

Marsh-Billings-Rockefeller National Historical Park

Invasives Monitoring, Assessment and Treatment Report

Field Season 2013

December, 2014

Prepared by:
Courtney Haynes, staff scientist
Daniel Ruddell, staff scientist
and Ben Machin, Principal
Redstart, Inc.



Prepared for:
Kyle Jones, Resource Manager and
Christina Marts, Asst. Superintendent
Marsh-Billings-Rockefeller
National Historical Park
Woodstock

Summary

Redstart's involvement with non-native, invasive plant monitoring, assessment, treatment and/or herbicide application at the Marsh-Billings-Rockefeller National Historical Park (NHP) during 2013 are in sum:

- Hand pulling garlic mustard, Spring 2013
- Herbicide application on black swallowwort, Spring 2013
- Herbicide application on European black alder, Summer and Fall, 2013
- Herbicide application on Rubus spp., Fall, 2013
- Pre-harvest Stand Inspections and Hand Pulling, Summer 2013
- Herbicide application on Common barberry in Billings Park, Summer 2013

Assessments by Redstart typically occurred at the time of treatment. Additional information about the status of non-native invasive plants, or the need for any herbicide application, was made by National Park Service (NPS) staff member, Kyle Jones, Resource Manager. Additional efforts to monitor, assess and treat non-native invasive plants in the Marsh-Billings-Rockefeller NHP were done by Student Conservation Association (SCA) intern, Bridget Likely.

Many of the efforts that occurred in 2013 marked ongoing efforts of previous assessment and treatment work. The majority of this report briefly details assessment and treatment results for these activities. Treatment hours reported for Redstart include prep and one-way travel time. Additional follow-up assessment and treatment will be needed in coming years. Recommendations for 2014 assessment and treatment are made at the end of this report.

During the winter 2013/2014, Redstart cross referenced data in the Weed Management Information System (WIMS), previous annual reports, and maps. Some discrepancies were found, and some additional time was spent resolving those discrepancies. At that time, unique identifiers were given to infestations of garlic mustard and black swallow-wort in an effort to track these invasive plant populations more closely and effectively (more information provided below). Species codes are used to refer to invasive plant species on the maps and they are also listed in parenthesis in the report next to the species common and scientific name. Any additional changes made to the NPS and Redstart tracking systems will be reported in the 2014 report.

Garlic mustard (*Alliaria petiolata*, ALPE)

Redstart was responsible for assessment and initial treatment of garlic mustard in 2013. Assessments were completed at the time of treatment in May, 2013. Garlic mustard plants were hand-pulled and bagged for disposal. Following the initial hand pulling treatment in 2013, NPS/SCA staff continued to monitor and pull any plants that were missed during the initial hand pulling efforts in 2013.

As was the case in previous years, gains were noted in reducing the levels of garlic mustard in the most densely infested areas, Site 1- McKenzie Lot/Prosper Road and Site 7- Compost area. Overall, progress seems to be made on reducing the infestation levels of garlic mustard at every site, however new locations in the Park have continued to be discovered annually.

Year	2007	2008	2009	2010	2011	2012	2013
Redstart Hours	38.5	20	52.5	112	NA	53*	46.5
SCA/NPS Hours	22.5	17	52.5	45.5	NA	NA	8.5

Note: Hours listed above are based on revised tallies from the audited and updated WIMS reports and differ from those reported previously (Redstart 2010). Significant expansion of hours in 2010 reflects summer and fall treatments by SCA crews, including newly discovered populations, and includes pulling of first-year (non-flowering basal rosettes) plants. Redstart did not participate in 2011 garlic mustard treatments, and total 2011 hours were not tracked in WIMS.

Although progress has been made on reducing the density of many of the garlic mustard infestations, 2013 marks the seventh year of hand pulling garlic mustard. Herbicide application to garlic mustard was informally considered for the Marsh-Billings-Rockefeller NHP but was never done. Within the past year or two, Redstart has had more experience treating garlic mustard with herbicide on other landowner's properties and has found this method to be effective in reducing the density of garlic mustard in heavily infested areas.

Due to the bi-annual nature of garlic mustard, the most effective time of year to treat garlic mustard plants with herbicide is when they are in their first year of life; as basal rosette. Basal rosettes emerge during the summer months, stay green all winter long, and then bolt into mature, flowering plants during the second growing season. Breaking this cycle is crucial to reducing the success of garlic mustard, and spraying basal rosettes during the late fall and early spring months has proven to be effective. This will drastically limit the number of flowering plants that bolt in the spring each year.

Marsh-Billings-Rockefeller NHP should consider treating basal rosettes of garlic mustard in the fall of 2014 and spring of 2015 with a foliar herbicide application. Applying herbicide during these times of year allows for collateral damage to native vegetation to be limited, since garlic mustard stays green long after native plants have senesced and emerges before spring ephemerals have emerged. From

Redstart's experience, a fall treatment is most beneficial, but we would strongly recommend a bi-annual foliar herbicide application if possible.

Detailed information about 2013 garlic mustard monitoring and treatment is listed below.

- **Treatment Dates:** May 13th and 15th, 2013
- **Total Treatment Hours:** 55 hours (includes 8.5 hours NPS/SCA personnel spent initially treating with Redstart, but does not include follow-up NPS/SCA treatment efforts)
- **Redstart Treatment Hours:** 46.5 hours
- **Treatment Type:** Hand pulling
- **Infestations Initially Treated by Redstart in 2013**
 - Site 1- Stand 14, McKenzie Lot, Prosper Road
 - Site 2- Stand 24, "loop" in North Ridge Trail
 - Site 3- Stand 1 and 2, Larch Trail and Skid Roads
 - Site 4- Stand 44, Pogue Brook Trail
 - Site 5- Stewardship Trail (not on MABI property)
 - Site 6- Recreation Path and Route 12, (not on MABI property)
 - Site 7- Compost Area, Upper Meadow Road
 - Site 8- Forest Center, Wood Barn, Bungalow
 - Site 10- River Street
 - Site 11- Pony Pasture
- **Infestations Follow-up Treated by NPS/SCA Staff in 2013**
 - Site 1- Stand 14, McKenzie Lot, Prosper Road
 - Site 5- Stewardship Trail (not on MABI property)
 - Site 7- Compost Area, Upper Meadow Road
 - Site 8- Forest Center, Wood Barn, Bungalow
 - Site 10- River Street
- **Sites with No Information Collected in 2013**
 - Site 12- Mansion Garage
 - Site 13- North Street
- **Newly Discovered Infestations in 2013**
 - Site 9- Slope behind Mansion
 - Site 14- Sugar House Road
 - Site 15- Stand 5

Description of Garlic Mustard Sites

In an effort to reduce confusion between annual Redstart reports, maps, and data in WIMS, each garlic mustard infestation that was listed in WIMS (most recent version 2013) was given a unique identifier. For garlic mustard, the unique identifier uses the species code (first two letter of the genus and species scientific name), a number, and a letter. Garlic mustard infestations were grouped together into "Sites"

(the number listed in the unique identifier) and individual infestations within the Site were designated a letter. For example, unique identifier “ALPE_1a” is:

Species code for garlic mustard: ALPE

Site: 1, McKenzie Lot and Prosper Road

Infestation: a, an individual garlic mustard infestation within Site 1.

