

**Annual Report**

**2016**

# Lower Hudson Partnership for Regional Invasive Species Management



**LOWER  
HUDSON  
PRISM**

*Working together to protect nature*

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\*Plants shown on cover page: Linden Viburnum (*Viburnum dilatatum*), Scotch Broom (*Cytisus scoparius*), and Hardy Kiwi (*Actinidia arguta*)

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## Our Mission

The Lower Hudson Partnership for Regional Invasive Species Management (LHPRISM) is a cooperative partnership between environmental organizations and individuals who aim to protect the Lower Hudson region from the harmful impacts of invasive species. Together, the LHPRISM partners and participants work together to protect the biodiversity and ecosystem services of the nine counties and boroughs which make up the Lower Hudson region through a collaborative and integrated approach to invasive species management.

## Looking Ahead

2016 was a very successful and productive year for the LHPRISM and our 45 partner organizations. As the third full year of LHPRISM operations, we completed 12 contracted projects and reached an extensive audience through our educational events, trainings, and eradication projects. The LHPRISM will continue to grow next year by engaging new partners, beginning new projects, reaching new audiences, and furthering website development.

## 2016 Steering Committee

Brenda Bates, Westchester County Parks  
Jonathan Rosenthal, Ecological Research Institute  
Jennifer Stengle, Cornell Cooperative Extension- Putnam County  
Kali Bird, Hike New York  
Michael Fargione, Cary Institute for Ecosystem Studies  
Tom Lewis, Trillium Invasive Species Management INC

## 2017 Steering Committee

Jonathan Rosenthal, Ecological Research Institute  
Jennifer Stengle, Cornell Cooperative Extension- Putnam County  
Meredith Taylor, New York City Department of Environmental Protection  
Michael Fargione, Cary Institute for Ecosystem Studies  
Tate Bushell, Westchester Land Trust  
Tom Lewis, Trillium Invasive Species Management INC

## Summary of Accomplishments

The LHPRISM and its partners had many significant accomplishments in the ongoing battle against invasive species. Through strategic planning, management efforts, and cooperation with each other, the partners made great progress this year. A summary of the PRISM's accomplishments in 2016 are described below:

- 45 partners now participate in the LHPRISM, and our partners dedicated 11,690 hours to LHPRISM efforts
- There have been 46 training sessions where 698 participants learned how to identify and monitor invasive species. They also learned how to manage and prevent the plants from recurring.
- The LHPRISM partners and participants held:
  - 54 events educating 2,768 individuals about invasive species
  - 49 presentations which reached 1,517 individuals
  - 48 outreach events which reached 6,040 individuals
- Recognizing the crucial role volunteers play in achieving our goals, 2,184 volunteers dedicated 15,941 hours to invasive species efforts
- In addition to volunteers, the LHPRISM partners supported 70 interns who conducted a variety of projects including invasive management, prevention, and education work.
- 164 eradication projects targeted 170 invasive species by treating 613 acres throughout the region. These were divided as follows:
  - 572 acres of terrestrial invasive species treated
  - 41 acres of aquatic invasive species treated
- Together, the LHPRISM participants reported a total of 6,761 invasive species observations to New York's iMapInvasives database with an additional 5,700 observations scheduled for bulk upload. Reports were submitted for 131 different invasive species.

## Progress According to Strategic Plan

The LHPRISM focuses on invasive species occurrences through building its partnerships and aims to protect the rich biodiversity of the region by identifying conservation areas. Together, the partners reach out to new audiences to increase public awareness and participation in the removal of invasive species. The LHPRISM focuses on likely areas for invasive species introductions in the region, and uses methods of early detection and rapid response to counter the spread of invasive species. Volunteers help by surveying to identify the species, collecting the data, restoring areas, working on eradication projects, and developing educational materials. The LHPRISM focuses on education and outreach so more people become aware of the issues and to motivate changes in behavior, and to spread the message to local municipalities, teachers, master gardeners, and landscapers. The LHPRISM hosts several meetings a year to gather and share information about the threats of invasive species in the region, prioritize our work, and help support one another in invasive species management efforts. The following is a progress report of what was done in 2016 to further our Strategic Plan:

### Lower Hudson PRISM Goals

#### Capacity Building

*Goal: The Lower Hudson PRISM has a robust public identity, strong internal structure and a sustainable resource base to continue its mission.*

The LHPRISM furthered its goal to build partnerships by increasing signed-partner membership from 42 partners in 2015 to 45 partners in 2016. Our new partners are Three Arrows Cooperative, Winnakee Land Trust, and Lake Guymard Association. The LHPRISM began engaging potential partners from underrepresented areas, including lake associations and yacht clubs, in an effort to further increase our membership.

In 2016, the LHPRISM formed a Publicity Working Group to organize and focus our public visibility efforts. Multiple press releases were issued resulting in a number of press mentions to help us become known in the region. The LHPRISM also discussed adding a tagline to its logo.

## Conservation Targets

*Goal: The Lower Hudson PRISM protects the rich, native biodiversity of the Lower Hudson Valley by focusing on priority targets for conservation.*

The LHPRISM worked to determine regional conservation targets, or target areas where invasive species management were likely to benefit SGCN species and other regionally rare species. In 2016, the LHPRISM continued work to determine methods for prioritizing invasive species management projects with respect to these conservation targets. In addition, control work was performed on black swallowwort (*Cynanchum louiseae*) to protect a population of a rare and endangered species.

## Strategic Invasive Species Management

*Goal: The Lower Hudson PRISM supports and optimizes regional conservation through strategic invasive species management.*

Three of our 2016 Contracted Projects focused on surveying and eradicating invasive species throughout the Lower Hudson region. Multiple LHPRISM partners worked together to create a list of 27 focal species, which were the target species for the Lower Hudson BlockBuster Survey. The BlockBuster Survey protocol was refined by Ecological Research Institute, in an effort to upgrade the surveyor experience, broaden participation, and enable the collection of more consistent, extensive, reliable, and scientifically rigorous invasive plant survey data. More information about the refined protocol can be found in the Contracted Projects section under Ecological Research Institute on page 13. Cornell Cooperative Extension of Rockland County worked to develop training for volunteers on identification and recording of our 27 focal species through our BlockBuster Survey program. The BlockBuster survey program deployed volunteers to survey for focal species so that we may detect new introductions and fill data gaps throughout the region. These, and other early detection efforts, identified multiple new infestations of Japanese hops (*Humulus japonica*) and kudzu.

Multiple partners conducted invasive species management projects and the Invasives Strike Force conservation corps of the New York – New Jersey Trail Conference conducted invasive plant removals throughout the region. Multiple emerging invasive species populations were controlled including giant hogweed (*Heracleum mantegazzianum*), hardy kiwi (*Actinidia arguta*),



silver vine (*Actinidia polygama*), scotch broom (*Cytisus scoparius*), dwarf bamboo (*Pleioblastus* sp.), small carpetgrass (*Arthraxon hispidus*), Chinese silvergrass (*Miscanthus sinensis*), Amur corktree (*Phellodendron amurense*), black jetbead (*Rhodotypos scandens*) and incised fumewort (*Corydalis incisa*). In addition, containment efforts to prevent the spread of established species to regions where these species have not yet been reported were conducted for Japanese angelica tree (*Aralia elata*), and mile-a-minute (*Polygonum perfoliatum*).

## Education and Outreach

*Goal: The Lower Hudson PRISM reaches out to new audiences and delivers education that communicates the positive impacts of invasive species management on ecosystems. The Lower Hudson PRISM offers clear steps for action on personal and community levels.*

LHPRISM partners held a total of 46 trainings in 2016, which reached a total of 698 people. The focus of these trainings varied, with some focused on invasive species management and others focused on invasive species identification.

Cornell Cooperative Extension Rockland County held five “Managing Common Invasive Species in the Home Garden” workshops. These workshops taught homeowners and gardeners invasive species removal techniques, and the workshops were taught by Master Gardener volunteers. Multiple educational resources were created and developed to increase invasive species understanding and management. These resources include Best Management Practices (by Hudsonia), and a phenological alert calendar (by Hudson Highlands Land Trust).

Five posters were produced by Cornell Cooperative Extension Dutchess County (CCEDC) that include information about NYSDEC prohibited and regulated species, plant identification, LHPRISM focal areas, ornamental alternatives, and best management practices. CCEDC produced these posters on durable heavy-duty plastic for use at outreach events and sets were given to a LHPRISM partner in each county to hold, use, and lend out to LHPRISM partners as needed. A few LHPRISM members worked together to develop a sign to educate the public about the Hydrilla monitoring in Croton, NY; it has been posted at various locations in Croton and provides information about Hydrilla identification and what to do if it’s found.

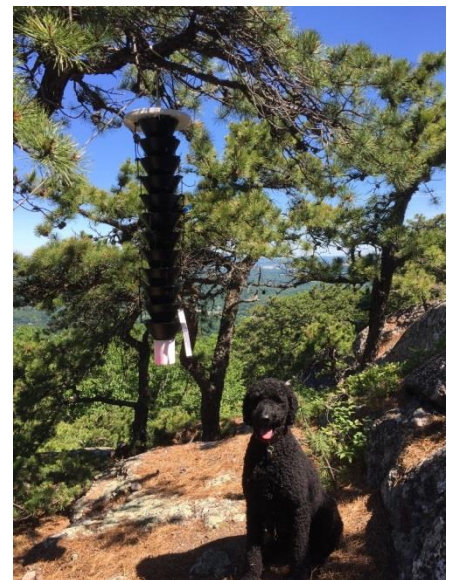
## Mitigating Pathways of Invasion

*Goal: PRISM has a coordinated program to prevent species introduction by focusing on pathways.*

The LHPRISM Aquatic Invasive Species worked to mitigate the spread of aquatic species. The watercraft inspection steward program inspected 1,317 boats and spoke with over 3,300 boaters. The program also identified three new potential watercraft inspection sites, developed criteria for identifying new sites, and began the process of polling LHPRISM partners for interest as stewards. More updates about the success of the LHPRISM Aquatic Invasive Species Program can be found in the Contracted Projects section under Hudson River Sloop Clearwater on page 16.

Scenic Hudson implemented a boot brush station at Shaupeneak Ridge near the Poppletown Road parking lot trailhead in order to mitigate the spread of invasive species along trails. More information on this boot brush station project can be found in the Partner Successes section under Intern Projects.

The LHPRISM participated in regional southern pine beetle (SPB) early detection efforts. We recruited 15 volunteers who checked 12 SPB traps located throughout the region. The monitoring effort totaled 175 volunteer hours that contributed to the detection of SPB at Bear Mountain, Schunnemunk Mountain, Roosa Gap and Minnewaska. After SPB was found in traps at Bear Mountain and Schunnemunk Mountain, we recruited volunteers to search for the infested trees and wrote press releases to get the information out to the local communities. Although no infested trees were found in these two parks, beetles were also found in traps at Minnewaska and Roosa Gap and potentially infested trees were observed there.



*Figure 1: Southern Pine Beetle Trap at Schunnemunk Mountain*

## Information Exchange

*Goal: The establishment of an information exchange allows Lower Hudson PRISM partners and other professionals to strategically manage and integrate information relevant to the management of invasive species and offer that information to any person, group, agency (partner and non-partner alike).*

The LHPRISM contracted a project to Cornell Cooperative Extension Rockland County to begin redesigning the LHPRISM website in order to make it more accessible and easier to navigate. A mock-up was created based on design aspects pulled from various comparable websites, which we will use when rebuilding the user-friendly website. This project also involved increasing our social-media presence, including a total of 38 Facebook posts and #UNselfie and #GivingTuesday campaigns.

After an initial review of the LHPRISM's educational materials and website information, Cornell Cooperative Extension Dutchess County received funding to fill gaps in our educational material. This was done by creating new pages for species missing from the website and adding more information to species that previously had limited information. More updates about website development can be found in the Contracted Projects section under Cornell Cooperative Extension Offices contracted projects on page 12.

A flyer of local native plant nurseries and native plant sales was compiled and created for partner and outreach use. A few of the featured native plant sales were hosted by LHPRISM partners. This native plant nurseries and sales flyer will be updated for 2017 as well.

