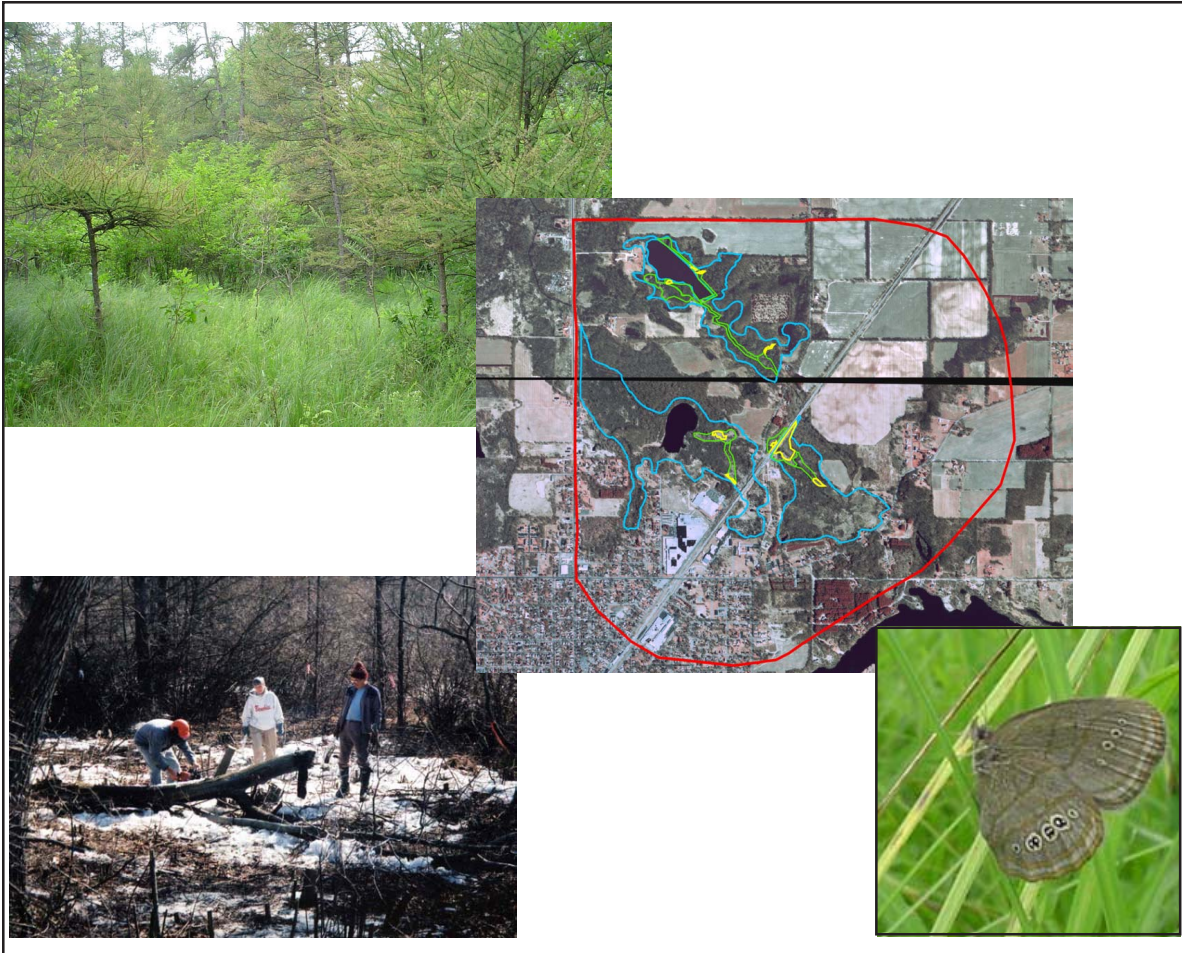


**Conservation of Mitchell's Satyr Butterfly
(*Neonympha m. mitchellii*)
and Eastern Massasauga Rattlesnake (*Sistrurus c. catenatus*)
in Southwest Michigan: Final Report - 2004**



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Introduction

The Mitchell's satyr, *Neonympha mitchellii mitchellii* French, is a federally-listed endangered species now known from only 17 sites in southern Lower Michigan and two sites in northern Indiana. The satyr was listed by the USFWS in 1992. To reclassify to federal threatened status, 16 geographically distinct populations or metapopulations must be established range wide, including 12 in Michigan; to de-list, nine more populations must be established (U. S. Fish and Wildlife Service 1997). These populations must remain viable for five consecutive years following reclassification, which will require a valid, repeatable monitoring protocol. At least 15 of the 25 recovered populations also must be protected and managed for the benefit of this species. Currently, only nine occupied sites in Michigan are considered to have any potential to contain viable populations. Satyrs at the remaining sites typically occur in much lower numbers or the amount of suitable habitat is limited in size or by threats to the site, making their long-term viability uncertain.

Various factors have contributed to the decline of Mitchell's satyr; the most important may be the loss and disruption of suitable habitat. The known historical range for the species in Michigan, Ohio and Indiana coincides with prime agricultural area, and farming and other development activities have heavily impacted much of it. Wetland alteration or complete draining has resulted in the loss of the single known Ohio population of the butterfly, and several sites in Michigan (U.S. Fish and Wildlife Service 1997). Other alterations to hydrology include the removal of forest cover from adjacent uplands, drain tiling of adjacent fields, digging of ponds and ditch or drain maintenance. Road development has, in several cases, divided fens and changed water flow to the extent that former fen habitat has been converted to plant communities unsuitable for the satyr.

Much of the species biology is largely unknown, although general accounts of closely related species (e.g. *N. m. francisi*, *Satyrodes eurydice*, *S. appalachia*, *Megisto cymela*) may be applicable. Observations of captive larvae by McAlpine et al. (1960), caged larvae by Legge and Rabe (1996), and larvae and pupae *in situ* by Szymanski (1999b) provide some insight into the species' basic biology and can be used to clarify protection and management goals. Several biologists, most recently Iftner et al. (1992), Legge and Rabe (1996), Rogers et al. (1992), Sferra and Darnell (1993), Szymanski (1999b), Hyde et. al. (1999) and Clampitt (2000) have reported observations of adults. A recent summary of much of this information has been provided by Szymanski (1999a) and Hyde (2000). Darlow (2000) provides a detailed understanding of the behavior, habitat usage and oviposition of this butterfly in his work at two of the occupied satyr sites. Further analysis of the butterfly's habitat was summarized by Kost (2000) who identified key vegetation characteristics common to occupied satyr sites. In the report by Rabe et. al. (2002), a GIS-based habitat model was used to aid in the identification of potential release sites for Mitchell's satyr. Barton (2003) conducted an extensive mark-recapture study at a site in Jackson County which provides useful information on estimated population size, distribution, movement and habitat use by the satyr.

