

Development of a Multi-State Mitchell's Satyr Habitat Conservation Plan 2010 Annual Report



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Michigan
Natural
Features
Inventory

MICHIGAN STATE
UNIVERSITY
EXTENSION



Deliverables and Products

(From the Workplan)

1. Number of records updated in BIOTICS.
 - Updated 16 Mitchell's satyr sites and 4 prairie fen sites
2. Time spent assisting in development/production of the HCP.
 - Provided edits as requested
 - Provided maps and tables for HCP
3. Number of regional planning efforts involved in along with number of meetings attended.
 - Attended the Mitchell's satyr working group meeting
 - Attended 8 meetings with Dr. Shu-Guang Li and Hassan Abbas
4. A copy of final products listed below
 - Develop a criteria and matrix for evaluating the suitability of fens as potential reintroduction sites.
 - See Appendix A.
 - Conduct field visits and evaluate fens for suitability for potential reintroduction sites. Provide a summary of the results of these surveys.
 - See Appendix B.
 - Develop a draft prioritized list of potential reintroduction sites for review by the HCP Management Team and the Mitchell's Satyr Working Group.
 - See Appendix C.
 - Develop a draft monitoring protocol for reintroduction sites which will be distributed to the HCP Management Team and the the Mitchell's Satyr Working Group.
 - See Appendix D.
 - Develop a draft table depicting the phenology of fire sensitivity for guilds of plants, insects, herps, and birds, including game, non-game and rare species.
 - See Appendix E.

- Develop maps of groundwater recharge areas around fens managed for the Mitchell's satyr. The number and type of maps produced will be determined by the availability of GIS layers by MSU faculty and staffs working on developing these groundwater models.
 - MNFI was an active participant in the fen hydrology group (Dr. Shu Guang Li, Hassan Abbas, Dr. Douglas Landis, Dr. Steve Hamilton, MSU, Matthew Herbert and Chris May, TNC, Christopher Hoving, DNRE).
 - Provided Dr. Li with shapefiles of prairie fens and satyr sites
 - Co-wrote and edited 4 grant proposals with Dr. Li and the fen group seeking funding to map the hydrology of groundwater of prairie fens as well as to develop a decision support system to assist managers in collaborative decision making. None of these proposals were successful although two were selected for full submission.
 - Met with USFWS to discuss the award of an \$85,000 grant (GLRI discretionary funding from USFWS) to Dr. Li's lab to model the groundwater of select fens. Provided guidance on the selection of fens that Dr. Li's lab will model with these funds
- Assist with the editing and layout of the HCP in Adobe InDesign.
 - MNFI's assistance was not needed for this task
- Provide a 2-4 page Executive Summary of the HCP for use as a guide by land managers.
 - MNFI's assistance was not needed for this task.

Appendix A.

Criteria and matrix for evaluating the suitability of fens as potential reintroduction sites.

Draft Matrix for Site Selection & Prioritization for Potential Satyr Introduction, Augmentation or Reintroduction

