



Early Detection of Invasive Species — Surveillance Monitoring and Rapid Response

Eastern Rivers and Mountains Network 2013-2015 Summary Report

Natural Resource Data Series NPS/ERMN/NRDS—2016/1032



ON THE COVER

Garlic mustard (*Alliaria petiolata*) in Gauley River National Recreation Area.
Photograph by: Douglas Manning.

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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.

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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.

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Executive Summary

Since 2008, the Invasive Species Early Detection (ISED) Program of the Eastern Rivers and Mountains Network (ERMN) has surveyed for and detected incipient populations of invasive plants, animals, and diseases in ERMN parks. Early detection of invasive species followed by rapid response can detect and eradicate incipient populations before they have a chance to become widely established; thus eliminating the need for costly and resource-intensive control programs. While long-term changes associated with established invasive species are being monitored through other protocols, the ISED program focuses on new populations of invasive species early in their invasion. Only when invasions are caught early will the chance of eradication remain high. The known ecological impacts of invasive species include loss of threatened and endangered species, altered structure and composition of terrestrial and aquatic communities, and reduction in overall species diversity.

During invasive species early detection surveillance monitoring in 2013, 18 new invasive plant and pest occurrences were documented in four parks in the ERMN by the vegetation monitoring crew, an NPS Biological Science Technician, and NPS Park Biologists. Twelve occurrences of early detection species were found in New River Gorge National River. Japanese barberry (*Berberis thunbergii*), winged burning-bush (*Euonymus alatus*), Japanese hops (*Humulus japonicus*), sweet autumn virginsbower (*Clematis terniflora*) and Norway maple (*Acer platanoides*) were found by the ERMN vegetation monitoring crew and Biological Science Technician, Layne Strickler. Two early detections were found in Gauley River National Recreation Area. Japanese barberry (*Berberis thunbergii*) and garlic mustard (*Alliaria petiolata*) were found by the vegetation monitoring crew. Three occurrences of early detection species were found in Delaware Water Gap National Recreation area. Two infestations of jetbead (*Rhodotypos scandens*) were found by the vegetation monitoring crew and Japanese aralia (*Aralia elata*) was found by the Park Biologist, Jeff Shreiner. In Bluestone National Scenic River, Chinese yam (*Dioscorea oppositifolia*) and Japanese knotweed (*Polygonum cuspidatum*) were found and treated by Biological Science Technician, Layne Strickler.

Invasive species early detection monitoring in 2014 encountered six new invasive plant and pest occurrences in the ERMN parks. Emerald ash borer (*Agilus planipennis*) was detected in Allegheny Portage Railroad National Historic Site. Two early detection species were found at Bluestone National Scenic River. Japanese knotweed (*Polygonum cuspidatum*) was discovered by the ERMN the vegetation monitoring crew and Biological Science Technician, Layne Strickler found emerald ash borer (*Agilus planipennis*). Sweet autumn virginsbower (*Clematis terniflora*) and Japanese hops (*Humulus japonicus*) were discovered along the New River in New River Gorge National River by Layne Strickler. Upper Delaware Scenic and Recreational River Park biologist, Jamie Myers, found several new patches of mile-a-minute (*Polygonum perfoliatum*) and it was determined that the infestation has moved beyond the scope of early detection.

In 2015, invasive species early detection monitoring encountered ten new invasive plant and pest occurrences in three ERMN parks. Seven early detections were found in New River Gorge National River. Japanese barberry (*Berberis thunbergii*), winged burning-bush (*Euonymus alatus*), and

Japanese hops (*Humulus japonicus*) were found by the vegetation monitoring crew as well as Biological Science Technician, Layne Strickler. In Gauley River National Recreation Area, Norway maple (*Acer platanoides*) was found by the vegetation monitoring crew. Japanese knotweed (*Polygonum cuspidatum*) was found by Biological Science Technician, Layne Strickler, in Bluestone National Scenic River.

Score cards which summarize the record of invasive species detections and rapid responses in each ERMN park from 2008 – 2015 are provided in Appendix A.

Introduction

An “invasive species” is an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (USPEO 1999). Early detection followed by rapid response can detect and eradicate incipient populations of invasive species before they have a chance to become widely established; thus, eliminating the need for costly and resource-intensive control programs (Ashton and Mitchell 1989, OTA 1993, Atkinson 1997, Myers et al. 2000, Timmins and Braithwaite 2001, Harris et al. 2001, Rejmánek and Pitcairn 2002). Only when invasions are caught early will the chance of eradication remain high (Rozenfelds et al. 1999, NISC 2008). Eradication of established invasive species is difficult, if not impossible, in many cases, but early detection and associated management responses have proven effective in reducing, if not eliminating, the associated costs and consequences (MacDonald et al. 1989, Braithwaite 2000).

In 2008, the Eastern Rivers and Mountains Network (ERMN) of the National Park Service (NPS) began early detection of invasive species surveillance monitoring throughout its nine parks. This monitoring effort is a component of the ERMN Vital Signs monitoring program (Marshall and Piekielek 2007), which is part of the nationwide NPS Inventory and Monitoring Program (Fancy et al. 2009).

One of the primary objectives of the surveillance monitoring program in the ERMN is to detect incipient populations of invasive plants, animals, and diseases before they have a chance to become widely established. To achieve this objective, target “watch” species lists were developed for each park. Target species identification information was then distributed to all ERMN field crews, interested cooperators, resource managers, and volunteers. In addition, an early detection reporting and tracking system that disseminates information on potential infestations in a timely and efficient manner was developed. The primary goals of this protocol are to assist park managers in identifying high priority invasive species, quickly disseminate new occurrence information to all interested parties (NPS, public, private, etc.), assess the risk presented by incipient populations, and assist with management of newly detected species.

This report is intended to provide ongoing results from the ERMN Invasive Species Early Detection Program to natural resource managers at Allegheny Portage Railroad National Historic Site (ALPO), Bluestone National Scenic River (BLUE), Delaware Water Gap National Recreation Area (DEWA), Fort Necessity National Battlefield (FONE), Friendship Hill National Historic Site (FRHI), Gauley River National Recreation Area (GARI), Johnstown Flood National Memorial (JOFL), New River Gorge National River (NERI), and Upper Delaware Scenic and Recreational River (UPDE).

Methods

Although a brief overview of the Invasive Species Early Detection (ISED) methods are provided here, a detailed explanation of the background, rationale, and methods, in addition to Standard Operating Procedures, are provided in the protocol (Keefer et al. 2014).

Selecting Early Detection Species

The process for selecting a short list of invasive species for inclusion in the ISED program for each park in the ERMN consisted of four main components: 1) review existing park datasets and literature and compile a list of all invasive plant and pest species known or thought to occur in the parks; 2) eliminate all common and well-established invasive species as candidates for “early detection;” 3) consult relevant existing invasive species data sources from nearby parks, towns, counties, and states for incipient invasive species not yet present in the parks and add them to the candidate ISED list; and 4) conduct more extensive research on each candidate species and consult with park natural resource managers to narrow down and finalize each park ISED list (Keefer et al. 2010). At the conclusion of this process, each park’s final ISED list (Table 1) generally consists of between 10 and 20 species. These lists are reviewed and updated annually to keep up with new and emerging threats.

Opportunistic Sampling

“Every person working or recreating in a national park has the potential to serve as an early detector” (Williams et al. 2007). Knowledgeable observers provide an additional “set of eyes and ears” to detect invasive species occurrences while they travel within the parks or conduct routine field activities. Invasive plants and pests present on each park’s ISED list (Table 1) are sought during routine vegetation monitoring activities (Perles et al. 2010). Park natural resource managers, Exotic Plant Management Teams (EPMT), volunteers, and other NPS individuals with scientific backgrounds also serve as early detectors during their daily park activities.