Field studies continue to be extremely difficult for this species because of its ephemeral nature, the fragility of its habitat, the short survey window, and the difficulties in observing this species. Despite these challenges our understanding of the satyr's biological and ecological requirements and habitat affinities has increased over the past several years. In addition, site conservation plans have been completed for over half of the occupied sites and at some sites management is already being implemented.

Michigan Natural Features Inventory (MNFI) has been working to determine the status and distribution of the satyr in Michigan since the 1980s. Wilsmann and Schweitzer (1991) have summarized much of the early work. With support from the U.S. Fish and Wildlife Service surveys continued into the 1990s in attempts to locate new extant sites, reconfirm historical occurrences, and monitor the butterfly's presence at known locations (Federal Aid in Endangered Species, Michigan Projects E-1-24, E-1-25, E-1-26, E-1-28, E-1-29 and E-1-30).

In 1995 and 1996 MNFI ecologists conducted an analysis of historical habitat at Mitchell's satyr sites with financial support from the Frey Foundation. This project was an attempt to more clearly identify the critical habitat components of Mitchell satyr habitat, to improve the likelihood of locating additional extant populations and to better understand the present status and distribution of the species. Infra-red aerial photos from 1978, black and white aerial photos from 1938-40, and vegetation maps from 1816-1826 prepared by Comer et al. (1995), were examined for each of sixteen extant and extirpated satyr populations (MacKinnon and Albert 1996). Community types with potential for satyr habitat were mapped including wet prairie, shrubby meadow, and tamarack swamp. Known sites and those sites where previous surveys were unsuccessful were mapped. Drainage systems that contained both satyr populations and probable satyr habitat were examined and sites were prioritized for future surveys. This analysis resulted in the identification of nearly 100 sites with potential satyr habitat.

Beginning in 1996, MNFI ecologists surveyed 30 sites within the larger watersheds containing known Mitchell's satyr populations. Their goal was to identify high quality prairie fens and other fen-associated elements. Ten of these sites had suitable Mitchell's satyr habitat and were revisited during the satyr summer flight period by both ecology and zoology staff. These surveys resulted in the discovery of two new Mitchell's satyr populations at Jackson County East and St. Joseph County East. In addition, zoology staff conducted Mitchell's satyr larval studies at Jackson County Central, an occupied fen complex (Legge and Rabe 1996). Also in 1996, the first meeting of the Mitchell's Satyr Working Group was held. The Group has provided a forum for a regular exchange of information between parties actively working on satyr recovery in Indiana and Michigan facilitates the coordination and cooperation of partners in the Midwest and provides regular input to the Fish and Wildlife Service.

Continuing in 1997, MNFI staff surveyed a total of 39 sites in eight southern Michigan counties for Mitchell's satyr; no new occupied sites were found. Five of the sites visited were identified as having quality prairie fen communities present with potential satyr habitat, and were targeted for future surveys.

From 1998 through 2000, MNFI completed a three-year study (funded by USFWS). This project allowed us to identify the most significant populations of *Neonympha m. mitchellii* in Michigan and assess their current condition including threats to existing populations and their habitat. We identified potential sites that may be suitable for reintroduction or translocation efforts in order to meet recovery goals in Michigan. We collected information on associated rare species and began to coordinate habitat management and restoration efforts for the satyr. As a result of this project MNFI began monitoring known populations, and accumulated 2-3 years of data on key sites. A summary of work completed in 1998, 1999 and 2000, can be found in Hyde et al. 2000.

In 2000, MNFI began a three-year study (funded by the USFWS). Because the vast majority of Mitchell's satyr butterfly populations and a large number of massasauga populations occur on private lands subject to potentially incompatible use, the primary needs for both of these rare species were identified as: 1) landowner contact and education, 2) protection of critical habitat on privately owned lands, and 3) development and implementation of habitat management plans. Our past experience with landowner contact and education convinced us that an established local presence was essential for successful long-term conservation on private lands. Because our centralized Lansing based program could not provide this local presence we initiated a contract with Southwest Michigan Land Conservancy for this project. Locally-based organizations, such as land conservancies, are valuable partners because they have an established relationship with the community, a good understanding of local politics, landscapes, and culture, and are readily accessible. By working with a local land conservancy, landowners can have better, more consistent access to technical assistance, protection tools, and land management resources. In addition, the

conservancy can build strong relationships with key landowners, which could lead to the permanent protection of critical habitat for Mitchell's satyr and the eastern massasauga.

This report summarizes the work completed and highlights relevant findings. Objectives for this project are listed below.

OBJECTIVES

1. Train Southwest Michigan Land Conservancy staff in identification, life history, habitat, and management needs of Mitchell's satyr and eastern massasauga rattlesnake.
2. Inform targeted landowners in southwest Michigan (Allegan, Barry, Berrien, Branch, Calhoun, Cass, Kalamazoo, St. Joseph, and Van Buren Counties) that their property contains, or provides suitable habitat for, Mitchell's satyr butterfly and other rare animals and plants.
3. Provide landowners with ecological and management information to enhance their awareness and understanding for the special habitat and features that occur on their property, and to help them make good conservation-based land use decisions.
4. Offer landowners in southwest Michigan the opportunity to voluntarily protect Mitchell's satyr, its habitat, and associated rare species that occur on their property either through a non-legally binding agreement such as a registry, or through a permanent legally binding option such as a conservation easement, gift, or acquisition.
5. Conduct systematic *de novo* surveys for Mitchell's satyr on lands with suitable habitat that are adjacent to existing satyr populations, and monitor existing satyr populations in southwest Michigan.
6. Develop a site conservation plan at each Mitchell's satyr site in southwest Michigan site. Major components of a site conservation plan include: information and analysis; documentation of historical and current land use; a protection plan; and a site management plan.
7. Initiate the formation of a volunteer stewardship team at each Mitchell's satyr site in southwest Michigan to implement management and monitoring activities identified in site conservation plans that would benefit the satyr, massasauga, and other associated rare species. Conduct management activities at selected sites.

