Surveys and Monitoring for the Hiawatha National Forest: FY 2016 Progress Report

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Cover photograph: Red-shouldered Hawks in newly discovered nest, HNF West Unit, 21 June, 2016. Photo by John Paskus.

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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 2016 (July 22, August 1-3) we conducted vegetation sampling at a total of 20 sites: 8 Option 1 sites, the 8 Reference sites, and at the Control 1-6 sites. In conjunction with the vegetation sampling, we placed data loggers at the same 20 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 (20-21) and all were collected in early September 2016. 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 2016 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. In addition, all of the vegetation monitoring data from 2012-2016 has now been entered into a large excel database awaiting analysis.

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

Figure 1. Three (35-39 day old) Red-shouldered Hawks in a newly discovered nest, West Unit HNF, 21 June 2016.

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 2016 surveys a total of 111 nests or old nesting territories (60 East, 51 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 60 nests to check for breeding use. Initial nest checks and conspecific call broadcasts were conducted during May 4-12. During the first visit, MNFI staff found 11 active or potentially active (i.e., decorated nest but adult not observed) Red-shouldered Hawk nests. Biologists from the USFS found an additional 19 active nests (16 Red-shouldered Hawk, 3 Northern Goshawk) during their first round of surveys. Staff from MNFI revisited all 30 active and potentially active (27 Red-shouldered Hawk, 3 Northern Goshawk) nests in June to assess nest success and productivity. Productivity surveys during 2016 were completed on June 22-30 using a telescoping fiberglass pole and video camera (GoPro Hero) to inspect nests. All three of the active Northern Goshawk nests found during the first round of surveys were successful, with a total of at least 5 chicks fledged. We observed 67% (18/27) of the Red-shouldered Hawk nests to be successful and counted 43 chicks total (1.59 young per active nest, 2.38 young per successful nest) (Table 1).

In the West Unit, we visited 51 nests to check for breeding use. Initial nest checks and conspecific call broadcasts were conducted during May 4-12. During the first visit, MNFI staff found 6 active or potentially active (i.e., decorated nest but adult not observed) Red-shouldered Hawk nests and four active Northern Goshawk nest. We revisited all 10 active and potentially active raptor nests in June to assess nest success and productivity. Productivity surveys were done during June 20-21 using a telescoping fiberglass pole and video camera (GoPro Hero) to inspect nests. Three of the four active Northern Goshawk nests found during the first round of surveys were successful. In addition, we determined that 3 successful Red-shouldered Hawks nested in the West Unit in 2016. We observed 50% (3/6) of the Red-shouldered Hawk nests to be successful and counted 6 chicks total (1.00 young per active nest, 2.00 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 in line with previous years (Figure 2), and up from 2015, with a total number of 49 chicks produced (1.48 young per active nest, 2.33 young per successful nest) (Table 1).

Table 1. 2016 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	**33**	**21**	**49**	**1.48**	**2.33**	**64 %**
East	27	18	43	1.59	2.38	67 %
West	6	3	6	1.00	2.00	50 %
NOGO	**7**	**6**	**10**	**1.43**	**1.67**	**86 %**
East	3	3	5	1.67	1.67	100 %
West	4	3	5	1.25	1.67	75%