Invasive Species Early Detection Field Guide

To assist with the identification of early detection species, ISED cards are provided to monitoring crews and interested parties. Three separate field guides are used to distribute target species identification information. The first is a hand-held, weather-proof pocket guide provided by the USDA Forest Service, “Invasive Plants Field and Reference Guide: An Ecological Perspective of Plant Invaders of Forests and Woodlands” (USFS field guide) (Huebner et al. 2005). The second is a supplemental identification field guide developed by the ERMN. Production of the “Early Detection of Invasive Species Surveillance Monitoring Field Guide” and nine species cards was completed in summer 2009. In addition, the ERMN began development of Supplement 1 to the Early Detection of Invasive Species Surveillance Monitoring Field Guide. The third is through NPS EDDmapS and the associated smartphone application IPAlert (<http://nps.eddmaps.org/>). This website acts as a resource for species lists and information. Each species card, as well as the entire field guide, is posted on the ERMN Web site and is available for download at <http://science.nature.nps.gov/im/units/ermn/monitoring/earlydetection.cfm>. The IPAlert app now also functions as a quicker and easier way to disseminate ISED reference material, though the cards are still available upon request.

Table 1. Plant and pest species included in the Invasive Species Early Detection (ISED) program in 2013 – 2015 for the Eastern Rivers and Mountains Network by park and taxa category. ^{A, B, C}

Scientific Name	Common Name	Taxa Category	ALPO	BLUE	DEWA	FONE	FRHI	GARI	JOFL	NERI	UPDE
<i>Adelges tsugae</i>	hemlock woolly adelgid	PEST	-	-	-	ED	ED	-	-	-	-
<i>Agrilus planipennis</i>	emerald ash borer	PEST	ED	-	ED						
<i>Anoplophora glabripennis</i>	Asian long-horned beetle	PEST	ED								
<i>Channa argus</i>	northern snakehead	PEST	-	-	-	-	-	-	-	-	ED
<i>Geosmithia morbida</i>	thousand cankers disease	PEST	ED								
<i>Pylodictis olivaris</i>	flathead catfish	PEST	-	-	-	-	-	-	-	-	ED
<i>Pyrrhalta viburni</i>	viburnum leaf beetle	PEST	ED	-	ED	ED	ED	-	-	-	ED
<i>Sirex noctilio</i>	sirex woodwasp	PEST	ED	-	ED	ED	ED	-	ED		ED
<i>Didymosphenia geminata</i>	didymo	AQPLANT	ED								
<i>Hydrilla verticillata</i>	Hydrilla	AQPLANT	-	-	ED	-	-	-	-	-	ED
<i>Trapa natans</i>	water chestnut	AQPLANT	-	-	ED	-	-	-	-	-	ED
<i>Acer platanoides</i>	Norway maple	PLANT	-	ED	-	-	-	P/ED	-	P/ED	-
<i>Achyranthes japonica</i>	Japanese chaff flower	PLANT	-	ED	-	-	-	ED	-	ED	-
<i>Ailanthus altissima</i>	tree of heaven	PLANT	-		-	-	-	-	ED		ED
<i>Akebia quinata</i>	chocolate vine	PLANT	-	ED	-	-	-	ED	-	ED	-
<i>Alliaria petiolata</i>	garlic mustard	PLANT	-	-	-	-	-	ED	-		-
<i>Ampelopsis brevipedunculata</i>	Amur peppervine	PLANT	-	ED	ED	-	-	ED	-	ED	-
<i>Aralia elata</i>	Japanese aralia	PLANT	ED	-	ED	-	-	-	-	-	ED
<i>Berberis thunbergii</i>	Japanese barberry	PLANT	-	ED	-	-	-	P/ED	-	P/ED	-

^A Parks include:

Allegheny Portage Railroad National Historic Site (ALPO), Bluestone National Scenic River (BLUE), Delaware Water Gap National Recreation Area (DEWA), Fort Necessity National Battlefield (FONE), Friendship Hill National Historic Site (FRHI), Gauley River National Recreation Area (GARI), Johnstown Flood National Memorial (JOFL), New River Gorge National River (NERI), and Upper Delaware Scenic and Recreational River (UPDE).

^B ED = Early detection species not yet known to occur in the park.

P/ED = Present within the park in small numbers, but early detection is still warranted to prevent the spread to other areas of the park.

^C The species listed here were on the ISED list at some point during this time- period, but some may have been removed during that time period

Table 1 (continued). Plant and pest species included in the Invasive Species Early Detection (ISED) program in 2013 – 2015 for the Eastern Rivers and Mountains Network by park and taxa category. ^{A, B, C}

Scientific Name	Common Name	Taxa Category	ALPO	BLUE	DEWA	FONE	FRHI	GARI	JOFL	NERI	UPDE
<i>Cardamine impatiens</i>	narrowleaf bittercress	PLANT	ED	-	-	ED	ED	-	ED	-	ED
<i>Celastrus orbiculatus</i>	oriental bittersweet	PLANT	-	ED	-	ED	-	ED	ED	-	-
<i>Clematis terniflora</i>	sweet autumn virginsbower	PLANT	-	ED	-	-	-	ED	-	ED	-
<i>Cynanchum louiseae/C. rossicum</i>	Louise's & European swallow-worts	PLANT	ED		ED	-	-	-	-	-	ED
<i>Dioscorea oppositifolia</i>	Chinese yam	PLANT	-	P/ED	-	-	-	ED	-	-	-
<i>Euonymus alatus</i>	winged burning-bush	PLANT	-	-	-	-	ED	-	-	P/ED	-
<i>Frangula alnus</i>	glossy buckthorn	PLANT	ED	ED	ED	ED		ED	ED	ED	-
<i>Heracleum mantegazzium</i>	giant hogweed	PLANT	ED								
<i>Humulus japonicus</i>	Japanese hop	PLANT	-	-	-	ED	ED	ED	ED	ED	-
<i>Lespedeza cuneata</i>	Chinese lespedeza	PLANT	-	-	-	-	-	P/ED	-	-	-
<i>Ligustrum obtusifolium/L. vulgare</i>	border/European privets	PLANT	-	-	-	-	-	-	-	-	ED
<i>Lonicera japonica</i>	Japanese honeysuckle	PLANT	-	-	-	-	-	-	ED	-	ED
<i>Lythrum salicaria</i>	purple loosestrife	PLANT	-	-	-	-	-	ED	-	-	-
<i>Microstegium vimineum</i>	Japanese stiltgrass	PLANT	-	-	-	-	-	-	ED	-	-
<i>Miscanthus sinensis</i>	Chinese silvergrass	PLANT		ED	ED	ED	ED	ED		ED	ED
<i>Oplismenus hirtellus ssp. undulatifolius</i>	wavyleaf basketgrass	PLANT	ED								
<i>Phellodendron amurense</i>	Amur corktree	PLANT	-	-	P/ED	-	-	-	-	-	ED
<i>Phragmites australis</i>	phragmites	PLANT	-	ED	P/ED	-	ED	-	-	-	-

^A Parks include:

Allegheny Portage Railroad National Historic Site (ALPO), Bluestone National Scenic River (BLUE), Delaware Water Gap National Recreation Area (DEWA), Fort Necessity National Battlefield (FONE), Friendship Hill National Historic Site (FRHI), Gauley River National Recreation Area (GARI), Johnstown Flood National Memorial (JOFL), New River Gorge National River (NERI), and Upper Delaware Scenic and Recreational River (UPDE).

^B ED = Early detection species not yet known to occur in the park.

P/ED = Present within the park in small numbers, but early detection is still warranted to prevent the spread to other areas of the park.

