

Census of American hart's tongue fern in central New York

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Summary of proposed work:

The American hart's tongue fern (*Asplenium scolopendrium* var. *americanum*; AHTF) is a federally protected (threatened) evergreen fern with approximately ninety percent of its U.S. population located in central New York. This species appears to be very sensitive to fluctuations in climatic conditions, although these effects are not clearly understood. AHTF colonies occur in very specific habitat conditions, which maintain cooler temperatures and higher humidity than surrounding areas. These include limestone tallus on steep slopes with north or east aspects under hardwood canopies, which tend to occur in ravines and glacial plunge basins in central New York. Many of these habitats currently face invasion by European pale swallow wort (*Vincetoxicum rossicum*; EPSW), a noxious twining herb common throughout the Great Lakes basin. In order to make and implement management decisions, it is important to know the current status of each colony regarding the number of AHTF individuals present and the degree of EPSW invasion.

The objectives of this internship were as follow: 1) Conduct a census of all AHTF individuals in known colonies throughout central New York. 2) Identify areas of immediate concern regarding threats to AHTF by EPSW. 3) Assist in management efforts to control EPSW in the vicinity of AHTF colonies.

In order to accomplish these goals, I partnered with the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) Central Region. Of the sixteen known AHTF colonies in New York, nine exist on OPRHP property. Six are located in Clark Reservation State Park (Jamesville, NY) and three are within Chittenango Falls State Park (Chittenango, NY). Based on census data collected in 2008/2009, these populations composed 91 percent of the total New York population. One additional colony is on protected land, owned by the New York Department of Environmental Conservation. This work was supervised by Tom Hughes, Natural Resource Stewardship Biologist, OPRHP Central Region. Appropriate permits were obtained to access public lands in this study. Private lands were accessed with permission from the appropriate land owners / managers.

Methods:

Each AHTF colony on public (protected) and private land (with the exception of one which could not be located) was censused by the sweep method first used by Hunter (1915). This method involves dividing each AHTF habitat slope into lanes and sweeping from side to side across the slope from top to bottom. Every AHTF individual encountered is recorded as one of three possible classes: sporeling (under 2.5 cm), immature (greater than 2.5 cm, sporangia absent), or mature (greater than 2.5 cm, sporangia present). Leaf litter is carefully brushed aside to reveal smaller sporelings, and care is taken not to crush any AHTF. Of the sixteen known colonies, fifteen were censused during my internship. I was unable to locate the Evergreen Lake 2 colony, but

plan to locate it next summer to conduct a census. A final colony on Rock Cut Rd is considered extirpated, as no AHTF individual have been recorded there since 1988.

Results:

The six colonies of AHTF at Clark Reservation State Park suffered a combined loss of 12.1% of mature and immature AHTF individuals. The largest losses were noted in CRSP-1 and CRSP-5, which decreased by 16.5% and 21.9% respectively. Invasion by EPSW was worse in CRSP-1 than any other observed during this study, with a large portion of the habitat containing EPSW stem densities from 28-56 stems/m². The eastern extent of the colony is in close proximity to a utility right-of-way at the park boundary, which likely provides a pathway for invasion by EPSW. The majority of AHTF individuals occur towards the western extent, but a few isolated individuals persist among the EPSW. All EPSW were manually removed within a 1 m radius of these AHTF individuals, which were also marked with surveyor's flags for ease of location in the future. An herbicide applicator was hired to spray EPSW within the colony, so I also delineated the boundary of the AHTF individuals at the colony's western extent so they could be avoided.

CRSP-5 had long been the largest AHTF colony in the United States. However, this has changed with the significant decline from 1089 individuals in 2008 to 851 at the current census. As with many AHTF colonies, the decline at Sentinel Basin can not be easily attributed to any factor. A large EPSW population exists immediately adjacent to the colony, but is not interspersed with the AHTF to a significant degree. Volunteers

were recruited to manually remove EPSW in near vicinity to AHTF individuals, and herbicide was applied to more extensive EPSW patches more removed from the colony.

CRSP-6 is the smallest AHTF colony existing on protected land in New York. Anecdotally, this colony seems less humid than others within the park, which may at least partially explain the lower numbers of AHTF encountered here. The slope is also less stable than others, and it is possible that falling rocks could be responsible for crushing some individuals. Significant patches of EPSW with stem densities as high as 27 stems/m² were present within the colony, with some directly interspersed within clumps of AHTF.

