



New York Invasive Species Research Institute

2016 Annual Report



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PROGRAM MISSION

The mission of the New York Invasive Species Research Institute (hereafter NYISRI) is to coordinate research to help prevent and manage the impact of invasive species.

NYISRI promotes collaboration and communication between partner organizations (including the Partnerships for Regional Invasive Species Management (PRISM) network and the New York State Department of Environmental Conservation (DEC)) and researchers from academic institutions and agencies. NYISRI organizes conferences, workshops and webinars, develops collaborations, promotes necessary research, and disseminates new findings to ultimately improve the scientific-basis of invasive species management.

NYISRI tailors its work primarily to New York State, however information and connections generated by NYISRI provide benefits to partners across the Northeast Region.

ACKNOWLEDGEMENTS

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Dr. Bernd Blossey and his lab group for their valuable feedback and contributions to improving and advancing the work that NYISRI does

Cornell IT and David Cutri for their assistance developing and maintaining the NYSRI website (nyisri.org)

Wade Simmons for improving a previous version of this report

Our partners, and the many researchers who have dedicated time and effort to improving the scientific basis of invasive species management



EXECUTIVE SUMMARY

Throughout 2016, NYISRI has worked to **make connections, promote and coordinate research,** and **communicate information** to improve invasive species policy and management in New York State.

Through participation in research conferences and statewide management meetings, NYISRI has built connections with academic researchers, management professionals, and policy makers, and actively sought out opportunities for collaboration both close to home and regionally. In 2016, in addition to traditional partnerships, NYISRI specifically reached out to researchers in disciplines less frequently related to invasive species (including decision science, robotics, and computer science) in hopes that engaging different perspectives and tapping into new expertise will improve our ability to address invasive species issues. In doing so, NYISRI expanded its network of researcher and organizational contacts who have been invaluable in the development of new projects, assembling of workshops, conferences and webinar series and providing relevant and up to date information on research.

Taking part in state meetings, calls, and working groups allowed NYISRI to connect with partners, gain insight into the current information needs of organizations across the state, and take actions to address them. NYISRI has worked to identify and communicate information gaps and research needs to appropriate researchers, and in 2016 presented to the NY Invasive Species Council strategies to advance three research projects (biocontrol of hemlock woolly adelgid, biocontrol of water chestnut, and the development of a statewide prioritization tool) that were supported by the Invasive Species Coordination Unit and PRISMs. NYISRI also provides research updates on its website via a monthly Invasive Species Research Digest, Research Blog, and News page.

Additionally, NYISRI regularly responds to information requests from partners and the general public, and plays an active role in planning conferences, symposia, and statewide webinars. The 2016 highlights provide an overview of some of the year's accomplishments.



2016 HIGHLIGHTS

- Planned and hosted a successful Invasive Species Conference at the CCE In-service with nine different sessions and nineteen speakers from across the Northeast
- Expanded the NYISRI network of collaborators and partners through attending conferences, visiting universities, and presenting at various venues
- Collaborated with Cornell Botanic Gardens to bring Dr. Doug Tallamy as a keynote speaker for the Cornell Cooperative Extension In-service
- Expanded the NYISRI web presence through Twitter (@NY_ISRI), launched a blog, posted monthly lists of invasive species research publications and built Managers and Lecturers Databases into the NYISRI website
- Coordinated the Northeast Regional Invasive Species and Climate Change Workshop at the University of Massachusetts Amherst in collaboration with the USGS Northeast Climate Science Center and Dr. Bethany Bradley
- Supported the advancement of research on the biological control of water chestnut, hemlock woolly adelgid, pale and black swallow-wort as well as an invasive species prioritization project and an evaluation of the effectiveness of purple loosestrife biocontrol in commemoration of the 25th anniversary of the agents' release of in NYS
- Led an Invasive Species Advisory Committee Work Group to summarize forest pest policy recommendations in a memo to the New York Invasive Species Council
- Conducted the first field season with NY State Parks FORCES program and faculty from SUNY Cortland to evaluate the effectiveness of swallow-wort control efforts
- Surveyed for and compiled research needs from all eight PRISMs and developed projects and programs, as well as organized research presentations to help meet those needs



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MAKING CONNECTIONS

Building a Network

A. Statewide Participation

NYISRI is a partner to many New York organizations, including the PRISMs, the New York Natural Heritage Program, and New York State Parks, and has served as an active participant in many work groups, including:

- Biological Control Advisory Team
- Brachypodium Working Group
- CCE Invasive Species Work Team
- Cultivar Assessment Team
- iMap Invasives Spatial Prioritization Working Group
- iMap Invasives User Feedback Group
- Invasive Species Awareness Week 2017 Planning Committee
- NY ISAC Restoration Working Group
- NYS IPM Biocontrol Specialist Search

NYISRI also participated in statewide meetings with partners:

- All NY Invasive Species Council Meetings
- All NY Invasive Species Advisory Committee Meetings
- Quarterly PRISM Leaders Meetings
- Monthly All PRISM Webinar meetings
- New York State Hemlock Initiative Meetings
- Spring Finger Lakes PRISM Meeting



Figure 1. Quarterly PRISM Meeting. Photo Credit: Meg Wilkinson

B. Scientific Conferences and Training Participation

As a link between the research and management worlds, NYISRI makes it a priority to connect with researchers and stay up-to-date with new invasive species research. Conferences are a fundamental component to making professional connections in the research sphere. NYISRI participated in the following conferences and trainings in 2016:

- 27th USDA Interagency Forum on Invasive Species, Annapolis, MD (January 12-15th, 2016)
- Communicating Science Workshop, Cornell University, Ithaca, NY (February 5-7th, 2016)
- Structured Decision Making Training, National Conservation Training Center, Shepherdstown, WV (March 7-11th, 2016)
- Climate Change Seminar Series, Cornell University, Ithaca, NY (Spring 2016)
- 4th annual International Computational Sustainability Network conference Cornell University, Ithaca, NY (July 6-8th 2016)
- International Workshop on Biological Invasions in Forests, Shepherdstown, WV (July 17-20, 2016)
- National Hemlock Woolly Adelgid Managers Meeting, Cornell University, Ithaca, NY (July 26-28th, 2016)
- Controversial Topics in Conservation Seminar, Cornell University, Ithaca, NY (Fall 2016)
- National Forum on Climate and Pests National Academy of the Sciences (Invited attendee), Washington D.C. (October 4-6th, 2016)
- Cornell Cooperative Extension In-service Invasive Species Track, Cornell University, Ithaca, NY (November 3-5th, 2016)
- The National Invasive Species Council Innovation Summit- Overcoming the Invasive Species Challenge, Washington D.C. (December 5th, 2016)



