records are likely to be minimal. The Service's section 7 guidance, for example, does not recommend surveys for the species except where its habitat is present in counties where it has been recorded previously and where it likely still occurs. Additionally, since habitat for these species is likely contracting, not expanding, documentation of either species outside their currently known ranges may become less likely over time. We anticipate that no more than one voucher will be collected in any single year to document a new county record for either species (Table 2).

Captive Rearing

Both species may be the subject of captive rearing, which is likely to result in some incidental take. For both species, captive rearing will consist of the following steps:

1) capture of adults by net;
2) holding captured females for up to 72 hours for egg collection; and,
3) captive rearing of eggs to late stage larvae; pupal; and/or adult stages for release to reintroduce the species to formerly inhabited areas or to augment existing populations.

Details of the methods used to collect eggs from wild females and to rear them in captivity are likely to vary to some degree, but we expect them to be similar to the efforts conducted recently for the Dakota skipper and the Poweshiek skipperling at the Minnesota Zoo. Each female is placed into a 9-ounce plastic cup for egg-laying and is returned to the capture site after two full days of egg-laying. Females are typically provided with nectar, a sugar solution, or both. Based on the combined data of 25 Dakota skipper females that the Minnesota Zoo captured in 2013 and 2014 under the procedures anticipated to be allowed by the Service, they collected an average of 29.72 eggs/female (standard deviation=12.2; range = 2 to 57; E. Runquist, Minnesota Zoo, pers. comm. 2016). We will allow permittees to hold females for up to 72 hours to ensure that females are released at optimal times during the day, but eggs are likely to be laid while in captivity for about two days. Therefore, we would expect females to lay about 30 eggs each. Additional eggs are likely to be laid by Dakota skippers in captivity as a result of some captive breeding among first generation individuals at Minnesota Zoo. In 2014 and 2015, respectively, adult Dakota skippers reared at the zoo from eggs collected in 2013 and 2014 laid an additional 119 and 1199 eggs, respectively.

We can base our predictions of success for captive rearing of the two species on results to date, but methods to rear larvae of both species are evolving and survival from egg to pupa may change. Egg to pupa survival is one useful metric to assess success of captive rearing, but we should also consider survival to the adult stage. Captive reared individuals face two procedural endpoints – 1) placement *in situ* (e.g., in field enclosures) as late stage larvae, pupae, or adults for release (reintroduction/augmentation); and, 2) death in captivity. Individuals that are not released may reproduce in captivity. The fate of any progeny from captive breeding is unclear at this time, but they could be used to establish insurance populations or they be used to address important research questions.

To help predict the likely fate of eggs collected in the wild, we will review the results of the Minnesota Zoo's efforts thus far. Survival of captive reared Dakota skipper or Poweshiek

skipperling may be measured at four distinct stages: 1) survival from egg to larval diapause; 2) survival of larvae during diapause; 3) survival of larvae from end of diapause to pupation; and, 4) survival from pupal stage to adult (Table 3). In 2014, 50% of the 733 eggs collected in the wild (n=614) or produced by mating at the zoo (n=119) produced larvae that entered diapause (Runquist and Nordmeyer 2014, p. 17; E. Runquist, pers. comm. 2015). Survival was higher among larvae reared with the "tube method" than with the 'free range method' (Runquist and Nordmeyer 2014, p. 16). In 2013-2014, survival during diapause was 33%, but this increased to about 47% in 2014-2015. Differences were again apparent between rearing methods, but for this stage survival among the 'free-range' larvae was higher than those reared with the 'tube method' (94% vs. 36%, E. Runquist, pers. comm. 2014). In 2014, 77% of post-diapause larvae survived to pupation and 95% of pupae survived to emerge as adults. If we assume that survival to diapause and during diapause will approximate what was observed in 2014-2015 and use the 2013-2014 survival for the latter two stages of development, egg to adult survival would be 17% (Table 2).

Table 5. Survival of Dakota skippers during successive life stages at Minnesota Zoo, 2013-2015.