CRSP-4 is the only colony to show a modest, although insignificant, increase of 2.8% since the 2008 census. The colony is not yet majorly impacted by EPSW, although it faces invasion on multiple fronts. Only a few small individuals of EPSW were located within the colony, but extensive patches of EPSW exist south and northwest of the ravine that houses the AHTF. Herbicide was used in an attempt to establish a buffer zone between the EPSW invasion front and the edge of the CRSP-4 colony. Additional treatments will be necessary to maintain and broaden this buffer zone.

CRSP-2 and CRSP-3 were the least impacted by EPSW at this location, with only small scattered patches in the vicinity of, but not interspersed with, the ferns. Both of these colonies suffered decreases in the number of mature and immature individuals present, but these losses were small and within the normal range of fluctuation. At 965 individuals, CRSP-3 now stands as the largest known colony of AHTF in the United States.

The three colonies at Chittenango Falls State Park had a combined population increase of 30.4%. CFSP-3 was the only colony to suffer a loss, down 10% since the 2008 census. CFSP-1 faces a threat of invasion by EPSW. The colony is bounded by heavily traveled stairs on two sides, and EPSW is very dense along the sides of these stairs. Multiple small patches of EPSW were located and manually removed from among AHTF clumps within this colony. No EPSW was recorded in either CFSP-2 and CFSP-3.

Split Rock Unique Area, managed by the New York Department of Environmental Conservation, is home to the colony where AHTF was originally discovered in 1807. Despite being on protected land, this colony is extremely degraded due to invasion by numerous non-native species, including EPSW. This colony saw a decline of 36.2% since the 2008 census.

The remaining six colonies are located on private land. The Ram's Gulch and Evergreen Lake 1 colonies both saw losses, 72.2% and 13.3% respectively. The Evergreen Lake 2 colony could not be located during this study. I will attempt to locate it next summer to complete the census. The small Perryville Falls community saw a 150% increase from 6 to 15 individuals. Although small, this colony appears relatively safe due to the lack of invasive species present and the landowner's restriction of access to the area. In the most recent previous census, the Munnsville 1 colony could not be located and was considered extirpated. Using maps and notes from an earlier census, I was able to locate this colony and recorded 8 mature and immature individuals. The Munnsville 2 colony was immediately adjacent to Munnsville 1 within the same basin.

This colony had a 16.2% increase. The Munnsville basin was free of EPSW, and neither colony appears to face any immediate threats of extirpation.

Summary of American Hart's Tongue Fern census counts (mature and immature individuals), 2008-2009

	M+I (2008/9)	M+I (2011)	% change
CRSP-1*	461	385	-16.5
CRSP-2*	266	254	-4.5
CRSP-3*	997	965	-3.2
CRSP-4*	107	110	2.8
CRSP-5*	1089	851	-21.9
CRSP-6*	25	23	-8.0
CFSP-1*	51	91	78.43
CFSP-2*	103	134	30.1
CFSP-3*	60	54	-10.0
Split Rock*	210	134	-36.2
Ram's Gulch	18	5	-72.2
Evergreen Lake 1	15	13	-13.3
Evergreen Lake 2	26	NA	NA
Perryville Falls	6	15	150.0
Munnsville 1	0	8	
Munnsville 2	37	43	16.2
Total (excluding EG Lake 2)	3445	3111	-9.7
Total (including EG Lake 2)	3471	NA	NA
Clark Res Total	2945	2588	-12.1
Chit Falls Total	214	279	30.4

*Colony is located on protected land.

Future work:

My work this summer has been essential in laying the groundwork for my thesis project, which will focus on modeling the effects of landscape and habitat scale factors on the suitability of habitat for AHTF and the distribution of clumps of AHTF within these habitats.

We will conduct a restoration project with the goal of planting 500 AHTF individuals to either augment existing populations or to establish new populations in order to meet U.S. Fish and Wildlife Service recovery goals. The results of my thesis will be used to determine the optimal locations to plant AHTF individuals within the selected sites to maximize survivability. This work will be supported by a grant from the U.S. Fish and Wildlife Service's Great Lakes Restoration Initiative.

I would like to thank the Edna Bailey Sussman Foundation for supporting my work this summer, and allowing me to gather important data in support of management, conservation, and restoration efforts regarding the AHTF.