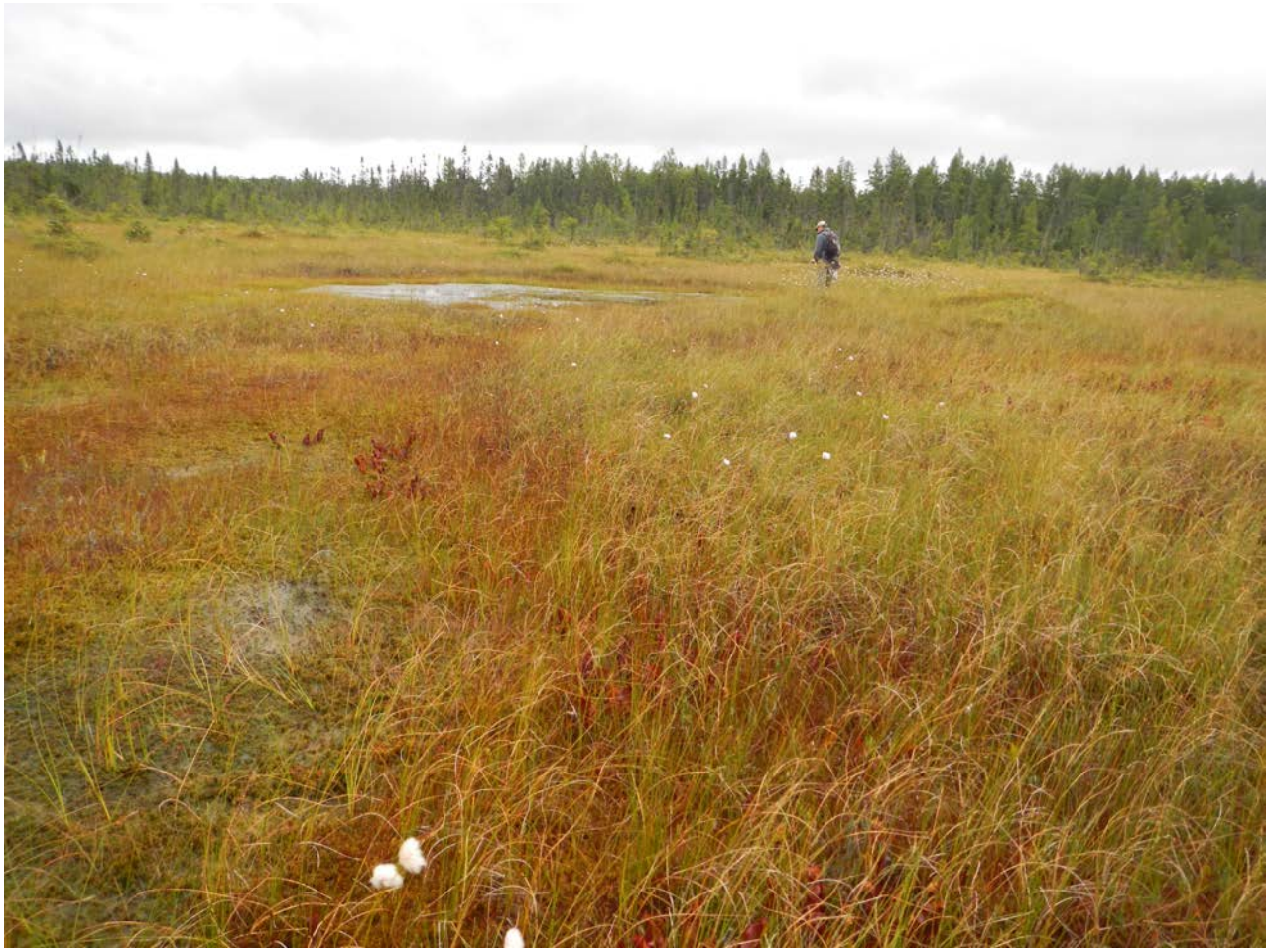
Surveys and Monitoring for the Hiawatha National Forest: FY 2015 Progress Report



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Cover photograph: McDonald Lake S, bog, Hiawatha National Forest, Delta County, MI 25 August, 2015. Photo by David L. Cuthrell

