



Big Heath Social Trails, 2016 - 2017



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Executive Summary

Big Heath in Acadia National Park is an unusual and important wetland ecosystem known as a coastal plateau bog or coastal raised peatland. Since at least 1980, researchers have expressed concerns about visitor use of Big Heath causing unacceptable impacts. We mapped “social trails” in Big Heath in fall 2016 and spring 2017 and compared our results to one earlier map by McInness (1986).

We found $\frac{3}{4}$ of a mile of “social trails” in the wetlands of Big Heath. Several of them were clearly trails mapped by McInness in 1986. Only one of them showed enough wear to be of minor concern, and could become a muck hole with substantially more visitor use. Social trails at Big Heath do not appear to be a significant problem now, but may well have shown more impact in the past based on written accounts and the persistence of a few incised trails that are now well vegetated but still easily seen in aerial imagery. The main access routes through the upland forested areas to the heath show, in some cases, more impact than trails in the heath. All trails appear to be used infrequently, and we think most of the visitor use ends at the open ponds located within the heath. It is difficult to separate the impacts of human use and deer traffic and their relative contributions to the persistence of these trails. Routes along the shrub-heath edge and the many wavy linear features in more remote sections of the heath suggest repeated use by wildlife.

We do not recommend any immediate action other than visits 2-3 times a season to monitor conditions visually and with photos. The Inventory and Monitoring team should report any changes observed during their site visits. If trail conditions deteriorate, hardening of a few trails with bog bridging or a viewing platform (this would however encourage more use) could be considered and/or some small signs along the main entry trails, or closure. Access might be also consolidated on one designated trail; if so, it would eventually be need to be hardened. Visitor use of the area should not be encouraged as it will only require the park to respond with additional management as described above.

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INTRODUCTION

Big Heath in Acadia National Park is an unusual and important wetland ecosystem known as a coastal plateau bog or coastal raised peatland. It is ranked S3 by the State of Maine for its rarity, right in the middle of the scale, which actually means it is rare and important enough to carefully and regularly monitor (Gawler and Cutko 2010).¹ In 1981, the Maine State Planning Office designated Big Heath as a Maine Critical Area². It was then ranked 4th out of 18 coastal raised bogs evaluated by Worley (1980) for their overall values. In 1989, other investigators determined that Big Heath qualified for nomination as a National Natural Landmark (Coffin and Tyler 1989).

Peatlands are wetlands with organic soils and a “heath” in Maine commonly refers to a largely treeless peatland. Bogs are nutrient poor, acidic, and fed largely by rain rather than streams and/or groundwater, which would characterize a fen (Calhoun et al 1994). By definition, a coastal raised peatland is fed by rainwater and fog, and not streams or ground water. These terms, bog and peatland, are often used interchangeably and classification of these kinds of wetlands varies from author to author based on geomorphology and vegetation.

In eastern North America, the coastal raised peatland ecosystem is found within a few miles of the coast and has a limited distribution in Maine, New Brunswick, Nova Scotia and Newfoundland. The cool moist maritime climate and the underlying geomorphology contribute to the development and maintenance of coastal raised bogs in the region, but they have been little studied.³

Coastal raised peatlands are important for their ecological, scientific, and educational values as well as their aesthetically appealing open landscape. More generally, peatlands have long been used for economic purposes also, especially fuel and horticulture. Peat deposits provide a long-term record of the ecology and climate of a region and are critical to our understanding environmental change. Sediment cores taken from Big Heath the 1980s went as deep as 13 – 22 feet and C¹⁴ (carbon) dating for some of these cores reached back more than 6,000 years (Tolonen et al 1988).

Within the region, Big Heath is the coastal raised peatland farthest south and west. As with the rest of the Acadia, this places Big Heath in an ecological transition zone that is key to understanding changes on the landscape. A number of species reach their southern limits in Big Heath including baked apple berry (*Rubus chamaemorus*) and black crowberry (*Empetrum nigrum*); skunk cabbage (*Symplocarpus foetidus*) reaches its northern limit. Within Big Heath are a variety of natural communities characterized by sphagnum mosses, sedges, shrubs, and carnivorous plants such as sundews (*Drosera* spp.) and pitcher plants (*Sarracenia purpurea*). Also notable are surface ponds contributing the diversity of the plant communities, and the so-called “bog lawns” with their uniform and often colorful herbaceous layer. Few non-native plants have penetrated the interior of Big Heath.

¹ Scale from S1 (most rare) to S5 (most common).

² The Maine Critical Area Program has since been discontinued.

³ Information in this report comes largely from Worley (1980), Coffin and Tyler (1989), and Gawler and Cutko (2010).

The wildlife of Big Heath is not known with much detail. Worler identified it as breeding site for the uncommon Lincoln Sparrow (*Melospiza lincolnii*). The Lincoln Sparrow is not now listed by the State of Maine even as a Species of Concern. Coffin and Tyler (1989) mention documentation of a rare bog elfin butterfly, (*Callophrys* (formerly *Incisalia*) *lanoraieensis*) in Big Heath. NatureServe reports this species as G3, vulnerable and globally uncommon with a limited range. Gawler and Cutko (2010) report the crowberry blue butterfly (*Plebejus idas empetri*), found in coastal raised bogs as a Species of Concern in Maine. Neither of these species was collected by Proctor and their current status in Big Heath is unknown. Whitcomb et al (1994) identified Spruce Grouse (*Dendragapus canadensis*) as a species reaching its southern limit on Mount Desert Island in small habitat patches of spruce forest with Big Heath as an area with several of these habitat patches.

Big Heath is of moderate size when compared with other coastal raised peatland ecosystems evaluated for the Maine Critical Areas Program. Of the 551 acres of Big Heath identified as critical habitat, about 150 are open peatland. As far as we know, Big Heath has not been used commercially.

There also is no evidence of roads constructed through Big Heath. State Route 102a appears to have been sited on dryer and higher ground along its southern edge. A wetland connected to Big Heath on the east that is fed by a stream is not technically part of the heath but is included in the Maine Critical Area designation. Route 102a crosses this wetland and probably has an effect on its hydrology. Big Heath has been little disturbed since its formation thousands of years ago, and since 1942 has been protected as part of the Acadia National Park⁴. Any disturbance that drains Big Heath would be considered a significant threat.