## Contracted Projects

One avenue of success for the LHPRISM is to contract out projects that need more comprehensive work. A total of twelve projects were funded in 2016. A request for proposals (RFP) was issued to the Steering Committee for approval of the projects. Some of the contracted projects this year included surveying, treating, and documenting management methods for high threat invasive species in the Lower Hudson Region, while others provided mainly educational and outreach material to the general public. Both terrestrial and aquatic invasive species in the Lower Hudson Region were monitored and treated, and each of the projects this year had their own successes by learning new ways to continue management efforts.

### Cornell Cooperative Extension Offices

#### BlockBuster Survey:

#### Recruitment and Training

In 2015 members of the LHPRISM created a BlockBuster Survey to enhance the understanding of the spatial dimensions of invasive species distribution within the LHPRISM region. The survey was successful, but LHPRISM members wanted the 2016 survey to help fill data



Figure 2: BlockBuster Training at CCE Rockland County

gaps and detect new introductions through the identification of target blocks in order to expand the baseline understanding of species presence/absence throughout the region. To do this, the LHPRISM needed a strategy to recruit and train volunteers on a regional level who would be able to collect survey data in a systematic and accurate manner.

Cornell Cooperative Extension (CCE) offices in Dutchess, Putnam, Rockland, and Ulster participated in this project. All four CCE offices had access to large cadres of Master Gardener Volunteers and other stakeholders, and were able to increase the public visibility of the BlockBuster Survey through concerted and relevant promotion and marketing.

Two educational presentations were created: an introductory presentation for potential volunteers and an in-depth training for those who had signed up to participate. The in-depth training covered safety precautions, plant identification, and use of smart phone technology for mapping, surveying

protocol, and other relevant information. It included information about the LHPRISM's 27 focal species. A printed, laminated identification book was created to distribute to all participants.

Two introductory presentations were held in late spring, followed by multiple in-depth trainings. By the end of the season, 47 blocks had been surveyed by 114 volunteers, a large increase from 2015 when only 20 volunteers participated and surveyed 23 blocks.

### **Invasive Species Educational Materials**

After an initial review was done of the LHPRISM's educational materials and website information, Cornell Cooperative Extension Dutchess County (CCEDC) received funding to fill information gaps about the LHPRISM 2016 Focal Species List on the LHPRISM website, create new pages for species with missing information, and create new educational materials that can be used by the LHPRISM partners at outreach events.

CCEDC Master Gardener volunteers analyzed the *New York State Prohibited and Regulation Invasive Plants* and used the information to create a presentation named *CCEDC Ornamental Alternatives to Invasive Species*. This presentation will be used to educate consumers who might purchase and plant invasives for ornamental purposes. To do this, the ornamental and cultural characteristics of the targeted invasive plants were analyzed and non-invasive alternative plants with similar characteristics were recommended.

A set of five large, durable, portable visual display boards were created and printed for training held on November 14, 2016. The materials described above were presented to the 37 attendees, which included LHPRISM partners and volunteers, and Cornell Master Gardener Volunteers from the seven Lower Hudson counties. The visual display boards are sturdy, weatherproof, and suitable for indoor and outdoor events. They include information about NYSDEC prohibited and regulated species, plant identification, LHPRISM focal areas, ornamental alternatives, and best management practices. Two sets have been made available for each county, one set for the LHPRISM coordinator, and one set for the New York Botanical Garden.

For more information about the educational materials created by CCE Dutchess, please see Appendix I on page 35.

## **Develop Social Media Presence**

CCE Rockland received funding to manage the LHPRISM social media pages and to increase website usability. This included maintaining the Facebook page, making posts, and managing the #GivingTuesday and #UNselfie campaigns. A total of 38 Facebook posts were created and shared 16 times.

CCE Rockland's Communication Coordinator met with the website sub-committee and worked to compile a wish-list of design aspects for the LHPRISM.org website. These design aspects were pulled from various comparable websites and were used to create a mock-up, which was presented at a LHPRISM Partners meeting. Some of the design aspects built into the mock-up include making the Partner Portal less evident, making the page tabs more user-friendly, including a search feature, creating a timed image rotation on the main page, and adding a spotlight carousel. To see the LHPRISM.org website mock-up, please see Appendix II on page 40.



## Ecological Research Institute

**BlockBuster Survey Design** The LHPRISM began the BlockBuster Survey in 2015 with the intention to survey natural areas and highly probable areas throughout the Lower Hudson region for some of the most invasive terrestrial species. While the survey was successful in its first year, it was noted that both the LHPRISM and the surveyors could get more out of the experience by enhancing some of the survey protocol. Ecological Research Institute (ERI) noted that by improving the BlockBuster site-selection, field-sampling, data-recording and reporting protocol and associated forms, we would be able to upgrade the surveyor experience, broaden participation, and enable the collection of more consistent, extensive, reliable, and scientifically rigorous invasive plant survey data.

ERI worked closely with various LHPRISM members to determine what changes to the survey would be most helpful both for the volunteer experience and for the validity of the data collected. This background research helped ERI determine that the BlockBuster Survey is unprecedented in its ambition. Despite relying largely on volunteers, it is meant to be a highly rigorous and consistent survey project that obtains both presence and absence data for a diverse species list over a large region. The surveying protocols and associated data forms needed to reflect this uniqueness.

One example of changes made to site-selection protocol was determining three basic types of sites that should each be surveyed at least once within every block. Those types include Highly Probable Areas (HPAs), natural areas (NAs), and natural area parking lot/trailheads. The data from each type yields different, important information, and the comparison among them would be valuable.

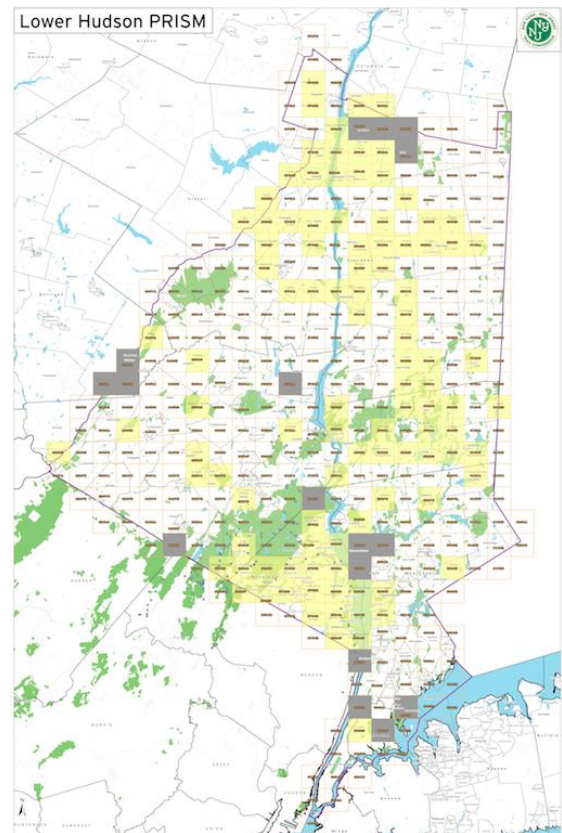


Figure 3: LHPRISM Regional Map. In yellow: assigned blocks surveyed in 2016

An example of a change made to the surveying protocol involves how volunteers determine where to survey. In 2015 it was decided to collect data at points every 330 feet, but species occurrences could be located between these points. Instead, a transect approach would be used. After doing test surveys at 17 sites, it was found that a transect length of 300 meters was sufficient to capture the invasive plant species representation. To err on the side of caution, another 100 meters was added to the transect length.

For more information about ERI's work to update the BlockBuster Survey protocols, or to see any of the supplementary materials developed, please see Appendix III on page 41.

## Hudson Highlands Land Trust and Orange County Land Trust

### Phenological Calendar

One of the Action Items for the LHPRISM in 2016 was to create an education and outreach tool that reaches new audiences and communicates the positive impacts of invasive species management on ecosystems in a very practical way. To help reach this goal, Hudson Highland Land Trust (HLLT) created the *CAP Invasives Calendar: Community Action Plan to Combat Invasive Species*. Calendar entries were designed to provide phenological data and a link to *CAP Action Sheets*, which contain detailed identification and suggested management practices. The goal of the calendar is both to provide a tool to LHPRISM members to help track invasive species in the lower Hudson Valley, and to provide invasive species information to the general public, empowering them to take action to combat invasive species.

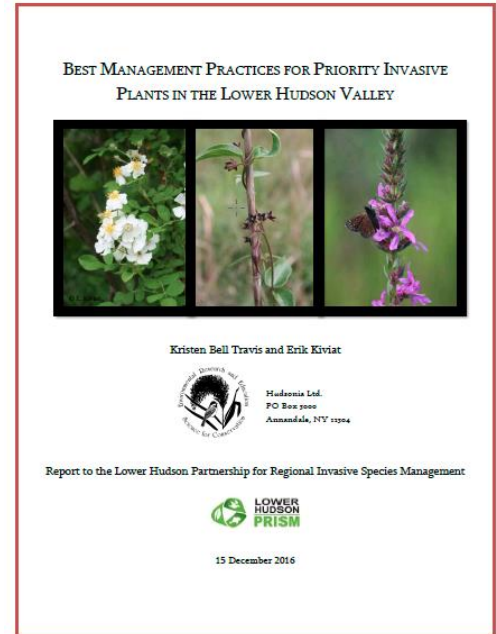
Information added to the calendar was received from eight invasive species sighting reports and a Scenic Hudson Weed Action Plan that includes phenological information and management suggestions for 24 species. The calendar now features 13 invasive species that are prevalent to the lower Hudson Valley: Norway maple, garlic mustard, Japanese angelica, Japanese barberry, oriental bittersweet, black swallowwort, burning bush, Japanese honeysuckle, purple loosestrife, Japanese stiltgrass, mile-a-minute, multiflora rose, and wineberry. Three other species that were sighted by LHPRISM members but not addressed in the Scenic Hudson Weed Action Plan are noted in the calendar as *CAP Observations*. HLLT also created 13 Community Action Plan sheets to correspond with the Google calendar listings.



## Hudsonia and Cornell Cooperative Extension Rockland County

### Best Management Practices

A very common issue in invasive species management is the “knowing-doing gap,” where research into best management practices often does not inform on-the-ground practices of land managers. Hudsonia set out to fix this problem by creating factsheets that help address this gap in the Lower Hudson Valley. Hudsonia interpreted scientific literature and experiences of professionals in the field, and made accurate information accessible and for landowners, land managers, gardeners, farmers, foresters, and anyone else with a connection to the land and an interest in managing for biodiversity by controlling invasive plants. These factsheets focused on non-chemical control. While chemical control is more labor-efficient, and often more cost-efficient, than manual or mechanical control, there are considerable environmental costs of herbicide use.



Factsheets were created for fifteen species that are both significant problems in the LHPRISM region, and had enough peer-reviewed literature and/or first-hand experience of practitioners in the region to come up with evidence-supported management recommendations. The fifteen species include: Norway maple, tree-of-heaven, garlic mustard, Japanese barberry, oriental bittersweet, black swallowwort, smooth buckthorn, bell’s honeysuckle, purple loosestrife, stiltgrass, mile-a-minute, common reed, knotweed, multiflora rose, and water chestnut.

Each factsheet provides pictures of the species, descriptions of similar species, where the invasive is found, any threats/benefits associated with the species, reproduction, management goals, and management methods. For more information about how to set realistic management goals and make management plans, please see Appendix IV on page 43.

## Hudson River Sloop Clearwater

### Aquatic Invasive Species Program



Figure 4: A steward inspects boats for invasive species in Newburgh. PC: Samantha Epstein

Clearwater's Aquatic Invasive Species (AIS) Program began in 2015 and has continued to expand each year. The AIS Program has worked to educate the public about aquatic invasive species identification and spread prevention in three ways: reach boaters directly with the Watercraft Inspection Steward Program, provide presentations and workshops to the general public with the Education and Outreach Program, and train volunteers to survey their region for aquatic invasive species with the Volunteer Training and Surveying Program.