Stage	Estimated Survival	Basis for Estimated Survival (Year/Period)	Cumulative Survival from Egg to End of Stage
Egg to Larval Diapause	50%	2014	50%
Larval Diapause	44%	2014-2015	22%
Diapause to Pupation	77%	2014	18%
Pupation	95%	2014	17%

Although about 83% of the Dakota skippers and Poweshiek skipperlings that are collected may die before reaching adulthood, this level of mortality may be less than what would occur in the wild. A wide variety of factors may kill butterflies during each life stage, including drowning or physical damage as a result of flooding; predation; ungulate herbivory; and, parasitoids (Benrey and Denno 1997; Borkin 2000; Severns et al. 2006, p. 368; Lambert 2011). Survival in the wild from egg to pupation of one rare butterfly was 3% based on a sample of 1,617 eggs (Lambert 2011, p. 110). In studies reviewed by Nail et al. (2015) predicted survival rate of monarchs (*Danaus plexippus*) from egg to adult was ~4.2 to 9%, but this was conservative since the pupal stage was raised in captivity and not exposed to mortality factors.

For the foreseeable future, we anticipate that no more than 3,000 Dakota skipper eggs and 900 Poweshiek skipperling eggs will be collected in any single year. That is, 300 eggs/site from no more than 10 sites for the Dakota skipper; and, 300 eggs/site from up to three sites for the Poweshiek skipperling. If the above mortality rates affect these eggs in a similar manner, this would result in the production of 340 Dakota skipper adults and up to 153 Poweshiek skipperling adults. As many as 1,660 Dakota skippers and 747 Poweshiek skipperlings may die at various developmental stages before release. In contrast, up to 1,940 Dakota skippers and 1,164 Poweshiek skipperlings would die in the wild, based on a 3% survival rate.

The number of eggs removed from any single wild population of Dakota skipper may approach 300, but is likely to be less than 13% of all eggs that would be laid in the population. Female Dakota skippers lay about ten eggs per day and potential fecundity is "probably between 180 and 250 eggs" (Dana 1991). Female Dakota skippers held for a maximum of 72 hours may lay about 30 eggs for use in captive rearing – about 8-11% of each female's potential fecundity. For the Dakota skipper, no females may be captured for egg collection unless at least 25 individuals are found within a 24-hour period. If the maximum of ten females are captured at a site, we assume that there are at least twelve different females that will be observed before any are captured if sex ratios are approximately 1:1. That is, there will be at least 22 females present at any site where egg collection takes place. If expected fecundity is 107 – half of potential fecundity – due to early death and other factors, total fecundity of these 22 females may be 2,354 eggs. If 300 eggs are removed for captive rearing, it would reduce total oviposition in the wild by about 13%. It is likely to be less than 13% because affected populations are likely to include more than 22 females and the number of females captured is likely to be lower than the maximum of ten that would be permitted – in 2014, for example, an average of six female Dakota skippers were captured for egg collection at five sites. Regardless of the total population size, based on an estimated 3% survival from egg to adult in the wild (see above, this section) each population would be reduced by about 9 individuals as a result of the permitted collection of 300 eggs.

We could not find similar information on oviposition rate and potential fecundity for the Poweshiek skipperling, but anticipate that approximately 30 eggs will be collected per female. For purposes of this analysis, we will assume that up to 14% of all eggs that would be laid in each affected population could be used for captive rearing. For Poweshiek skipperling, we assume that 10 females will be captured and used for egg collection at each of three sites/year; if that many are captured and used for egg collection, there would be at least 20 females in each population because only one female will be captured and held for egg collection for every four Poweshiek skipperlings observed. If 30 eggs are collected from each female, up to 300 eggs would be collected per site. Assuming that each female would lay 107 eggs if left in the wild, about 14% of the total eggs in each population could be diverted into the captive rearing program if all of the females in the population are captured. Applying the 17% survivorship assumption (based on Dakota skipper, above) to 300 eggs, 51 individuals would survive captive rearing to adulthood. In contrast, 9 of the 300 eggs would survive into adulthood at any one site if no females are captured for egg collection, based on an estimated survival rate in the wild of 3% (see above, this section). Current plans are to return captive reared pupae or late stage larvae to the sites from which they were collected, so we expect a net increase to each affected population.