Previous researchers have suggested recreational use as a potential threat to Big Heath. This is prompted our rapid assessment to document the location and condition of “social trails” that are the subject of this report. Worley (1980) reported that the NPS had not improved the site with signs, parking, or trails, but noted “...moderate to heavy trampling in the vicinity of the ponds...” and the potential for “considerable disruption” because of the high level of visitors. In a letter to Chief of Resource Management Carroll Schell at Acadia National Park (Nov. 7, 1983, park files), ecologist Lissa Widoff from the Maine Critical Area program referenced “...the increased foot traffic through the bog and the resulting muddiness and erosion of the trail.” Visitors to Big Heath are a specialized group of birders and botanists, probably rarely including commercial nature tours (Michael Good, personal communication).

These descriptions of trail impacts are likely what prompted park resource managers to count visitors to Big Heath in 1986. Pressure plates were installed that summer to count hikers on three of four social trails leading into the heath as sketched roughly in Figure 1 on a topographic map (from McInness 1986). McInness described Big Heath as having “...a network of well-established trails.” The pressure plates were each in place for a period of 4-6 weeks between the end of June and Labor Day, though not always at the same time. A total of 265 counts of foot traffic (enter and exit) were recorded for all three sites over the season. The pressure plate traffic was not validated but researchers expressed confidence that they were reasonably accurate.

⁴ Deed 05 158. Park Lands Files. The eastern wetland was acquired in 1930 (Deed 05 151)

By 1989, however, Coffin and Tyler described “... a small amount disturbance caused by foot traffic in the bog.” Is it possible visitor use has decreased in the intervening years, or remained steady? Measuring low use that is dispersed across a landscape is challenging and time consuming. We did not do this as part of our trail mapping project either, but will offer our own assessment based on the social trail impacts we found, just as previous researchers have done. We will also compare the McInness map to our GPS map and Google Earth images in the Results section of this report.

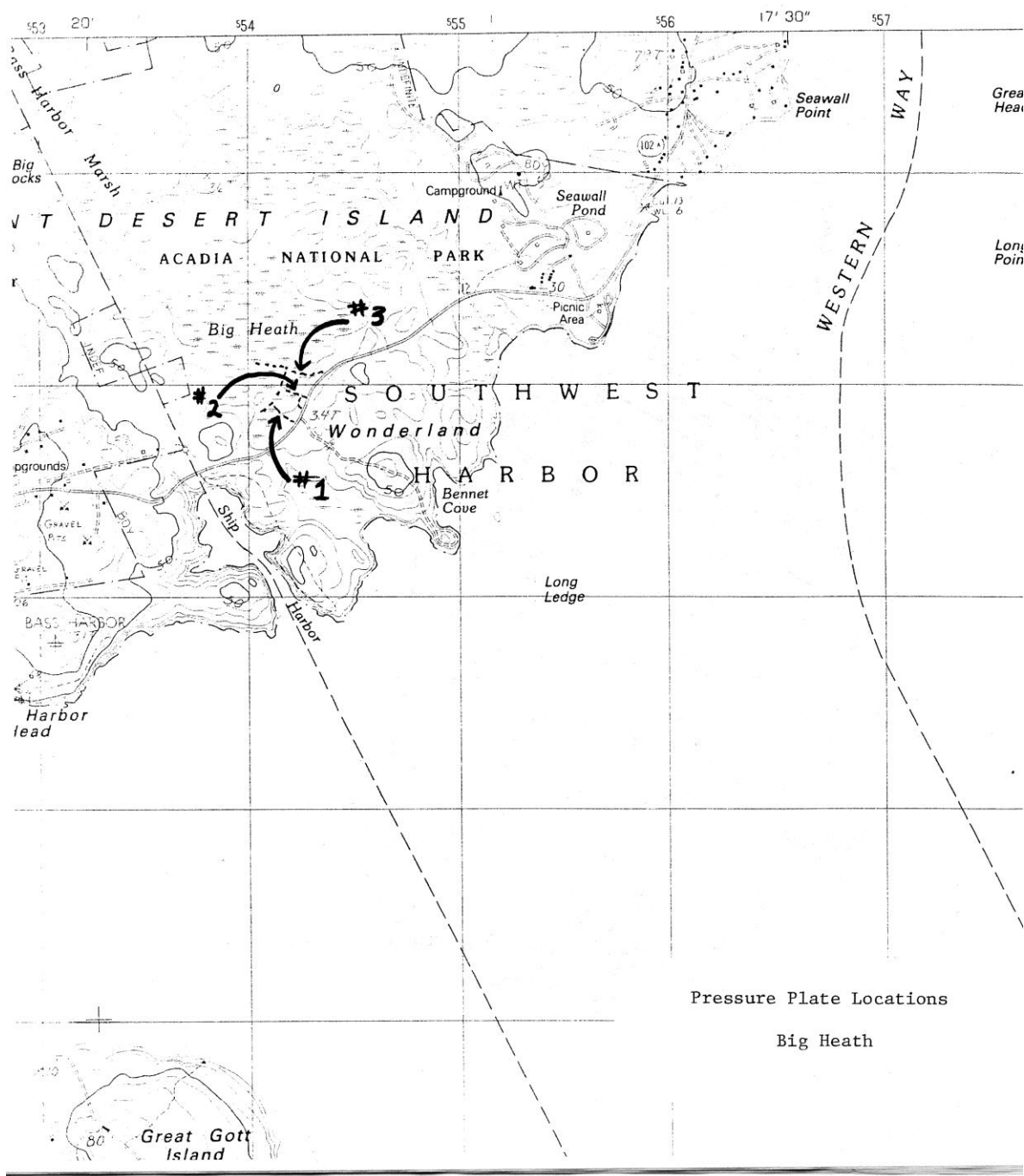


FIGURE 1: SOCIAL TRAILS IN BIG HEATH FROM MCINNESS, 1986.

METHODS

On October 4, 2016, we searched for “social trails” along the north side of Route 102a from just west of the Ship Harbor Trail parking area to the eastern edge of the stream-fed wetland bounded by an abandoned road that leads into Seawall Campground (Figure 2). We walked the Route 102a shoulder and concurrently a line about 20-30 meters into the woods in case these paths were not obvious from the road. Field notes are in Appendix 1. All social trails found were explored and mapped as far as we could follow them in the upland and the wetlands. When we reached the end of a trail mapped along the wetland edge, we continued to traverse the edge between the wetland and any upland to the south looking for additional social trails. After looking at Google Earth imagery over the winter of 2016-2017, we discovered several linear features that we had not found the previous fall. We returned to Big Heath in May 2017 to find and map them.

