M.L. 2014 Project Abstract
For the Period Ending June 30, 2017

PROJECT TITLE: Imperiled Prairie Butterfly Conservation, Research, and Breeding Program - Activity 3 by DNR
PROJECT MANAGER: Robert Dana, Ph. D.
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2014, Chp. 226, Sec. 2, Subd. 05j-2

APPROPRIATION AMOUNT: $245,000.00

Overall Project Outcomes and Results

This project was a collaboration with the Minnesota Zoo to find the cause or causes of the recent precipitous declines of two prairie-dependent skipper butterflies, the Poweshiek skipperling and the Dakota skipper, and to restore both to a level of abundance that will assure their survival. These declines have prompted the U.S. Fish & Wildlife Service to list the Poweshiek skipperling as endangered and the Dakota skipper as threatened. The MN DNR was responsible for one of the project's component activities—surveying sites throughout MN's prairie region that historically supported these two butterflies as well as sites with appropriate habitat that had never been previously surveyed.

The goals of this survey were to determine if there were extant populations of these two species in Minnesota, to initiate monitoring of any populations found, and to survey for 11 additional butterfly species that are prairie-dependent or highly associated with native prairie in MN to determine whether they also show evidence of decline from historical levels. Surveys were conducted from July 1 through early September in 2014 and from early June through early September in 2015 and 2016.

A total of 63 sites throughout western Minnesota were surveyed one or more times, 44 in 2014, 51 in 2015, and 52 in 2016. Seven of the target species were not observed: Dusted skipper, Garita skipperling, Uhler's arctic, Iowa skipper, Ottoe skipper, Assiniboia skipper, and most significantly, Poweshiek skipperling, adding to the probability that this federally endangered species is extirpated in Minnesota. One population of the federally threatened Dakota skipper was confirmed to remain, and this population probably declined over the three survey years. Only two populations of the Pawnee skipper were located, one in same site as the Dakota skipper. Other species found were Gorgone checkerspot, Prairie ringlet, Melissa blue, and Regal fritillary. The results indicate a sharp decline from historical levels for Gorgone in the south half of the surveyed region and probable but weaker declines for the blue and the ringlet. Only the Regal fritillary appears to be resisting the trend.

Project Results Use and Dissemination

Two presentations: one to the annual Day of Insects symposium at Iowa State University in 2015, one to a workshop organized by the MN Zoo with the University of Minnesota on the possibility that insecticide contamination is a contributor to the declines. Interviews with reporters, one with the Fargo Forum newspaper, one with a MN Public Radio reporter resulting in some media coverage. Participation in a meeting organized by USFWS with land managers to discuss management strategies in the Felton Prairie. Presentation to the Clay County Board on the Dakota skipper presence in the Felton Prairie. The County owns the prime Dakota skipper habitat in the Felton prairie, and the presentation, along with ones by USFWS staff and other DNR staff, was to update them on the

biological significance of the site. Annual reports to DNR Div. of Parks and Trails, Scientific & Natural Areas Program, The Nature Conservancy, the town of Fertile, MN, Clay County, USFWS, Morris Wetland District, The MN Zoo has made many presentations in which this survey work has been given some exposure.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2014 Work Plan Final Report

Date of Report: May 31, 2017

Final Report

Date of Work Plan Approval: June 4, 2014

Project Completion Date: June 30, 2017

PROJECT TITLE: Imperiled Prairie Butterfly Conservation, Research, and Breeding Program - Activity 3 by DNR – (Part 1 - Activities 1, 2, 4 and 5 are being done and described in a separate work plan by the Minnesota Zoo - $380,000)

Project Manager: Robert Dana, Ph. D.

Organization: Minnesota Dept. of Natural Resources

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Location: Counties in the prairie region of MN: McLeod, Cottonwood, Murray, Pipestone, Lincoln, Lyon, Chippewa, Swift, Big Stone, Pope, Clay, Norman, Polk, Kittson, Roseau

Total ENRTF Project Budget:	**ENRTF Appropriation: $245,000**
(This is for the DNR portion of the appropriation only.)	**Amount Spent: $244,992**
	Balance: $8

Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 05j-2

Appropriation Language:
$380,000 the second year is from the trust fund to the Minnesota Zoological Garden and $245,000 the second year is from the trust fund to the commissioner of natural resources to prevent the extirpation and possible extinction of imperiled native Minnesota butterfly species through breeding, genetics and mortality research, inventory, monitoring, and public education. This appropriation is available until June 30, 2017, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Imperiled Prairie Butterfly Conservation, Research, and Breeding - Activity 3 by DNR – (Part 1 - Activities 1, 2, 4 and 5 are being done and described in a separate work plan by the Minnesota Zoo - $380,000)

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. Of the butterfly species native to Minnesota prairies, 10 are of statewide conservation concern and two, the Poweshiek skipperling and the Dakota skipper, have now largely disappeared from the state and are proposed for listing under the U.S. Endangered Species Act despite being historically among the most common prairie butterflies and having their historic ranges concentrated in Minnesota.

With a particular focus on endangered butterfly species, the Minnesota Zoo and the Minnesota Department of Natural Resources are partnering to advance the understanding and conservation of this important component of Minnesota's prairie ecosystems. The Minnesota Zoo will expand its conservation breeding program for butterfly species most under threat of extinction like the Poweshiek skipperling and Dakota skipper, researching butterfly genetics and causes of mortality, and providing educational information on these species and efforts. The Minnesota DNR will simultaneously monitor the status of these and a number of additional targeted species on native prairie remnants across Minnesota. Such monitoring is necessary to detect negative trends so that they may be addressed before they become irreversible.

This work will provide needed information of status of not only Minnesota's native prairie butterflies, but also the greater prairie ecosystem. 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 loss of prairie has significant consequences for Minnesota's water quality and wildlife interests.