Figure 2. Attendees from the Climate Change and Pest Summit held at the National Academy of Sciences in Washington D.C with NYISRI Director Carrie Brown-Lima front row, second from right. Photo credit: Nancy Cusumano

C. Presentations

In order to promote and share the work that NYISRI does, as well as establish new connections, NYISRI gives presentations across a range of venues, from academic conferences to local outreach programs. In 2016, NYISRI reached thousands of people through the following presentations:

- Presented NYS research priorities to the NY Invasive Species Council, Albany, NY (January 2016)
- Presented on NYISRI, invasive species infrastructure in NYS & early detection, Annual Meeting of the Society for American Foresters – New York Section, Syracuse, NY (January 2016)
- Tabled and introduced NYISRI at CCE Horticulture In-service Event, Cornell University (April 2016)
- Invited speaker at the Annual FRESH In-service (In-service for CCE county educators on forest issues), Cornell University Arnot Forest, (May 2016)
- Seminar speaker in the Department of Natural Resources Seminar Series, Cornell University, Ithaca, NY (May 2016)
- Invited speaker on the CCE Horticulture Webinar (June 2016)
- Poster presenter at the International Workshop on Biological Invasions in Forests held at the NCTC in Shepherdstown, WV (July 2016)
- Guest lecturer for Intro to Field Biology course, Department of Natural Resources, Cornell University (October 2016)
- Lab section leader on invasive species and iMap for Intro to Field Biology course in the Department of Natural Resources, Cornell University (October 2016)
- Tabled at the Cornell Department of Entomology Insectapalooza Outreach Event, Cornell University (October 2016)
- Presented on the outcomes of the Climate Change and Invasive Species Workshop at the CCE Inservice Invasive Species Track (November 2016)



Figure 3. Teaching about invasive species at the 2016 Insectapalooza, an event attended by over 2,200 people from around the region.

D. Meeting with Scientists & Other Organizations

In order to create a network of researchers and institutes to address invasive species research needs in NYS, NYISRI director Carrie Brown-Lima continually met with invasive species researchers throughout the year. She sought to better understand their work and open up opportunities for future collaboration and information sharing. NYISRI also met with individuals from many institutions and organizations (listed in Appendix 2) to identify synergies and potential partnerships.

Collaborations

A major role of NYISRI is to facilitate partnerships which further the mission of improving the scientific basis of invasive species management. The following projects or programs are the results of NYISRI's valuable collaborations.

E. Northeast Regional Invasive Species & Climate Change Management Collaboration

As a direct result of input from PRISMs and partners on the need to understand how to manage invasive species in the context of climate change, NYISRI reached out to and established partnerships with researchers at the University of Massachusetts Amherst and the Northeast Climate Science Center to create the Northeast Regional Invasive Species and Climate Change (RISCC) Management Project.

In Summer 2016, a workshop was coordinated to address the question: *"How can we manage for upcoming biological invasions in the light of climate change?"* Further details on this collaboration are provided in Research Initiatives Section M.



Figure 4. The Northeast RISCC Management Logo, a collaboration between NYISRI, UMass and the USGS NE Climate Science Center.

F. Cornell Naturalist Outreach Program Partnership

Working in partnership with Dr. Linda Rayor and the Cornell Naturalist Outreach Program and Carol Jennings of the Park Media Lab at Ithaca College, NYISRI worked collaboratively to produce an educational video on a high-priority invasive species.

Hydrilla (*Hydrilla verticillata*), a high-impact invasive aquatic plant with serious potential to expand its range within the Finger Lake's Region, was selected as the focal species of this video.



Figure 5. Ithaca College's video production team films hydrilla among other aquatic plants

Consulting primary literature on the topic, the NYISRI team developed a script for a short (5-6 minute), scientifically-accurate and engaging video on hydrilla for a boat steward or general community audience. The video provides a basic overview of the biology and life cycle of hydrilla, focusing on its ability to expand and spread (the “why” of management), and emphasizes prevention as the best management option for this aggressive species.

In addition to writing the script, NYISRI connected the film crew with professionals in the field to get needed video footage, requested images from partner organizations, and staged scenes for filming as needed. The final product will be available in Spring 2017 on the Naturalist Outreach YouTube channel and website, as well as on the NY Invasives YouTube channel for public use.

G. Cornell Botanic Gardens Partnership & ISAW 2016

NYISRI has partnered with Cornell Botanic Gardens (formerly Cornell Plantations) for two consecutive years to put together events for Invasive Species Awareness Week (ISAW).

In 2016, Cornell Botanic Gardens' botanist Robert Wesley led an invasive plant identification walk for ISAW. NYISRI director Carrie Brown-Lima kicked off the walk with an overview on the PRISM network and the importance of ISAW. The event was a success with over 30 attendees, despite inclement weather.



Figure 6. Robert Wesley talks to plant walk participants about oriental bittersweet.



Figure 7. Carrie Brown-Lima with the NY ISAW table in the Cornell Botanic Garden Nevin Welcome Center.

During the week ISAW (July 11-15, 2016) NYISRI also maintained a table in the Welcome Center of Cornell Botanic Gardens which displayed invasive species materials including fact sheets, stickers, pamphlets, and other outreach material such as the NYS DEC Prohibited and Regulated Invasive Plant and Animal booklets. The table was well visited as the Welcome Center received approximately 800 visitors throughout the week.

In addition to collaborating to plan local events for Invasive Species Awareness Week, in Fall 2016, NYISRI and Cornell Botanic Gardens worked together to bring Dr. Doug Tallamy to Cornell’s campus for the once-a-year In-service.

H. iMap Invasives Partnership

The New York Natural Heritage Program Team maintains the iMap Invasives database, an online resource which allows registered users to report invasive species observations and management work. Working with the New York iMap Invasives program, NYISRI coordinated three user training sessions in 2016.