^C The species listed here were on the ISED list at some point during this time- period, but some may have been removed during that time period

Table 1 (continued). Plant and pest species included in the Invasive Species Early Detection (ISED) program in 2013 – 2015 for the Eastern Rivers and Mountains Network by park and taxa category. ^{A, B, C}

Scientific Name	Common Name	Taxa Category	ALPO	BLUE	DEWA	FONE	FRHI	GARI	JOFL	NERI	UPDE
<i>Phyllostachys spp.</i>	bamboo	PLANT	-	-	ED	-	-	-	-	-	-
<i>Polygonum cuspidatum/sachalinense</i>	Japanese/giant knotweed	PLANT	-	P/ED	-	-	-	-	-	-	-
<i>Polygonum perfoliatum</i>	mile-a-minute	PLANT	P/ED	ED	P/ED	ED	ED	ED	ED	ED	ED
<i>Pueraria montana var. lobata</i>	kudzu	PLANT	ED		ED						
<i>Ranunculus ficaria</i>	lesser celandine	PLANT	ED								
<i>Rhamnus cathartica</i>	common buckthorn	PLANT	-	ED		ED	ED	ED	ED	P/ED	ED
<i>Rhodotypos scandens</i>	jetbead	PLANT	ED	-	ED	ED	P/ED	-	ED	-	ED
<i>Viburnum dilatatum</i>	linden arrowwood	PLANT	ED	-	P/ED	ED	ED	-	ED	-	ED

^A Parks include:

Allegheny Portage Railroad National Historic Site (ALPO), Bluestone National Scenic River (BLUE), Delaware Water Gap National Recreation Area (DEWA), Fort Necessity National Battlefield (FONE), Friendship Hill National Historic Site (FRHI), Gauley River National Recreation Area (GARI), Johnstown Flood National Memorial (JOFL), New River Gorge National River (NERI), and Upper Delaware Scenic and Recreational River (UPDE).

^B ED = Early detection species not yet known to occur in the park.

P/ED = Present within the park in small numbers, but early detection is still warranted to prevent the spread to other areas of the park.

^C The species listed here were on the ISED list at some point during this time- period, but some may have been removed during that time period

Alert System

Data acquired from ISED are time-sensitive and all new detection occurrences are immediately reported through the appropriate chain of command (see Keefer et al. 2014 for further details). Each observer or monitoring crew leader is responsible for alerting the designated park contact (DPC) and the Invasive Species Early Detection Coordinator (ISEDC) to all new species detections. In cases where noxious weeds or high priority pests are detected, the ISEDC will follow up with each DPC and may assist with alerting relevant outside agencies.

Rapid Response

Rapid responses to invasions are effective and can prevent the spread and permanent establishment of invasive species. Coordinating and/or executing a rapid response is primarily the responsibility of the respective resource manager(s) for the park in which the infestation was detected. Rapid response should include positive species identification and management/eradication activities, and may involve coordination with an EPMT, the NPS Regional Integrated Pest Management (IPM) Coordinator, U.S. Department of Agriculture agencies such as the Bureau of Plant Industry and the Animal and Plant Health Inspection Service (APHIS), local weed management organizations, and network and park personnel, including park interns. Each response should be based on the individual needs of the park and the resources available (Figure 1) (Keefer et al. 2014).

Data Management and Reporting

Currently, the ERMN is using a Microsoft Excel spreadsheet, as well as NPS EDDmapS, to track all ISED occurrences. The EDDmapS database will track new species occurrences, assessments, and all management of rapid responses at the documented location.

The Early Detection and Distribution Mapping System (EDDMapS, <http://www.eddmaps.org/>), in conjunction with the ERMN Web site, will provide a data entry port, alert system, and a resource for invasive species information, including links to other invasive species web sites, photos, important contacts, and other pertinent information. To view the current ERMN Web site, visit:

<http://science.nature.nps.gov/im/units/ermn/monitoring/EarlyDetection.cfm>.

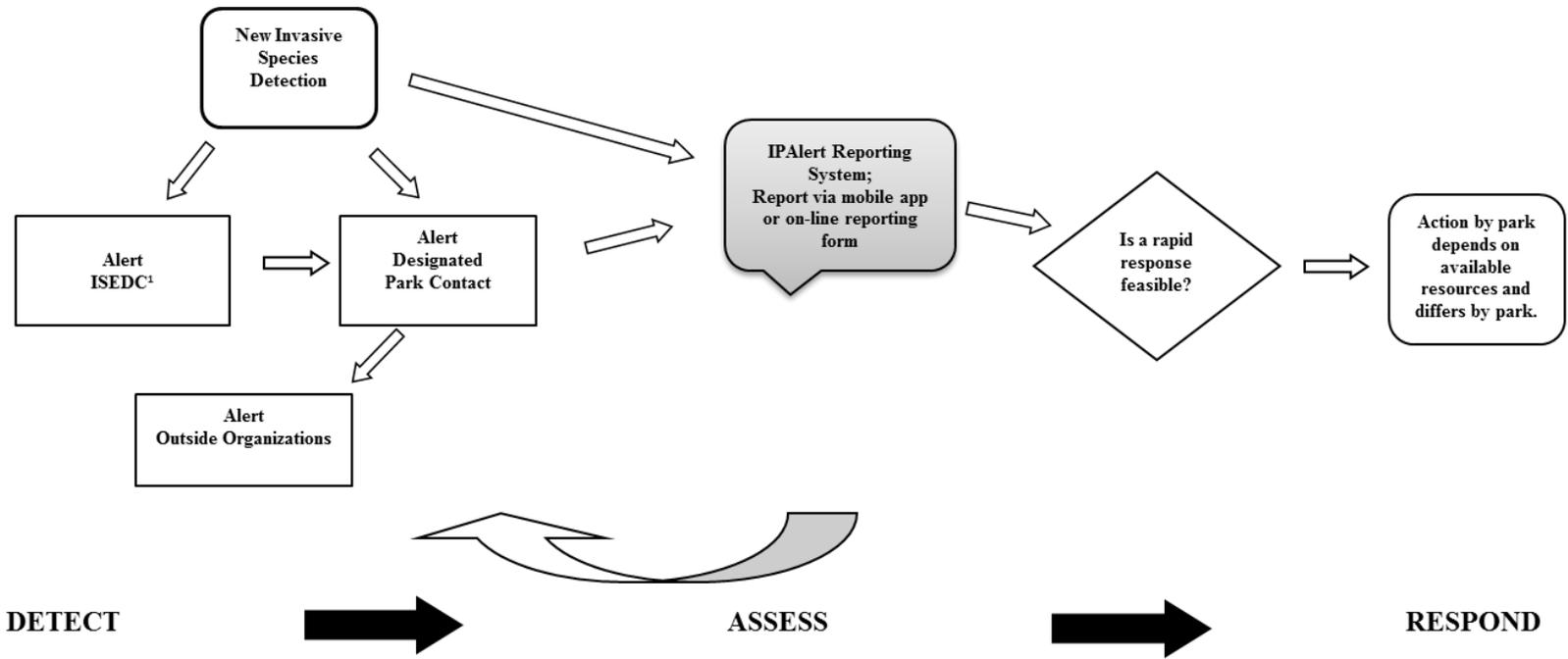


Figure 1. Early Detection of Invasive Species Rapid Response system for the Eastern Rivers and Mountains Network (ERMN).

Results and Discussion

New ISED tools for 2016

The smartphone application (app) for the ERMN ISED monitoring is linked to EDDMapS with an app specifically designed for the NPS. This app functions as a field guide, mapping tool, and an EDDMapS reporting tool. This app is available to download for free from <http://apps.bugwood.org/apps/nps/>. It is available in the Apple store at: <https://itunes.apple.com/us/app/ipalert/id757073910?mt=8>. This does not change the ISED protocol and new species detections should still be reported to the ISEDC and the appropriate DPC.

During the spring/summer of 2014, the early detection monitoring protocol was updated and those revisions were published by Jesse Wheeler and Douglas Manning (Keefer et al. 2014).

Allegheny Portage Railroad National Historic Site (ALPO)

The ALPO invasive species early detection list was reviewed in 2013, 2014, and 2015 and no new species were added to the list. Emerald ash borer (*Agrilus planipennis*) was detected near Foot of Ten in 2014 and has been removed from the ISED list since there are no effective large scale treatment options.

The ALPO invasive species early detection list will be re-evaluated and updated during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for ALPO.

Bluestone National Scenic River (BLUE)

The BLUE invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. Chinese silvergrass (*Miscanthus sinensis*) was added to the list in 2014.

In August of 2014, emerald ash borer (*Agrilus planipennis*) was detected for the first time within the park boundary in two ash trees (*Fraxinus* sp.) by Biological Science Technician, Layne Strickler. The infestation was left untreated because there are not currently effective ways to quell the spread of this noxious invasive which is wiping out ash trees across North America. Japanese knotweed was found growing in a backchannel to the Bluestone River by the vegetation monitoring crew. It was treated with herbicides by Biological Science Technician, Layne Strickler later that summer.