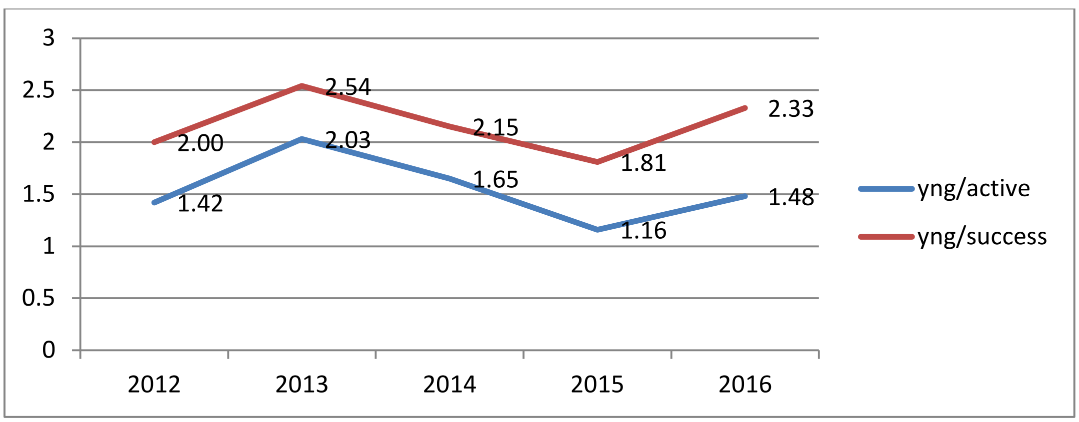

Figure 2. RSHA productivity 2012-2016 on the Hiawatha National Forest, East and West Units.

Recommendations for Future Work

The raptor nest monitoring data set is approaching two decades and therefore we recommend continuing this level of work. We also recommend publishing the results of the data set in a peer reviewed journal. This may help determine, or better define, the overall goal or objective of the monitoring program.

If a goal is to find additional Northern Goshawk nesting territories within the HNF, we recommend doing surveys for Northern Goshawks during the courtship phase, which for northern Michigan, is likely from 1 March through 7 April. Recent studies (Roberson et al. 2005) suggest this may be the best time to survey for this species. Alternatively, or in addition to, surveys could be conducted during the fledgling-dependency phases (approximately 25 June – 20 July).

Evaluation of Possible Bat Hibernacula (East Unit) 015

In the fall of 2014, MNFI investigated the use Hiawatha National Forest karst areas by bats. In that investigation acoustic data suggested that the site known as CAVE1 could be a potential bat hibernaculum (Schools, et al, 2014). This current investigation further assessed this possibility.

Five Wildlife Acoustics SM2BAT+ acoustic monitors with SMX-U1 microphones were deployed in the area around CAVE1 on April 4 and April 5, 2016. The microphone was placed approximately 15 feet above ground level, oriented slightly downward, and was equipped with a foam windscreen, as per manufacturer recommendation for foul weather operation Figure 3). The acoustic monitors were programmed to be active from a half hour before sunset until a half hour after sunrise. One monitor, Cave1-1 was placed at the cave entrance. The other monitors were placed from approximately 60 to 110 meters from Cave1 (Figure 3). The acoustic monitors operated from the installation date through the night of May 8.