In May 2016, NYISRI arranged for an iMap Invasives Training workshop to be held at Cornell University as part of iMap’s Spring Training Blitz. Twenty-five people attended the informational session, which was followed by a



Figure 8. Dr. Jennifer Dean trains new users on how to use iMap Invasives.

guided invasive species walk around the Cornell campus and Cornell Botanic Gardens.

In Fall 2016, NYISRI partnered with iMap and professors of an Introductory Field Biology course at Cornell University to develop a lesson plan to teach students about invasive species. The lesson gave an overview of invasive species and their impacts. The lab section that followed gave students hands-on experience with invasive plant identification, GPS units and collecting data in the field. Students then learned how to enter their data into the iMap Invasives database both using the App and the online interface. A third iMap training session was also held during the annual November In-service.

In addition to coordinating trainings, NYISRI is also partnering with the iMap team on a state-wide invasive species prioritization project, detailed under Research Initiatives Section L.

I. NYS Parks FORCES Program Partnership

Assessing whether management efforts are effective in achieving their objectives is a challenge that many invasive species managers face. As part of a pilot program to establish a monitoring system within managed areas, NYISRI partnered with Dr. Andrea Davalos of SUNY Cortland and Tom Hughes and Rebecca Sibner of New York State Parks, to assess the success of pale swallow-wort management in Taughannock State Park.



Figure 9. Left, Becky Sibner and the FORCES team discuss swallow-wort management; right, FORCES interns survey for swallow-wort seedlings at a field site.

Working with interns and students of the FORCES (Friends of Recreation, Conservation and Environmental Stewardship) program, this partnership developed and implemented a scientifically-rigorous monitoring plan for the management of swallow-wort. The pilot program targeted management in the Park's extensive population of swallow-wort, a plant that is pervasive in both open fields and forest understory.

On June 23, 2016, NYISRI provided support for the first training day, where FORCES stewards established experimental transects and collected quantitative data on swallow-wort presence. Additional transects were established and monitored in subsequent months as part of the FORCES work plan. This partnership is ongoing, and further monitoring and protocol improvement is slated for Summer 2017.



Figure 10. Dr. Andrea Davalos of SUNY Cortland and Tom Hughes of NY State Parks during the FORCES training



PROMOTING RESEARCH

Surveying Research Needs

A key role of the New York Invasive Species Research Institute is to coordinate and connect PRISMs and partners with the science needed to improve invasive species management. In order to understand the research needs of the PRISMs, NYISRI annually solicits input from partners around the state, including each of the PRISMs, the New York Natural Heritage Program, NYS Parks, and NY DEC’s Invasive Species Coordination Unit.

Feedback from these surveys is arranged by topic, and prioritized based on 1) feasibility, 2) potential for statewide benefit, and 3) frequency of research topic requests across organizations. Using these results, NYISRI develops potential research programs and presents these to the NYS Invasive Species Council (NY ISC). Several research projects are currently receiving or will receive funding (provided by the Environmental Protection Fund administered by the NYS DEC) thanks to these requests. These initiatives are detailed in the Research Initiatives Section below.

Research Initiatives

J. Water Chestnut Biocontrol



The advancement of the biological control of water chestnut emerged as a priority for 2014. Previous studies conducted by researchers in China identified a promising candidate: a leaf-feeding beetle, *Galerucella birmanica*. Led by Dr. Bernd Blossey (Associate Professor at Cornell University) with support through NYISRI and funding from the EPF funds administered by the NYS DEC, beetles were brought into quarantine in the United States for further testing in June of 2016. Host-specificity tests have been encouraging, and host preference tests as well as demographic studies are planned for the 2017 season. For a full report on the project’s 2016 activity, consult Appendix 1.

Figure 11. Left, *G. birmanica* larvae feeding on a water chestnut leaf.
Photo Credit: Audrey Bowe

K. Hemlock Woolly Adelgid Monitoring and Control



Figure 12. Releasing *Leucopis* flies at Skaneateles Lake.
Photo Credit: Mark Whitmore

Throughout 2016, NYISRI dedicated considerable time communicating about and facilitating and promoting the advancement of a Hemlock Woolly Adelgid (HWA) detection program and biocontrol research and monitoring. In response to requests from the PRISMs for additional access to HWA biocontrol agents, NYISRI developed a proposal together with forest entomologist Mark Whitmore on the next steps in this process and presented this proposal to the NY Invasive Species Council which was subsequently approved for funding.

NYISRI has continued to support the development of a comprehensive program by meeting regularly with Whitmore and his staff and attending the Hemlock Initiative's workshops and meetings. In Fall 2016, additional funding was approved for the establishment of an HWA biological control rearing facility on the Cornell University Campus.

L. Priority Setting

Due to limited resources (funding, time, materials), invasive species management almost always requires strategic prioritization of projects, areas, and species in order to have the greatest positive impact.

Since its inception in 2014, NYISRI has recognized discrepancies in the way invasive species managers are setting priorities and the challenges they face in allocating their limited resources. In 2015, in an effort to create a more uniform framework for invasive species decision-making in the state, NYISRI, together with the Cornell Cooperative Extension Invasive Species Program, coordinated an expert facilitated structured decision making workshop to tackle this issue. All eight PRISM leaders, the NYS DEC ISCU, iMap invasives, and NYS Parks Invasive Species coordinator and researchers participated in this two day meeting at Cornell University in Ithaca, NY. NYISRI took the outcome from this meeting and together with Dr. Jennifer Dean from the New York Natural Heritage Program (iMap Invasives), Dr. Angela Fuller from the New York Cooperative Fish and Wildlife Research Unit (Cornell University) and Dr. Carla Gomes from the Institute for Computational Sustainability (Cornell University), designed a project to address New York's invasive species prioritization needs.

A proposal for hiring a post-doctoral associate to further develop this project under the guidance of Dr. Angela Fuller (Cornell University) has been approved for funding in 2017.

M. Climate Change & Invasive Species Initiative

The question of how to manage invasive species in light of climate change emerged in discussions of research needs in 2015. NYISRI took a lead role in coordinating with faculty at the University of Massachusetts and climate scientists at the USGS Northeast Climate Science Center to organize and execute the Northeast Invasive Species and Climate Change Workshop on July 21st, 2016.



