



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2016 Work Plan

Date of Report: May 29, 2016

Date of Next Status Update Report: November 30, 2016

Date of Work Plan Approval: June 7, 2016

Project Completion Date: June 30, 2019

Does this submission include an amendment request?

PROJECT TITLE: Prairie Butterfly Conservation, Research, and Breeding – Phase II

Part 2 (Activities 3 and 4) of the project is described in a separate work plan with an appropriation of \$329,000 to the Minnesota DNR

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Location:

Dakota, Cottonwood, Murray, Pipestone, Lincoln, Chippewa, Big Stone, Pope, Clay, Norman, Polk, Kittson, Roseau, and potentially other counties in western and southern Minnesota with prairies.

Total ENRTF Project Budget:	ENRTF Appropriation:	\$421,000
	Amount Spent:	\$0
	Balance:	\$421,000

Legal Citation: M.L. 2016, Chp. 186, Sec. 2, Subd. 03c1

Appropriation Language:

\$750,000 the second year is from the trust fund. Of this amount, \$421,000 is to the Minnesota Zoological Garden and \$329,000 is to the commissioner of natural resources in collaboration with the United States Fish and Wildlife Service to continue efforts to prevent the extinction of imperiled native Minnesota butterfly species through breeding, research, field surveys, and potential reintroduction. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Prairie Butterfly Conservation, Research and Breeding - Phase 2

II. PROJECT STATEMENT:

Prairies and their native wildlife are an important part of Minnesota’s natural and cultural heritage. But with only 1% of that native prairie remaining, many prairie plant and animal species—including many species of once prevalent native butterflies—have dramatically declined. Ten of Minnesota’s prairie butterflies are of statewide conservation concern and two, the Poweshiek skipperling (*Oarisma poweshiek*) and Dakota skipper (*Hesperia dacotae*), are listed as Endangered and Threatened Species under the U.S. Endangered Species Act. Both have disappeared from the majority of their historic ranges (96+% for Poweshiek, 76+% for Dakota) in recent decades. Dakota skippers may only remain in one or two Minnesota locations. The Poweshiek skipperling was once one of the most abundant butterflies on Minnesota’s prairies, but has not been confirmed in Minnesota since 2008. It has also disappeared in North Dakota, South Dakota and Iowa between 2001 and 2008. Intensive surveys across the remaining isolated known populations in Michigan, Wisconsin, and Manitoba indicate that fewer than 500 Poweshiek skipperlings likely remain globally.

In partnership with the US Fish and Wildlife Service and the Minnesota Department of Natural Resources, the Minnesota Zoo’s Prairie Butterfly Conservation Program is establishing the world’s first and only conservation breeding populations for endangered, threatened, and imperiled Minnesota-native prairie butterflies. We utilize the recognized organizational capacity and experience of the Minnesota Zoo for the conservation of endangered species.

Currently largely supported by a M.L. 2014 ENRTF (M.L. 2014, Chp. 226, Sec. 2, Subd. 05j-1), this new ENTRF Project 009-A will provide the resources necessary to continue and expand the Minnesota Zoo’s Prairie Butterfly Conservation Program. Based on the recommendations from an independent working group, the Minnesota Zoo has been tasked with beginning the world’s first wild population supplementations and reintroductions of endangered Poweshiek skipperlings and Dakota skippers. It will also allow the Minnesota Zoo to continue to research on the risk to these endangered butterflies of potential exposure to widely applied agricultural pesticides.