Effects of Netting for Captive Rearing

We anticipate sub-lethal injuries to result from netting of each species for captive rearing and that 25% of these will experience sub-lethal injuries (see discussion for the Dakota skipper above, in the section, **Survey and Monitoring**). For captive rearing, attempts to capture female Poweshiek skipperlings are likely to include the capture of an equal number of males because they cannot be sexed reliably before capture. Behavioral differences between the two sexes in the field may lower the number of males captured. Therefore, if ten females are captured per site each year, up to 20 Poweshiek skipperlings of either sex could be captured per site each year. Based on the numbers of Poweshiek skipperlings observed in 2015 and on current plans for

captive rearing, individuals are likely to be captured for captive rearing at three Michigan sites in the foreseeable future: Brandt Road; Long Lake Eagle; and, Long Lake Eaton. If 60 are captured each year – 20 per site – we would expect eight to experience sub-lethal injuries in total (Table 2). This likely represents an overestimate of the number of injuries based on input provided by persons experienced with netting and handling Poweshiek skipperlings in the wild (D. Cuthrell, pers. comm. 2016; C. Nordmeyer, Minnesota Zoo, pers. comm. 2016). For Dakota skipper captive rearing, if up to ten females are captured per site each year at ten sites, we would expect 25 to experience sub-lethal injuries (Table 2).

Effects of Interrelated or Interdependent Actions

The implementing regulations for section 7 define interrelated actions as those that are a part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. No interrelated or interdependent actions have been identified in this consultation.

CUMULATIVE EFFECTS

The implementing regulations for section 7 define cumulative effects to include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Cumulative effects are likely to include primarily the following:

- effects of habitat management intended to maintain or improve habitat conditions for either species, including prescribed fire, grazing, and haying; and,
- land management carried out without the objective of managing habitat of either species – e.g., grazing and haying on private lands;

Other actions, such as conversion of habitat for row crop production, construction or maintenance of highways or pipelines, and pesticide drift may also affect one or more populations. The latter is currently under investigation and the extent of the threat posed by aerial pesticide drift or transport in water from agricultural lands may be better understood as those investigations develop.

CONCLUSION

The regulatory definition of the ESA's phrase "…jeopardize the continued existence of…" is "…to engage in an action that reasonably would be expected directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

The Service has reviewed the current status of the Dakota skipper and Poweshiek skipperling, the environmental baseline for the action area, the effects of the proposed action, and any

cumulative effects. After that review, it is the Service's Biological Opinion that the proposed action to issue a programmatic section 10(a)(1)(A) permit is not likely to jeopardize the Dakota skipper nor the Poweshiek skipperling. We support that conclusion based on the following.

1. Most Dakota skippers or Poweshiek skipperlings captured will be only temporarily harassed. We expect injuries to occur – in the form or loss of a labial palp or a leg – to 38 and 25 Dakota skippers each year when netted for survey and captive rearing purposes, respectively. For the Poweshiek skipperling, these figures are 1 and 8 per year. We do not expect any adult mortality to occur as a result of capture. The extent of capture and likely injury related to survey activities is unlikely to have significant effects on the number or reproduction of either species at any individual site. On average, about one Dakota skipper would be injured at each site where the species is likely to be recorded each year. This is based on the assumption that 25 Dakota skippers would be observed at each site where the species is detected and that 10% would be netted for identification. Injuries are unlikely to be lethal and may not have significant effects on the fitness of the affected individual. Even if effects are lethal, the loss of a single individual per site per year is unlikely to have a detectable effect on the viability of any population. In addition, preliminary data from 2015 suggest that our anticipated annual levels of netting and injuries to Dakota skipper are likely overestimates – especially with regard to injuries. Forty-two Dakota skippers were captured in 2015 and there were no reports of injuries related to capture. We will wait for two additional years of data before adjusting our estimates.