Figure 13. Dr. Bethany Bradley presents an overview of the impacts of climate change on invasive plants at the Northeast Invasive Species and Climate Change Workshop

This workshop was the result of input from various organizations (including many PRISM coordinators) about the need to address and plan for the implications of climate change when managing invasive species. This one-day event had participants from 9 natural resource agencies representing states across the Northeast. NYISRI and collaborators summarized the results of this workshop and the full [Northeast Invasive Species and Climate Change Workshop Report](#) is available on the NYISRI website.

Given considerable region-wide interest in this topic, one of the workshop recommendations was to create a list-serve to allow for continued communication and information sharing. NYISRI created and manages this list-serve (NE_RISCC-list), which has a membership of 125 members, and continues to grow as the initiative becomes more widely known.

Moving forward, NYISRI is working with partners to organize a 2-day symposium for July 2017, as well as a webinar series based around this topic. Further details on the symposium will be posted on the NYISRI website in Spring 2017.

N. Swallow-wort Biological Control Initiative

Along with water chestnut and hemlock woolly adelgid, the biological control of pale and black swallow-wort has emerged as a priority for research in New York State. NYISRI has been meeting with the key researchers that have been studying and rearing *Hypena opulenta*, a defoliating moth, to understand the status of approval for release and develop a strategy for additional research and biocontrol releases in New York State once permits are available. NYISRI has shared this strategy with the NY Invasive Species Council and has been working with the NYS DOT, the NYS DEC and researchers on ways to implement this strategy.



Figure 14. Pale Swallow-wort in flower. Photo Credit: Audrey Bowe



COMMUNICATING INFORMATION

Conference Organization

O. Cornell Cooperative Extension In-service

For the past two years, NYISRI has coordinated the Invasive Species Track of the Annual Cornell Cooperative Extension Agriculture, Food, and Environmental Systems In-service. In 2016, over 100 invasive species professionals attended the 3-day conference.

NYISRI worked with Cornell IT to have sessions recorded for both 2015 and 2016, and videos are posted on our Webinar and Recorded Talks page. Recordings from the 2016 In-service cumulatively gathered over 200 views in a month and a half.

Based on feedback received from the 2015 In-service, NYISRI organized fewer presentations in order to accommodate more discussion and time for questions. The In-service had nine different sessions, with a total of 19 speakers. Session topics included:

- Climate Change and Invasive Species
- Post Control Monitoring: Success or Invasion Treadmill
- Are “Alien” Plants “Bad”? – Keynote by Dr. Doug Tallamy
- Aquatic Invasive Species I: Environmental DNA
- Computer Science Applications for Invasive Species Prioritization and Management
- Aquatic Invasive Species II: Starry Stonewort and Robotic Applications for Water Sampling
- Biological Control: Advances and Updates
- Lessons Learned from Statewide Responses to Invasive Species
- Watercraft Inspection and Boat Washing Stations: Current Trends and Future Research Needs

The intention of each session was to provide content that would be interesting to attendees, as well as bring in speakers from outside fields to inspire novel collaborations. For example, sessions on aquatic invasive species featured talks on using environmental DNA to detect invasive aquatic species. A subsequent session included a talk on robotic boats that can autonomously sample waterbodies, collecting massive amounts of environmental data in a short time frame.

The computer science applications session showcased the growing field of computational sustainability, which applies computer science concepts to generate optimal solutions for approaching complicated environmental problems.



Figure 15. Dr. Carla Gomes, Director of the Institute for Computational Sustainability, talks about using computer science applications to solve invasive species problems. Photo Credit: Carrie Brown-Lima

Participants from the 2016 In-service gave very positive feedback via a post-meeting survey, with 94% agreeing or strongly agreeing that the conference was beneficial to their professional development, and 97% agreeing or strongly agreeing that there was a good selection of workshops relevant to their interests. Eighty-eight percent of attendees indicated that they will likely implement something they learned at the conference upon returning to their job. Some feedback from participants included:

“Very engaging speakers and good networking with fellow attendees”

“I liked how presentations on similar topics were clustered together into one session. The presentation of different perspectives or research on one topic was useful and spurred meaningful discussion.”

“A good variety of topics were covered relating to invasive species management.”

“Invasive species sessions were spot-on and very informative.”

Collaborating with the Cornell Botanic Gardens, NYISRI brought Dr. Doug Tallamy, a high-profile researcher from the University of Delaware, to speak. His seminar, [Are “Alien” Plants “Bad”?](#), was integrated with the seminar series of the Department of Natural Resources. He also gave a public talk, [“It’s for the Birds,”](#) as part of the Cornell Botanic Garden’s Annual Fall Lecture Series. Both talks were well attended (over 100 people), and generated interest in creating a documentary-style video to further disseminate his message about the ecological importance of native landscaping that was shared in his presentations. NYISRI is currently working with staff from the NYS DEC ISCU to pursue this project.

P. Contributed Planning

In addition to planning its own conferences and events, NYISRI often plays a role in the identification and coordination of speakers for events held by other organizations. In 2016, NYISRI provided suggestions, contacted potential speakers, or assisted in logistical planning for the following:

- NY Chapter of the Society for American Foresters Invasive Species Workshop (Syracuse, NY, January 2016)
- New York State IPM Conference on invasive species conference (Albany, NY, scheduled for July 2017)

Hosting Monthly PRISM Calls

In February 2016, NYISRI assumed responsibility for hosting the monthly state-wide calls for the PRISM network. The calls, which occur on the last Wednesday of every month (excepting field season and holidays: July, August, December), typically draw 30-60 participants and feature a speaker on an invasive species topic. NYISRI is responsible for selecting, inviting, and coordinating with presenters before each call. This includes holding a test webinar to ensure speakers are comfortable with the platform and work out any technological problems on either end.

In 2016, NYISRI sought out speakers to present on a range of current topics, which are listed in Appendix 3. NYISRI posted presentation recordings for each call to the NY Invasives YouTube Channel (with permission from the speaker). Videos on the YouTube channel from 2016 garnered over 400 views, in addition to being viewed by call participants each month.

Invasive Species Advisory Council Memo – Recommendations to Prevent Forest Pests

Inspired by the publication of the paper [Nonnative forest insects and pathogens in the United States: Impacts and policy options](#) (Open Access), by Dr. Gary Lovett of the Cary Institute and his co-authors, NYISRI coordinated the drafting of a memo to submit to the NY Invasive Species Council promoting the paper’s recommendations to mitigate the introduction of invasive pests and pathogens into the United States. NYISRI has scheduled further discussions on this topic and is coordinating experts to present on this topic at the Spring 2017 NY ISAC meeting.

