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Natural Resource Stewardship and Science

Early Detection of Invasive Species - Surveillance Monitoring and Rapid Response

Eastern Rivers and Mountains Network 2011–2012 Summary Report

Natural Resource Data Series NPS/ERMN/NRDS—2013/435

ON THE COVER
Winged burning-bush *(Euonymous alatus*) at New River Gorge National River (NERI); photograph by Doug Manning.

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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. 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 2011, six new invasive plant and pest occurrences were documented at three parks in the ERMN by the vegetation monitoring crew and a NPS Park Biologist. Two early detection species were found in New River Gorge National River. Japanese barberry (*Berberis thunbergi*) and winged burning-bush (*Euonymus alatus*) were found by the ERMN vegetation monitoring crew near the Long Point Trail. The NERI Park Biologist was notified and he alerted his invasive species control technician within 24 hours of the initial discovery of the plants. In Upper Delaware Scenic and Recreational River, the Park Biologist discovered a new infestation of mile-a-minute (*Polygonum perfoliatum*). Three early detection species were found in Delaware Water Gap National Recreation area. Viburnum leaf beetle (*Pyrrhalta viburni*) was found by the vegetation monitoring crew, phragmites (*Phragmites australis*) was found by the Park Biologist, and mile-a-minute was found growing along utility rows by a contractor.

Invasive species early detection monitoring in 2012 found six new invasive plant and pest occurrences in the ERMN parks. Two early detection species were found at Friendship Hill National Historic Site. Lesser celandine (*Ranunculus ficaria*) was discovered by the ERMN Hydrologic Technician and Data Manager in March and the vegetation monitoring crew found jetbead (*Rhodotypus scandens*) in July. Mile-a-minute (*Polygonum perfoliatum*) was discovered along the Delaware River in Delaware Water Gap National Recreation Area by the vegetation monitoring crew. Two patches of Chinese yam (*Dioscorea oppositifolia*) were found at Bluestone National Scenic River by the vegetation monitoring crew and by NPS invasive species control technicians. Sweet autumn virginsbower (*Clematis terniflora*) was found in New River Gorge National River during data collection for the ERMN rare riparian plant community monitoring. Didymo (*Didymosphenia geminate*) was found in the Delaware River at Delaware Water Gap National Recreation Area by a NPS Biologist. Score cards, which summarize the record of invasive species detections and rapid responses in each ERMN park from 2008–2012, are provided in the Appendix.

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, Harris et al. 2001, Timmins and Braithwaite 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 Invasive Species Early Detection (ISED) methods are provided here, detailed explanations of the background, rationale, and methods, in addition to Standard Operating Procedures, are provided in the protocol (Keefer et al. 2010).

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 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.

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. Two separate field guides are used to distribute target species identification information. The first is a hand-held, weather-proof pocket guide provided cost-free 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 in spring 2010. Supplement 1 contains 10 new species cards. Each species card and the entire field guide are posted on the ERMN Web site and are available for download at http://science.nature.nps.gov/im/units/ermn/monitoring/earlydetection.cfm.

Table 1. Plant and pest species included in the Invasive Species Early Detection (ISED) program in 2011 and 2012 for the Eastern Rivers and Mountains Network by park and taxa category.

Scientific Name	Common Name	Taxa Category	ALPO	BLUE	DEWA	FONE	FRHI	GARI	JOFL	NERI	UPDE
Adelges tsugae	hemlock woolly adelgid	PEST				ED	ED				
Agrilus planipennis	emerald ash borer	PEST	ED	ED	ED	ED	ED	ED	ED		ED
Anoplophora glabripennis	Asian long-horned beetle	PEST	ED	ED	ED	ED	ED	ED	ED	ED	ED
Channa argus	northern snakehead	PEST									ED
Geosmithia morbida	thousand cankers disease	PEST	ED	ED	ED	ED	ED	ED	ED	ED	ED
Pylodictis olivaris	flathead catfish	PEST									ED
Pyrrhalta viburni	viburnum leaf beetle	PEST	ED		ED	ED	ED				ED
Sirex noctilio	Sirex woodwasp	PEST	ED		ED	ED	ED		ED		ED
Didymosphenia geminata	didymo	AQPLANT	ED	ED	ED	ED	ED	ED	ED	ED	ED
Trapa natans	water chestnut	AQPLANT			ED						ED
Hydrilla verticillata	Hydrilla	AQPLANT			ED						ED
Acer platanoides	Norway maple	PLANT		ED				ED		ED	
Achyranthes japonica	Japanese chaff flower	PLANT		ED				ED		ED	
Ailanthus altissima	tree of heaven	PLANT							ED		ED
Akebia quinata	chocolate vine	PLANT		ED				ED		ED	
Alliaria petiolata	garlic mustard	PLANT						ED			
Ampelopsis brevipedunculata	Amur peppervine	PLANT		ED	ED			ED		ED	
Aralia elata	Japanese aralia	PLANT	ED		ED						ED
Berberis thunbergii	Japanese barberry	PLANT		ED				ED		P/ED	
Cardamine impatiens	narrowleaf bittercress	PLANT	ED			ED	ED		ED		ED
Celastrus orbiculatus	oriental bittersweet	PLANT		ED		ED		ED	ED		
Clematis terniflora	sweet autumn virginsbower	PLANT		ED				ED		ED	
Cynanchum louiseae/C. rossicum	Louise's & European swallow-worts	PLANT	ED		ED						ED
Dioscorea oppositifolia	Chinese yam	PLANT		P/ED				ED			
Euonymus alatus	winged burning-bush	PLANT					ED			P/ED	
Frangula alnus	glossy buckthorn	PLANT	ED	ED	ED	ED		ED	ED	ED	
Heracleum mantegazzium	giant hogweed	PLANT	ED	ED	ED	ED	ED	ED	ED	ED	ED
Humulus japonicus	Japanese hop	PLANT				ED	ED	ED	ED	ED	
Lespedeza cuneata	Chinese lespedeza	PLANT						P/ED			
Ligustrum obtusifolium/L. vulgare	border/European privets	PLANT									ED
Lonicera japonica	Japanese honeysuckle	PLANT							ED		ED
Lythrum salicaria	purple loosestrife	PLANT						ED			