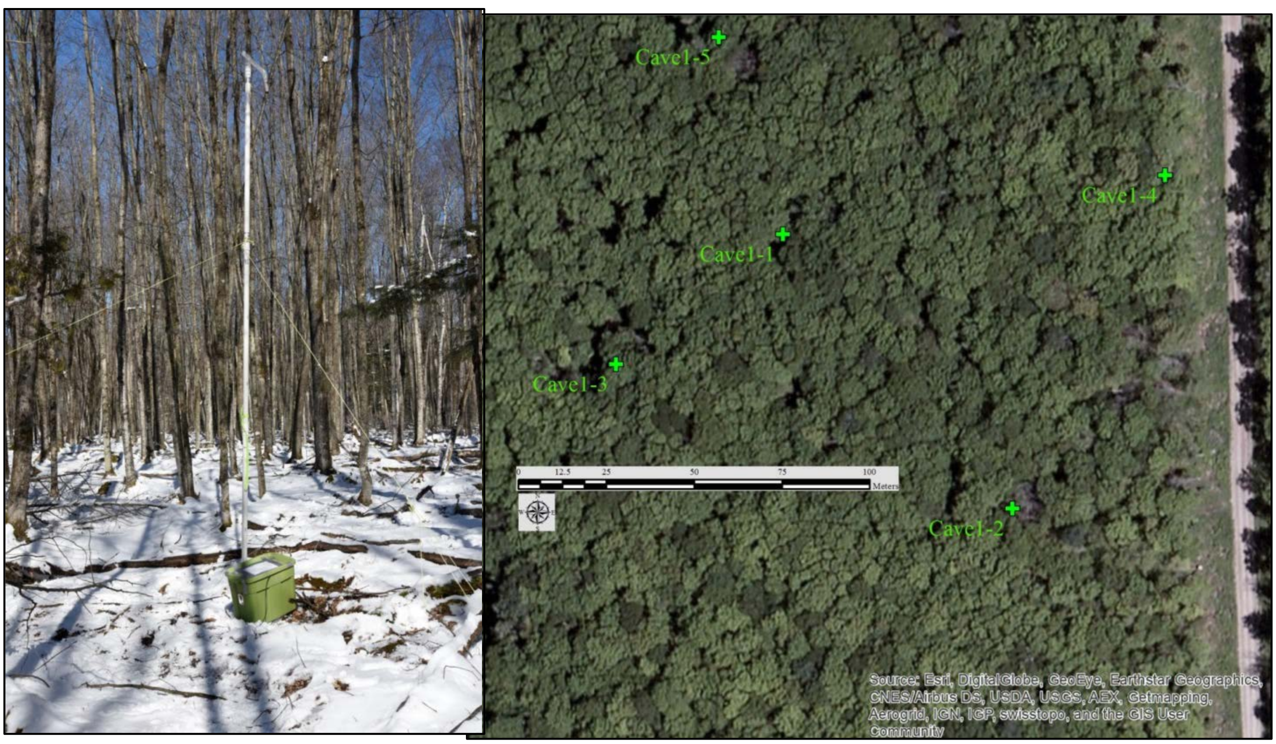

Figure 3. Typical monitor installation (left) and monitor placement around CAVE1 (right).

Visual/video monitoring of CAVE1 was conducted April 18-20, May 1-2, and May 5-8, 2016. Monitoring was not conducted on omitted dates between April 18 and May 5, 2016, due to low temperatures and/or rain; conditions not recommended for bat surveys by the USFWS (2016). An infrared video camera was used to film the cave entrance during the visual monitoring.

Visual/video monitoring took place from at least a half hour before sunset to an at least an hour after sunset. During visual monitoring, an additional SM2BAT+ acoustic monitor with a SMX-U1 microphone was placed at the cave entrance. The microphone was approximately eight feet high, and oriented upward without a foam windscreen. At the end of each evening monitoring period, the acoustic data from the additional cave monitor was examined for the presence of bats. If a bat was acoustically detected during the visual monitoring period, the video from that time period was reviewed to ascertain if the bat went into or out of CAVE1.

Due to the known occurrence of White Nose Syndrome (WNS) in the Upper Peninsula of Michigan, visual surveys for deceased bats in the vicinity of Cave1 took place at all visits to the cave. No deceased bats were found during any visit.

No bats were visually observed utilizing CAVE1. Acoustic monitoring shows sporadic bat presence in the area starting April 14, with detection rates increasing starting May 1. Table 2 shows the number of bat passes detected per night. These passes do not necessarily represent the number of bats present due to

	CAVE1-1	CAVE1-2	CAVE1-3	CAVE1-4	CAVE1-5	CAVE1-6
14-Apr	1			1	2	
15-Apr						
16-Apr		4				
17-Apr			1	1		
18-Apr						
19-Apr						
20-Apr	1		2	2	1	
21-Apr	1				1	
22-Apr					1	
23-Apr		1	1	1		
24-Apr			1	1	1	
25-Apr	1					
26-Apr	1					
27-Apr						
28-Apr		1				
29-Apr					1	
30-Apr		1	3	4		
01-May	5	4	6	2	5	1
02-May	1	2	2	3	4	1
03-May	2	2	5	1	3	
04-May		3	2			
05-May	3	3	5	18	7	1
06-May		2	2	17	9	
07-May	3	5	7	2	6	2
08-May	2		3	2	2	

Table 2. Number of recorded bat passes by day. Note that CAVE1-6 is the monitor set up during visual surveys.

the fact that an individual bat may conduct multiple passes in the monitor's detection zone. In particular, the results for monitor CAVE1-4 on the nights of May 5 and May 6 may be skewed. Close examination of the call timing for those two days indicates that 15 of 18 passes on May 5, and nine of 17 on May 6, appear to be from a single a single silver-haired bat, based on the time stamp of the recorded calls.