The Minnesota Zoo is collaborating with the Minnesota Department of Natural Resources (DNR) for this joint ENTRF. Described in a separate Work Plan, the DNR will simultaneously monitor the status of these and a number of additional targeted butterfly species on native prairie remnants across Minnesota and will work to train new surveys to help alleviate a severe shortage of qualified observers. This joint work will provide needed information of status of not only Minnesota’s native prairie butterflies, but also the greater prairie ecosystem, and steps that may be needed to further their conservation. Beyond serving as pollinators for various prairie plants and as food sources for other prairie wildlife, butterflies are sensitive “canary in the coalmine” indicators of prairie ecosystem health. The disappearance of these historically widespread Minnesota prairie butterflies is noteworthy and troubling.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of November 30, 2016:

Project Status as of May 31, 2017:

Project Status as of November 30, 2017:

Project Status as of May 31, 2018:

Project Status as of November 30, 2018:

Project Status as of May 31, 2019:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Breeding and potential reintroduction of endangered butterflies

Description:

In October 2015, the US Fish and Wildlife Service commissioned the Conservation Breeding Specialist Group (a branch of the International Union for the Conservation of Nature) to conduct an *ex situ* assessment and conservation planning workshop for the U.S.-listed Poweshiek skipperling and Dakota skipper. The workshop brought together experts from across the global ranges of these Minnesota endangered butterflies. Workshop attendees reached a consensus to continue and expand the Minnesota Zoo’s *ex situ* programs with these species. Attendees recommended the initiation of the world’s first wild reintroduction program of Dakota skippers using individuals that are reared and/or “headstarted” at the Minnesota Zoo. This reintroduction program will likely be fully implemented in the summer of 2017, but smaller efforts may begin in 2016 depending on site selection and availability of individuals. It was also recommended that the Minnesota Zoo initiate a new formal headstarting program with critically endangered Poweshiek skipperlings beginning in 2016 to help support the last relatively reliable populations in the United States in Michigan and reduce the risk of global extinction.

Continued funding from ENTRF will provide personnel and material support for expansion of our operations to conduct these recommended *ex situ* actions. It will also allow us to advance research on a variety of methodological approaches to optimize breeding success and minimize mortality. Among the remaining questions we are interested in addressing include the effects of different larval hostplants on growth rates and survivorship, temperature tolerances for winter hibernation survival, and, the optimizing the conditions that provide the greatest success for mating. Our ability to perform some of these tests with the endangered species is contingent on having large populations, and adaptive rearing techniques may take priority over experimental arrays in the short-term to maximize survivorship. We will also use non-endangered surrogate species closely related to the listed species to explore many of these questions. Note that the entire personnel (wage and benefits) budget for the entire program is grouped under this Activity for simplicity. In reality, personnel supported by this ENTRF will be working on some or all Minnesota Zoo Activities, but these percentages will vary proportionately within and across years.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 386,000
Amount Spent: \$ 0
Balance: \$ 386,000

Outcome	Completion Date
1. Collect first set of Poweshiek skipperling larvae and headstart them at the Zoo; collect additional Dakota skipper larvae as needed and rear them at the Zoo	July 2016
2. Conduct first set of population supplementations of Poweshiek skipperlings	June 2017
3. Conduct first summer of reintroductions of Dakota skippers	June 2017
4. Collect second set of Poweshiek skipperling larvae and headstart them at the Zoo; collect additional Dakota skipper larvae as needed and rear them at the Zoo	July 2017
5. Conduct second set of population supplementations of Poweshiek skipperlings	June 2018
6. Conduct second summer of reintroductions of Dakota skippers	June 2018
7. Collect third set of Poweshiek skipperling larvae and headstart them at the Zoo; collect additional Dakota skipper larvae as needed and rear them at the Zoo	July 2018
8. Conduct third set of population supplementations of Poweshiek skipperlings	June 2019
9. Conduct third summer of reintroductions of Dakota skippers	June 2019

Project Status as of November 30, 2016:

Project Status as of May 31, 2017:

Project Status as of November 30, 2017:

Project Status as of May 31, 2018:

Project Status as of November 30, 2018:

Project Status as of May 31, 2019:

Overall Project Outcomes and Results:

ACTIVITY 2: Pesticides Research – Phase 2

Description:

The historically vast tallgrass prairies of the Upper Midwest have been dramatically reduced and fragmented, with the vast majority of the historic acreage now converted to intensive row crop agriculture. The close proximity of agricultural lands to prairie remnants that formerly or may still retain populations of threatened and endangered prairie butterflies presents the possibility that drift from agricultural pesticide applications near prairie fragments may have indirect effects on these imperiled and other prairie species. Since 2014, the Minnesota Zoo has used support from the ENRTF (and leveraged that support for matching US Fish and Wildlife Service funds) to begin assessing the degree of pesticides drift onto three prairies in Minnesota and one in South Dakota. These four prairies are designated as critical habitat for the Poweshiek skipperling and Dakota skipper by the U.S. Fish and Wildlife Service. As described in semi-annual updates for the Minnesota Zoo’s M.L. 2014 ENRTF support, we have documented the presence of several insecticides along the edges (within 10 m) and within the interiors (>100 m away from an agricultural edge) of these prairies. These insecticides (primarily chlorpyrifos, cyhalothrin, and bifenthrin) are primarily associated with applications for the control of invasive soybean aphids.

Building on our current research, the Zoo will continue to collect field samples for pesticides screening from native prairie remnants, especially those designated as critical habitat for Poweshiek skipperling and Dakota skippers and/or those sites where reintroductions may occur. Final site selection and sampling regime will be coordinated with the US Fish and Wildlife Service and other relevant parties. Based on current cost structures and depending on the scope of analyses, the current budget would allow for testing of about 75-200 more samples.

Grass skippers spend the majority of their lives as caterpillars, and aerial insecticide spraying against soybean aphids usually occurs in mid-August during the first 1-2 months of a caterpillar’s life. However, the consequences of exposure to aerial sprays of insecticides against soybean aphids on butterflies is generally unknown, and is completely unknown for prairie grass skippers like Poweshiek skipperling and Dakota skipper. Dakota skipper larvae construct shelters at the bases of their host grasses, but Poweshiek skipperling larvae do not and may be more exposed to aerial drift. Our field sampling research will be paired with experimental tests on the effects of these soybean aphid insecticides on the survivorship and growth rates of grass skipper butterfly caterpillars, pupae and adults. We will perform the experimental tests using non-endangered surrogate species of related grass skippers that are similar in terms of their natural history and ecological associations to mitigate the cost of conducting these experiments with endangered species. No experiments on the effects of these pesticides on small butterflies like these skippers have been conducted to date.

Depending on the availability of planned future facilities at the University of Minnesota, we plan to expose young larvae and the plants that they feed on to aerial applications of these compounds. The formal experimental design and the needed resources will be determined in 2016 pending further discussions with all relevant parties.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 35,000

Amount Spent: \$ 0

Balance: \$ 35,000

Outcome	Completion Date
2. Complete field sampling of prairie remnants for pesticides	September 2018
3. Complete pesticides exposure experiments	June 2019

Project Status as of November 30, 2016:

Project Status as of May 31, 2017:

Project Status as of November 30, 2017:

Project Status as of May 31, 2018:

Project Status as of November 30, 2018:

Project Status as of May 31, 2019:

Overall Project Outcomes and Results:

V. DISSEMINATION:

Description:

The activities and results of the Minnesota Zoo's husbandry, reintroduction, population supplementation, and research operations will be shared with all named partners through annual reports. The outcomes of the pesticides research will be submitted for publication in independent peer-reviewed scientific journals. Findings will also be communicated through the Minnesota Zoo's marketing and education departments as much as possible, including on the Zoo's webpage (mnzoo.org), as well as presentations by the Project Manager to the public and other interested parties. Zoo staff, interns, and volunteers will also be trained to talk about the program, prairie butterflies, and the importance of prairies to the public.

Project Status as of November 30, 2016:

Project Status as of May 31, 2017:

Project Status as of November 30, 2017:

Project Status as of May 31, 2018:

Project Status as of November 30, 2018:

Project Status as of May 31, 2019:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 350,000	1 State Program Administrator Principal at 100% FTE for 2 years; 1 Project Analyst/Specialist at 100% FTE for 2 years and

