



Invasive Species Early Detection in the Northeast Temperate Network

2013 Summary Report

Natural Resource Data Series NPS/NETN/NRDS—2014/638



ON THE COVER

Wine raspberry (*Rubus phoenicolasius*) shrubs at Weir Farm National Historic Site
Photograph by: Jesse S. Wheeler, National Park Service

Invasive Species Early Detection in the Northeast Temperate Network

2013 Summary Report

Natural Resource Data Series NPS/NETN/NRDS—2014/638

Jesse S. Wheeler
Northeast Temperate Network
Acadia National Park
Bar Harbor, ME 04609

Kate M. Miller
Northeast Temperate Network
Acadia National Park
Bar Harbor, ME 04609

April 2014

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available from <http://science.nature.nps.gov/im/units/netn/> and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/nrpm/>). To receive this report in a format optimized for screen readers, please email irma@nps.gov.

Please cite this publication as:

Wheeler, J. S., and K. M. Miller. 2014. Invasive species early detection in the Northeast Temperate Network: 2013 summary report. Natural Resource Data Series NPS/NETN/NRDS—2014/638. National Park Service, Fort Collins, Colorado..

Contents

	Page
Figures.....	v
Tables.....	v
Executive Summary	ix
Acknowledgements.....	xi
Introduction.....	1
Methods.....	3
Sampling.....	3
Reporting and Data Management	3
Rapid Response	3
Results and Discussion	5
Acadia National Park.....	10
Boston Harbor Islands National Recreational Area.....	10
Marsh-Billings-Rockefeller National Historical Park	11
Minute Man National Historical Park.....	13
Morristown National Historical Park.....	13
Roosevelt-Vanderbilt National Historic Sites	15
Saint-Gaudens National Historic Site.....	15
Saratoga National Historical Park	17
Saugus Iron Works National Historic Site.....	17
Weir Farm National Historic Site	18
Conclusions.....	21
Literature Cited	23

Figures

	Page
Figure 1. Locations of five Invasive Species Early Detection (ISED) sightings reported in Morristown National Historical Park by the NETN Forest Health monitoring Crew and park staff in 2013.	14
Figure 2. Invasive Species Early Detection (ISED) locations of wine raspberry (<i>Rubus phoenicolasius</i>) at Roosevelt-Vanderbilt National Historic Sites by the NETN Forest Health monitoring Crew in spring, 2013.	16
Figure 3. Invasive Species Early Detection (ISED) locations of wine raspberry (<i>Rubus phoenicolasius</i>) at Weir Farm National Historic Site by the NETN Forest Health Monitoring Crew in spring, 2013.....	19

Tables

	Page
Table 1. Invasive species early detection target lists for each park in the Northeast Temperate Network. “X” indicates a species remaining on the list, “--” indicates a species removed from the list, and “X” indicates a species added to the list for 2014.....	7

Appendices

	Page
Appendix A: Scientific nomenclature changes for early detection species.....	25
Appendix B: Early detection species summary tables.....	27
Appendix C: Invasive species early detection target list for Boston Harbor Islands by park subunit.....	37
Appendix D: Invasive plant inventory and treatment information.	39
Appendix E: Location descriptions of early detection species records for Marsh- Billings-Rockefeller National Historical Park (MABI) and Morristown National Historical Park (MORR) 2013	41

Executive Summary

The 2013 field season marked the 4th year of the Northeast Temperate Network (NETN) implementing an invasive species early detection (ISED) program in 12 national park units. The ISED program was designed to facilitate detection of priority pests and exotic plants at early stages of establishment while the costs of eradication are still low and the chances of successful eradication are high. The major components of the ISED program include 1) a target list of early detection species for each park, 2) laminated field guides for each park containing the target list and identification cards for each target species, 3) a reporting plan to ensure park managers and NETN staff are informed quickly of detections, and 4) data management and annual reporting of early detection and invasive species data.

Over the last year, NETN provided several parks with updated laminated ISED field guides, and offered training to NETN field staff and interested parks. NETN and park staff recorded 29 new detections of 18 different plant species in all NETN parks except Saratoga National Historical Park (SARA) and Saint-Gaudens National Historic Site (SAGA). ISED target species lists were also reviewed and updated in parks visited by NETN vegetation crews in 2013, including Roosevelt-Vanderbilt National Historic Sites (ROVA), Morristown National Historical Park (MORR) and Weir Farm National Historic Site (WEFA), which were visited by the forest crew, and Boston Harbor Islands National Recreation Area (BOHA) and Saugus Iron Works National Historic Site (SAIR), which were visited by salt marsh monitoring staff. As part of the ISED target list review of these parks, we looked for species where annual control measures and repeated detections indicated that a species was more established than previously known and in most cases, these species were removed from the ISED target lists. Examples include wine raspberry (*Rubus phoenicolasius*) in WEFA and ROVA and linden arrowwood (*Viburnum dilatatum*) in MORR. We also looked for new species to add to target lists that have high invasive potential and are being found closer to park boundaries. These include autumn olive (*Elaeagnus umbellata*) for ROVA and Japanese sedge (*Carex kobomugi*) for five of the islands/units within BOHA.

In addition to reporting on early detections in NETN parks, we provide a brief summary of the routine inventory and management efforts of established invasive plants that were conducted by park staff, cooperators and the Northeast Exotic Plant Management Team (NEEPMT) at each park during 2013. Perennial pepperweed (*Lepidium latifolium*), Japanese stiltgrass (*Microstegium vimineum*) and glossy buckthorn (*Rhamnus frangula*) were some of the more established and common invasive species treated in NETN parks in 2013.

Acknowledgements

The Invasive Species Early Detection protocol that the Northeast Temperate Network is implementing was developed by Jennifer Stingelin Keefer of the Eastern Rivers and Mountains Network. We are grateful to Jennifer for all of her hard work in getting this protocol up and running for both networks, for her continued collaboration, and for the many excellent species identification cards she has designed and shared. We would like to thank Charlene Donahue, Forest Entomologist for the state of Maine, for information regarding winter moth distribution in Maine. We would like to thank Ed Sharron (NETN Science Communication Specialist) for revising the format of this report, incorporating ISED training into his “Road Shows” and printing the ISED field guides. We would like to thank our park resource managers for helping to develop the target species lists, and their continued commitment to making this protocol successful. Finally, we thank Kyle Jones, Robert Masson, and Brian Mitchell for reviewing and providing helpful suggestions on the report.

Introduction

Invasive exotic species are those that have the potential to cause negative economic impacts and/or harm to the environment or human health (USPEO 1999). Invasive species are also one of the leading threats to biodiversity and ecological integrity of ecosystems worldwide (Mooney et al. 2005). Many environmental and anthropogenic variables may contribute to the effectiveness with which invasive species spread or out-compete indigenous plants. One of these factors, changing climate, may alter the environment in a way that increases invasive species vigor or reduces indigenous species robustness. In many areas of the US, climate change is expected to increase biological invasions, such as in the Rocky Mountain and Upper Columbia River Basin regions (Ashton et al. 2010). Early detection of invasive species was identified as a priority vital sign by several Inventory and Monitoring (I&M) Networks in the Northeast Region of the National Park Service (NPS). In 2008 the Northeast Temperate Network (NETN) and Eastern Rivers and Mountains Network (ERMN) began developing a shared invasive species early detection (ISED) protocol. A protocol update is expected to be completed in 2014 and will include the addition of Mid-Atlantic Network (MIDN) and Northeast Coastal & Barrier Network (NCBN) parks that are visited by forest health monitoring crews.

NETN is currently implementing the ISED protocol in 12 NETN parks, including Acadia National Park (ACAD), Boston Harbor Islands National Recreation Area (BOHA), Marsh-Billings-Rockefeller National Historical Park (MABI), Minute Man National Historical Park (MIMA), Morristown National Historical Park (MORR), Roosevelt-Vanderbilt National Historic Sites (ROVA), Saint-Gaudens National Historic Site (SAGA), Saratoga National Historical Park (SARA), Saugus Iron Works National Historic Site (SAIR), and Weir Farm National Historic Site (WEFA). Roosevelt-Vanderbilt National Historic Sites includes Eleanor Roosevelt National Historic Site (ELRO), Home of Franklin D. Roosevelt National Historic Site (HOFR), and Vanderbilt Mansion National Historic Site (VAMA). NETN is also monitoring status and trends of invasive species in many of these parks as part of the Long-term Forest Monitoring Protocol (Tierney et al. 2013).

The overall goal of the ISED protocol is to utilize opportunistic sampling to detect invasive species in the early stages of establishment while the costs of eradication are still relatively low. This is accomplished by first developing a modest list of target insect pest and exotic plant species specific to each park that can easily be managed by non-experts. The target list includes species that are either 1) present in the park at low levels and of management concern if new populations are detected, or 2) not present in the park, but that have demonstrated impacts to ecosystem function in the region. Target lists are reviewed biennially and updated as needed. To aid with identification, NETN provides laminated field guides to each park and to NETN field crews, and annual ISED training for NETN field crews and interested parks. The field guides contain each park's target list, identification cards for each species on the target list, and laminated pest and plant detection forms. The detection forms list the information that should be collected for each detection and can be written on using dry erase markers or wax pencils. The detection forms are also available as datasheets on Rite in the Rain paper, and digitally as fillable Adobe .pdf forms upon request. Starting in 2013, NETN field crews recorded ISED sightings into the smartphone application "What's Invasive!" facilitating speedy recordings of detections. This app includes updated target lists for each NETN park. The app automatically stores

important data associated with the detection including GPS location, photographs, and extent of population. This information can later be downloaded as an excel spreadsheet from their website (http://www.whatsinvasive.org/display_list.cfm). The “What’s Invasive!” smartphone app can be downloaded at: <https://itunes.apple.com/us/app/whats-invasive/id529665562?mt=8> for the iPhone, and at <https://play.google.com/store/apps/details?id=edu.ucla.cens.whatsinvasive> for the Android operating system.

A reporting plan is in place for each park so that park managers can be immediately notified of early detections. Data management tasks, such as gathering and storing early detection location and species information from NETN field crews and park staff and volunteers, are handled by NETN staff. Finally, summaries of early detections for each park are included in annual reports. For more details on the ISED protocol, refer to Keefer et al. (2010).

The aim of this report is to centralize early detection and invasive species information for each park into a single annual report. Herein we provide updates on the ISED program and park target lists, report all early detections from 2013, and summarize invasive species management efforts in each park from 2013. There are two important caveats to keep in mind while reading this report. First, the invasive species management information is a brief summary of the information that was provided to us by each park and/or the NEEPMT, and may not include all species that were inventoried or managed over the year. Secondly, while the locations of forest plots with target invasive species are provided, forest plots must NOT be specifically targeted for invasive species removal. That is, forest monitoring plots need to be treated the same as the surrounding area to maintain the integrity of the forest monitoring sample design.