<i>PRIMARY CRITERIA</i>	<i>DESCRIPTION</i>	<i>JUSTIFICATION</i>	<i>SCORING METHODOLOGY</i>	<i>DETAIL</i>	<i>Pts</i>
GIS analysis					
Size of Site	Acres of fen habitat	Larger sites can provide refugia from stochastic events and incompatible land use and may contain more varied microclimates and greater biodiversity.	Calculate size of fen polygon	Small-<10 ac	0
				Medium- 11-50 ac	2
				Large 51-150 ac	4
				Very Large >150ac	6
Condition, Quality	Integrity of hydrology- % of fen with intact hydrology (i.e <u>not</u> directly impacted by roads, ponds, ditching, drain tiles, etc.)	Intact hydrology is critical ecological process for maintaining fens and providing the proper microclimate for satyrs. Altered hydrology is linked to loss of species & vegetation change.	Buffer channelized streams, ditches and roads and calculate % of fen impacted	Highly Disturbed > 30%	0
				Medium Dist- 11-30%	2
				Low Disturbance-<10%	4
Local Matrix of Compatible Habitat	Percentage of Undeveloped Land within a 100 meter buffer around fen site.	Fens with a greater buffer of undeveloped land are less vulnerable to negative effects from nutrient loading, sedimentation, invasive species, grazing and ORV use.	Calculate % of land that is developed within 100m - Anderson layers (ag, res, comm, indust.)	< 10 %	0
				11-25%	2
				26-50%	4
				> 50%	6
Landscape Matrix of Compatible Habitat	Wetland is buffered from agriculture, development and roads with natural community vegetation (2mi)	Fens within a compatible habitat matrix are less vulnerable to threats to water quality and incompatible human activities.	Calculate % of land that is undeveloped within 2 miles – (Anderson layers)	<38%	0
				38-52%	2
				53-67%	4
				68-100%	6
Field analysis					
Condition and Quality	Native Fen Vegetation- Percent cover of native vegetation	The greater the % of native vegetation, the less impacted the fen is by non-natives and invasives which could out-compete the native flora.	Visit site and collect/estimate this data and/or review community field forms	<50%	0
				51-75%	2
				76-90%	4
				<90%	6
<i>SECONDARY CRITERIA</i>	<i>DESCRIPTION</i>			<i>DETAIL</i>	<i>Pts</i>
GIS analysis					
Site Ownership	Percentage of land that is public land or owned by a conservation organization	Land in conservation ownership by a public or nonprofit organization is less vulnerable to incompatible land use and more likely to receive stewardship.	Calculate using CARL data layers of ownership supplemented with knowledge of sites not in CARL	0-25% public/cons. owned	0
				26 -50% public/conservation owned	2
				51-75% - public or conservation owned	4
				>76% in public or conservation ownership-	6
Distance to Occupied Site	Distance of fen from currently occupied Mitchell's satyr site	Sites closer to occupied sites have the potential to be reconnected	Calculate distance of fen polygon to satyr site polygon	> 5miles from occupied site	0
				1-5 miles from occupied site	2
				500-1600 m. from occ.site	4
				<500 meters from occ. site	6

Appendix B.

Summary of sites surveyed for potential reintroduction

Summary of Fen Surveys

On August 16 and August 31, 2010, surveys were conducted to multiple prairie fens in Indiana by Mike Kost, MNFI, and Rich Dunbar and Lee Casebere of the Indiana DNR. The aim of these surveys were to observe the last known occupied site for Mitchell's satyr (Cedar Lake Fen) in Indiana and to assess potential for the introduction of the Mitchell's satyr at other fen sites in Indiana.

Cedar Lake Fen

Cedar Lake Fen is a privately owned site that occurs within a large wetland complex along Cedar Lake. The prairie fen occurs in a very small area of the wetland complex that is located just down slope from an expansive field of intensively farmed row crops. The fen contains areas of quaking mat and several headwater streams that are fed by the constant seepage of groundwater. With the exception of an absence of tamarack, the areas surveyed appear very similar to sites that support Mitchell's satyr in Michigan. The soils are slightly alkaline, hemic peat to a depth of at least 1 meter. Marl is present in the seepage areas that form the stream headwaters. The vegetation is comprised of diverse mix of fen meadow species. Hardstem bulrush (*Schoenoplectus acutus* [*Scirpus a.*]) is abundant in a large portion of the fen. The invasive, narrow-leaf cattail (*Typha angustifolia*) is also abundant. The wetland areas bordering the small pocket of open fen supports southern hardwood swamp and southern shrub-carr.

Swamp Angel

Swamp Angel is a large wetland complex that contains a prairie fen and several small, marl lakes surrounded by dry southern forest. The site is an Indiana Nature Preserve that is owned by The Nature Conservancy. The Indiana DNR conducts management at the site. Swamp Angel supports a lake basin marl fen along the shores of a small lake as well as areas of prairie fen that occur along groundwater fed, narrow, headwater streams and open marl pools. The soils near the lake are slightly alkaline marl to a depth of at least 1 m. The soils farther from the lake are slightly alkaline, hemic peat to a depth of at least 1 meter. Beaked spike-rush (*Eleocharis rostellata*) dominates the open marly areas along the lakeshore. Areas around the headwater streams and marl pools are dominated by twig rush (*Cladium mariscoides*) and sedges (*Carex lasiocarpa*, *C. sterilis*, and *C. stricta*). The areas visited were mostly open but rich tamarack swamp and southern shrub-carr border the open fen. The invasive shrub glossy buckthorn (*Rhamnus frangula*) occurs at this site. The seepy portions of the fen near the rich tamarack swamp appear to be suitable habitat for Mitchell's satyr.