The Watercraft Inspection Steward Program began in 2015 with two stewards located at the Croton and Staatsburg launch. The stewards worked Saturday-Sunday every week between Memorial Day and Labor Day. In 2016 Clearwater received enough funding to hire three stewards, who were located at Haverstraw, Newburgh, and Staatsburg. Stewards worked twice as often as stewards from the previous year, spending Thursday-Sunday each week by their launch. Below you will find summaries comparing the 2015 and 2016 program:

#### 2015

- Inspected 792 boats
- 94% of boaters willing to participate
- 4.7% of boats had hitchhikers
- 50.3% of boaters know about AIS
- 63.5% of boaters take precautions to clean boats

#### 2016

- Inspected 1,317 boats
- 78.7% of boaters willing to participate
- 8% of boats had hitchhikers
- 72.5% of boaters know about AIS
- 69.3% of boaters take precautions to clean boat
- Spoke with over 3,300 boaters

The Education and Outreach Program reached three times as many people in 2016 as it did the previous year, reaching an estimated 2,815 people at over 40 presentations, tabling events, Clearwater events, invasive species removals, and trainings. The Program Coordinator was able to teach 600 students about invasive species over the course of a week through the Hudson River Stewards Program.

Clearwater's Volunteer Training and Surveying was adjusted from the previous year. Instead of just holding public trainings in Croton, the Program Coordinator also trained government officials and members of Lake Associations. These larger groups were trained so that they can check their specific regions annually, rather than surveying one body of water one year and a different one the following year. This will let us see how lakes in the region are changing.

The Aquatic Invasive Species Program had a successful year in 2016, and was able to expand and adapt each sub-program in order to be more effective. Clearwater educated over 6,000 people in 2016, which is a three-fold increase from the 2,000 people reached in the previous year. The program expects to continue its growth in the following years, which will hopefully allow us to teach even more people about aquatic invasive species identification, management, and spread prevention.

### **Lower Hudson PRISM Assistant**

The 2016 LHPRISM Assistant was funded by the LHPRISM budget under a Ramapo College contract. The LHPRISM Assistant, Heather Darley, was successful in assisting in and often leading invasive species efforts including, but not limited to, coordinating the southern pine beetle monitoring program, helping to organize the Lower Hudson New York Invasive Species Awareness Week (NYISAW), and coordinating the BlockBuster Survey program volunteers.

In May and June, the LHPRISM participated in an effort to monitor for Southern Pine Beetle (SPB), an invasive insect emerging in our area. Coordination of this monitoring project involved working with Jessica Cancelliere and Tom Schmeelk at the NYSDEC to prepare assignments, supplies and maps, and train volunteers. Heather recruited and coordinated 15 volunteers who were assigned to check 12 SPB traps located throughout the region. Overall, the SPB monitoring project was a success. The monitoring effort was a total of 174 volunteer hours that contributed to the detection of SPB at Bear Mountain, Schunnemunk, Roosa Gap and Minnewaska. After

SPB was found in traps at Bear Mountain and Schunnemunk Mountain, we recruited volunteers to search for the infested trees. No infested trees have been found at these sites in 2016.

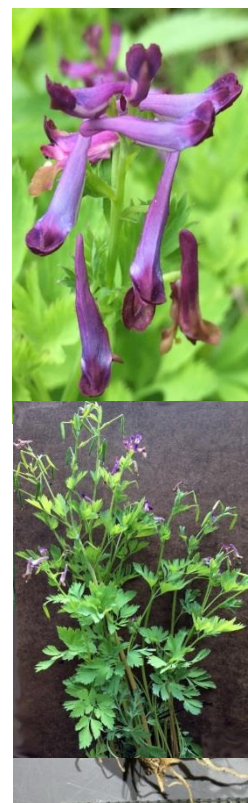
Assistant responsibilities also included posting any LHPRISM partner-hosted events or invasives-related events to the LHPRISM website calendar and advertising LHPRISM projects and accomplishments on the Facebook page. The LHPRISM Assistant also participated in the Publicity Committee in efforts to plan to promote our efforts and events. The LHPRISM Assistant also participated in the NYISAW monthly calls in preparation for the week's event postings and partner coordination.

The LHPRISM Assistant was also responsible for coordinating the 115 BlockBuster Surveyors and ensuring that surveyors had everything they needed to complete and submit their survey assignments. Coordination efforts included constant email and newsletter communications, attending trainings to instruct surveyors on how to operate the Avenza PDF Maps application, assigning block maps, aiding surveyors in plant identification and GPS operation, and accepting submitted survey data components.

## The New York Botanical Garden

### ***Corydalis incisa* Survey**

Incised Fumewort (*Corydalis incisa*) is an annual or biennial herb that was first documented growing wild in North America in 2005 from a small population on the Bronx River in NY. Since then, that population has expanded and additional populations have been found in various states. By 2015, there were three known populations in New York, all on the floodplain of the Bronx River. The New York Botanical Garden (NYBG) proposed a strategy to survey the length of the River for additional populations and identify the northernmost occurrence. Another goal of the survey is to accumulate additional information about the life cycle, morphology, pollination, and dispersal of the plants, since very little is written about the species in English.



Twenty sites spaced one kilometer apart were surveyed intensively. Once the sites were identified, a workshop designed to recruit and train volunteers to conduct the surveys and enter the results in iMapInvasives was held. Twenty teams were assembled with a minimum of two surveys for each site. The 100m transect was divided into 10 plots, each plot 10m x 10m. These plots were surveyed for the presence of incised fumewort. If the species was found, the team estimated the number of patches and size of each patch. A random number was generated between 1 and 100, and a one-meter PVC square was placed at the corresponding subplot which was then surveyed. To learn more about the survey protocol, please see Appendix V on page 44.



The length of the Bronx River was surveyed from its source in Valhalla to the Bronx County border in Yonkers from May 26, 2016 to July 11, 2016. Individuals of the species were found and mapped at four locations, representing three previously unknown populations. The northernmost population was found at the Leewood North site in Eastchester, NY. All plants found were pulled and properly disposed of over the course of the survey. NYBG also created an information flier illustrating the species and describing the threat, which was distributed within the community as well as more broadly in New England and the Mid-Atlantic regions.



Photo descriptions from top to bottom: *Corydalis* flowers; 1<sup>st</sup> year *Corydalis*; root tubers, *Corydalis* seeds; Volunteers survey along the Bronx River



## SOLitude Lake Management

### *Hydrilla* Survey of Croton River

*Hydrilla verticillata* was discovered in the Croton Bay during a rare species survey in 2013, and the LHPRISM has funded follow-up surveys since then. SOLitude Lake Management (SLM) received funding from the LHPRISM to do aquatic plant mapping in 2014, and the results from those surveys can be directly compared to the data collected from this year's survey. Due to funding constraints, surveying was only done in Black Rock Park this year.

*2016 Delineation of Hydrilla and other Submersed Aquatic Vegetation (SAV) in the Croton River: Black Rock Park*



Similarly to previous years, SLM used the Point Intercept Method (PIM) to sample aquatic macrophytes in the Croton River. In the 2014 survey, a 40m x 40m grid was used to determine sampling locations. This year, SLM decreased their grid size to 20m x 20m, which gave a total of 93 sites to sample, compared to 29 sites in 2014. Tuber sampling locations were also included in this survey. This year, 6 sites were surveyed, compared to 2 sites in 2015. For more information about aquatic plant surveying and tuber monitoring protocol, please see Appendix VI on page 46. SLM found that *Hydrilla* was the dominant submersed aquatic plant, occurring at 87% of the 93 sampling sites. 54% of those sites were considered medium or dense abundance. In 2014, *Hydrilla* was found at only 62% of sites surveyed, and only 28% of those sites had medium or dense abundances. This tells us that *Hydrilla* is now out-competing another invasive plant, Eurasian water milfoil, at Black Rock Park.

Tuber densities increased in this period as well. In 2015, North Carolina State University surveyed two sites and found that one had a tuber density of 161.499 tubers/m<sup>2</sup>, and the other site had 283.9543 tubers/m<sup>2</sup>. In 2016, those numbers increased to 1637.6 tubers/m<sup>2</sup> at the first site (+1014% change) and 498.4 tubers/m<sup>2</sup> at the second site (+176% change).

## Trillium Invasive Species Management

### Hardy Kiwi Treatments

#### Bedford, NY

An infestation of hardy kiwi patches was identified in 2013 in the Town of Bedford, NY. After two years of collaboration with various stakeholders, Trillium Invasive Species Management (Trillium) received funding from the LHPRISM to conduct control activities.



*Figure 5: Hardy Kiwi Infestation in Bedford, NY*

The project involved educating locals about the infestation, publicizing removal activities in newspapers and newsletters, and removing the infestation. Education included creating a brochure that described the local problem with the hardy kiwi and lists procedures for eradicating the species.

Control plans for the hardy kiwi patches included cutting all stems growing into trees and shrubs at ground level and about 5' high from the ground, and applying herbicides to the cut-stumps. The goal was to release all trees from the vine mass, leaving the ground layering vine mass ready for foliar application of the herbicide. The initial herbicide application is followed up by a second application approximately four weeks after the initial application. The second application is done to make contact with leaves that were previously obscured by the top layer of the vine mass.



*Figure 6: Bedford 2020 Volunteers helping with removal work*

Removals were conducted at all locations where permission was given, and two landowners were added to the project scope over the course of the summer. Mature stems were cut at both properties, but herbicides were not applied. Only one of the landowners was willing to allow herbicide applications in the future.

## Croton, NY

Several distinct patches of hardy kiwi were found in the Brinton Brook Sanctuary in Croton-on-Hudson in 2014. Subsequent surveys identified additional occurrences of the species surrounding the area, on land owned by Hudson National Golf Club and Con Edison. Those companies agreed to participate in a coordinated control effort with the goal of eradication.

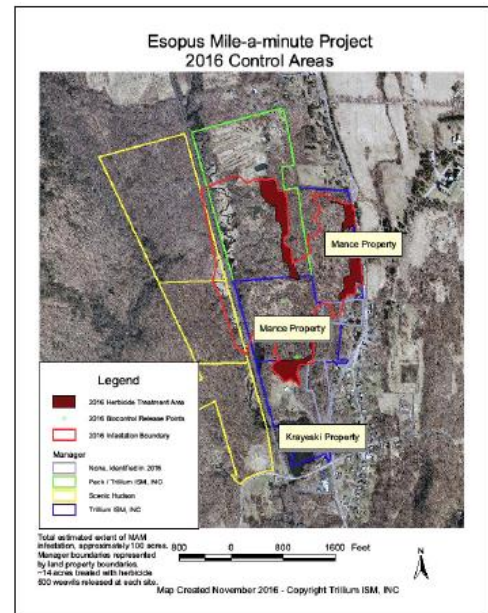
Hudson National Golf Club participated in Hardy Kiwi removals in 2016, and the patches will be treated with herbicides in 2017. Con Edison agreed to control the hardy kiwi in 2015 with follow-up efforts in 2016, but due to program constrictions and crew sizing, follow-up efforts were not conducted. Grow back in 2016 was minimal.

One patch within the Sanctuary was treated with Rodeo using the leaf wiping method, while foliar applications with Rodeo were used on the remaining two patches. One month later a follow-up visit was conducted. No growing leaves were observed at any of the patches, so no herbicides were applied.

### Mile-a-Minute Treatment

## Esopus, NY

While mile-a-minute (MAM) is considered to be an established species in the LHPRISM, the patch found in Esopus was the first occurrence within Ulster County and is in close proximity to the LHPRISM/CRISP (Catskill Regional Invasive Species Partnership) boundary, making it a high priority site. CRISP and Scenic Hudson engaged in an education and outreach campaign in 2015 to prevent further spread. Scenic Hudson and landowners actively managed portions of the infestation and the LHPRISM funded Trillium Invasive Species Management (Trillium) control efforts in 2015 and 2016. The LHPRISM management efforts included multiple stakeholders, including affected landowners, NYNJTC Invasive Strike Force, and Scenic Hudson.