Methods

Landowner Contact

Early in the project MNFI met with SWMLC and discussed landowner contact and education as well as satyr survey methodology. A copy of landowner contact letters which had previously been sent to individuals at known or potential satyr sites were shared with SWMLC in order to provide them with a history of landowner contact and to insure that contact and education efforts were continued in a consistent manner. A list of all landowners that have properties occupied by the satyr as well as those who have potential habitat for the satyr and other prairie fen associated species was provided to SWMLC. Each spring during the project SWMLC staff contacted all landowners of occupied satyr sites to request permission to monitor the satyr on their property. In addition some landowners of fen habitat with potential for the satyr were contacted as well. This contact most often was conducted over the phone to provide an opportunity to address any questions or concerns more directly. Staff at SWMLC kept track of all contacts with targeted landowners using an organized filing system, entered the data into their land project tracking database. Landowners were invited to accompany staff during the surveys so they could learn to identify the satyr and other fen plants and animals. Occasionally they did join staff in the surveys and in some cases participated in the monitoring activities. In the fall of each year, landowners were sent a letter thanking them for their cooperation and support and were informed of the results of the surveys. In addition, follow up meetings with some landowners occurred at their homes to discuss the design and implementation of management activities to conserve satyr habitat.

Training

The first step identified in order to achieve the goals and objectives of this project was to build the capacity of SWMLC by providing them with needed information and expertise. On June 27, 2001, MNFI provided a one-day workshop to three staff from SWMLC as well as 18 volunteers targeted to work on this project. The morning session focused on identification and life history of Mitchell's satyr and associated rare species, threats to the satyr and its habitat, management considerations, survey methodology, landowner contact, site confidentiality and safety considerations. The afternoon session provided participants with an opportunity to identify the satyr and other associated prairie fen plants and animals in the field as well as provide instructions in survey methodology. This afternoon training session was the first day spent in the field monitoring known satyr sites and collecting data.

The following year SWMLC provided a one-day workshop on the identification and ecology of the Mitchell's Satyr Butterfly and associated rare species on June 28, 2002. Three SWMLC staff participated in the training as well as 9 volunteers, including two landowners and land managers from a private foundation that own property with potential satyr habitat in Cass County. The workshop provided an overview on the ecology and status of the Mitchell's Satyr Butterfly as well as protocol for conducting surveys for the Mitchell's satyr, massasauga and other rare fen species. On June 30, 2003 SWMLC provided a one-day workshop for 10 volunteers on the identification and ecology of the Mitchell's satyr butterfly as well as protocol for surveying sites.

Mitchell's satyr monitoring and surveys

In 2001, MNFI provided 3 staff to act as team leaders during surveys for the Mitchell's satyr, eastern massasauga and associated rare species. SWMLC provided 3 staff and 15 volunteers to participate in the surveys. MNFI met with SWMLC on November 1, 2001 to organize and compile data from the 2001 field surveys. The group decided on how to best summarize data, evaluated our 2001 efforts, and discussed what worked well and potential improvements for next year. We also outlined a 2001-2002 work plan and clarified the roles of MNFI and SWMLC.

In 2002, SWMLC organized and supervised 3 staff and 9 volunteers to conduct surveys for Mitchell's satyr, massasauga and associated rare species. In 2003, SWMLC organized and supervised 2 staff, 4 interns and 8 volunteers to participate in surveys for satyr and other associated rare species. All sites where permission was granted were visited at least twice, many three times. *De novo* sites were surveyed in Kalamazoo, Barry, Van Buren and Cass counties totaling 4 potential sites in 2002 and 2003.

Timed meander surveys were conducted at all sites. Surveyors recorded the date, site name, landowner name, weather conditions, the number of surveyors, the amount of time spent searching for the satyr in suitable habitat, the number of satyrs counted, the sex of the satyrs observed (if able to distinguish) other rare species seen, and any threats to the satyr and its habitat that were documented on field forms provided. Field forms were submitted to SWMLC and the forms were copied with the originals sent to MNFI. MNFI staff submitted the data for inclusion into the statewide database of rare and declining plants, animals and natural communities. GPS data of satyr locations and habitat boundaries were collected from most of the occupied sites by MNFI and SWMLC staff. This contributes to more informed conservation planning at satyr sites.

Educational Materials

MNFI and SWMLC conducted an inventory of available educational resources and identified additional educational needs associated with this project. It was determined that materials included; a Mitchell's satyr poster produced by MDNR Natural Heritage Program; a brochure on the eastern massasauga, produced by the Detroit Zoo; a brochure on prairie fen, bogs and marshes, produced by SWMLC; and abstracts on rare plants, animals and natural communities (including the Mitchell's satyr, eastern massasauga, and prairie fens) produced by MNFI. We determined that it would be most useful to produce a brochure on prairie fens targeted towards landowners which highlights rare species found in this community, especially the Mitchell's satyr and eastern massasauga, and which outlines stewardship activities needed to maintain this community.

Site Plans

Work on developing a matrix to prioritize satyr sites for conservation was initiated by MNFI and SWMLC at a meeting held on December 13, 2001. The matrix was designed to reflect various factors, which are important to consider when prioritizing these sites for management and restoration. They include landowner cooperation, size of site, restorability and potential for expansion, degree of threat, population size and urgency. The matrix was completed and ten sites within the jurisdiction of SWMLC (where permission to survey has been granted) were run through the matrix and scored. The sites were then ranked and put in order of priority.

The writing of site conservation plans was initiated in April 2002. Site conservation plans were written to serve as a blueprint for future protection, inventory, outreach, and stewardship activities. Nine site plans were completed for the sites which occur in the SWMLC service area in southwest Michigan. A brief description of each section in the plan follows:

- ❖ **Site Information, Analysis and Description:** This introductory section of each plan is intended to provide a overall description of the site including: geographic information, geology of the site, land use history, and land cover change between four time periods (circa 1800, 1938, 1978 and 1999).
- ❖ **Conservation Targets and Goals:** Although the primary goal is to protect, maintain and enhance the population of Mitchell's satyr and its habitat at each site, the specific objectives for each site vary depending on the viability of the population, the level of threat, the degree of habitat degradation, and the presence of other rare species.
- ❖ **Ecological Information:** This section provides a brief summary of what is currently known about the Mitchell's satyr including: life history characteristics, habitat requirements, key ecological processes which maintain prairie fen vegetative structure and activities which disrupt these processes.
- ❖ **Conservation Zones:** This portion of the plan delineates three core areas for differing levels of protection. The primary zone requires the most protection as this is the area which is occupied by the Mitchell's satyr. The secondary zone includes wetlands which currently or historically provided potential habitat for the satyr. The tertiary zone includes the surrounding groundwater recharge area which has the potential to affect the satyr and its habitat.
- ❖ **Mitchell's Satyr Observations:** This is a compilation of recent satyr observations at each site which is provided as a general reference. Since there are a number of environmental and human factors which influence the number of satyrs counted on any given day, these numbers are not intended to be used to deduce population trends or to infer population viability.
- ❖ **Threat Assessment:** Based on the current knowledge of each site, an assessment was conducted to identify known or potential threats (and the sources of these threats) which could compromise the viability of a satyr population.
- ❖ **Conservation Strategies and Management Techniques:** This section outlines the conservation strategy which the authors believe will assist in protecting and maintaining the satyr and its wetland habitat. Where complete information is available, we have attempted to provide very specific goals (# of acres and type of management) for specific areas at each site. Where information is lacking, we have done our best to outline a general strategy. Management techniques which could be utilized and protocols for implementing this management are also included.

- ❖ **Stakeholder Assessment and Feasibility Analysis:** This is an assessment of the perceived level of cooperation, interest and role of the landowners and stakeholders at each site. It also provides an estimate of how feasible the conservation goals for each site may be and the factors which may influence the success of the conservation strategy.
- ❖ **Implementation:** This section is essentially a prioritized timeline and task list which supports the implementation of the conservation strategy for each site.
- ❖ **Monitoring, Evaluation and Measures of Success:** The final portion of each site plan is intended to provide a means for evaluating and measuring the success of the conservation strategy. Ecological and land protection goals are outlined and specific objectives for measuring and evaluating progress are provided.

Restoration and Management

Throughout the project SWMLC has continued to develop positive relationships with local landowners that own fen and/or satyr habitat. They discuss with landowners various land protections options which are available which could provide long-term benefits to the satyr and fen habitat including: conservation easements, extinguishing development rights to preventing subdivision and incompatible use, as well as donation or acquisition of property. In addition, SWMLC has begun to implement much needed management at several satyr sites (**See Appendix 2-Attachment 5: SWMLC Fen Management**).

Working Group coordination

Coordination of activities with the Mitchell's satyr working group has been an essential element of this project. This coordination has provided a forum for meaningful discussion, valuable guidance for the design of research studies and implementation of management at satyr sites and a means for sharing important resources.

Results and Discussion

Landowner Contact

Over the past 3 years SWMLC and MNFI have had many positive discussions with landowners. These conversations took place over the phone, through correspondence, face to face at the landowner's home and walking their property with them. Topics covered the status, life history and habitat requirements of the satyr and the eastern massasauga, threats to these species and their habitat, the landowner's goals for their property, potential management activities that would help to restore satyr and massasauga habitat and programs and resources available to landowners who wish to improve habitat on their property. In addition opportunities to conserve these species and their unique habitat in perpetuity through conservation easements, extinguishing development rights, or donation or selling of property to a land conservancy organization were discussed. Landowners were provided with educational materials by mail or in person which included biological, ecological, management and protection information.

In May of 2001, SWMLC contacted 40 landowners and received permission to survey 31 properties. These landowners included those in southwest Michigan with satyr on their property as well as some landowners with prairie fen and potential for the satyr. In 2001, two landowners at two sites assisted with surveys for the Mitchell's satyr and eastern massasauga. It provided a good opportunity to learn more about their land while providing them with a better understanding of the status and ecology of fen-associated species.

In May of 2002, SWMLC contacted 28 landowners and received permission to survey 26 properties. Again, these landowners included those with the satyr on their property as well as landowners with potential for satyr habitat. Three landowners at two sites participated in conducting surveys for the Mitchell's satyr and eastern massasauga. Through their knowledge of their land, these landowners assisted SWMLC in finding

additional occupied habitat. These particular landowners are very interested in initiating management activities, such as shrub removal, to benefit the satyr and other fen-associated species.

In 2003, SWMLC contacted landowners of occupied sites during the month prior to the satyr flight and received permission to conduct surveys at 27 sites. During visits to monitor the satyr, SWMLC had many positive discussions with landowners, and individuals at four satyr sites expressed that they are very interested in actively supporting conservation efforts for the satyr on their property.

One of these satyr sites occurs in Branch County and appears to have a relatively large population of butterflies and ample habitat (30 acres). This site is owned by three different landowners. In the fall of 2003, staff from MNFI and SWMLC met with each of the landowners in their homes. Our goal was to discuss with them their vision and plans for their land and better understand what they value about their property. We also wanted to share with them the status of the satyr on their land, the importance of this site to the species as a whole and to discuss with them potential management activities outlined in a site conservation plan which could be implemented to maintain and improve habitat for the butterfly.

We were very pleased with the results of these discussions and plans are underway which will ultimately benefit the private landowners on these three properties and the Mitchell's satyr butterfly. One of the landowners has a cow-calf operation and currently has approximately 100 head of cattle at any one time. During dry years, when the cattle run out of pasture or water, the landowner has allowed the cattle to graze in an around the vicinity of the prairie fen and to drink from the stream on the other side of the fen. There were well worn paths in the fen which resulted in soil compaction and the creation of very tall hummocks. Although grazing has in the short term kept the fen more open, it has also impeded the regeneration of tamarack and contributed to the establishment of purple loosestrife and cattails due to disturbance and nitrification. It is also likely that this has had a negative impact on satyr eggs and larvae. After discussions with the landowner it was agreed that MNFI would release the *Galerucella* beetles as a biological control for the purple loosestrife this spring and the landowner would keep the cattle out the fen in the spring and early summer to allow the beetles to become established. In addition we will pursue funding for an alternative water source for the cattle (i.e. wind or solar powered water pump), so that the cattle do not need to access the fen and the stream.

Another landowner would like to cut horse trails through their property so they can use their land for private recreation. Since the habitat the satyr occupies is too wet and soft for this purpose and obviously would be incompatible with satyr conservation, it was agreed that MNFI and SWMLC would assist the landowners in marking areas where they can cut trails that will meet their needs but be placed in areas unsuitable for the satyr. They agreed to assist us with cutting a connecting corridor between two isolated satyr populations which will improve the viability of this population. The third landowner primarily uses the property for hunting and agreed to assist us in cutting connecting corridors through occupied and unoccupied habitat. This will provide the landowner with hunting lanes and help to improve the connectivity and suitability of the habitat for the satyr. We are confident that the foundation has been built for a positive partnership with the private landowners at this site that will ultimately aid in the conservation of a rare species.