Lime Lake Fen

Lime Lake Fen occurs along the shores of Lime Lake. The site is located within a large wetland complex that spans into southern Michigan. Prairie fen occurs in both states within this large wetland complex. The Interstate and Indiana Toll Road 80/90 occurs along the north edge the Lime Lake Fen and effectively separates it from the remainder of the wetland complex to the north. A large area of invasive cattail occurs along near the toll road in the northern portion of the site. Lime Lake Fen contains numerous headwater streams and areas of groundwater seepage. Areas near the Lake contain open marl flat and areas further from the lake support diverse fen meadow. The fen is mostly open with only approximately 10% shrub cover. Except for the absence of tamarack and low shrub cover, Lime Lake Fen appears similar to many other fens that occur in southern Michigan. The fen appears suitable as an introduction site for Mitchell's satyr.

Buckbean Fen North

Buck Bean Fen North is publically owned and occurs along the Pigeon River in the Pigeon River Fish and Wildlife Area. This site contains two areas of open fen that are separated by approximately 200 meters by southern shrub-carr, floodplain forest, and dry southern forest. Ground water seepage was evident and the areas contain headwater streams. Soils are peat to at least 1 meter and are likely slightly alkaline. The fens support approximately 45% shrub cover. Tamarack occurs in a portion of one of the openings. The ground layer is dominated by three-square (*Schoenoplectus pungens* [*Scirpus americanus*]) with wiregrass sedge and tussock sedge locally dominant. The fen supports a diversity of typically fen plants. The invasive, narrow-leaf cattail (*Typha angustifolia*) is common in one of the openings. The habitat of this site appears to be suitable for a reintroduction of the Mitchell's satyr. Ideally, narrow-leaf cattail would be controlled and several prescribed burns aimed at reducing woody plant and thatch cover would be conducted before the reintroduction was made.

Martin Fen

Marin Fen is privately owned and borders the Pigeon River Fish and Wildlife Area. The site is a large wetland with zones of prairie fen, southern wet meadow, emergent marsh, and southern shrub-carr. The survey was concentrated within 50 meters of a gravel road in an area of groundwater seepage that was dominated by beaked spike-rush and dioecious sedge (*Carex sterilis*). The groundwater seepage in this area forms several narrow headwater streams that join together and travel toward the Pigeon River. Soils in this area are marl mixed with peat to at least 1 meter and are likely slightly alkaline. Tufa was observed at the soil surface within marly seepages. Because of its large size, further surveys of this site will need to be done to adequately evaluate this site as a potential for Mitchell's satyr. However, with the exception of tamarack, the open seepage area that was surveyed appears similar to sites that currently support the species in Michigan.

Spike-rush Fen

Spike-rush Fen is publically owned and occurs along the Pigeon River in the Pigeon River Fish and Wildlife Area. As its name implies, the site is dominated by spike-rush, especially beaked spike-rush. The open section of the fen occurs in a long, narrow swale, which has likely stayed open because of constant groundwater seepage. A very narrow headwater stream channel emanates from this open swale. Soils in the swale are peat to at least 1 meter. Although no pH was recorded, based on the vegetation and groundwater seepage observed, the peat is likely slightly alkaline. Separating the open swale from the river is a zone of shrub-carr dominated by poison sumac (*Toxicodendron vernix*), bog birch (*Betula pumila*), and pussy willow (*Salix discolor*), with a ground layer dominated by sphagnum mosses. Separating the fen from the dry southern forest in the uplands is a dense thicket of the highly invasive tree black alder (*Alnus glutinosa*). In its current condition, this site does not appear suitable habitat for a long-term, viable population of Mitchell's satyr.

Appendix C.