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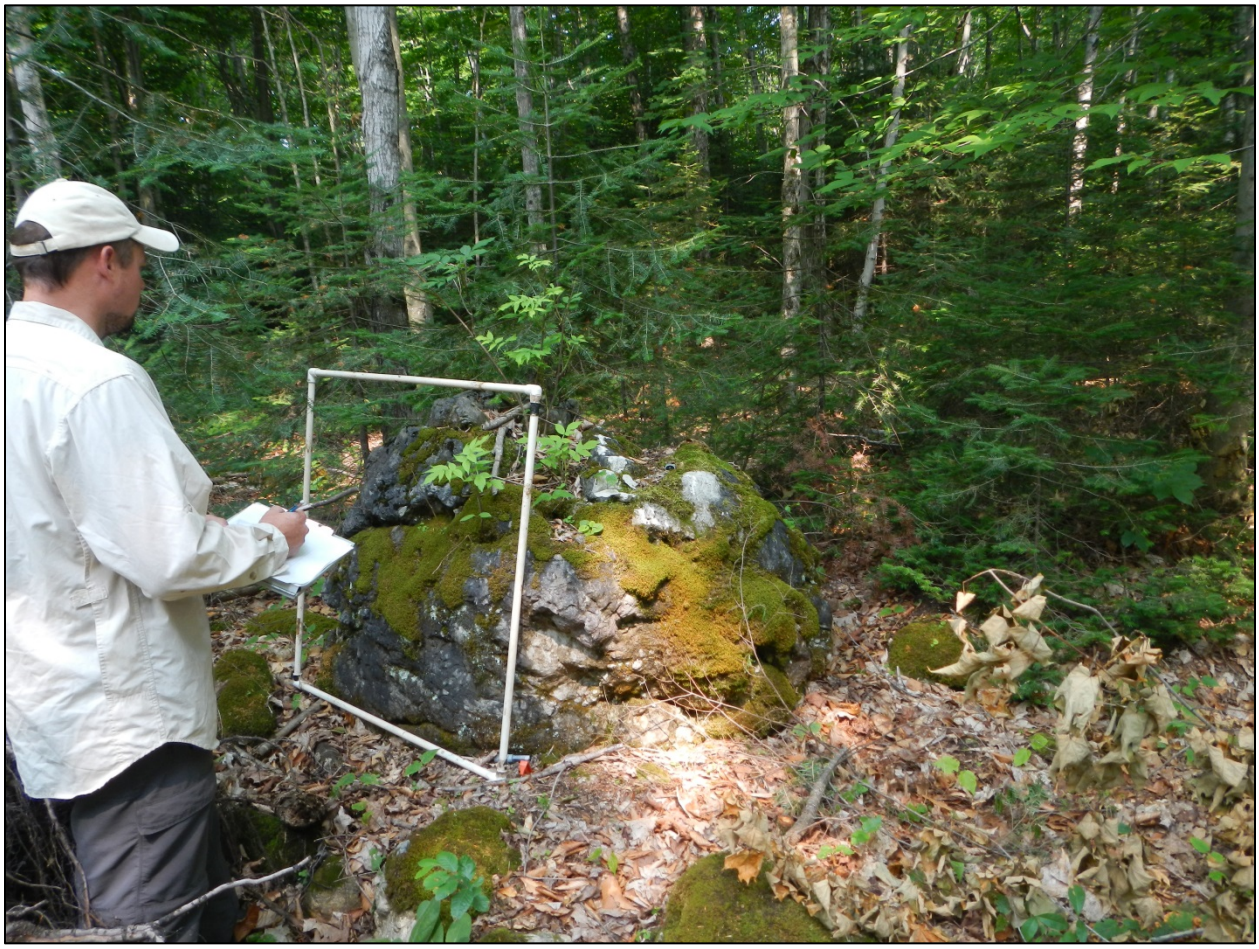

Figure 1. Vegetation sampling as part of the Niagara EIS, July 2015.

Vegetation monitoring, as outlined in Alternative 2 of the Niagara EIS, was initiated to develop the methodology needed to understand the changes that may occur in karst feature habitat due to vegetation management. Specifically, this monitoring was designed to address microhabitat conditions within karst feature habitat and how those conditions may be affected by vegetation management with respect to changes in light intensity, ground temperature, relative humidity, and moss cover between treated and untreated sites.

After reviewing the monitoring plan sites were selected for sampling with the assistance of HNF staff. Sampling plots were circular and 1/10 of an acre (11.3 m radius; James and Shugart 1970). Sampling included the collection of overall plot level and three 1 m^2 plots along the cliff/boulder face where rare ferns typically would be growing or rare land snails were likely to occur. Measurements collected at the overall plot level focused on forest structure and species composition. Tree density and composition was measured in two categories: tree (dbh ≥ 3.5 inches) and subcanopy (dbh < 3.5 inches). Other overall plot level measurements included percent canopy closure, plant species lists and coarse woody debris (CWD) qualitative assessment. Percent canopy closure was estimated along the cardinal directions from the plot center. Ocular tube readings of canopy conditions were taken at paced

intervals (~1 m) five times in each cardinal direction. The ratio of hits to misses in the ocular tube gave the percentage canopy cover for that plot.

To address the changes that may occur after the different forest treatments, during the summer of 2015 we conducted vegetation sampling at a total of 18 sites: year 0 sampling at the 8 Option 3 sites, year 2 sampling at the 8 Option 1 sites, and at the 2 new Control sites. In conjunction with the vegetation sampling, we placed data loggers at a total of 32 sites (8 reference sites, 8 Option 1, 8 Option 3, and 8 Control sites). Two data loggers were placed at each site at the plot center. One data logger placed at the top of the cliff or boulder recorded temperature and light intensity while a second data logger placed at the base recorded both temperature and relative humidity. All data loggers were placed in the field during July (16-18) and all were collected in late August 2015. Data has been offloaded from the devices and are currently being summarized for preliminary analysis.

We continue to compile temperature, humidity, and light intensity data gathered by data loggers during 2012 through 2015 into a database to facilitate future analyses. Because the data loggers export information in different formats depending on type (i.e., temperature and relative humidity vs. temperature and light intensity), substantial data manipulation is necessary to produce a consistent format for data summarization and analysis.

Raptor Nest Checks and Productivity Surveys (East and West Units) 015

Figure 2. Two Red-shouldered Hawk chicks in a newly discovered nest, West Unit HNF, June, 24, 2015.

Both the Red-shouldered Hawk (*Buteo lineatus*, state threatened) and Northern Goshawk (*Accipiter gentilis*, special concern) are Regional Forester Sensitive Species (RFSS) with known nesting occurrences within the east and west units of the Hiawatha National Forest (HNF). During the 2015 surveys a total of 103 nests or old nesting territories (63 East, 40 West) were checked for breeding use with a subset of those (active or possibly active nests) visited a second time for nest productivity.

In the East Unit, we visited 63 nests to check for breeding use. Initial nest checks and conspecific call broadcasts were conducted during May 5-8. During the first visit, MNFI staff found 13 active or potentially active (i.e., decorated nest but adult not observed) Red-shouldered Hawk nests. Biologists from the USFS found an additional 9 active nests (8 Red-shouldered Hawk, 1 Northern Goshawk) during their first round of surveys. Staff from MNFI revisited all 22 active and potentially active (21 Red-shouldered Hawk, 1 Northern Goshawk) nests in June to assess nest success and productivity. Productivity surveys during 2015 were completed on June 14-15 and June 22-23 using a telescoping fiberglass pole and video camera (GoPro Hero) to inspect nests. The one active Northern Goshawk nest found during the first round of surveys was successful, with the nest containing two chicks. We observed 58% (11/19) of the Red-shouldered Hawk nests to be successful and counted 20 chicks total (1.05 young per active nest, 1.81 young per successful nest)(Table 1).