III. PROJECT STATUS UPDATES:

Project Status as of November 30, 2014:
See detailed report under Activity 3, the MN DNR's portion of this project. Briefly, we were able to conduct at least one survey in 33 of the 45 sites we planned to survey; most were surveyed more than once. We surveyed 28 of 41 sites during early July that were priorities for the Poweshiek skipperling and Dakota skipper, 20 of 31 sites during mid-late July that were priorities for several species, and 27 of 37 sites during mid-August through early September that were priorities for the two late summer prairie skippers. Shortage of qualified surveyors was a significant problem. Survey protocols will allow us to use data from sites where target species were found as a basis for future monitoring.

Project Status as of May 31, 2015:
See detailed report under Activity 3, the MN DNR's portion of this project. The documentation for the survey and monitoring work in 2014 has been completed. Preparation for the 2015 survey is nearly complete.

Project Status as of November 30, 2015:
See detailed report under Activity 3, the MN DNR's portion of this project. Of the 47 sites we had planned to survey in 2015 we were able to conduct at least one survey in 39. In 25 of these we conducted at least one survey in each of the three periods during the summer (late May-mid June, late June-mid July, mid August-early September) that encompassed the adult flight periods of all the target species. (Seasonal development in 2015 was closer to average than the delayed development in 2014.) Most omissions were because a site lacked habitat for the target species for that survey period. The early season survey in 2015 was the first under this project, as the 1 July start date in 2014 precluded surveying this period the first year. However, early survey of many of the sites was conducted in 2014 by USFWS using the same contractor we subsequently used. Monitoring initiated in 2014 for the federally threatened Dakota skipper in the Felton Prairie complex was

continued in 2015. No captive-bred butterflies were released in 2015, and therefore no monitoring of releases was initiated.

Project Status as of May 31, 2016:
See detailed report under Activity 3, the MN DNR's portion of this project. The documentation for the survey and monitoring work in 2015 is a little more than halfway complete. Staff turnover has slowed this process. Preparation for the 2015 survey is nearly complete.

Project Status as of August 15, 2016:
See the detailed report under Activity 3. The DNR component of the project, survey and monitoring, was scheduled to end June 30, 2016. The work plan had specified that 2016 field work was to be limited to completing a second year of survey effort for the early season species (late May, early June), which could not be surveyed for in 2014 as work under the grant could not begin before July 1 that year. But because our proposal (again in partnership with the MN Zoo) to continue this work beginning July 1, 2016 was recommended for funding by LCCMR and approved by the Legislature, we conducted survey for the middle-season group of species from June 21 through June 30, 2016 and continued under the new grant from July 1 on. In part this was to enable the Zoo to determine whether there would be enough Dakota skippers present in the Felton Prairie site this summer to meet the threshold requirement for capturing and temporarily holding females to obtain eggs from that population. The adult emergence of this species began in late June this year.

Retroactive Amendment Request (08/15/2016):
The MN DNR is requesting that the project time line be extended and the end date be changed from June 30, 2016 to May 31, 2017. We have not made as much progress with data management and analysis as we had expected, due in large part to staff departures. We are expecting to fill a position shortly that will be partly assigned to data management for the DNR component of this project. We anticipate assigning someone to assist with this work later this winter, probably January. Changing the end date to May 31 will give us ample time to complete the data work and prepare a final report. Also, at the end of the project on 30 June 2016 as originally planned, a substantial amount of the grant remained unspent. We would like to pay for the field work in the summer of 2016 from 1 July through early September out of this grant rather than charge it to M.L. 16 as the workplan of the latter calls for doing. This will allow us to spend down the M.L. 14 grant before beginning to draw on M.L. 16. We were a bit more restrained in our field survey than we had planned to be, and we can use some of the savings to M.L. 16 from paying for the July-August 2016 survey out of M.L. 14 to beef up the survey effort planned under M.L. 16 in 2017 and beyond. (In the 30 November update report for M.L. 16 I will be proposing an amendment to the workplan and budget for that grant to shift some of the budget for field survey in that plan to pay for completion of work on the 2016 data.)

We propose reducing the total budget allocation of personnel from $148,500 to $102,262. A major reason is that the employee who was the assistant to the principal investigator became unavailble for part of the 2015 field season and left DNR employment before the 2016 field season. No replacement was hired for the 2016 field work. In contrast, the budget for contract survey work is proposed to be almost doubled, from $56,959 to $102,400. The recent Federal listing of the Dakota skipper and Poweshiek skipperling has resulted in a great increase in the demand for survey work in conjunction with various development projects in the ranges of these species, notably projects associated with petroleum resource extraction in North Dakota. Because there are currently fewer than five individuals in the U.S. qualified to survey for these butterflies and their services are highly valued by private developers, the cost of contracting has risen well about our original estimate. In addition to this, we are adding two months of survey work (July-August 2016) that were not included in the original work plan and budget. The reduction in the budget for personnel will be used to increase that for contract work.

We were fortunate to obtain the field data collection devices and software at no cost, so we are proposing to zero out the lines in the original budget for these items and shift these dollars to data management. Our

expenditures for field supplies came in $12 above our budget estimate, so we are proposing a small increase in the budget for this item. We are proposing to increase the budget for travel expenses from $16,350 to $17,600, to cover the addition of the July-August 2016 survey work to the workplan. Billing for DNR Direct and Necessary came in below what was originally calculated, and accordingly we propose to reduce the budget for this item from $21,006 to $19,178 and redirect the balance to salary for data management.

Amendment Approved: [1/12/2017]

Project Status as of November 30, 2016:
See the detailed report under Activity 3. All field survey work for this project as amended was completed on 30 August 2016. This was the third year of surveys for the late-season group of species. Work continued on incorporating the 2015 field data into the project database and the Natural Heritage Information System database and it has begun on incorporating the 2016 field data.