We did not scout the western edge of Big Heath for access trails from private lands that are within a few hundred meters of the heath. We can say that within the first few hundred meters off Route 102a this upland on the west side of the heath has a dense shrub layer under the forest canopy that is very difficult to negotiate.

We used a Trimble ProXR GPS backpack unit to collect data. All field GPS data were differentially corrected with Trimble Pathfinder Office version 5.6 using the Bar Harbor CORS base station, then exported into GIS format. Minor editing and smoothing were accomplished while proofing the data in GIS. Most data met submeter accuracy standards.

We did not do a formal condition assessment as outlined by Marion (2013) and others, but our field notes provide a brief description of the trails we mapped. There were multiple paths of crushed graminoids leading into the upland meadow across from the Ship Harbor Trail parking area, but we did not map them because they were not in a wetland or near Big Heath nor were they worn down to bare soil. These were likely created by a combination of visitors and deer checking out an apple tree and other places in the meadow. This is an historic homesite.

RESULTS AND DISCUSSION

All social trails found and mapped are shown in Figure 2. Each trail or trail group is numbered 1 – 7 and numbers correspond with Field Notes (Appendix 1) and photos (Appendix 2) from October. Trails 3b, 3c, and 3d were the only trails mapped in May 2017. There are no field notes or photos for these three trails.

We sorted social trails into broad categories of wetland or upland habitat in GIS using physiognomic hydrologic classification. Note that parts of some trails are through forested wetlands, but most are in the open heath area. Trail numbers 1 and 6 are completely in upland habitat along with a little more than half of trail 7. Trails 2, 3a-d, 4, and 5 lead into or are located within Big Heath and almost entirely in wetlands. Sample photos shown below illustrate their conditions (Figures 3 and 4). The total length of social trails in wetlands was 3,049 feet, or nearly $\frac{3}{4}$ of a mile (Table 1).

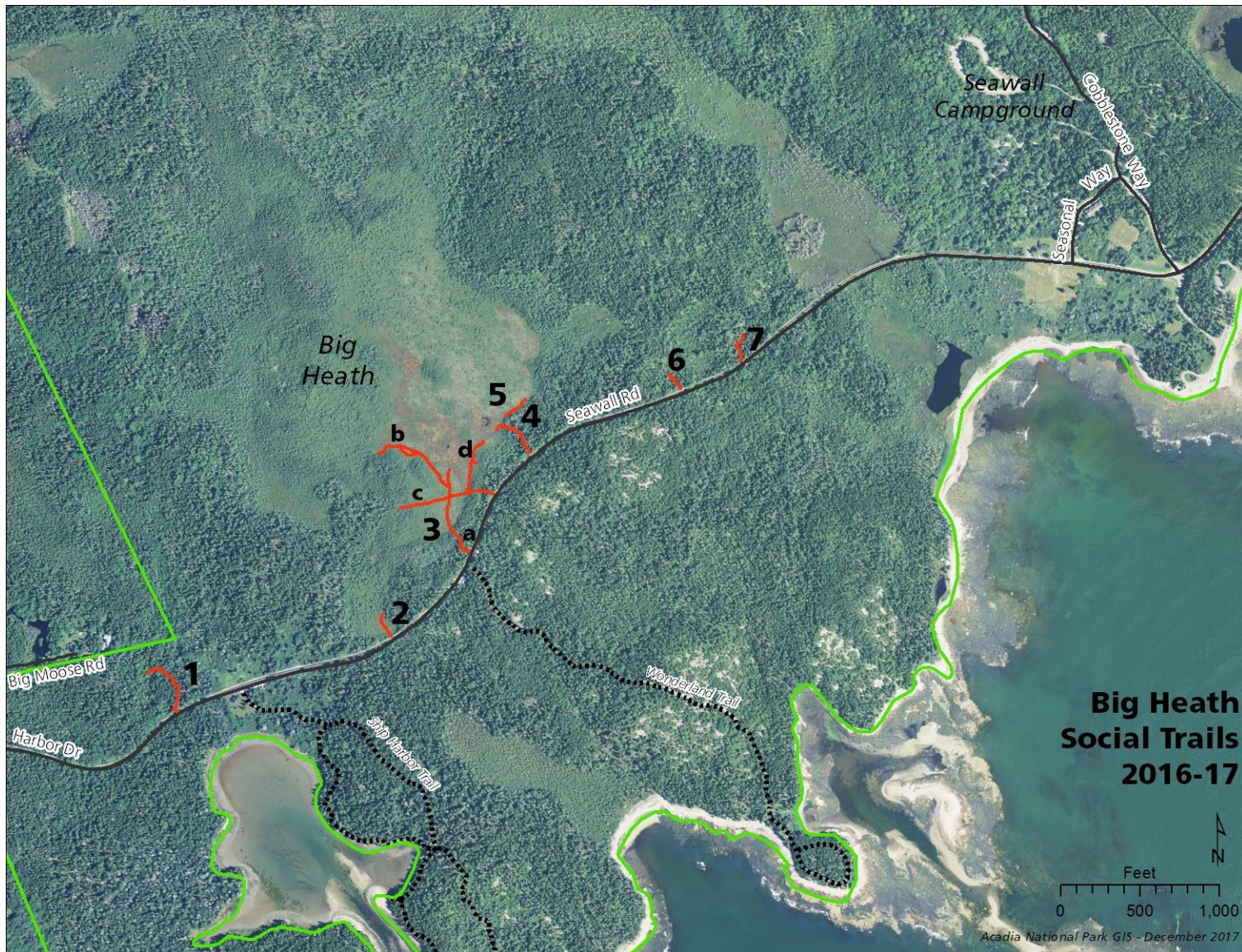


FIGURE 2: BIG HEATH SOCIAL TRAILS, 2016-2017 (NUMBERS ARE SAME AS THOSE REFERRED TO IN TEXT AND FIELD NOTES).