In 2015, Chinese yam (*Dioscorea oppositifolia*) was found near the parking lot adjacent to the confluence of the Bluestone River and the Little Bluestone River in the same location as in 2012. The infestation was found by the vegetation monitoring crew and reported to Park Biologist John Perez and Biological Science Technician, Layne Strickler who treated the plants with herbicide. The infestation was reported to EDDMaps and can be viewed under record number 4449906.

The BLUE invasive species early detection list will be re-evaluated and updated during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for BLUE.



Figure 2. Chinese yam (*Dioscorea oppositifolia*) in Bluestone National Scenic River. Photograph by: Douglas Manning

Delaware Water Gap National Recreation Area (DEWA)

The DEWA invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. No new species were added to the list during this time. Mile-a-minute (*Polygonum perfoliatum*) was removed from the list in 2014 because it was determined that the infestation had moved beyond the scope of ISED.

Three early detection species were found in Delaware Water Gap National Recreation Area in 2013. Two infestations of jetbead (*Rhodotypos scandens*) were found by the vegetation monitoring crew and Japanese aralia (*Aralia elata*) was found by DEWA Park Biologist, Jeff Shreiner. The larger of

the jetbead infestations was located along Mountain Rd Trail near an old orchard. The infestation was treated by EPMTs and reported to EDDMapS and can be viewed under record number 3060932. The smaller jetbead infestation was discovered in an ERMN Vegetation Monitoring Plot by the vegetation monitoring crew. It was only a single, non-reproductive stem and was removed from the site. The EDDMapS report number is 3060933. DEWA Park Biologist, Jeffery Shreiner, found an infestation of Japanese aralia near the Pocono Environmental Education Center on Wellhouse Road. The plants were treated with a combination of cut stump treatments for larger stems as well as foliar application of herbicide to smaller individuals. The plants were reported to EDDMapS under report number 4452817.



Figure 3. Japanese aralia (*Aralia elata*) along Wellhouse Road in DEWA. (Note the lack of central axis in the inflorescence by which this species is distinguished from devil's walking stick, (*A. spinosa*)). Photograph by: Jeffery Shreiner.

The DEWA invasive species early detection list will be re-evaluated and updated during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for DEWA.

Fort Necessity National Battlefield (FONE)

The FONE invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. Chinese silvergrass (*Miscanthus sinensis*) was added to the list in 2014. No new invasive species early detection occurrences were recorded at FONE between 2013 and 2015.

The FONE invasive species early detection list will be re-evaluated and updated during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for FONE.

Friendship Hill National Historic Site (FRHI)

The FONE invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. Chinese silvergrass (*Miscanthus sinensis*) was added to the list in 2014. Lesser celandine (*Ranunculus ficaria*) was removed from the ISED list in 2014. No new invasive species early detection occurrences were recorded at FRHI between 2013 and 2015.

The FRHI invasive species early detection list will be re-evaluated and updated during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for FRHI.

Gauley River National Recreation Area (GARI)

The GARI invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. Chinese silvergrass (*Miscanthus sinensis*) was added to the list in 2014.

Garlic mustard (*Alliaria petiolata*) was found by the ERMN vegetation monitoring crew in 2013, growing along the railroad tracks and into the surrounding forest over a roughly 500 m stretch in the western portion of GARI (Cover Photo and Figure 4). It was determined to be established in the park and therefore left untreated. It was removed from the park's ISED list in 2014. The infestation was reported to EDDMaps can be found under record number 3061272. Japanese barberry (*Berberis thunbergii*) plants were found growing in GARI on top of the ridge west of the dam by the ERMN vegetation monitoring crew. The infestation was reported to the park ISED contacts, John Perez and Biological Science Technician, Layne Strickler. Layne Strickler treated the infestation with herbicides. The infestation was reported to EDDMaps and can be found here:

<http://www.eddmaps.org/user/manage/point.cfm?id=3061271>.

In 2015, Norway maple (*Acer platanoides*) was found growing near the restrooms for the GARI campground by the ERMN vegetation monitoring crew. The infestation was reported to the park ISED contacts, John Perez and Biological Science Technician, Layne Strickler. Layne Strickler treated the infestation with herbicides. The infestation was reported to EDDMapS and can be found under record number 3061272.

The GARI invasive species early detection list will be re-evaluated and updated during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for GARI.

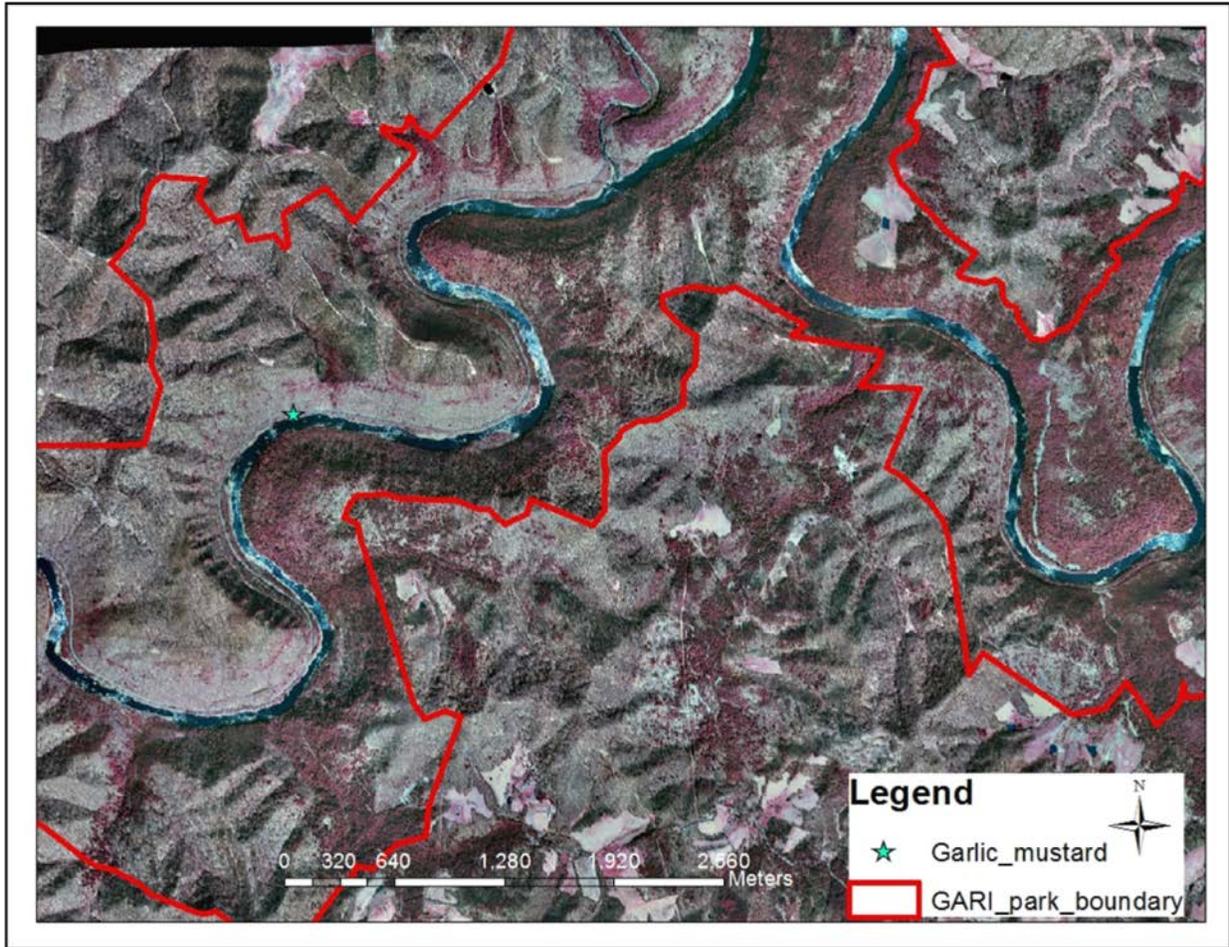


Figure 4. Map of the location for garlic mustard (*Alliaria petiolata*) in GARI.

Johnstown Flood National Memorial (JOFL)

The JOFL invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. No new invasive plant or pests were detected within the Park between 2013 and 2015.