Overall Project Outcomes and Results:
This project was a collaboration with the Minnesota Zoo to find the cause or causes of the recent precipitous declines of two prairie-dependent skipper butterflies, the Poweshiek skipperling and the Dakota skipper, and to restore both to a level of abundance that will assure their survival. These declines have prompted the U.S. Fish & Wildlife Service to list the Poweshiek skipperling as endangered and the Dakota skipper as threatened. The MN DNR was responsible for one of the project's component activities—surveying sites throughout MN's prairie region that historically supported these two butterflies as well as sites with appropriate habitat that had never been previously surveyed. The goals of this survey were to determine if there were extant populations of these two species in Minnesota, to initiate monitoring of any populations found, and to survey for 11 additional butterfly species that are prairie-dependent or highly associated with native prairie in MN to determine whether they also show evidence of decline from historical levels. Surveys were conducted from July 1 through early September in 2014 and from early June through early September in 2015 and 2016. A total of 63 sites throughout western Minnesota were surveyed one or more times, 44 in 2014, 51 in 2015, and 52 in 2016. Seven of the target species were not observed: Dusted skipper, Garita skipperling, Uhler's arctic, Iowa skipper, Ottoe skipper, Assiniboia skipper, and most significantly, Poweshiek skipperling, adding to the probability that this federally endangered species is extirpated in Minnesota. One population of the federally threatened Dakota skipper was confirmed to remain, and this population probably declined over the three survey years. Only two populations of the Pawnee skipper were located, one in same site as the Dakota skipper. Other species found were Gorgone checkerspot, Prairie ringlet, Melissa blue, and Regal fritillary. The results indicate a sharp decline from historical levels for Gorgone in the south half of the surveyed region and probable but weaker declines for the blue and the ringlet. Only the Regal fritillary appears to be resisting the trend.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Minnesota Zoo breeding conservation program for imperiled prairie butterflies (See separate work plan by MN Zoo)

ACTIVITY 2: Conservation genetics research on imperiled prairie butterflies (See separate work plan by MN Zoo)

ACTIVITY 3: DNR Butterfly Status Monitoring (was Activity 3 in the previous combined work plan)
Description:
This component of the project will focus heavily on two prairie-dependent skippers that are critically imperiled, the Poweshiek skipperling (PS) and the Dakota skipper (DS). In the first year (2014) approximately 40 sites distributed throughout the prairie region of MN will be surveyed. These include all of the sites having historical records indicative of strong populations of PS and DS, as well as sites without such documentation but having attributes that should support such populations. These sites will be surveyed for the other prairie species as

well. Surveys will be timed to coincide with peak adult numbers in the flight periods of target species. Two species have their adult flight in spring (May-early June), one in late summer (mid-late August), and the rest in early-mid-summer (mid June-late July). In order to survey all sites during the brief peak flight times four survey crews (two persons if possible) will be deployed. Those species whose flight periods are done before the July 1 start of the funding period will not be included in the 2014 work. Presence-absence survey work in 2015 will begin in time to include these species, and will provide a second year of survey for the later-flying species. In 2016 a second year of survey for the early-season species and a third year of survey for the later season species will be completed.

Surveys will follow standard protocols regarding time of day and weather conditions. Survey work in each site will continue until 10 observations are recorded or until the time limit for the site is reached, whichever comes first. Time limits will be determined based on the areal extent of the habitat to be surveyed. Surveyors will follow a roughly delineated route taking them through most or all of the appropriate habitat in a site, but adjusting the precise route as their judgment of conditions (e.g. locations of nectar flowers, host plants) indicates would be productive. They will employ GPS units to help guide them and record track logs of actual survey route taken.

In 2015 abundance-monitoring will be implemented for the summer skipper species in sites where the 2014 survey recorded 10 observations of the species. (If two similar nearby sites should meet this criterion, only one may be selected for the more intensive monitoring.) Similarly, this will be initiated for the early-season species in 2016 in those sites where the 2015 survey accumulated 10 observations. In 2016 abundance monitoring of mid- and late-season species will be repeated in sites where it was conducted in 2015 and will be initiated in any site where 10 or more of the species were counted for the first time in 2015. The methodology to be used for this is a version of the "Pollard Walk" approach (Pollard, E. & T.J. Yates. 1993. Monitoring butterflies for ecology and conservation. Chapman and Hall, London), essentially counts of observations along transects, standardized by either distance or time (therefore, an observational rate). In addition to these abundance-monitoring events (if any), presence-absence monitoring will be repeated in the remaining sites.

Summary Budget Information for Activity 3:

ENRTF Budget: $245,000
Amount Spent: $244,992
Balance: $8

Activity Completion Date:

Outcome	Completion Date	Budget
1. 40 sites surveyed for presence of target species for ~~2~~ 3 consecutive years.	Sept. 15, 2016	$174,000
2. Sampling protocols for quantitative monitoring developed and tested	Sept. 15, 2015	$8,000
3. Quantitative monitoring initiated in up to 13 of the 40 sites, depending on results of presence survey	Sept. 15, 2016	$44,110
4. DNR direct and necessary	May 31, 2016	$18,890

Activity Status as of November 30, 2014:

Fortunately for the project the seasonal warmup in 2014 was slower than average, and the flight period of the two highest priority target species, the Poweshiek skipperling and the Dakota skipper, did not begin until early July, allowing us to survey for these species during the period of their maximal potential abundance.