In the West Unit, we visited 40 nests to check for breeding use. Initial nest checks and conspecific call broadcasts were conducted during May 11-14. During first visit, MNFI staff found 5 active or potentially active (i.e., decorated nest but adult not observed) Red-shouldered Hawk nests and one active Northern Goshawk nest. We revisited all 6 active and potentially active raptor nests in June to assess nest success and productivity. Biologists from the USFS and/or contractors found an additional 6 active raptor nests. Productivity surveys were done during June 24-25 using a telescoping fiberglass pole and video camera (GoPro Hero) to inspect nests. The active Northern Goshawk nest found during the first round of surveys was successful. In addition, we determined that 5 successful Red-shouldered Hawks nested in the West Unit in 2015. We observed 83% (5/6) of the Red-shouldered Hawk nests to be successful and counted 9 chicks total (1.50 young per active nest, 1.80 young per successful nest)(Table 1).

When combined, the results of the East and West units, overall Red-shouldered Hawk nest success appeared to be low compared to previous years, with a total number of 29 chicks produced (1.16 young per active nest, 1.81 young per successful nest) (Table 1).

Table 1. 2015 Season Summary of nesting raptors in the Hiawatha National Forest.

Raptor Species	Active Nests	Successful Nests	Number of young	young/ active	young/ successful	% active nests successful
RSHA	**25**	**16**	**29**	**1.16**	**1.81**	**64 %**
East	19	11	20	1.05	1.81	58 %
West	6	5	9	1.50	1.80	83 %
NOGO	**2**	**2**	**4**	**2.00**	**2.00**	**100 %**
East	1	1	2	2.00	2.00	100 %
West	1	1	2	2.00	2.00	100%

Groundwater-dependent Ecosystems (GDE) Level I Inventory (East and West Units) 015

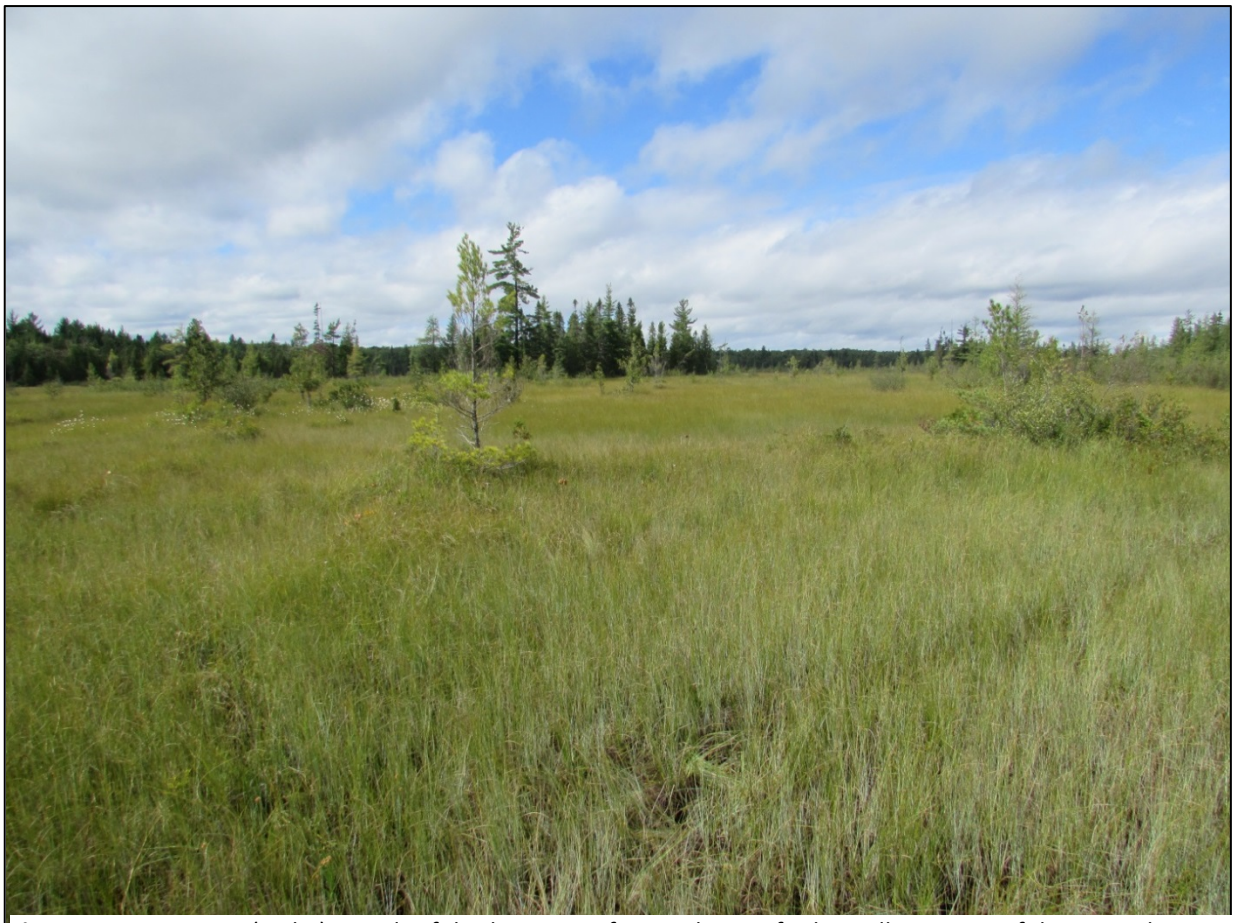

Figure 3. Two 40-acre (16 ha) parcels of this large poor fen northeast of Lake Stella are part of the HNF, Alger Co., 26 August 2015.