The goals of using this unique identifier are so that various manager (NPS personnel, SCA personnel, Redstart personnel) can more effectively communicate about infestations and so that the extent and location of individual infestations can be monitored, assessed, and treated more effectively.

Figure 1 and Figure 2 show garlic mustard sites in the western and eastern portions of the Marsh-Billings-Rockefeller NHP, respectively. Figures 3 and 4 show more detailed, close-up images of the garlic mustard infestations at each site. The garlic mustard sites are listed in this report, but individual infestations at each site are not specifically mentioned since this labeling system was not derived until after the 2013 field work was completed. It is conceivable that in the coming years, assessment and treatment of individual infestations at each garlic mustard site will be mentioned in future annual reports and will be tracked in WIMS.

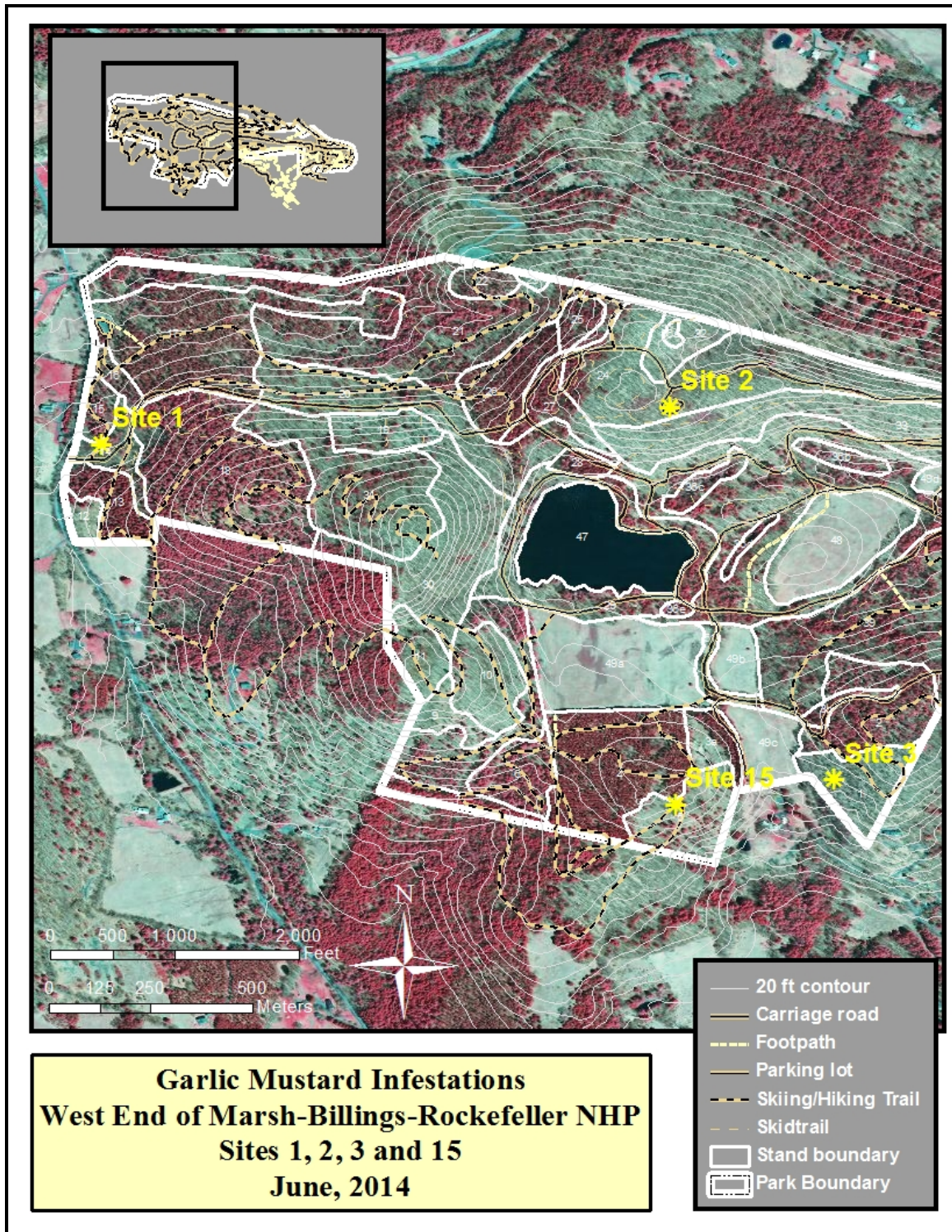


Figure 1. Garlic mustard sites in the west end of Marsh-Billings-Rockefeller National Historical Park.