Trillium implemented control activities on the private properties in May, which involved about four acres of brush cutting to open areas where applicator access was facilitated. About two miles of trails were cut to allow for applicator movement around the site. About fourteen acres of dense infestation were applied with herbicide, focusing on the perimeter of the infestation near roads and developed areas in order to reduce propagule movement by humans and reduce the expansion of the infestation.

The NYNJTC Invasive Strike Force hand-pulled mile-a-minute in low-density areas within a floodplain on one of the private properties. The crew covered 14.7 acres and pulled 2,609 plants. Scenic Hudson continued control efforts on the portion of the infestation that falls within Shaupeneak Ridge Park. One of the property owners implemented chemical and mechanical control efforts and provided at least 80 hours of labor, which included brush cutting and post-emergent herbicide applications.

## Partner Successes

Our 45 LHPRISM partner organizations are the ones on the front lines of fighting invasive species in the Lower Hudson valley. Without the hard work and determination of our partners, their interns and our valiant volunteers, the success of the LHPRISM would not be possible. All LHPRISM projects and efforts are essential to protecting and preserving our native landscapes; here are a few highlights of superlative success by our partners and volunteers.

## Intern Projects

### Scenic Hudson – Boot Brush Station

Megan Johnson, the SCA Natural Resources Assistant at Scenic Hudson, implemented a boot brush station at Shaupeneak Ridge near the upper parking lot located on Poppletown Road. The boot brush station was installed in November 2016 at the trailhead of the blue trail. Its intended function was to have hikers clean their boots as they come and go from the park, so that they don't contribute to the spread of invasive species. The idea was conceptualized by The Nature Conservancy and the University of Wisconsin Extension.



Figure 7: Scenic Hudson Boot Brush Station at Shaupeneak Ridge

This location was selected because of Scenic Hudson and Trillium ISM's work on LHPRISM-funded mile-a-minute treatments at the Shaupeneak Ridge. This was the northernmost infestation of mile-a-minute, and this boot brush station was intended to educate passersby on this invasive plant.

For more information on project details and estimated costs provided by Scenic Hudson, please see Appendix VII on page 48.

## Training Sessions and Educational Programs

### BlockBuster Survey Training

Nine training sessions for the 2016 BlockBuster Survey program were hosted and taught by the Cornell Cooperative Extension Offices in Dutchess, Putnam, Rockland and Ulster County and an additional workshop was taught in Orange County. With the help of Master Gardener volunteers, Linda Rohleder, Annie Christian-Reuter, Joyce deVries Tomaselli, and Jennifer Stengle trained 130 new surveyors in how to: identify the 27 focal invasive species, perform the survey protocol, and use a GPS or smartphone application to collect infestation coordinates.



Figure 8: Training Session at CCE Dutchess County

### Managing Common Invasive Species in Home Gardens

The Rockland County Cornell Cooperative Extension Office and their Master Gardener volunteers were also successful in teaching a lecture series about “Managing Common Invasive Species in Home Gardens.” Five workshops taught homeowners and gardeners invasive species removal techniques, and all of these workshops were taught by Master Gardener volunteers.



Figure 9: Master Gardener Ann Barry teaching at Jay Heritage Center

## **Native Plant Center – Native U Classes**

The Native Plant Center at Westchester Community College held over two dozen classes that taught 150 participants about native plants, many of which featured invasive species.

### **Outreach Events**

Bedford Audubon Society attended four tabling events and reached 80 individuals; they tabled at three lectures and the John Jay Farmer's Market in Bedford, NY.

The Cary Institute of Ecosystem Studies held an Invasive Species Walk in Millbrook, NY that taught 25 individuals how common invaders negatively impact native wildlife, pollinator habitat, forest regeneration and soil health. Dr. Dave Strayer and Dr. Gary Lovett of the Cary Institute gave 12 presentations on invasive species at various locations throughout the country, including the University of Vermont, Sacramento, Washington DC, the Hudson River Environmental Society in New Paltz, and several Tree Smart Trade events in Massachusetts, Indiana, Connecticut, and New York.

The Native Plant Center had a native plant sale on April 30, 2016 where 11,000 native plants were sold, and 400 people were in attendance. The Putnam County Soil and Water Conservation District also held two native plant sales on April 2 and July 29 in Carmel, NY where they reached 500 people between the two sales.

The Sawmill River Audubon Society created multiple education and outreach materials which included: a press release for a Hardy kiwi eradication project, Hydrilla outreach packets distributed to 11 Hudson Valley yacht clubs, Hydrilla signage posted at Croton boat ramps, and a Hydrilla tri-fold displayed at the Croton Earth Day event.

### **Eradication Projects**

For the full list of invasive species targeted by LHPRISM partners in eradication projects, please see Appendix IX on page 52.

## **Giant Hogweed**

Giant hogweed, *Heracleum mantegazzianum*, is a federally listed noxious weed. When giant hogweed sap reacts with moisture and sunlight, it can cause serious skin and eye irritation.



The New York New Jersey Trail Conference worked with Trillium Invasive Species Management, Inc., and the NYC DEP to eradicate Giant hogweed on private properties throughout Putnam County. Nine participants were involved and treated an area of about 2.21 acres.



Black Rock Forest Consortium also had an eradication project involving Giant hogweed. They worked in Black Rock Forest on Aleck Meadow Dam encompassing a treatment area of 0.5 acres.

### Mile-a-Minute

Mile-a-minute, (MAM) *Persicaria perfoliata*, is an herbaceous annual vine with light green, triangular leaves. This invasive vine can pose a serious ecological threat, because it can grow up to six inches a day.



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Scenic Hudson and Trillium ISM had a contracted project to eradicate mile-a-minute in Esopus, NY; this was the northernmost known location of MAM, and so this project's efforts were intended to contain and prevent MAM from spreading north. Please see page 22 to learn more about this project.

Mianus River Gorge and the New York – New Jersey Trail Conference eradicated 3 acres of MAM at the Mianus River Gorge Preserve in Bedford, NY.

Photo on Left: Before photo of Mile-a-Minute Pull with NYNJTC (Credit: Budd Veverka)



Photo on Right: After photo of Mile-a-Minute Pull with NYNJTC (Credit: Budd Veverka)

New York State Parks treated 0.1 acres of MAM at the John Jay State Historic Site in Katonah, NY. The Pound Ridge Land Conservancy treated one acre of MAM at the Armstrong Preserve in Pound Ridge, NY. Westchester County Parks, Reservation and Preservation treated 8 acres of MAM in various parks around Westchester County. Westchester Land Trust removed 0.1 acres of MAM from the Rose Preserve and 0.2 acres from Pine Croft Meadow; both of these removal sites were in Lewisboro, NY. Black Rock Forest Consortium removed 0.25 acres of MAM from their property in Cornwall, NY. And the New York Botanical Garden treated a small patch of their MAM infestation in the Bronx, NY.

### **Japanese Angelica Tree**

Japanese angelica tree, *Aralia elata*, has unfortunately been proliferating throughout the Lower Hudson valley. Japanese angelica tree is best known as the invasive look-alike for the native Devil's Walking Stick. With spiny thorns and prickles along the trunk and compound leaf axials, it's likely that this invasive species has been present in the area for quite some time but has been misidentified as the native species.

Black Rock Forest Consortium treated 6 sites of Japanese angelica tree; this infestation encompassed 4 acres of the Black Rock Forest preserve property in Cornwall, NY. The New York Botanical Garden treated 2 acres at their property in the Bronx, NY. New York State Parks treated 0.2 acres at the John Jay State Historic Site in Katonah, NY, and they also treated 6.3 acres at the Trailside Zoo at Bear Mountain State Park. Teatown Lake Reservation treated 0.2 acres at their reservation in Ossining, NY. The Invasives Project – Pound Ridge treated 0.2 acres at the Pound Ridge Town House property. And the Village of Tuxedo treated 1 acre in Tuxedo Park, NY.



John M. Randall, The Nature Conservancy, Bugwood.org

## Kudzu

The Friends of Old Croton Aqueduct (FOCA) discovered an infestation of kudzu, *Pueraria montana*, along the Old Croton Aqueduct Trail in Westchester County in Yonkers and Hastings, NY. The discovery was made by FOCA friends and NYNJTC-trained surveyors, Shaun Gorman and Ilona Fabian. Shaun and Ilona surveyed 3.1 miles of the OCA trail and together dedicated a combined 105 hours of volunteer work. The infestation was reported as an emergency request to the New York State Parks Invasive Strike Force team. New York State Parks treated 0.25 acres of kudzu along the Old Croton Aqueduct Trail.



Figure 10: Kudzu compound leaves

The NYS Parks team was made up of four people who dedicated five days of 10-hour shifts to removing the kudzu infestation in Yonkers. NYS Parks also funded herbicide treatment of the Old Croton Aqueduct Trail kudzu infestations. Three of the treatment sites along the trail in Yonkers were just north of the New York City border, Lamartine Avenue and Rudolph Terrace.



Figure 11: Ilona Fabian with Kudzu Infestation along OCA Trail

The New York State Department of Environmental Conservation was notified of the kudzu infestations and may assist with eradication efforts in 2017.

Property owners adjacent to the trail herbicide treatments were informed of both the treatments and kudzu infestations. The Friends of the Old Croton Aqueduct are hoping that these property owners will aid in future mitigation efforts.



## Post-Treatment Monitoring

### Mile-a-Minute Weevils: Scenic Hudson

Following the mile-a-minute management in Esopus, Scenic Hudson and Trillium ISM hand pulled the MAM in the floodplain of Black Creek and weed wacked the inland plants. 1,000 biocontrol weevils were released onto the neighboring infested parcel.

### Rye Nature Center

Rye Nature Center partnered with ConEdison and Volunteer NY to remove 1-acre of jetbead, wisteria and *Ailanthus*. The removal was followed with planting of natives (*Viburnum dentatum*) and pulling any invasive regrowth. The wisteria was cut, covered with a cardboard and woodchip barrier, and replanted over; this method has shown success for the past two years, but this method is time and labor intensive.

### Constitution Marsh Audubon Center and Sanctuary - *Phragmites*

Constitution Marsh Audubon Center and Sanctuary continued to monitor a 7-acre *Phragmites* infestation that was previously treated. They have been experimenting with a manual treatment of their *Phragmites* infestations that proved successful with a 70% revegetation of native species and no *Phragmites* or other invasives revegetation.

The experimental manual treatment technique involves covering patches of *Phragmites*. They start by using a 4'x8' board to smash down the plants, and then a geotextile material is stapled over. This patch is solar baked for two years. They do not work on the same patch every year. When last year's patch's geotextile was removed, there were cattails and natives coming back up.



Figure 12: MAM Biological Control (*Rhinoncomimus latipes*)



Figure 13: Rye Nature Center volunteers removing invasives and planting natives

## Friends of the Great Swamp – Autumn Olive

The Friends of the Great Swamp in Pawling, NY cut a one-acre infestation of autumn olive in March and April 2016, and they are currently monitoring the regrowth. By late summer, the plants that were cut and not treated had re-sprouted to be 50cm to 75cm tall. The autumn olive that was cut and treated with a 30% Roundup dilution showed no sign of re-sprouting.

## Volunteer Recognition

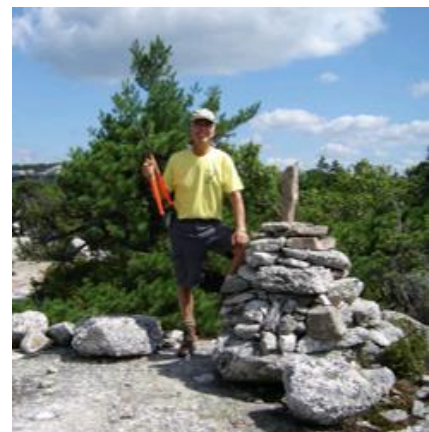


Figure 14: Volunteers removing garlic mustard along the Old Croton Aqueduct

A total of 2,184 LHPRISM volunteers dedicated 15,941 hours to help combat invasive species and help preserve the native habitats of our region. A lot of what the LHPRISM accomplishes could not be done without the hard work and dedication of our invaluable volunteers. The following is a few spotlight features of some outstanding volunteer efforts. The LHPRISM would like to extend a huge thank you to all our volunteers who were out surveying, pulling, and plotting against invasive species throughout 2016!