In spring 2013, MNFI identified approximately 35 peatlands on Hiawatha National Forest lands for potential surveys using high resolution aerial imagery and other resources. In August 2015, we completed Forest Service GDE Level I field inventories for four sites, two in the eastern unit and two in the western unit of the HNF (Table 2) (USDA Forest Service 2012a, b). Over the past three years (2013 – 2015), we have completed Level I inventories, ecological assessments, vegetation inventories, and meander surveys for T, E, and SC vascular plants and dragonflies at a total of 17 sites (corresponding to peatland element occurrences, or EOs) on the HNF (10 in the eastern unit and seven in the western unit).

Surveys in 2015 resulted in two new EOs for poor fen (Figure 3) and one EO each for northern fen and bog (Table 2). One new population each of the state special concern incurvate emerald (*Somatochlora incurvata*), state endangered dwarf raspberry (*Rubus acaulis*), and state special concern sedge *Carex billingsii* were also documented during field surveys (Table 2).

Following completion of peatland surveys, MNFI staff will complete and distribute Forest Service GDE Level I Inventory field forms, vascular plant species lists, and rare species data to Hiawatha NF staff.

After a sufficient number of GDE sites have been surveyed, we plan to work with Hiawatha NF staff to implement Level II monitoring protocols at selected sites representative of a diversity of GDE types.

Table 2. List of 2015 GDE Field Survey Sites and Associated Element Occurrences.

Site	Unit	County	Central TRS	EOs
Hulbert Fen*	E	Chippewa	T46N R07W S34	Northern fen (new); *Rubus acaulis* (new); *Somatochlora incurvata* (new)
FR-3136	E	Chippewa	T45N R04W S34	Poor fen (new)
McDonald Lake S	W	Delta	T42N R20W S15	Bog (new); *Carex billingsii* (new)
Z Road S	W	Delta	T41N R20W S30	None; Rejected on reconnaissance
Lake Stella NE	W	Alger	T44N R20W S23	Poor fen (new)

*Occurs on Lake Superior State Forest just W of Hiawatha NF, E Unit.

Rare Plant Surveys (East and West Units) 020

Figure 4. Calypso (*Calypso bulbosa*) in a rich conifer swamp, Hiawatha NF, 27 May 2015.

In winter 2015, MNFI and Hiawatha NF botanists identified and prioritized element occurrences of state-listed plant species on HNF lands for resurvey, focusing on populations of declining species such as the state threatened calypso (*Calypso bulbosa*) and state endangered round-leaved orchis (*Amerorchis rotundifolia*). In addition, de novo surveys for rare plants were conducted on two 40-acre (16 ha) HNF parcels within the Lake Stella Bog cRNA. This cRNA falls within the proposed Plumb Bruno Integrated Resource Management project area.

In late May and mid-June 2015, meander surveys for rare plant species were conducted in habitats previously determined to support populations of target species. The Lake Stella Bog cRNA parcels were surveyed in late August 2015.

Population data and spatial locations were recorded using the BackCountry Navigator Pro GPS Application (CritterMap Software LLC) for Android. To facilitate detection of population trends, a census approach was used for calypso and round-leaved orchis. All flowering and sterile individuals (leaves) of calypso were recorded and marked with GPS, and all flowering or budding individuals of round-leaved orchis were counted and marked. For all other rare species documented, spatial coordinates and more general estimates of populations were recorded. Following field surveys, element occurrence ranks were updated and new element occurrences were created for newly documented populations (Table 3).

Field survey data for most occurrences, including censuses and GPS coordinates, were processed and shared with Hiawatha NF botanists in late October 2015. Data for the remaining four occurrences were processed in December 2015 and will be made available to HNF botanists as part of the MNFI data sharing agreement.

Table 3. Rare plant element occurrences surveyed on HNF in 2015.

Species	EOID	State Status	Old Rank	New Rank	Survey Type
Amerorchis rotundifolia	2159	E	B	B	Fertile count
Amerorchis rotundifolia	8929	E	B	CD	Fertile count
Calypso bulbosa	17	T	AB	D	Count
Calypso bulbosa	2720	T	C	F	Count
Calypso bulbosa	3639	T	A	C	Count
Carex billingsii	20496	SC	new	A	Qualitative meander
Carex billingsii	20497	SC	new	A	Qualitative meander
Carex billingsii	20498	SC	new	B	Qualitative meander
Carex heleonastes	133	E	B?	F	Qualitative meander
Carex novae-angliae	4459	SC	B?	B	Qualitative meander
Cypripedium arietinum	4470	SC	C	F	Count
Drosera anglica	4410	SC	E	B	Qualitative meander
Rubus acaulis	10389	E	A	BC	Qualitative meander

Hine's Emerald Dragonfly Surveys (East Unit) 015

In winter 2015, MNFI and Hiawatha NF biologist identified the activity of additional surveys for Hine's emerald dragonfly (HED) south of the known and mapped occurrence at Summerby Swamp. On August 4, 2015 a meander survey was conducted at the site, which is essentially just south of Summerby Swamp, south of Highway M-123. Amongst the large wetland complex, mostly comprised of cedar swamp, there are pockets of small, open rooms of northern fen habitat. Within these openings HEDs were observed, thereby increasing the known distribution of the occurrence here.

Subpopulation data and spatial locations were recorded using the BackCountry Navigator Pro GPS Application for Android. All adult HEDs were recorded and marked with GPS, spatial coordinates and more general estimates of populations were recorded. Following field surveys the element occurrence rank was updated. Refer to Appendix 1 for copies of the MNFI Special Field Forms.