TABLE 1: LENGTH OF SOCIAL TRAILS (FEET) IN BIG HEATH IN WETLAND, UPLAND, AND OVERALL, 2016-2017.

	Trail 1	Trail 2	Trail 3a	Trail 3b	Trail 3c	Trail 3d	Trail 4	Trail 5	Trail 6	Trail 7	Total
Wetland	0	161	578	762	609	394	266	185	0	94	3049
Upland	471	14	55	0	20	0	78	0	143	119	899
Overall	471	175	632	762	629	394	343	185	143	213	3947

Trail 2 leads immediately into an open wetland. The tread was slightly incised, completely vegetated, and is overgrown at its end (Figure 2, Figure 3). Trail 3a snakes through forested upland and wetland shrubs into the open heath (Figure 2). Its tread was also slightly incised and mostly vegetated, with a few sections of exposed soil showing footprints in the mud (Figure 3). It ends just before a small pond. Trail 3b branches off the northern end of 3a and heads northwest before turning westerly (Figure 2). It hugs the shrub-heath edge nearly its entire length before fading out. Trail 3c crosses trail 3a just south of the 3a-3b fork (Figure 2). This trail is very straight and obvious. Trail 3d forks off of the eastern half of 3c and follows the shrub-heath edge headed directly towards Trail 5, which also hugs the shrub-heath edge, but we could not connect the two sections with any obvious tread (Figure 2). Trail 5 was barely incised, and completely vegetated (Figure 6).

Trail 4 leaves Route 102a across from a small pulloff on the south side of the road. It also snakes through the upland forest to the heath (Figure 2, Figure 5). In the heath, the tread of this trail was slightly incised and completely vegetated. No photo of this trail in the heath is available but its appearance is most like Trail 2. Trail 4 is used by the NPS Inventory and Monitoring team to access a vegetation plot and test well and is visited by them about three times per year by a group of four people.

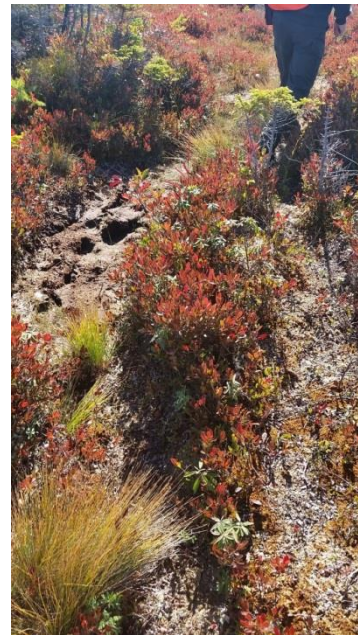
**FIGURE 3: TRAIL 2, GRASSY WETLAND.****FIGURE 4: TRAIL 3A: EAST OF WONDERLAND.**



FIGURE 5: TRAIL 4, I&M PLOT ROUTE.

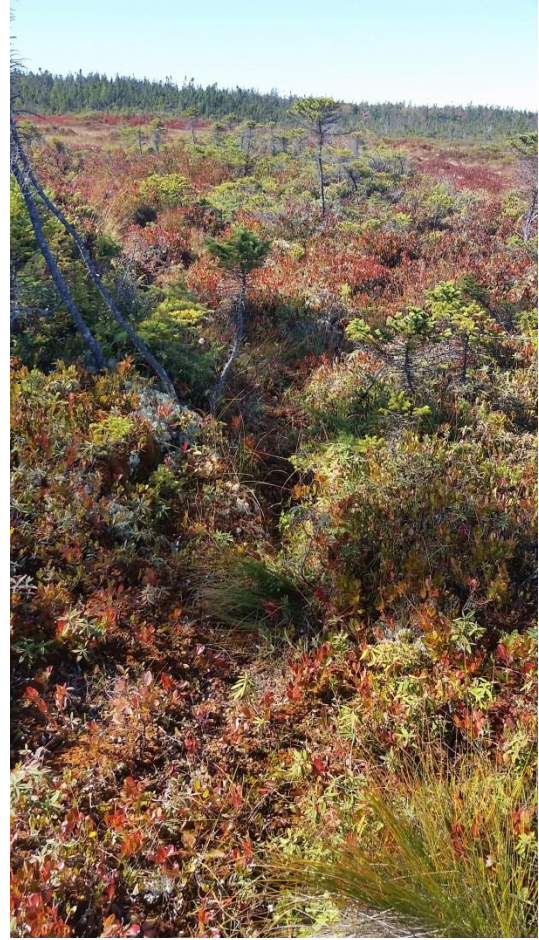


FIGURE 6: TRAIL 5: WILDLIFE TRAIL.

Comparing the 1986 McInness map (Figure 1), our 2016-2017 map (Figure 2), the 1991 Google Earth image (Figure 7), and the 2013 digital orthophoto (DOQQ) image from 2013 (Figure 8), it is possible to trace the history of social trails with some confidence. We do not think we found McInness Trail 1. Trail 2 from McInness looks like it is our Trail 3a, which starts from just east of the Wonderland Parking Area. Once in the heath it curves northerly ending just before a small pond. This trail shows in Figure 7 (Google Earth) as the prominent north-south linear feature. McInness Trail 3 is a trail we missed entirely first time around but mapped in late May 2017. It is our trail 3c and also the southernmost of the two east-west linear features shown in Figure 7 (Google Earth) and Figure 8 (DOQQ). It extends west and appears to go into the upland forest a good distance, but we did not try to follow or map it because of the vegetation density.

The northernmost of the two east-west lines shown in Figure 7 (Google Earth) and Figure 8 (DOQQ) is our trail 3c mapped in May 2017. We cannot determine with any confidence if this is the small segment shown on the McInness map connecting his trails 1, 2, and 3. McInness's work was focused on counting visitors, not mapping trails. Also visible on the 1991 Google Earth image and the 2013 DOQQ image (but not shown by McInness) is a linear feature that runs north up the east side of the heath along the shrub-heath edge before ending south of the largest (circular) pond shown. Our trail 5 is likely a part of this trail.



FIGURE 7: 1991 GOOGLE EARTH IMAGE OF BIG HEATH.