### Cliff Berchtold

was first volunteer introduced to invasive species back in 2013 when he was looking to do more to protect our parks. An all-star volunteer of the New York – New Jersey Trail Conference since 1994, Cliff is an avid outdoorsman and is passionate about preserving our native landscapes. Cliff volunteered every Wednesday morning helping to process Invasives Strike Force and BlockBuster Survey data. He has also surveyed over 50 miles of trails for invasive plants. In 2016 alone, Cliff dedicated 185 hours to invasive species efforts. Cliff was also instrumental in the LHPRISM Southern Pine Beetle (SPB) monitoring project. He adopted the Schunnemunk Mountain trap with Linda Rohleder and checked it every two weeks for two months. Their hard work helped alert the NYSDEC of the SPB's presence at Schunnemunk. The trap at Schunnemunk was also vandalized and the rope securing the trap to its tree was stolen. Cliff bought a new rope for the trap and hiked out to tie it back up. Thanks so much for all you do, Cliff!





**Glenn Sungela** took an Invasive Plant Identification workshop with the New York – New Jersey Trail Conference in early summer of 2016. From there, an interest was sparked, and Glenn was on a mission to take on the invasives of the Lower Hudson Valley. Both a warrior in the office and out in the field, Glenn assisted the LHPRISM in improving website content and spent countless hours cutting invasive plants in



*Figure 15: Glenn Sungela cutting invasive vines to help save the trees. PC: Jim Capossela*

Westchester and Rockland Counties. In collaboration with the Rockland County Department of Environmental Resources, Glenn established a framework for an Invasive Plant Control Program, which will soon allow volunteers to remove invasive plants in the Town of Clarkstown (currently not possible due to insurance liability with the town.) Glenn has big plans for fighting invasives in 2017 that include an Invasive Plant Exhibit at the New City Library, working with NYDOT to eradicate Japanese knotweed along NYS roads, becoming an LHPRISM partner, and applying to be a member of the Rockland County Environment Management Council. Keep up the awesome work, Glenn!

**Daria Gregg** started out as an average hiker who enjoyed being outdoors, exercising, and rewarding herself with beautiful summits. Daria wanted to learn more about what surrounded her on her hikes so she began taking plant courses at the New York Botanical Garden and there she learned about invasives. Now she sees them everywhere! As an empathetic person, Daria began to feel the pain of the trees covered by invasive vines and the lost native vegetation at their roots.



*Figure 16: Daria Gregg and her grandson removing invasives*

Daria decided to adopt an 800-foot section of the Old Croton Aqueduct (OCA) Trail. Daria walks her section of the OCA trail almost daily, and this section has some native vegetation to be saved.

She's been working on restoring her section of the OCA for the past three years. In 2016, Daria was able to focus almost exclusively on a native "planting marathon," instead of invasive removals.

The most important lesson that Daria has learned along the way is that the forest needs tender care and attention when it comes to restoration. Daria says, "nature arbores a vacuum. Have an empty place; nature will fill it – now more often with an invasive weed. If you take out an invasive, plant a native in its place. Try and disturb the soil as little as possible. All the plants and trees lived in a rhythmic relationship with one another. It will take hundreds of years to restore that, but we can create a little oasis where it has a chance to return." Thank you, Daria, for your dedication to healing our forests!

## Emerging Invasive Species in the Lower Hudson Valley

The following list is a brief report of emerging invasive species observed and, in most cases, treated by the LHPRISM partners. These emerging species are ones that were recently introduced but not yet widespread in a region. Some of the following species were included on the 2016 BlockBuster Survey focal list, and their survey observations will be noted below.

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### ***Cytisus scoparius***

#### **Scotch broom**



The New York – New Jersey Trail Conference visited 33 out of 52 sites of Scotch broom infestations in Bear Mountain and Harriman State Parks and completed treatment at 26 of these sites. 13,290 Scotch broom plants were removed.

Scotch broom was not observed in any of the 2016 BlockBuster Surveys.

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***Corydalis incisa***  
**Incised fumewort**



The New York – New Jersey Trail Conference pulled 1,900 plants at the Bronx River Parkway Reservation in Crestwood and Muskrat Cove parks in the Bronx. The Bronx River Parkway Reservation Conservancy treated 0.1 acres of *Corydalis* in Eastchester, NY. The New York Botanical Garden eradicated 0.05 acres of *Corydalis* at their location in the Bronx.

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***Miscanthus sinensis***  
**Chinese silver grass**



Chris Evans, University of Illinois, Bugwood.org

The New York – New Jersey Trail Conference did treatment on 3.2 acres of *Miscanthus* populations in Harriman State Park with the New York State Parks Invasives crew.

This was a focal species for the 2016 BlockBuster Survey, and four observations were recorded in Dutchess County by LHPRISM partner, Matthew Aiello-Lammens of Pace University. One observation was recorded in Rockland County, and one observation was recorded in Westchester County.

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***Aegopodium podagraria***  
**Bishop's Goutweed**



Mianus River Gorge Preserve treated 0.2 acres of a roadside infestation of Bishop's Goutweed. The New York City Parks Department also treated 29.5 acres of Bishop's Goutweed at Inwood Hill Park.

This was a focal species for the 2016 BlockBuster Survey, and three observations were recorded in Ulster County.



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***Rhodotypos scandens***

**Black Jetbead**



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Mianus River Gorge treated 0.3 roadside acres of Black Jetbead on their preserve in Bedford. The New York Botanical Garden treated 0.01 acres of Black Jetbead at their property in the Bronx. The New York-New Jersey Trail Conference also removed individuals at Westchester Wilderness Walk/Zofnass Family Preserve in Pound Ridge.

This was a focal species for the 2016 BlockBuster Survey, and three observations were recorded in Dutchess County.

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**Hardy Kiwi**

***Actinidia arguta***

**and**

**Silver Vine**

***Actinidia polygama***



Stan Porse, Bugwood.org

Trillium Invasive Species Management, Inc. conducted Hardy Kiwi eradication projects in Pound Ridge, NY and Croton, NY that encompassed 2 acres of treatment. They also began treatment on a silver vine population in Mt. Kisco.

The New York-New Jersey Trail Conference helped with the Mt. Kisco silver vine treatment and had an eradication project in Sterling Forest State Park. Nine participants removed and treated an isolated population of Silver vine at an old furnace ruins over an area encompassing about 0.1 acres (4500ft<sup>2</sup>).

Hardy kiwi was a focal species for the 2016 BlockBuster Survey, and one observation was recorded in Dutchess County by LHPRISM partner, Joyce Tomaselli of the Dutchess County Cornell Cooperative Extension Office.

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***Humulus japonicus***

**Japanese Hops**



Chris Evans, University of Illinois, Bugwood.org

Putnam County Soil and Water treated 0.25 acres of Japanese hops at the County Community Gardens in the Town of Southeast.

This was a focal species for the 2016 BlockBuster Survey; one observation was recorded by Linda Rohleder in Dutchess County, and one observation was recorded in Westchester County.

---

***Arthraxon hispidus***

**Small carpetgrass**



Bill Harms, Patuxent Research Refuge Plant inventory Project, Laurel, MD


The New York – New Jersey Trail Conference removed both reported locations in the Lower Hudson Valley at Shrub Oak Memorial Park in Westchester Co. and a location in Ulster Co.

This was a focal species for the 2016 BlockBuster Survey.

## Appendix I: Cornell Cooperative Extension Outreach Posters




# INVASIVE PLANTS



## THE PROBLEM

- Invasive plants threaten food supply, thus human health.
- Invasive plants change ecosystems:
  - Reduce biological diversity.
  - Alter community structures.
  - Out-compete native species.




## NYS DEC PROHIBITED INVASIVE PLANTS

Plants that are nonnative to a particular ecosystem which cause harm to the environment, economic, and/ or human health. They cannot be sold, imported, purchased, transported, propagated, or introduced.

## NYS DEC REGULATED INVASIVE PLANTS

Plants that are nonnative to a particular ecosystem which have the potential to cause harm to the environment, economic, and/ or human health. No person shall knowingly introduce them into a free-living state, although they can be sold, purchased, propagated, and transported.

## THE EXPERTS




- NYS Department of Environmental Conservation , **DEC**, is responsible for the conservation, improvement, and protection of natural resources.
- Lower Hudson Partnership for Regional Invasive Species Management, **LHPRISM**, coordinates regional invasive species work on behalf of NYS DEC.
- Cornell Cooperative Extension, **CCE**, works in partnership with LHPRISM.


Key websites:

- <http://www.lhprism.org>
- <http://www.nyis.info>
- <http://woodyplants.cals.cornell.edu>
- <http://plants.usda.gov>

Appendix I (Continued): Cornell Cooperative Extension Outreach Posters




## PLANT IDENTIFICATION



HOW TO IDENTIFY PLANTS

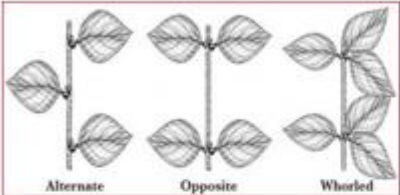
BRANCHING PATTERNS

Norway Maple  
*Acer platanoides*  
(Regulated)



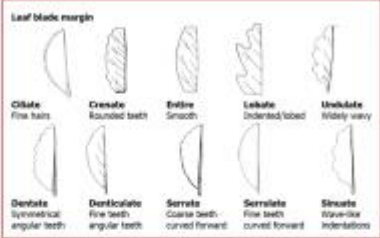
Opposite branches  
Opposite leaves  
Lobed, dentate leaves  
Palmate Leaves

LEAF MARGINS



Alternate      Opposite      Whorled

Texas A&M AgriLife Extension



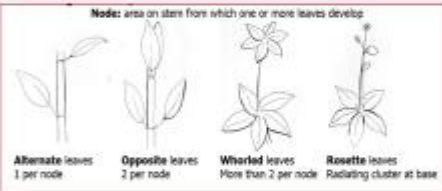
Leaf blade margin

Ciliate: Fine hairs  
Dentate: Serrated, angular teeth  
Denticulate: Fine teeth, angular teeth  
Serrate: Coarse teeth, curved forward  
Serrulate: Fine teeth, curved forward  
Sinuate: Wave-like indentations

LEAF POSITIONS

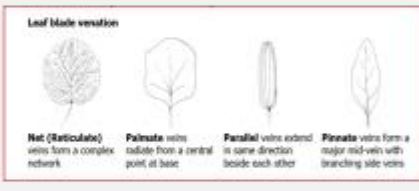
LEAF VENATIONS

Node: area on stem from which one or more leaves develop



Alternate leaves: 1 per node  
Opposite leaves: 2 per node  
Whorled leaves: More than 2 per node  
Rosette leaves: Radiating cluster at base

Leaf blade venation



Net (Reticulate): veins form a complex network  
Palmate: veins radiate from a central point at base  
Parallel: veins extend in same direction beside each other  
Pinnate: veins form a major mid-vein with branching side veins


Cornell University Cooperative Extension and Department of Horticulture. Botany Language Basics for Identification of Flowering Plants.