New York Invasive Species Research Institute Webpage

The New York Invasive Species Research Institute website was redesigned and soft-launched in November 2014. Since the redesign, various features and functions have been added in response to partner information needs and requests.

While the target audience of NYISRI is invasive species managers within New York State and the Northeast, the reach of the website is worldwide. Since tracking visitors began in October 2015, the site has received over 3,900 visitors and 11,100 views. In 2016, the NYISRI website saw over 3,000 visitors and gained 8,170 page views. Per day average over the course of the year was 22 views per day. Globally, nyisri.org has been accessed from over 1,000 different cities representing 92 different countries, and visitors within the United States were responsible for approximately 66% of global views and 63% of global users.

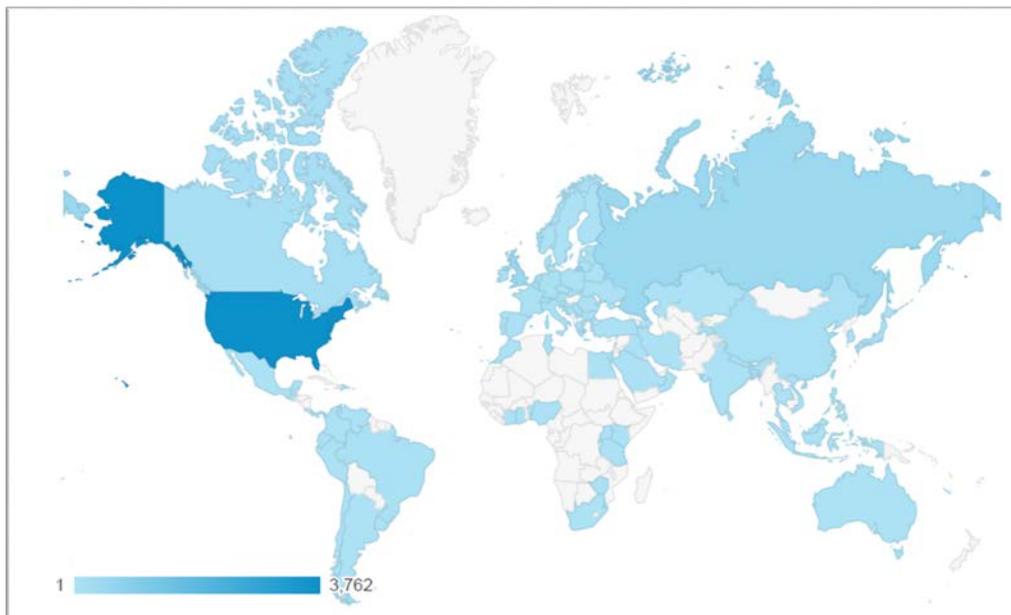


Figure 16. Site visits by country (October 2015 – January 2017)

Within the United States, users from 48 states have accessed nyisri.org, with 54% of viewers and 64% of sessions in the United States coming from New York State, and 71% of viewers and 79% of sessions from states making up the Northeast. In New York, users accessed nyisri.org from over 280 unique cities and towns.

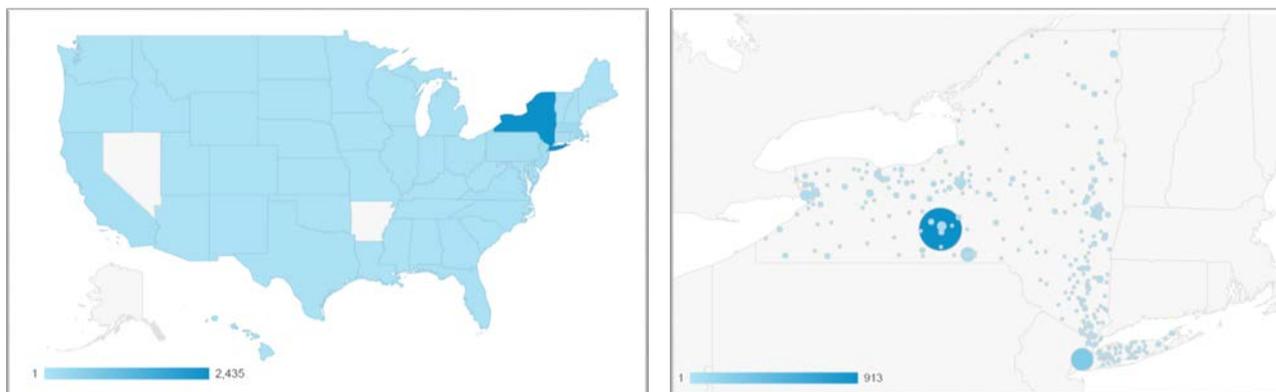


Figure 17. Site visitors by state (October 2015 – January 2017), left; Site visitors across the state (October 2015 – January 2017), right.

The NYISRI website (nyisri.org) is the primary medium by which the New York Invasive Species Research Institute communicates information on a day-to-day basis. The site features news on Research Institute initiatives, upcoming events and conferences, recent invasive species findings, funding opportunities, and many other resources.

Over the years, NYISRI has continually sought to increase the number and diversity of resources the site offers.

Q. Expert Database

Working with Cornell Information Technologies (CIT), NYISRI constructed and expanded upon a [searchable database](#) of invasive species experts working in New York State and the surrounding region.

A comprehensive search of New York State University websites and targeted literature surveys resulted in the identification of 180 researchers located in New York with publications on invasive species topics. These researchers were contacted in Spring of 2015 with a request to fill out a survey detailing their research. The survey received a 50% response rate, and these responses were used to populate a new database.

The updated database now features profiles of nearly 100 researchers and has been publicly accessible since 2015. Profiles of invasive species researchers include species worked on, contact information, location information, as well as a brief description of research.

Anyone wishing to connect with experts can search the database by these fields (PRISM region, University, species, etc.) and easily print results of the search. The database page is one of the

most popular website resources. In 2016, the Expert Database and related pages received over 650 page views.

R. Expert Database Expansion

More recently, the Expert Database has been further expanded to include invasive species managers to reflect the on-the-ground experience and expertise many managers can offer. It also provides the opportunity for people who are working on the same issues to share information. This addition, which went live in January of 2017, was the product of many month's development and testing.