Between DNR staff and contract surveyors we were able to conduct surveys in 33 of the 45 sites we had selected. Unfavorable weather, difficulties locating landowners to secure permission, or denial of permission accounted for the omitted sites. However, the survey effort in the 33 sites was close to the limit of what was possible given our resources. The dependency of detection of these animals on weather conditions means that

more than one visit to a site during the flight period of the target species will sometimes be required to make non-detection convincing evidence for absence. In order to minimize travel time among sites we had planned to allocate survey effort among three surveyor crews, with each assigned a geographic cluster of sites, one southwest, one west-central, and one northwest, but only one suitably qualified contractor was available, and the seasonal DNR employee whose assistance had been planned on proved to be unavailable for much of the survey season. It is hoped that these exigencies will not constrain survey effort in calendar year 2015.

Of the 45 intended sites, 41 were considered priorities for Poweshiek skipperling and Dakota skipper. We surveyed 28 of these during the near-synchronous flight periods of these two species. The majority of the missed sites were of lower priority, but a few were sites having historical records of strong numbers. The Poweshiek skipperling was not observed in any site. Most disappointing was the failure to find it at a site where we had a credible report of a sighting in 2013. Our failure to find this butterfly increases the probability that it is extirpated in MN. We encountered the Dakota skipper in one site only, but strong numbers appeared to be present in that site. Timed counts along transects were made for the purpose of future monitoring. We collected a single leg each from 11 individuals for DNA analysis. This positive result is more than counterbalanced by the failure to find this species at any of its other historically important sites.

We surveyed 20 of the 31 sites considered priorities for the Arogos or Beardgrass skipper during the mid-late July period when adults should have been on the wing in 2014. We did not observe this species in any of these sites. We surveyed both of the sites that historically supported populations of the Ottoe skipper, plus one other site with limited historical documentation, during its flight period, which overlaps the Poweshiek-Dakota and Arogos flight periods. There has been no verifiable report of this species in western MN since the early 1990s, so we were not surprised by the negative results of this survey effort.

During the mid-August to early September period when the Pawnee skipper and Assiniboia or Plains skipper are on the wing, we surveyed 27 of the 37 sites that were priorities for one or both. We did not encounter the Assiniboia skipper in any of the 12 of these that are possibilities for this northern species. We found Pawnee skippers in three of the 20 priority sites for this taxon that we surveyed; two of the sites where we found it are adjacent and would be counted as one site except for the very different management regimes. Again, disturbingly, this butterfly was not detected in several of its historically most important sites.

The flight period of the Regal fritillary extended from early July into early September, giving us multiple opportunities to detect its presence. This butterfly reaches its northern range limit in Polk Co, MN, so it was not expected in our sites north of this. We surveyed 26 of the 32 target sites within its range and encountered it in 21 of these. One of the five surveyed sites where we didn't observe it was surveyed only once, at the beginning of the flight period when few adults had yet emerged.

Activity Status as of May 31, 2015:
The fall, winter, and early spring months were devoted to some data management and preparations for the calendar year 2015 survey work, which will begin 1 June. A few of the sites targeted in 2014 have been dropped for 2015 based on conditions observed in 2014. A few sites have been added. The sampling transects within all sites were reviewed and revised based on the 2014 field work. An RFP was sent out for the part of the 2015 survey work to be done under contract, bids were received and evaluated, and a contract has been awarded. Information about the upcoming survey work was sent out to all land managers responsible for the public sites and those owned by The Nature Conservancy. Requests have been sent to private landowners for permission to survey in their properties. Field instruments have been upgraded.

Activity Status as of November 30, 2015:
The seasonal warm up in 2015 throughout the survey area was closer to the long-term average than in 2014. In 2014 temperatures didn't begin to rise above 50°F until a week or so into May, whereas in 2015 this warmup

began in April. Thus the emergence dates of the spring and early-summer butterflies were earlier in 2015 than in 2014.

We added two sites to the 45 we had identified in 2014 for survey. Between DNR staff and contract surveyors we were able to conduct at least one survey in 39 sites. Only one of the sites we failed to survey was a high priority site, and it is adjacent to two sites we did survey. Denial of permission by the private landowner was the reason we did not survey this site. In 25 of the39 surveyed sites we conducted at least one survey in each of the three periods during the summer (late May-mid June, late June-mid July, mid August-early September) that encompassed the adult flight periods of all the target species. Most of the 14 sites that were not surveyed in all three periods had just one period omitted intentionally because they lacked habitat for target species flying during that period, but a scheduling mix-up led to a few of the omissions. We conducted two or more surveys in 10 of the 38 sites we surveyed during the first period, in 9 of the 29 sites surveyed during the middle period, and in 6 of the 33 sites surveyed during the last period. Most of the repeat surveys during a period were because of less than favorable conditions during the first survey. In the Felton Prairie sites the repeat visits during the middle period were part of the protocol for monitoring the Dakota skipper population there.

We had the same difficulty in 2015 that we had in 2014 in finding qualified contractors to conduct survey work. We were able to secure the same contractor that we used in 2014; although he was not available during the middle survey period, he subcontracted the work for this period. This contracted survey work covered all the sites in southwest Minnesota up to the Minnesota River valley plus several sites in the Glenwood area. This group of 20 sites spread over an area 130 miles south to north and 60 miles east to west is too large to permit a single surveyor to repeat-survey more than a couple of sites during the fairly brief survey window in each period. Consequently, the results for this group of sites are not as conclusive as we would have liked.