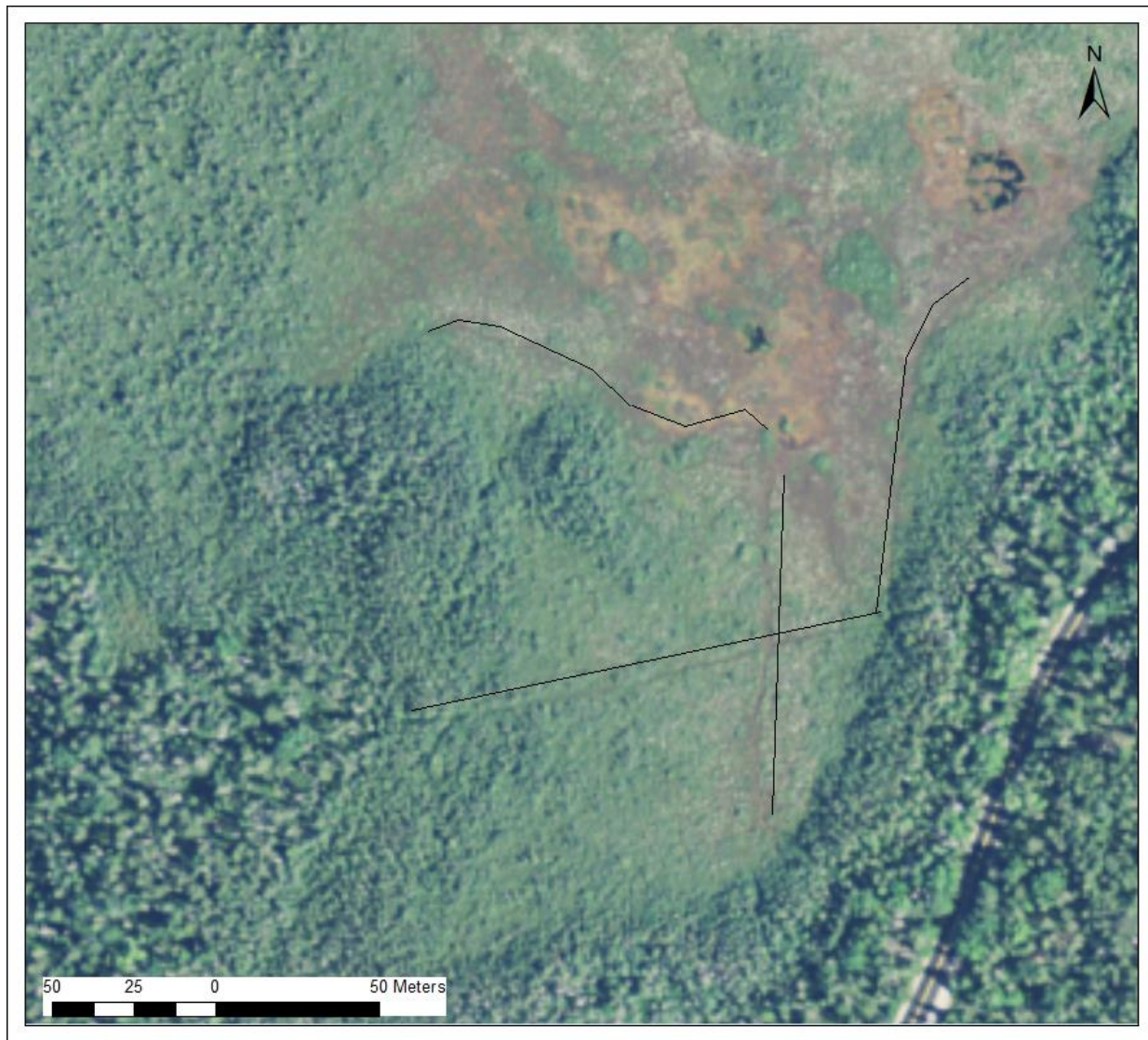


FIGURE 8: 2013 DOQQ IMAGE OF BIG HEATH.



FIGURE 9: 1991 GOOGLE EARTH IMAGE, NORTHERN PART OF OF BIG HEATH.



FIGURE 10: 1991 GOOGLE EARTH IMAGE, EASTERN WETLAND CONNECTED TO BIG HEATH.

Figure 7 (Google Earth, 1991) also shows numerous faint wavy, linear features especially in the shrubby and more remote parts of the heath.

At this point, we question whether all of these linear features are really “social trails” created by visitors and kept open and visible through continued human use. The straight line character of trail 3c suggests some other type of human activity in the past although we found no record of other uses. The routes of 3b, 3d, and 5 along the habitat edges or boundaries suggest regular use by wildlife, probably deer. The multitude of similar lines in remote parts of the heath as shown in Figure 9 also suggest creation through repeated use by wildlife over many years. Visitors are clearly using the access trails into the heath (2, 3a, 3c, and 4) but it seems unlikely that they explore any farther than the open ponds. We do not believe the heath is in danger of degradation through visitor use. The tread of trail 3a is the only one that shows a partly muddy tread and is worth monitoring visually several times a year. However, a level of visitor use much above whatever the current level is could make this trail a muck hole with unacceptable trail widening and braiding.

Figure 10 (Google Earth) shows one other straight line feature and a circular feature in the wetland closest to Seawall Campground. This property was owned by the Navy for a radio substation associated with the Fabbri radio station circa 1917-1919, was then transferred to the park, then transferred back to the navy in 1942 for the same purpose during WWII, and then back again to the park after the war. The straight line feature was a power line corridor to the circular feature, which was the antenna array.

SUMMARY AND RECOMMENDATIONS

Social trails at Big Heath do not appear to be a significant problem now, but may well have shown more impact in the past based on written accounts and the persistence of a few incised trails that are now well vegetated but still easily seen in aerial imagery. The main access routes through the upland forested areas to the heath show, in some cases, more impact than trails in the heath. All trails appear to be used infrequently, and we think most of the visitor use ends at the open ponds located within the heath. It is difficult to separate the impacts of human use and deer traffic and their relative contributions to the persistence of these trails. Routes along the shrub-heath edge and the many wavy linear features in more remote sections of the heath suggest repeated use by wildlife.

We recommend 2-3 visits per season to monitor conditions visually and with photos. The Inventory and Monitoring team should report any changes observed during their site visits. If trail conditions deteriorate, hardening of a few trails with bog bridging or a viewing platform (this would however encourage more use) could be considered and/or some small signs along the main entry trails, or closure. Access might be also consolidated on one designated trail; if so, it would eventually be hardened. Visitor use of the area should not be encouraged as it will only require the park to respond with additional management as described above.