Methods

Sampling

The ISED protocol was designed to require minimal staff time and funding and to rely on opportunistic sampling by NETN field crews (e.g., forest health monitoring crew (FHMC), water monitoring staff), park staff (e.g., maintenance crews, biological technicians), cooperators and volunteers who may encounter invasive species while performing other tasks in the parks. In some cases, park staff and volunteers were actively searching for early detections. While this is highly encouraged, it is not a requirement of the ISED protocol.

Reporting and Data Management

New detections of invasive species on our target lists were documented with as much detail and supporting evidence as possible. Several ISED detections that were made by park staff and/or resource managers were mapped and assessed in-house. All ISED detections made by the FHMC in 2013 were reported with smartphones using the app, “What’s Invasive!”, or on-line at www.whatsinvasive.org. This app and website are managed by the Early Detection & Distribution Mapping System (EDDMapS), which is the University of Georgia’s web-based mapping system for documenting invasive species distributions. Data collection procedures are outlined in SOP #2 – Data Collection: ISED Reporting Forms and SOP #3 – Data Collection: “What’s Invasive!” of the ISED protocol (Keefer et al. 2010, and Keefer et al. in Prep). When target species were detected, the designated park contact (DPC) listed on the ISED field guides and/or the NETN Early Detection Lead (Jesse Wheeler) were notified immediately of the location and species detected. The DPC and NETN Early Detection Lead alerted each other of new detections. NETN staff managed the spatial and tabular data related to early detection in network parks and summarized these results in this annual report.

Rapid Response

Rapid response is a key component of the ISED program and is primarily the responsibility of park managers to plan and implement. Additional assistance may be provided by the Northeast Exotic Plant Management Team (NEEPMT), the NPS Regional Integrated Pest Management (IPM) Coordinator, the Animal and Plant Health Inspection Service (APHIS), local weed management organizations (e.g., the New Jersey Invasive Species Strike Team), and network and park personnel. The rapid response process is laid out in SOP #4 – Rapid Response Procedures of the ISED protocol (Keefer et al. 2010).

Results and Discussion

ISED Species Review

As part of our biennial protocol review, the 2014 ISED target list has been reviewed for half of the NETN parks to reflect the current top priority species. The parks visited by the FHMC in 2013 had their target lists reviewed, including MORR, ROVA, and WEFA, as well as BOHA and SAIR that were sampled for salt marsh vegetation (lists for these parks are reviewed every 3 years). The remaining parks – ACAD, MABI, MIMA, SAGA and SARA – will have their target lists reviewed in 2014 and in alternate years after that. Species that have had numerous detections in a park and appear to be well-established were considered by NETN and park staff for removal from the park ISED target list. In addition, we evaluated new candidates for park ISED target lists that are close to park boundaries and potentially present a high invasive threat to habitats represented within the park. Current species distribution data obtained from EDDMapS (2013) and Invasive Species Impact Rankings (I-Rank) were evaluated using NatureServe Explorer (2013). For further information on this review process, refer to SOP #1 – Updating Invasive Species Early Detection Lists of the ISED protocol (Keefer et al. 2010).

In efforts to keep scientific names relevant, six early detection species names were updated according to the Integrated Taxonomic Information System (ITIS). The new species names are reported throughout this document; however, old species names can be seen in Appendix A. All common names have remained the same.

ISED Program Updates

Updated target species lists for each park are incorporated in Table 1 and listed by park in Appendices B & C. Discussion of candidate species for addition and removal for each park are summarized below. Identification cards have been developed for each species listed in Table 1, and are available digitally (as .pdf files) from NETN's website (http://science.nature.nps.gov/im/units/netn/monitor/programs/invasiveSpecies/earlydetection_guides.cfm) or upon request. For the 2014 field season, new species cards will be developed for Japanese sedge (*Carex kobomugi*) and Japanese spiraea (*Spiraea japonica*). Eastern Rivers and Mountains Network (ERMN) also continues to create new species cards to keep up with their ISED needs, and we will inform NETN parks of new cards as they are completed. Detections of target species in 2013 are discussed for each park in the sections that follow.

In cooperation with ERMN, MIDN and NCBN, the ISED protocol was reviewed for potential updates and will be revised in 2014. Among other new procedures to be adopted, SOP #3 – Data Collection: “What’s Invasive!” has signaled the transition of ISED data collection from paper to digital format in the field using smartphones. In 2013, all new ISED locations were uploaded, along with GPS coordinates and notes associated with the detections, to the “What’s Invasive!” website, which is a portal for the EDDMapS database, as described in the ISED protocol (Keefer et al. 2010).

An invasive aquatic plant and algae component of ISED monitoring was expanded to all parks (except BOHA) in 2013. Native to North America yet increasingly invasive in the northeast, the alga didymo (*Didymosphenia geminata*), was added to MIMA, MORR, ROVA, and SARA target lists as these parks all contain streams or water bodies at risk of invasion. NETN staff created aquatic ISED target lists and corresponding species identification cards to be used in

these parks. The 12 aquatic plants (lakes and ponds) and one alga species (streams) for these parks can be found in Table 1. The lists were distributed as .pdf documents to park staff and to the NETN water monitoring staff, who routinely visit these locations collecting water quality samples throughout the growing season. There were no reports of invasive aquatic plants in any of the parks during 2013.

Finally, several network parks and the NEEPMT provided information on invasive species management and inventory efforts over the 2013 season. Associated data are being stored by NETN in spreadsheets and shapefiles, and can be provided to parks upon request. This

Table 1. Invasive species early detection target lists for each park in the Northeast Temperate Network. “X” indicates a species remaining on the list, “--” indicates a species removed from the list, and “X” indicates a species added to the list for 2014.

Scientific Name	Common Name	Category	ACAD	BOHA ¹	MABI	MIMA	MORR	ROVA	SAGA	SAIR	SARA	WEFA
<i>Adelges tsugae</i>	hemlock woolly adelgid	PEST	X		X				X		X	
<i>Agrilus planipennis</i>	emerald ash borer	PEST	X	X	X	X	X	X	X	X	X	X
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	PEST	X	X	X	X	X	X	X	X	X	X
<i>Pyrrhalta viburni</i>	viburnum leaf beetle	PEST		X			X	X		X		X
<i>Operophtera brumata</i>	winter moth	PEST	X									
<i>Sirex noctilio</i>	sirex woodwasp	PEST			X			X	X		X	
<i>Acer platanoides</i>	Norway maple	PLANT	X ²		X							
<i>Ailanthus altissima</i>	tree of heaven	PLANT	X	X	X				X		X	X
<i>Akebia quinata</i>	chocolate vine	PLANT					X					
<i>Alliaria petiolata</i>	garlic mustard	PLANT	X		X				X			
<i>Ampelopsis brevipedunculata</i>	porcelainberry	PLANT		X		X	X	X	X	X	X	X
<i>Aralia elata</i>	Japanese aralia	PLANT					X	X				
<i>Berberis thunbergii</i>	Japanese barberry	PLANT		X								
<i>Berberis vulgaris</i>	common barberry	PLANT	X		X							
<i>Cabomba caroliniana</i>	fanwort	AQ PLANT	X									
<i>Cardamine impatiens</i>	narrowleaf bittercress	PLANT	X	X	X	X			X	X	X	
<i>Carex kobomugi</i>	Japanese sedge	PLANT		X								
<i>Celastrus orbiculatus</i>	oriental bittersweet	PLANT	X		X							
* <i>Centaurea stoebe</i> / <i>C. jacea</i>	spotted / brown knapweed	PLANT				X						
<i>Didymosphenia geminata</i>	didymo	AQ ALGAE	X		X	X	X	X	X	X	X	
<i>Dioscorea oppositifolia</i>	Chinese yam	PLANT				X	X	X	X		X	X
<i>Egeria densa</i>	Brazilian waterweed	AQ PLANT	X		X					X		X
<i>Eichhornia crassipes</i>	water hyacinth	AQ PLANT										X
<i>Elaeagnus umbellata</i>	autumn olive	PLANT	X		X			X	X			X

¹ The ISED target lists for BOHA were combined in this table to save space. See Appendix C for the target lists for each BOHA subunit.

² Species on ISED list does not include eastern portion of Mount Desert Island unit of ACAD.

* See Appendix A for species nomenclature change.

Table 1. Invasive species early detection target lists for each park in the Northeast Temperate Network. “X” indicates a species remaining on the list, “--” indicates a species removed from the list, and “X” indicates a species added to the list for 2014 (continued).

Scientific Name	Common Name	Category	ACAD	BOHA ¹	MABI	MIMA	MORR	ROVA	SAGA	SAIR	SARA	WEFA
<i>Euonymus alatus</i>	winged burning bush	PLANT	X	X	X				X		X	
<i>Euonymus europaeus</i>	European spindle tree	PLANT		X								
* <i>Fallopia japonica</i> / <i>F. sachalinense</i>	Japanese / giant knotweed	PLANT		X	X				X			X
<i>Heracleum mantegazzium</i>	giant hogweed	PLANT	X		X	X		X			X	X
<i>Hydrilla verticillata</i>	hydrilla	AQ PLANT	X						X			X
<i>Hydrocharis morsus-ranae</i>	common frogbit	AQ PLANT	X						X			
<i>Lepidium latifolium</i>	perennial pepperweed	PLANT				X				X		
<i>Ligustrum</i> spp.	privet species	PLANT	X		X				X			
<i>Lonicera</i> spp.	bush honeysuckle species	PLANT	X							X		
<i>Lonicera japonica</i>	Japanese honeysuckle	PLANT	X	X						--	X	
<i>Lonicera maackii</i>	amur honeysuckle	PLANT					X					
<i>Lythrum salicaria</i>	purple loosestrife	PLANT	X									X
<i>Microstegium vimineum</i>	Japanese stiltgrass	PLANT	X	X	X	X			X	X	X	
<i>Myriophyllum aquaticum</i>	parrotfeather	AQ PLANT	X									X
<i>Myriophyllum heterophyllum</i>	variable watermilfoil	AQ PLANT	X		X				X	X		X
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	AQ PLANT	X		X				X	X		X
<i>Najas minor</i>	brittle waternymph	AQ PLANT	X		X				X	X		X
<i>Nymphoides peltata</i>	yellow floating heart	AQ PLANT	X		X							
<i>Opismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	PLANT		X			X	X	X	X	X	X
<i>Parthenocissus tricuspidata</i>	Boston ivy	PLANT					X					
<i>Paulownia tomentosa</i>	princess tree	PLANT				X		X	X			X
* <i>Persicaria perfoliata</i>	mile-a-minute	PLANT		X		X	X	X	X	X	X	X

¹ The ISED target lists for BOHA were combined in this table to save space. See Appendix C for the target lists for each BOHA subunit.