BARK


FLOWERS

FRUIT/SEED


Texture, color, patterns



Tree of Heaven  
*Ailanthus altissima*



Size, shape




Rough gray bark with light color striations  
Small flowers, in large panicles  
Large masses of fruit/seed pods


Photos: plants.usda.gov



Appendix I (Continued): Cornell Cooperative Extension Outreach Posters



# MANAGEMENT



## MANUAL

## MECHANICAL





Photo: Irene Stover

**Hand pull**



Mile-A-Minute Vine  
*Persicaria perfoliata*  
Photo: Leslie J. Mehrhoff





Photo: Lewis Bamboo

**Cut**






Golden Bamboo  
*Phyllostachys aurea*  
Photo: Bill Johnson


**Other manual controls:**

- Hand dig
- Girdling
- Mulch
- Soil Solarization
- Controlled flooding/burn


Mow repeatedly and/or excavate










Multiflora Rose  
*Rosa multiflora*







Phragmites  
*Phragmites australis*  
Photos: Leslie J. Mehrhoff


Japanese Knotweed  
*Reynoutria japonica*

## BIOLOGICAL


## OTHER




**Control beetle**  
Black-margined  
loosestrife beetle  
*Galerucella  
calmariensis*




Purple Loosestrife  
*Lythrum salicaria*  
Photos: Leslie J. Mehrhoff




**Control weevil**  
Black weevil  
*Rhinocominus  
latipes*  
Photo: Ellen Lake




Mile-A-Minute Vine  
*Persicaria perfoliata*



**Public Awareness**





**Native Plants**  
Photo:  
NYBG

**Grazing**  
Photo: Theresa Hogue

**Other alternatives:**

- Revegetation
- Environment manipulation (e.g. forest canopy and edges)
- Ornamental alternatives


**CHEMICAL CONTROL** – Contact your local professional or Cornell Cooperative Extension.
















Appendix I (Continued): Cornell Cooperative Extension Outreach Posters



## ORNAMENTAL ALTERNATIVES




Cornell University  
Cooperative Extension


DESIRED ATTRIBUTES	ORNAMENTAL ALTERNATIVES
<p><b>VINES</b></p> <p>Profusion of flowers Bloom season/color Climber Deer resistant Attracts wildlife</p> <p style="font-size: x-small;">Photos: Wikipedia</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Black-eyed Susan Vine* <i>Thunbergia alata</i></p> </div> <div style="text-align: center;">  <p>Trumpet Honeysuckle <i>Lonicera sempervirens</i></p> </div> <div style="text-align: center;">  <p>Climbing Hydrangea* <i>Hydrangea anomala ssp. petiolaris</i></p> </div> <div style="text-align: center;">  <p>Virgin's Bower <i>Clematis virginiana</i></p> </div> </div>
<p><b>TREES</b></p> <p>Ornamental Shade Screening Disease resistant Attracts wildlife</p> <p style="font-size: x-small;">Photos: woodyplants.clas.cornell.edu</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Red Maple <i>Acer rubrum</i></p> </div> <div style="text-align: center;">  <p>American Beech <i>Fagus grandifolia</i></p> </div> <div style="text-align: center;">  <p>Sugar Maple <i>Acer saccharum</i></p> </div> <div style="text-align: center;">  <p>River Birch <i>Betula nigra</i></p> </div> </div>
<p><b>SHRUBS</b></p> <p>Ornamental Spring or fall color Deer resistant Low maintenance Attracts wildlife</p> <p style="font-size: x-small;">Photos: woodyplants.clas.cornell.edu</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Spicebush <i>Lindera benzoin</i></p> </div> <div style="text-align: center;">  <p>Virginia Sweetspire <i>Itea virginica</i></p> </div> <div style="text-align: center;">  <p>Red Chokeberry <i>Aronia arbutifolia</i></p> </div> <div style="text-align: center;">  <p>Ninebark <i>Physocarpus opulifolius</i></p> </div> </div>
<p><b>HERBACEOUS</b></p> <p>Fast growing Seasonal color Wet/dry conditions Attracts wildlife Supports pollinators</p> <p style="font-size: x-small;">Photos: Missouri Botanical Garden</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Turtlehead <i>Chelone glabra</i></p> </div> <div style="text-align: center;">  <p>Partridge Pea <i>Chamaecrista fasciculata</i></p> </div> <div style="text-align: center;">  <p>Coneflower <i>Echinacea purpurea</i></p> </div> <div style="text-align: center;">  <p>Feather Reed Grass* <i>Calamagrostis x acutiflora 'Karl Foerster'</i></p> </div> </div>

\* non-native

Appendix I (Continued): Cornell Cooperative Extension Outreach Posters


















ESTABLISHED vs. EMERGING



Cornell University  
Cooperative Extension

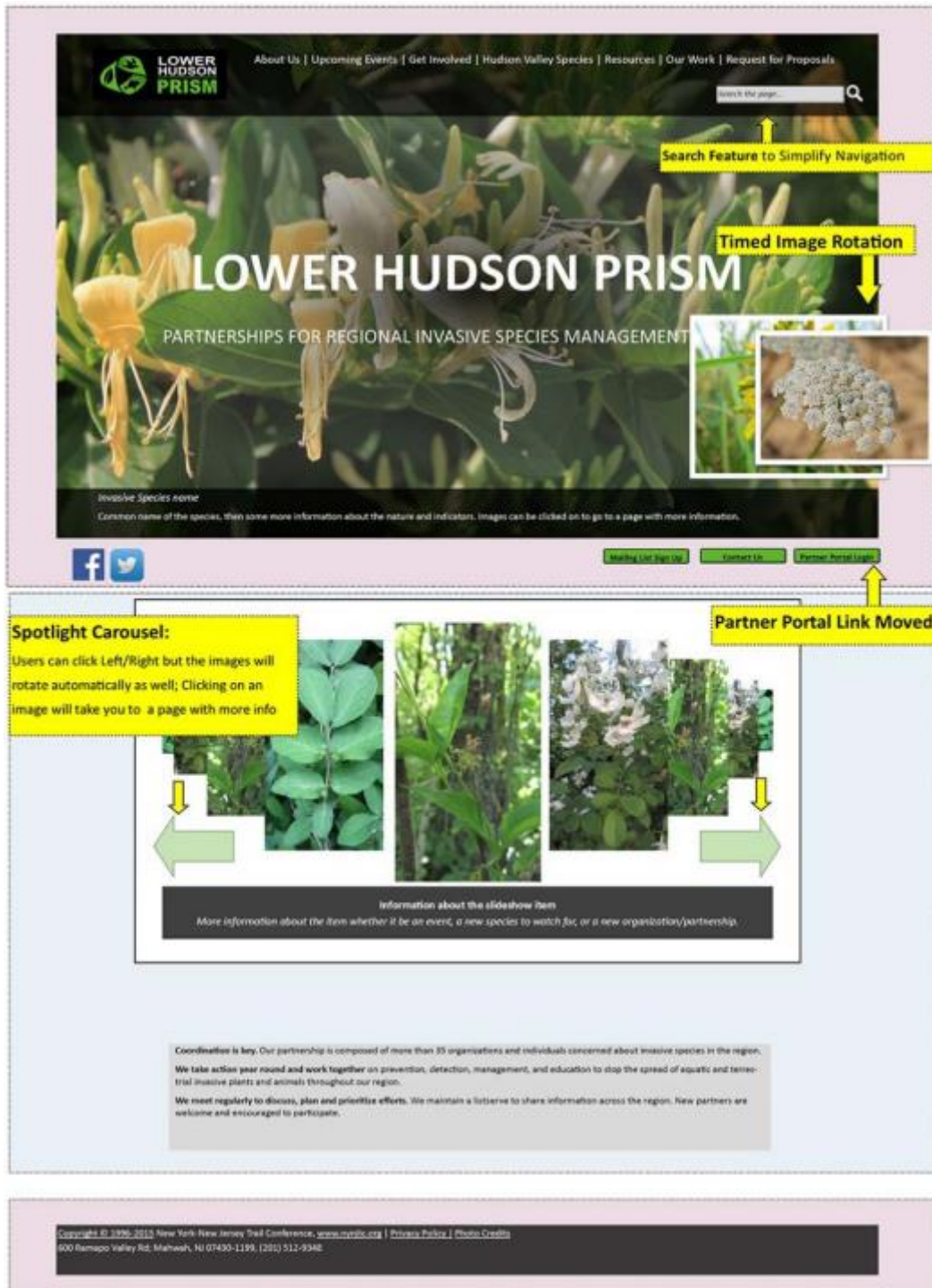
WELL ESTABLISHED

EMERGING

<p><b>VINES</b> Weak woody or non-woody stems that climb.</p> <p>Photos: Leslie J. Mehrhoff</p>	 <p style="text-align: center;">Oriental Bittersweet <i>Celastrus orbiculatus</i></p>	 <p style="text-align: center;">Mile-A-Minute <i>Persicaria perfoliata</i></p>	 <p style="text-align: center;">Black Swallow-Wort <i>Cynanchum louiseae</i></p>	 <p style="text-align: center;">Kudzu Vine <i>Pueraria montana</i> Photo (bottom): Kenny Britton</p>
<p><b>TREES</b> Stiff woody portions with bark, usually one trunk.</p>	 <p style="text-align: center;">Tree of Heaven <i>Ailanthus altissima</i> Photo: plant.usda</p>	 <p style="text-align: center;">Japanese Angelica <i>Aralia elata</i> Photo: John M. Randall</p>	 <p style="text-align: center;">Amur Cork Tree <i>Phellodendron amurense</i> Photo: Leslie J. Mehrhoff</p>	
<p><b>SHRUBS</b> Multiple woody stems, usually shorter than trees.</p> <p>Photos: Leslie J. Mehrhoff</p>	 <p style="text-align: center;">Japanese Barberry <i>Berberis thunbergii</i></p>	 <p style="text-align: center;">Burning Bush (Regulated) <i>Euonymus alatus</i></p>	 <p style="text-align: center;">Linden Viburnum <i>Viburnum dilatatum</i> Photo: Doug Manning</p>	 <p style="text-align: center;">Scotch Broom <i>Cytisus scoparius</i> Photo: woodyplants.cals.cornell.edu</p>
<p><b>HERBACEOUS PLANTS</b> No persistent woody stems or bark; flowers, grasses, ferns.</p> <p>Photos: Leslie J. Mehrhoff</p>	 <p style="text-align: center;">Purple Loosestrife <i>Lythrum salicaria</i></p>	 <p style="text-align: center;">Wild Parsnip <i>Pastinaca sativa</i></p>	 <p style="text-align: center;">Yellow Flag Iris <i>Iris pseudacorus</i></p>	 <p style="text-align: center;">Chinese Lespedeza <i>Lespedeza cuneata</i></p>



## Appendix II: LHPRISM Website Mockup



# Appendix III: Ecological Research Institute 2016 BlockBuster Survey

## Overview and Protocol



### 2016 LOWER HUDSON PRISM BLOCKBUSTER SURVEY OVERVIEW

Welcome to the 2016 Lower Hudson PRISM Blockbuster Survey –thank you for your participation in it! This year, the Blockbuster is focusing on two kinds of sites within our PRISM region: **natural areas** and **High Probability Areas (HPAs)**. Whereas natural areas represent what their name implies (sites that largely comprise natural, relatively undisturbed habitat), HPAs represent areas that are particularly likely to host invasives, often although not always because they have been disturbed by human activity.

It is crucial to survey HPAs for invasive plants because they are places where such species are especially likely to appear first within a survey block, and will thus give us a great deal of information about how widely spread the focal species are within our PRISM region. Surveying natural areas is also important, because these are the places that are of higher conservation priority and where incursions of invasive plants would have the greatest impacts on native biodiversity. By comparing results of surveys of natural areas and HPAs from the same blocks, we can assess the degree to which invasive species found in the HPAs have reached and penetrated the natural areas. Also, because the HPA and natural area surveys will not necessarily reveal every focal invasive species occurring with each block, we are supplementing the formal survey with a procedure for collecting opportunistic data recording (see below), which will enable reporting sightings of focal species that would otherwise go overlooked and unreported.

#### Survey site selection and data collection:

*Natural areas.* – Please make sure to select a natural area that you have permission to enter. Your formal survey will consist of two parts: 1) a survey of the parking lot/trailhead area; and 2) a survey along a trail within the natural area itself. We are employing this two-part approach because it is likely that some invasive species will have established themselves in the disturbed area comprising the parking lot and trailhead, but these species may have penetrated the interior of the natural area only to a limited extent.

For the parking lot/trailhead survey, you will go along the perimeter of the lot and trailhead area, using your GPS unit or cell phone (with the appropriate app) to record your route, measure your distance as you proceed, and record locations of certain species (those listed as Group 2 Species on the forms), while manually recording other data on the appropriate form. If the perimeter of this area is 400 meters or less, please make sure to survey all of it in 100-meter segments. If it is more than 400 meters, you will need to survey the first 400 meters, and if in the last 100-meter segment you encounter new focal species, you should survey an additional 100 meters. After you are done with the parking lot/trailhead area, you should proceed along the trail itself, surveying for 400 meters in 100 meter segments (using the Natural Area Trail Form to record data). If you find species in the last 100 meters that you had not found along the previous 300 meters of trail, you should survey an additional 100 meters along the trail.