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APPENDIX 1: FIELD NOTES

Big Heath Social Trails: A Rapid Assessment

Mapping Notes, West to East, Ship Harbor to Seawall Residence on Route 102a.

10/4/16 Charlie Jacobi and Becca Flesh

Numbers refer to mapping of social trails done on this date. We mapped lines from Route 102a North with no formal condition class assessment.

1. West of Ship Harbor parking: faint wildlife trail into upland area
2. Grassy Wetland: pitcher plants too, heavily vegetated tread, overgrown at end. A social trail.
3. East of Wonderland: social trail to Big Heath, snakes through forest then goes far out into heath; old braiding of trails evident; tread all vegetated in heath.
4. I and M Plot Route: across from small pulloff on South side of road; not very visible from road, snakes through forest and is overgrown, some blue flagging; in heath the tread is all vegetated; does not go all the way to the plot.
5. Wildlife trail: parallels southern end of heath, some old braiding, tread is all vegetated.
6. Pulloff on North side of road: very overgrown, removed pink flagging. Probably wildlife trail only now.
7. Another wildlife trail: overgrown.

Note: Opposite Ship Harbor Parking there are multiple paths into the meadow, all just crushed vegetation; people are going to apple tree plus wildlife trails. We did not map these.

Numbers 2, 3, 4, and 5 all access or are in wetlands, and are part of Big Heath. There is more obvious impact (such as loss of soil and vegetation) in the uplands between the road and these wetland areas. In the heath, the trail treads are all fully vegetated, though incised. There is some evidence of past trail braiding, but the braids, while also incised somewhat, have grown back and are fully covered in vegetation. Hikers have always found a drier place to walk. At current use levels (whatever they are) the impacts in the wetlands are minor. There are no muck holes. It seems likely that wildlife, especially deer, are using these paths extensively.

APPENDIX 2: PHOTOS



Trail 1, West of Ship Harbor Parking Photo 1.



Trail 1, West of Ship Harbor Parking Photo 2.



Trail 1, West of Ship Harbor Parking Photo 4.



Trail 2, Grassy Wetland Photo 1.



Trail 2, Grassy Wetland Photo 2



Trail 2, Grassy Wetland Photo 3



Trail 2, Grassy Wetland Photo 4.



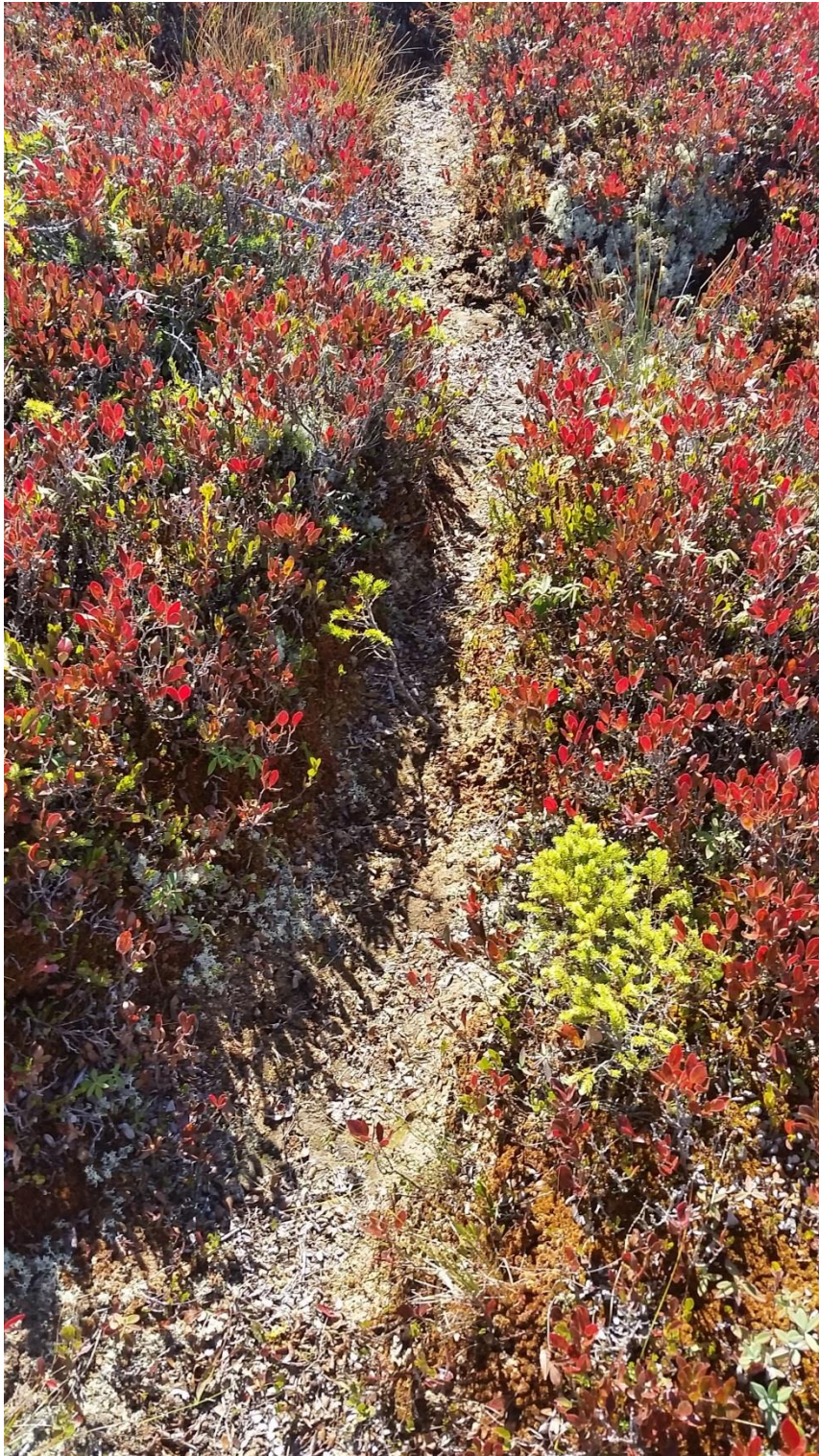
Trail 2, Grassy Wetland Photo 5.