Draft prioritized list of potential reintroduction sites for the Mitchell's satyr

Fen Scores in Range- Primary Criteria

	EO_NUM	SURVEYSITE	County	EORANK	ACRES	AREASC	NAT100M SC	NAT2MI SC	HYDRO SC	TOTAL
1	22.00	Park Lyndon Fen	Washtenaw	B	207.6	6	6	4	4	20
2	123.00	Barry State Game Area -- Havens Road Meadow	Barry	B?	111.6	4	6	6	4	20
3	16.00	Barry State Game Area -- Turner Creek Wetlands	Barry	BC	17.1	2	6	6	4	18
4	51.00	Monette Street	Cass	A?	240.2	6	6	2	4	18
5	52.00	Liberty Fen	Jackson	A	273.9	6	6	2	4	18
6	61.00	Somerset Fen	Hillsdale	B	321.3	6	6	2	4	18
7	90.00	Whelan Lake Fen	Washtenaw	B	57.8	4	6	4	4	18
8	110.00	Barry State Game Area -- Horseshoe Lake Fen	Barry	B	32.2	2	6	6	4	18
9	117.00	Yankee Springs Recreation Area -- Yankee Springs Fen	Barry	BC	35.0	2	6	6	4	18
10	122.00	Barry State Game Area -- Hill Creek Fen (Great Fen)	Barry	B	50.6	4	6	4	4	18
11	134.00	Nirdlinger Fen	Jackson	B	26.5	2	6	6	4	18
12	136.00	Waterloo Long Lake Fen	Washtenaw	BC	41.3	2	6	6	4	18
13	155.00	Waterloo Recreation Area -- Little Portage Lake	Jackson	B	38.2	2	6	6	4	18
14	156.00	Pinckney Recreation Area -- Sullivan Lakes, Hadley Road	Washtenaw	BC	16.8	2	6	6	4	18
15	82.00	67th Avenue (Paw Paw Prairie Fen)	Van Buren	BC	50.2	4	6	2	4	16
16	125.00	Bowens Mill Fen	Barry	C	11.5	2	6	4	4	16
17	31.00	Butterfield Lake Fen	Kalamazoo	CD	28.6	2	6	4	4	16
18	146.00	Jephtha Lake	Van Buren	BC	16.2	2	6	4	4	16
19	69.00	Lincoln Lake Fen	Kent	B	59.0	4	6	2	4	16
20	137.00	Little Goose Lake Fen	Lenawee	B	107.2	4	6	2	4	16
	98.00	Locker Lake Fen	Jackson	B	32.5	2	6	4	4	16
21	3.00	McKay Lake Fen	Kalamazoo	C?	30.6	2	6	4	4	16
22	135.00	McLaughlin Fen	Washtenaw	AB	78.6	4	6	4	2	16
23	73.00	Mott Road Fen	Kalamazoo	AB	7.0	0	6	6	4	16
24	158.00	Palmatier Lake Fen	Barry	BC	8.8	0	6	6	4	16