Training

The efforts put into providing training to SWMLC staff and volunteers appear to be successful. The number of people who can confidently identify the Mitchell's satyr, eastern massasauga and other fen-associated plant and animals has increased from a small group of staff at MNFI and TNC (The Nature Conservancy) to include 3 staff and over 30 volunteers at SWMLC, 3 staff at USFWS and many local landowners of occupied habitat. As a result more sites can be efficiently monitored in a shorter period of time. This is particularly beneficial given the short flight period of the satyr. In addition, many of the staff and volunteers have local ties to the communities where they are conducting surveys and may be more likely to earn the trust of landowners and develop positive long term relationships with them.

It is becoming increasingly important to record locations of satyrs with GPS technology so that management activities can be carefully planned to avoid negative impacts on satyr populations and other rare fen species. In addition, it will be important to document oviposition sites and female activity areas to avoid impacting these critical areas of habitat. It remains to be seen if volunteers can be trained to use GPS units and whether there are sufficient resources to supply them with the equipment. It may be unrealistic to expect volunteers to correctly distinguish female satyrs from male satyrs and to commit the time needed to document oviposition at satyr sites.

Satyr Monitoring and Surveys

In 2001, a total of 67 visits were made to 24 properties (9 sites) during the flight season. The distribution of satyrs at known sites was expanded at two locations in St. Joseph and Van Buren counties as newly occupied habitat was found. In 2002, a total of 59 visits were made to 26 properties (9 sites) and *de novo* surveys were conducted at 2 sites. The distribution of satyrs at known sites was expanded at three locations in Branch, St. Joseph and Van Buren counties. In 2003 a total of 75 visits were made to 24 properties during the flight season and *de novo* surveys were conducted at one site. Satyrs were discovered occupying additional habitat at two sites in Branch and Cass counties. (See **Appendix 1 -Satyr observations 2001-2003 and Appendix 2- SWMLC Mitchell's Satyr Project Report**).

In 2001, the massasauga rattlesnake was documented at two sites during surveys for the Mitchell's satyr in Cass and Van Buren counties. In addition, a landowner reported a sighting of a massasauga at a satyr site in Berrien county. Other occurrences of rare species documented during satyr surveys include: cerulean warbler (*Dendroica cerulea*), two occurrences of eastern box turtle (*Terrapene c. carolina*) and spotted turtle (*Clemmys guttata*). In 2002, box turtles were seen at 4 locations during satyr surveys at sites in Barry, Berrien, Cass and Van Buren counties. In 2003, eastern massasauga was observed at one satyr site in Barry County by the MDNR and MNFI, and box turtle was documented at 3 satyr sites in Barry, Cass and Kalamazoo counties.

Educational Materials

After meeting with SWMLC and USFWS, it was decided that what was most needed to supplement existing educational materials was a "user friendly" color publication on fens based on the "Borne of the Wind" booklet written by MNFI staff and produced by MSU extension (Albert 2000). SWMLC has produced a draft publication as a foundation for such a publication which includes information on prairie fen ecology, threats to fen habitat, management strategies for maintaining and restoring fen habitat and numerous color photos of fen flora and fauna and the natural processes which maintain this habitat. MNFI is currently in the process of identifying and securing funds to underwrite the costs involved with editing and further refining this draft material and publishing a high quality educational booklet on prairie fens. (See Appendix 2: Attachment 1- Prairie Fen Booklet). Carrie Tansy produced a one page "user-friendly" handout about the Mitchell's satyr butterfly for distribution to landowners and the general public (See **Appendix 3- USFWS Satyr Handout**).

Site Conservation Plans

Detailed site conservation plans have been completed for nine Mitchell's satyr sites which occur in southwest Michigan within the service area of SWMLC. These plans are intended as a guide for directing conservation activities on lands where the Mitchell's satyr occurs that will benefit this butterfly, its wetland habitat, and associated plants and animals. These plans have been compiled in a notebook which ultimately will include fourteen site conservation plans written by MNFI. Site plans will not be written for two sites owned by TNC and the Berrien County South site which already has a plan written by Szymanski and Shuey (2002). The remaining 5 site conservation plans (including sites in SE Michigan and 2 state owned sites in Barry County) will be written under a current Section 6 grant with USFWS within the next 3 years. The notebook of plans has been distributed to Carrie Tansy, East Lansing office of USFWS, Matt Herbert, acting Endangered Species Coordinator, MDNR, and SWMLC and MNFI. (See **Appendix 4-Site Conservation Plan Cover Pages**).

Because the Mitchell's satyr butterfly is so rare, it is highly vulnerable to collection. Many private landowners that have this butterfly on their property are reluctant to share information about their land with public agencies and the general public due to concerns about unwanted regulation or trespassing. For these reasons, none of the Mitchell's satyr site conservation plans are intended for general distribution, copying or sharing without prior permission from the authors.

Although every effort was made to learn as much as possible about these sites, the information is still incomplete. We have a good understanding of some sites where we have developed positive working relationships with the landowners and have the resources to do annual monitoring surveys. At other sites we have had limited success in gathering information due to the inability to gain permission to conduct surveys, or limited resources to thoroughly survey very large sites or safely access all of the potential habitat.

These plans have already proved to be very useful in guiding the planning and implementation of stewardship activities, providing pertinent information to MDNR Landowner Incentive Program staff in coordinating management activities on satyr sites, and supplying important information to MDNR staff applying for funds to acquire land under the Endangered Species Habitat Acquisition Program. Overall, the plans provide a very thorough understanding of the status, threats and management needs at each satyr site, and give specific recommendations and timelines for initiating conservation activities at these sites. The plans will assist the USFWS in reviewing proposed management and research activities, and should streamline the process for implementing much needed management at these sites.

Restoration and Management Activities

Management activities have already been initiated at 4 sites (6 different properties) in Berrien, Branch, Cass and Van Buren counties. Work at 3 sites was conducted by SWMLC staff and volunteers in unoccupied areas adjacent to occupied satyr habitat during late February and early March 2004 (See Appendix 2: Attachment 4- Maps and Photos of Site Management). MNFI staff released the *Galerucella* beetle on a landowner's property in Branch County in May 2004, in an attempt to control purple loosestrife that is invading the satyr site there. MNFI will continue to monitor the impacts of the beetle release at this site. Overall landowners have been very supportive of stewardship activities and more management is slated over the next several years at a number of sites (**See Appendix 2: Attachment 5- SWMLC Fen Management**).