Scientific Name	Common Name	Taxa Category	ALPO	BLUE	DEWA	FONE	FRHI	GARI	JOFL	NERI	UPDE
Microstegium vimineum	Japanese stiltgrass	PLANT							ED		
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass	PLANT	ED	ED	ED	ED	ED	ED	ED	ED	ED
Phellodendron amurense	Amur corktree	PLANT			P/ED						ED
Phragmites australis	phragmites	PLANT		ED	P/ED		ED				
Polygonum cuspidatum/sachalinense	Japanese/giant knotweed	PLANT		P/ED							
Polygonum perfoliatum	mile-a-minute	PLANT	P/ED	ED	P/ED	ED	ED	ED	ED	ED	ED
Pueraria montana var. *lobata*	kudzu	PLANT	ED	ED	ED	ED	ED	ED	ED		ED
Ranunculus ficaria	lesser celandine	PLANT	ED	ED	ED	ED	ED	ED	ED	ED	ED
Rhamnus cathartica	common buckthorn	PLANT		ED		ED	ED	ED	ED	P/ED	ED
Rhodotypos scandens	jetbead	PLANT	ED		ED	ED	ED		ED		ED
Viburnum dilatatum	linden arrowwood	PLANT	ED		P/ED	ED	ED		ED		ED

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).

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.

Alert System

Data acquired from ISED are time-sensitive and all new detection occurrences are immediately reported through the appropriate chain of command. 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. 2010).

Data Management and Reporting

Currently, the ERMN is using a Microsoft Excel spreadsheet to keep track of all ISED occurrences. However, we are in the process of developing an ISED database, which is a Microsoft Access-based and Natural Resource Database Template (NRDT)-compliant relational database. This database will keep track of new species occurrences, assessments, and all management or rapid responses at the documented location.

The Early Detection and Distribution Mapping System (EDDMapS), 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. EDDMapS can be viewed at http://www.eddmaps.org/.