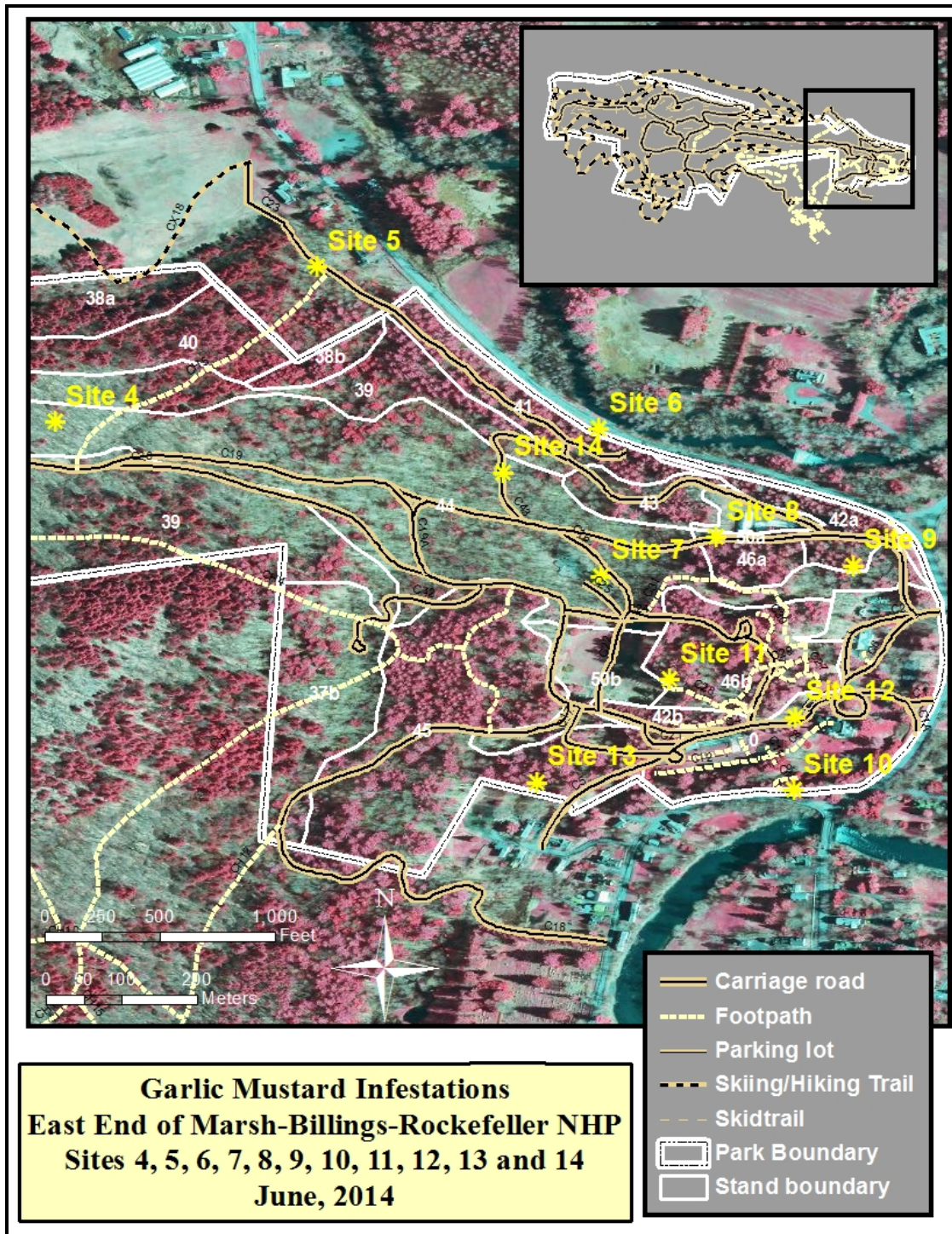


Figure 2. Garlic mustard sites in the east end of the Marsh-Billings-Rockefeller National Historical Park.



Figure 3. Close-up maps of garlic mustard infestations in the west end of the Marsh-Billings-Rockefeller National Historical Park.

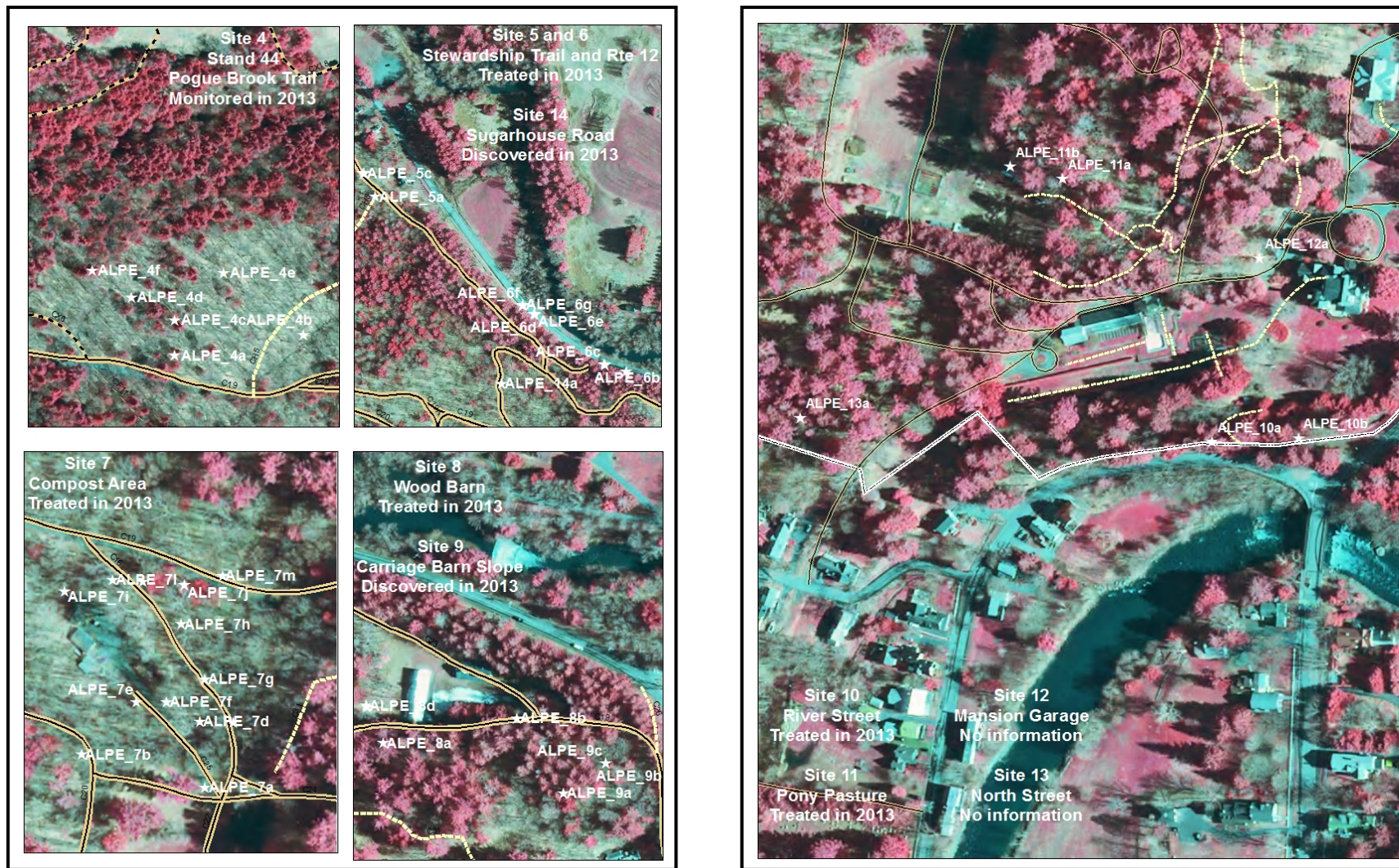


Figure 4. Close-up maps of garlic mustard infestations in the east end of Marsh-Billings-Rockefeller National Historical Park.

Site 1- McKenzie Lot, Prosper Road (ALPE_1a to ALPE_1e)

Garlic mustard assessment in the McKenzie Lot and along Prosper Road found plants distributed throughout a similar extent as has existed since 2009 assessments. The infestation in the perimeters of the area have been greatly in density, but the core of the original infestation remains at moderate levels in the vicinity of McKenzie Lot black locust trees and the adjacent portion of Prosper Road.