² Species on ISED list does not include eastern portion of Mount Desert Island unit of ACAD.

* See Appendix A for species nomenclature change.

Table 1. Invasive species early detection target lists for each park in the Northeast Temperate Network. “X” indicates a species remaining on the list, “--” indicates a species removed from the list, and “X” indicates a species added to the list for 2014 (continued).

Scientific Name	Common Name	Category	ACAD	BOHA ¹	MABI	MIMA	MORR	ROVA	SAGA	SAIR	SARA	WEFA
<i>Phragmites australis</i>	common reed	PLANT	X						X			
<i>Populus alba</i>	white poplar	PLANT		X								
<i>Potamogeton crispus</i>	curly pondweed	AQ PLANT	X						X	X		X
* <i>Pueraria montana</i>	kudzu	PLANT		X		X	X	X		X		X
<i>Ranunculus ficaria</i>	lesser celandine	PLANT				X	X	X	X		X	X
<i>Rhamnus cathartica</i>	common buckthorn	PLANT										X
* <i>Rhamnus frangula</i>	glossy buckthorn	PLANT	X ²		X			X			X	X
<i>Rhodotypos scandens</i>	black jetbead	PLANT					X					
<i>Rosa multiflora</i>	multiflora rose	PLANT	X		X							
<i>Rubus phoenicolasius</i>	wine raspberry	PLANT		X	X	X		--	X		X	--
<i>Spiraea japonica</i>	Japanese spiraea	PLANT					X					
<i>Styrax japonicus</i>	Japanese snowbell	PLANT					X					
<i>Trapa natans</i>	water chestnut	AQ PLANT	X						X	X		X
<i>Viburnum dilataum</i>	linden arrowwood	PLANT					--					
* <i>Vincetoxicum nigrum</i> / <i>V. rossicum</i>	black / European swallowwort	PLANT	X	X	X		X			X	X	
<i>Wisteria floribunda</i> / <i>W. sinensis</i>	Japanese/Chinese wisteria	PLANT						X				X

¹ The ISED target lists for BOHA were combined in this table to save space. See Appendix C for the target lists for each BOHA subunit.

* See Appendix A for species nomenclature change.

information is also summarized in the park sections below. We would like to hear from park managers regarding whether including summaries of invasive species management in this report is useful, and if there are other ways park managers would like us to convey this information.

Acadia National Park

Early Detections

There were two reports of early detection plants from “What’s Invasive!”, oriental bittersweet (*Celastrus orbiculatus*) and glossy buckthorn (*Rhamnus frangula*). Several vines of bittersweet were found growing inside the loop road at Frazer point picnic area at Schoodic peninsula, while a few glossy buckthorn seedlings were reported along the Jesup path in Great meadow. This glossy buckthorn location is likely part of a much larger population on the west and north edges of Great meadow. The Acadia Exotic Plant Management Team (EPMT) has focused their survey efforts to defining the extent of the population as they continue to target this species for management. The Acadia EPMT spent the majority of their time controlling targeted invasive plant species including the following ED species: common barberry (*Berberis vulgaris*), oriental bittersweet, giant hogweed (*Heracleum mantegazzianum*), Japanese honeysuckle (*Lonicera japonica*) and exotic bush honeysuckle (*Lonicera* spp.). The EPMT crew devoted a couple of days a month to surveying areas of the park where the introduction of invasive plants would be most likely, including Liscomb and Satterlee pits, trail heads, roads, construction sites and areas of the park that abut private lands or contain old home sites. There were no reports of invasive aquatic plants detected during annual aquatic plant surveys in the ponds and lakes of ACAD in 2013.

While visiting the park, a trained entomologist reported finding an adult Emerald Ash Borer (*Agilus planipennis*; EAB) while hiking on the Long Pond trail on the south side of Beech Mountain. With help from State of Maine entomologists, several nearby ash trees were inspected for any signs of damage. The larval galleries that were present under some of the bark were not identified as EAB. Further surveys are scheduled to occur in nearby locations, including a commercial campground with mature ash trees on their property. While EAB has not been verified in the park or nearby lands, this does not mean EAB is absent from the park.

ISED Target List Review

There was no ISED target list review conducted for ACAD in 2013. Invasive species will be considered for removal or addition to the target list in the fall of 2014. The current ISED target list can be viewed in Appendix B: Table B-1.

Invasive Species Management

Most of the control efforts were focused on invasive plants that have seeded or rooted in disturbed areas of the park. Largely, this included construction areas and other sites with landscaping “escapees” in the surrounding communities of Bar Harbor. Much of the ED species treated in 2013 addressed already known populations in disturbed locations. Three types of herbicide were used to treat 22 species of invasive plants on 7.60 total combined ha.

Boston Harbor Islands National Recreational Area

Early Detection

After detecting black swallow-wort (*Vincetoxicum nigrum*) on Peddocks Island’s Tombolo trail in 2012, small patches of the vine were again detected and treated on the island between East and

Middle Head in 2013 by the NEEPMT and BOHA staff. During the 2013 season, new infestations of perennial pepperweed (*Lepidium latifolium*) were documented along the beach in between the two drumlins at World's End. Two new infestations of porcelainberry (*Ampelopsis brevipedunculata*) were also found at World's End and treated with foliar herbicide late in the season. These detections were near the Park entrance, with one large cluster on the north side of the trail and one smaller cluster on the south side of the trail. They were treated the same day they were located.

ISED Target List Review

Three slowly expanding species were considered for removal from the list in 2013, but were kept because new population locations of these species would still be valuable to park managers. Porcelainberry (*Ampelopsis brevipedunculata*) at Webb Memorial State Park (3rd year it's been found and treated there) and swallow-wort on Peddocks island (population sighted again in 2013 and treated) have seen successful rapid responses from park staff and NEEPMT crews in recent years, but persistent control is still needed. The new population of perennial pepperweed found at World's End suggests that increased surveillance is appropriate to understand the extent of the population in the coming field seasons and the species should therefore remain on the target watch list for now.

One coastal, invasive plant species, Japanese sedge (*Carex kobomugi*), is getting closer to BOHA. This dune stabilizer is found on Cape Cod in Falmouth MA, and throughout locations of Gateway National Historic Sites including Sandy Hook, Staten Island, Queens and Brooklyn. New observations have come in on the bay side of Fire Island National Seashore as well. This plant will be added to the following units at BOHA that contain preferred dune or disturbed, upper beach habitat: Grape Island, Great Brewster Island, Lovells Island, Spectacle Island, Thompson Island and World's End. See Appendix C for individual BOHA unit target species lists.

Invasive Species Management

A variety of invasive plant types, including vines, trees, shrubs and herbs, were managed in eight island and peninsula units at BOHA with cooperation from park staff, NEEPMT, Trustees of Reservations partners and youth workers from Thompson Island Outward Bound Education Center. Thompson Island was targeted heavily for invasive plant control, including new populations of common reed (*Phragmites australis*) and perennial pepperweed. The number of managed species increased from five in 2012 to seven in 2013. While efforts at Webb Memorial were limited, one ISED species, porcelainberry, was found and treated. Specific invasive species treated are found in Appendix D (Table D-1). The most common invasive species managed in 2013, oriental bittersweet (*Celastrus orbiculatus*), was controlled on four islands. Tree of heaven (*Ailanthus altissima*), swallow-wort and multiflora rose (*Rosa multiflora*) were all found on three separate units. Spectacle Island does not usually get visited by exotic plant crews, but in 2013, one visit helped to improve an indigenous plant restoration area near the west-facing beach by removing autumn olive (*Eleagnus umbellata*).

Marsh-Billings-Rockefeller National Historical Park

Early Detection

Six species on the ISED target list were found and/or managed in MABI by park staff and cooperators in 2013 (Appendix E). Winged burning bush (*Euonymus alatus*) continues to be

found in low numbers outside of the mansion grounds with 19 plants in three forest stand locations in 2013. Fortunately, most of the ISED detections continue to be outside the interior forest areas of the park. 2013 marked another solid year in attacking garlic mustard (*Alliaria petiolata*), where more than 300 plants were pulled, and control efforts covered many locations in the park. Much of the focus of the control was addressed on a large patch near North Street, and small populations cropping up elsewhere suggest that vigilance is necessary to stay ahead of the spreading weed. From June to October, about 80 common barberry (*Berberis vulgaris*) shrubs were pulled or had stumps cut. The control efforts, being stepped up from last year, will hopefully stall this species intrusion into forested areas of the park. A small section of a larger population of Norway maple (*Acer platanoides*) was removed from the eastern part of MABI, which was close to old stands that were eradicated starting in 2005-2006. The remaining seed bank is likely to blame for persistent seedlings, however, no mature, seed-bearing trees are known to exist anymore within Park boundaries. A few Norway maple seedlings continue to be occasionally found in mixed-forest areas, as was documented by the FHMC west of the Horse shed in the closed canopy of intact forest. Autumn olive (*Elaeagnus umbellata*) was found in great numbers in Stand 5 for another consecutive year. More than 80 individuals were pulled or wrenched out of the ground in July at that site. More than a dozen others were pulled in five other locations. As part of recent annual efforts, black swallow-wort (*Vincetoxicum nigrum*) reproductive pods were pulled near the gravel parking lot across from the Billings Farm & Museum on Old River Road. Two new populations were found and treated as well. Reproductive pods and flower buds were pulled in Stand 5 and along the North Ridge Trail. There were no reports of invasive aquatic plants in the Pogue or elsewhere in MABI.

ISED Target List Review

There was no ISED target list review conducted for MABI in 2013. Invasive species will be considered for removal or addition to the target list in the fall of 2014. The current ISED target list can be viewed in Appendix B: Table B-2.

Invasive Species Management

Through cooperation between park staff, Student Conservation Association (SCA) interns, Redstart Forestry and George Perkins Marsh interns, 22 invasive species (including some ISED target list species) were managed in 2013. Six invasive plant species were heavily targeted in Stand 5, an old field successional stand, including Japanese and common barberry (*Berberis thunbergii* and *B. vulgaris*), common buckthorn (*Rhamnus cathartica*), exotic bush honeysuckle (*Lonicera spp.*), autumn olive and black swallow-wort. The compost area and road leading to the compost area saw some invasive management activity on burdock (*Arctium spp.*), common buckthorn and Dutchman's pipe (*Aristolochia spp.*). As a potential vector for incoming invasive seeds and vegetation fragments, the compost area needs ongoing surveillance for new invasives. There were a few new species being managed in 2013 that are currently at low levels, including wild parsnip (*Pastinaca sativa*), Cypress spurge (*Euphorbia cyparissias*) and European ginger (*Asarum spp.*). Cypress spurge should be monitored closely in the future as it has been noted by regional EPMT crews as presenting high invasive potential in the northeast. Redstart Forestry conducted additional invasive plant management work within MABI and a report on that work will be available later in 2014. The focus of the Redstart Forestry work was European alder (*Alnus glutinosa*), oriental bittersweet (*Celastrus orbiculatus*), garlic mustard, black swallow-wort (*Vincetoxicum nigrum*), and chemical treatment of invasive plants on abutting properties.