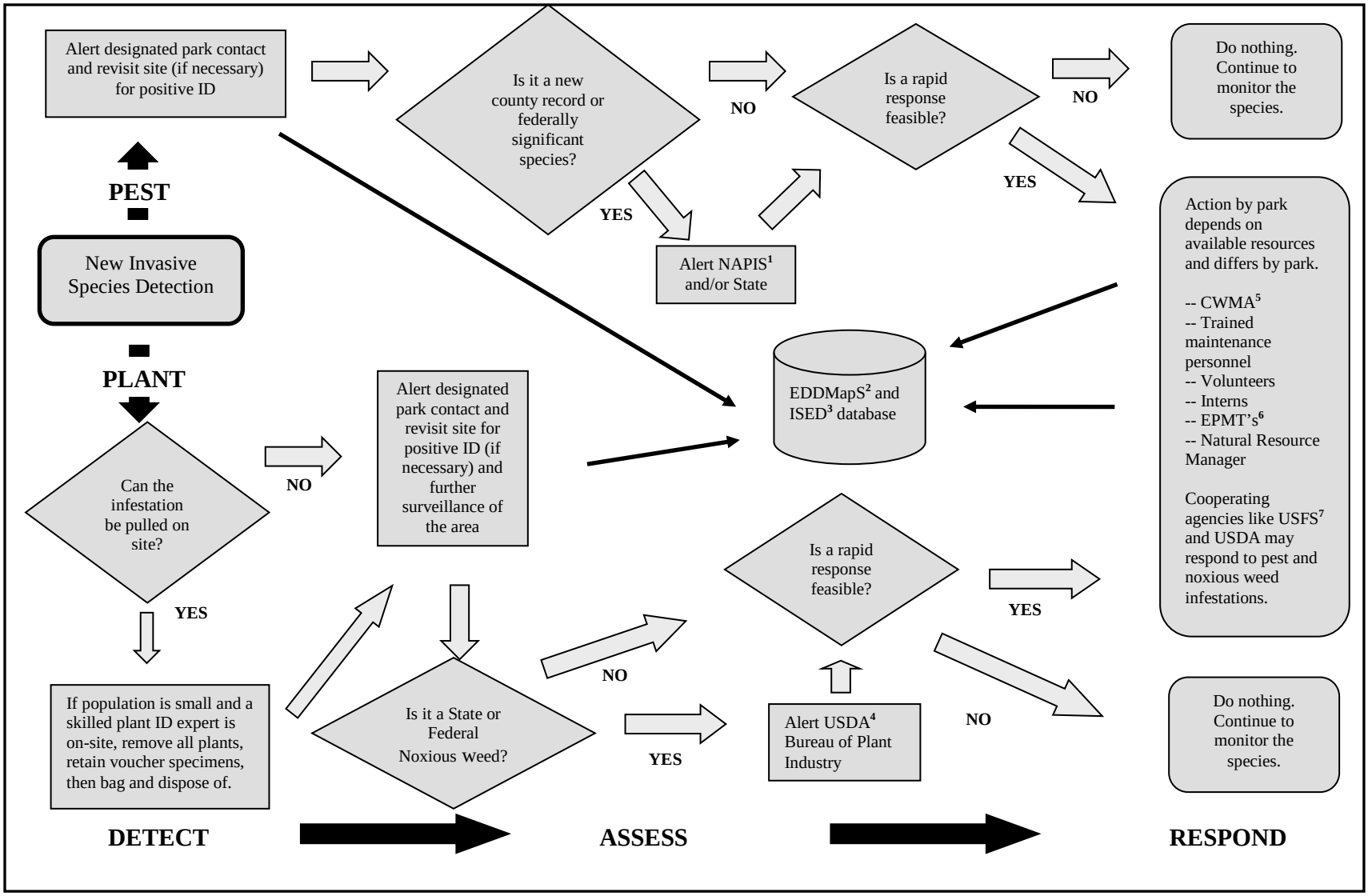

Figure 1. Early Detection of Invasive Species Rapid Response system for the Eastern Rivers and Mountains Network (ERMN)**.**

1. National Agricultural Pest Information System (NAPIS); 2. Early Detection & Distribution Mapping System (EDDMapS); 3. Invasive Species Early Detection (ISED); 4. United States Department of Agriculture (USDA); 5. Cooperative Weed Management Area (CWMA); 6. Exotic Plant Management Team (EPMT); 7. United States Forest Service (USFS).

Results and Discussion

New ISED Tools for 2011

The final four species cards to Supplement 1 to the Early Detection of Invasive Species Surveillance Monitoring Field Guide were completed. Japanese hop (*Humulus japonicus*), jetbead (*Rhodotypos scandens*), Chinese lespedeza (*Lespedeza cuneata*), and water chestnut (*Trapa natans*) were all designed, printed, and posted to the ERMN website: http://science.nature.nps.gov/im/units/ermn/monitoring/earlydetection.cfm.

New ISED Tools and News for 2012

Thousand Cankers Disease was detected in Bucks County, PA, in August of 2011. This fungus (*Geosmithia morbida*), is disseminated by a beetle that burrows beneath the bark and infects walnut trees (*Juglans spp.*), eventually killing them. It was first detected east of the Mississippi River in Tennessee during July of 2010. The disease was added to the ISED list for all ERMN parks in 2012.

The Mid-Atlantic Early Detection Network smartphone app developed by The University of Georgia was expanded to include the species on the ISED lists for the ERMN parks. 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/. This does not change the ISED protocol and new species detections should still be reported to the ISEDC and the appropriate DPC.

Allegheny Portage Railroad National Historic Site (ALPO)

The ALPO invasive species early detection list was reviewed during winter/spring 2011 and 2012. No new species were added to the list for 2011. Japanese aralia (*Aralia elata*) was added to the early detection list in 2012. No new invasive species early detection occurrences were recorded at ALPO by the vegetation monitoring crew or park personnel in 2011 or 2012.

The ALPO invasive species early detection list will be re-evaluated and updated during spring 2013. See the Appendix 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 2011 and 2012. No new species were added to the list for 2011. Japanese chaff flower (*Achyranthes japonica*) was added to the list in 2012.

No new invasive species early detection occurrences were recorded at BLUE by the vegetation monitoring crew or park personnel in 2011. Chinese yam (*Dioscorea oppositifolia*) was found near the parking lot adjacent to the confluence of the Bluestone River and the Little Bluestone River, as well as upstream of the Mountain Creek Lodge at Pipestem Resort State Park in August 2012. The former of the two infestations was found by the vegetation monitoring crew and reported to Park Biologist John Perez who had Biological Technicians Layne Strickler, Tiffany Petranek, and Brailey Simplican treat the plants with herbicide. The infestation was reported to EDDMaps and can be viewed at: http://www.eddmaps.org/county.cfm?sub=4527&id=us_wv_54089.