Figure 5. Hine's emerald dragonfly meander surveys were conducted in the large wetland complex south of Summerby Swamp and south of M-123.

Mussel Surveys (West Unit) 020

Figure 6. Mussel survey Site 8 at Herman Lake.

Mussel surveys were performed at eight lake sites and three stream sites in 2015 within the west unit of Hiawatha National Forest. Little or no documentation of mussel populations from these waterbodies was available previously. Though introductions of zebra mussel (*Dreissena polymorpha*) to inland lakes in the Upper Peninsula are expected to increase, relatively few occurrences are currently documented. Native freshwater mussels (Unionidae) can be severely impacted by zebra mussels, sometimes resulting in a nearly complete loss of the native mussel community from a lake or river reach. These surveys are part of an ongoing effort to document native mussel occurrences and community composition in the Upper Peninsula before the introduction of zebra mussels to these waterbodies.

Unionid mussel surveys were performed to determine the presence/absence and abundance of each species at each site. A measured search area was used to standardize sampling effort among sites and allow unionid density estimates to be made. Typically 128m² provides a good compromise between amount of search effort per site and the number of sites to be completed within the timeline of the project. In lakes, a transect line was used to delineate the search area. In streams the search area spanned the width of the steam, and the length of reach surveyed was measured to determine the search area. Only wadeable habitats were surveyed, i.e. waist deep (approximately 70cm) and

shallower. Survey of deeper habitats is possible with the use of dive equipment, but this was outside the scope of this survey. Zebra mussels and other aquatic invasive species are often inadvertently transported on boats, trailers, and recreation/fishing gear. Boat ramps or access points are likely points of entry into lakes for zebra mussels. Sample sites were located adjacent to boat access points, when they were present, to maximize chances of detecting any zebra mussels. GPS units were used to document the location of survey sites. Latitude and longitude of each site was recorded.

Live unionids and shells were located with a combination of visual and tactile means. Glass bottom buckets were used to facilitate visual searches. Water clarity was generally very good in the lakes and streams sampled. Occasional tactile searches through the substrate were made to help ensure that buried unionids were not overlooked. Live individuals were identified to species and planted back into the substrate anterior end down (siphon end up) in the immediate vicinity of where they were found. Shells were also identified to species. Presence/absence was recorded for zebra mussel and Asian clam (*Corbicula fluminea*). In cases where zebra mussels are found attached to live native unionid mussels, the number attached to each was counted. Zebra mussels attached to live unionid mussels were removed by hand before the unionid was placed back in the substrate. Habitat data were taken to describe and document conditions at the time of the surveys. The substrate within each transect was characterized by estimating percent composition of each of the following six particle size classes (diameter); boulder (>256mm), cobble (256-64mm), pebble (64-16mm), gravel (16-2mm), sand (2-0.0625mm), silt/clay (<0.0625) (Hynes 1970). Woody debris, aquatic vegetation, exposed solid clay substrate, and erosion were noted when observed. Conductivity and pH were recorded with an Oakton handheld meter. Total alkalinity and hardness (calcium and magnesium) were measured with LaMotte kits.

No zebra mussels or Asian clams were detected at any of the sites surveyed. A total of five native mussel species were found. Six of the nine lakes, and one of the two stream survey sites had native mussels. The highest density of mussels was found in McKeever Lake (0.53 indvs./m^2), followed by Herman Lake (0.34 indvs./m^2). Giant floater (*Pyganodon grandis*) and fatmucket (*Lampsilis siliquoidea*) were the most abundant and frequently found mussel species.

The area surveyed at each site is a small fraction of the available habitat in each lake. Surveying additional sites within these lakes could reveal extant populations. Locations of mussel survey sites are given in Table 4, and the number of individuals of each species found is provided in Table 5. A total of eight species of aquatic snails were found incidentally while performing mussel surveys (Table 5). They were present at seven of the eleven sites surveyed. No listed or special concern snail species were found.

Total alkalinity and hardness (calcium and magnesium) were near zero in Banana Lake and McNeil Lake. No unionid mussels, aquatic snails, or fingernail clams (Sphaeriidae) were found at these sites, possibly due to a lack of available calcium for shell production. These were the only two sites with <28mg/L calcium concentration, a level that might support native unionid mussels while excluding zebra mussels (Hollandsworth et al. 2011, Cohen and Weinstein 2001, Hincks and Mackie 1997). Physical and chemical habitat measures are provided in Table 6.

Table 4. Locations of mussel survey sites in Hiawatha National Forest, summer 2015.

Site #	Waterbody	Latitude (N)	Longitude (W)
1	Banana Lake	46.07072	86.49024
2	N. Muleshoe Lake	46.13254	86.43616
3	Little Murphy Creek	46.12425	86.45078
4	Leg Lake	46.12890	86.48311
5	Norway Lake	46.13202	86.51090
6	Kilpecker Creek	46.12898	86.51387
7	McNeil Lake	46.28752	86.62721
8	Herman Lake	46.23990	86.58504
9	Pete's Lake	46.22968	86.60363
10	McKeever Lake	46.21761	86.58859
11	Deer Creek	46.20313	86.56449

Table 5. Numbers of unionid mussels (#), relative abundance (RA), and density (D, indvs./m²) recorded at each survey site, summer 2015. Presence/absence of aquatic snails, fingernail clams, and non-native bivalves are noted.