Minute Man National Historical Park

Early Detection

One early detection species was observed and controlled for MIMA in 2013. Porcelainberry (*Ampelopsis brevipedunculata*) was found near the Hartwell parking lot and the Stow House grounds. Nearby threats, emerald ash borer (*Agrilus planipennis*) and Asian longhorned beetle (*Anoplophora glabripennis*), have not yet been discovered in MIMA. There were no reports of invasive aquatic algae in the Concord River or elsewhere in MIMA.

ISED Target List Review

There was no ISED target list review conducted for MIMA in 2013. Invasive species will be considered for removal or addition to the target list in the fall of 2014. The current ISED target list can be viewed in Appendix B: Table B-3.

Invasive Species Management

The NEEPMT did not visit MIMA in 2013, however local efforts by park staff contributed to successful management of six species in a total area of 2.1 ha. Japanese knotweed (*Fallopia japonica*, formerly an ISED target species) was controlled in three locations by a combination of hand pulling and mowing of 0.008 ha each at the Hartwell parking lot and the Smith House field, and stump cut with herbicide applied to approximately 0.052 ha in the Parkers Revenge area. In fields on either side of the Concord River, black swallowwort (*Vincetoxicum nigrum*) was mowed (0.81 ha on the west side and 1.21 on the east side) in early summer, prior to seed pod formation. Garlic mustard (*Alliaria petiolata*) was hand pulled from 0.004 ha behind the Smith house. Several invasive species, including oriental bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*) and an early detection species, porcelainberry, were cut from 0.004 ha near the Hartwell parking lot and Stow House grounds.

Morristown National Historical Park

Early Detection

Five ISED target list species were observed in five locations in 2013 by park staff and the FHMC (Figure 1). Mile-a-minute (*Persicaria perfoliata*) and Japanese aralia (*Aralia elata*) were detected by park staff. Linden viburnum (*Viburnum dilatatum*) and lesser celandine (*Ranunculus ficaria*) were found in two different forest health plots by the FHMC, and promptly recorded in the field using the mobile app, “What’s Invasive!”. Other locations of linden viburnum may exist throughout the park, particularly in the New Jersey Brigade section. New single observations each of Japanese aralia and porcelainberry (*Ampelopsis brevipedunculata*) were also recorded using “What’s Invasive!” by the FHMC in late spring of 2013 (Appendix E). There were no reports of invasive aquatic algae in MORR.

ISED Target List Review

Considering the removal of three target species and the addition of two target species to the ISED list for 2013, we recommend making only minor edits to the list for 2014. With a high turnover rate of target species for MORR, we suggest making two changes: remove linden viburnum and add Japanese spiraea (*Spiraea japonica*) to the target list. Linden viburnum had been observed in multiple locations over the past couple of years by the New Jersey Invasive Strike Team as well as the NETN FHMC. Japanese spiraea is found at low levels in the park, with one confirmed location near the Cross Estate water tower. The shrub has a High/Medium I-

Rank and MORR staff suggested adding it to the list to get a better understanding of whether it is spreading to other areas in the park (Appendix B: Table B-4).

Invasive Species Management

Several species were mechanically removed or treated with herbicide in 2013, including the targeted ISED species mile-a-minute and Japanese aralia. Biological control of mile-a-minute by the stem boring weevil (*Rhyncomimus latipes*) was also implemented outside of the park. Although some signs of the weevil have been observed within the park, it is expected that the range of mile-a-minute will continue to expand, at least for the next few years. Other invasive species controlled in MORR were Japanese spiraea (*Spiraea japonica*), Siebold's arrowwood (*Viburnum sieboldii*), Japanese knotweed (*Fallopia japonica*) and Japanese barberry (*Berberis thunbergii*). The NEEPMT assisted in inventorying forest gaps in the park and in developing an Invasive Plant Management Plan which will be included in MORR's Vegetation & Deer Management Plan Environmental Impact Statement. No invasive species inventory or control occurred in 2013.

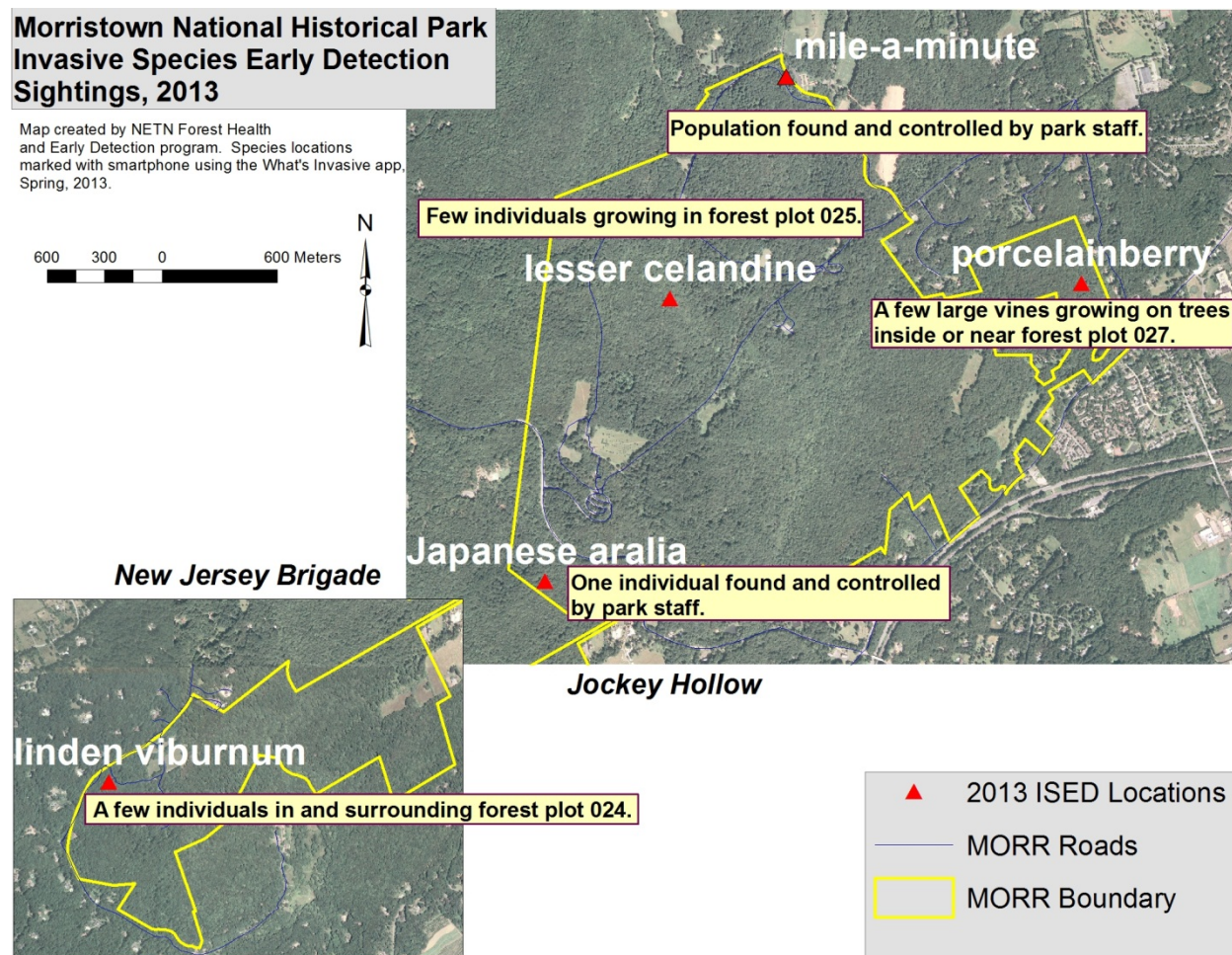


Figure 1. Locations of five Invasive Species Early Detection (ISED) sightings reported in Morristown National Historical Park by the NETN Forest Health monitoring Crew and park staff in 2013.

Roosevelt-Vanderbilt National Historic Sites

Early Detection

Now that emerald ash borer (*Agrilus planipennis*; EAB) has been confirmed as present in the VAMA unit, it will be important to increase surveillance for EAB in the other units of ROVA. Detecting and mapping the spread of EAB throughout the region is a realistic goal, but treating already infected trees is not a practical option at this point. Four new locations of wine raspberry were documented in 2013 by the FHMC and park staff (Figure 2). The FHMC found two forest health plots with wine raspberry (*Rubus phoenicolasius*) in them, with one plant in VAMA plot 024 and a few plants in HOFR plot 021. There were no reports of invasive aquatic algae in ROVA.

ISED Target List Review

Wine raspberry was found in several locations by multiple crews. The sightings have become more numerous and 2013 marked the third visit in a row since 2009 that the FHMC has come across wine raspberry while conducting forest health monitoring. Therefore, NETN recommends taking wine raspberry off the target watch list (Appendix B: Table B-5). Other highly invasive species, like autumn olive (*Elaeagnus umbellata*), could establish themselves in the open fields of the park. This species is found in Dutchess county and the region, including high densities in nearby Connecticut. With a High/Medium I-Rank and the likelihood of invading the many fields of ROVA, autumn olive was added to the target watch list for 2014.

Invasive Species Management

The Northeast Exotic Plant Management Team (NEEPMT) visited ROVA again in 2013, focusing their energy on Japanese stiltgrass (*Microstegium vimineum*) and Japanese knotweed (*Fallopia japonica*). Japanese stiltgrass was targeted along the edges of Roosevelt Farm Lane with foliar herbicide, as it may have come in with recent resurfacing material. Japanese knotweed was treated at one location in the HOFR unit and three sites in the VAMA unit. The NEEPMT ran some limited surveys in HOFR for wine raspberry, an early detection species. Within 0.32 hectare inventoried, approximately 95 m² of wine raspberry were spot treated with foliar herbicide in September.

Saint-Gaudens National Historic Site

Early Detection

No new detections of target terrestrial or aquatic species were observed in SAGA during 2013.

ISED Target List Review

There was no ISED target list review conducted for SAGA in 2013. Invasive species will be considered for removal or addition to the target list in the fall of 2014. The current ISED target list can be viewed in Appendix B: Table B-6.

Invasive Species Management

No information on invasive species management was provided for SAGA in 2013.