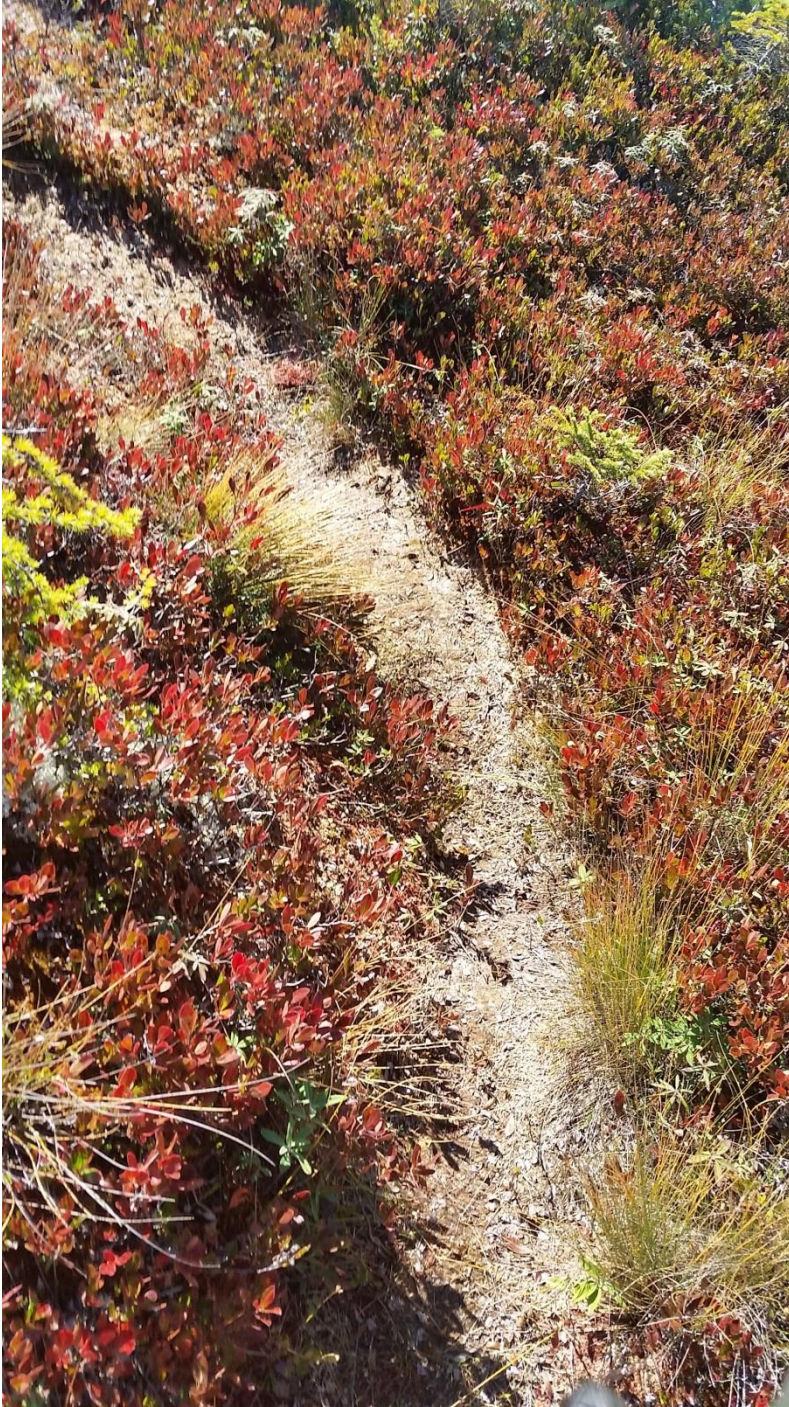
Trail 3, East of Wonderland Photo 1.



Trail 3, East of Wonderland Photo 2.



Trail 3, East of Wonderland Photo 3.



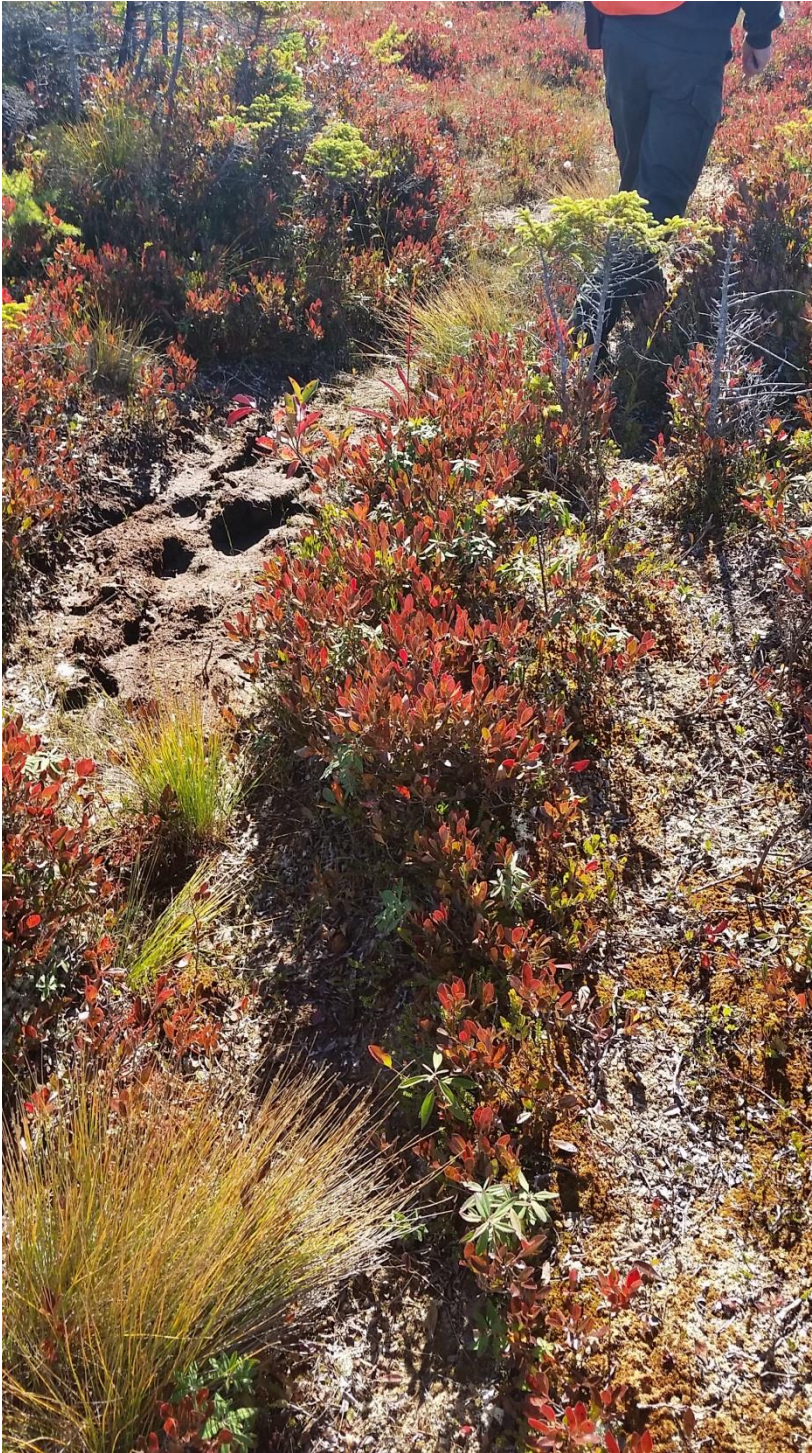
Trail 3, East of Wonderland Photo 4.