Fen Scores in Range- Primary Criteria

25	145.00	Portage Lake	Jackson	C	3.3	0	6	6	4	16
26	64.00	Portage Lake Fen	Washtenaw	C	5.8	0	6	6	4	16
27	92.00	Skiff Lake Prairie Fen	Jackson	BC	18.1	2	6	4	4	16
28	91.00	Thompson Lake Complex	St. Joseph	AB	192.8	6	6	0	4	16
29	99.00	Waterloo Recreation Area -- Hankard Lake Fen	Washtenaw	C	3.4	0	6	6	4	16
30	21.00	Whitman Lake Fen	Kalamazoo	C	13.4	2	6	4	4	16
31	147.00	Willis Road	Jackson	C	1.2	0	6	6	4	16
32	139.00	Yankee Springs Recreation Area -- Hall Lake Fen	Barry	C	13.2	2	6	6	2	16
33	138.00	Yankee Springs Recreation Area -- McKibben Fen	Barry	CD	1.9	0	6	6	4	16
34	143.00	Baker Audubon Sanctuary Prairie Fen	Calhoun	BC	5.9	0	6	4	4	14
35	60.00	Blue Creek Fen	Berrien	B?	59.1	4	6	0	4	14
36	154.00	Buss Road	Washtenaw	B	27.3	2	6	2	4	14
37	133.00	Butternut Creek Fen	Berrien	B	10.9	2	6	2	4	14
38	34.00	Chilson Fen	Livingston	B	59.2	4	4	4	2	14
39	24.00	Concord Fen	Jackson	BC	116.5	4	6	0	4	14
40	94.00	Culver Road Fen	Jackson	C	13.4	2	6	2	4	14
41	83.00	Eight Foot Lake Fen	St. Joseph	C	33.5	2	6	2	4	14
42	120.00	Gourdneck State Game Area -- Vanderbilt Fen	Kalamazoo	BC	21.6	2	6	2	4	14
43	19.00	Hall Lake Fen	Calhoun	C	18.5	2	6	2	4	14
44	59.00	Independence Lake County Park	Washtenaw	C	3.7	0	6	4	4	14
45	114.00	Irwin's Farm	Washtenaw	CD	10.0	2	6	2	4	14
46	32.00	Ives Road Fen	Lenawee	A	55.1	4	6	0	4	14
47	153.00	Lime Lake/Cedar Creek	Van Buren	B	11.8	2	6	2	4	14
48	132.00	Osius Road Fen	Washtenaw	B	11.3	2	6	6	0	14
	57.00	Quimby Road Fen	Branch	BC	37.6	2	6	2	4	14
49	78.00	Sutfin Road Fen	Jackson	C?	7.7	0	6	4	4	14
50	77.00	Waterloo Recreation Area -- Mt. Hope Road Fen	Jackson	B	30.3	2	6	4	2	14
51	140.00	Yankee Springs Recreation Area -- McDonald Lake Fen	Barry	CD	1.6	0	6	6	2	14
52	157.00	unnamed fen	Kalamazoo	unranked	8.4	0	6	4	4	14

Fen Scores in Range- Primary Criteria

	EO_NUM	SURVEYSITE	County	EORANK	ACRES	AREASC	NAT100M SC	NAT2MI SC	HYDRO SC	TOTAL
53	55.00	Anderson Lake Fen	Branch	C?	96.3	4	4	0	4	12
54	144.00	Arntz Fen	Jackson	C	11.0	2	6	0	4	12
55	17.00	Bayley's Fen	Jackson	BC	10.4	2	6	0	4	12
56	152.00	Beckwith Lake	Hillsdale	C	15.0	2	6	0	4	12
57	30.00	Cold Springs Fen	Kalamazoo	C	5.1	0	6	2	4	12
58	151.00	Cranberry Lake Road	Hillsdale	C	10.8	2	6	0	4	12
59	89.00	Dew Road Fen	Jackson	C	10.9	2	6	0	4	12
60	97.00	Fay Lake Fen	Jackson	C	47.0	2	6	2	2	12
61	11.00	Helmer Brook Fen	Calhoun	C	12.8	2	6	0	4	12
62	12.00	Indian Bowl	Berrien	A	46.4	2	6	0	4	12
63	103.00	Jefferson Center	Cass	BC	147.9	4	4	0	4	12
64	88.00	Leslie School District	Jackson	CD	8.6	0	6	2	4	12
65	63.00	Liberty Bowl Fen	Jackson	AB	29.0	2	6	0	4	12
66	18.00	Lime Lake Fen -- Jackson County	Jackson	C	1.2	0	6	2	4	12
67	79.00	Little Fawn River	Branch	AB	40.7	2	6	0	4	12
68	108.00	Paw Paw Lake	Kalamazoo	B	31.9	2	6	2	2	12
69	36.00	Pokagon Creek -- Allen Street	Cass	B	30.0	2	6	0	4	12
70	141.00	Pokagon Creek -- Old Mill Road	Cass	CD	13.1	2	6	0	4	12
71	84.00	Prairie River Complex	St. Joseph	B	29.2	2	6	0	4	12
72	4.00	Radrick Fen	Washtenaw	B	3.0	0	6	2	4	12
73	86.00	Riker Lake Prairie Fen	Washtenaw	B	42.5	2	6	2	2	12
74	112.00	Sarett Nature Center	Berrien	C	6.1	0	6	2	4	12
75	124.00	Sharonville State Game Area -- Sharonville Fen	Washtenaw	C	2.1	0	6	2	4	12
76	142.00	Shavehead Lake -- Camp Friedenswald	Cass	CD	5.2	0	6	2	4	12
77	53.00	Spring Lake Fen	Cass	CD	25.1	2	6	0	4	12
78	93.00	Springbrook Fen	Kalamazoo	C	5.9	0	6	2	4	12
79	148.00	Swains Lake Southwest	Jackson	C	8.2	0	6	2	4	12
	85.00	Vandalia Prairie Fen (Christiana Creek)	Cass	B	33.7	2	6	0	4	12
80	54.00	Vincent Lake Fen	Branch	C?	10.2	2	6	0	4	12

Appendix D.