The densest part of the infestation remains located around the stump of a former black locust tree along Prosper Rd, where a 40x50 ft. patch of roughly 60% cover was found. The next grove of black locusts, downslope and a bit into the interior of the McKenzie Lot, had a roughly 30% cover of garlic mustard; elsewhere levels had mostly dropped below 5% cover but there remained a diffuse scattering of plants.

This site was assessed and treated by Redstart in 2013 and required 9 hours.

Previous Treatment Estimates for this Area:

- 2012- 7 hours
- 2011- no data
- 2010- 55.5 hours, including pulling basal rosettes in the fall
- 2009- 25.5 hours
- 2008- 32.5 hours
- 2007- 12 hours

Site 2- Stand 24, “loop” on North Ridge Trail (ALPE_2a and ALPE_2b)

Garlic mustard occupied roughly 750 sq. ft. at 70% cover in Stand 24, with scattered small populations found within 50 feet downslope. This was a slight increase over previous levels.

As in 2012, Redstart swept through the area surrounding the “Loop Road” in which this population has been treated since 2007, and also surveyed the area around the nearby overlook where SCA crew members had reported plants in 2011. No recurrences were found in the area of the overlook in 2013.

This site was assessed and treated by Redstart in 2013 and required 2.5 hours.

No previous treatment estimates are available for this area; it has likely been lumped with other sites when reporting time needed for treatment.

Site 3- Stands 1-2, Larch Trail and Skid Roads (ALPE_3a to ALPE_3e)

Garlic mustard in stands 1 and 2 was most concentrated downslope of the western-most skid trail in the European larch of Stand 1, approaching the shared boundary

with the French Lot hayfield. Scattered populations of 1-4 plants were found dispersed at the top of the slope, along the western branch of the Larch Trail passing from Stand 2 into Stand 1. Patches near the downslope edge of Stand 1 included a 75 x 150 foot patchy distribution of ~40% cover and a 5x5 patch at ~ 70% cover.

This site was assessed and treated by Redstart in 2013. A total of 10 hours were spent pulling garlic mustard here.

Previous Treatment Estimates for this Area:

- 2012-10 hours
- 2011- no data
- 2010- 1.5 hours, population first discovered

Site 4- Stand 44, Pogue Brook Trail (ALPE_4a to ALPE_4f)

Garlic mustard was originally found at relatively low densities but widely dispersed off the Mountain Road in the vicinity of the Pogue Brook Trail and eastward toward a nearby snowshoe trail.

Despite our initial reporting in 2010 that no occurrences of garlic mustard had been located in this area since initial reports in 2003, WIMS audits indicated that Mandy Vellia and Kyle Jones located and treated a small population in this area in 2010. This population was located in the same general vicinity as originally noted in 2003, but nothing was relocated in annual surveys from 2007-2009.

In 2013, a crew of 5 Redstart personnel surveyed an area near the Pogue Brook Trail and a nearby snowshoe trail and found a limited number of scattered singles and small groups widely dispersed in this area. This location should be monitored again in 2014.

Assessment and treatment in this area took roughly 2.5 people-hours in 2013.

Previous Treatment Estimates for this Area:

- 2012- 2.5 hours
- 2011- no data
- 2010- 1.5 hours

Site 5- Stewardship Trail (ALPE_5a to ALPE_5c)

Although not located on MABI property, Redstart assessed and hand pulled patches of garlic mustard along the Stewardship trail. Two major infestations are reported in WIMS, but the plant is also growing north of the Stewardship trail, along a bank in close proximity to a private house.

This site was assessed and pulled in 2013 by Redstart and required roughly 4 hours.

Site 6- Recreation Path, Rte. 12 Frontage (ALPE_6a to ALPE_6g)

Redstart pulled along the Route 12/MABI property boundary in 2013 and pulled plants along the Route 12 corridor until the wooden foot bridge at the west end (before the first private house on the south side of Route 12).

This site was assessed and pulled in 2013 by Redstart and required roughly 2.5 hours.

Site 7- Compost Area, Upper Meadow Road (ALPE_7a to ALPE_7m)

Site 8- Forest Center, Wood Barn, Bungalow (ALPE_8a to ALPE_8d)

Site 11- Pony Pasture (ALPE_11a and ALPE_11b)

As consistent with previous year' assessments, the cores of the original infestation in the Wood Barn/Compost/Pony Pasture area are significantly decreasing, but satellite and isolated populations along the perimeters of those original areas have seen increases in both density and extent. In 2012, primary increases were noted on the perimeters of the Pony Pasture and these levels remained the same in 2013.

In 2013, these sites were assessed and treated together and thus treatment time is reported for all three of these sites. Pulling treatment in this area required 17 hours from Redstart personnel in 2013. Additional limited time was spent treating the area by NPS/SCA personnel but the amount of time was unquantified.

Previous Treatment Estimates for this Area:

- 2012- 17.5 hours
- 2011- no data
- 2010- 23.5 hours
- 2009- 20 hours
- 2008- 11 hours
- 2007- 15 hours

Site 10- River Street (ALPE_10a and ALPE_10b)

Dense patches of garlic mustard were found in the area of original infestation on River Street (near telephone guy wire), beneath a large Norway spruce at the top of the slope, and in a newly discovered patch upslope of the trimmed hemlock hedge near the eastern terminus of River Street. Other than these patches , garlic mustard along River Street was limited to scattered single plants along the bank on the north side of the road.

Pulling in the River Street vicinity took 7.5 hours for Redstart personnel in 2013.

Previous Treatment Estimates for this Area:

- 2012- 7.5 hours

- 2011- no data
- 2010- 2.5 hours
- 2009- 7 hours
- 2008- 0.5 hours

Site 12- Mansion Garage (ALPE_12a)

Site 13- North Street (ALPE_13a)

No information was reported on treatment of garlic mustard in these areas in 2013. Data about these infestations exists in WIMS but it is not clear if they were assessed and/or treated in 2013.

It is expected that these infestations are historic and either the data is incorrect or the infestations have been completely eradicated. The latter is less likely.

Regardless, these infestations should be checked in 2014 to determine the current status and how to proceed with assessment and treatment of these sites in the coming years.

Site 9- Slope Behind Mansion (ALPE_9a to ALPE_9c)

Site 14- Sugar House Trail (ALPE_14a)

Site 15- Stand 5 (ALPE_15a)

These sites were all newly discovered infestations by NPS and/or SCA personnel in 2013. They were discovered after the 2013 hand pulling season, thus were not treated by Redstart in 2013. All of these infestations were added into WIMS in 2013 and should be assessed and treated in 2014.

