

# 2021 Metrics Workshop:

## *How Can We Measure Our Success in Invasive Species Management?*

### Part II Workshop Report

October 7th, 2021

12:30-4:30pm

Via Zoom



## Acknowledgements

*This workshop was coordinated in partnership between the New York Invasive Species Research Institute (NYISRI), Cornell University (the Blossey Lab), and the New York Natural Heritage Program (iMapInvasives). Carrie Brown-Lima, Audrey Bowe, Jennifer Dean, Stacy Endriss and Justin Dalaba facilitated workshop coordination, discussions, and compiled this report. Dr. Bernd Blossey contributed the “Reflections & Conclusions” section.*

*Funding for the New York Invasive Species Research Institute (NYISRI) is provided by the Environmental Protection Fund as administered by the New York State Department of Environmental Conservation (NYSDEC).*

## Participants

*This workshop involved a focused group of statewide partners, with approximately 25 people representing the following organizations:*

Adirondack Park Invasive Plant Program  
Capital Region PRISM  
Catskill Region Invasive Species Partnership PRISM  
Cornell University  
Finger Lakes PRISM  
Lower Hudson PRISM/New York-New Jersey Trail Conference  
Long Island Invasive Species Management Area  
New York City Department of Environmental Protection  
New York Natural Heritage Program/iMap Invasives  
New York Invasive Species Research Institute  
New York State Department of Environmental Conservation  
New York State Department of Agriculture and Markets  
New York State Office of Parks, Recreation & Historic Preservation  
St. Lawrence Eastern Lake Ontario PRISM / The Nature Conservancy  
Western New York PRISM

# Table of Contents

- Agenda.....4**
- Overview and Objectives .....5**
- Workshop Structure & Discussions.....5**
- Key Take-aways .....7**
- Next Steps Identified .....8**
- Recommendations from NYISRI.....8**
- Reflections & Conclusions ..... 10**
- Moving Forward..... 12**
- Appendices ..... 14**
  - A1. Breakout Group Discussion Exercise ..... 14*
  - A2. Group Photo..... 15*

## Agenda

- 12:30 pm **Welcome & Recap**  
*Carrie Brown-Lima, New York Invasive Species Research Institute*
- 12:45 pm **Facilitated Discussion: What are Indicators?** (Assignment: Read Dale & Beyeler 2001)  
*Jennifer Dean, iMapInvasives, New York Natural Heritage Program*
- 1:45 pm **Break (5 minutes) & Group Photo**
- 1:50 pm **Discussion & Exercise: Objectives & Metrics for Invasive Species Projects** (Assignment: Bring a project example)  
*Stacy Endriss, Department of Natural Resources, Cornell University*
- 1:55 pm Breakout Rooms & Exercise
- 2:30 pm Come Back & Share
- 3:00 pm **Break (10 minutes)**
- 3:10 pm **Facilitated Discussion: Evaluating Projects Across the State**  
*Carrie Brown-Lima, New York Invasive Species Research Institute*
- 3:15 pm Breakout Room Discussion
- 3:35 pm Come Back & Share
- 4:00 pm **Group Discussion: Next Steps**
- 4:30 pm **Adjourn**

## Overview and Objectives

The objective of this workshop was to continue a conversation around measuring success and documenting failure in invasive species management in New York State initiated in the February 2021 Metrics Workshop with a smaller group of PRISM Leaders and partners.

In the first workshop, the overarching questions addressed related to invasive species management were:

*How can we better assess what's working or not and report in a way that captures both project-based and collective statewide successes?*

*How can we embrace and learn from our failures so that we don't repeat them?*

In considering these questions, we categorized ways we are working to measure identified goals of prevention and management, while outlining challenges to measuring success and articulated the following action items to address:

1. Establish common definitions for terms we are using
2. Articulate our end goals - what kind of statements do we want to be able to make?
3. Develop a list of different metrics for different objectives
4. Collect and compile existing metrics and monitoring protocols
5. Evaluate whether funding includes monitoring and measuring
6. Develop a decision flow chart

In this second workshop, we sought to address items 1 – 3 in the list of action items above through a series of group discussions and brainstorming.

While the focus of this workshop was New York State invasive species management and the comprehensive network of partners tackling this problem, appropriately defining and quantifying success is a universal challenge in conservation.

## Workshop Structure & Discussions

The workshop, which took place over 4 hours, was broken out into three main sections, starting with the discussion of a paper on ecological indicators, then transitioning into a breakout discussion on project-specific objectives and metrics, and ending with a group discussion on broader statewide objectives.