Draft monitoring protocol for reintroduction sites

Methodology for monitoring known Mitchell's satyr sites

- 1) All landowners must be contacted to obtain permission before entering the property. Appropriate individuals responsible for managing State land should also be contacted prior to surveys.
- 2) Teams of at least two observers should work together to conduct a timed meander survey at the site.
- 3) One observer should record a GPS track to document the path followed and to record locations of satyrs. Go to Track Set up and set the GPS unit to (STOP WHEN FULL). Set the Record Method to Time and to record a point every 30 seconds. Include the name of the site and the date when naming the track.
- 4) The other observer should record the starting time (when entering suitable habitat), the weather conditions (temperature, cloud cover, estimated wind speed) and fill out the satyr data form at the end of the survey. Be sure to submit your data form to SWMLC or MNFI when the satyr surveys have been completed.
- 5) Observers should walk parallel to each other approximately 10 feet apart and use a long thin stick or butterfly net to lightly brush the top of the vegetation as they meander through suitable habitat. (Only those working under a special permit from USFWS as part of a Mark-release-recapture study should attempt to capture satyrs in a net). Observers should make as many loops as needed through the habitat maintaining the 10 foot separation distance (i.e. when the end is reached observers should move over in one direction 20 feet and walk back through the habitat).
- 6) Observers should look in front, to the sides and behind, paying special attention to areas containing fine-leaved sedges growing in association with low growing shrubs and tamarack, seeps and springs, small openings along streams and between the shrubs.
- 7) The person using the GPS unit should record points for every satyr seen. (For large sites each observer can record satyrs with a GPS). There is no need to name each point as this is too time consuming. Record the number of the first point and then continue to take points. When the survey is complete, be sure to record the number of the last point taken. (If you are experienced with differentiating males and females, take note of the numbers corresponding to points where females, males and satyrs of unknown sex are seen. Only do this if you are reasonably sure of your identification and if it is practical to do so. At sites with large populations, this may not be feasible).
- 8) The other observer should keep count of all satyrs seen, and if able, note how many females, males and satyrs of unknown sex are seen. (Can also GPS satyrs at large sites).
- 9) Observers should work together to insure that satyrs are not double-counted and to make sure that all suitable habitat is covered.
- 10) If another rare species is encountered that requires stopping to record information, or if you need to walk through an area of unsuitable habitat; stop the track and begin a new track, once you are ready to begin the timed-meander survey for satyrs again. Be sure to record a new starting time each time a new track is recorded and name the track with the site name, date and number 2...3...4...etc.
- 11) Be aware of how many tracks and points your GPS unit can record and be sure to download the information regularly so that you do not run out of room.
- 12) If your GPS unit malfunctions, continue the survey and be sure to draw on a topo map the path where you conducted your survey, using topographical features to determine where you traveled.