		35% FTE for 1 year; 1 Temporary Student Worker at 25% FTE for 2 years
Professional/Technical/Service Contracts:	\$30,000	1 contract (RFP) pesticide residue testing
Equipment/Tools/Supplies:	\$29,000	Supplies needed to support butterfly rearing and breeding operations as well as pesticides research, including tables, rearing cages, butterfly nets, collecting supplies, plants, and laboratory supplies
Travel Expenses in MN:	\$5,000	Mileage, lodging, meals for travel to and between prairie sites for data collection and breeding operations
Other:	\$7,000	Travel expenses outside of MN. Mileage, lodging, meals for travel to and between prairie sites to obtain individuals for the Zoo conservation breeding program. All known viable populations of the Minnesota-native endangered butterflies are now outside of Minnesota in Wisconsin, Michigan, North Dakota, South Dakota, and Manitoba, necessitating out of state travel to obtain founder stock.
TOTAL ENRTF BUDGET:		\$421,000

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 4.842

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 0

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
Minnesota Zoo Foundation	\$25,000	\$ 0	Private funds to support the Prairie Butterfly Conservation Program. Support extra supplies and travel to non-State or Federally-supported events.
US Fish and Wildlife Service	\$72,128	\$15,368	Two separate" CFDA Endangered Species – Candidate Conservation Action Fund Cooperative Agreements" have been issued to support the Minnesota Zoo's Prairie Butterfly Conservation Program in 2014 and 2015. These provide funding for facilities expansion for Poweshiek skipperling operations and a limited number of associated supplies, current

			pesticides research, personnel costs for unsupported Outside of Minnesota work, and support to host the Conservation Breeding Specialist Group <i>ex situ</i> planning workshop.
Association of Zoos and Aquariums Conservation Grants Fund	\$22,467	\$ 0	Competitive grant to the Minnesota Zoo in 2015 to provide needed facilities expansion for Dakota skipper and a limited number of associated supplies associated with a larval hostplant performance experiment.
State			
ENRTF (ML 2014)	\$380,000	\$184,175	Portions of the FY17 personnel budget are beginning supported by the existing ENRTF granted to the Minnesota Zoo in 2014.
Legacy Clean Water Arts and Cultural Heritage Fund, grant to MN Zoo for FY17	\$37,200	\$ 0	Supports unfunded 62.4% of existing Project Analyst/Specialist salary and benefits.
TOTAL OTHER FUNDS:	\$ 536,795	\$ 199,543	

VII. PROJECT STRATEGY:

A. Project Partners:

Beyond the Minnesota Zoo and DNR partnership, we are also partnering with the numerous agencies and organizations. None will receive funding from this partnership:

- U.S. Fish and Wildlife Service: Permitting under the US Endangered Species Act; access to federal lands
- U.S. Department of Agriculture: Permitting to allow the movement of live insects between states and internationally
- Provincial government of Manitoba: Permitting under the Species at Risk Act
- Sisseton Wahpeton Oyate: Permitting under tribal endangered species provisions, access to tribal lands
- Michigan DNR: Permitting under the state's endangered species provisions; access to state lands, assistance in collections of individuals for breeding
- Wisconsin DNR: Permitting under the state's endangered species provisions; access to state lands
- The Nature Conservancy: Access to prairie preserves
- The Nature Conservancy of Canada: Access to prairie preserves
- University of Minnesota: Collaborative pesticides-associated mortality research
- New College of Florida: Collaborative conservation genetics research

B. Project Impact and Long-term Strategy:

The Minnesota Zoo's Prairie Butterfly Conservation Program and the Minnesota DNR's survey and monitoring program are complimentary and integrative. Extensive survey efforts for Poweshiek skipperlings and Dakota skippers have pointed to steep recent declines in both species, to the point that the Poweshiek skipperling may now be extinct in Minnesota and the Dakota skipper may be close to meeting the same fate. Surveys in other states in these skippers' ranges are yielding similar results. There are troubling indications of declines in other Minnesota-native prairie species as well.

This project will provide the necessary support to allow the Minnesota Zoo to initiate the world's first and only reintroduction and population supplementation efforts for Minnesota endangered Dakota skippers and Poweshiek skipperlings and to reduce their risk of extinction in Minnesota and globally. The complementary monitoring efforts by the Minnesota DNR of individual populations, including those sites in Minnesota where

reintroductions may occur, will provide the foundation for a higher-resolution tracking of population trends and reintroduction success.