Trail 3, East of Wonderland Photo 5.



Trail 3, East of Wonderland Photo 6.



Trail 3, East of Wonderland Photo 7.



Trail 4, I&M Plot Route Photo 1.



Trail 4, I&M Plot Route Photo 3



Trail 4, I&M Plot Route Photo 4.



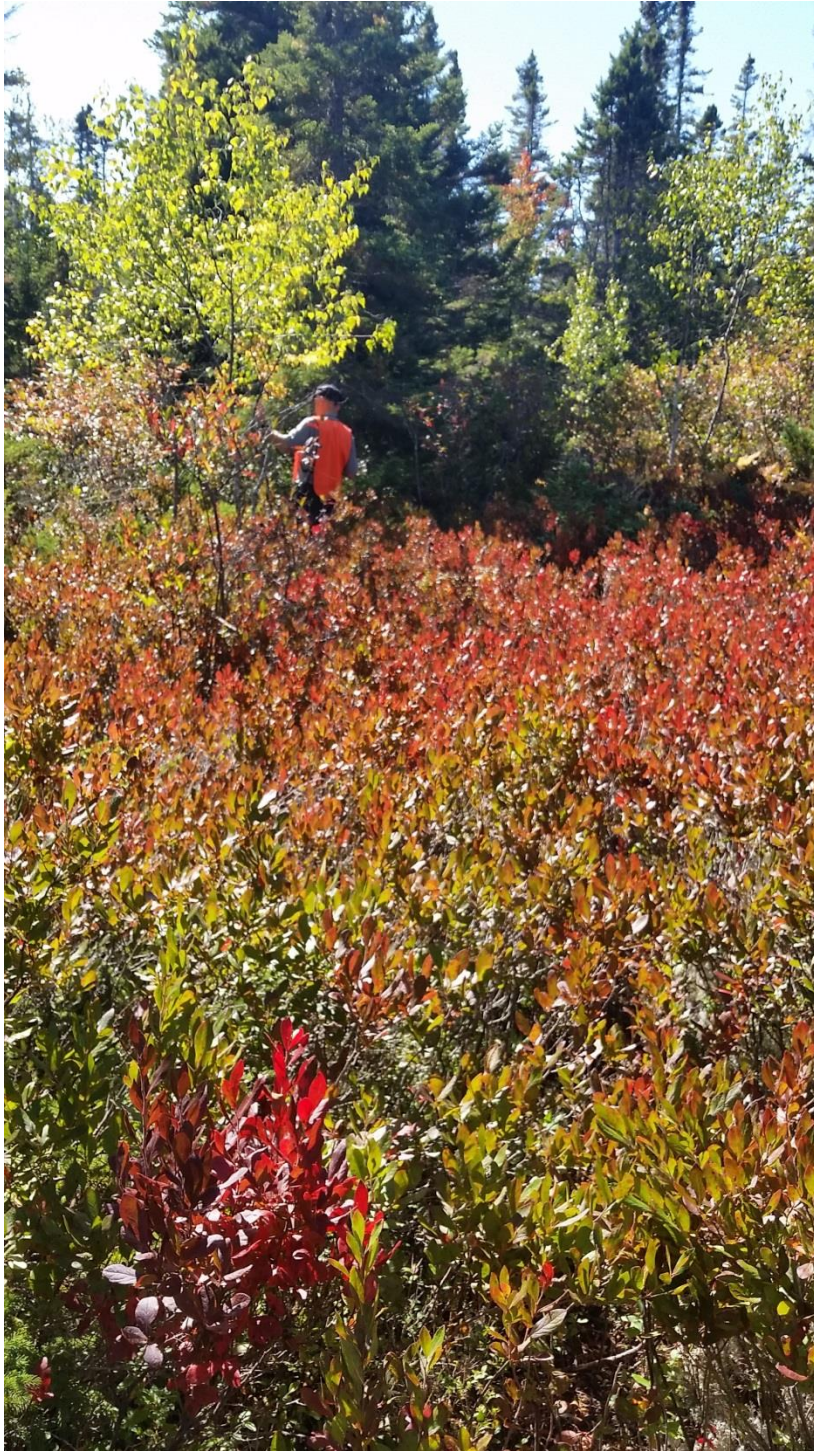
Trail 4, I&M Plot Route Photo 5



Trail 5, Wildlife Trail Overgrown Photo 1.



Trail 5, Wildlife Trail Overgrown Photo 2.



Trail 5, Wildlife Trail Overgrown Photo 3.



Trail 5, Wildlife Trail Parallels South End of Heath Photo 1.



Trail 5, Wildlife Trail Parallels South End of Heath Photo 2.



Trail 6, Pulloff on North Side of Road Photo 1.



Trail 6, Pulloff on North Side of Road Photo 2.