Manager profiles are similar to researcher profiles in content, and include a section where reports and other grey literature that may not be publicly available can be posted.

NYISRI is also currently in the early stages of expanding the Expert Database once again to incorporate invasive species lecturers and educators at the university level. Working with Megan Phillips (Invasive Species Education and Outreach Coordinator, NYS DEC) and Cornell IT, NYISRI is in the process of developing a new section of the database to accommodate this user group. This resource will help the NYS DEC meet an objective of the recently published NYS Invasive Species Education and Outreach 5 year Plan.

S. Monthly Research Digest

Since October of 2015, NYISRI has scanned over three dozen ecology journals on a monthly basis to compile a list of newly published papers that could be of interest to those working with invasive species in New York. Papers are included if they contain one or more of the following criteria:

- 1) applied research on invasive species present in New York State or the Northeast,
- 2) theoretical concepts or models that have implications for management in New York
- 3) economic, social, or ecological impacts of invasive species on a regional or global scale

Studies of the “knowing-doing gap” in invasive species management have found that managers typically do not read or consult primary literature, and suggest limited time and access to scientific journals is a contributing factor. By providing this monthly list of recent invasive species publications, NYISRI hopes managers and partners across the state of New York can more easily access and keep up to date on current research.

NYISRI makes a point of connecting those who may not have access to particular journals to the resources they need. This page, which has been active since September of 2015 has generated 338 views, and many further engagements (as clicks on links to papers).

T. Biological Control Page

Given the potential for large-scale application and control of target species, there is tremendous interest in the manager community about biological control programs for invasive species. A problem identified by partners was the lack of publicly available information surrounding certain biological control programs, including the status and sources of biocontrol candidates and agents.

Additionally, rules and regulations surrounding the biocontrol approval process often mean agents can take years to become available, and the various stages of approval can be difficult to understand.

In an effort to clarify current promising biocontrol programs for problematic species, NYISRI created an interactive [Biocontrol in NYS](#) page. This page, which features 24 New York invasive species with active biocontrol programs, provides up-to-date information on stage of development and availability of the biocontrol agents.

Target pests



Biocontrol agent	Stage of development
Galerucella californiensis	Available, released in 1992
Galerucella pusilla	Available, released in 1992
Hylobius transversovittatus	Released in 1991
Nanophyes marmoratus	Released in 1994

Figure 18. Biocontrol page output for Purple Loosestrife (*Lythrum salicaria*).

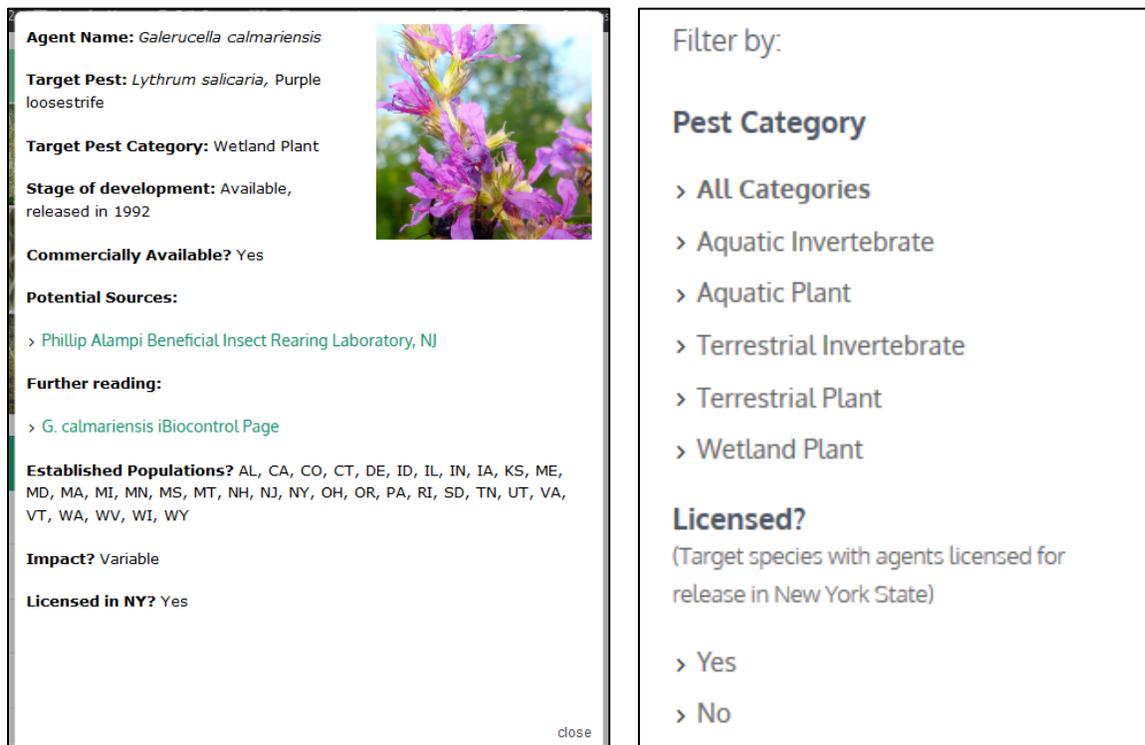


Figure 19. *Galerucella californiensis* agent profile (left); Filter options for biocontrol tool (right).

Users can filter by the target invasive species, or the biological control agent that are currently permitted for release in New York. When a species image is clicked on, the biological control agents associated with that plant or animal and current status of agents (e.g. approved, in-testing) appear below.

Clicking on an agent species brings up a profile which includes links to relevant studies as well as potential providers of these licensed insects, where available (Figure 19.).

Working with Dr. Bernd Blossey of Cornell University and other scientists managing biocontrol programs, NYISRI hopes to improve usability of this tool in the near future by adding a species synopsis to agent profiles. This summary paragraph will provide background context and current status of specific agents and the associated invasive species. In addition, profiles will include information about the efficacy of the biocontrol agent on the target species in the lab and in the field, as well as its impact on the recovery of ecological communities. The biocontrol page was accessed over 200 times in 2016.

U. Blog

The NYISRI blog was kicked off in September of 2016. Modelled after the [blog of The Journal of Applied Ecology](#), which serves a similar purpose (“Bridging the gap between researchers, and practitioners, and policymakers”), the blog is a venue where researchers can summarize and clearly communicate their findings from recent research on invasive species.