The latter infestation was found, treated, and reported by Biological Technicians Layne Strickler, Tiffany Petranek, and Brailey Simplican. The infestation was reported to EDDMaps and can be viewed at: http://www.eddmaps.org/distribution/point.cfm?id=2482761**.**

The BLUE invasive species early detection list will be re-evaluated and updated during spring 2013. See the Appendix to view a summary score card of early detection plant and pest species for BLUE.

Delaware Water Gap National Recreation Area (DEWA)

The DEWA invasive species early detection list was reviewed during winter/spring 2011 and 2012. No new species were added to the list for 2011. Hydrilla (*Hydrilla verticillata*) was added to the list in 2012.

The vegetation monitoring crew observed viburnum leaf beetle (*Pyrrhalta viburni*) larvae and damage to southern arrowwood (*Viburnum dentatum*) leaves in the Loch Lomond area of DEWA in June of 2011. No specimens of the beetle larvae were obtained. Mile-a-minute (*Polygonum perfoliatum*) was found growing throughout utility rows near Bushkill Creek by Anthony Froonjian of AMEC Earth & Environmental Inc., who then reported it to DEWA Park Biologist Jeff Shreiner. The infestation covered a 3.6-ha area and was treated by Weeds Inc. under contract in April and June of 2012. The infestation was reported to EDDMaps and can be viewed at: http://www.eddmaps.org/distribution/point.cfm?id=2486009. In December of 2011, phragmites (*Phragmites australis*) was found by Jeff Shreiner along the shoreline of Thunder Mountain Pond. The plants were treated with herbicide by NPS Resource Management in October of 2012. The infestation was reported to EDDMaps and can be viewed at: http://www.eddmaps.org/distribution/point.cfm?id=2486004. In July of 2012, the vegetation monitoring crew found mile-a-minute (Figure 2.) along the Delaware River near the Walpack Bend in New Jersey. Jeff Shreiner visited the site and was able to confirm the presence of the mile-a-minute weevil (*Rhinocomimus latipes*) which had been previously released in the park as a biological control. In August 2012, the New Jersey Department of Agriculture, in partnership with the NPS, released 1,700 adult mile-a-minute weevils at the site to aid in control efforts. The infestation was reported to EDDMaps and can be viewed at: http://www.eddmaps.org/county.cfm?sub=3065&id=us_nj_34037. In April of 2012, Didymo (*Didymosphenia geminate*) was reported by Delaware River Basin Commission Aquatic Ecologist, Erik Silldorff. It was determined to be established in DEWA; therefore, it is now only being tracked in the tributaries by this protocol. This infestation was reported to EDDMaps and can be viewed at: http://www.eddmaps.org/distribution/point.cfm?id=2485845.

The vegetation monitoring crew observed leaf necrosis on some of the oak trees (*Quercus* spp.) at the top of Mt. Tammany near the Delaware Water Gap in June of 2012. Jeff Shreiner was notified and he consulted with plant pathologists from Pennsylvania and New Jersey who suggested bacterial leaf scorch as a possible cause. Bacterial leaf scorch is a disease caused by the bacterium *Xylella fastidiosa*. It is an important pathogen of some landscape trees because it often results in tree mortality. A sample was obtained and sent to the Plant Diagnositcs Laboratory at Rutgers University where it was determined to be caused by a minor fungal pathogen (*Apiognomonia quercina*) and not likely to have a long-term impact on tree health.

Figure 2. Damage from Chinese weevil (*Rhinoncomimus lapites*) larvae on mile-a-minute near the Walpack Bend in Delaware Water Gap National Recreation Area. Photograph by: Jeff Shreiner.

The DEWA invasive species early detection list will be re-evaluated and updated during spring 2013. 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 2011 and 2012. No new species were added to the list for 2011 or 2012. No new invasive species early detection occurrences were recorded at FONE in 2011 or 2012.

The FONE invasive species early detection list will be re-evaluated and updated during spring 2013. See Appendix to view a summary score card of early detection plant and pest species for FONE.

Friendship Hill National Historic Site (FRHI)

The FRHI invasive species early detection list was reviewed during winter/spring 2011 and 2012. No new species were added to the list for 2011 or 2012. No new invasive species early detection occurrences were recorded at FRHI by the vegetation monitoring crew or park personnel in 2011. In 2012, two early detection species were found at FRHI. In March, ERMN Hydrologic Technician Andrew Weber and the ERMN Data Manager Kristina Callahan found

lesser celandine (*Ranunculus ficaria*) (Figure 3.) growing near the NPS boundary along the New Geneva Spur Trail. In July, the ERMN vegetation monitoring crew found jetbead (*Rhodotypos scandens*) growing along Ice Pond Run Loop Trail, southeast of the maintenance sheds. These infestations were reported to EDDMaps and can be viewed at: http://www.eddmaps.org/county.cfm?sub=6891&id=us_pa_42051 for the lesser celandine and http://www.eddmaps.org/county.cfm?sub=3069&id=us_pa_42051 for the jetbead. The Natural Resource Manager position at FRHI is currently vacant, so no management actions have been taken at either of these occurrences.