The JOFL invasive species early detection list will be reviewed and updated during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for JOFL.

New River Gorge National River (NERI)

The NERI invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. Chinese silvergrass (*Miscanthus sinensis*) was added to the list in 2014.

In 2014, the ISED monitoring in NERI was modified such that certain species would only be targeted in high priority areas. These areas include Camp Brookside, Grandview Sandbar, the Long Point Trail area, and Army Camp. Within these areas, plants that have been determined to be no longer ISED within the larger Park will still be targeted for rapid response since these areas have been identified as being highly susceptible to invasion by exotic plants and pests.

Six early detection species, Japanese barberry (*Berberis thunbergii*), Japanese hops (*Humulus japonicus*), Norway maple (*Acer platanoides*), sweet autumn virginsbower (*Clematis terniflora*), and winged burning-bush (*Euonymus alatus*) were found in the park in 2013. The ERMN vegetation monitoring crew found four patches of Japanese barberry. Three populations were found on Highland Mountain as well as a population along the New River across from the town of Thayer. All four infestations were reported to the park ISED contacts, John Perez and Biological Science Technician, Layne Strickler. Layne Strickler, treated the infestation with herbicides. These infestations were reported to EDDMaps and can be found under record numbers 3061273 (which covers two populations), 3061275, and 4455352. Norway maple was found growing between the railroad and the New River just above Caperton Beach. This infestation was reported to the DPC and was treated by Layne Strickler can be viewed under record number 4498891. The ISEDC found winged burning bush that had been planted outside of the Canyon Rim Visitor Center. The infestation was reported to the park ISED contacts, John Perez and Layne Strickler. Maintenance crews removed the plants. This detection can be viewed in EDDMapS under record number 4452823. Three infestations of sweet autumn virginsbower were found and treated with herbicides by Biological Science Technician, Layne Strickler at Grandview Sandbar (Figure 5). This detection was reported to EDDMapS and can be viewed at 3060934. At Camp Brookside, Layne Strickler found and treated an infestation of Japanese hops. This detection was reported to EDDMapS and can be found at 3060935. Japanese barberry was found by Layne Strickler along the Long Point Trail as well as near the Fern Creek trailhead. Both infestations were treated with herbicides and can be viewed in EDDMapS under record numbers 4455349 and 4455351.

Sweet autumn virginsbower and Japanese hops were found in New River Gorge National River in September 2014 by Layne Strickler. The sweet autumn virginsbower was found at Grandview Sandbar where it was immediately treated. This detection was reported to EDDMapS and can be viewed under record number 4101303. Two populations of Japanese hops were found and treated with herbicides at Camp Brookside. The detections were reported to EDDMapS and can be found under record numbers 4436020 and 4436021.



Figure 5. Sweet autumn virginiblower (*Clematis terniflora*) at Grandview Sandbar in 2013. Photograph by: Layne Strickler

In 2015, seven new invasive plant occurrences were found and treated in NERI. In May, the ERMN vegetation monitoring crew found a few stems of Norway maple (Figure 6.) and winged burning bush in a vegetation monitoring plot near the Long Point Trail. The plants were reported to the park and treated by Biological Science Technician, Layne Strickler in 2015. The EDDMaps reports can be viewed under report numbers 4436009 for the Norway maple and 4436010 for the winged burning-bush. Layne Strickler found and treated populations of Japanese barberry at Camp Brookside, Sandstone Falls, and near Wolf Creek. The detections were reported to EDDMapS and can be viewed under report numbers 4436012, 4436014, and 4436017.

See Appendix A to view a summary score card of early detection plant and pest species for NERI.



Figure 6. Norway maple (*Acer platanoides*) seedling observed in New River Gorge National River near the Long Point Trail in 2015. Photograph by: Douglas Manning

Upper Delaware Scenic and Recreational River (UPDE)

The UPDE invasive species early detection list was reviewed during winter/spring 2013, 2014, and 2015. Chinese silvergrass (*Miscanthus sinensis*) was added to the list in 2014.

Mile-a-minute (*Polygonum perfoliatum*) was found at UPDE in August of 2013 by Park Biologist Jamie Myers. This species was determined to be beyond the scope of ISED and was removed from the list.

No new species were found at UPDE in 2014 or 2015.

The UPDE invasive species early detection list will be re-evaluated and updated as necessary during spring 2016. See Appendix A to view a summary score card of early detection plant and pest species for UPDE.

Invasive Species Occurrence Mapping

All new invasive plant species occurrences were mapped and are available for viewing in the Early Detection and Distribution Mapping System (EDDMapS). To view these data in EDDMapS, visit: <http://www.eddmaps.org/> and click on “Distribution Maps.” Choose a species, and then click on a state and then a county to see information about the species. (Note: An EDDMapS account is required in order to view records.)

Table 2. Table of EDDMapS records from 2013 – 2015.

Park	Year	Scientific Name	Common Name	EDDMaps Record Link
BLUE	2013	<i>Dioscorea oppositifolia</i>	Chinese yam	http://www.eddmaps.org/user/manage/point.cfm?id=4449906
DEWA	2013	<i>Rhodotypos scandens</i>	Jetbead	http://www.eddmaps.org/user/manage/point.cfm?id=3060932
DEWA	2013	<i>Rhodotypos scandens</i>	Jetbead	http://www.eddmaps.org/user/manage/point.cfm?id=3060933
DEWA	2013	<i>Aralia elata</i>	Japanese angelica tree	http://www.eddmaps.org/user/manage/point.cfm?id=4452817
GARI	2013	<i>Alliaria petiolata</i>	Garlic mustard	http://www.eddmaps.org/user/manage/point.cfm?id=3061272
GARI	2013	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=3061271
NERI	2013	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=3060929
NERI	2013	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=3060917
NERI	2013	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=3060931
NERI	2013	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=4455349
NERI	2013	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=3061275
NERI	2013	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=3061273
NERI	2013	<i>Acer platanoides</i>	Norway maple	http://www.eddmaps.org/user/manage/point.cfm?id=4498891
NERI	2013	<i>Euonymus alatus</i>	Winged burning-bush	http://www.eddmaps.org/user/manage/point.cfm?id=4452823
BLUE	2014	<i>Agilus planipennis</i>	Emerald ash borer	http://www.eddmaps.org/user/manage/point.cfm?id=4436022
BLUE	2014	<i>Polygonum cuspidatum</i>	Japanese knotweed	http://www.eddmaps.org/user/manage/point.cfm?id=4436019
NERI	2014	<i>Humulus japonicus</i>	Japanese hops	http://www.eddmaps.org/user/manage/point.cfm?id=4436021
NERI	2014	<i>Humulus japonicus</i>	Japanese hops	http://www.eddmaps.org/user/manage/point.cfm?id=4436020
NERI	2014	<i>Clematis terniflora</i>	Sweet autumn virginsbower	http://www.eddmaps.org/user/manage/point.cfm?id=4101303
BLUE	2015	<i>Dioscorea oppositifolia</i>	Chinese yam	http://www.eddmaps.org/user/manage/point.cfm?id=4449906
GARI	2015	<i>Acer platanoides</i>	Norway maple	http://www.eddmaps.org/user/manage/point.cfm?id=4436008
NERI	2015	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=4436012
NERI	2015	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=4436014
NERI	2015	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=4436017
NERI	2015	<i>Humulus japonicus</i>	Japanese hops	http://www.eddmaps.org/user/manage/point.cfm?id=4436015
NERI	2015	<i>Euonymus alatus</i>	Winged burning-bush	http://www.eddmaps.org/user/manage/point.cfm?id=4436018

Table 2 (continued). Table of EDDMapS records from 2013 – 2015.