Black swallowwort (*Vincetoxicum nigrum*, VINI)

In 2013, Restart personnel were primarily responsible for monitoring and treating black swallow-wort infestations in the Marsh-Billings-Rockefeller NHP. Black swallow-wort assessment occurred at the time of treatment, and treatments consisted mostly of follow-up treatments of previously treated populations and a treatment of a newly discovered population.

In general, black swallow-wort infestations that had undergone treatment in previous years had seen a reduction in population size. Unfortunately, three new populations of black swallow-wort were discovered in the Marsh-Billing-Rockefeller NHP. NPS staff removed seed pods at the time of discovery. One infestations that was discovered in 2013 was also treated in 2013 by Redstart, but the other two other new infestations were not treated.

Detailed information about 2013 black swallow-wort monitoring and treatment is listed below.

- **Treatment Dates:** June 9th, 2013
- **Total Treatment Hours:** 8.5 hours
- **Redstart Treatment Hours:** 8.5 hours
- **Treatment Type:** Foliar herbicide application- foliar wipe and backpack sprayer. Used 1.5 gallons of total volume of a 6.25% solution in water, with non-ionic surfactant. This volume represents the total volume of herbicide that was used to treat all of the infestations in 2013. This total volume incorporated 12 fluid ounces of Rodeo Herbicide (EPA Registration Number 62719-324).
- **Licensed Pesticide Applicator:** Courtney Haynes of Redstart, Certification #1210-4380
- **Infestations Initially Treated by Redstart in 2013**
 - VINI_1 and VINI_2- Forest Center and Wood Barn
 - VINI_3 and VINI_4- River Street and above stone wall
 - VINI_5- Below 50th Anniversary Plantation
 - VINI_8- Stand 8, off Ashes to Ashes Trail
- **Infestations Assessed but Not Treated in 2013**
 - VINI_6- North Side of Pony Pasture
 - VINI_9- Stand 8, Near Elm Lot
- **Infestations Not Assessed or Treated in 2013**
 - VINI_7- Stand 28, Carriage Road North of Pogue
- **Infestations Newly Discovered in 2013**
 - VINI_10- Stand 5
 - VINI_11- North Ridge Trail

Description of Black Swallow-wort Infestations

Similar to garlic mustard, black swallow-wort infestations that were identified in WIMS were also given unique identifiers. Unlike garlic mustard, where infestations were grouped into larger sites, black swallow-wort infestations are much smaller and can be efficiently discussed by referring to the individual infestation, which typically consists of only a few plants covering a relatively small area. Therefore, individual black swallow-wort infestations (not Sites) are referred to in this report and on the maps. The unique identifier uses a number to identify each individual infestation, and no letter designation is needed. For example, unique identifier "VINI_1" is:

Species code for garlic mustard: VINI

Infestation: 1, Forest Center- a few plants comprise the infestation

Figure 5 and Figure 6 show black swallow-wort infestations on the western and eastern portions of the Marsh-Billings-Rockefeller NHP, respectively.

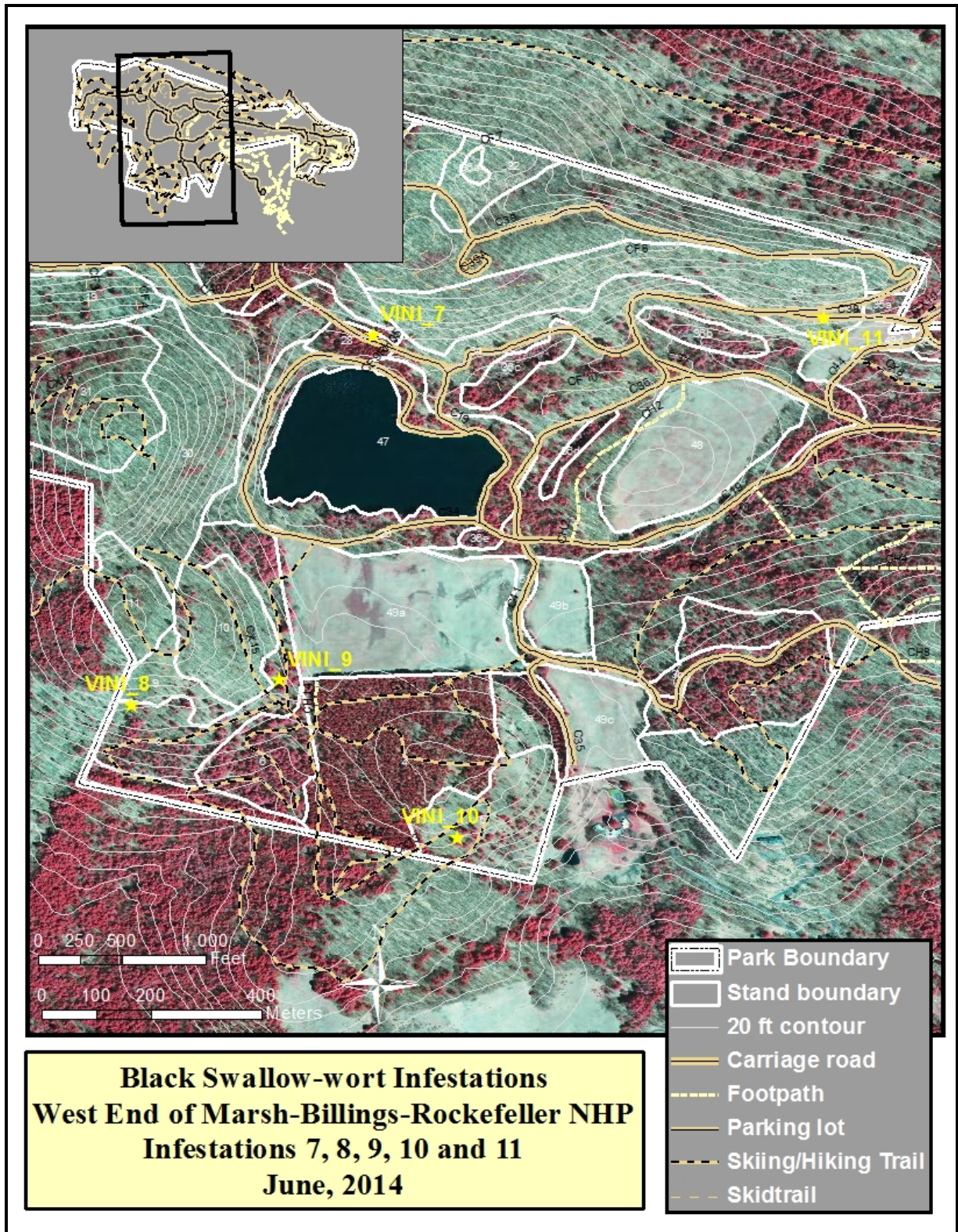


Figure 5. Black swallow-wort infestations in the west end of Marsh-Billings-Rockefeller National Historical Park.