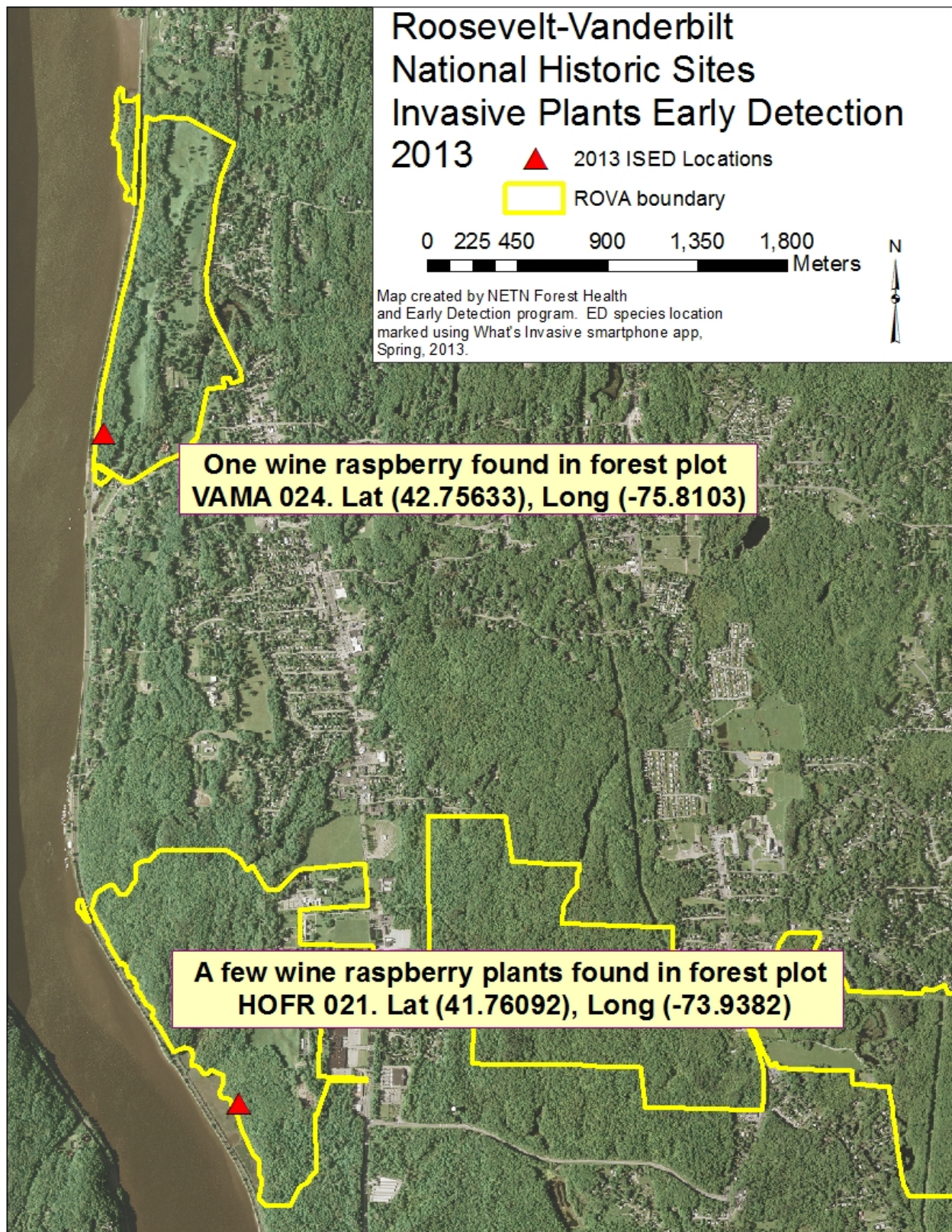


Figure 2. Invasive Species Early Detection (ISED) locations of wine raspberry (*Rubus phoenicolasius*) at Roosevelt-Vanderbilt National Historic Sites by the NETN Forest Health monitoring Crew in spring, 2013.

Saratoga National Historical Park

Early Detection

With the increase in observations of emerald ash borer (EAB; *Agrilus planipennis*), including in Roosevelt-Vanderbilt National Historic Sites recently, there is an increasing threat of invasion up the Hudson River valley into Saratoga county. Fortunately, SARA did not report any new observations of early detection species in 2013.

ISED Target List Review

There was no ISED target list review conducted for SARA in 2013. Invasive species will be considered for removal or addition to the target list in the fall of 2014. The current ISED target list can be viewed in Appendix B: Table B-7.

Invasive Species Management

The NEEPMT and park staff inventoried approximately 5.6 ha in the field by stop 2 of the tour road for brown knapweed (*Centaurea jacea*) and Canada thistle (*Cirsium arvense*). Approximately 283 m² of these invasive plants were sprayed with herbicide. Park staff focused their efforts on treating the following species: multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), bush honeysuckle (*Lonicera* spp.), Norway maple (*Acer platanoides*), Japanese knotweed (*Fallopia japonica*), common reed (*Phragmites australis*) and garlic mustard (*Alliaria petiolata*). Some of these targeted areas were re-treated infestations from previous years. The total area treated with herbicide, including efforts from the NEEPMT, was 17.9 ha.

Saugus Iron Works National Historic Site

Early Detection

Two new early detection species, Japanese honeysuckle (*Lonicera japonica*) and perennial pepperweed (*Lepidium latifolium*), were found on the east bank of the Saugus River in 2013. The Natural Resource Stewardship staff at SAIR hand pulled clusters of perennial pepperweed from the mudflat banks and rocky berm near the turning basin. The Japanese honeysuckle populations were dense and uniform in nature and were located south of the carpenter's shop and uphill of the nature trail as it bends near the eastern park boundary. The total population (approximately 278 m²) was identified as three, distinct segments with the segment nearest the carpenter's shop being the largest. The area is filled with other invasive plants that were hiding much of the honeysuckle vine. Staff pulled about half of the entire population.

Emerald Ash Borer was recently confirmed in North Andover, Essex County, Massachusetts in November 2013. USDA and APHIS are conducting coordinated surveys and working to define a quarantine area. Essex County is the second county in Massachusetts, after Berkshire County, to have confirmed presence of this destructive pest.

ISED Target List Review

After discovering three dense patches of Japanese honeysuckle, SAIR staff and volunteers made great efforts to remove roughly half of this population. The trailing vine was previously concealed below shrubs and other vegetation. Now that it has been discovered and the extent of the population is being assessed, hopefully this species can be managed effectively into the future. Since it is likely that this vine is fairly well established in the park it will be taken off the target watch list for 2014 (Appendix B: Table B-8).

Invasive Species Management

With the help from volunteers and summer youth workers, SAIR staff treated nine non-indigenous, invasive plant species on both sides of the Saugus river (Appendix D: Table D-2). Six of these species, common reed (*Phragmites australis*), oriental bittersweet (*Celastrus orbiculatus*), purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Fallopia japonica*), multiflora rose (*Rosa multiflora*) and glossy buckthorn (*Rhamnus frangula*), were treated again in 2013. The two early detection species plus greater burdock (*Arctium minus*) were new invasive species controlled at SAIR in 2013. Again in 2013, management efforts were particularly focused on common reed and purple loosestrife, and with increasing attention, Japanese knotweed. Since the Turning basin restoration project in 2008, in which common reed was mechanically removed, the invasive grass has mounted a bit of a comeback, and has expanded its range and abundance in the last 6 years. The struggle to keep this population in check will undoubtedly continue in years to come.

Weir Farm National Historic Site

Early Detection

Three ISED species were found by park staff and the FHMC in 2013. The FHMC reported wine raspberry (*Rubus phoenicolasius*) in four locations, two within forest health monitoring plots (008 and 009), a few plants near plot 007 and one site about 10 m northeast of Weir Pond (Figure 3). Park staff found scattered patches of purple loosestrife (*Lythrum salicaria*) at Truants meadow and some dense patches just below the western Weir house terrace. Park staff also noted *Wisteria* spp. in the park and will be keeping an eye on the vine's potential spread in the future.

Emerald Ash Borer is now found in several Connecticut counties, including the town of Sherman in Fairfield County. Quarantines are being expanded in much of central and western Connecticut following extensive surveys conducted in 2013 by state and federal agencies, in response to detections in New Haven County in 2012.

ISED Target List Review

After multiple sightings of wine raspberry during the FHMC's visit in spring of 2013, it is likely that this shrub is fairly well established now in the park and it will be taken off the target watch list for 2014 (Appendix B: Table B-9). Autumn olive and Japanese knotweed will be added to the watch list. Even though these two species have recently been found in WEFA at low levels, park staff eradicated the known occurrences in 2013. Because the invasive potential is so great (High I-Rank for autumn olive and High/Medium I-Rank for Japanese knotweed), a rapid response is essential for any future populations that are identified.

Invasive Species Management

For the first time ever, Japanese knotweed (*Fallopia japonica*) and autumn olive (*Elaeagnus umbellata*) were found inside the park. A patch of Japanese knotweed was treated with herbicide on the east side of Nod Hill road near the south visitor parking area. Autumn olive, an open field invader, had a few seedlings pulled out of the Burlingham field #3, west of South island.