The wild reintroductions and population supplementation programs and the wild population monitoring programs are both long-term commitments, and this ENTRF project will constitute only the beginning for them. We intend for our work to develop husbandry, reintroduction, and monitoring protocols that will be used long-term. We will be working on strategies for funding the work in the long-term.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
Environment and Natural Resources Trust Fund - M.L. 2014, Chp. 226, Sec. 2, Subd. 05j-1: Appropriation of cash funds to support the Zoo’s Prairie Butterfly Conservation Program operations and experiments	FY15-FY17	\$ 380,000
Legacy Clean Water Arts and Cultural Heritage Fund: Appropriation of cash to MN Zoo to support all operations and staff of the Prairie Butterfly Conservation Program since its inception.	February 2012-November 2015	\$ 349,000
US Fish and Wildlife Service CFDA Endangered Species – Candidate Conservation Action Fund Cooperative Agreements: Two separate cash grants have been issued to support the Minnesota Zoo’s Prairie Butterfly Conservation Program. These provide funding for facilities expansion for Poweshiek skipperling operations and a limited number of associated supplies, current pesticides research, personnel costs for unsupported Outside of Minnesota work, and support to host the Conservation Breeding Specialist Group <i>ex situ</i> planning workshop.	FY15-FY17	\$ 72,128
In-kind donations, managed by the Minnesota Zoo Foundation	FY14-FY16	\$ 34,385
Association of Zoos and Aquarium Conservation Grants Fund – grant of cash funds to build Dakota skipper rearing facilities and conduct hostplant experiment.	October 2015-September 2016	\$ 22,467
		\$ 857,980

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS: N/A

IX. VISUAL COMPONENT or MAP(S): See attached graphic of Minnesota’s imperiled prairie butterflies, the history of Dakota skipper and Poweshiek skipperling observations in Minnesota, and sites to be surveyed for prairie butterflies by MN DNR.

X. RESEARCH ADDENDUM: N/A, per communication with LCCMR staff

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than November 30, 2016; May 31, 2017; November 30, 2017; May 31, 2018, November 30, 2018, and May 31, 2019. A final report and associated products will be submitted between June 30 and August 15, 2019.

**Environment and Natural Resources Trust Fund
M.L. 2016 Project Budget**



Project Title: Prairie Butterfly Conservation, Research, and Breeding – Phase II

Legal Citation: M.L. 2016, Chp. 186, Chp. 2, Sec. 2, Subd. 03c1

Project Manager: Dr. Erik Runquist

Organization: Minnesota Zoo

M.L. 2016 ENRTF Appropriation: \$ 421,000 to the Minnesota Zoo

Project Length and Completion Date: 3 years, June 30, 2019

Date of Report: May 29, 2016

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Zoo Breeding, Headstarting, and Reintroduction Program		Pesticides Research - Phase 2					
Personnel (Wages and Benefits)	\$350,000	\$0	\$350,000				\$350,000	
Butterfly Conservation Biologist Erik Runquist (State Program Administrator Principal at 100%, salary & benefits for FY18 & FY19 - \$180,000).								
Butterfly Conservation Specialist Cale Nordmeyer (Project Analyst/Specialist at 34.2% salary and benefits FY17 and 100% salary & benefits for FY18 and FY19 - \$153,800).								
Seasonal Temporary Student Worker (1 unclassified at 100% time for 6 months total during FY18 and FY19 - \$16,200)								
Professional/Technical/Service Contracts								
Pesticides residue analysis contract. Contractor and actual amount subject to RFP, but the USDA National Sciences Lab was selected in the Zoo's first ENRTF and is likely to be used again. Current rates are \$176-\$396/sample, depending on analysis.				\$30,000	\$0	\$30,000	\$30,000	
Equipment/Tools/Supplies								
Breeding program supplies: butterfly plants, rearing cages, tables, collecting supplies	\$ 24,000	\$0	\$24,000				\$24,000	
Pesticides research supplies: plants, chemicals, and space rental at the University of Minnesota or other facilities.				\$5,000	\$0	\$5,000	\$5,000	
Travel expenses in Minnesota								