We surveyed 29 sites that are priorities for the two federally listed species, Dakota skipper and Poweshiek skipperling. We did not find Poweshiek in any site, adding to the evidence that it is probably extirpated from Minnesota. We again found Dakota in only one site, the Felton prairie complex, the only site where it was present in 2014. Counts along the monitoring transects were lower here in 2015 than in 2014, but this may have been due to significant attenuation of sunlight by high-altitude smoke from forest fires in Canada during our counts. This smoke pall had the same effect as cloudiness in reducing butterfly activity. As in 2014, the majority of the observations were in the Bicentennial unit of the Felton Prairie SNA, but there were a few in the Blazing Star unit of this SNA as well as in the county-owned piece that is leased for hay harvest. This year we secured permission to survey in the B Bar B Ranch south of the other units in the Felton complex, and we confirmed the presence of this species in the part of the ranch that we surveyed. We had another encouraging surprise as well. Our results in the part of the Bluestem Prairie site that we surveyed were negative again this year, but a single female Dakota skipper was photographed by two individuals conducting an independent "4th of July Butterfly Count" in another part of this large site. Their observation was in an area where a few adults had been observed back in the 1980s, but the amount of well-drained prairie there is small, and these butterflies were thought to have been strays from the much more extensive area of this habitat to the north across a gravel road where all other observations of this skipper occurred. Our survey transects in 2014 and 2105 were in the latter area, for obvious reasons, but clearly a more intensive and extensive survey in Bluestem Prairie is called for. Bluestem Prairie is about 14 miles south of the Felton complex, so the skipper photographed there is not a stray from the latter.

The only other target skipper we found was the Pawnee skipper, and the only sites in which we found it were the same three sites where we observed it in 2014, the Felton Prairie complex, including this year the surveyed part of the B Bar B Ranch, Glacial Lakes State Park, and the large privately owned prairie pasture east of the park. Numbers observed along the survey transects were much smaller than in 2014, and very few females were observed.

As in 2014 we found no Ottoe skippers, Iowa skippers or Plains skippers. It appears that Ottoe has disappeared from southwestern Minnesota prairies, although it may still be present in southeast Minnesota in sand prairies and bluff prairies. The Iowa skipper has been recorded in the past five decades from many prairies across the southern half of Minnesota, including the southeast. It also may still occur in that part of the state. Historical Minnesota records for the Plains skipper are confined to the northwest edge of the state, from Clay County northwards, which is at the eastern limit of its range. We did not find Dusted skippers in any site, nor did we encounter Uhler's arctic in its one historical Minnesota site, the Felton prairie complex. Both species have early flight periods and 2015 was the first year we could survey for them, although USFWS contractors did survey many of our sites during the early period in 2014. Neither species was observed during that survey effort. Uhler's arctic is a western species with the Minnesota occurrence being the eastern-most known. It is clearly extirpated from the state. The Dusted skipper occurs throughout eastern North America in open to partially wooded habitats where its larval host plants, grasses in the genera *Andropogon* and *Schizachyrium* (bluestems), are common. It is maintaining a presence in the Anoka Sand Plain, and may be faring similarly in other parts of eastern Minnesota, but our results indicate that it has suffered a recent dramatic decline in western Minnesota prairie remnants. Two other target species with early flight periods, the Prairie ringlet and Gorgone checkerspot, were detected in 2015, the ringlet in several sites but the checkerspot in only a couple. We found Melissa blue in five sites, the same number as in 2014, though not all the same sites. The Regal fritillary, an iconic prairie butterfly, was observed in 21 of 32 sites surveyed during the flight period in 2015 compared with 22 of 30 sites in 2014. We observed it in 19 sites both years, and the numbers observed were similar between the two years. Both sites where we observed in in 2015 but not 2014 were surveyed for the first time in 2015. The three sites where we observed it in 2014 but not 2015 were either not surveyed during the flight period in 2015 or surveyed late in the flight period.

The Zoo did not release captive-reared butterflies in 2015, and therefore we did not monitor any captive releases.

Activity Status as of May 31, 2016:
Entry of 2015 data from DNR employees and the contractor into the Observation Database is nearly complete. The employee performing this work took another job and a replacement has not been found.

Summary reports of the results of the 2015 survey work have been submitted to USFWS and the organizations responsible for the management of sites dedicated to prairie and wildlife conservation: DNR Scientific and Natural Areas Program, DNR Division of Parks and Trails, DNR Division of Fish and Wildlife, The Nature Conservancy, and the City of Fertile, MN.

Robert Dana gave a presentation in early April on the survey work to the annual Day of Insects symposium hosted by Iowa State University in Ames, IA.

Preparation for field work during the period from late-May through 30 June is complete. Bids for the contracted portion of the work were solicited and evaluated, and the contract has been signed.

Activity Status as of August 15, 2016:
The previous Activity Status report states that entry of 2015 data was nearly complete; this is a typo, it was the 2014 data entry that was meant. We have now completed data entry for the 2014 survey and made a start on entry of the 2015 data, but the employee responsible left to take a job elsewhere before much was entered. Most of this task remains to be done, as does data entry for the work in June and July, 2016.

Field survey for the 2016 season began May 30 and continued through June 17, targeting the early-season species. Survey for the next group of species was initiated on June 21 and continued through July 24. Surveys for the late-season species began on 15 August and these results are not included in this update. We conducted survey work in 36 sites during the first period, and in 39 sites during the second period. Several of the sites

surveyed during the first period were omitted from the second period surveys as they do not have good habitat for the second-period species. Some smaller sites were also dropped in order to put more effort into survey and monitoring in sites where Dakota skipper was observed in 2015: the sites in the Felton prairie complex and the Bluestem Prairie complex. We also added a very large, privately-owned site that is grazed and not burned that we learned of last spring, and in order to keep the work load manageable a couple of small sites that had yielded no observations of target species were dropped. Surveyed sites were in McLeod, Pipestone, Lincoln, Murray, Lyon, Swift, Chippewa, Big Stone, Pope, Clay, Norman, Polk, and Kittson counties.

We did not encounter the highest priority species in the early-season group, Uhler's arctic, Garita skipperling, and Dusted skipper, in any site. This is the same result as the 2015 survey, and a survey of many of our sites in 2014 under a different grant. We did observe three lower priority species, Gorgone checkerspot, Prairie ringlet, and Melissa blue, in four, twelve, and seven sites, respectively. It is noteworthy that the greatest numbers of both the ringlet and the blue were in sites without fire management, one of them hayed and two lightly to moderately grazed. No more than a few checkerspots were seen in any site, and there was no obvious relation between fire management and their occurrence and abundance.