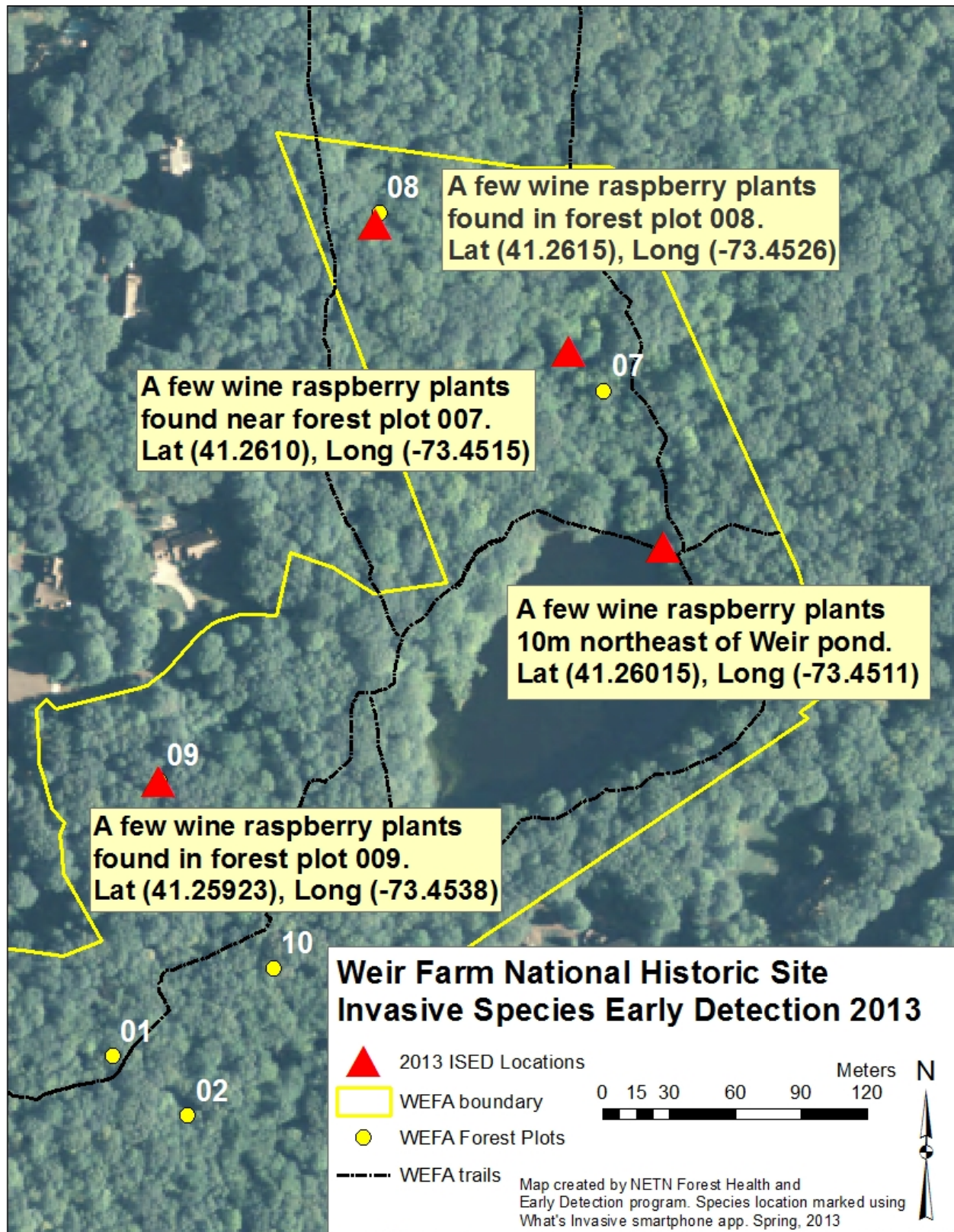


Figure 3. Invasive Species Early Detection (ISED) locations of wine raspberry (*Rubus phoenicolasius*) at Weir Farm National Historic Site by the NETN Forest Health Monitoring Crew in spring, 2013.

Conclusions

2013 marks the 4th year of the ISED program and, for many NETN parks, the second visit from the FHMC since the ISED protocol was adopted. In many cases, having the presence of field crews that go beyond the front-country paths and roads has resulted in new detections of target invasive species. The increased presence beyond areas normally visited by Park staff or EPMT crews has helped provide a greater reach and higher chance of detecting invading pests and plants in these areas. The addition of smartphones with the mobile app, “What’s Invasive!” has made prompt reporting more feasible. In its pilot year with our field crews, “What’s Invasive!” proved useful for quick data collection, albeit clunky at times. The performance of this mobile invasive reporting app is expected to get better as the programmers continue to develop it into a NPS specific application. For invasive species reporters without smartphones, we encourage the continued use of paper forms and/or on-line reporting to www.whatsinvasive.com or www.eddmaps.org.

Early Detection species were found in 29 different locations among all NETN parks except SAGA and SARA during 2013. The numbers of reports have steadily increased in the last several years, compared with six sightings in 2011 and 12 in 2012. Much of this increase may not necessarily indicate higher prevalence of Early Detection Species in our parks, but that field crews are more aware, using more efficient reporting tools, and the species lists are still being refined to a point where established species should not be represented anymore. Support of the ISED program from park staff, EPMT crews and volunteers continues to enhance the efficiency and relevance of the program. Successful rapid response remains crucial to maintaining its effectiveness within network parks. This is likely to be the case as the program grows and becomes more robust in the years to come.

Literature Cited

- Ashton, I.W., S.Ostermann-Kelm, T. Rodhouse, K. Tonnessen, E. Porter, and D. McWethy. 2010. Observed and projected ecological response to climate change in the Rocky Mountains and Upper Columbia Basin: A synthesis of current scientific literature. Natural Resource Report NPS/ROMN/NRR-2010/220. National Park Service. Fort Collins, Colorado.
- U.S. Presidential Executive Order (USPEO). 1999. Executive Order 13112 of February 3, 1999. Federal Register: February 8, 1999 (Volume 64, Number 25).
- Keefer, J. S., M. R. Marshall, and B. R. Mitchell. 2010. Early detection of invasive species: surveillance, monitoring, and rapid response: Eastern Rivers and Mountains Network and Northeast Temperate Network. Natural Resource Report NPS/ERMN/NRR–2010/196. National Park Service, Fort Collins, Colorado.
- Keefer, J. S., M. R. Marshall, B. R. Mitchell, D.R. Manning, and J.S. Wheeler. In Prep. Early detection of invasive species: surveillance, monitoring, and rapid response: 2013 Revision. Natural Resource Report NPS/ERMN/NRR–2014/XXX. National Park Service, Fort Collins, Colorado.
- Mitchell, B. R., W. G. Shriver, F. Dieffenbach, T. Moore, D. Faber-Langendoen, G. Tierney, P. Lombard, and J. Gibbs. September 2006. Northeast Temperate Network Vital Signs Monitoring Plan. Technical Report NPS/NER/NRTR--2006/059. National Park Service, Northeast Temperate Network, Woodstock, Vermont.
- Mooney, H., R. Mack, J. McNeeley, L. Neville, P. Schei, and J. Waage. 2005. Invasive alien species: a new synthesis. Island Press, Washington, DC.
- Tierney, G., B. Mitchell, K. Miller, J. Comiskey, A. Kozlowski, and D. Faber-Langendoen. 2013. Northeast Temperate Network long-term forest monitoring protocol: 2013 revision. Natural Resource Report NPS/NETN/NRR—2013/639. National Park Service, Fort Collins, Colorado.

Appendix A: Scientific nomenclature changes for early detection species.

New (2013 and later)	Old (prior to 2013)	
Scientific Name	Scientific Name	Common Name
<i>Centaurea stoebe</i>	<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	spotted knapweed
<i>Fallopia japonica</i> / <i>F. sachalinense</i>	<i>Polygonum cuspidatum</i> / <i>P. sachalinense</i>	Japanese / giant knotweed
<i>Persicaria perfoliata</i>	<i>Polygonum perfoliata</i>	mile-a-minute
<i>Pueraria montana</i>	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu
<i>Rhamnus frangula</i>	<i>Frangula alnus</i>	glossy buckthorn
<i>Vincetoxicum nigrum</i> / <i>V. rossicum</i>	<i>Cynanchum louiseae</i> / <i>V. rossicum</i>	black / European swallowwort

Appendix B: Early detection species summary tables.

Table B-1. 2014 target species list for Acadia National Park.

Scientific Name	Common Name	Status
Pest		
<i>Adelges tsugae</i>	hemlock woolly adelgid	Near ACAD boundary
<i>Agrilus planipennis</i>	emerald ash borer	
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	
<i>Operophtera brumata</i>	winter moth	Near ACAD boundary
Herb		
<i>Alliaria petiolata</i>	garlic mustard	In disturbed areas of ACAD
<i>Cardamine impatiens</i>	narrowleaf bittercress	In ACAD at low levels
<i>Heracleum mantegazzianum</i>	giant hogweed	In ACAD at low levels
<i>Lythrum salicaria</i>	purple loosestrife	In ACAD at low levels
<i>Microstegium vimineum</i>	Japanese stiltgrass	
<i>Phragmites australis</i>	common reed	Hancock county
Vine		
<i>Celastrus orbiculatus</i>	oriental bittersweet	In disturbed areas of ACAD
<i>Lonicera japonica</i>	Japanese honeysuckle	In ACAD at low levels
<i>Vincetoxicum nigrum/V. rossicum</i>	swallow-worts	Lincoln county
Shrub		
<i>Berberis vulgaris</i>	common barberry	In ACAD at low levels
<i>Euonymus alatus</i>	winged burning bush	Hancock county
<i>Ligustrum</i> spp.	privet species	In ACAD at low levels
<i>Rhamnus frangula</i> (Except East MDI)	glossy buckthorn	Established on east side MDI
<i>Lonicera</i> spp.	bush honeysuckle species	In disturbed areas of ACAD
<i>Rosa multiflora</i>	multiflora rose	In ACAD at low levels
Tree		
<i>Acer platanoides</i> (Except East MDI)	Norway maple	Established on east side MDI
<i>Ailanthus altissima</i>	tree of heaven	Penobscot county

Appendix B. Early detection species summary tables (continued).

Table B-1. 2014 target species list for Acadia National Park (continued).

Scientific Name	Common Name	Status
Aquatic alga/plant		
<i>Cabomba caroliniana</i>	fanwort	
<i>Egeria densa</i>	Brazilian waterweed	
<i>Didymosphenia geminata</i>	didymo	
<i>Hydrilla verticillata</i>	hydrilla	Lincoln county
<i>Hydrocharis morsus-ranae</i>	common frogbit	
<i>Myriophyllum aquaticum</i>	parrotfeather	
<i>Myriophyllum heterophyllum</i>	variable watermilfoil	
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	
<i>Najas minor</i>	brittle waternymph	
<i>Nymphoides peltata</i>	yellow floating heart	Knox county
<i>Potamogeton crispus</i>	curly pondweed	
<i>Trapa natans</i>	water chestnut	

Appendix B. Early detection species summary tables (continued).

Table B-2. 2014 target species list for Marsh-Billings-Rockefeller National Historical Park.

Scientific Name	Common Name	Status
Pest		
<i>Adelges tsugae</i>	hemlock woolly adelgid	Nearby county
<i>Agrilus planipennis</i>	emerald ash borer	
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	
<i>Sirex noctilio</i>	sirex woodwasp	
Herb		
<i>Alliaria petiolata</i>	garlic mustard	In MABI at low levels
<i>Cardamine impatiens</i>	narrowleaf bittercress	Windsor county
<i>Heracleum mantegazzianum</i>	giant hogweed	Windsor county
<i>Microstegium vimineum</i>	Japanese stiltgrass	
<i>Fallopia japonica/ F. sachalinense</i>	Japanese/giant knotweed	In MABI at low levels
Vine		
<i>Celastrus orbiculatus</i>	oriental bittersweet	In MABI at low levels
<i>Vincetoxicum nigrum / V. rossicum</i>	swallow-worts	In MABI at low levels
Shrub		
<i>Berberis vulgaris</i>	common barberry	In MABI at low levels
<i>Elaeagnus umbellata</i>	autumn olive	In MABI at low levels In MABI at low levels & maintained as an ornamental in the formal gardens
<i>Euonymus alatus</i>	winged burning bush	
<i>Ligustrum</i> spp.	privet species	Windsor county
<i>Rhamnus frangula</i>	glossy buckthorn	Windsor county
<i>Rosa multiflora</i>	multiflora rose	Near MABI boundary
<i>Rubus phoenicolasius</i>	wine raspberry	Windsor county
Tree		
<i>Ailanthus altissima</i>	tree of heaven	
<i>Acer platanoides</i>	Norway maple	In MABI at low levels
Aquatic alga/plant		
<i>Didymosphenia geminata</i>	didymo (alga)	
<i>Egeria densa</i>	Brazilian waterweed	Nearby county
<i>Myriophyllum heterophyllum</i>	variable watermilfoil	
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Windsor county
<i>Nymphoides peltata</i>	yellow floating heart	Nearby county

Appendix B. Early detection species summary tables (continued).