The FRHI invasive species early detection list will be re-evaluated and updated during spring 2013. See Appendix A to view a summary score card of early detection plant and pest species for FRHI.

Figure 3. Lesser celandine (*Ranunculus ficaria*) in Friendship Hill National Historic Site in March, 2012. Photograph by Kristina Callahan.

Gauley River National Recreation Area (GARI)

The GARI invasive species early detection list was reviewed during winter/spring 2011 and 2012. There were no changes to the list for 2011. *Polygonum cuspidatum/sachalinese* was removed from the list in 2012 because it is now established in GARI. Japanese chaff flower **(***Achyranthes japonica*) was added to the list in 2012. No new invasive species early detection occurrences were recorded at GARI by the vegetation monitoring crew or park personnel in 2011 or 2012.

The GARI invasive species early detection list will be re-evaluated and updated during spring 2013. See Appendix A to view a summary score card of early detection plant and pest species for GARI.

Johnstown Flood National Memorial (JOFL)

The JOFL invasive species early detection list was reviewed during winter/spring 2011 and 2012. No new species were added to the list for 2011 or 2012. No new invasive species early detection occurrences were recorded at JOFL in 2011 and 2012.

The JOFL invasive species early detection list will be reviewed and updated during spring 2013. See Appendix 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 2011 and 2012. No new species were added to the list for 2011. Japanese chaff flower **(***Achyranthes japonica*) was added to the list in 2012. The NERI invasive species early detection list will be revised and updated during the spring of 2013.

Two early detection species, Japanese barberry (*Berberis thunbergii*) and winged burning-bush (*Euonymus alatus*), were found near the Long Point Trail in NERI in June of 2011 by the vegetation monitoring crew (Figures 4 and 5). Within 24 hours of the initial detection, Park Biologist John Perez alerted his invasive species technician, Jason Liddle, to have the plants treated with herbicides. These infestations were reported to EDDMaps and can be view at http://www.eddmaps.org/county.cfm?sub=3010&id=us_wv_54019 for the Japanese barberry and http://www.eddmaps.org/county.cfm?sub=3023&id=us_wv_54019 for the winged burning-bush.

Sweet autumn virginsbower (*Clematis terniflora*) was found in New River Gorge National River during data collection for the ERMN rare riparian plant community monitoring in August 2012. Park Biologist John Perez was notified and the plants are scheduled to be treated in 2013. This detection was reported to EDDMaps and can be viewed at http://www.eddmaps.org/county.cfm?sub=5354&id=us_wv_54081. See Appendix to view a summary score card of early detection plant and pest species for NERI.