Based on the information obtained in this study, CAVE1 was not utilized as a bat hibernaculum during the winter of 2015 - 2016. While sporadic, there has been some level of bat activity in the area covered by the acoustic monitors since April 14. Acoustic activity at the cave entrance, however, is not any greater than the activity detected at any other monitor, as would be expected had bats been entering or exiting the cave. Nor were any bats visually detected exiting or entering the cave during a time period when they would be expected to be observed.

Recommendations for Future Work

It is still possible that CAVE1 is a hibernaculum. Northern long-eared bats (NLE) (*Myotis septentrionalis*) are known to shift hibernacula and not use the same hibernaculum year to year (Caceres and Barclay 2000). Given the level of bat activity detected in 2014, it is possible that CAVE1 has been utilized in the past. Another potential factor contributing to the lack of bat detection at CAVE1 could be the effects of white-nosed syndrome. Researchers are reporting population die-offs of 90% at known hibernacula within the region. For these reasons another survey in either the spring or fall should be undertaken to confirm or reject CAVE1 as a hibernaculum.

The evaluation of the karst features conducted in 2014 (Schools, et al. 2014), provides a set of baseline data for bat activity around those features and the area in general. As noted above, WNS has been reported for the Upper Peninsula, with a large die-off of cave bats during the winter of 2015-2016. It is suggested that the monitoring conducted for the karst evaluation be repeated in 2017. This would provide valuable information on the effect of WNS on the landscape, as well as help differentiate between the possibilities of the low activity of NLE in the vicinity of CAVE1 in 2016, being the result of WNS or hibernaculum switching.

Rare Plant Surveys (East and West Units) 015

In winter 2016, 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 late May and late June 2016, meander surveys for rare plant species were conducted in habitats previously determined to support populations of target species. 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. All flowering and sterile individuals (leaves) of calypso were recorded and marked with GPS. 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).

Table 3. Rare plant element occurrences surveyed on HNF in 2016.

Species	EOID	State Status	Old Rank	New Rank	Survey Type
Amerorchis rotundifolia	2159	E	B	B	*
Calypso bulbosa	17	T	AB	D	Count
Calypso bulbosa	3639	T	A	C	Count
Calypso bulbosa	13006	T	BC	CD	Count
Carex billingsii	20667	SC	new	B	Qualitative meander
Carex scirpoidea	20643	T	new	CD	Qualitative meander
Carex scirpoidea	20644	T	new	C	Qualitative meander
Coptidium lapponicum	3369	T	B	B	Qualitative meander
Coptidium lapponicum	6460	T	BC	BC	Qualitative meander
Cypripedium arietinum	19665	SC	C	C	Count
Cypripedium arietinum	20645	SC	new	D	Count
Empetrum nigrum	693	T	A	B	Qualitative meander
Empetrum nigrum	5059	T	A	C	Qualitative meander
Empetrum nigrum	11566	T	AB	AB	Qualitative meander
Erigeron hyssopifolius	10068	T	A	A	Qualitative meander
Muhlenbergia richardsonis	6407	T	BC	BC	Qualitative meander
Pinguicula vulgaris	3671	SC	B	B	Count estimate

*Surveys cancelled after reconnaissance found that the species had flowered early in very low numbers due to warm weather and dry conditions.

Figure 4. Lapland buttercup (*Coptidium lapponicum*) in a rich conifer swamp, Hiawatha National Forest, Delta Co., MI. June 30, 2016. Photo by B.S. Slaughter.

Recommendations for Future Work

We recommend continued surveys of previously documented populations of climate-sensitive and declining species, especially *Calypso bulbosa* and *Amerorchis rotundifolia*, but also *Galium kamtschaticum* and species of boreal fens such as *Carex scirpoidea*, *Empetrum nigrum*, *Erigeron hyssopifolius*, and *Pinguicula vulgaris*.