The goal of developing a local stewardship team has been formed with SWMLC staff and volunteers. They have a committed group of 8 volunteers who have conducted monitoring at sites on a yearly basis and who have expressed an interest in continuing surveys at sites which have become familiar to them. In addition SWMLC has a group of between 10-20 volunteers that they can call on to conduct shrub removal at sites during the winter, summer and fall under SWMLC supervision.

SWMLC has determined that areas where much of the critical brush removal is needed at satyr sites occurs in unoccupied habitat. They recommend that unoccupied openings be expanded and corridors extended to within 10 - 20 meters of occupied habitat during the summer and fall, except during the Mitchell's satyr flight season when all work should be suspended. Work during the dormant season could focus on expanding occupied habitat to connect to the areas in unoccupied habitat where management has occurred. SWMLC has found that the maps and GIS shape files from the site conservation plans were very useful in directing management activities at the sites where they did work since workers were able to maintain at least a 10 meter buffer to avoid accidental take. SWMLC has found that power equipment is more efficient to use for shrub removal and recommend that hand tools only be used in occupied habitat to minimize negative impacts (**See Appendix 2- SWMLC Mitchell's Satyr Progress Report**).

Working Group Coordination

The Mitchell's satyr working group has been instrumental in guiding monitoring, research and management at satyr sites. MNFI and SWMLC have attended working group meetings throughout the project and have reported to the group on the results of landowner contact, training, monitoring and surveys, site conservation planning efforts and management activities. It has been useful to interact with other members of the group and to collaborate and learn from each other.

Future Efforts and Recommendations

SWMLC will continue to monitor 5 of the 9 sites in their service region on an annual basis. They have also committed to conducting management activities at 7 of the 9 sites in their area. SWMLC is currently negotiating agreements with landowners to purchase property at occupied sites and to protect land through conservation easements.

MNFI received funding through the USFWS Sec. 6 grant program for FY 2003-2005. The objectives of this project are to survey for new populations, monitor extant populations (at sites not monitored by SWMLC or TNC), provide current site occurrence information at least yearly to agencies, study habitat disturbance response (at sites receiving active management) and develop site conservation plans for the remaining 5 satyr sites in Michigan.

Barbara Barton, and EMU graduate student, conducted a mark recapture study at Jackson County Central in 2003. Her results provided a much more optimistic estimate of the population at this site than what was originally thought. In addition, her results indicate that satyrs (at least at large sites) have the ability to travel longer distances than has been found at other sites in Berrien County. In addition, the GPS locations of the satyrs are primarily distributed in areas close to cover (shrubs or trees). She will conduct oviposition observations at this site in 2004 and will initiate a mark-recapture study at a site in Washtenaw County. The results of her work in Washtenaw County will guide management activities which will commence in the winter of 2004-2005 at this site.

The Landowner Incentive Program, funded by the USFWS and administered by MDNR biologists couldn't have been initiated at a more opportune time. Over the past several months MNFI and SWMLC has worked closely with LIP biologists to recommend and coordinate the initiation of specific management activities at satyr sites on private land. Projects are currently being planned at a number of sites and work should begin this fall and winter.

Pete Tolson at the Toledo Zoo has initiated a captive breeding program for the northern eyed brown (*Satyroides eurydice*) which is closely related to the Mitchell's satyr. If these efforts are successful then a captive breeding program for the Mitchell's satyr could be instituted as a repository of butterflies for reintroduction at historical locations or for introduction at sites with suitable habitat. If successful this effort could accelerate our progress towards recovery of this species.

Genetic research has been initiated to determine the taxonomic status of recently discovered butterflies in Alabama, Mississippi and Virginia, that closely resemble the Mitchell's satyr. Superficially the individuals from the three new populations key out to be *Neonympha m. francisci*, yet molecular analysis indicates they are actually more closely related to (nominated) *Neonympha m. mitchellii*. A more formal taxonomic revision is needed for the *Neonympha mitchellii* complex but if the three newly discovered populations are considered to be *N. m. mitchellii* this will greatly contribute to the recovery goals for this species (Goldstein et.al 2004).

It is an exciting time for those involved with Mitchell's satyr conservation because there are many resources available to assist with planning, management and land acquisition at satyr sites. With careful coordination between the various partner's it is conceivable that the recovery goal can be met for this species and the Mitchell's satyr butterfly and its habitat can be preserved for future generations to appreciate and enjoy.

Acknowledgements

There are a number of individuals and organizations that we would like to acknowledge for their contributions to this project and to the conservation of the Mitchell's satyr in Michigan. This project was made possible with funding by the regional office of the USFWS. Carrie Tansy USFWS, East Lansing Field Office, has provided instrumental leadership to the Mitchell's Satyr Working Group and has provided valuable assistance to this project. Helen Enander, MNFI Information Technologist, has provided critical technical assistance related to the interpretation and analysis of data in ArcView, and has been incredibly patient with those of us who are GIS neophytes. Dave Cuthrell, MNFI Zoologist has contributed greatly to the development of the site conservation plans and has provided wise counsel on the potential implications of management activities on the satyr and the need for careful monitoring of satyr populations' response to management. Mike Kost, MNFI Ecologist has provided his expertise and guidance to the Mitchell's Satyr Working Group and has offered valuable insights into fen ecology and stewardship. Barb Barton's research was conducted in a highly professional and comprehensive manner and has been very informative to the members of the Mitchell's Satyr Working Group. Finally, Nate Fuller and Jody Simoes, SWMLC, and partner's on this project, provided valuable knowledge and skills in the areas of land management and land protection and Peter Terlouw, SWMLC director has committed the resources of his organization to accomplishing the goals of this project.