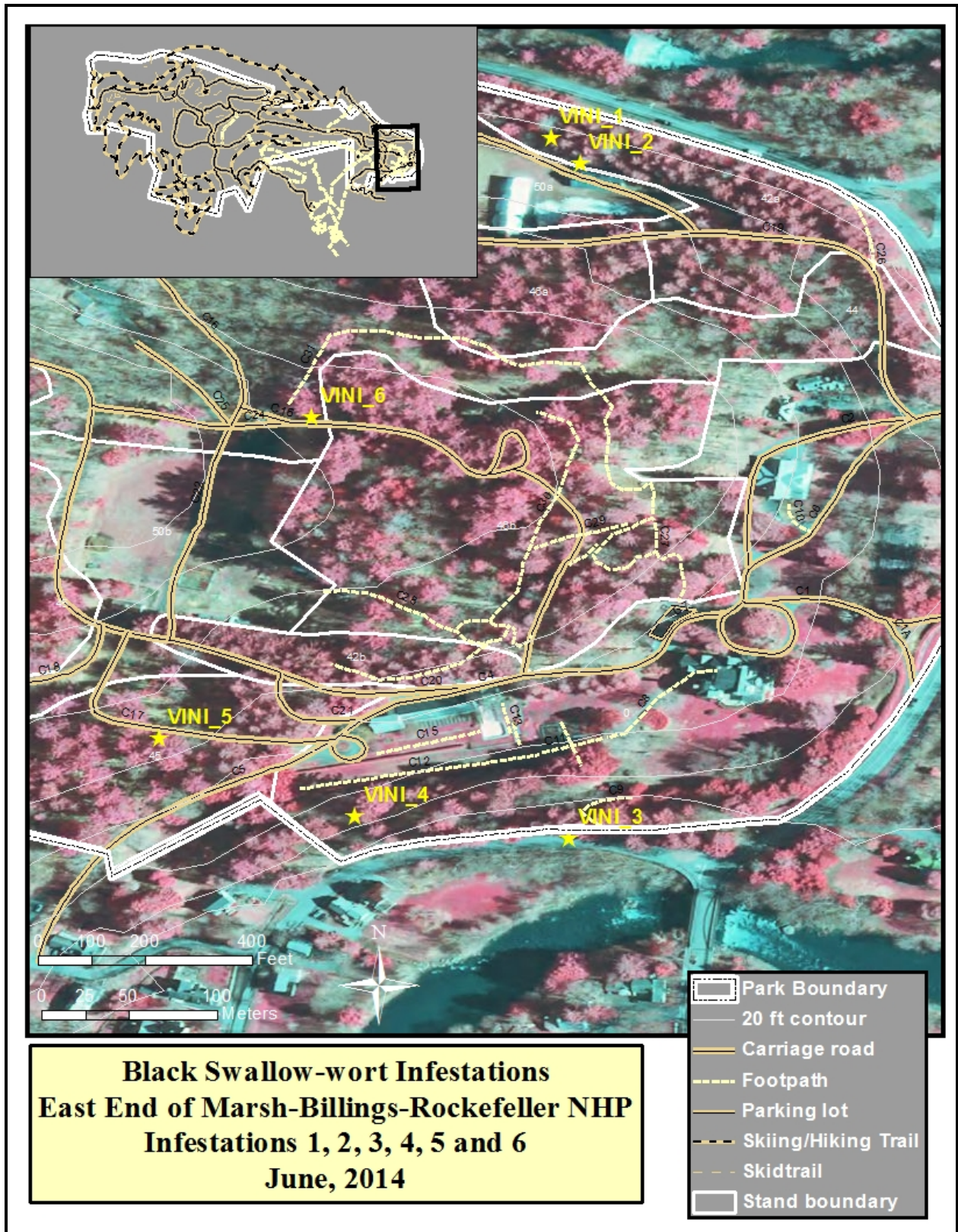


Figure 6. Black swallow-wort infestations in the east end of Marsh-Billings-Rockefeller National Historical Park.

Infestations 1 and 2- Forest Center (VINI_1 and VINI_2)

Assessment in 2013 found 5 larger, flowering plants, and 1 cluster of smaller seedlings. These infestations were found mostly along the north edge of the lawn behind (to the north) the Forest Center building. One plant was found about 15 feet to the north into the woods (from the lawn edge).

Plants in this area were treated with herbicide (Rodeo) in 2013. This area should continue to be monitored and treated in 2014. The area to the north (headed down the bank to Rte. 12) should be scouted for emerging plants.

Infestation 3 and 4- River Street (VINI_3 and VINI_4)

The heaviest density of black swallowwort is between the tall oak trees and the telephone pole on the west end. There were a few small patches within this area that contained between 11-25% cover, but most of the infestation is between 1-10% cover (usually less than 3% cover).

A few seed-bearing plants were found in the densest areas and seed pods were removed from the plant before they were treated with herbicide. Smaller seedlings were found on the lower portions of the bank and throughout the middle section of the bank. No plants were found east of the 3rd tall Norway spruce (from the east end of a row along the top of the slope). Only one plant was found north of the stone wall. No plants were discovered here in 2012, but this area should be continued to be monitored due to the occurrence in 2013.

The black swallow-wort on this site was treated with herbicide using a hand-wiping foliar herbicide application. Redstart would strongly suggest a foliar herbicide application using a backpack sprayer or hand held in the future. The hand-wiping method was thought to provide less herbicide drift and collateral damage (not to mention is slightly more discrete in a high-visibility site), however, Redstart does not feel that this method is achieving those goals and actually believes this method to be less effective and requires the use of more herbicide.

Infestation 5 - Below 50th Anniversary Plantation (VINI_5)

This infestation was first discovered by Kyle Jones (NPS) in 2013. Two plants were found, one larger and one smaller, but neither was seed bearing. Kyle flagged the infestation, and it was treated with herbicide by Redstart in 2013. This infestation should be assessed and/or treated in 2014.

Infestation 6- North Side of Pony Pasture (VINI_6)

Redstart looked for black swallow-wort in this location, but could not find any plants. One single plant was first detected and treated in 2011, but no returns were

found in 2012 or 2013. This area should be monitored for one more year (2014) and then checked again on intervals of 3 years.

Infestation 7- Stand 28, Carriage Road North of Pogue (VINI_7)

This infestation was originally identified and treated in 2007, but no returns were found with 2008 and 2010 assessments. The population was assessed and treated again in 2012, and consisted of three small seedlings.

This infestation was not assessed or treated in 2013 due to discrepancies between WIMS and the annual report and maps. This infestation should be checked again in 2014 and treated if plants are found.