Table B-3. 2014 target species list for Minute Man National Historical Park.

Scientific Name	Common Name	Status
Pest		
<i>Agrilus planipennis</i>	emerald ash borer	Nearby county
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	Nearby county
Herb		
<i>Cardamine impatiens</i>	narrowleaf bittercress	In MIMA at low levels
<i>Centaurea stoebe</i>	spotted knapweed	In MIMA at low levels
<i>Heracleum mantegazzianum</i>	giant hogweed	
<i>Lepidium latifolium</i>	perennial pepperweed	Middlesex county
<i>Microstegium vimineum</i>	Japanese stiltgrass	Near MIMA boundary
<i>Ranunculus ficaria</i>	lesser celandine	Middlesex county
Vine		
<i>Ampelopsis brevipedunculata</i>	porcelainberry	In MIMA at low levels
<i>Dioscorea oppositifolia</i>	Chinese yam	
<i>Persicaria perfoliata</i>	mile-a-minute	Middlesex county
<i>Pueraria montana</i>	kudzu	Middlesex county
Shrub		
<i>Rubus phoenicolasius</i>	wine raspberry	Middlesex county
Tree		
<i>Paulownia tomentosa</i>	princess tree	
Aquatic alga		
<i>Didymosphenia geminata</i>	didymo	

Appendix B. Early detection species summary tables (continued).

Table B-4. 2014 target species list for **Morristown National Historical Park**.

Scientific Name	Common Name	Status
REMOVED FROM LIST		
Tree		
<i>Viburnum dilatatum</i>	Linden arrowwood	Established in MORR
ADDED TO LIST		
Shrub		
<i>Spiraea japonica</i>	Japanese spiraea	In MORR at low levels
KEPT ON LIST		
Pest		
<i>Agrilus planipennis</i>	emerald ash borer	Nearby county
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	
<i>Pyrhalta viburni</i>	viburnum leaf beetle	
Herb		
<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	In MORR at low levels
<i>Ranunculus ficaria</i>	lesser celandine	
Vine		
<i>Akebia quinata</i>	chocolate vine	In MORR at low levels
<i>Ampelopsis brevipedunculata</i>	porcelainberry	In MORR at low levels
<i>Dioscorea oppositifolia</i>	Chinese yam	Nearby county
<i>Parthenocissus tricuspidata</i>	Boston ivy	Morris county
<i>Persicaria perfoliata</i>	mile-a-minute	Morris county
<i>Pueraria montana</i>	kudzu	Morris county
<i>Vincetoxicum nigrum</i> / <i>V. rossicum</i>	swallow-worts	In MORR at low levels
Shrub		
<i>Rhodotypos scandens</i>	black jetbead	In MORR at low levels
<i>Styrax japonicus</i>	Japanese snowbell	In MORR at low levels
Tree		
<i>Aralia elata</i>	Japanese aralia	In MORR at low levels
Aquatic alga		
<i>Didymosphenia geminata</i>	didymo	

Appendix B. Early detection species summary tables (continued).

Table B-5. **2014 target species** list for **Roosevelt-Vanderbilt National Historic Sites**.

Scientific Name	Common Name	Status
REMOVED FROM LIST		
Shrub		
<i>Rubus phoenicolasius</i>	wine raspberry	Established in ROVA
ADDED TO LIST		
Shrub		
<i>Elaeagnus umbellata</i>	autumn olive	Dutchess county
KEPT ON LIST		
Pest		
<i>Agrilus planipennis</i>	emerald ash borer	Established in VAMA
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	
<i>Pyrrhalta viburni</i>	viburnum leaf beetle	
<i>Sirex noctilio</i>	sirex woodwasp	
Herb		
<i>Heracleum mantegazzianum</i>	giant hogweed	
<i>Opismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	
Vine		
<i>Ampelopsis brevipedunculata</i>	porcelainberry	Dutchess county
<i>Dioscorea oppositifolia</i>	Chinese yam	
<i>Persicaria perfoliata</i>	mile-a-minute	Dutchess county
<i>Pueraria montana</i>	kudzu	
<i>Ranunculus ficaria</i>	lesser celandine	In ROVA at low levels
<i>Wisteria floribunda</i> /W. <i>sinensis</i>	Japanese/Chinese wisteria	
Shrub		
<i>Aralia elata</i>	Japanese aralia	Nearby county
<i>Rhamnus frangula</i>	glossy buckthorn	
Tree		
<i>Paulownia tomentosa</i>	princess tree	Nearby county
Aquatic alga		
<i>Didymosphenia geminata</i>	didymo	

Appendix B. Early detection species summary tables (continued).

Table B-6. 2014 target species list for **Saint-Gaudens National Historic Site**.

Scientific Name	Common Name	Status
Pest		
<i>Adelges tsugae</i>	hemlock woolly adelgid	Nearby county
<i>Agrilus planipennis</i>	emerald ash borer	
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	
<i>Sirex noctilio</i>	sirex woodwasp	
Herb		
<i>Alliaria petiolata</i>	garlic mustard	Sullivan county
<i>Cardamine impatiens</i>	narrowleaf bittercress	Sullivan county
<i>Fallopia japonica/ F. sachalinense</i>	Japanese/giant knotweed	Nearby county
<i>Microstegium vimineum</i>	Japanese stiltgrass	
<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	
<i>Phragmites australis</i>	common reed	Sullivan county
<i>Ranunculus ficaria</i>	lesser celandine	
Vine		
<i>Ampelopsis brevipedunculata</i>	porcelainberry	
<i>Dioscorea oppositifolia</i>	Chinese yam	
<i>Persicaria perfoliata</i>	mile-a-minute	Nearby county
Shrub		
<i>Elaeagnus umbellata</i>	autumn olive	Sullivan county
<i>Euonymus alatus</i>	winged burning bush	Nearby county
<i>Ligustrum</i> spp.	privet species	In SAGA at low levels
<i>Rubus phoenicolasius</i>	wine raspberry	Sullivan county
Tree		
<i>Ailanthus altissima</i>	tree of heaven	Nearby county
<i>Paulownia tomentosa</i>	princess tree	Nearby county
Aquatic alga/plant		
<i>Didymosphenia geminata</i>	didymo	
<i>Hydrilla verticillata</i>	hydrilla	
<i>Hydrocharis morsus-ranae</i>	common frogbit	
<i>Myriophyllum heterophyllum</i>	variable watermilfoil	
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Sullivan county
<i>Najas minor</i>	brittle waternymph	
<i>Potamogeton crispus</i>	curly pondweed	Sullivan county
<i>Trapa natans</i>	water chestnut	

Appendix B. Early detection species summary tables (continued).

Table B-7. **2014 target species** list for **Saugus Iron Works National Historic Site**.

Scientific Name	Common Name	Status
REMOVED FROM LIST		
Herb		
<i>Lonicera japonica</i>	Japanese honeysuckle	Established in SAIR
KEPT ON LIST		
Pest		
<i>Agrilus planipennis</i>	emerald ash borer	Essex county
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	Nearby county
<i>Pyrrhalta viburni</i>	viburnum leaf beetle	
Herb		
<i>Cardamine impatiens</i>	narrowleaf bittercress	Nearby county
<i>Lepidium latifolium</i>	perennial pepperweed	In SAIR at low levels
<i>Microstegium vimineum</i>	Japanese stiltgrass	Nearby county
<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	
Vine		
<i>Ampelopsis brevipedunculata</i>	porcelainberry	Essex county
<i>Persicaria perfoliata</i>	mile-a-minute	Nearby county
<i>Pueraria montana</i>	kudzu	Essex county
<i>Vincetoxicum nigrum</i> / <i>V. rossicum</i>	swallow-worts	In SAIR at low levels
Shrub		
<i>Lonicera</i> spp.	bush honeysuckles	Essex county
Aquatic plant/alga		
<i>Didymosphenia geminata</i>	didymo (alga)	
<i>Egeria densa</i>	Brazilian waterweed	
<i>Myriophyllum heterophyllum</i>	variable watermilfoil	
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Essex county
<i>Najas minor</i>	brittle waternymph	Nearby county
<i>Potamogeton crispus</i>	curly pondweed	In SAIR at low levels
<i>Trapa natans</i>	water chestnut	Essex county

Appendix B. Early detection species summary tables (continued).

Table B-8. 2014 target species list for **Saratoga National Historical Park**.

Scientific Name	Common Name	Status
Pest		
<i>Adelges tsugae</i>	hemlock woolly adelgid	Nearby county
<i>Agrilus planipennis</i>	emerald ash borer	Nearby county
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	
<i>Sirex noctilio</i>	sirex woodwasp	
Herb		
<i>Cardamine impatiens</i>	narrowleaf bittercress	Nearby county
<i>Heracleum mantegazzianum</i>	giant hogweed	
<i>Microstegium vimineum</i>	Japanese stiltgrass	Nearby county
<i>Opismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	
<i>Ranunculus ficaria</i>	lesser celandine	
Vine		
<i>Ampelopsis brevipedunculata</i>	porcelainberry	
<i>Dioscorea oppositifolia</i>	Chinese yam	
<i>Lonicera japonica</i>	Japanese honeysuckle	Saratoga county
<i>Persicaria perfoliata</i>	mile-a-minute	
<i>Vincetoxicum nigrum/V. rossicum</i>	swallow-worts	Nearby county
Shrub		
<i>Euonymus alatus</i>	winged burning bush	In SARA at low levels
<i>Rhamnus frangula</i>	glossy buckthorn	Nearby county
<i>Rubus phoenicolasius</i>	wine raspberry	In SARA at low levels
Tree		
<i>Ailanthus altissima</i>	tree of heaven	In SARA at low levels
Aquatic alga		
<i>Didymosphenia geminata</i>	didymo	

Appendix B. Early detection species summary tables (continued).

Table B-9. 2014 target species list for Weir Farm National Historic Site.