## **Paper Discussion**

In the first session of the workshop, participants engaged in a discussion facilitated by Jennifer Dean (Invasive Species Biologist, iMapInvasives/ NYNHP) reflecting on the pre-assigned reading “Challenges in the Development & Use of Ecological Indicators” (Dale & Beyeler, 2001). This paper articulates considerations and eight important criteria for ecological indicators to meet. After a brief summary and overview of the paper, attendees responded to a series of prompts and participated in a 45-minute discussion led by Dr. Dean about the applicability of ecological indicators to their work. Recurring themes are summarized in the “Key Take-aways” section below.

## **Breakout Group Sessions**

In the next session, Stacy Endriss (Cornell University) walked the group through an activity (Appendix A1) with a strawman layout for documenting project goals and variables to measure. The goal was to infuse the big picture objectives into the reality of on-the-ground work, and explicitly link the two.

This conversation centered around metrics of success for existing projects with examples of proposed metrics and feasibility of implementing the metrics from each PRISM region. Each attendee was asked to bring an example of a real-life project for which they wanted to discuss metrics. After breaking out into groups of 4-5, each person pitched their project. Once everyone had shared their scenario, the group selected one to discuss. Working with a designated group note-taker and facilitator, the group articulated up to three objectives associated with each project, their link to invasive species issues, and proposed ways of measuring whether these objectives were being reached.

After 30 minutes, breakout groups dissolved, and one person from each group shared a slide summarizing their project and objectives with all participants.

## **New York Statewide Discussion**

In the last discussion of the day, Carrie Brown-Lima led the group in a conversation about what we hope to say about the success and accomplishments of the New York Invasive Species Network. Brown-Lima couched the discussion in the example of what we want to say talking to legislators in Albany for the Environmental Protection Fund Lobby Day, but the conversation evolved and broadened beyond this framing.

## Key Take-aways

Some key themes and take-aways from the workshop sessions described above are summarized by topic area below.

### Complexities & Challenges

- There is no one-size-fits-all; complete standardization is neither possible nor desired due to project specificity, large variation of goals, and scale/habitats (ex. a local organization suppressing Phragmites in a wetland to protect a population of rare plants versus a state agency trying to eliminate all populations of a high-impact/low abundance species).
- Many major funding streams require only the reporting of acres treated or land area protected by a certain activity. Linking reporting and funding to performance outcomes is still a major challenge in many cases, as is securing funding for longer-term monitoring.
- There are numerous significant challenges and considerations for PRISMs. For example, certain aspects of assessing success (ex. pursuing ecological indicators) may be outside the scope of PRISM contracts. There are also disparities between staffing, volunteer networks, internal priorities, missions of the host organization and landscape types (ex. urban vs. rural).
- PRISMs frequently partner with and support other organizations, and not all of these organizations collect data on management.
- Any resource or tool that is developed will need to be maintained and updated moving forward.

### Best Practices & Recommended Actions

- There are many existing definitions for terms that we are using. We should utilize existing definitions wherever possible and collectively decide on definitions.
- The question of “have we been successful?” depends on what your goal was to begin with. Different goals will have different appropriate metrics, and this could be represented in a flow chart.
- Developing different metrics for different objectives is desirable, and could be tailored to different scales, for example eliminating Tier 1 & 2 species versus suppressing Tier 4 species for asset protection. (For definitions of the Invasive Species Tiers, see [www.nynhp.org/invasives/species-tiers-table](http://www.nynhp.org/invasives/species-tiers-table)).
- Clarifying our specific audience is an important next step toward developing statements about what we want to accomplish (ex. policy-makers and the public who support respective projects).
- Given the challenge of establishing metrics of success in invasive species management, it would be best to start small. Perhaps starting with demonstration

projects (ex. kudzu) before collectively working towards larger scale adoption of whatever approach we choose.

### **Existing Resources & Tools**

- There are existing tools that could be utilized or adopted for planning and feasibility (ex. IPMDAT).
- The score card used in the breakout session could be useful for reporting back on outcomes of management projects. Some modification of this chart could help identify broad categories for “bare-bones” metrics (Appendix A1).
- A Story Map or a similar statewide dashboard could be used to showcase projects at the statewide level.