Mileage, lodging, meals for travel to and between prairie sites for data collection and husbandry/reintroduction operations	\$5,000	\$0	\$5,000				\$5,000	
Other								
Zoo Travel expenses outside of MN. Mileage, lodging, meals for travel to and between prairie sites to obtain individuals for the Zoo conservation program and to conduct wild supplementations/reintroductions. All known viable populations of the Minnesota-native endangered butterflies are now outside of Minnesota in Wisconsin, Michigan, North Dakota, South Dakota, and Manitoba, necessitating out of state.	\$7,000	\$0	\$7,000				\$7,000	
COLUMN TOTAL	\$386,000	\$0	\$386,000	\$35,000	\$0	\$35,000	\$421,000	\$421,000

Minnesota's imperiled prairie butterflies

Poweshiek skipperling

Dakota skipper

Ottoë skipper

Uncas skipper

Assiniboia skipper

Garita skipperling

Uhler's arctic

Arogos skipper

Leonard's skipper

Regal fritillary

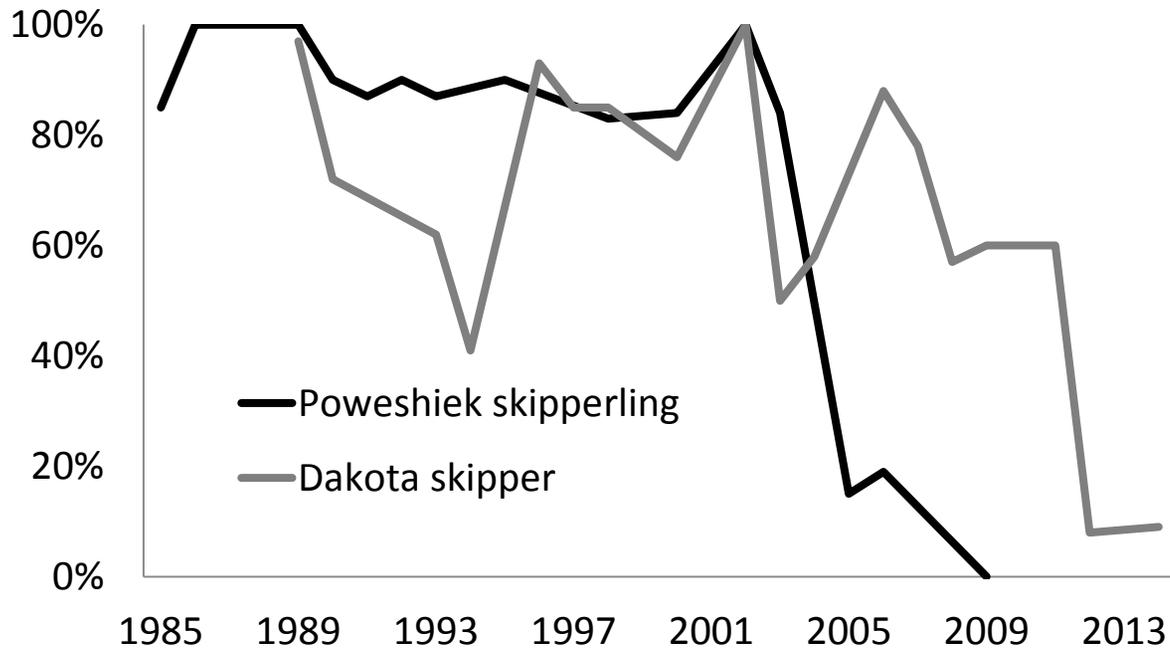
US Threatened or Endangered

MN Threatened or Endangered

MN Special Concern



Male Dakota skipper reared from egg to adult at MNZoo. The Zoo successfully bred this species in 2014.



The percentage of surveyed sites in Minnesota where protected species were found has dropped precipitously.