Please note that you do not need to attempt to survey the entirety of a large natural area or even the full extent of its trails. Rather, because your GPS unit or cell phone will be tracking your route, your data will be used just to characterize the area that you actually surveyed. However, if you know of habitat types (especially clearings or wetlands) that occur within the natural area, but that would not be sampled along the trail portion you are formally surveying, we encourage you to go to such sites and use the Opportunistic Observation Data Form to document any occurrences of any focal species found there that were not found during your formal survey of the natural area.

## Appendix III (Continued): BlockBuster Overview and Protocol

*HPAs.*- Typically, these are areas that have been disturbed by human activity and that are also not being managed. Weedy edges of shopping center parking lots and roadsides are two types of HPAs that are especially heavily invaded in our area, and tend to have high diversities of invasive species. In urban areas, abandoned lots can be quite productive. In rural areas, abandoned farmland can be heavily invaded. Utility right of ways can, in some settings, also serve as invasion corridors. Other sites that can be HPAs include river frontage and wetland edges, as they are open areas that can be easily colonized by invasive plants. This list is not meant to be exhaustive, but only to provide examples of some types of sites that can be HPAs. Sites that border a range of habitats (such as a roadside bordering residential areas and unmanaged fields or a weedy parking lot edge alongside field and forest remnants) can be especially promising, as can disturbed areas that are connected to multiple possible invasion corridors (e.g., roads, railroad tracks and utility right of ways).

**In any case, make sure to survey safely; e.g., do not survey on or immediately adjacent to an active railroad track or on a roadside where you will not be safe from vehicular traffic.** As in the case with natural areas, make sure to choose a site for which you would have sufficient access to survey it (this can include, for example, looking at the vegetation in an abandoned lot through a surrounding fence).

As will be described to you in your training session, you should survey the HPA for 400 meters in 100-meter segments (using the HPA Data Form and your GPS unit or cellphone). If you detect species in the last 100 meters that you had not detected along the previous 300 meters, you should survey an additional 100 meters of the HPA.

### Species lists:

You will note that each of the data recording forms lists two groups of species. Group 1 consists of species that are known to be widely established throughout our PRISM region. Group 2 comprises species that have only begun to establish themselves in our region or are threatening to invade from adjacent areas. Based on this distinction between the two groups of species, the data-collection and documentation procedures differ between them, with greater requirements for Group 2, as will be described in your training session.

### Opportunistic observations :

As noted above, the Opportunistic Observation Forms are to be used to record information on focal species that would otherwise go unreported in your block. You can use these forms not only for such sightings from natural area locations that you are not formally surveying, but also to record those from anywhere in your block where otherwise unreported species appear. For example, if you have completed the HPA and natural area surveys for your block without recording wild parsnip in either of them, and then find this species established along a roadside in your block, you should use the this form to record the relevant information for this occurrence (and a GPS unit or cellphone to obtain the geospatial location data).

### Thanks again:

By participating in the 2016 LHPRISM Blockbuster Survey, you'll be making an important contribution to the knowledge and understanding of invasive plants in our region, which is greatly appreciated. We hope that you find this an enjoyable and rewarding experience.

This project was contracted by the Lower Hudson Partnership for Regional Invasive Species Management using funds from the Environmental Protection Fund as administered by the New York State Department of Environmental Conservation.




## Appendix IV: Example of Best Management Practices Created by Hudsonia


For the full PDF of Best Management Practices, please visit <https://goo.gl/zIX0qO>

**BEST MANAGEMENT PRACTICES  
FOR INVASIVE PLANTS**

**LOWER HUDSON VALLEY PRISM**




**HUDSONIA**




### JAPANESE BARBERRY (*Berberis thunbergii*)

Prohibited Invasive Species in New York (6 NYCRR § 575.3(d)(2)(ix))



Dense barberry understory in a NY forest

© E. Kiviat



Leaves are obovate (wider above the middle) and clustered

B.E. Wofford and E.W. Chester  
<http://tenn.bio.utk.edu/>

A thorny shrub, usually less than 1.5 m tall (but sometimes to 3 m). Leaves have smooth margins and occur in clusters on alternate branch nodes, often with a single spine.

Japanese barberry flowers in early spring, and fruits ripen to red in early fall. Fruits are fleshy, with a single seed, and often persist well into winter.

*Japanese barberry was introduced to the North America from Japan in the 19<sup>th</sup> century. It has a widespread distribution in the US (most of the Northeast and Midwest, and parts of the Southeast and West) because it has been planted as an ornamental for over 100 years.*

**Similar species:** Common barberry (*Berberis vulgaris*), seen much less frequently, is also nonnative. It has serrate leaves and three-branched spines.

**Where found:** Japanese barberry tolerates a wide variety of soil and light conditions and can be found in disturbed areas, oldfields, forest edges, deciduous and coniferous forest interiors, and swamps.<sup>1</sup> It occurs more often (and has higher productivity) in soils with high nitrogen availability.<sup>2</sup> Germination requires adequate light and moisture, but once established barberry can persist under a dense canopy (<1% sunlight) and in all but the driest sites.<sup>1,3</sup> Barberry has been described as a “long-term abandonment specialist” because its occurrence is strongly associated with pasture or cropland that returned to forest many decades ago.<sup>3</sup> White-tailed deer seem to find Japanese barberry distasteful and their preferential browsing of other plants may reduce woody competition for

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Lower Hudson PRISM

## Appendix V: New York Botanical Garden *Corydalis incisa* Survey

### Materials and Methods (Excerpt from NYBG Final Report)

Permission was requested and granted by the Westchester County Parks Department to conduct the research. A large-scale Hagstrom Westchester County Street map and a tape measure were used to designate 20 sites spaced as close to one kilometer apart as possible. The sites were marked on the physical map and then used to locate the sites on Google Earth and Google Maps. A snapshot of each Google Earth and Google Map section encompassing that site was then extracted. Using Adobe Illustrator, a star was placed at the approximate site where each transect should be placed and the image was saved as a jpeg file. In determining placement, some consideration was given to terrain at that site as well as obstructions such as bridges, roads, and buildings, such that a 100-meter straight line could be accommodated as fully as possible and as close to one kilometer distance from either adjacent site as possible. Once the sites were identified, a workshop was designed to recruit and train volunteers to conduct the surveys as well as enter survey results in iMapInvasives, the invasives database maintained by the New York Natural Heritage Program. The workshop was advertised through the PRISM network, the NYBG network, and the iMapInvasives website. The workshop was held on May 18, 2016 at NYBG. Daniel Atha gave a presentation introducing *Corydalis incisa*, its introduction and discovery in North America and its identifying features. Jennifer Dean, Ph.D., Invasive Species Biologist, New York Natural Heritage Program, introduced iMapInvasives and gave an overview on data entry. Twenty teams were assembled with a minimum of two surveyors for each site. The exact survey date was chosen by the participants. Each team was given a survey kit consisting of the following equipment: safety vests; two orange plastic stakes; four snow marking pins; a 100-meter mason line on spool, marked every ten meters; a 10-meter heavy rope marked every meter; a 1-meter PVC square; a measuring tape; plant press; clipboard; pencils; a copy of the work-plan with maps of each site and datasheets. Each team was required to have a GPS enabled device for obtaining latitude and longitude. All personnel were required to wear safety vests while conducting the surveys. Upon arrival at each site, the team established the two end points of the 100-meter transect as indicated by the star on the map provided. One of the orange plastic stakes was sunk at each end of the transect and the line was extended in a straight line the full 100-meter length and attached to the stakes at both ends. The location of each stake was recorded using GPS. The accuracy as indicated by the device was recorded. The canopy cover was estimated for the transect and recorded. Dominant species were recorded for each layer of the vegetation (canopy, shrub and herb layers). The landscape type was recorded based on broad categories such as riparian forest, lawn, floodplain forest, etc. Notes regarding special problems or unusual occurrences at each site were recorded. The 100-meter transect was divided into 10 plots, each plot 10 meters by 10 meters. The 10-meter heavy rope was extended perpendicular to the 100-meter mason line and the ends marked with the snow marking stakes. These formed two of the four corners of the plot. The process was repeated 10 meters further down the mason line to establish the remaining two corners.



## **Appendix V (Continued): New York Botanical Garden *Corydalis incisa* Survey**

In this way, the survey crew could efficiently survey the site without having to remeasure the distance from the center line. The 10 meter square plots were then surveyed for the presence of *Corydalis incisa*. If none was found, the team moved on to the next plot along the transect and repeated the process for establishing the 10 x 10 meter plot. If any *Corydalis incisa* plants were found, the team estimated the number of patches and the size of each patch within the plot and recorded the information on the data sheets. A random number between 1 and 100 was generated using an electronic random number generator. The one-meter PVC square was placed in the subplot corresponding to that number as depicted in the diagram. Each subplot was surveyed for the presence of *Corydalis incisa* plants. Juveniles and adults were counted separately and recorded on the data sheets. After the plants were counted within the plots and subplots all individuals of *Corydalis incisa* were pulled and bagged. The plants were later discarded with municipal trash. If *Corydalis incisa* was found, a herbarium specimen was prepared for permanent deposition in the William and Lynda Steere Herbarium at NYBG. In addition, a tissue sample of the plants was placed in silica gel for DNA analysis. At sites where *Corydalis incisa* was removed, locally sourced seed of *Persicaria virginiana*, *Juncus tenuis* and *Symphyotrichum cordifolium* was or will be broadcast. Management suggestions for the site were recorded by the teams. Suggestions included removal of trash and dangerous obstacles and management of invasive species, etc. Data sheets were returned to Project staff at NYBG for photocopying, data entry, and archiving. All data was entered into iMapInvasives where it is publicly available. The transect polygons were entered as a survey record and, if *Corydalis incisa* was found at a site, the specimen was entered as an occurrence record.

## Appendix VI: SOLitude Lake Management *Hydrilla* Survey Protocol

### (Excerpt from SOLitude Lake Management Final Report)

#### Point Intercept Aquatic Plant Surveys

The Point Intercept Method (PIM) of sampling aquatic macrophytes is generally accepted by lake managers as a suitable procedure to map submersed aquatic macrophytes in a lake. The PIM is designed to be utilized by volunteer and citizen science groups, and is the method preferred by the NYSDEC. Prior to conducting the initial hydrilla delineation 2014, the *2013 Monitoring Report of the Cayuga Inlet and Southern Cayuga Lake Monoecious Hydrilla Eradication Project* (Johnson, 2014) was reviewed to develop similar surveying protocols for this project. In 2016, we used similar survey protocols, but we increased our effort from 29 GPS-referenced sites in 2014 to 93 GPS-referenced sites in 2016.

The total number of sample locations is typically based on the total acreage of the lake. As a rule of thumb, one sample location per acre (minimum 50 sample locations) is surveyed at a given site. A 50 meter by 50 meter grid is considered standard and was overlaid to establish sampling locations (Johnson, 2014). For the 2014 survey at Black Rock Park, we utilized a 40 meter by 40 meter grid to increase the number of sampling points to 29. This year, we further decreased our grid size to 20 meters by 20 meters, which gave us 93 sites to sample. This additional effort was conducted due to the increased abundance and distribution of hydrilla at this location. Table 1 below is a summary of the sampling areas, including code, description, date surveyed, the number of GPS-referenced sampling locations (if applicable), and notes.

Table 1 2016 Sample Site Summary

Section	Description	Date	# Sites	Notes
A	Black Rock Park SAV	10/4/16	93	2014: 29 sites were surveyed
A	Black Rock Park Tuber	10/25/16	6	2015: 2 sites were surveyed

Before the survey began, sample locations were plotted on a grid overlay map of the target locations focusing on the littoral areas. Since there is no boat launch in the area, a canoe was carried in at the park (following permission from the Village of Croton-on-Hudson) to access the site. At GPS-referenced sites, using the overlay grid loaded onto the GPS unit, the canoe was paddled to the first sample location. On arrival, the GPS coordinates of the sample location was recorded using a Trimble GeoXH 2008 series handheld GPS unit with sub-meter accuracy. The water depth was also measured, using a handheld depth gun (HawkEye digital sonar system, or equivalent), or a calibrated metal pole, as appropriate to the conditions. The water depth was recorded on a field log. Any other pertinent field notes (such as floating fragments of hydrilla or established beds not sampled) regarding the sample location were also recorded on a field log.