Infestation 8- Stand 8, off Ashes to Ashes Trail (VINI_8)

Infestation 9- Stand 8, near Elm Lot (VINI_9)

Assessment in 2013 found approximately 10-15 smaller seedling plants next to a two-forked girdled white pine. Approximately 25 feet to the southeast, one larger black swallow-wort plant was found. None of the plants were flowering or seed bearing.

The description of Infestation 8 in the 2012 report indicated that three (not two) smaller populations were found and treated. Given this, more time was spent scouting for additional plants in the larger vicinity, but not additional plants were found.

Plants found at Infestation 8 were treated in 2013 with herbicide. This area should be assessed and treated again in 2014, and scouting for additional plants should be also completed at that time.

Infestation 9 was originally reported in 2011 by an SCA intern. Since then, the infestation has not been relocated or treated. It is unclear if this location was actually an infestation of black swallow-wort or if some other plant was mistakenly mis-identified as black swallow-wort. This area should be monitored for one more year (2014) and then either removed from being assessed further (if mis-id was likely) or scouted for every 3 years.

Infestation 10- Stand 5 (VINI_10)

Infestation 11- North Ridge Trail (VINI_11)

Infestation 10 and Infestation 11 are newly discovered infestations of black swallow-wort in 2013. They were discovered by Kyle Jones (NPS) during the summer months. Kyle flagged both of these infestations and data associated with the infestations was recorded into WIMS.

Infestation 10 is located in Stand 5, within the small patch cut that NPS and VYCC staff began in 2012 and continued in 2013. Black swallow-wort plants were found growing within the patch cut, near the western edge. A flag was placed on a fallen down log next to the infestation.

Infestation 11 is on the North Ridge Trail, approximately 130 feet from the trail sign for the North Ridge Loop trail and the trail to the Ski Cabin. The black swallow-wort plants are growing on the bank upslope of the North Ridge Trail.

Both of these infestations should be assessed and treated with herbicide in 2014.

Additional Black Swallow-wort Infestations

The Town of Woodstock is heavily populated with black swallow-wort in places. The Marsh-Billings-Rockefeller NHP abuts two properties where treatment of black swallow-wort has been done. The King Farm abuts the Marsh-Billings-Rockefeller NHP to the south, and has a small infestation of black swallow-wort growing very close to the property boundary. Redstart and other NPS staff have been somewhat involved in this treatment and are expected to be in the future. This infestation is not recorded in WIMS but has been included on maps and annual reports previously.

NPS and SCA staff have been involved in removing seed pods from black swallow-wort on the Billings Farm & Museum property (near the R/V parking lot and Barnard Brook) previously. This infestation is recorded in WIMS (does not have spatial coordinates) but is not included in annual reports or maps from Redstart.

European Black Alder (*Alnus glutinosa*, ALGL)

Infestation of European black alder are growing along the shoreline of the Pogue, in the northeast corner of the Summer Pasture, and in the Spring Lot. In the Spring lot area black alder is growing in the drainage to the south, and along the south and eastern edge of the Spring Lot.

In 2012, several larger European black alder trees (between 16-18 inches in diameter) were cut from the drainage south the Spring Lot and the stumps were treated with herbicide by Redstart. Also in 2012, the black alder growing along the north and east edge of the Pogue were cut and freshly cut stumps were treated with herbicide.

In 2013, NPS staff decided that the original recommendation to mow the black alder was not sufficient in managing the plant, thus they requested that Redstart treat the alder with herbicide. Redstart treated the Spring Lot and Summer Pasture infestations using a foliar herbicide application. Most of the plants were between 0.5 to 1 inches caliper and between 3 to 7 feet in height. A few of the larger trees that were cut in 2012 also had re-sprouted (Figure 7), despite literature reviews that cited black alder as more commonly sprouting from seed rather than root sprouts (Redstart annual report, 2012). These stump-sprouts were re-treated with a foliar herbicide application in 2013. The 2013 SCA intern, Bridget Likely, assisted with the foliar herbicide application treatment of plants in the Spring Lot and Summer Pasture.

Figure 7. A black alder stump that was cut and treated with herbicide in the Spring Lot. Re-sprouts were treated with foliar herbicide application in 2013. Photo taken July 2013 by Redstart.



Redstart also re-treated the black alder plants growing along the Pogue. Many of the plants that were cut and treated with herbicide in 2012 appeared to have re-sprouted in 2013. Redstart re-cut these plants and treated the stumps with herbicide again.

All of the black alder infestations should be re-assessed in 2014 and retreated with herbicide as necessary. It is unclear as to why the 2012 was not effective in killing the treated plants around the Pogue and the larger stumps in the Spring Lot drainage. This infestation should be reassessed in 2014 to determine if another treatment method or brand/type of herbicide should be used if the plants are not dead after the 2013 treatment.

Detailed information about 2013 black alder treatment is listed below.

- **Treatment Dates:** August 16th, 2013, August 29th and October 25th
- **Total Treatment Hours:** 24 hours
- **Redstart Treatment Hours:** 8 hours; 6 including hours from SCA intern
- **Treatment Type:** Foliar herbicide application- backpack sprayer for Spring Lot and Summer Pasture infestations. Used 203 fluid ounces of total volume of a 5.0% solution in water, with non-ionic surfactant. This total volume incorporated 10.16 fluid ounces of Garlon 3A herbicide (EPA Registration Number 62719-37).
Cut-stump herbicide application for the black alder infestation around the edge of the Pogue. Used 20 fluid ounces of total volume of a 50% solution in water, with a non-ionic surfactant. This total volume incorporated 10 fluid ounces of Rodeo herbicide (EPA Registration Number 62719-324).
- **Licensed Pesticide Applicator:** Courtney Haynes of Redstart, Certification #1210-4380, with assistance from SCA volunteer Bridget Likely.
- **Infestations Initially Treated by Redstart in 2013**
 - Spring Lot
 - Summer Pasture
 - Pogue Shoreline

Additional Non-Native, Invasive Plant Assessments and Treatments

Japanese knotweed (*Polygonum cuspidatum*, POCU)

Redstart treated Japanese knotweed along the White Pine Trail, just off Park property in 2012; there was no treatment of these plants in 2013. This infestation was relocated in 2013 when Redstart was scouting the neighbors, Tom and Tracy Phillips, property. Redstart plans to work for the Phillips' in 2014 to address non-native, invasive plants on their property and will likely deal with this infestation of Japanese knotweed.

Common reed (*Phragmites australis*, PHAU)

Redstart treated common reed at the edge of the Proper Road parking lot in 2012. Informal assessments were completed in 2013, which revealed no reoccurrence of the plant in this location. This area should be scouted again in 2014 to determine if re-treatment is necessary.