		1	2	3			4			5		
		Banana Lake	N. Muleshoe Lake	Little Murphy Creek			Leg Lake			Norway Lake		
Common Name	Species	#	#	#	RA	D	#	RA	D	#	RA	D
Spike	*Elliptio dilatata*			1	0.06	0.01						
Fatmucket	*Lampsilis siliquoidea*			S								
Creek heelsplitter	*Lasmigona compressa*			4	0.23	0.03						
Giant floater	*Pyganodon grandis*						4	1.00	0.03	1	1.00	0.01
Strange floater	*Strophitus undulatus*			12	0.71	0.09						
	Total # individuals and density	0	0	17		0.13	4		0.03	1		0.01
	# species live	0	0	3			1			1		
	# species live or shell	0	0	4			1			1		
	Area searched (m^2)	128	128	128			128			128		
Asian clam	*Corbicula fluminea*											
Zebra mussel	*Dreissena polymorpha*											
Aquatic snails	Gastropoda		X	X			X					
Fingernail clams	Sphaeriidae			X			X					

		6	7	8			9			10			11		
		Kilpecker Creek	McNeil Lake	Herman Lake			Pete's Lake			McKeever Lake			Deer Creek		
Common Name	Species	#	#	#	RA	D	#	RA	D	#	RA	D	#	RA	D
Spike	*Elliptio dilatata*														
Fatmucket	*Lampsilis siliquoidea*			8	0.18	0.06				53	0.78	0.41	1	1.00	0.01
Creek heelsplitter	*Lasmigona compressa*														
Giant floater	*Pyganodon grandis*			36	0.82	0.28	2	1.00	0.02	3	0.04	0.02			
Strange floater	*Strophitus undulatus*									12	0.18	0.09			
	Total # individuals and density	0	0	44		0.34	2		0.02	68		0.53	1		0.01
	# species live	0	0	2			1			3			1		
	# species live or shell	0	0	2			1			3			1		
	Area searched (m^2)	128	128	128			128			128			128		
Asian clam	*Corbicula fluminea*														
Zebra mussel	*Dreissena polymorpha*														
Aquatic snails	Gastropoda			X			X			X			X		
Fingernail clams	Sphaeriidae			X			X						X		

Table 6. Physical and chemical habitat measures taken at mussel survey sites, summer 2015.

Site #	Waterbody	Boulder	Cobble	Pebble	Gravel	Sand	Silt	Aquatic Vegetation	Woody Debris	pH	Conductivity (µS)	Total Alkalinity (mg/l)	Hardness (Ca and Mg, mg/l)	Water Temp. (C)
1	Banana Lake					50	50	Y	Y	7.94	21.7	4	4	20.5
2	N. Muleshoe Lake					10*	90	Y	Y	8.50	120.8	48	44	21.3
3	Little Murphy Creek					50	50	N	Y	8.80	193.0	96	90	20.2
4	Leg Lake						##	Y	Y	8.30	198.0	96	92	22.2
5	Norway Lake						##	Y	Y	9.45	181.1	84	80	21.6
6	Kilpecker Creek					90	10	N	Y	8.24	193.0	100	80	13.3
7	McNeil Lake					50	50	Y	Y	8.87	6.55	4	0	20.4
8	Herman Lake					50	50	Y	Y	8.62	166.3	76	64	21.5
9	Pete's Lake					75	25	Y	Y	8.59	193.0	96	86	21.2
10	McKeever Lake					60	40	Y	Y	9.02	173.3	72	68	21.1
11	Deer Creek					75	25	Y	Y	8.66	180.1	80	64	19.3
* Firm sand covered with 10-20cm of silt														

Golden Eagle Camera-Trapping **(East Unit) 015**

Figure 7. Golden Eagle on bait at the East Lake camera-trapping site, Hiawatha National Forest, Mackinac Co., MI.

On December 4, 2014, in consultation with Derek Heubner, we set-up two camera-trapping stations on the East Unit of the Hiawatha National Forest, both located in northern Mackinac County, and in the

East Lake vicinity. The first station (East Lake) is located off East Lake Road and is a tiny opening (0.45 acre) within mixed northern forest habitat. The second station (Worth Road) is located off Worth Road north of Brevort Lake in a small opening (0.81 acre) within mixed forest in which many of the young pines have been cut to maintain a wildlife opening. On January 10, 2015 a third station (Gamble Road) was established and is located off the east end of Gamble Road west of the intersection with Mackinac Trail Road, in an area of mixed forest. This site was the largest opening (3.5 acres) and we didn't expect to find a lot of Golden Eagles using the site but was to give us an idea of the density of Bald Eagles also wintering in the area.

Stations were established following the protocol outlined in Jachowski et al. 2015. The protocol advised establishing sites in small forest gaps or clearings (≥10-20 m in diameter). To encourage eagles to visit, we baited each site with a road-killed white-tailed deer (*Odocoileus virginianus*) carcass secured to the ground using a metal stake. Motion-sensing digital game trail cameras were used to record images on removable solid-state memory cards. Cameras were placed 1m from the ground and 2–3m from the carcass, pointed at the carcass. Protocol required that motion-triggered cameras were programmed to record an image, and then pause for ≥ 1min prior to taking an additional motion-triggered image. A camera was to be active at each site for ≥ 2 weeks, targeted for operation between 15 January and 15 February, after the cessation of most white-tailed deer hunting seasons when high rates of human activity could disturb or impact raptor behavior. We extended trapping throughout the winter from 4 December 2014 through 5 February, 2015. Sites were typically visited every 5–7 days to check on camera function and to download image files.

A total of 113 camera trapping days were completed and a total of 6,416 images were obtained (Table 7). We were successful in documenting Golden Eagles at both the East Lake and Worth Road sites. In addition we had Bald Eagles documented at all three sites and a variety of other wildlife, including collared wolves at both the Worth Road and Gamble Road locations. This effort is part of a larger multi-state project which was started in 2011 (Jachowski et al. 2015). We hope to continue with the trapping in the Hiawatha National Forest and possibly expand the trapping to include the West Unit as well as other National Forests in Michigan.

Table 7. Summary of Golden Eagle camera-trapping project within the Hiawatha National Forest, winter of 2014-15, Mackinac County, MI.