Thus, land managers can easily access this new information, and identify its applications to their own work. NYISRI also plans to invite and showcase manager-researcher partnerships occurring across the state in the coming year.

Posts on the blog have been well-read and to-date, the most popular post on the website is a blog post ([The Geography of Invasion Risk](#) by Dr. Jenica Allen), which received over 270 views in less than a week, and was circulated on multiple list-serves.

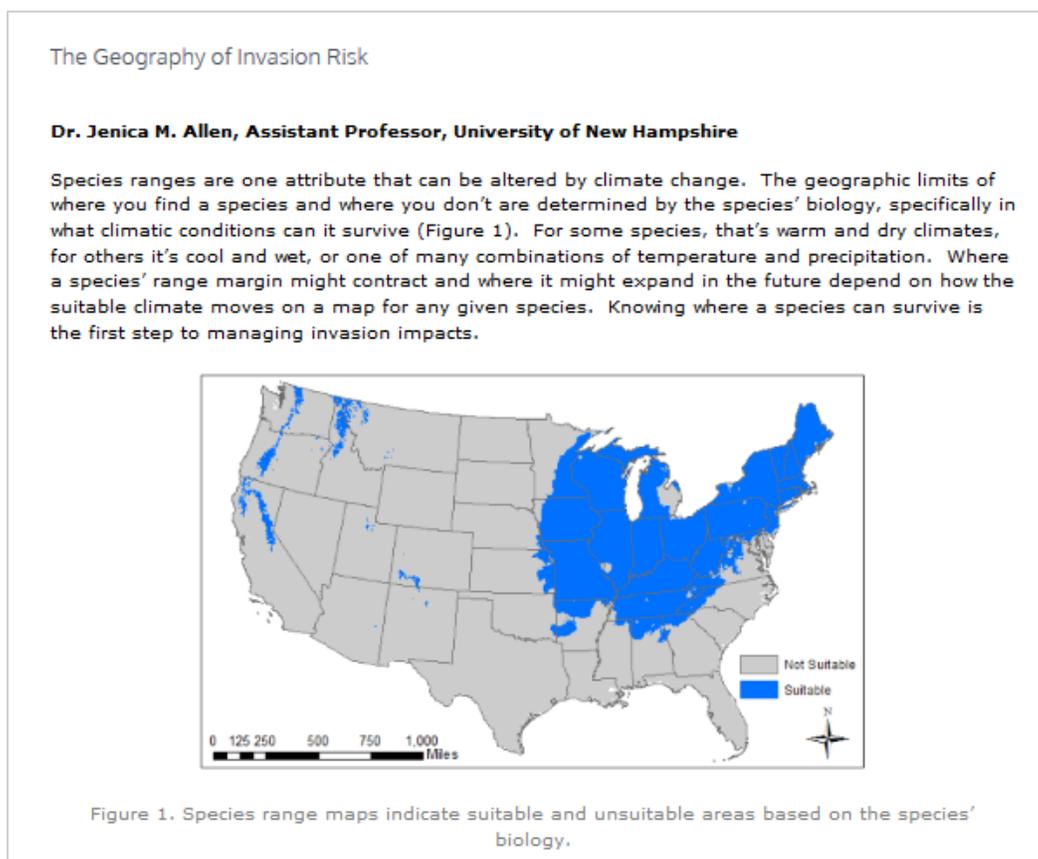


Figure 20. The most popular blog post to-date: *The Geography of Invasion Risk* by Dr. Jenica Allen.

V. Other Website Resources

The NY Invasive Species Research Institute Webpage also maintains and updates several other resources on a regular basis.

- The Events page provides a list of upcoming regional and national invasive species talks, events and conferences.

- The News page includes recent news articles featuring invasive species research, as well as updates from the New York Invasive Species Research Institute about initiatives or current activities.
- The Funding page provides a list of links to the grant pages of organizations that fund invasive species-related work, as well as to specific grant opportunities that are open for applications.
- The Webinars and Recorded Talks page archives presentations from the annual in-service as well as the presentations from the monthly state-wide invasive species calls, and other relevant webinar recordings.
- The Web Resources page provides link to good online resources for those interested in invasive species, including the NY DEC’s prohibited and regulated species lists and the Nature Conservancy’s Invasive Plant Management Decision Analysis Tool (IPMDAT).

Twitter



Figure 21. NYISRI's Twitter profile

In February of 2016, NYISRI created a Twitter account to further engage with managers and researchers. NYISRI follows close to 50 different ecology journals, scientists, and news outlets and retweets interesting scientific articles, papers, and blogs to followers. NYISRI also posts news and blogs from its own website to direct followers to new resources on the website.

Since its inception in February 2016 (until 25 January 2016) content of NYISRI’s tweets have made over 10,000 impressions, with 90 engagements (clicks), and 19 retweets of original content.

Appendix 1. Water Chestnut Biocontrol Update

Wade Simmons, Graduate Student, Department of Natural Resources, Cornell University

In early June 2016, Dr. Bernd Blossey flew to China, part of water chestnut's native range, to collect a beetle known to be a damaging pest of the plant. Previous research conducted by Dr. Blossey and Chinese collaborators have shown that herbivory by the adult and larval stages of the leaf-feeding beetle, *Galerucella birmanica*, can completely defoliate and sink water chestnut rosettes in a matter of days. What's more, research has demonstrated that the beetle is a specialist with high host-specificity, meaning it can only survive by feeding on a very limited number of plants. The severity of feeding damage, and the highly restrictive diet of the beetle, have motivated efforts to study the beetle as a biocontrol agent to control water chestnut in North America, where the plant is a problematic invasive species. With USDA permits in hand approving the import of the beetle into special quarantine laboratory facilities for more detailed testing, Dr. Blossey returned to the United States with hundreds of *G. birmanica* beetles.



Figure 1: The leaf feeding beetle, *Galerucella birmanica*.