Vernal Pool Mapping (East and West Units) 015

Vernal pool surveys on Hiawatha National Forest Lands in 2016 focused on revisiting and confirming a subset of the vernal pools/potential vernal pools that had been previously identified and/or surveyed in 2015. Michigan Natural Features Inventory (MNFI) identified and mapped a total of 419 potential vernal pools in the Plumb-Bruno (n=201) and Raco-Eckerman (n=218) project areas in 2015. Of these, 118 (60 in Plumb Bruno, 58 in Raco-Eckerman) were surveyed in the field in 2015 (Lee 2016). Of the potential vernal pools and additional pools that were surveyed in the field, 74 were verified as vernal pools, and 16 were identified as other wetland types. However, a number of these were surveyed in the fall in 2015 and were dry. In addition, we were not able to determine the status (i.e., verified vernal pool or other wetland type) of 15 potential vernal pools that were surveyed in 2015 due to lack of information or because they were dry. Surveys in 2016 focused on determining the status of the potential vernal pools that had uncertain status and confirming the status of a number of vernal pools and other wetland sites that were surveyed in 2015.

Vernal pool surveys in 2016 were conducted in early July. A total of 60 vernal pools or potential vernal pools that had been identified from air photo interpretation and/or field surveys in 2015 were surveyed in 2016. Survey sites consisted of 27 vernal pools that had been surveyed in 2015 but were dry, 15 vernal pools/potential vernal pools that had uncertain status, and 3 sites that were designated as not vernal pools in 2015. We also surveyed 15 additional potential vernal pools that were not surveyed in 2015.

Each site was visited only once during the 2016 surveys. Survey sites were located in the field using GPS, shapefiles, and the BackCountry Navigator application on a Samsung Galaxy Tablet A. Each vernal pool/potential vernal pool that was surveyed was photographed for documentation.

Surveys in 2016 were able to confirm a total of 35 vernal pools. Of these, 27 were identified as vernal pools in the field in 2015, 6 were identified as potential vernal pools that needed more information to verify their status in 2015, and 2 were new vernal pools that were verified in 2016 (Table 4). Although a number of the vernal pools that were surveyed in 2016 were completely or mostly dry (i.e., little/no standing water on the surface), we were able to confirm the status of these pools as active vernal pools based on the presence of standing water and/or saturated substrates observed in the field (Figure 5), evidence of spring flooding in aerial imagery from different times of year and multiple years, vegetation within the pool basin, and other signs of flooding/inundation (i.e., dark/wet matted leaves, water marks at base of tree trunks, etc.).

Table 4. Summary of vernal pool survey results in the Raco-Eckerman (RE) and Plumb-Bruno (PB) project areas on the Hiawatha National Forest in July 2016. (Note: The pool identification numbers for the pools in each designation are shown in the table. Each pool ID number in the table is preceded by 'MNFI6.')

Vernal Pool/Potential Vernal Pool Status Designations based on 2015/2016 Surveys	Vernal Pools Verified as Vernal Pools in the Field in 2016 (H2O-VP)	Potential Vernal Pools – Status Uncertain in 2016 (H2O-VP?)	Verified as Not Vernal Pools – Other Wetland Types or Dry in 2016 (H2O-NVP or Dry)
Verified Vernal Pool (H2O-VP) (n=27)	**RE:** 214, 215F, 216, 217, 218F, 225, 319F, 320, 321, 322, 323, 372, 373, 374, 399, 400, 401, 404, 408, 409F, 420, 423, 442, 449, 452, 456 **PB:** 44		
Potential Vernal Pool – Status Uncertain (H2O-VP?) (n=15)	**RE:** 412, 413, 414, 348, 427, 451	**RE:** 272F, 324, 403F, 441, 446, 448	**RE:** 375 **PB:** 42, 453
Verified as Not Vernal Pools (H2O-NVP/Dry) (n=3)		**RE:** 402F	**RE:** 450, 457
Potential Vernal Pools First Surveyed in 2016 (PVP) (n=15)	**RE:** 225A, 461	**RE:** 325, 346, 349, 431, 432, 459, 462	**RE:** 424, 425, 458, 460, 463, 464
TOTAL	**35**	**14**	**11**