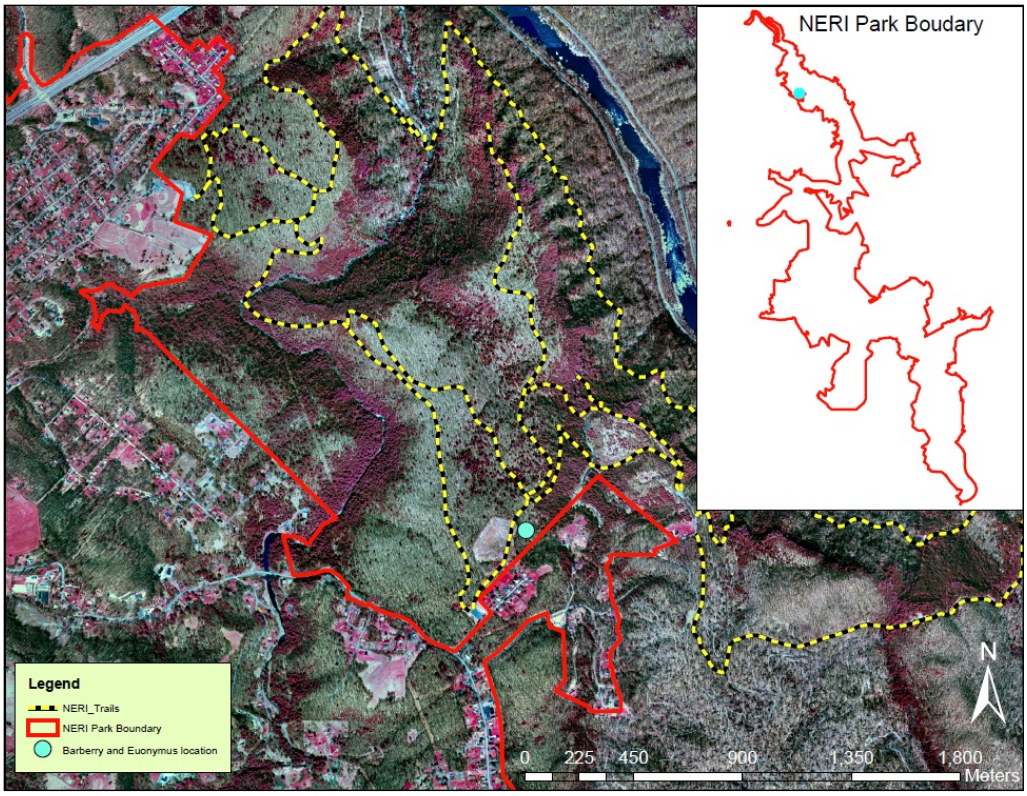

Figure 4. A map of the location of the Japanese barberry and winged burning-bush detections near the Long Point Trail in New River Gorge National River.

Figure 5. Japanese barberry (*Berberis thunbergii*) observed in New River Gorge National River in 2011.

Upper Delaware Scenic and Recreational River (UPDE)

The UPDE invasive species early detection list was reviewed during winter/spring 2011 and 2012. No new species were added to the list for 2011. Northern snakehead (*Channa argus*), flathead catfish (*Pylodictis olicaris*), and hydrilla (*Hydrilla verticillata*) were added to the early detection list in 2012.

Mile-a-minute (*Polygonum perfoliatum*) was found at UPDE in August of 2011 by Park Biologist Jamie Myers. The plants were hand-pulled and removed from the site. This infestation was reported to EDDMaps and can be viewed at: http://www.eddmaps.org/county.cfm?sub=3065&id=us_pa_42103.

No new species were found at UPDE in 2012.

The UPDE invasive species early detection list will be re-evaluated and updated as necessary during spring 2013. See Appendix 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.

Looking Ahead to 2013

ISED lists for the ERMN parks will be made available through the What's Invasive! smartphone app. This app will allow any interested persons to look up the early detection species list for any park and report them to EDDMaps.org from many smartphones. Any detections reported to EDDMaps in any ERMN parks are automatically emailed to the ISEDC who will then follow the rapid response system (Figure 1.) to alert the appropriate person(s).

Specimen collection will be added to the ISED protocol in order to confirm species detections and provide accurate information to cooperating agencies. The protocol will specify how detailed photographs and specimens should be collected and processed.

Field identification cards will be created and printed for the flathead catfish, northern snakehead, and Japanese chaff flower.

The ISED protocol will be reviewed and updated during the winter of 2012–2013. The ISEDC will coordinate with park managers to find areas of improvement for the ISED protocol.

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

Table A-1. Summary score card of early detection plant and pest species for Allegheny Portage Railroad National Historic Site (ALPO).

Scientific Name	Common Name	Year Detected					Action[†]			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Adelges tsugae	hemlock woolly adelgid			X			'10			
Agrilus planipennis	emerald ash borer									
Anoplophora glabripennis	Asian longhorned beetle									
Geosmithia morbida	thousand cankers disease									
Pyrrhalta viburni	viburnum leaf beetle									
Sirex noctillio	sirex woodwasp									
AQUATIC										
Didymosphenia geminata	didymo									
HERB										
Cardamine impatiens	narrowleaf bittercress									
Heracleum mantegazzium	giant hogweed									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Ranunculus ficaria	lesser celandine									
VINE										
Cynanchum spp.	Swallow-worts									
Polygonum perfoliatum	mile-a-minute									
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Frangula alnus	glossy buckthorn									
Rhodotypos scandens	jetbead									
Viburnum dilatatum	linden arrowwood									
TREE										
Aralia elata	Japanese aralia									

Yellow shading indicates years that species were on the park's Invasive Species Early Detection list.

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

[*] 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.

Table A-2. Summary score card of early detection plant and pest species for Bluestone National Scenic River (BLUE).

Scientific Name	Common Name	Year Detected					Action†			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Agrilus planipennis	emerald ash borer									
Geosmithia morbida	thousand cankers disease									
AQUATIC										
Didymosphenia geminata	didymo									
HERB										
Achyranthes japonica	Japanese chaff flower									
Dioscorea oppositifolia	Chinese yam					X	'12			'12
Heracleum mantegazzium	giant hogweed									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Phragmites australis	phragmites									
Polygonum cuspidatum/sachalines	Japanese/giant knotweed	X					'09			'09
Ranunculus ficaria	lesser celandine									
VINE										
Akebia quinata‡	chocolate vine									
Ampelopsis brevipedunculata‡	Amur peppervine									
Celastrus orbiculatus	Oriental bittersweet									
Polygonatum perfoliatum	mile-a-minute									
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Berberis thunbergii	Japanese barberry									
Frangula alnus	glossy buckthorn									
Rhamnus cathartica	common buckthorn									
TREE										
Acer platanoides	Norway maple									

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

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

* 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.