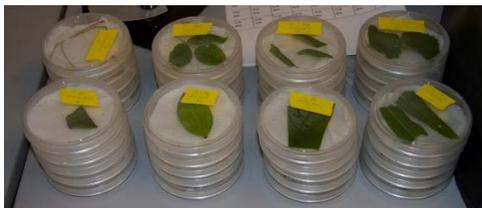
Critical to the advancement of the biocontrol program was successful rearing of the beetle in the laboratory. Fortunately, survivorship of the beetles from China was high. In the greenhouse, we devised a system where the beetles were separated by life stage in buckets containing water chestnut rosettes and capped with a mesh top. New water chestnut rosettes were added every few days to keep up with the voracious beetle consumption rates (Figure 2). Our system of separating the different life stages was efficient for beetle rearing, but also helpful for designing experiments and studying the beetle's biology and life history. We monitored how quickly the eggs developed into adults, the reproductive output of females, survivorship, and average life-span. By the end of season, five generations of beetles had hatched in our greenhouse, a positive indication of the vitality of our greenhouse colony.



Figure 2: *G. birmanica* rearing in quarantine.

A requirement for the development of any biocontrol program is testing the host-specificity of the control agent. Initial research on host-specificity screening had been done for *G. birmanica* in China, but needed to be re-examined and expanded upon to include additional plant species found in North America. With the help and input of multiple managers and scientists, a list of 55 plants that are related to water chestnut, share characteristics and habitat requirements, are fed upon by other *Galerucella* species, or are of economic importance were compiled for testing. During this past season, we tested whether larvae or adult *G. birmanica* fed upon 50 of these plant species, nearly completing the initial round of screening that we had allotted two seasons for.

As expected, the majority of tested plants were not consumed by either adult or larval beetles during the three day no-choice tests. A few species, particularly those closely related to water chestnut, which presumably share similar plant chemistry profiles, had minor feeding damage. In the upcoming season, we will run more detailed tests on beetle interactions with these plants, including multiple choice tests where relative food preferences of *G. birmanica* will be explored. Another finding from our host-specificity testing was the confirmation that water shield, *Brasenia schreberi*, a plant native to both Asia and North America, is an alternate host for the plant, meaning that the beetles eat it, lay eggs on it, and those larvae are in turn able to fully develop into adults.



In addition to testing if beetles fed upon plant species other than water chestnut, we have also been investigating beetle performance on various populations of *Trapa natans* from throughout the eastern United States. Initial results indicate that the beetles express no preference for different population, a promising sign that *G. birmanica* will consume any population that it encounters in North America.



Figure 3: Host specificity testing (above) and water chestnut demography experiments (below).

A critical lack of understanding that is essential to address in order to determine the potential impacts and success of the biocontrol program is a more detailed accounting of water chestnut's life cycle. Surprisingly, basic questions about the plant's biology are unanswered, such as: when do seeds germinate? How many rosettes are produced per plant individual? How many seeds are produced per individual? What percentage of seeds are viable? A complete accounting of water chestnut's life cycle is critical because it serves as a

benchmark from which to compare the impacts of *G. birmanica* on water chestnut. It is from this benchmark that we can assess whether the biocontrol program has population level growth rate reductions for water chestnut, a key metric of success. We have been running demography experiments

on individual plants from multiple water chestnut populations to explore these questions about the plant's life history. After seed germination this spring, we will have completed an entire year's accounting. We will continue to run these experiments in the upcoming year, and add varying numbers of beetles to plants to monitor how different levels of herbivory affect plant growth. Similar experiments will be constructed for water shield in order to explore whether the biocontrol beetles will have any population level consequences for the plant.

Currently, the beetles are in an inactive state known as diapause in environmental growth chambers. We will be changing the environmental conditions to promote their emergence in a few short weeks to align with germination of water chestnut. The priorities for this upcoming season are to complete the initial screening of host-specificity testing, to develop multiple choice tests to test beetle food preferences of the plants that they consumed, and to continue with the demography monitoring of water shield and water chestnut. The results from our first year of biocontrol development testing are encouraging, and we look forward to continuing our work this upcoming season.

Appendix 2: Organizations and Institutions

NYISRI met with professionals from the following organizations and institutions in 2016:

- Atkinson Center for a Sustainable Future (Cornell University)
- Cary Institute for Ecosystem Studies
- Computational Sustainability Institute (Cornell University)
- Cornell Botanic Gardens (formerly Cornell Plantations)
- Cornell Cooperative Extension
- Cornell Naturalist Outreach Program
- Cornell University
- Dartmouth College
- Master Naturalist Program
- National Invasive Species Council
- National Plant Diagnostic Network
- New York Audubon
- New York Cooperative Fish And Wildlife Research Unit
- New York Department of Environmental Conservation (Climate Office, Forest Health, and others)
- New York Sea Grant
- New York State IPM program
- New York Water Resources Institute
- North Carolina State University
- Northeast USGS Climate Science Center
- Northeastern IPM Center
- Resources for the Future
- SUNY ESF
- SUNY Cortland
- The Baker Institute (Cornell University)
- The Nature Conservancy
- University of Rhode Island
- University of Massachusetts Amherst
- University of New Hampshire
- University of Delaware
- USDA APHIS
- US Forest Service
- US Fish and Wildlife Service
- US Geological Survey
- Yale University

Appendix 3. NYS PRISM Call Presenters & Topics

Speaker topics for 2016 monthly PRISM calls:

February 2016 – Dr. Richard Sniezko, US Forest Service: *“Saving Our Trees & Forests- Developing Durable Resistance to Non-native Pathogens and Insects in the U.S.”*

March 2016 – Josh Galperin, Environmental Protection Clinic, Yale Law School: *“Eating Invaders: Should We Manage Biological Invasions with a Fork and Knife?”*

April 2016 – Cathy McGlynn, NYS DEC: *“A Pound of Prevention: New York’s Updated Aquatic Invasive Species Management Plan”*

May 2016 – Gernot Hoch, BFW-Austrian Research Center for Forests: *“Scent Detection Dogs for the Asian Long-horned Beetle”*

June 2016 – Rebecca Shirer, Senior Conservation Scientist, The Nature Conservancy: *“Introducing the Natural Resource Navigator: A Climate Change Planning Tool for Natural Resources”*

September 2016 – Megan Phillips, Invasive Species Education and Outreach Coordinator, NYS DEC: *“Invasive Species Awareness Week 2016 Results and Recommendations”*

October 2016 – John Baker, Location Coordinator & Research Leader, USDA Agriculture Research Service: *“Spotted Lanternfly: Updates & Outlook from Pennsylvania”*

November 2016 – Jennifer Dean, Invasive Species Biologist, NYS Natural Heritage Program: *“Where to Focus our Invasive Species Efforts? Spatial Prioritization of Conservation Values and Invasion Risk”*