Documenting the Mitchell's satyr butterfly at new sites

- 1) Identify presence or absence of potential habitat
 - Potential habitat is defined as a mosaic of open prairie fen and sedge meadow mixed with tamarack savanna and shrub-carr. The presence of fine-leaved sedges (e.g. *Carex stricta*, *Carex sterilis*, and *Carex lasiocarpa*) are key as these are dominant in the ground layer of all known satyr habitats and are considered to be the larval host plant for the satyr. These fine-leaved sedges are often found in association with shrubby cinquefoil (*Potentilla fruticosa*), tamarack (*Larix laricina*) and poison sumac (*Toxicodendron vernix*).
- 2) If potential habitat is identified the site should be surveyed for the satyr during the appropriate flight period. This flight period can be determined in the following ways:
 - Contact USFWS (E. Lansing Field Office) to determine the beginning of the flight period
 - USFWS will use information from permit holders to determine first day of flight.
 - USFWS will use degree day calculations as well as earliest and latest flight dates in previous years to determine flight window.
- 3) Only those persons who can either document skill at butterfly identification or who have attended a field-based training session in satyr identification are considered appropriate to conduct satyr surveys.
 - USFWS or MNFI (Michigan Natural Features Inventory) can provide training sessions for consultants, partners, etc.
- 4) Minimum number of surveys, optimal survey conditions, and length of survey visits for new sites:
 - A minimum of 3 survey visits should be conducted during the documented flight period
 - These 3 visits should be conducted no more frequently than every 3 days at a site.
 - Surveys should be conducted during periods of no rain and winds less than 10 mph.
 - Surveys should be conducted between 10am and 6pm, avoiding the period of 12 noon to 2pm if there is no cloud cover and if temperatures exceed 85 degrees. The minimum temperature should be at least 65 degrees.
 - Minimum length of survey visit should be 30 minutes per acre of potential habitat. At larger sites (i.e. >20 acres) this may require each visit to span 2 days.
- 5) Survey methodology
 - Observers should walk in a meandering pattern looking forward, to the sides and behind to increase the likelihood that all butterflies in an area are seen. Particular attention should be paid to areas containing fine-leaved sedges growing in association with low growing shrubs and tamarack, seeps and springs, and small openings along streams and between the shrubs.
 - Locations of satyrs should be recorded with a GPS unit and GIS shapefiles should be sent to the USFWS.
 - Photographs should be submitted to USFWS to identify/document the Mitchell's satyr.

Appendix E.

Table depicting the phenology of fire sensitivity for guilds of plants, insects, herps, and birds, including game, non-game and rare species

Plant Species Phenology and Fire Sensitivity

Weeks		1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4	1-2	3-4				
Plant Guilds/Species		JAN		FEB		MAR		APRIL		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV		DEC			
Forbs																											
Annuals - early season		D	D	D	D	D	D	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D	D	D	D	D	
Annuals - late season		D	D	D	D	D	D	D	D	D	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Biennials - early season		D	D	D	D	D	D	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D	D	D	D	D	
Biennials - late season		D	D	D	D	D	D	D	D	D	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Perennials - early season		D	D	D	D	D	D	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D	D	D	D	D	
Perennials - late season		D	D	D	D	D	D	D	D	D	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Sedges																											
Annuals-early season		D	D	D	D	D	D	E	FL	FL	FL	FR	SD	SD	SD	D	D	D	D	D	D	D	D	D	D	D	D
Annuals-late season		D	D	D	D	D	D	D	D	D	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Perennials-early season		D	D	D	D	D	D	E	FL	FL	FL	FR	SD	SD	SD	D	D	D	D	D	D	D	D	D	D	D	D
Perennials-late season		D	D	D	D	D	D	D	E	E	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Grasses																											
Annuals-cool season		D	D	D	D	D	D	E	FL	FL	FL	FR	SD	SD	SD	D	D	D	D	D	D	D	D	D	D	D	D
Annuals-warm season		D	D	D	D	D	D	D	D	D	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Perennials-cool season		D	D	D	D	D	D	E	FL	FL	FL	FR	SD	SD	SD	SD	SD	D	D	D	D	D	D	D	D	D	D
Perennials-warm season		D	D	D	D	D	D	D	E	E	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Vines																											
Early season		D	D	D	D	D	D	D	D	E	E	FL	FL	FR	FR	SD	SD	SD	SD	D	D	D	D	D	D	D	D
Late season		D	D	D	D	D	D	D	D	D	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Trees																											
Early season		D	D	D	D	D	E	FL	FL	FL	FR	FR	SD	SD	SD	SD	SD	E	E	E	E	D	D	D	D	D	D
Late season		D	D	D	D	D	D	D	D	D	E	E	E	FL	FR	FR	FR	SD	SD	SD	SD	SD	SD	SD	SD	D	D
Rare Plant Species																											
Scientific Name	Common Name																										
<i>Asclepias purpurascens</i>	Purple milkweed	D	D	D	D	D	D	D	D	E	E	E	FL	FL	FL	FR	FR	SD	SD	SD	SD	D	D	D	D	D	D
<i>Berula erecta</i>	Cut-leaved water parsnip	D	D	D	D	D	D	D	D	E	E	E	FL	FL	FL	FR	FR	SD	SD	SD	SD	D	D	D	D	D	D
<i>Cacalia plantaginea</i>	Prairie Indian plantain	D	D	D	D	D	D	D	D	E	E	E	FL	FL	FL	FR	FR	FR	SD	SD	SD	D	D	D	D	D	D
<i>Cypripedium candidum</i>	White lady-slipper	D	D	D	D	D	D	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D	D	D	D	D	
<i>Eryngium yuccifolium</i>	Rattlesnake master	D	D	D	D	D	D	D	D	D	E	E	E	FL	FL	FL	FR	FR	FR	SD	SD	D	D	D	D	D	D
<i>Filipendula rubra</i>	Queen-of-the-prairie	D	D	D	D	D	D	D	D	E	E	E	E	FL	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D
Rare Plant Sp. (cont.)																											
Scientific Name	Common Name																										
<i>Helianthus hirsutus</i>	Whiskered sunflower	D	D	D	D	D	D	D	D	E	E	E	E	E	FL	FL	FL	FR	FR	SD	SD	D	D	D	D	D	D