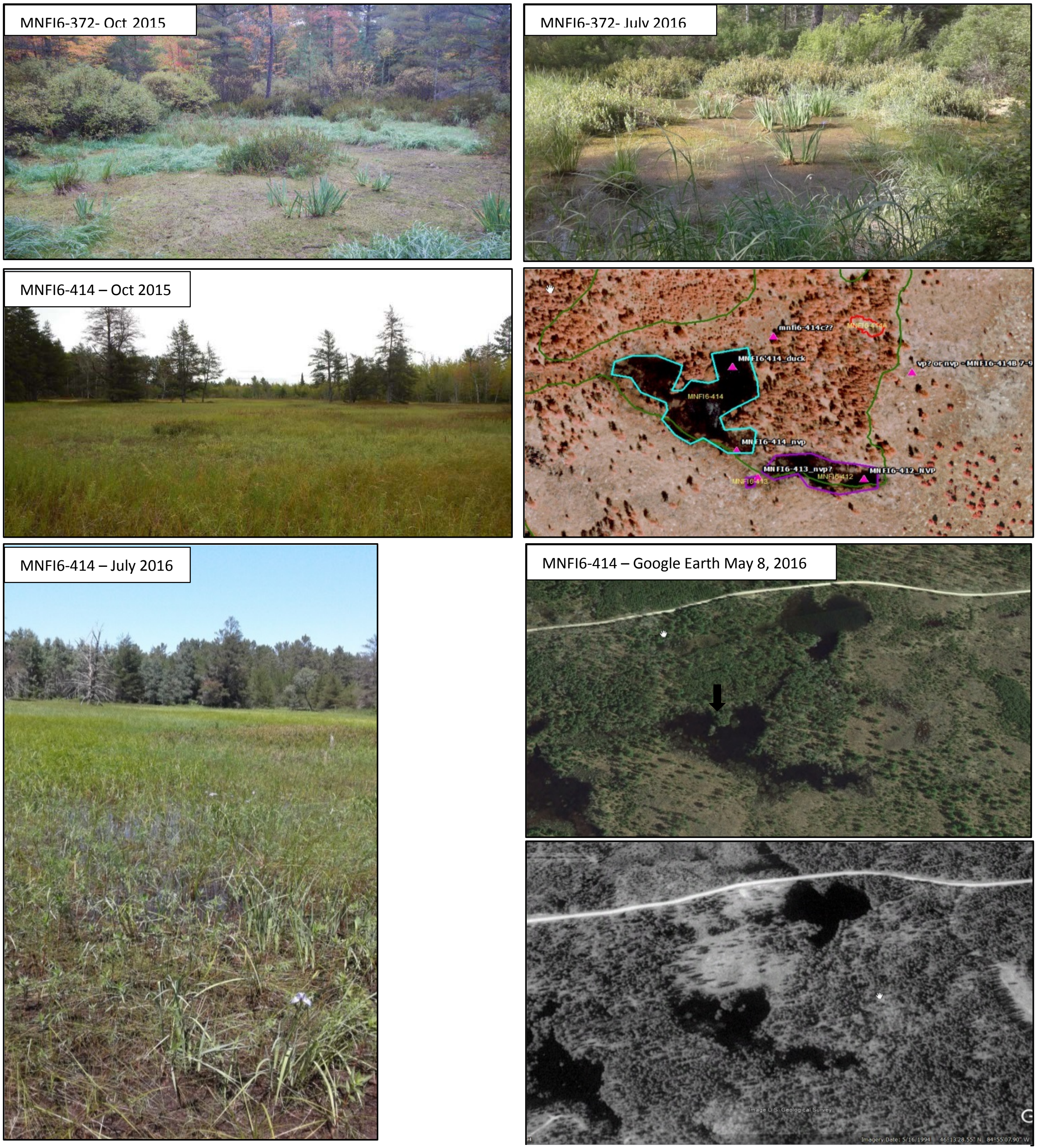

Figure 5. Examples of two vernal pools that were verified as vernal pools and were dry in October 2015, and were confirmed as vernal pools and had standing water in July 2016. Both are examples of intermittent wetlands. Air photos on the right show MNFI6-414 flooded in early to mid-May of 2016 and in the spring of 1994 and 2007. This provides evidence that the pool floods regularly and can hold standing water for at least 2 months in the spring (i.e., into early July) in some years.