Species originally discovered in 11/28/2003 by contractor, but was re-visited and treated in 2009 as a result of the development and initiation of the ISED protocol.

~ New species record for the park.

Table A-3. Summary score card of early detection plant and pest species for Delaware Water Gap National Recreation Area (DEWA).

Scientific Name	Common Name	Year Detected					Action†			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Agrilus planipennis	emerald ash borer									
Anoplophora glabripennis	Asian longhorned beetle									
Geosmithia morbida	thousand cankers disease									
Pyrrhalta viburni	viburnum leaf beetle		X#		X		'09, '11			
Sirex noctillio	sirex woodwasp									
AQUATIC										
Didymosphenia geminata	didymo					X~		'12		
Hydrilla veticillata	hydrilla									
Trapa natans	water chestnut									
HERB										
Cardamine impatiens	narrowleaf bittercress	X~	X				'08, '09		'08, '09	'09
Heracleum mantegazzium	giant hogweed									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Phragmites australis	phragmites				X		'12			'12
Ranunculus ficaria	lesser celandine									
VINE										
Ampelopsis brevipedunculata	Amur peppervine									
Cynanchum spp.	Swallow-worts									
Polygonum perfoliatum	mile-a-minute			X	X	X	'10, '11, '12			'10, '11, '12
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Frangula alnus	glossy buckthorn									
Rhodotypos scandens	jetbead									
Viburnum dilatatum	linden arrowwood		X	X			'09		'10	'09, '10
TREE										
Aralia elata	Japanese aralia									
Phellodendron amurense	Amur corktree		X				'09			'09

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

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

* 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.

Evidence was reported to the Department of Agriculture and species confirmation is needed before the detection can be listed in the National Agricultural Pest Information System (NAPIS).

~ New species record for the park.

Table A-4. Summary score card of early detection plant and pest species for Fort Necessity National Battlefield (FONE).

Scientific Name	Common Name	Year Detected					Action†			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Adelges tsugae	hemlock woolly adelgid									
Agrilus planipennis	emerald ash borer									
Anoplophora glabripennis	Asian longhorned beetle									
Geosmithia morbida	thousand cankers diesease									
Pyrrhalta viburni	viburnum leaf beetle									
Sirex noctillio	sirex woodwasp									
AQUATIC										
Didymosphenia geminata‡	didymo									
HERB										
Cardamine impatiens	narrowleaf bittercress									
Heracleum mantegazzium	giant hogweed									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Ranunculus ficaria	lesser celandine									
VINE										
Celastrus orbiculatus‡	Oriental bittersweet									
Humulus japonicus‡	Japanese hop									
Polygonum perfoliatum	mile-a-minute									
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Frangula alnus	glossy buckthorn									
Rhamnus cathartica	common buckthorn									
Rhodotypos scandens‡	jetbead									
Viburnum dilatatum‡	linden arrowwood									

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

* 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.

Table A-5. Summary score card of early detection plant and pest species for Friendship Hill National Historic Site (FRHI).

Scientific Name	Common Name	Year Detected					Action[†]			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Adelges tsugae	hemlock woolly adelgid									
Agrilus planipennis	emerald ash borer									
Anoplophora glabripennis	Asian longhorned beetle									
Geosmithia morbida	thousand cankers disease									
Pyrrhalta viburni	viburnum leaf beetle									
Sirex noctillio	sirex woodwasp									
AQUATIC										
Didymosphenia geminata	didymo									
HERB										
Cardamine impatiens	narrowleaf bittercress									
Heracleum mantegazzium	giant hogweed									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Phragmites australis	phragmites									
Ranunculus ficaria	lesser celandine					X~		'12		'12
VINE										
Humulus japonicus	Japanese hop									
Polygonum perfoliatum	mile-a-minute									
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Euonymus alatus	winged burning-bush									
Ligustrum spp.	privet	X						'09		'09
Rhamnus cathartica	common buckthorn									
Rhodotypos scandens	jetbead					X~		'12		'12
Viburnum dilatatum	linden arrowwood									

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

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

[*] 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.

Table A-6. Summary score card of early detection plant and pest species for Gauley River National Recreation Area (GARI).

Scientific Name	Common Name	Year Detected					Action[†]			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Agrilus planipennis	emerald ash borer									
Geosmithia morbida	thousand cankers disease									
AQUATIC										
Didymosphenia geminata	didymo									
HERB										
Achyranthes japonica	Japanese chaff flower									
Alliaria petiolata	garlic mustard									
Dioscorea oppositifolia	Chinese yam									
Heracleum mantegazzium	giant hogweed									
Lespedeza cuneata	Chinese lespedeza									
Lythrum salicaria	purple loosestrife									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Polygonum cuspidatum/ sachalinense	Japanese/giant knotweed		X						'09	'09
Ranunculus ficaria	lesser celandine									
VINE										
Akebia quinata	chocolate vine									
Ampelopsis brevipedunculata	Amur peppervine									
Celastrus orbiculatus	Oriental bittersweet									
Humulus japonicus	Japanese hop									
Polygonum perfoliatum	mile-a-minute									
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Berberis thunbergii	Japanese barberry									
Frangula alnus	glossy buckthorn									
Rhamnus cathartica	common buckthorn									
TREE										
Acer platanoides	Norway maple									

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

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

[*] 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.