Animal Species Phenology and Fire Sensitivity

Week		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4												
Animal Groups/Species (Rare and SGCN)		JAN				FEB				MARCH				APRIL				MAY				JUNE				JULY				AUGUST				SEPT				OCT				NOV				DEC			
COMMON NAME	SCI NAME																																																
MAMMALS																																																	
Southern bog lemming	<i>Synaptomys cooperi</i>									B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B												
Mammal Phenology Key																																																	
Breeding/Nesting	B																																																
BIRDS																																																	
Ground- nesting																																																	
American bittern	<i>Botaurus lentiginosus</i>											A	A	A	A	A	A	A	N	N	NY	NY	NY	NY	NY	NY	NY	NY	Y	Y	Y	Y	P	P	P	P	P												
American woodcock	<i>Solopax minor</i>											A	AN	AN	N	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	Y	Y	P	P	P	P	P	P	P	P	P													
Blue-winged teal	<i>Anas discors</i>												A	A	A	A	N	N	NY	NY	NY	NY	NY	NY	NY	Y	Y	Y	Y	Y	Y	P	P	P	P	P	P	P											
Blue-winged warbler	<i>Vermivora pinus</i>																	A	A	N	N	N	NY	Y	Y	Y	Y	P	P	P	P	P	P																
Henslow's Sparrow	<i>Ammodramus henslowii</i>															A	A	A	A	N	N	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	Y	P	P	P	P												
Northern harrier	<i>Circus cyaneus</i>											A	A	A	A	A	N	N	N	N	N	N	NY	NY	NY	NY	Y	Y	P	P	P	P	P	P	P	P													
Wilson's snipe	<i>Gallinago delicata</i>												A	A	A	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	P	P	P	P	P	P													
Virginia Rail	<i>Rallus limicola</i>															A	A	A	N	N	N	NY	NY	NY	NY	NY	NY	NY	Y	Y	Y	Y	P	P	P	P	P												
Sedge wren	<i>Cistothorus plantensis</i>																	A	A	N	N	N	N	N	N	N	N	N	N	NY	NY	NY	NY	P	P	P	P												
Sora	<i>Porzana carolina</i>															A	A	A	N	N	N	NY	NY	NY	NY	NY	NY	NY	Y	Y	Y	Y	P	P	P	P	P												
Cavity- nesting																																																	
Northern flicker	<i>Coaptes auratus</i>												A	A	A	A	A	N	N	N	NY	NY	NY	NY	NY	NY	Y	Y	Y	Y	Y	Y	P	P	P	P													
Shrub- nesting																																																	
Black-billed & Yellow -billed cuckoo	<i>Coccyzus spp</i>																	A	A	N	N	NY	NY	NY	NY	NY	NY	NY	NY	NY	NY	Y	Y	P	P	P	P												