### **Next Steps Identified**

In the final wrap-up of the workshop, participants brainstormed actionable next steps to move this conversation forward, including:

- Identify our different target audiences for communicating metrics
- Agree on definitions for the following terms identified at this workshop, utilizing existing resources:
  - Restored, Success, Suppression, Containment, Eradicated, Resiliency, Managed, Population, Area searched, Functional eradication
- Form a smaller workgroup for definitions with volunteers from the NY invasive species network
- Draft a “strawman” flowchart or decision tree to help develop statements and associated metrics

### **Recommendations from NYISRI**

After reflecting on workshop discussions and considering the recommended steps above, we would like to share the following reflections and recommendations:

We, as well as others in the workshop, recognize a need for developing metrics at two levels:

- 1) Project-by-project level success at meeting invasive species-related objectives



## 2) Collective effectiveness of invasive species programs in New York State

For both levels, setting clear and measurable objectives within and between programs is a critical component. Three broad objective categories emerge for both: 1) ecological, 2) economic, and 3) social/cultural.

However, to understand some of the economic and socio-cultural impacts, we first need to understand the ecological impacts. For example, the economic impact of an invasive bivalve may not be able to be quantified until we understand how they impact popular sport fish.

Below, we have summarized potential next steps for moving towards measuring statewide and project-level success.

### 1. **Statewide Programming Outcomes**

Challenges to assessing success are present throughout the field of conservation, not just invasive species, and there are a variety of organizations thinking about this issue with whom we might be able to engage.

We feel that metrics associated with the entire state programming for New York State (Level 1, above) might be best addressed by the expertise of a specialist consultant (ex. [Foundations of Success](#), or a similar organization).

### 2. **Project-Based Outcomes**

Methodologies focused on assessing social, ecological, and economic outcomes or impacts will first and foremost require the development, evaluation, validation and then deployment of metrics that can capture the desired data. Methodologies to engage in these activities are not presently agreed upon but ultimately they will require partnerships between New York stakeholders and researchers specializing in these fields. The initial development of appropriate indicators will require dedicated research efforts for development and validation to assure their sensitivity to changes in invasive species presence and abundance. Below, we articulate suggestions on how to advance efforts for each of the three categories:

**Ecological:** The Blossey lab at Cornell University is developing and testing approaches for assessing impacts of invasive species and their management. However, more labs with different taxonomic and scientific expertise should be engaged and funded to support development of ecological indicators in different systems.

**Socio-cultural:** There are many groups that focus on assessing opinions, values, risk perceptions and other socio-cultural aspects of residents, including the [Center for Conservation Social Sciences](#) at Cornell University. Developing appropriate inquiries, including using questionnaires, can be complex depending on species, urban or rural livelihoods, and many other factors. While it can be costly to repeatedly ask about impacts of hundreds or even thousands of introduced species that already occur in New York alone, method development to make this possible and useful will be important.

**Economic:** Economic costs and benefits of invasive species are difficult to tabulate because we lack tools to appropriately assess the value of species, habitats or ecosystem services that may be affected (ex. monetary values associated with trade, agriculture, forestry and horticulture are easier to measure than the value of functioning natural ecosystems). Advancing economic assessments will require funding, dedicated method development and engagement with economists with expertise in measuring or evaluating impacts of invasive species. However, the fundamental problems of appropriately assessing impacts on things that typically do not have a price tag, including cost to future generations of residents or impacts on species or natural processes, will remain.

## Reflections & Conclusions

FROM DR. BERND BLOSSEY, NYISRI PRINCIPAL INVESTIGATOR

We came together with the recognition that we need better ways to document impacts of introduced species, as well as impacts of their management. The dimensions of impacts and success (or failure) of management to alleviate impacts of introduced species can be broadly classified into ecological, socio-cultural, and economic. Simply measuring effort (ex. hours worked or financial investments), acres treated, or the short-term reduction in abundance or cover of an introduced species, or the biomass removed, is insufficient and can be misleading. We manage introduced species to reduce their negative impacts, not because they are non-native. But how to do this, and what metrics to use to measure success is far less obvious, it can be contentious, labor and expertise intensive, and thus costly.

Introduced species are only one of the stresses native species and ecosystems are facing. The question then is, are introduced species the leading cause for species declines, or are other factors (ex. climate change, pollution, or even high populations of white-tailed deer or other introduced species, such as earthworms) more important? If we want to manage

appropriately, we need to better understand whether we are targeting the right stressor(s) and whether the management methods we deploy are improving the living conditions for native species, ecosystems, and societal interests. At present, we do not have the tools and understanding to do this effectively and accurately.

Invasive species management is considered a wicked problem, and the metrics we deploy to assess outcomes need to be appropriately sophisticated, and sensitive to changes in abundance of the targeted species to be considered reliable indicators. Unfortunately, the issue with using change in abundance of native biodiversity (ex. Shannon-Wiener, Simpson, or just species richness), ecosystem productivity, carbon sequestration, other ecosystem services to assess ecological outcomes of invasions or their management is that they are demonstrably not sensitive to changes in the abundance of introduced species.