Next, a weed rake attached to a 10 meter-long piece of rope is tossed from a random side of the boat. It is important to toss the weed rake the full 10 meters (a loop at the end of the rope is attached to the boat to prevent losing the anchor). The weed rake is slowly retrieved along

## Appendix VI (Continued): SOLitude Lake Management *Hydrilla* Survey Protocol

the bottom, and carefully hoisted into the boat. To determine the overall submersed vegetation amount, the weed mass is assigned one of five densities, based on semi-quantitative metrics developed by Cornell University (Lord, et al, 2005). These densities are: **No Plants** (empty anchor), **Trace** (one or two stems per weed rake, or the amount that can be held between two fingers), **Sparse** (three to 10 stems, but lightly covering the weed rake, or about a handful), **Medium** (more than 10 stems, and covering all the tines of the weed rake), or **Dense** (entire weed rake full of stems, and one has trouble getting the mass into the boat). See the Appendix of this report for pictures of these representative densities. These densities are abbreviated in the field notes as 0, T, S, M, and D. Next, the submersed weed mass is sorted by genus (or species if possible) and one of the five densities (as described above) is assigned to each genus and/or species. This procedure is then repeated for the remaining sample points.

Following methods established at Cayuga Lake Inlet for the monitoring of hydrilla, we utilized two weed rake tosses per site. The tosses were conducted from opposite sides of the canoe and were labeled Toss A, and Toss B, respectively. The data for both of these tosses are included on Table #2, in the Appendix. Each density was assigned a numeric value: 0 for no plants, 1 for trace, 2 for sparse, 3 for medium, and 4 for dense plants. The mean of these three values for all tosses (rounded up) are also displayed on Table #2. These mean values were used to assign overall densities, as depicted on the distribution maps in the Appendix. For example, if toss A was dense density (4), and toss B was sparse density (2) for the same macrophyte, the mean density would be medium ( $4+2=6/2=3$ ). Although using two tosses is ideal for detecting the presence of target species (and species occurring infrequently), these procedures and associated calculations tend to decrease the overall abundance per site. However, our primary goal was to delineate hydrilla, so two tosses per site should result in a greater frequency of occurrence for target species.

A sample of each different macrophyte is collected and placed in a bottle or Ziploc-type bag with a letter or number code (A, B, 1, 2, etc.). If possible, these samples included both submersed and floating leaves (if any), seeds, and flowers (if present), to facilitate identification. These bottles are placed in a cooler stocked with blue-ice packs or ice, and returned to Allied Biological's lab for positive identification and photographing. Regionally appropriate taxonomic keys are used to identify the aquatic macrophytes (a list of references is included in the appendix) to the lowest practical taxa, typically to species.

The weed rake used for aquatic macrophyte surveys has a specific design. It is constructed with two 13.5-inch wide metal garden rakes attached back to back with several hose clamps. The wooden handles are removed and a 10 meter-long nylon rope is attached to the rake heads.

## Appendix VII: Scenic Hudson Boot Brush Station Plans

### Boot Brush Stations

Nate Nardi-Cyrus and Megan Johnson, Scenic Hudson  
January 2017

Boot brush stations are designed to educate the public about the spread of invasive organisms. These stations consist of an educational sign and a brush where people can clean their boots. The sign is designed to give some general information about a few invasives in the area/park. The function of the boot brush is to give people the opportunity to clean their boots as they come and go from an area/park so they don't contribute to the spread of invasives. The idea was conceptualized by The Nature Conservancy and the University of Wisconsin Extension.

#### Frame Assembly

Best-Ex, Inc  
820 Industrial Court  
Baraboo, WI 53913-0454  
[www.best-xfab.com](http://www.best-xfab.com)  
(800) 867-6884  
[info@best-xfab.com](mailto:info@best-xfab.com)

\$285.81 per frame (not including shipping)

The standard frame for the panel is designed to attach to 2 rot resistant wood posts, and a boot brush assembly attaches to the main posts and holds a replaceable boot brush.

Shipping costs for two units from Baraboo, WI to Poughkeepsie, NY is \$ 56.35.





## Appendix VII (Continued): Scenic Hudson Boot Brush Station Plans

### Sign

Timely Signs  
154 Clinton Ave  
Kingston, NY 12401  
www.timelysigns.com  
(845) 331-8710  
mail@timelysigns.com

\$75 per sign (18" x 24", 1/8" thick single sided aluminum laminate panel)

The sign was designed and ordered to fit the boot brush frame. The design of the sign was adopted from the Finger Lakes PRISM and personalized by a Scenic Hudson graphic designer. The content of the sign was modeled after the signs from the Finger Lakes PRISM and personalized to fit the specific site where the boot brush stations were being implemented.

### Other Information

Other materials that might be needed include treated lumber and any cement/gravel for an optional catch underneath the boot brush. Replaceable boot brushes are available online, and Best-Ex can be contacted for more information.

You can contact Nate Nardi-Cyrus directly for more information or digital high resolution copies of our signs for printing; [ncyrus@scenichudson.org](mailto:ncyrus@scenichudson.org)





## Appendix VIII: LHPRISM Signed Partners and Participants

Partners listed in bold are elected from the membership to serve on the Steering Committee.

### **Signed Partners**

1. Andrew P. Thompson
2. Bedford Audubon Society
3. BioBoat
4. Black Rock Forest Consortium
5. Bronx River Alliance
6. The Bronx River Parkway Reservation Conservancy
- 7. Cary Institute of Ecosystem Studies**
8. Constitution Marsh Audubon Center & Sanctuary
9. Cornell Cooperative Extension – Dutchess County
10. Cornell Cooperative Extension – Orange County
- 11. Cornell Cooperative Extension – Putnam County**
12. Cornell Cooperative Extension – Rockland County
- 13. Ecological Research Institute**
14. Friends of the Great Swamp
15. The Friends of the Old Croton Aqueduct
16. Hike New York
17. Housatonic Valley Association
18. Hudson Highlands Land Trust
19. Hudsonia
20. Hudson River Sloop Clearwater
21. Jay Heritage Center
22. John Mickelson of Geospatial & Ecological Services
23. Mianus River Gorge, Inc.
24. The Native Plant Center, a program of Westchester Community College Foundation
25. Natural Areas Conservancy
26. The New York Botanical Garden
- 27. New York City Department of Environmental Protection**
28. New York City Department of Parks & Recreation
- 29. New York-New Jersey Trail Conference**
30. Pace University
31. The Pound Ridge Land Conservancy Inc.
32. Putnam County Soil and Water Conservation District
33. Rye Nature Center
34. Saw Mill River Audubon
35. Scenic Hudson, Inc.
36. SOLitude Lake Management
37. Teatown Lake Reservation
38. The Invasives Project - Pound Ridge
39. Three Arrows Cooperative
- 40. Trillium Invasive Species Management, Inc.**
41. Village of Tuxedo Park
42. Walter Daniels

- 43. Westchester County Parks, Recreation, Conservation
- 44. Westchester Land Trust**
- 45. Winnakee Land Trust

***Participants***

- 46. New York State Department of Environmental Conservation Region 3 – Lands & Forests
- 47. New York State Office of Parks, Recreation, and Historical Preservation
- 48. Orange County Land Trust
- 49. Palisades Interstate Park Commission
- 50. Three Lakes Council
- 51. Wave Hill
- 52. West Point US Military Academy

## Appendix IX: LHPRISM Partner Invasive Species Targeted For Eradication

Scientific Name	Common Name	Acres Treated
<i>Acer palmatum</i>	Japanese maple	0.96993
<i>Acer platanoides</i>	Norway maple	2.45433
<i>Actinidia polygama</i>	silver vine	1.61313
<i>Aegopodium podagraria</i>	bishop's goutweed	30.13988
<i>Ailanthus altissima</i>	tree-of-heaven	11.01138
<i>Alliaria petiolata</i>	garlic mustard	38.97685
<i>Alnus glutinosa</i>	European alder	0.20000
<i>Ampelopsis brevipedunculata</i>	porcelainberry	83.96975
<i>Arabidopsis</i>	rock cress	0.75000
<i>Aralia elata</i>	Japanese angelica tree	19.68929
<i>Artemisia vulgaris</i>	mugwort	3.79860
<i>Arthraxon hispidus</i>	small carpetgrass	0.00506
<i>Berberis thunbergii</i>	Japanese barberry	61.15944
<i>Cardamine impatiens</i>	narrowleaf bittercress	1.48163
<i>Celastrus orbiculatus</i>	Oriental bittersweet	48.49836
<i>Chelidonium majus</i>	celandine	0.18225
<i>Clematis terniflora</i>	sweet autumn virginsbower	0.25000
<i>Corydalis incisa</i>	incised fumewort	0.28646
<i>Cynanchum louiseae</i>	black swallowwort	11.59912
<i>Cytisus scoparius</i>	Scotch broom	9.98559
<i>Deutzia scabra</i>	fuzzy pride-of-Rochester	0.01688
<i>Elaeagnus umbellata</i>	autumn olive	3.23761
<i>Epipactis helleborine</i>	broadleaf helleborine	0.00005
<i>Euonymus fortunei</i>	winter creeper	1.61258
<i>Euonymus alatus</i>	burning bush	15.84058
<i>Ficaria verna</i>	fig buttercup	0.60000
<i>Forsythia intermedia</i>	showy forsythia	0.71775
<i>Frangula alnus</i>	glossy buckthorn	1.16133
<i>Hedera helix</i>	English ivy	0.26131
<i>Heracleum mantegazzianum</i>	giant hogweed	0.52363
<i>Humulus japonicus</i>	Japanese hops	0.43135
<i>Hydrilla</i>	hydrilla	1.00000
<i>Ilex crenata</i>	Japanese holly	0.00578
<i>Ligustrum L.</i>	privet	2.79863
<i>Ligustrum obtusifolium</i>	border privet	2.64881
<i>Lonicera japonica</i>	Japanese honeysuckle	42.85801
<i>Lonicera L.</i>	honeysuckle	1.85950
<i>Microstegium vimineum</i>	Japanese stiltgrass	17.13220
330 <i>Miscanthus sinensis</i>	Chinese silvergrass	3.26080
<i>Morus alba</i>	white mulberry	0.83835
<i>Pachysandra</i>	pachysandra	0.25000
<i>Phalaris arundinacea</i>	Reed canarygrass	0.20506

<i>Phellodendron amurense</i>	amur corktree	0.04000
<i>Philadelphus coronarius</i>	sweet mock orange	0.18000
<i>Photinia villosa</i>	Oriental photinia	0.55800
<i>Phragmites australis</i>	common reed	30.20000
<i>Pleioblastus</i>	dwarf bamboo	0.15638
<i>Polygonum cuspidatum</i>	Japanese knotweed	6.45338
<i>Polygonum persicaria</i>	lady's pepperthumb	3.40000
<i>Polygonum perfoliatum</i>	mile-a-minute	27.69348
<i>Pueraria montana</i>	kudzu	0.25000
<i>Rhodotypos scandens</i>	black jetbead	41.15884
<i>Rosa multiflora</i>	multiflora rose	25.36526
<i>Rubus phoenicolasius</i>	wineberry	20.10314
<i>Salicornia virginica</i>		0.14063
<i>Salvia glutinosa</i>	sticky sage	5.74650
<i>Spiraea prunifolia</i>	bridalwreath spirea	0.13500
<i>Syringa vulgaris</i>	common lilac	0.30713
<i>Trapa natans</i>	water chestnut	7.00000
<i>Viburnum dilatatum</i>	linden vibernum	3.40224
<i>Viburnum sieboldii</i>	Siebold's vibernum	0.09281
<i>Vinca minor</i>	common periwinkle	0.69863
<i>Wisteria sinensis</i>	Chinese wisteria	1.08281

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