Eleven of the pools or wetlands that were surveyed in 2016 were found to be other wetland types (e.g., leatherleaf bogs) or upland sites (Table 3). Three of these pools were potential vernal pools that needed more information to determine their status in 2015. Two were designated as other wetland types in 2015, and surveys in 2016 confirmed this. Six of these were first surveyed in 2016. Almost all of these wetlands were dry in 2015 and/or 2016, and some contained some wetland plants. Some of these wetlands may be ephemeral, and may fill up with water when there is sufficient precipitation but dry up within a few days or weeks (i.e., flooded less than 2 months).

In Lee (2016), we mentioned that some of these larger marshy vernal pools that were surveyed in 2015 may be intermittent wetland natural communities. After consultation with MNFI's lead ecologist and lead botanist, we have determined that at least a few of these are intermittent wetlands. Some of the other vernal pools/potential vernal pools may be intermittent wetlands as well, but additional information is needed to confirm this. Also, some of these wetlands did have standing water on the surface, but others were completely dry during surveys in 2016. Intermittent wetlands have fluctuating water levels, both seasonally and annually, and seasonally, water levels tend to be highest during the winter and spring and lowest in late summer and fall (Cohen and Kost 2007). However, it is uncertain if some of the potential vernal pools that may be intermittent wetlands meet the definition of a vernal pool in terms of being flooded for at least two months in the spring on an annual or regular basis. These sites may need to be monitored for several years to assess their hydrology and verify their status. Intermittent wetland is one of the least studied wetland community types of the Great Lakes region (Cohen and Kost 2007). Additional surveys and research, particularly classification research, would help us to better identify and differentiate intermittent wetlands from related natural community types (i.e., bog, coastal plain marsh, poor fen, northern fen, and northern wet meadow), determine if they are vernal pools, better understand their ecology, and help inform and prioritize conservation and management efforts.

Finally, it is important to note that vernal pool classification and our knowledge and understanding of vernal pool ecology are still in the early stages in Michigan. As we conduct additional surveys and monitor and learn more about vernal pools on the Hiawatha National Forest and in Michigan, it is very possible that some of our vernal pool designations from earlier surveys may need to be revisited. However, it is our intention to minimize changing designations as much as possible and only when needed. We also have tried to take a more conservative approach to mapping and designating vernal pools by identifying and mapping as many potential vernal pools as possible based on any evidence of flooding or standing water on aerial imagery or in the field, maintaining uncertain status for potential vernal pools when we are not sure and until we have enough information to determine their status, and only designating potential vernal pools as other wetland types and not vernal pools when there is clear and sufficient evidence to do so. Some vernal pools/potential vernal pools may require multiple years of monitoring data before we can make a final determination on their status.

Recommendations for Future Work

Three recommendations for additional vernal pool research and monitoring on the Hiawatha National Forest in 2017 and beyond are provided below. Additional recommendations are provided in Lee (2016).

1) Follow-up surveys and monitoring of a targeted subset of vernal pools/potential vernal pools focused on the Raco-Eckerman project area and marshy vernal pools/potential vernal pools

2) Investigate the use of radar and LiDAR to identify and map vernal pools/potential vernal pools to increase vernal pool mapping efficiency and effectiveness

3) Vernal pool mapping and surveys in other project areas in the Hiawatha National Forest

Statewide Bumble Bee Surveys 015

Surveys for bumble bees were conducted throughout the lower peninsula of Michigan during August and September of 2016 (Cuthrell 2016). These surveys will continue in 2017 and 2018 with this summer work focusing in the upper peninsula. Survey sites will be identified specifically within the HNF both the East and West units and bumble bee species lists will be compiled, relative abundance by species, as well as nectar plants utilized. This information will be summarized into another report for the MDNR-Wildlife Division and will be shared with the HNF.

Reconcile databases – MNFI/NRIS (East and West Units) 015

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 12 Element Occurrences from the Hiawatha National Forest were transcribed or added to the MNFI Biotics Database and an additional 50 records were updated. Before the next field season we plan to update or newly transcribe several 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 five years and we look forward to continued collaboration on this and future projects!

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