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Appendices

Appendix 1-Satyr Observations 2001-2004

Appendix 2-SWMLC Mitchell's Satyr Project Report

Attachment 1-Prairie Fen Booklet

Attachment 2-2003 Survey Season Results

Attachment 3-SEMLC Contacts for Private Land Management

Attachment 4-Maps and Photos of Management

Attachment 5- SWMLC Fen Management

Attachment 6- Region 3 Section 6 Endangered Species Grant Proposal

Appendix 3-USFWS Satyr Handout

Appendix 4-Site Conservation Plan Cover Pages

Appendix 1

Satyr Observations 2001-2004

Number of satyrs observed at occupied sites 2000-2003

	2000		2001		2002		2003		Average #satyrs/4years
Official Site Name	#satyrs/# surv/hr	#satyrs/# surv/hr	#satyrs/# surv/hr	#satyrs/# surv/hr	#satyrs/# surv/hr	#satyrs/# surv/hr	#satyrs/# surv/hr	#satyrs/# surv/hr	
Barry Co. South	15/1/3	14/3/1.5	*8/1/1.5	6/1/1	11				
Barry Co. SW	8/2/1.75	4/3/1.25	*8/1/1.5	1/2/1	21				
Berrien Co. South	only transect data/mean daily	34/3/1.75	*6/2/2	7/2/1.75	16/3 yrs				
Berrien Co. North	only transect data/mean daily	32/4/1	60/2/1.5	28/2/1.5	40/3yrs				
Berrien Co. East			8	no data					
Branch Co. Site	147/2/4.75	103/2/3.75	110/1-2/4.25	130/2/5	123				
Cass Co. SW	86/2-3/4.25	77/2-4/?	*57/2/3	47/2/3	67				
Cass Co. East	24/2/3	*7/1/1	14/2/2	no data	15/3 yrs				
Jackson Co. West	14/1/1.5	no survey	no survey	no survey					
Jackson Co. Central	15/1/3.5	24/1/2.5	58/2/2.5	MR est-1106	32/3 yrs				
Jackson Co. East	26/1/7	no survey	no survey	no survey					
Kalamazoo Co. West	17/2/2	10/3/2.75	4/2/1.75	8/2/2.5	10				
Kalamazoo Co. North	8/2/2.5	*3/2/1.5	*1/2/1.25	2/2/2	4				
St. Joseph Co. West	15/1/3.75	10/3/3.5	23/2/2.5	17/3/2	16				
St. Joseph Co. East	6/2/2.5	*2/2/1.5	8/1/1.25	0/1/1	4				
Van Buren Co. NW	11/1/1.5	12/2/1.5	18/2/2	9/2/1.75	13				
Van Buren Co. Site	no survey	no survey	no survey	no survey					
Washtenaw Co. West	16/2/1.25	6/1/1.5	12/2/2	32/3/2	17				
note: Numbers reflect satyrs counted on one visit (highest recorded/visit/year)									
* not all occupied habitat surveyed									
Michigan Natural Features Inventory- (Daria Hyde)- 12/01/04 DO NOT DISTRIBUTE-CONFIDENTIAL INFORMATION									

Appendix 2.

SWMLC Mitchell's Satyr Project Report (See attached folder)

Appendix 3.

USFWS Satyr Handout



Mitchell's satyr butterfly

An Endangered Species



Scientific Name

Neonympha mitchellii mitchellii (French)

What does a Mitchell's satyr butterfly look like?

The Mitchell's satyr butterfly is a medium-sized, dark-brown butterfly, with eyespots (ocelli) on the margins of the undersides of the wings, and a pair of orange lines which encircle the rows of eyespots on both the forewings and hindwings. The upper surface of the wing lacks eyespots but it is thinly scaled and often the pattern on the underside shows through. Males tend to be smaller and darker than the females. Mature caterpillars (larvae) are pale green with pale, lateral stripes.



Photo by Dave Cuthrell

When can I see Mitchell's satyrs?

Mitchell's satyr adults fly for only three weeks of the year, usually in late June through mid-July. Females lay their eggs very close to the ground on the leaves of vegetation. The eggs hatch after about a week, and the caterpillars feed on grasses and sedges. The caterpillars are very small and can be quite difficult to find. Mitchell's satyr butterflies overwinter as caterpillars, likely burrowed under the ground.

Mitchell's satyr butterflies are often seen flying low over vegetation, with a characteristic slow, bobbing flight pattern. Females tend to be sedentary and typically move only short distances when disturbed. Males are usually more active as they patrol suitable habitat looking for females.

Where do Mitchell's satyrs live?

Mitchell's satyr are restricted to a unique type of wetland called a prairie fen, which is a low nutrient system that receives carbonate-rich ground water from seeps and springs. Mitchell's satyr butterflies are typically found in fens dominated by narrow-leaved sedges (such as *Carex stricta*), often in areas with scattered tamarack, shrubby cinquefoil, and poison sumac. Fens are also home to a variety of other rare and imperiled plants and animals.



Photo by Dave Cuthrell

Why are Mitchell's satyr butterflies so rare?

Loss of suitable fen habitat is the biggest threat to Mitchell's satyrs. Wetland alteration due to urban and agricultural development has eliminated habitat for this species. Loss of natural processes such as fires and flooding by beavers has increased the encroachment of surrounding forests. Also, invasion from exotic weeds and woody plants threaten the fens on which the butterflies depend. In addition to habitat loss, some sites have historically been exploited by collectors of rare butterflies.



Mitchell's satyr butterfly



Where are they found?

Although historically found in several states, including Michigan, Indiana, Ohio, New Jersey, and possibly Maryland, the range of this butterfly is now restricted to only 2 states. Mitchell's satyr butterflies are currently found in nine counties in southern Michigan and two counties in northern Indiana. This butterfly is found at only 19 sites in the entire world.

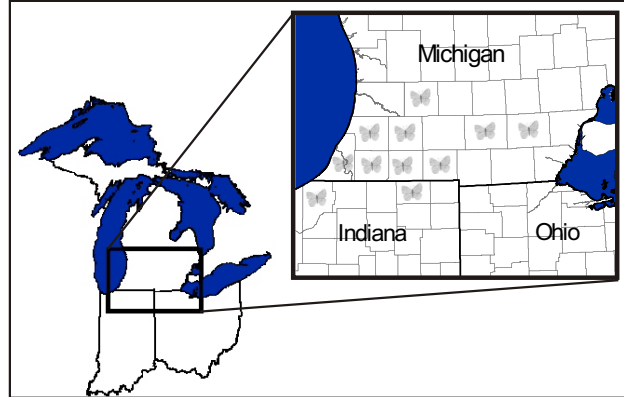
How can I help protect the Mitchell's satyr?

Learn more about the Mitchell's satyr and the potential threats to the species and its habitat. Support local conservation organizations that may be active in helping endangered species in your area.

If you think you might have Mitchell's satyrs or suitable habitat on your property, contact the U.S. Fish and Wildlife Service or Michigan Department of Natural Resources to obtain more information. Local universities or conservation organizations may be able to conduct surveys to determine if the species is present, and can help identify if management can be done on your property to create or maintain habitat for the satyr.