	East Lake	Worth Road	Gamble Road	
GPS Coordinates	E671049 N5109243	E661146 N5099089	E681109 N5108578	
Date initiated	12/04/2014	12/04/2014	01/10/2015	
Date of first Bald Eagle	12/19/2014	12/13/2014	01/20/2015	
Date of first Golden Eagle	12/22/2014	02/03/2015	na	
Date completed	01/08/2015	02/05/2015	01/27/2015	
Camera Trapping days	34	62	17	113
Total number of images	1,519	1,830	3,067	6,416

Reconcile databases – MNFI/NRIS (East and West Units) 020

MNFI continues to update the Biotics Database after every field season and we have been making changes to web-based subscription access. This year a total of 22 new Element Occurrences from the Hiawatha National Forest were transcribed or added to the MNFI Biotics Database and an additional 74 records were updated. We plan to update or newly transcribe several peatland sites, HED sites, and raptor nesting records on the Hiawatha National Forest. As for data we have received from the HNF, most of this data are animal records and exclusively from the East Unit. We would appreciate receiving additional plant records from both Units and animal records from the West Unit. We are also currently reviewing access requirements/rates with several agencies and groups of data users and have provided the Hiawatha National Forest access at the full shape file level because of your level of financial support to our program.

This access is being provided as a direct result of our great working relationship we have established over the past four years and we look forward to continued collaboration on this and future projects!

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Figure 9. Gray wolf, with collar, recorded at the Gamble Road site, HNF East Unit, 20 January 2015.

Appendix 1

Michigan Natural Features Inventory

Special Animal Survey Form

MICHIGAN STATE UNIVERSITY EXTENSION

ELEMENT IDENTIFICATION

Data sensitive? ☐ Yes ☒ No

Name (scientific and/or common): Somatochlora hineana EO Rank: AB EOID: 2751 EO #: 03

SURVEY INFORMATION

Survey date: Aug 4, 2015 Time: from 10:34 ☒ AM ☐ PM to 4:30 ☐ AM ☒ PM Sourcecode: F15CUT03MIUS

Surveyors (principal surveyor first, include first & last name):

David Cuthrell

Weather conditions: Mostly sunny, 25% cloud cover, winds out of west 10-15, temperature 75 degrees F.

Revisit needed? ☒ Yes ☐ No Why? Periodic re-visits to the site to confirm prolonged persistence of the population here.

LOCATIONAL INFORMATION

Survey site: Summerby South Site name: Summerby Swamp

Quadcode: 4508487 Quad name: Moran

Township/Range/Section: T41N R04W Sec: 3 and 10 County: Mackinac Managed area: Hiawatha National Forest

DIRECTIONS: Provide detailed directions to the observation (rather than the survey site). Include landmarks, roads, towns, distances, compass directions.

In previous years searching for HED was confined to North of Highway 123 but this year I spent most of day South of Highway 123.

Landowner type: ☒ Public ☒ Private ☐ Other:

Landowner Name - Contact Information: Hiawatha National Forest

Notes:

Was a GPS used? ☒ Yes ☐ No Type of unit: notebook Unit number:

Waypoint name/#: File name and location :

Latitude: Longitude:

Feature Information: (mandatory)

Conceptual feature type: ☐ Point: < 9 m in both dimensions ☐ Line: > 9 m in one dimension ☐ Polygon: > 9 m in both dimensions

Source feature: ☐ Single Source EO ☒ Multiple Source EO

MAP (mandatory)

1. Attach appropriate part of a USGS topographic map or map showing exact locations of species. Image can be uploaded into the Map Insert field located at the end of this form or clearly associated with this form once completed.
2. Indicate on the map the exact location of the observation(s):
   a. When the observation area is ***no larger then a pen point*** on the map (i.e., only a small number of individuals or extremely small patches), place small points on the map indicating the location(s) of the individuals or patches, and label each point with an arrow so they are more easily seen.
   b. When the observed area is ***larger then a pen point*** on the map. (e.g., a population of plants, foraging birds):
      (1) Draw a thin solid boundary line showing the extent of the observed area occupied by the individuals.
      (2) Indicate disjunct patches (polygons) by drawing the boundary for each patch separately.
      (3) If the boundary follows the edge of a lake, stream, road, marsh or other feature, draw the boundary precisely on the edge of the feature.
      (4) When needed, add notes to the map with instruction on where the boundary line is located or if the boundary is shared with other observations.
3. A hand drawn sketch may be included for finer details.

LOCATIONAL CERTAINTY

Is your depiction of the observed area on the map within 4.5 m (approx. 15ft) of its actual location on the ground? ☒ Yes ☐ No

If No, complete the following:

a. Estimate of uncertainty distance: based on landmarks, elevation, etc., the location of the observed area on the map is accurate to within

_____ ☐ meters ☐ kilometers ☐ feet ☐ miles of its actual location on the ground.

b. Is the observed area known to be located within some feature(s) on the map (e.g., wetland boundary, lake, road, trail, highway, contour lines)? ☒ Yes ☐ No
If Yes, indicate the boundary within which the observed area is known to be located on the map line, and if applicable, identify the feature (e.g., marsh).

IDENTIFICATION

Photo/slide taken? ☒ Yes ☐ No Name and location of photo?

Specimen collected? ☐ Yes ☒ No Collection # and repository:

Identification problems? ☐ Yes ☒ No

If necessary, describe the important animal characteristics **you** used for identification:
Males so genetalia distinctive.

SIZE OF ELEMENT OCCURRENCE

Size is a quantitative measure of the area and/or abundance of an occurrence. Components of this factor are 1) area of occupancy, 2) population abundance, 3) population density and 4) population fluctuation.

Type of observation: ☒ sight ☐ song/vocalization ☐ road kill ☐ trapped ☐ other (explain): net, photo and released

Abundance (number of pairs, chicks, nests, adults, juveniles, hatchlings, behavior, sex, size of each individual, etc):

Actual number observed:
8 adults observed including flyby males, females ovipositing, and males hover guarding.