Park	Year	Scientific Name	Common Name	EDDMaps Record Link
NERI	2015	<i>Polygonum cuspidatum</i>	Japanese knotweed	http://www.eddmaps.org/user/manage/point.cfm?id=4436019
NERI	2015	<i>Euonymus alatus</i>	Winged burning-bush	http://www.eddmaps.org/user/manage/point.cfm?id=4436018
NERI	2015	<i>Euonymus alatus</i>	Winged burning-bush	http://www.eddmaps.org/user/manage/point.cfm?id=4436010
NERI	2015	<i>Acer platanoides</i>	Norway maple	http://www.eddmaps.org/user/manage/point.cfm?id=4436009
NERI	2015	<i>Berberis thunbergii</i>	Japanese barberry	http://www.eddmaps.org/user/manage/point.cfm?id=4455351

Looking Ahead to 2016

The ISEDC will continue to work with Bugwood to make the IPAlert smartphone app more functional to the ISED mission. The app has the ISED list for each park, but does not have as much identifying information for the individual species as was available in What's Invasive! app. It is also lacking the ability to add non-plant organisms to the lists.

The ISEDC will continue to work with park managers to improve the ISED protocol and species lists. Dealing with invasive species is a constantly evolving process which requires vigilance and adaptation to determine the best methods by which we will confront this threat to NPS lands.

Literature Cited

- Ashton, P. J., and D. S. Mitchell. 1989. Aquatic Plants: Patterns and Modes of Invasion, Attributes of Invading Species and Assessment of Control Programmes. In J. A. Drake, H. A. Mooney, F. di Castri, R. H. Groves, F. J. Kruger, M. Rejmánek, and M. Williamson (Eds.), *Biological Invasions: A Global Perspective*. Pp. 111–154. Chichester, England. John Wiley & Sons, Ltd.
- Atkinson, I. A. E. 1997. Problem weeds on New Zealand islands. *Science Conservation* 45. Wellington, Department of Conservation. 58 pp.
- Braithwaite, H. 2000. Weed Surveillance Plan for the Department of Conservation. Wellington, Department of Conservation. 24 pp.
- Bucher, Nicole L. "Agriculture Department Announces Detection of Thousand Cankers Disease in Pennsylvania Trees, Enacts Quarantine to Prevent Spread." PR Newswire: Press Release Distribution, Targeting, Monitoring and Marketing. PR Newswire, 12 Aug. 2011. Web. 15 Mar. 2012. Available at <http://www.prnewswire.com/news-releases/agriculture-department-announces-detection-of-thousand-cankers-disease-in-pennsylvania-trees-enacts-quarantine-to-prevent-spread-127584993.html> (accessed 29 April 2016).
- Fancy, S. G., J. E. Gross, and S. L. Carter. 2009. Monitoring the condition of natural resources in U.S. national parks. *Environmental Monitoring Assessment* 151:161–174.
- Harris, S., J. Brown, and S. Timmins. 2001. Weed Surveillance — How Often to Search? *Science for Conservation* 175. 27 pp.
- Huebner, C. D., C. Olson, and H. C. Smith. 2005. Invasive plants field and reference guide: An ecological perspective of plant invaders of forests and woodlands. NA-TP-05-04. Morgantown, WV. U.S. Department of Agriculture, Forest Service, Northeastern Area State & Private Forestry. Available at <http://www.treesearch.fs.fed.us/pubs/20715> (accessed 29 April 2016).
- Keefer, J. S. 2010. Early detection of invasive species; surveillance, monitoring, and rapid response: Eastern Rivers and Mountains Network summary report 2008–2009. Natural Resource Data Series NPS/ERMN/NRDS—2010/038. National Park Service, Fort Collins, CO.
- Keefer, J. S., J. S. Wheeler, D. R. Manning, M. R. Marshall, B. R. Mitchell, and F. Dieffenbach. 2014. Early detection of invasive species—surveillance, monitoring, and rapid response: Version 2.0. Natural Resource Report NPS/ERMN/NRR–2014/837. National Park Service, Fort Collins, Colorado
- Keefer, J. S., J. S. Wheeler, D. R. Manning, M. R. Marshall, B. R. Mitchell, and F. Dieffenbach. 2014. Early detection of invasive species—surveillance, monitoring, and rapid response: Version 2.0. Natural Resource Report NPS/ERMN/NRR–2014/837. National Park Service, Fort Collins, Colorado.

- MacDonald, I. A. W., L. L. Loope, M. B. Usher, and O. Harmann. 1989. Wildlife conservation and the invasion of nature reserves by exotic species: a global perspective. In Drake, J., F. diCastri, R. Groves, F. Kruger, H. A. Mooney, M. Rejmánek, and M. Williamson, (eds.), *Biological Invasions: a global perspective*. Wiley and Sons.
- Marshall, M. R., and N. B. Piekielek. 2007. Eastern Rivers and Mountains Network Ecological Monitoring Plan. Natural Resource Report NPS/ERMN/NRR—2007/017. National Park Service. Fort Collins, CO.
- Myers, J. H., D. Simberloff, A. M. Kuris, and J. R. Carey. 2000. Eradication Revisited: Dealing with Exotic Species. *Trends in Ecology and Evolution* 15(8):316–320.
- National Invasive Species Council (NISC). 2008. 2008-2012 National Invasive Species Management Plan. 35 pp.
- Perles, S., J. Finley, and M. Marshall. 2010. Vegetation and soil monitoring protocol for the Eastern Rivers and Mountains Network, Version 2. Natural Resource Report NPS/ERMN/NRR—2010/183. National Park Service. Fort Collins, CO.
- Rejmánek, M., and M. J. Pitcairn . 2002. When is eradication of exotic plant pests a realistic goal?. Pages. 169–176. In Veitch, C. R., and M. N. Clout (eds.). *Turning the Tide: The Eradication of Invasive Species*. Gland (Switzerland): IUCN.
- Rozenfelds, A. C. F., L. Cave, D. I. Morris, and A. M. Buchanan. 1999. The weed invasion in Tasmania since 1970. *Australian Journal of Botany* 47:23–48.
- Sherald, J. L. 2007. Bacterial leaf scorch of landscape trees: what we know and what we do not know. *Arboriculture and Urban Forestry* 33(6):376-385.
- Timmins, S. M., and H. Braithwaite. 2001. Early detection of invasive weeds on islands. Pp 311–318. In Veitch, C. R., and M. N. Clout (eds.). *Turning the tide: the eradication of invasive species*. IUCN SSC Invasive Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.
- Tisserat, N., W. Cranshaw, D. Leatherman, C. Utley, and K. Alexander. 2009. Black walnut mortality in Colorado caused by the walnut twig beetle and thousand cankers disease. Online. *Plant Health Progress* doi: 10.1094/PHP-2009-0811-01-RS.
- US Congress Office of Technology Assessment (OTA). 1993. *Harmful Non-Indigenous Species in the United States*. US Government Printing Office, Washington DC.
- U.S. Presidential Executive Order (USPEO). 1999. Executive Order 13112 of February 3, 1999. *Federal Register*: February 8, 1999 (Volume 64, Number 25).

Williams, A. E., S. O'Neil, E. Speith, and J. Rodgers. 2007. Early Detection Monitoring of Invasive Plant Species in the San Francisco Bay Area Network: A Volunteer-Based Approach. Natural Resource Report NPS/PWR/SFAN/NRR—2007/00N. National Park Service Pacific West Regional Office, Oakland, CA.

Appendix A. Summary score cards of early detection plant and pest species for parks in the Eastern Rivers and Mountains Network.