The Blossey lab at Cornell is assessing the utility of using experimental plantings to function as bioindicators and results thus far are promising. This would provide a standardized way of assessing both impacts and outcomes of management. Of course, the specific plant species to be used would need to vary by location and habitat, but the approach can be generalized. We are also experimenting with using amphibians, fish, and invertebrates as bioindicators in aquatic systems. However, before any of these methods can be recommended with confidence, we need to fully understand whether they are sensitive to changes in abundance of introduced species, and whether we can find ways to decouple the response to introduced species from the influence of other stressors. It took nearly a decade of scientific work to develop appropriate new indicators to assess deer browse severity using oak seedlings, but scientific validation is essential to effectively use limited resources. We are confident that using sentinel plantings is an important step forward that can measure the response of native species and we are in the process of summarizing these recommendations. We will propose to work with PRISMs and other land managing organization on further demonstration projects. Additional options clearly exist and further developments in proposing and validating ecological indicators will be essential. More research labs with different expertise will need to be engaged to develop other indicators, and this will require dedicated funding.

How to measure socio-cultural and economic impacts of invasive species, and of their management, is equally underdeveloped. This is particularly true when working comprehensively to assess both positive and negative impacts, assess what risks residents are willing to accept, or how native species and human health may be affected by the methods we deploy to reduce negative impacts. This does not exist at present and would require dedicated research and an accepted methodology. For socio-cultural impacts, we often hear from specific interest groups, such as users of introduced species (ex. agriculture, horticulture or the pet and aquarium trade) but we have no comprehensive

information about attitudes of New York residents in general. This could be accomplished using surveys of representative samples of New York residents. The Blossey lab has done this for attitudes regarding biological control and other management activities on a nationwide basis using vignettes, which could serve as a starting point for development. But even with an approach such as this, questions remain. Should such surveys be conducted for every species, every group of species, for every management project and how would this be administered?

Gauging the economic impacts of introduced species presents the same challenge of lack of an appropriate methodology. This needs to be comprehensive and assess outcomes that are beneficial as well as detrimental and go beyond industries or trade interest where monetary value can be more easily determined. But how do we value long-term impacts on native species, ecosystems, and their services? How much is a Trillium worth, or a native bee, or a parasitic insect? Are we willing to spend money only on charismatic species or also on unassuming species? Economists have struggled with these questions for decades, and there are no easy solutions or approaches. It is even questionable whether such approaches can be developed and be trusted. A dedicated funding stream, or strategic RFP's, would need to be developed to allow those with expertise to come together and begin to develop novel assessment methods.

Significant challenges lie ahead. There is a clear need for assessments and accountability to taxpayers who ultimately are funding invasive species management projects. At present, projects fall short of scientific and social expectations resulting in many conflicts over target species and different management approaches (ex. biocontrol and herbicide use). The participants in the workshop expressed concern whether current scopes of work would allow PRISMs to engage in such work of evaluating outcomes. If this is not part of the scope at present, it is important that we remove this barrier going forward. Without assessing outcomes, we are unable to learn and improve our approaches. Funding for management projects needs to include the requirement and funding for multi-year follow-up assessment of outcomes. Deploying ecological indicators (ex. sentinel plants) and some baseline surveys to gauge public opinion appear easy targets. What else may need to be developed should be assessed, potentially through funding a small working group or think tank.

## Moving Forward

Further discussion among involved partners will be needed to come to a consensus on the next steps required to tackle this challenge. Identifying which organizations will take on different responsibilities, as well as the role of PRISMs and partners in collecting data will

be important. Between the PRISMs and NYS DEC, an internal conversation about PRISM funding limitations has been identified as a critical next step.

Due to the scope and scale of these issue, external experts should undoubtedly be brought to the table. Researchers focused on metrics-related topics and consultants with experience in this field should be engaged, perhaps by a statewide working group dedicated to advancing the development and adoption of metrics for invasive species projects.

The challenge of assessing the effectiveness of invasive species management efforts is universal and faced by all countries, agencies and organizations who are engaged in invasive species management. New York State has one of the most advanced, well-coordinated and funded invasive species programs, setting an example nationally and globally, and is positioned to take on the challenge through focused partnerships between PRISMs and research labs with diverse expertise.

## Appendices

### A1. Breakout Group Discussion Exercise

Fill in the following for each example project with up to 3 objectives:

Goal	Objectives	Expected invasive species threat	Define successful outcome	Other stressors that could limit success	Proposed metrics	Feasibility of proposed metric/cost

## A2. Group Photo