   Where Poweshiek skipperlings may be netted for identification we anticipate that only one would be netted at each site and that a sub-lethal injury is likely to occur to only one per year. Eight Poweshiek skipperlings may suffer sub-lethal injuries as a result of capture for captive rearing purposes. This is also unlikely to have significant effects on reproduction or the likelihood of the species' survival at any site. Based on preliminary 2015 data for the Dakota skipper and the likelihood that Poweshiek skipperlings are less likely to suffer injuries during netting, our anticipated injury rate of 12.5% may be high.

2. Death of Dakota skippers or Poweshiek skipperlings to collect specimens that represent new county records (voucher specimens) is likely to be minimal and limited to no more than one per species per year. The loss of a single individual from any population is not likely to have a detectable effect on that population's likelihood of persistence.

3. Collection of eggs for captive rearing will occur at no more than ten sites for the Dakota skipper and at three sites for the Poweshiek skipperling each year. We expect that survival of captive reared eggs to the late stage larvae or pupal or adult stages will exceed survival in the wild. Temporary removal of eggs to captivity is not likely to result in the reduction in the viability of any population. For the Dakota skipper, we assume that captive rearing will facilitate releases of progeny to sites from which it is apparently extirpated and will help to address important research questions, such as larval food preferences. Based on assumed egg to adult survival rates, we expect the removal of 300 eggs to reduce each affected population by about nine adults. This is unlikely to have a

substantial effect on the population's viability in light of the required conservation measures. We assume that any captive rearing of the Poweshiek skipperling will include only augmentation of the populations from which the eggs are removed. Any decrease in population size due to egg collections would likely be mitigated by release of captive-reared progeny at the site if sound *ex situ* practices are followed.

4. The action is unlikely to cause significant impacts on the reproduction or numbers of the species at any individual site and on the species' distribution. Therefore, this action is not likely to result in the appreciable reduction in the probability of survival and recovery of the Dakota skipper or Poweshiek skipperling.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service as "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering." Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement. The measures described below are non-discretionary, and must be undertaken by the Forest so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply.

Amount or Extent of Take Anticipated

Incidental take in the form of harm (non-lethal) is expected to occur to the Dakota skipper and Poweshiek skipperling through netting and associated handling. As stated above, we expect non-lethal injuries to occur to no more than 63 Dakota skippers and 9 Poweshiek skipperlings in any single year. No more than 1,660 and 747 Dakota skippers and Poweshiek skipperlings are likely to die during captive rearing each year, respectively.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Dakota skipper or Poweshiek skipperling across their ranges. This level of incidental take in the form of death is likely to be less than mortality rates expected to occur in the wild. In addition, we expect the collection of no more than one voucher specimen of either species from the wild each year. Collection of a

single voucher specimen per year is unlikely to affect the likelihood of survival of any population.

Reasonable and Prudent Measures

Due to the nature of the proposed action – the issuance of section 10(a)(1)(A) recovery permits – we have no reasonable and prudent measures or terms and conditions in addition to those incorporated into the action, primarily as Conservation Measures. These Conservation Measures will be incorporated, as appropriate, into each permit to reduce the likelihood of incidental take.

Reporting and Monitoring Requirements

The implementing regulations for incidental take require that Federal agencies must report the progress of the action and its impact on the species (50 CFR 402.14(i)). To meet this mandate, the Service will annually review the extent of intentional and incidental take of listed species in Region 3 and Region 6 that occurs in conjunction with the issuance of section 10(a)(1)(A) permits to ensure that the level of take anticipated in this biological opinion is not being exceeded.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery programs, or to develop new information on listed species.

The Service has identified no additional conservation recommendations to apply to the proposed actions at this time.

REINITIATION-CLOSING STATEMENT

This concludes formal consultation on the Service's proposal to issue section 10(a)(1)(A) permits for the Dakota skipper and Poweshiek skipperling IN REGIONS 3 AND 6. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

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