Because the Mitchell's satyr occurs on private lands, private landowner participation in conservation of this endangered species is critical to successful species recovery. Most landowners have not experienced any difficulties in co-existing with the satyr and are proud to be stewards of this very unique butterfly. Several programs exist to promote endangered species recovery on private lands. For more information, check out: <http://endangered.fws.gov/landowner/index.html>

Current county distribution of Mitchell's satyr butterfly



Protection under the Endangered Species Act

The Mitchell's satyr butterfly is protected under the Federal Endangered Species Act of 1973. The butterfly is listed as "endangered", which means that it is at risk of becoming extinct in the near future. The Endangered Species Act prohibits activities that might harm a listed species, and provides penalties for killing, injuring, capturing and harassing a listed species unless authorized by a permit from the U.S. Fish and Wildlife Service. The butterfly is also protected by Part 365 of the Michigan Natural Resources and Environmental Protection Act of 1994.

Where can I get more information?

For additional information on endangered species or Mitchell's satyr butterfly, please contact:

U.S. Fish and Wildlife Service
East Lansing Field Office
2561 Coolidge Road, Suite 101
East Lansing, Michigan 48823
517-351-2555



Prepared by the U.S. Fish and Wildlife Service, East Lansing Field Office, October 2003



Appendix 4.

Site Conservation Plan Cover Pages

Collection of Site Conservation Plans for Mitchell's Satyr Butterfly in Michigan



Prepared by:

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Submitted March 31, 2004



**Conservation Site Plan for Mitchell's Satyr Butterfly:
Cedar Creek Fen
Van Buren County, Michigan**



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**Report Number 2004-7
Submitted March 31 , 2004**



Conservation Site Plan for Mitchell's Satyr Butterfly: Coldwater Lake Fen Complex Branch County, Michigan



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Report Number 2003-
Submitted October , 2003



Conservation Site Plan for Mitchell's Satyr Butterfly: Lower Paw Paw River Fen Berrien County, Michigan



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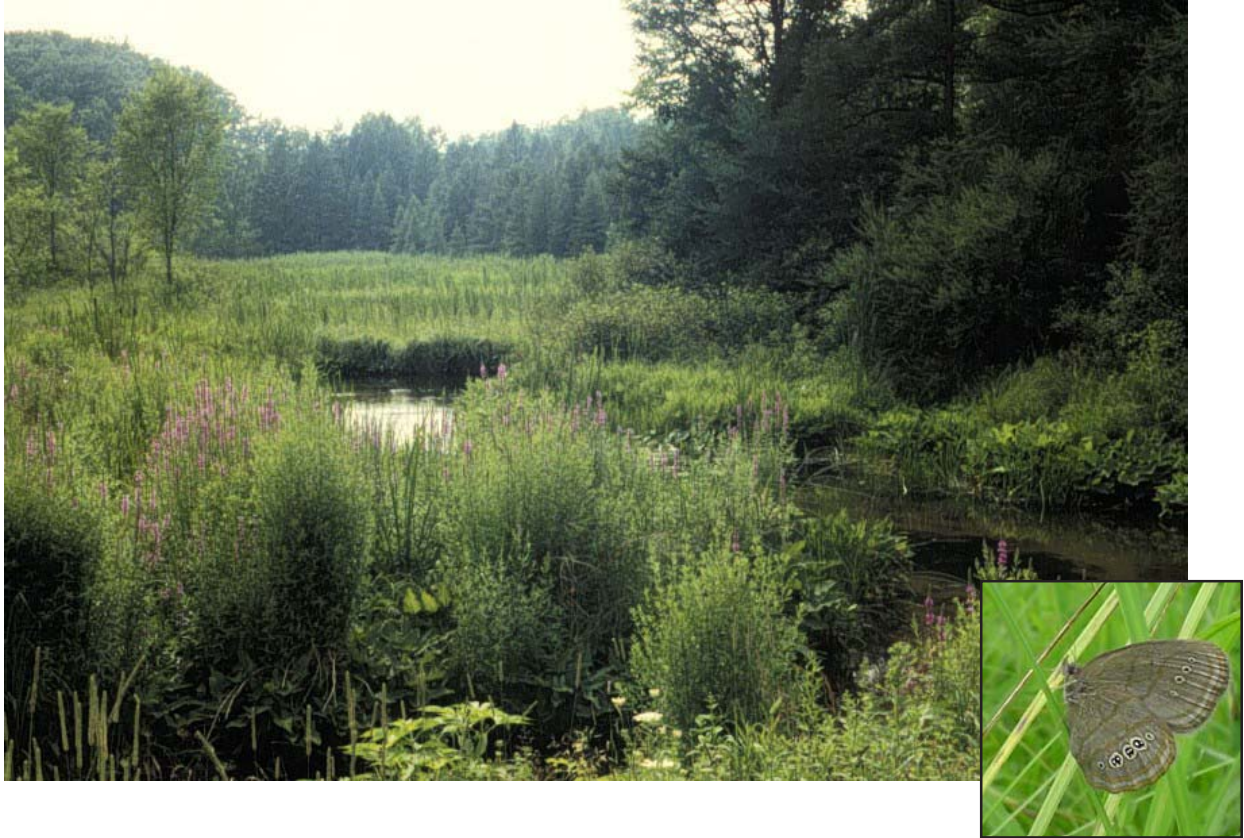
For:

MDNR Wildlife Division
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Report Number 2004-4
Submitted February , 2004



**Site Conservation Plan for Mitchell's Satyr Butterfly:
Mill Creek-West Fen Complex
Cass and St. Joseph Counties, Michigan**



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**Report Number 2004-6
Submitted March 31, 2004**



**Site Conservation Plan for Mitchell's Satyr Butterfly:
Paw Paw Lake Fen
Kalamazoo County, Michigan**



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**Report Number 2004-11
Submitted March 31, 2004**



**Conservation Site Plan for Mitchell's Satyr Butterfly:
Spring Brook Fen
Kalamazoo County, Michigan**



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Report Number 2004-5
Submitted March 31, 2004



Site Conservation Plan for Mitchell's Satyr Butterfly: Thompson Lake Fen Complex St. Joseph County, Michigan



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Report Number 2004-9
Submitted March 31, 2004



**Site Conservation Plan for Mitchell's Satyr Butterfly:
Upper Paw Paw River Fen
Van Buren County, Michigan**



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