Oriental bittersweet (*Celastrus orbiculata*, CEOR)

No treatment was done on oriental bittersweet in 2014. It is unclear if some of the bittersweet plants found on the Marsh-Billings-Rockefeller NHP are the non-native bittersweet, or the native bittersweet (*Celastrus scandens*). The "Invasives monitoring, assessment and treatment report (Redstart, 2012) provides detailed information about the difference between the two species. It is recommended that these plants are monitored again in 2014 and if possible, determine if they are native or non-native bittersweet.

Black locust (*Robinia pseudoacacia*, ROPS)

As reported in the 2012 "Invasives monitoring, assessment and treatment report (Redstart, 2012), black locust is growing in the western area of the Marsh-Billings-Rockefeller NHP in Stands 12, 13, and 18. Original treatment was done on some black locust trees in this general vicinity in 2007, but no treatment has been done since and the infestation has continued to spread. This infestation should be re-assessed in 2014 and treated with either a cut stump treatment (for taller plants) and/or a foliar herbicide application. Black Locust is a historic species in the park in the McKenzie area, and will be retained there. However, spread from that area into stand 18 should be managed.

Autumn Olive (*Elaeagnus umbellata*, ELUM)

In general, the Marsh-Billings-Rockefeller NHP has very low levels of Autumn olive, however, this species has been found growing in a few places. A few plants were found scattered in the Summer Pasture by Kyle Jones, and they were treated at the same time the black alder was treated in October, 2013. A few other plants were growing along the McKenzie Orchard/property boundary and were originally treated by Redstart and SCA interns in 2011. These plants should be re-assessed and treated as necessary.

Pre-Harvest Stand Inspections

Redstart assisted with pre-timber harvest stand inspections in 2013. Stands 24, 19 and 31 were harvested during the summer months in 2013. Before the timber harvesting commenced, one Redstart employee and the 2013 SCA intern, Bridget Likely, walked transects through the each of these stand to scout for and hand pull any non-native, invasive plants.

Stand 24 had very low levels of invasive plants; only a handful of plants were found and were subsequently hand pulled. Stands 19 and 31 were slightly more infested with invasive plants, namely common and Japanese barberry. Infestation levels and plant size were still light and small enough that plants could be hand pulled.

Blackberry and Raspberry (*Rubus spp.*)

Although not non-native, NPS staff enlisted Redstart to control the growth of *Rubus spp.* in Stand 3a to ensure the survival of planted white pine and red pine seedlings. This stand was clear cut and replanted with white pine and red pine seedlings in 2012. Within one growing season, *Rubus spp.* plants were out-competing the pine seedlings and hand-pulling was not effective. The herbicides used in this application were not broad-leaf specific, but the timing of the application likely reduced the negative effect any non-desired, residual herbicide drift onto the softwood stems since they had “hardened off” at this point in the growing season.

A small portion of the stand (approximately 50 feet by 50 feet) was excluded from the herbicide treatment and *Rubus spp.* were hand pulled instead. This experiment was designed to weight the costs and benefits associated with each treatment method.

Detailed information about 2013 *Rubus spp.* treatment is listed below.

- **Treatment Dates:** October 25th, 2013
- **Total Treatment Hours:** 10 hours
- **Redstart Treatment Hours:** 10 hours
- **Treatment Type:** Foliar herbicide application- Birchmeier backpack sprayer. Used 7.5 gallons of total volume of an 8 % solution in Thinvert RTU. This total volume incorporated 76.8 fluid ounces of Rodeo Herbicide (EPA Registration Number 62719-324).
- **Licensed Pesticide Applicator:** Dana Hazen of Redstart, Certification #1210-4303 and Tyler Mousley of Redstart, Certification # 1210-4604
- **Infestations Initially Treated by Redstart in 2013**
 - Stand 3a- White Pine and Red Pine Plantation

Common Barberry (*Berberis vulgaris*, BEVU)

In 2013 Redstart was also hired to treat a small patch of mature common barberry plants on Mount Tom in the Billings Park, adjacent to the Marsh-Billings-Rockefeller NHP. Kyle Jones, NPS, had scouted the area and coordinated the treatment by Redstart.

A follow-up treatment of plants in this area may be needed in 2014, but overall the infestation should be drastically reduced and hand pulling may be an appropriate follow-up method.

Detailed information about 2013 common barberry treatment on the Billings Park is listed below.

- **Treatment Dates:** August 29th, 2013
- **Total Treatment Hours:** 3 hours
- **Redstart Treatment Hours:** 3 hours
- **Treatment Type:** Foliar herbicide application- Birchmeier backpack sprayer. Used 2.25 gallons of total volume of an 8 % solution in Thinvert RTU. This total volume incorporated 23.32 fluid ounces of Rodeo Herbicide (EPA Registration Number 62719-324).
- **Licensed Pesticide Applicator:** Courtney Haynes of Redstart, Certification #1210-4380
- **Infestations Initially Treated by Redstart in 2013**
 - Mount Tom- Billings Park

Table 1. Recommendations for Assessment and Treatment of Non-native, Invasive Plants on the Marsh-Billings-Rockefeller NHP in 2014.

Task Number	Estimated Hours	Plant	Timing	Task
1	50	Garlic mustard	Spring 2014	Continue hand pulling garlic mustard; mid-May-early June
2	8	Black swallow-wort	Spring/Summer 2014	Follow-up assessment and treatment of black swallowwort populations; late June-early July
3	8	All	Summer 2014	Transects and treat (hand pulling or foliar) of forest Stand 20 scheduled for 2013 harvesting; pre-harvest
4	28	All	Summer 2014	Assessment and treatment of all invasives in previously-harvested Stands 17 and 18; early summer
5	4	Common Barberry	Summer 2014	Follow-up assessment and treatment of common barberry in Stands 30/31 and Common and Japanese barberry at Billings Park; July
6	4	Oriental bittersweet	Summer 2014	Assessment and treatment of sprouting bittersweet and other invasives in Stand 5
7	6	European black alder	Summer 2012	Follow-up assessment and treatment (foliar) of European black alder in the Summer Pasture and between Summer Pasture and Spring Lot. Pull seedlings.
8	1	Japanese knotweed	Late Summer - Fall 2013	Follow-up treatment Japanese knotweed near Stand 18; late August to early Sept.
9	3	Autumn olive	Late Summer - Fall 2013	Follow-up assessment and treatment (foliar) of sprouting or new seedling autumn olives in and adjacent to McKenzie orchard and Summer Pasture; October-November
10	10	Black locust	Fall 2013	Follow-up treatment of sprouting black locust in and adjacent to McKenzie orchard- basal bark; October-November
11	4	European black alder	Fall 2013	Follow-up treatment of remaining European black alder - basal bark or cut-stump on returns along the shore of the Pogue, in the Summer Pasture and the intermittent drainage between the Summer Pasture and Spring Lot; October-November
12	4	Garlic mustard	Late Fall 2014	First year of foliar herbicide treatment of basal rosettes of garlic mustard; October-November.

Total Hours: 126