Number estimated and basis for estimate:

Population density (if practical): number: _____ per area unit: ☐ meters² ☐ kilometers² ☐ feet² ☐ miles²

Does population fluctuate? (May be particularly relevant to invertebrates):

○ Yes ○ No ○ unknown Explain:

Area of occupancy (fill in one): _____ meters 5 acres _____ miles Type of measurement (check one): ☐ precise ☐ estimate

ASSOCIATED SPECIES

List other species observed at this site. Note especially listed species and potential competitors, predators, and prey. Mark appropriate columns.

Species	ID +	ID ?	Number Observed	Notes, observations, etc.
Twelve spotted skimmer	☒	☐	5	
Aeshna spp.	☒	☐		
	☐	☐		
	☐	☐		
	☐	☐		
	☐	☐		
	☐	☐		
	☐	☐		
	☐	☐		
	☐	☐		

CONDITION:

Condition is an integrated measure of the quality of biotic and abiotic factors, structures and processes within the occurrence, and the degree to which they affect the continued existence of the occurrence. Components of condition for species are: 1) reproduction and health. 2) ecological processes, 3) species composition and biological structure, 4) abiotic physical/chemical factors. Factors to consider: evidence of regular successful reproduction, habitat degradation, disturbance, presence of exotic species, the degree to which ecological processes are sustaining the habitat. Where possible include a comparison to other occurrences.

EVIDENCE OF REPRODUCTION:

Adults present in suitable breeding habitat.

EVIDENCE OF DISEASE/PREDATION:

none

CONDITION (continued):

HABITAT DESCRIPTION: Describe the specific habitat or micro habitat where this animal occurs. Convey a mental image of the habitat and its features including: land forms, aquatic features, vegetation, slope, aspect, soils, natural disturbances.

Adults seen flying throughout northern fen within a large cedar swamp complex. Area contained small rivulets or tiny pools of water with no perceptable flow, area dominated by Eleocharis, Muhlenbergia richardsonis, and Carex spp.

LANDSCAPE CONDITION: Describe the condition of the landscape surrounding the elements habitat (i.e., farmland, residential area, pristine forest)

A large wetland complex w/ areas of deeper water surrounded by cedar swamp on all sides. Also several cedar/tamarack islands. HED found in areas with water, either small pools, or in small rivulets.

CURRENT THREATS to this occurrence: (i.e., grazing, logging, mining, plantation, ATVs, dumping, etc.) Discuss exotics in the next section.

ORVs might be really only current threat,and even this is extremely little risk due to the thick cedar swamp you have to traverse to get into this portion of the site. The site is bisected by US 123 which is a fairly busy highway during the summer months and road-killed specimens of HED have been found here.

POTENTIAL THREATS to this occurrence:

Changes to hydrology, increased ORV use, additional road-killed specimens, increased cat tail invasion from the road margins/ditches.

EXOTICS PRESENT? : ☐ yes ☒ no If yes, describe their impacts to the occurrence.

PAST IMPACTS to this occurrence: (i.e., logging, etc.)

some areas have been logged but nothing recently.

TOPOGRAPHY

Elevation: _____ ft.

If elevation is a range:

Minimum: _____ ft.

Maximum: _____ ft.

Aspect (down slope):

Measured Aspect: _____ ° (N = 0°)

☐	Flat	
☐	Variable	
☐	N	338 - 22°
☐	NE	23 - 67°
☐	E	68 - 112°
☐	SE	113 - 157°
☐	S	158 - 202°
☐	SW	203 - 247°
☐	W	248 - 292°
☐	NW	293 - 337°

Slope:

Measured Slope: _____ ° _____ %

☐	Flat	0°	0%
☐	Gentle	0 - 5°	0 - 9%
☐	Moderate	6 - 14°	10 - 25%
☐	Somewhat steep	15 - 25°	26 - 49%
☐	Steep	26 - 45°	50 - 100%
☐	Very Steep	45 - 69°	101 - 275%
☐	Abrupt	70 - 100°	276 - 300%
☐	Overhanging/sheltered	> 100°	> 300%

Light:

- ☐ Open
- ☐ Partial
- ☐ Filtered
- ☐ Shade

Topographic position:

- ☐ Ridge, summit, or crest
- ☐ High slope (upper slope, convex slope)
- ☐ Midslope (middle slope)
- ☐ Lowslope (lower slope, footslope)
- ☐ Toeslope (alluvial toeslope)
- ☐ Low level (terrace lakeplain, outwash plain, lake bed, etc)
- ☐ Channel
- ☐ Other: _____

Hydrologic Regime:

Wetlands:

- ☐ Intermittently flooded
- ☐ Permanently flooded
- ☐ Semipermanently flooded
- ☐ Temporarily flooded (e.g., floodplains)
- ☐ Seasonally flooded (e.g., seasonal ponds)
- ☐ Saturated (e.g., bogs, perennial seeps)
- ☐ Unknown

Non-Wetlands:

- ☐ Wet Mesic
- ☐ Mesic (moist)
- ☐ Dry-Mesic
- ☐ Xeric (dry)

MANAGEMENT AND PROTECTION

Management (stewardship and restoration), **Monitoring and Research Needs** for the Element at this location (e.g., burn periodically, open the canopy, control invasives, ban ORV's, remove drainage ditches, clear blocked culvert, break drain tile, reduce deer densities, study effects of herbivore impacts)

Protection Needs for the Element at this location (e.g., protect the entire marsh, the slope and crest of slope)

Protect the entire wetland complex here including portions of the adjacent cedar swamps, and all of the open northern fen.

IMAGE INSERT: **click** on space below and navigate to saved photo, supported formats include BMP, JPG, GIF, PNG, TIF

MAP INSERT: **click** on space below and navigate to saved map file, supported formats include BMP, JPG, GIF, PNG, TIF