During the survey of the second-period species we did not encounter Poweshiek skipperling in any site, the third year of negative results for this federally endangered species. And again we did not encounter Ottoe or Arogos skippers in any site. As in 2014 and 2015 we observed the federally threated, state endangered Dakota skipper only in the Felton Prairie complex, but in only two of the three sites in the complex where we have recorded in the two previous years. As in 2015 the largest number of encounters was in the Felton Prairie SNA, a fire-managed site. Only one was observed in the lightly grazed pasture where we recorded several in 2015 (we didn't survey this site in 2014), and none were encountered in the haying-managed county prairie site where we observed a few in both previous years. Despite expanding the survey in the Bluestem Prairie complex to include the area where the female was photographed in 2015 by an independent searcher, we did not find Dakota skipper in this site. The Regal fritillary flight began early in this second period and was still ongoing at the end. As in the previous two years we encountered this spectacular butterfly in the majority of our survey sites, with strong numbers in several.

The field work in the Felton prairie complex collected data to monitor Dakota skipper population trend; we made three transect counts each in the SNA and the county site during the period, and one count in each of two pastures in the private ranch. The number observed in 2016 was lower than in 2015, which in turn was lower than in 2014. There has been no management burning in this complex since spring 2014, although a wildfire burned about half of the county-owned prairie outside the SNA in fall 2015.

None of our daily count totals of Dakota skipper adults in the Felton prairie complex in 2016 met the threshold requirement for the Zoo to capture females in this site and briefly hold them to obtain eggs.

Activity Status as of November 30, 2016:
We conducted surveys in 22 sites for the late season species, with the Pawnee skipper and Assiniboia skipper being the highest priority. We did not find Assiniboia skipper in any site, the same result as in 2014 and 2015. We encountered Pawnee skipper in the same two site complexes where we observed it in 2014 and 2015—the Glacial Lakes State Park complex and the Felton Prairie complex. We conducted only one survey during the period in the majority of these sites, but in the two site complexes where we could compare numbers between sites managed with fire and ones managed with grazing and no fire we conducted three to five counts spaced over several days. This provides a measure of control for factors other than actual abundance that may have influenced the number of butterflies observed.

Final Report Summary:
Since the Nov. 30, 2016 Activity Status we have completed various data management tasks and generated summary statistics for use in the final report and in other reporrts and presentations.

Over the 3 years of the project a larger number of sites were surveyed than was originally proposed. This was mostly the result of dropping some sites and adding others, but obviously more sites were added than were dropped. Thirty five sites were surveyed all three years. Most of the sites were selected as likely to be occupied by one or both of the highest priority species, Poweshiek skipperling and Dakota skipper, on the basis of historical data. A few sites were included that had little or no historical data for these species but have not been managed with prescribed fire, which has been argued to be the main agent of declines in prairie specialist butterflies. Overall, the survey confirms that with the exception of the Regal fritillary, prairie specialist butterflies are in trouble in Minnesota. The most significant of the species declines are those of the Poweshiek skipperling and the Dakota skipper, both having small historical ranges whose Minnesota portion supported a major fraction of their global populations. This survey adds to the evidence that Poweshiek is extirpated in Minnesota, as it appears to be in Iowa and the Dakotas as well, four states that supported probably more than 95 per cent of its global population. The situation of the Dakota skipper is not so dire, as there are still some populations in the Dakotas and Manitoba, but the loss of all but one population in Minnesota, one that probably declined in number during the survey, significantly increases the vulnerability of this species to global extinction. Because we do not know what has caused this decline we cannot be confident that the populations farther west won't also be affected eventually.

One of the goals of the survey was to locate existing populations of Poweshiek and Dakota to provide the Minnesota Zoo with founding stock with Minnesota genetics for the captive breeding component of this project. Based on the numbers encountered in the 2014 survey of the one Dakota skipper population in the state the Zoo was able to obtain eggs from the site that year, but the number of encounters in the two subsequent years did not meet the threshold considered tolerable for doing this safely. Not finding any Poweshiek populations has created an obstacle for the Zoo's plans for reintroducing this species in the state. Also, had surviving populations been found, these would have provided a valuable basis for research to discover causal factors.

Several of the species targeted in this survey (not Poweshiek or Dakota) also occurred historically in east-central and southeast Minnesota, and their current status in this less-intensively agricultural part of their ranges is unclear. Expanding surveys to this part of the state could shed light on factors causing their declines in the prairie region of western Minnesota.

One significant deficiency in the work accomplished was the infrequency with which multiple surveys in sites during each of the flight periods were conducted. Many factors can influence the probability of detecting a butterfly other than its actual abundance, especially weather. Conditions during many surveys turned out to be less than desirable, but the demands of surveying all the sites usually prevented repeating a survey under better conditions. This would have required either surveying fewer sites or deploying more surveyors. Even with greater financial resources, the latter was not possible, as the number of individuals with the necessary expertise is very small, and several of them were not available. The effort in the northernmost part of the survey area was not commensurate with the amount of potential habitat there. The remoteness of this area is part of the difficulty. Another problem is that several of the sites of interest are privately owned and securing permission to survey has been difficult. The result is that additional survey is needed, especially in this north western corner of Minnesota, but also in some sites along the eastern side of the prairie region.