Scientific Name	Common Name	Status
REMOVED FROM LIST		
Shrub		
<i>Rubus phoenicolasius</i>	wine raspberry	Established in WEFA
ADDED TO LIST		
Herb		
<i>Fallopia japonica</i>	Japanese knotweed	In WEFA at low levels
Shrub		
<i>Elaeagnus umbellata</i>	autumn olive	In WEFA at low levels
KEPT ON LIST		
Pest		
<i>Agrilus planipennis</i>	emerald ash borer	Fairfield county
<i>Anoplophora glabripennis</i>	Asian longhorned beetle	
<i>Pyrrhalta viburni</i>	viburnum leaf beetle	
Herb		
<i>Heracleum mantegazzianum</i>	giant hogweed	In WEFA at low levels
<i>Lythrum salicaria</i>	purple loosestrife	In WEFA at low levels
<i>Opismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	
<i>Ranunculus ficaria</i>	lesser celandine	
Vine		
<i>Ampelopsis brevipedunculata</i>	porcelainberry	Fairfield county
<i>Dioscorea oppositifolia</i>	Chinese yam	Nearby county
<i>Persicaria perfoliata</i>	mile-a-minute	Near WEFA boundary
<i>Pueraria montana</i>	kudzu	In WEFA at low levels
<i>Wisteria floribunda</i> /W. <i>sinensis</i>	Japanese/Chinese wisteria	In WEFA at low levels
Shrub		
<i>Rhamnus cathartica</i>	common buckthorn	Fairfield county
<i>Rhamnus frangula</i>	glossy buckthorn	In WEFA at low levels
Tree		
<i>Ailanthus altissima</i>	tree of heaven	In WEFA at low levels
<i>Paulownia tomentosa</i>	princess tree	Fairfield county
Aquatic plant/alga		
<i>Didymosphenia geminata</i>	didymo (alga)	
<i>Egeria densa</i>	Brazilian waterweed	Fairfield county
<i>Eichhornia crassipes</i>	water hyacinth	Fairfield county
<i>Hydrilla verticillata</i>	hydrilla	Fairfield county
<i>Myriophyllum aquaticum</i>	parrotfeather	
<i>Myriophyllum heterophyllum</i>	variable watermilfoil	Fairfield county
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Fairfield county
<i>Najas minor</i>	brittle waternymph	Fairfield county
<i>Potamogeton crispus</i>	curly pondweed	Fairfield county
<i>Trapa natans</i>	water chestnut	

Appendix C: Invasive species early detection target list for Boston Harbor Islands by park subunit.

Table C. BOHA early detection target list by island. An “X” indicates species was detected in 2013. “X^{TR}” represents removal treatments in 2013. “-” indicates a species removed from the target list and “X” indicates a species added to the list for 2014. Cells that are shaded are NOT on the ED list for that island.

Scientific Name	Common Name	Bumpkin Island	Grape Island	Webb Memorial St. Pk.	World's End	Spectacle Island	Thompson Island	Georges Island	Lovells Island	Calf Island	Little Brewster	Pedlocks Island	Great Brewster
Pest													
<i>Agrilus planipennis</i>	emerald ash borer												
<i>Anoplophora glabripennis</i>	Asian longhorned beetle												
<i>Pyrrhalta viburni</i>	viburnum leaf beetle												
Herb													
<i>Alliaria petiolata</i>	garlic mustard												
<i>Carex kobomugi</i>	Japanese sedge		X		X	X	X		X				X
<i>Cardamine impatiens</i>	narrowleaf bittercress												
<i>Fallopia japonica/ P.sachalinense</i>	Japanese/giant knotweed												
<i>Lepidium latifolium</i>	perennial pepperweed				X								
<i>Microstegium vimineum</i>	Japanese stiltgrass												
<i>Opismenus hirtellus ssp. undulatifolius</i>	wavyleaf basketgrass												
Vine													
<i>Ampelopsis brevipedunculata</i>	porcelainberry			X ^{TR}									
<i>Lonicera japonica</i>	Japanese honeysuckle												
<i>Persicaria perfoliata</i>	mile-a-minute												
<i>Pueraria montana</i>	kudzu												
<i>Vincetoxicum spp.</i>	swallow-worts											X ^{TR}	
Shrub													
<i>Berberis thunbergii</i>	Japanese barberry												
<i>Euonymus alatus</i>	winged burning bush												
<i>Euonymus europaeus</i>	European spindletree												
<i>Rubus phoenicolasius</i>	wine raspberry												
Tree													
<i>Ailanthus altissima</i>	tree of heaven												
<i>Populus alba</i>	white poplar												

Appendix D: Invasive plant inventory and treatment information.

Table D-1. 2013 Invasive plant species locations and management data for Boston Harbor Islands National Recreation Area (BOHA). The visiting Northeast-Exotic Plant Management Team aided in treatments conducted on Grape, Peddocks and Thompson Islands. Table only includes information that was available at the time this report was published and may not contain every treatment that occurred in NETN parks in 2013.

Location	Scientific Name	Common Name	Treatment	Inventoried / Treated
Bumpkin Island	<i>Berberis thunbergii</i>	Japanese barberry	manual, chemical	Near campsites
	<i>Celastrus orbiculatus</i>	oriental bittersweet	cut	Along SW trail
	<i>Rosa multiflora</i>	multiflora rose	cut	Along SW trail
	<i>Lonicera morrowii</i>	morrow's honeysuckle	cut	Along SW trail
	<i>Scrophularia nodosa</i>	woodland figwort	none	Small numbers, will treat next year
Grape Island	<i>Ailanthus altissima</i>	tree of heaven		Removed from SE / Central part of island
	<i>Rhamnus frangula</i>	glossy buckthorn	hand pulled	
	<i>Lepidium latifolium</i>	perennial pepperweed		Near full removal from freshwater marsh
	<i>Phragmites australis</i>	common reed	none	
Lovells Island	<i>Ailanthus altissima</i>	tree of heaven	Basal barked	Perimeter of burned area
	<i>Populus alba</i>	white poplar	Basal barked	Perimeter of burned area
	<i>Lonicera morrowii</i>	morrow's honeysuckle	manual	In burned area and between dunes and trail
	<i>Vincetoxicum spp.</i>	swallow-worts	manual /foliar	Two populations diminished
	<i>Celastrus orbiculatus</i>	oriental bittersweet	foliar, cut/paint	Between dunes and trail
Peddocks Island	<i>Lonicera morrowii</i>	morrow's honeysuckle	manual	Well spread clusters
	<i>Celastrus orbiculatus</i>	oriental bittersweet	manual	Well spread clusters
	<i>Rosa multiflora</i>	multiflora rose	manual	Well spread clusters
	<i>Vincetoxicum spp.</i>	swallow-worts	foliar	Large patches along Tombolo trail
Spectacle Island	<i>Eleagnus umbellata</i>	autumn olive		Removed section near west-facing beach
Thompson	<i>Rosa multiflora</i>	multiflora rose	foliar	Wooded, south area of island and east edge of wetland
	<i>Vincetoxicum spp.</i>	swallow-worts	foliar	Re-treatment near the climbing towers
	<i>Rhamnus frangula</i>	glossy buckthorn	foliar	Eastern edge of wetland
	<i>Phragmites australis</i>	common reed		Knocked back in wetland and marsh areas
	<i>Lepidium latifolium</i>	perennial pepperweed		Large patch on the southern spit
	<i>Ailanthus altissima</i>	tree of heaven	foliar	Spot treatments along trail
	<i>Celastrus orbiculatus</i>	oriental bittersweet	foliar	Wooded area at S end of island & east edge of wetland
Webb Memorial	<i>Ampelopsis brevipedunculata</i>	porcelainberry	foliar	Two new clusters near Park entrance
World's End	<i>Lepidium latifolium</i>	perennial pepperweed	none	New patches along beach between drumlins

Appendix D: Invasive plant inventory and treatment information (continued).

Table D-2. Saugus Iron Works National Historic Site invasive plant management actions by park staff and volunteers in 2013. Table only includes information that was available at the time this report was published and may not contain every treatment that occurred in NETN parks in 2013.

Scientific Name	Common Name	Treatment	Location
<i>Alliaria petiolata</i>	garlic mustard	hand pulled	
<i>Arctium minus</i>	greater burdock	hand pulled	West riparian zone near Turning basin and east riparian zone
<i>Celastrus orbiculatus</i>	oriental bittersweet	hand pulled	East riparian zone
<i>Fallopia japonica</i>	Japanese knotweed	pulled	West riparian zone near Turning basin
<i>Lepidium latifolium</i>	perennial pepperweed	hand pulled	East side of the Saugus River on the mudflat banks and rocky berm bordering the Turning basin
<i>Lonicera japonica</i>	Japanese honeysuckle	hand pulled	Three patches along eastern park boundary, south of the carpentry shop
<i>Lythrum salicaria</i>	purple loosestrife	hand pulled	West riparian zone near Turning basin and east riparian zone
<i>Phragmites australis</i>	common reed	hand pulled and cut stumped - chemically treated with glyphosate	East riparian zone
<i>Rhamnus frangula</i>	glossy buckthorn	hand pulled / cut stumped	East riparian zone near nature trail
<i>Rosa multiflora</i>	multiflora rose	cut and pulled	East riparian zone

Appendix E: Location descriptions of early detection species records for Marsh-Billings-Rockefeller National Historical Park (MABI) and Morristown National Historical Park (MORR) 2013. All specific locations provided are in UTM zone 18N. Table only includes information that was available at the time this report was published and may not contain every treatment that occurred in NETN parks in 2013.

Park	Scientific Name	Common Name	Location Description	Notes
MABI	<i>Euonymus alatus</i>	winged burning bush	Along North street, Tree stands 42, 45 and 46 (pulled), and hillside garden (cut stump)	19 pulled and 3 stumps cut
MABI	<i>Acer platanoides</i>	Norway maple	Management at Tree stands 42, 44, 45 and 46 as well as on hillside above carriage barn and near double cottage. New locations at E 699856, N 4833769 and E 699857, N4833742	Many seedlings found, but no existing seed bearing trees are known to exist in the park at this point. Many of the seedlings likely from seed bank of stand that was removed in 2005-2006
MABI	<i>Berberis vulgaris</i>	common barberry	Several plants pulled from many locations, chiefly stand 5 and "Barberry Forest" off the Billings Trail, located at: E 699096, N 4833813	Many small seedlings were pulled throughout the Park
MABI	<i>Elaeagnus umbellata</i>	autumn olive	Stand 5, along Pogue shoreline, French lot, near prosper lot and McKenzie road next to orchard	More than 75 wrenched/pulled from Stand 5 with handfuls (2-6) removed from other locations
MORR	<i>Aralia elata</i>	Japanese aralia	E 538339, N 4511964	One individual found.
MORR	<i>Ranunculus ficaria</i>	lesser celandine	E 538984, N 4513443	A few individuals found in wet area of forest health monitoring plot 025.
MORR	<i>Viburnum dilatatum</i>	linden arrowwood	E 536911, N 4510831	A few individuals in and surrounding forest health monitoring plot 024.
MORR	<i>Ampelopsis brevipedunculata</i>	porcelainberry	E 541132, N 4513504	A few large vines growing on trees inside or near forest health monitoring plot 027.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 962/124313, April 2014

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

EXPERIENCE YOUR AMERICA TM