Table A1. Summary score card of early detection plant and pest species for Allegheny Portage Railroad National Historic Site.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A			
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B
Pest	<i>Adelges tsugae</i>	hemlock woolly adelgid	No ^C	No ^C	Yes ^C	No	No	No	No	No	10	None	None	None
	<i>Agrilus planipennis</i>	emerald ash borer	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	Yes ^C	No	None	14	None	None
	<i>Anoplophora glabripennis</i>	Asian longhorned beetle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Geosmithia morbida</i>	thousand canker disease	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pyrrhalta viburni</i>	viburnum leaf beetle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Sirex noctilio</i>	sirex woodwasp	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Herb	<i>Cardamine impatiens</i>	narrowleaf bittercress	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Heracleum mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Vine	<i>Cynanchum</i> spp.	swallow-worts	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Polygonatum perfoliatum</i>	mile-a-minute	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Shrub	<i>Frangula alnus</i>	glossy buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Rhodotypos scandens</i>	jetbead	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Viburnum dilatatum</i>	linden viburnum	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Tree	<i>Aralia elata</i>	Japanese aralia	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ~ New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

Table A2. Summary score card of early detection plant and pest species for Bluestone National Scenic River.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A			
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B
Pest	<i>Agilus planipennis</i>	emerald ash borer	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	Yes ^C	No	None	None	None	None
	<i>Geosmithia morbida</i>	thousand cankers disease	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Herb	<i>Achyranthes japonica</i>	Japanese chaff flower	No	No	No	No	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Dioscorea oppositifolia</i>	Chinese yam	No ^C	No ^C	No ^C	No ^C	Yes ^C	Yes ^C	No ^C	Yes ^C	'12, '13	None	15	'12, '15
	<i>Heracleum mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Miscanthus sinensis</i>	Chinese silvergrass	No	No	No	No	No	No	No ^C	No ^C	None	None	None	None
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Phragmites australis</i>	phragmites	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Polygonum cuspidatum/sachalines</i>	Japanese / giant knotweed	Yes ^C	Yes ^C	No ^C	No ^C	Yes ^C	Yes ^C	Yes ^C	Yes ^C	'09, '10, '12, '13, '14, '15	None	None	'09, '14, '15
	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Vine	<i>Akebia quinata</i>	chocolate vine	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ampelopsis brevipedunculata</i>	Amur peppervine	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Celastrus orbiculatus</i>	Oriental bittersweet	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Polygonatum perfoliatum</i>	mile-a-minute	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Shrub	<i>Berberis thunbergii</i>	Japanese barberry	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Frangula alnus</i>	glossy buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Rhamnus cathartica</i>	common buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Tree	<i>Acer platanoides</i>	Norway maple	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ^C New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

Table A3. Summary score card of early detection plant and pest species for Delaware Water Gap National Recreation Area.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A				
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B	
Pest	<i>Agilus planipennis</i>	emerald ash borer	No ^C	No ^C	No ^C	No ^C	None	None	None	None					
	<i>Anoplophora glabripennis</i>	Asian longhorned beetle	No ^C	No ^C	No ^C	No ^C	None	None	None	None					
	<i>Geosmithia morbida</i>	thousand cankers disease	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pyrrhalta viburni</i>	viburnum leaf beetle	No	Yes ^C	No ^C	Yes ^C	No ^C	No ^C	No ^C	No ^C	No ^C	'09, '11	None	None	None
	<i>Sirex noctilio</i>	sirex woodwasp	No ^C	No ^C	No ^C	No ^C	None	None	None	None					
Aquatic	<i>Didymosphenia geminata</i> ^B	didymo	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Hydrilla verticillata</i>	hydrilla	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Trapa natans</i>	water chestnut	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Herb	<i>Cardamine impatiens</i>	narrowleaf bittercress	Yes ^C	Yes ^C	No	No	No	No	No	No	No	'09		'09	'09
	<i>Heracleum mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	None	None	None	None					
	<i>Miscanthus sinensis</i>	Chinese silvergrass	No	No	No	No	No	No	No ^C	No ^C	No ^C	None	None	None	None
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	No ^C	No ^C	No ^C	None	None	None	None				
	<i>Phragmites australis</i>	phragmites	No ^C	No ^C	No ^C	Yes ^C	No ^C	No ^C	No ^C	No ^C	No ^C	12	None	None	12
	<i>Phyllostachys</i> spp.	bamboo	No	No	No	No	No	No	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	None	None	None	None					
Vine	<i>Ampelopsis brevipedunculata</i>	Amur peppervine	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Cynanchum</i> spp.	swallowworts	No ^C	No ^C	No ^C	No ^C	None	None	None	None					
	<i>Polygonum perfoliatum</i>	mile-a-minute	No ^C	No ^C	Yes ^C	Yes ^C	Yes ^C	No ^C	No ^C	No	'10, '11, '12	None	None	None	'10, '11, '12
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	No ^C	No ^C	No ^C	None	None	None	None					
Shrub	<i>Frangula alnus</i>	glossy buckthorn	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Rhodotypos scandens</i>	jetbead	No	No	No ^C	No ^C	No ^C	Yes ^C	No ^C	No ^C	13	None	None	None	13
	<i>Viburnum dilatatum</i>	linden arrowwood	No ^C	Yes ^C	Yes ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	'09	None	'10	'09, '10
Tree	<i>Aralia elata</i>	Japanese aralia	No	No ^C	No ^C	No ^C	No ^C	Yes ^C	No ^C	No ^C	13	None	None	None	13
	<i>Phellodendron amurense</i>	Amur corktree	No ^C	Yes ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	'09	None	None	'09

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ^C New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

Table A4. Summary score card of early detection plant and pest species for Fort Necessity National Battlefield.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A				
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B	
Pest	<i>Adelges tsugae</i>	hemlock woolly adelgid	No ^C	None	None	None	None								
	<i>Agrilus planipennis</i>	emerald ash borer	No ^C	None	None	None	None								
	<i>Anoplophora glabripennis</i>	Asian longhorned beetle	No ^C	None	None	None	None								
	<i>Geosmithia morbida</i>	thousand cankers disease	No	No	No	No ^C	None	None	None	None					
	<i>Pyrrhalta viburni</i>	viburnum leaf beetle	No ^C	None	None	None	None								
	<i>Sirex noctilio</i>	sirex woodwasp	No ^C	None	None	None	None								
Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	None	None	None	None						
Herb	<i>Cardamine impatiens</i>	narrowleaf bittercress	No ^C	None	None	None	None								
	<i>Heracleum mantegazzium</i>	giant hogweed	No ^C	None	None	None	None								
	<i>Miscanthus sinensis</i>	Chinese silvergrass	No	No ^C	No ^C	None	None	None	None						
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	None	None	None	None							
	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	None	None	None	None								
Vine	<i>Celastrus orbiculatus</i>	Oriental bittersweet	No	No	No ^C	None	None	None	None						
	<i>Humulus japonicus</i>	Japanese hop	No	No	No ^C	None	None	None	None						
	<i>Polygonum perfoliatum</i>	mile-a-minute	No ^C	None	None	None	None								
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	None	None	None	None								
Shrub	<i>Frangula alnus</i>	glossy buckthorn	No ^C	None	None	None	None								
	<i>Rhamnus cathartica</i>	common buckthorn	No ^C	None	None	None	None								
	<i>Rhodotypos scandens</i>	jetbead	No	No	No ^C	None	None	None	None						
	<i>Viburnum dilatatum</i>	linden arrowwood	No	No	No ^C	None	None	None	None						

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ~ New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

Table A5. Summary score card of early detection plant and pest species for Friendship Hill National Historic Site.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A				
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B	
Pest	<i>Adelges tsugae</i>	hemlock woolly adelgid	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Agilus planipennis</i>	emerald ash borer	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Anoplophora glabripennis</i>	Asian longhorned beetle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Geosmithia morbida</i>	thousand cankers disease	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pyrrhalta viburni</i>	viburnum leaf beetle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Sirex noctilio</i>	sirex woodwasp	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
Herb	<i>Cardamine impatiens</i>	narrowleaf bittercress	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Heraclium mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Micanthus sinensis</i>	Chinese silvergrass	No	No	No	No	No	No	No	No ^C	No ^C	None	None	None	None
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Phragmites australis</i>	phragmites	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	Yes ^C	No ^C	No	No	None	'12	None	'12	
Vine	<i>Humulus japonicus</i>	Japanese hop	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Polygonum perfoliatum</i>	mile-a-minute	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
Shrub	<i>Euonymus alatus</i>	winged burning-bush	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Ligustrum</i> spp.	privet	Yes ^C	No ^C	No	No	No	No	No	No	None	'09	None	'09	
	<i>Rhamnus cathartica</i>	common buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Rhodotypos scandens</i>	jetbead	No ^C	No ^C	No ^C	No ^C	Yes ^C	No ^C	No ^C	No ^C	None	'12	None	'12	
	<i>Viburnum dilatatum</i>	linden arrowwood	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ^C New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