ACTIVITY 4: Pesticides-related mortality research on surrogate prairie butterflies (See separate work plan by MN Zoo)

ACTIVITY 5: Prairie Outreach and Environmental Education at the Zoo (See separate work plan by MN Zoo)

V. DISSEMINATION:

Description:

The survey and monitoring results will be entered into the DNR Natural Heritage Information System. A major use of this database is environmental review. The results will be shared with the US Fish and Wildlife Service for the two federally listed species. If USFWS initiates status review of any of the other species, the data for these will be made available. For the state-listed species, the species pages in the DNR website will be updated to reflect new information. The current state wildlife action plan (SWAP), Tomorrow's Habitat for the Wild and Rare will be revised and updated in 2016, and the results of this project will be incorporated in the new SWAP. Land managers (DNR Wildlife Management Areas, State Parks, Scientific and Natural Areas, Prairie Bank Easements, USFWS Waterfowl Production Areas, National Wildlife Refuges, The Nature Conservancy preserves) will be informed of the results for their respective units. Beyond the term of this project, the quantitative monitoring of selected sites will be analyzed for evidence of trends and for effects of particular management activities. These data may trigger more intensive research to determine causality.

Status as of November 30, 2014:
Data compilation in several spreadsheet documents and a GIS document is nearly complete. Results for the two federally listed species, the Poweshiek skipperling and the Dakota skipper, have been communicated informally to the USFWS Twin Cities Field Office.

Status as of May 31, 2015:
Data compilation for the 2014 survey work was completed and reports submitted to DNR Division of Parks and Trails for work done in State Parks, to DNR Division of Ecological and Water Resources for work done in Scientific and Natural Areas, to USFWS Morris Wetland District for work done in their Waterfowl Production Area unit, and to The Nature Conservancy for work done in their preserves. Data from the Dakota skipper monitoring in the one site where it was observed has been provided to USFWS.

Status as of November 30, 2015:
Since the end of the field season we have been organizing and entering the data. We are currently preparing reports to those agencies and organizations listed in the May 31 update. We have provided all 2015 data for the Dakota skipper to the USFWS, and we will shortly be providing data for their respective sites to DNR Wildlife and Fisheries, DNR Parks and Trails, DNR Scientific and Natural Areas, and The Nature Conservancy.

Status as of May 31, 2016:
Dissemination of the results of the 2015 season survey and monitoring to the agencies and organizations managing surveyed sites—DNR Wildlife, DNR Parks and Trails, DNR Scientific and Natural Areas Program, USFWS, TNC, City of Fertile, is complete.

Status as of August 15, 2016:
I failed to report in the previous status update that I gave a 15 min presentation on our survey work at the Day of Insects event at Reimann Gardens (Iowa State University), Ames, IA, on April 9, 2016. My title was "Where have all the skippers gone? Searching for prairie butterflies in Minnesota 2014-2015."

Erik Runquist and I were interviewed by a reporter with the Fargo Forum newspaper and by a reporter with Minnesota Public Radio about this project. The resulting stories ran in July. Fargo Forum: http://www.inforum.com/news/4063926-why-dakota-skipper-butterfly-disappearing-regions-prairies, and on Minnesota Public Radio: http://www.mprnews.org/story/2016/07/12/minnesota-prairie-butterflies-disappear-concerns .Other than these interviews, since the last update I did not disseminate results of this work beyond the group of experts (DNR, MN Zoo, USFWS) working on the conservation of the two federally listed skippers and federal, state and private organization staff responsible for managing sites where we have observed target species.

Activity Status as of November 30, 2016:

Work continued on entering data from the 2015 field work into the DNR Natural History Information System database, albeit slowly because of the departure of the employee who was doing the majority of this work. We have started this process for the 2016 data.

I participated, along with several other DNR staff and Phil Delphey (Twin Cities Ecological Services Field Office, USFWS), in a meeting to present information about the conservation significance of the native prairie owned by Clay County in the Felton Prairie complex to members of the Clay County Board and staff. I presented the results of the prairie butterfly monitoring the DNR has conducted there as part of this project, emphasizing the fact that this is the only remaining site in Minnesota known to still support a population of the Dakota skipper.

I also participated, along with Erik Runquist and Cale Nordmeyer of the MN Zoo, in a symposium and workshop on the possible role of insecticides applied to control soybean aphid in the decline of prairie butterflies. This was organized by the Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC) at the University of Minnesota with a grant from the U's Institute on the Environment. I presented a synopsis of the results of this survey.

Final Report Summary:
The emphasis on dissemination has so far been to the MN Zoo and to USFWS endangered species staff. Periodic updates have been presented to a wider group of individuals who are involved in the captive breeding/reintroduction project. Members of this group include agency staff from the Michigan DNR and the Wisconsin DNR, the Nature Conservancy of Canada, the Assiniboine Zoo in Winnipeg, and researchers at the University of Winnipeg and Minot State University in North Dakota, in addition to the MN Zoo and USFWS. I gave a presentation about the survey and its findings as of the completion of the 2015 field season at the annual Day of Insects symposium at Iowa State University. I gave a presentation with greater emphasis on the biology of the Poweshiek skipperling and Dakota skipper than on the survey at a symposium and workshop on the possible role of agricultural insecticide drift in the decline of these butterflies. This was under the auspices of the Minnesota Invasive Terrestrial Plants and Pests Center at the University of Minnesota. I presented a summary of the 2016 field work to the LCCMR Pollinator Projects Group update meeting, organized by the Univ. of Minnesota. I gave a presentation on the biological significance of the Felton prairie to the Clay Co. Board and its staff. There have been discussions with land managers, especially staff of The Nature Conservancy and the Scientific and Natural Areas Program in the MN DNR, about adjusting fire management to minimize threat to these butterflies. This will need more attention. Reporters for the Fargo Forum newspaper and MN Public Radio interviewed Erik Runquist and me and produced media coverage about the whole project.