Table A-7. Summary score card of early detection plant and pest species for Johnstown Flood National Memorial (JOFL).

Scientific Name	Common Name	Year Detected					Action[†]			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Agrilus planipennis	emerald ash borer									
Anoplophora glabripennis	Asian longhorned beetle									
Geosmithia morbida	Thousand cankers disease									
Pyrrhalta viburni	viburnum leaf beetle			X[#~]					'10	
Sirex noctillio	sirex woodwasp									
AQUATIC										
Didymosphenia geminata	didymo									
HERB										
Cardamine impatiens	narrowleaf bittercress									
Heracleum mantegazzium	giant hogweed									
Microstegium vimineum	Japanese stiltgrass									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Ranunculus ficaria	lesser celandine									
VINE										
Celastrus orbiculata	Oriental bittersweet									
Humulus japonicus	Japanese hop									
Lonicera japonica	Japanese honeysuckle									
Polygonum perfoliatum	mile-a-minute									
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Frangula alnus	glossy buckthorn									
Rhamnus cathartica	common buckthorn									
Rhodotypos scandens	jetbead									
Viburnum dilatatum	linden arrowwood									
TREE										
Ailanthus altissima	tree of heaven									

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

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

[*] 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.

[#] Evidence was sent to the Department of Agriculture and the species was confirmed. The detection was added to the National Agricultural Pest Information System (NAPIS).

[~] New species record for the park.

Table A-8. Summary score card of early detection plant and pest species for New River Gorge National River (NERI).

Scientific Name	Common Name	Year Detected					Action[†]			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Agrilus planipennis	emerald ash borer		X[#~]						'09	
Lymantria dispar	gypsy moth		X[~]					'09		
Geosmithia morbida	thousand cankers disease									
AQUATIC										
Didymosphenia geminata	didymo									
HERB										
Heracleum mantegazzium	giant hogweed									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Ranunculus ficaria	lesser celandine									
VINE										
Akebia quinata	Chocolate vine									
Ampelopsis brevipedunculata	Amur peppervine									
Clematis terniflora	sweet autumn virginsbower					X[~]			'12	'12
Humulus japonicus	Japanese hop									
Polygonum perfoliatum	mile-a-minute									
SHRUB										
Berberis thunbergii	Japanese barberry		X		X		'09, '11			'09, '11
Euonymus alatus	winged burning-bush				X[~]		'11			'11
Frangula alnus	glossy buckthorn									
Rhamnus cathartica	common buckthorn									
TREE										
Acer platanoides	Norway maple									

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

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

[*] 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.

[#] Emerald ash borer presence discovered and confirmed by the Animal and Plant Health Inspection Service (APHIS).

[~] New species record for the park.

Table A-9 Summary score card of early detection plant and pest species for Upper Delaware National Scenic and Recreational River (UPDE).

Scientific Name	Common Name	Year Detected					Action[†]			
		2008	2009	2010	2011	2012	Treated or removed	No Action	Treatment planned	Reported to EDDMaps*
PEST										
Agrilus planipennis	emerald ash borer									
Anoplophora glabripennis	Asian longhorned beetle									
Channa argus	northern snakehead									
Geosmithia morbida	thousand cankers disease									
Pylodictis olivaris	flathead catfish									
Pyrrhalta viburni	viburnum leaf beetle									
Sirex noctillio	sirex woodwasp									
AQUATIC										
Didymosphenia geminata	didymo									
Hydrilla verticillata	hydrilla									
Trapa natans	water chestnut									
HERB										
Cardamine impatiens	narrowleaf bittercress									
Heracleum mantegazzium	giant hogweed									
Oplismenus hirtellus ssp. *undulatifolius*	wavyleaf basketgrass									
Ranunculus ficaria	lesser celandine									
VINE										
Cynanchum spp.	Swallow-worts									
Lonicera japonica	Japanese honeysuckle									
Polygonum perfoliatum	Mile-a-minute				X[~]		'11			'11
Pueraria montana var. *lobata*	kudzu									
SHRUB										
Ligustrum obtusifolium/L. vulgare	border/European privets									
Rhamnus cathartica	common buckthorn									
Rhodotypos scandens	jetbead									
Viburnum dilatatum	linden arrowwood									
TREE										
Ailanthus altissima	tree of heaven									
Aralia elata	Japanese aralia									
Phellodendron amurense	Amur corktree									

Yellow shading indicates years that species were on the parks Invasive Species Early Detection list.

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

[*] 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.

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.

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