Table A6. Summary score card of early detection plant and pest species for Gauley River National Recreation Area.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A				
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B	
Pest	<i>Agrilus planipennis</i>	emerald ash borer	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Geosmithia morbida</i>	thousand cankers disease	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	No ^C	No ^C	Yes ^C	No ^C	No ^C	None	None	None	None	
Herb	<i>Achyranthes japonica</i>	Japanese chaff flower	No	No	No	No	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Alliaria petiolata</i>	garlic mustard	No ^C	No ^C	No ^C	No ^C	No ^C	Yes ^C	No	No	None	'13	None	'13	
	<i>Dioscorea oppositifolia</i>	Chinese yam	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Heracleum mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Lespedeza cuneata</i>	Chinese lespedeza	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Lythrum salicaria</i>	purple loosestrife	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Micanthus sinensis</i>	Chinese silvergrass	No	No	No	No	No	No	No ^C	No ^C	None	None	None	None	
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Polygonum cuspidatum/sachalinense</i>	Japanese/giant knotweed	No ^C	Yes ^C	No ^C	No ^C	No	No	No	No	None	None	'09	'09	
<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None		
Vine	<i>Akebia quinata</i>	chocolate vine	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Ampelopsis brevipedunculata</i>	Amur peppervine	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Celastrus orbiculatus</i>	Oriental bittersweet	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Humulus japonicus</i>	Japanese hop	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Polygonum perfoliatum</i>	mile-a-minute	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
Shrub	<i>Berberis thunbergii</i>	Japanese barberry	No ^C	No ^C	No ^C	No ^C	No ^C	Yes ^C	No ^C	No ^C	None	None	None	'13	
	<i>Frangula alnus</i>	glossy buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Rhamnus cathartica</i>	common buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
Trees	<i>Acer platanoides</i>	Norway maple	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	Yes ^C	'15	None	None	'15	

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ~ New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

Table A7. Summary score card of early detection plant and pest species for Johnstown Flood National Memorial.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A				
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B	
Pest	<i>Agrilus planipennis</i>	emerald ash borer	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Anoplophora glabripennis</i>	Asian longhorned beetle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Geosmithia morbida</i>	Thousand cankers disease	No	No	No	No ^C	None	None	None	None					
	<i>Pyrrhalta viburni</i>	viburnum leaf beetle	No ^C	No ^C	Yes ^C	No	No	No	No	No	No	None	None	'10	None
	<i>Sirex noctilio</i>	sirex woodwasp	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Cardamine impatiens</i>	narrowleaf bittercress	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Heracleum mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Microstegium vimineum</i>	Japanese stiltgrass	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Vine	<i>Celastrus orbiculata</i>	Oriental bittersweet	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Humulus japonicus</i>	Japanese hop	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Lonicera japonica</i>	Japanese honeysuckle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Polygonum perfoliatum</i>	mile-a-minute	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Shrub	<i>Frangula alnus</i>	glossy buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Rhamnus cathartica</i>	common buckthorn	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Rhodotypos scandens</i>	jetbead	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Viburnum dilatatum</i>	linden arrowwood	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Tree	<i>Ailanthus altissima</i>	tree of heaven	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ~ New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

Table A8. Summary score card of early detection plant and pest species for New River Gorge National River. Targeted areas include Grandview Sandbar, Camp Brookside, Army Camp, and the area surrounding the Long Point Trail. In these areas, Japanese barberry, winged burning-bush, and Japanese hops are tracked by ISED and treated.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A				
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B	
Pest	<i>Agrilus planipennis</i>	emerald ash borer	No ^C	Yes ^C	No	No	No	No	No	No	No	None	None	'09	None
	<i>Lymantria dispar</i>	gypsy moth	No ^C	Yes ^C	No	No	No	No	No	No	No	None	'09	None	None
	<i>Geosmithia morbida</i>	thousand cankers disease	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Herb	<i>Heraclium mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Micanthus sinensis</i>	Chinese silvergrass	No	No	No	No	No	No	No	No	No	None	None	None	None
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Vine	<i>Akebia quinata</i>	Chocolate vine	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ampelopsis brevipedunculata</i>	Amur peppervine	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Clematis terniflora</i>	sweet autumn virginsbower	No	No	No	No	Yes	Yes	Yes	No ^C	12, '13, '14	None	None	'12, '13, '14	
	<i>Humulus japonicus</i>	Japanese hop	No	No	No ^C	No ^C	No ^C	Yes	Yes ^D	Yes ^D	13, '14, '15	None	None	13, '14, '15	
	<i>Polygonum perfoliatum</i>	mile-a-minute	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Shrub	<i>Berberis thunbergii</i>	Japanese barberry	No ^C	Yes ^C	No ^C	Yes ^C	No ^C	Yes ^C	No ^D	Yes ^D	'09, '11, '13, '15	None	None	'09, '11, '13, '15	
	<i>Euonymus alatus</i>	winged burning-bush	No ^C	No ^C	No ^C	No ^C	No ^C	Yes ^C	No ^D	Yes ^D	11, '13, '15	None	None	11, '13, '15	
	<i>Frangula alnus</i>	glossy buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
	<i>Rhamnus cathartica</i>	common buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None	
Tree	<i>Acer platanoides</i>	Norway maple	No ^C	No ^C	No ^C	No ^C	No ^C	Yes ^C	No ^C	No ^C	13, '15	None	None	13, '15	

^A Numbers listed in each field represent the year action was taken; for example, '10 = 2010.

^B As of December 2010, only plant observations can be entered into EDDMapS. As the Mid-Atlantic Mapping System is developed as part of EDDMapS, the ability to enter and view maps of pest detections may be added in the future. ~ New species record for the park.

^C Indicates years that species were on the parks Invasive Species Early Detection list (also shaded in yellow).

^D Indicates that the plant is now only targeted in targeted areas of NERI and will not be treated in ERMN Vegetation Monitoring Plots (also shaded in red).

Table A9. Summary score card of early detection plant and pest species for Upper Delaware National Scenic and Recreational River.

Species Type	Scientific Name	Common Name	Year Detected								Action ^A				
			2008	2009	2010	2011	2012	2013	2014	2015	Treated or Removed	No Action	Treatment Planned	Reported to EDDMapS ^B	
Pest	<i>Agilus planipennis</i>	emerald ash borer	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Anoplophora glabripennis</i>	Asian longhorned beetle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Channa argus</i>	northern snakehead	No	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Geosmithia morbida</i>	thousand cankers disease	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pylodictis olivaris</i>	flathead catfish	No	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Pyrrhalta viburni</i>	viburnum leaf beetle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Sirex noctilio</i>	sirex woodwasp	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	Aquatic	<i>Didymosphenia geminata</i>	didymo	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No	No	None	None	None
<i>Hydrilla verticillata</i>		hydrilla	No	No	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
<i>Trapa natans</i>		water chestnut	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Herb	<i>Cardamine impatiens</i>	narrowleaf bittercress	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Heracleum mantegazzium</i>	giant hogweed	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Miscanthus sinensis</i>	Chinese silvergrass	No	No	No	No	No	No	No	No ^C	No ^C	None	None	None	None
	<i>Oplismenus hirtellus</i> ssp. <i>undulatifolius</i>	wavyleaf basketgrass	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Vine	<i>Ranunculus ficaria</i>	lesser celandine	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Cynanchum</i> spp.	Swallow-worts	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Lonicera japonica</i>	Japanese honeysuckle	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Polygonum perfoliatum</i>	Mile-a-minute	No ^C	No ^C	No ^C	Yes ^C	No ^C	Yes ^C	No	No	'11	13	None	'11	
	<i>Pueraria montana</i> var. <i>lobata</i>	kudzu	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Shrub	<i>Wisteria</i> spp.	Wisteria	No	No	No	No	No	No	No	No ^C	No ^C	None	None	None	None
	<i>Ligustrum obtusifolium</i> /L. <i>vulgare</i>	border/European privets	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Rhamnus cathartica</i>	common buckthorn	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Rhodotypos scandens</i>	jetbead	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
Tree	<i>Viburnum dilatatum</i>	linden arrowwood	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Ailanthus altissima</i>	tree of heaven	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Aralia elata</i>	Japanese aralia	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None
	<i>Phellodendron amurense</i>	Amur corktree	No	No	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	No ^C	None	None	None	None

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