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	$ Amount	Explanation
Personnel:	$98,075	DNR entomologist (1 unclssf @ 50%time, salary and benefits, 2 yrs) DNR asst. entomologist (1 unclssf @ 50% time, salary & benefits, 2 yrs)
Professional/Technical/Service Contracts:	$109,900	Survey & monitoring contracts (experienced insect surveyors), information system product development
Equipment/Tools/Supplies:	$558	Data measurement & collection, specimen curation supplies
Travel Expenses in MN:	$17,577	Travel to sites, meals, lodging during field work
Other:	$18,890	DNR Direct and Necessary*
TOTAL ENRTF BUDGET:	**$245,000**	

*Direct and Necessary expenses include both Department Support Services (Human Resources, IT Support, Safety, Financial Support, Communications Support, Planning Support, and Procurement Support) and Division

Support Services. Department Support Services are described in the agency Service Level Agreement, and is billed internally to divisions based on rates that have been developed for each area of service. These services are directly related to and necessary for the appropriation. Department leadership services (Commissioner's Office and Regional Directors) are not assessed. Division Support Services include costs associated with Division business offices and clerical support. Those elements of individual projects that put little or no demand on support services such as large single-source contracts, large land acquisitions, and funds that are passed-thru to other entities are not assessed Direct and Necessary costs for those activities.

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:
2

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:
0.75

B. Other Funds:
No other funds will be used for this part of the project.

VII. PROJECT STRATEGY:

A. Project Partners: Minnesota Zoo

B. Project Impact and Long-term Strategy: Extensive survey efforts in MN directed at the Poweshiek skipperling and Dakota Skipper from 2006 to 2013 have pointed to a steep decline in both, to the point that Poweshiek may be extirpated and Dakota skipper may be close to meeting the same fate. Survey work in other states in these skippers' ranges are yielding similar results. Although the other species have been the target of comparable survey work, there are troubling indications of declines. This project will assist the DNR in broadening the scope of survey and monitoring efforts for prairie-dependent butterflies. The immediate benefit will be the discovery of surviving colonies of one or both of the two highest priority species. This will support the Zoo's genetic study and captive breeding project for these species. Initiation of the complementary monitoring of individual populations will provide the foundation for a higher-resolution tracking of population trends and for detection of causation.

Monitoring is obviously a long-term commitment, and this project will constitute only the beginning. We intend this project to develop monitoring protocols that will be used long-term. We will be working on strategies for funding the long-term work.

C. Spending History:

Funding Source	M.L. 2008 or FY09	M.L. 2009 or FY10	M.L. 2010 or FY11	M.L. 2011 or FY12-13	M.L. 2013 or FY14

VIII. ACQUISITION/RESTORATION LIST:

IX. VISUAL ELEMENT or MAP(S):
See attached Map of survey sites superimposed on Prairie Plan map.

X. ACQUISITION/RESTORATION REQUIREMENTS WORKSHEET:
No acquisitions or restoration work is included in this part of the project.

XI. RESEARCH ADDENDUM:
See Research Addendum which is part of the separate MN Zoo work plan.

XII. REPORTING REQUIREMENTS:
Periodic work plan status update reports will be submitted no later than Nov. 30, 2014, May 31, 2015, Nov. 30, 2015, May 31, 2016, Aug. 15, 2016, Nov. 30, 2016, May 30, 2017. A final report and associated products will be submitted no later than June 30, 2017.

Final Attachment A: Budget Detail for M.L. 2014 Environment and Natural Resources Trust Fund Projects

M.L. 2014 Project Budget

Project Title: Imperiled Prairie Butterfly Conservation, Research, and Breeding Program –MN DNR part

Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 05j-2

Project Manager: Robert Dana, Ph. D.

Organization: MN Dept. of Natural Resources - Activity 3 only - Activities 1, 2,4 and 5 are in a separate Work Plan by the MN Zoo

M.L. 2014 ENRTF Appropriation: $ 245,000.00

Project Length and Completion Date: 3 Years, June 30, 2017

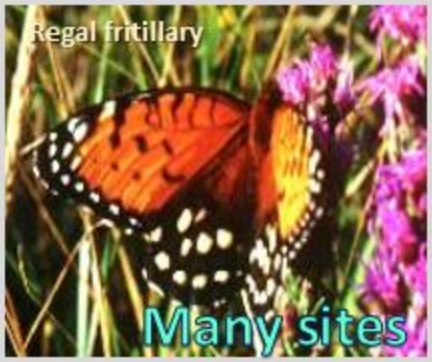
Date of Report: November 30, 2016

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 3 Budget	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	**DNR Butterfly**				
Personnel (Wages and Benefits)	$98,075	$98,070	$5	$98,075	$5
Robert Dana, Lead Entomologist. $98,500 (75% salary, 30% benefits); 1 FTE for 2 years				$0	$0
Assistant Entomologist. $50,000 (75% salary, 30% benefits); 1 FTE for 2 years				$0	$0
Professional/Technical/Service Contracts				$0	$0
TBD (competitive bid); site surveys to detect presence of target butterfly species; quantitative monitoring in selected sites.	$109,900	$109,900	$0	$109,900	$0
Equipment/Tools/Supplies				$0	$0
1 GPS-enabled field data recorder (Trimble Juno 3B)	$0	$0	$0	$0	$0
ArcPad software for Juno	$0	$0	$0	$0	$0
Kestrel 2500 Pocket Weather Meter	$0	$0	$0	$0	$0
Miscellaneous field supplies	$558	$556	$2	$558	$2
Travel expenses in Minnesota Mileage, lodging, meals for travel to and among survey/monitoring sites	$17,577	$17,576	$1	$17,577	$1
Other DNR Direct and Necessary	$18,890	$18,890	$0	$18,890	$0
COLUMN TOTAL	**$245,000**	**$244,992**	**$8**	**$245,000**	**$8**

* Activities 1, 2 and 4 are in a separate budget sheet by the MN Zoo - Erik Runquist Project Manager

Minnesota's Thirteen Prairie Butterflies

Results of surveys of 63 prairie sites 2014-2016



✖ None observed

Except as noted, all photos by R. Dana

DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND