NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell University

Using Volunteer Migration Data to Model Conservation Zones for Vernal Pool Amphibians

HRES, October 2026

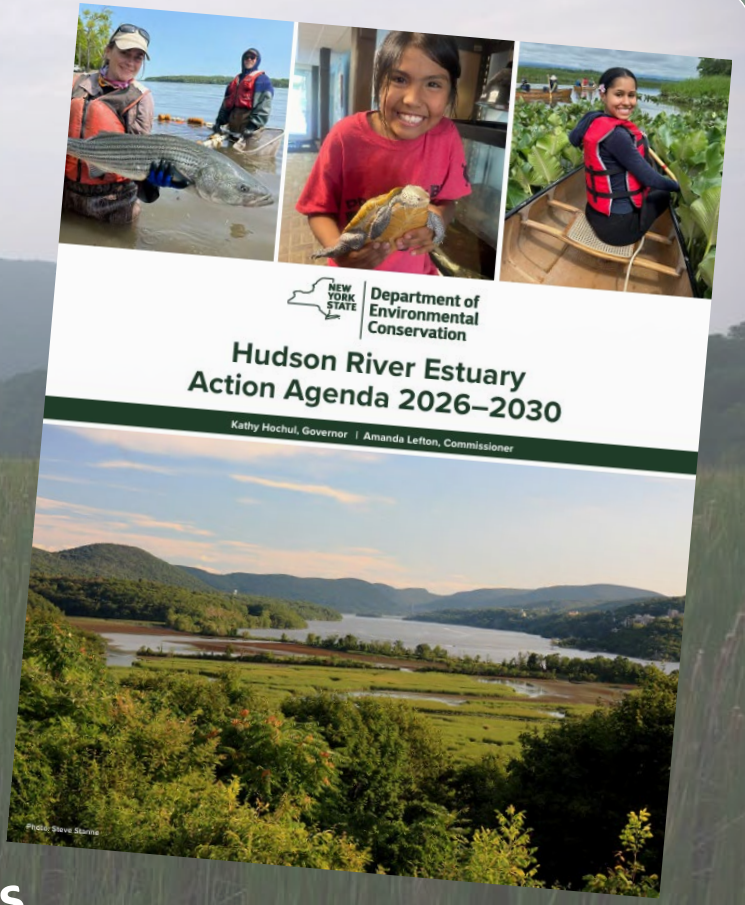


Photo by M. McDonald

Laura Heady, NYSDEC Hudson River Estuary Program and Cornell University Dept of Natural Resources & the Environment,
John Vanek, Hollie Shaw, Tim Howard, and Matt Schlesinger, New York Natural Heritage Program and SUNY ESF

Hudson River Estuary Program

Helping communities conserve and ensure a resilient estuary and watershed for present and future generations.

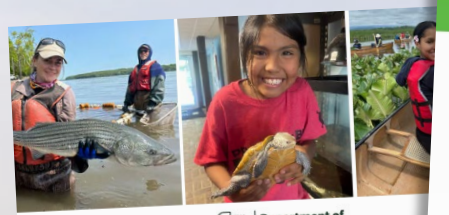


Goals:

- **Clean water**
- **Robust river habitats**
- **Healthy tributaries**
- **Conserved natural areas***
- **Climate-adaptative communities**
- **Informed and engaged public**
- **River access for all people**

*Not a wildlife agency
*Not academic researchers

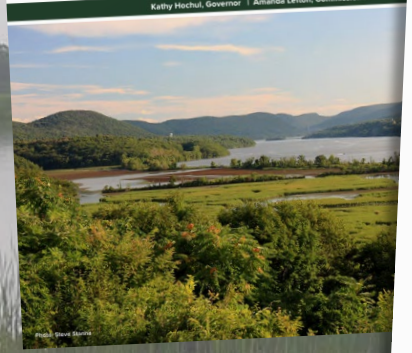
Photo by Laura Heady



Department of Environmental Conservation

Hudson River Estuary Action Agenda 2026–2030

Kathy Hochul, Governor | Amanda Lefton, Commissioner



Conserved Natural Areas

Background

The communities of the estuary watershed are as diverse as its natural areas and habitats, but they all share three key characteristics. First, they connect to the estuary, either directly on its shorelines or tributaries, or through the living landscape of forests, fields, wetlands, and streams that constitute its watershed. Second, community residents benefit from these ecosystems, which help to keep drinking water and air clean; moderate temperature; store carbon; absorb floodwaters; and provide wildlife and fish habitat, scenery, and opportunities for spending time in nature. And third, all communities rely on local decision-makers and volunteers—town boards, planning and zoning boards, conservation advisory councils, and open space commissions—to play a significant role in determining the fate of natural areas and biodiversity.

While NYS, land trusts, municipalities, and nongovernmental conservation organizations have permanently conserved approximately 27% of the watershed, significant areas that support nature and human needs remain vulnerable to land-use change.

The Hudson River Estuary Program and its partners assist local communities and land trusts with advancing their goals to protect priority lands and waters by providing current scientific data and increasing capacity for conservation planning. Further assistance and capacity building are needed to engage new municipalities in conservation planning, promote inclusive community engagement, strengthen partnerships, and increase the creation and implementation of plans and local policies to achieve conservation of the region's [illegible] natural assets.

Goal

Priority lands and waters are identified and conserved through planning, land-use policy, and land protection, and connectivity of conserved habitats and natural areas in the estuary watershed is achieved.

Key Trends, Challenges, and Opportunities

- Natural areas like forests and wetlands contribute to the well-being of watershed residents in rural, suburban, and urban communities by supporting water quality, climate resilience, habitat, and outdoor recreation.
- Many natural areas are unprotected; unmanaged; and vulnerable to incompatible land-use change, climate change, and invasive species. Ongoing needs like renewable energy siting and housing present new conservation and land-use challenges and opportunities to create resilient, diverse communities.
- Biological data is the foundation of successful conservation programs but is lacking in many places.



The Hudson Highlands are a significant biodiversity area with excellent examples of large unfragmented forest.



Some municipalities are using a critical environmental area designation to protect wetlands like this marsh in Wawarsing.

Conserved Natural Areas Goal:

Priority lands and waters are identified and conserved through planning, land-use policy, and land protection, and connectivity of conserved habitats and natural areas in the estuary watershed is achieved.

Photo by Laura Heady

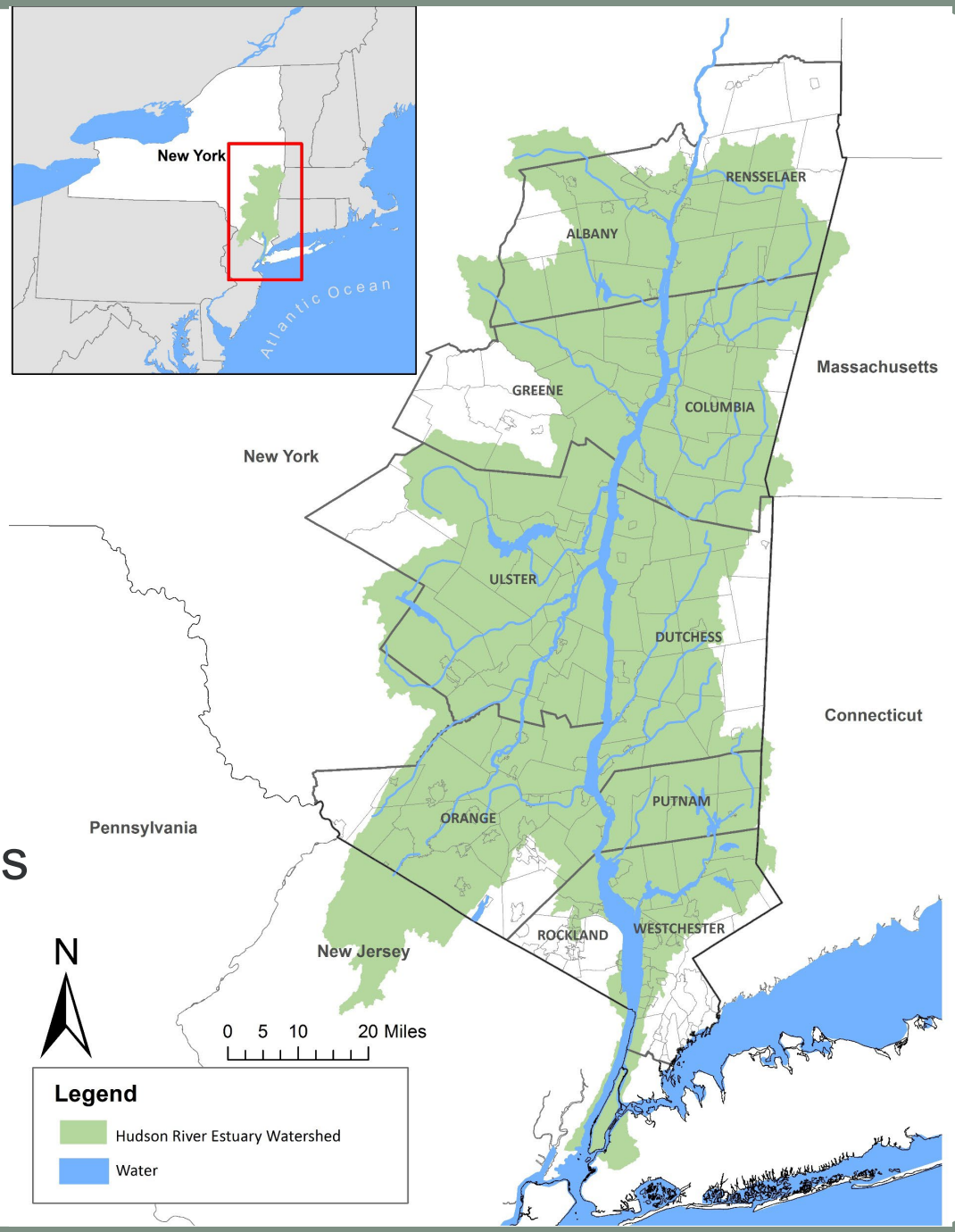
Conserving Biodiversity in a "Complex Decision-Making Landscape"

Hudson River estuary:

- 153-mile tidal estuary from NY Harbor to Troy

Hudson River estuary "corridor":

- 10 counties and 260 individual municipalities (+ New York City)
- ~89% private ownership
- >5,000 square miles (13.5% NY)
- ~50% NY's population



CONSERVATION AND LAND USE TEAM

NEW YORK STATE | Department of Environmental Conservation | Hudson River Estuary Program

Cornell University



Photo by Laura Heady

What we do:

1) increase **scientific understanding** of conservation priorities;

2) build **partnerships**;

3) **raise awareness** of the watershed's biodiversity and **increase local capacity** for conservation planning;

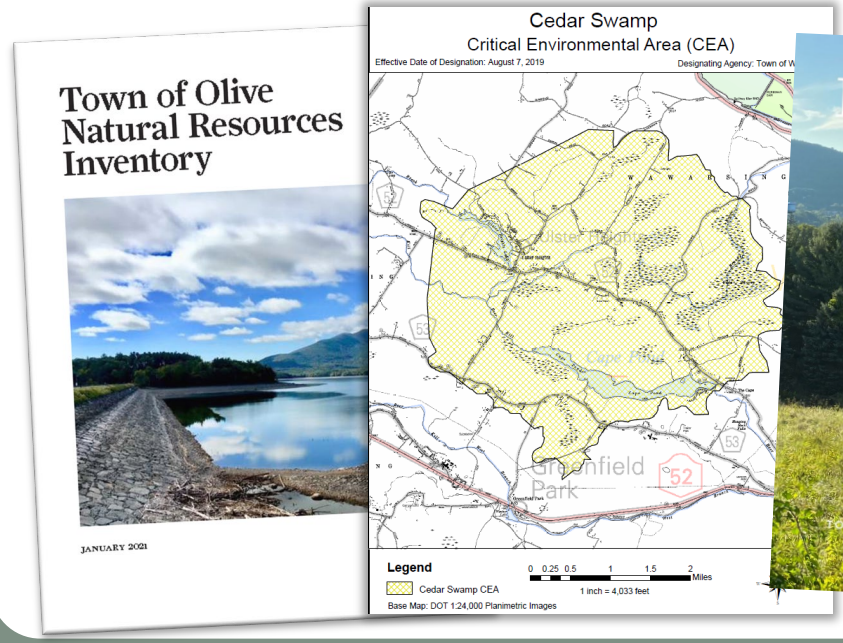
4) foster the use of **best available data for local and regional inventories, plans, and policies**.

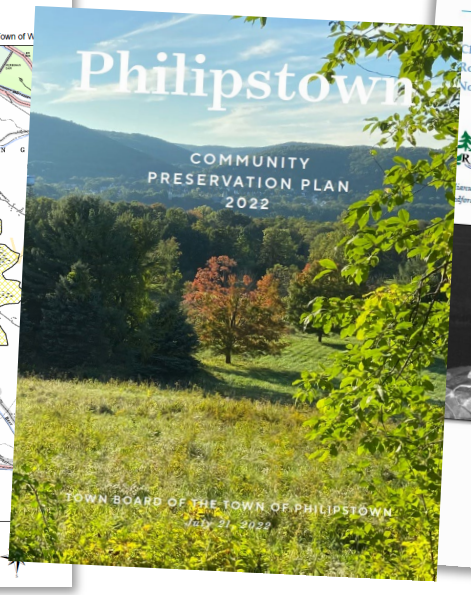


CONSERVATION AND LAND USE TEAM

Examples of Outcomes

- natural resource inventories
- open space plans
- connectivity plans
- critical environmental area designation
- conservation overlay zoning
- local wetland and watercourse laws
- conservation financing









Contact Us

College of Agriculture and Life Sciences | Department of Natural Resources and the Environment

Conservation Planning in the Hudson River Estuary Watershed

Home | Natural Areas & Biodiversity | Conservation Planning | Maps & Data | Opportunities | Library | About Us

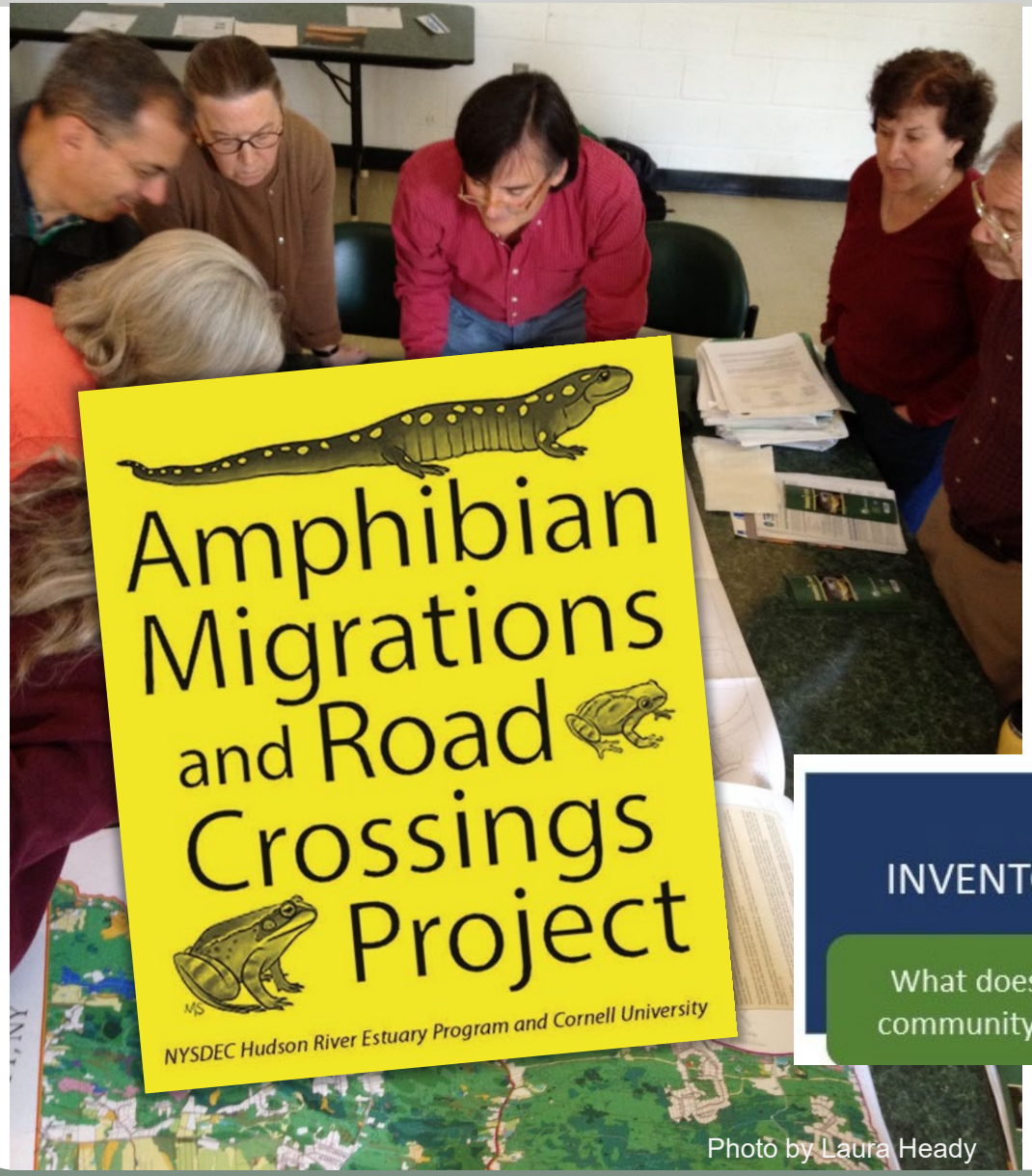


"Through the creation of a sensible and balanced community preservation plan, the Town of Blooming Grove is prepared to protect open space, farmland, natural beauty, and critical environmental areas to help keep Blooming Grove a desirable community in which to live, work, invest, and thrive."

– Elinor Hart, Chair, Town of Blooming Grove Community Preservation Committee

hudson.dnr.cals.cornell.edu

CONSERVATION AND LAND USE TEAM



What we do:

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Amphibian Migrations & Road Crossings Project → started in 2009

Photo by L. Heady

Amphibian Migrations & Road Crossings (AM&RC) - Project Goals

- **Raise awareness** about vernal pool and forest habitat, Hudson Valley biodiversity, and the impact of land use on connectivity
- **Provide a rewarding volunteer experience**, connect people to nature
- **Locate road crossings**, **reduce road mortality** of migrating amphibians, and **identify conservation opportunities**
- **Create a foundation for asking research questions**
- **Build support** for community conservation & policy initiatives



Photo by Steve Stanne

AM&RC Project Goals ☑ Raising Awareness











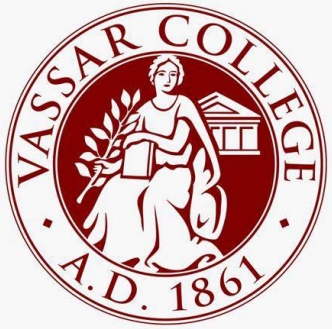


AM&RC Project Goals

☑ **Providing a Rewarding Volunteer Experience**





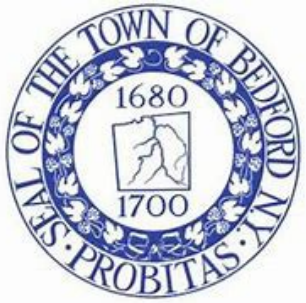






























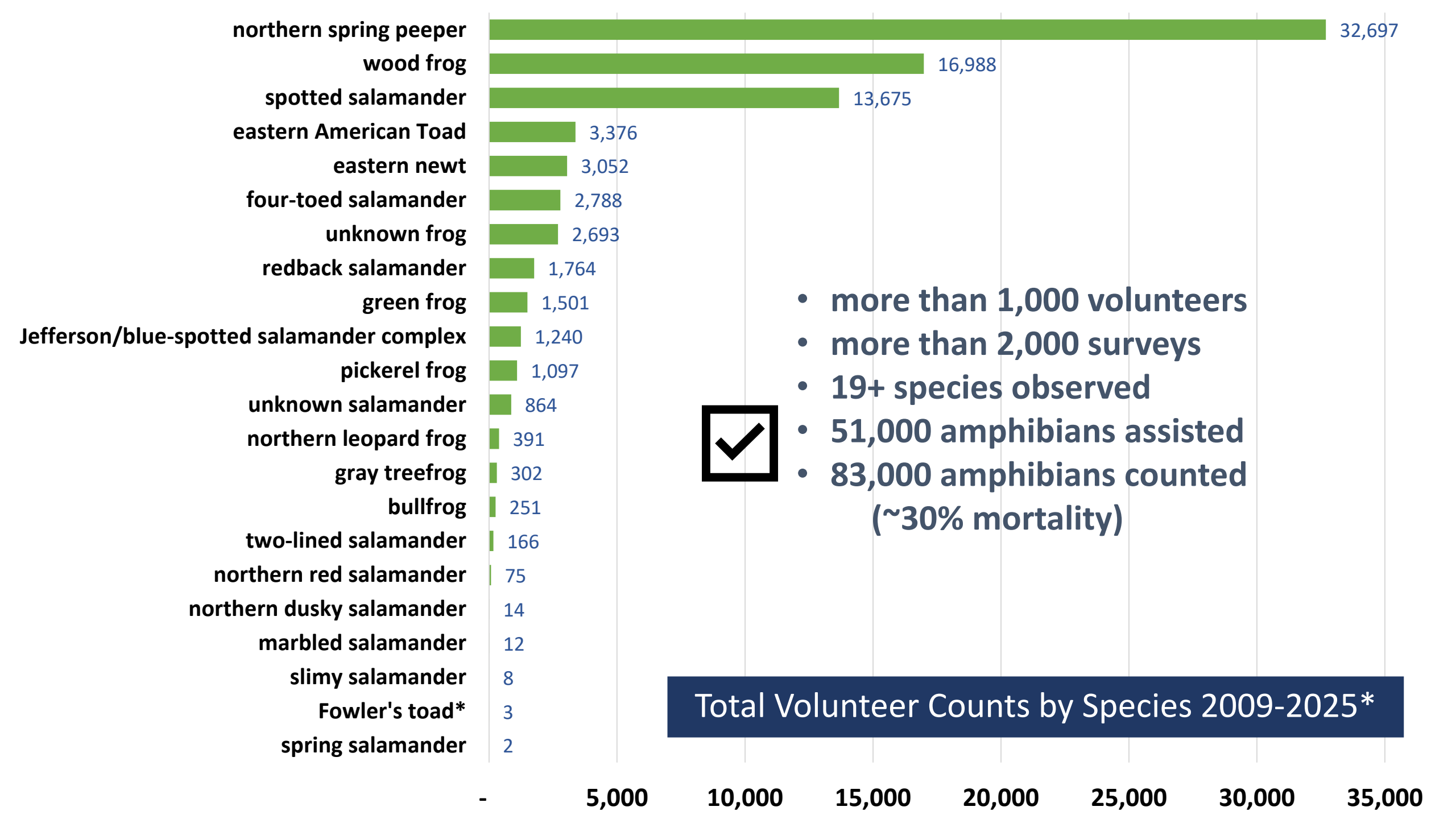
Cornell Cooperative Extension
Columbia and Greene Counties

Feedback from an AM&RC Partner (conservation NGO)**:**

“It has been exciting to see the project's influence spread into the surrounding community. Through our ongoing relationship with the Town of New Castle and its Conservation Board, we have watched local residents begin their own road monitoring efforts. Knowing that Teatown's work has helped inspire that kind of independent action is one of the most meaningful outcomes of the season.”



Photo by J. DiPaola


northern spring peeper 32,697
wood frog 16,988
spotted salamander 13,675
eastern American Toad 3,376
eastern newt 3,052
four-toed salamander 2,788
unknown frog 2,693
redback salamander 1,764
green frog 1,501
Jefferson/blue-spotted salamander complex 1,240
pickerel frog 1,097
unknown salamander 864
northern leopard frog 391
gray treefrog 302
bullfrog 251
two-lined salamander 166
northern red salamander 75
northern dusky salamander 14
marbled salamander 12
slimy salamander 8
Fowler's toad* 3
spring salamander 2
- 5,000 10,000 15,000 20,000 25,000 30,000 35,000
• more than 1,000 volunteers
• more than 2,000 surveys
• 19+ species observed
• 51,000 amphibians assisted
• 83,000 amphibians counted (~30% mortality)
Total Volunteer Counts by Species 2009-2025*

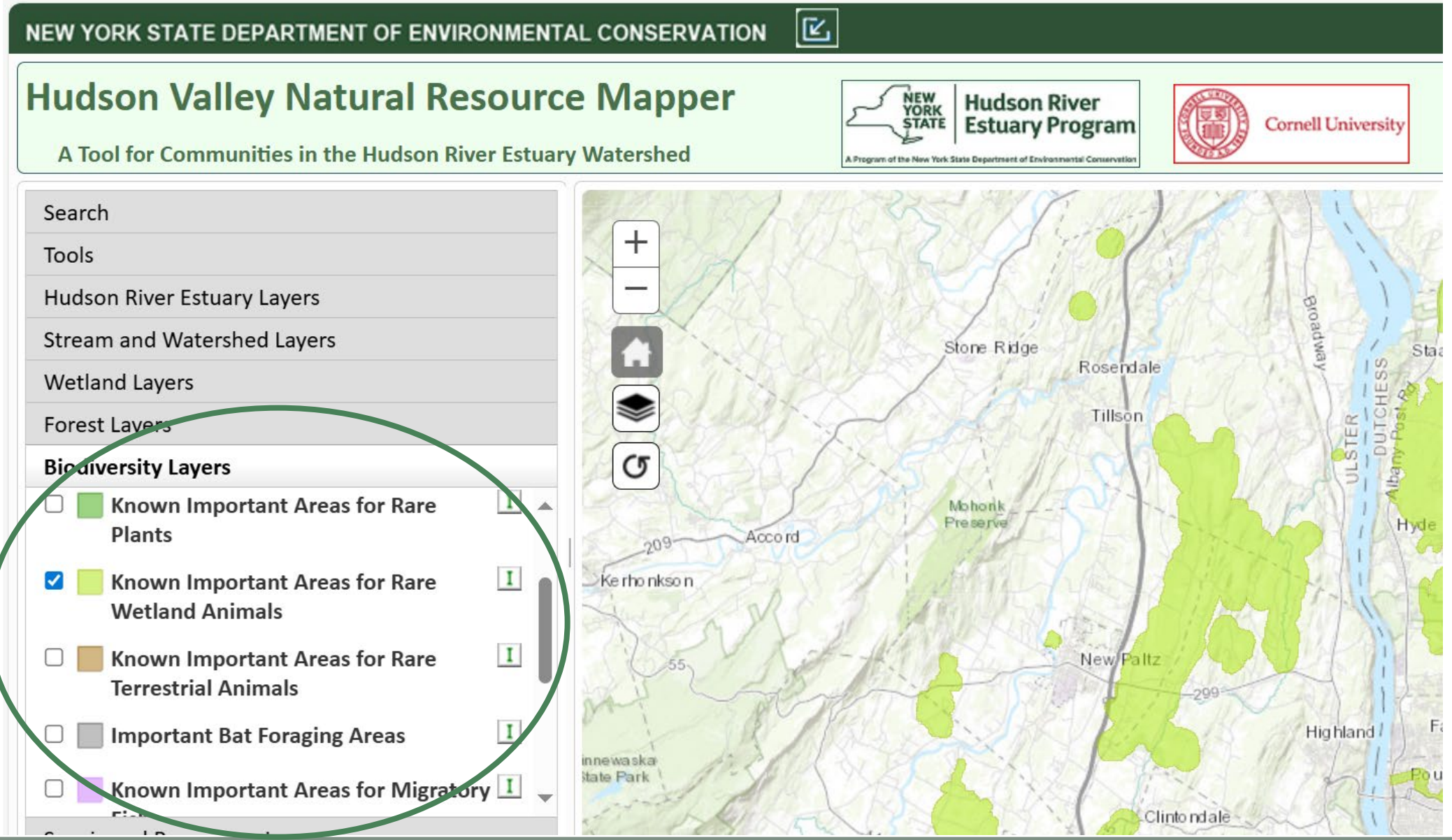
Amphibian Migrations & Road Crossings (AM&RC) - Project Goals

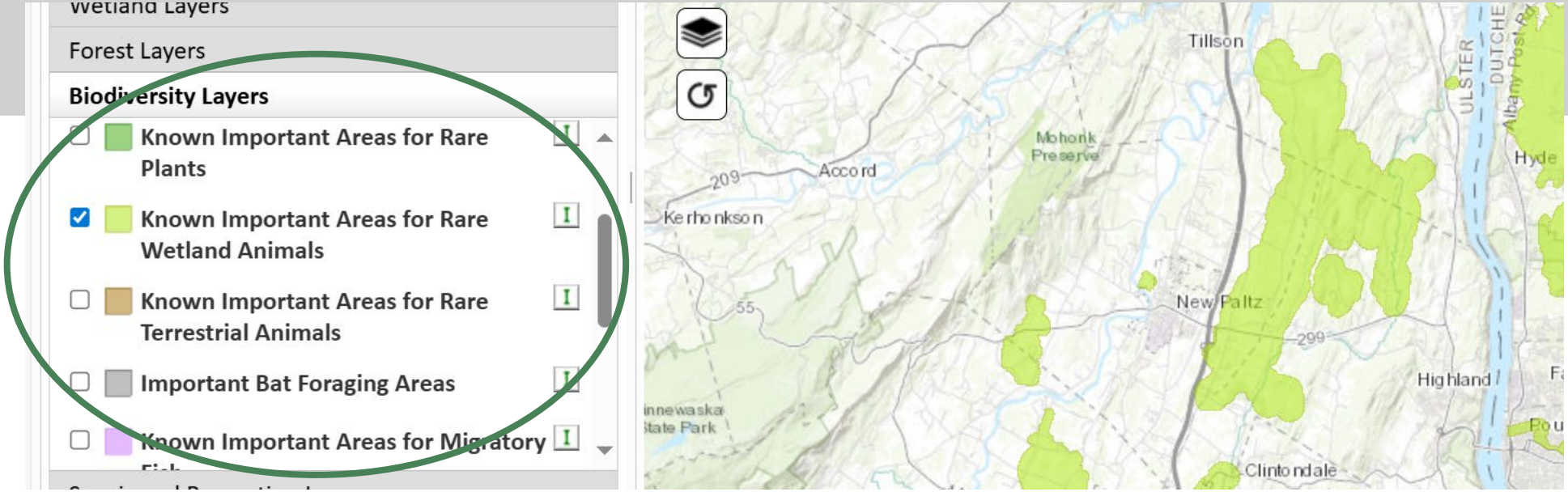
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- **Create a foundation for asking research questions**
- **Build support** for community conservation initiatives (including local policy)

Photo by S. Stanne



Examples of Data and Tools





Important Areas **(IAs) are non-regulatory and are intended for conservation planning:**

- create conservation zones to consider for protecting known populations at a particular location
- based on GIS models that include element occurrence data ("EOs") but also consider species' habitat requirements and movements, areas that support ecological processes, and areas where activity could impact species

Question: Can AM&RC volunteer data be used to model Important Areas for vernal pool species assemblages?

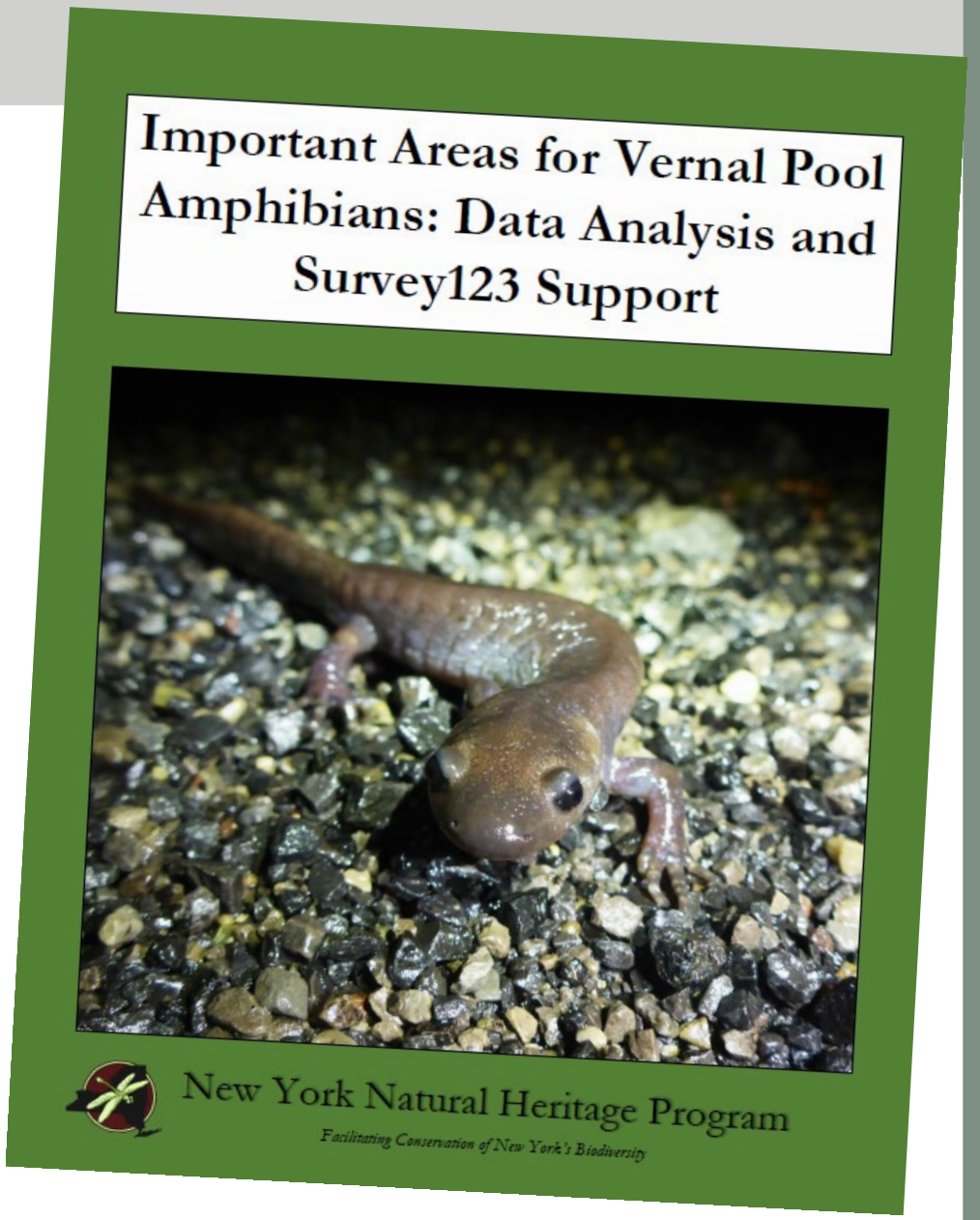
Preliminary “Important Areas” Modeling

NY Natural Heritage Program Collaboration

“Important Areas for Vernal Pool Amphibians” (2023)

We wanted to create IAs that could be used by communities, conservation partners, and planners to support the protection of:

- breeding habitat of VP amphibians
- terrestrial upland habitat for VP amphibians
- broader landscape that supports ecological integrity and persistence of the amphibian assemblage.



Preliminary “Important Areas” Modeling

First Step: Data Cleaning

Second Step: What will drive the IA? Decisions needed to mimic the “EO”:

- What species to include?
- How many individuals will be considered a “hot spot?”
- How many “repeat” surveys are needed?
- How to combine survey midpoints into a “hot spot?”
- How will breeding and non-breeding habitat be factored in?

Third Step: Creating “Important Area”

What species to include?


Photo by Laura Heady

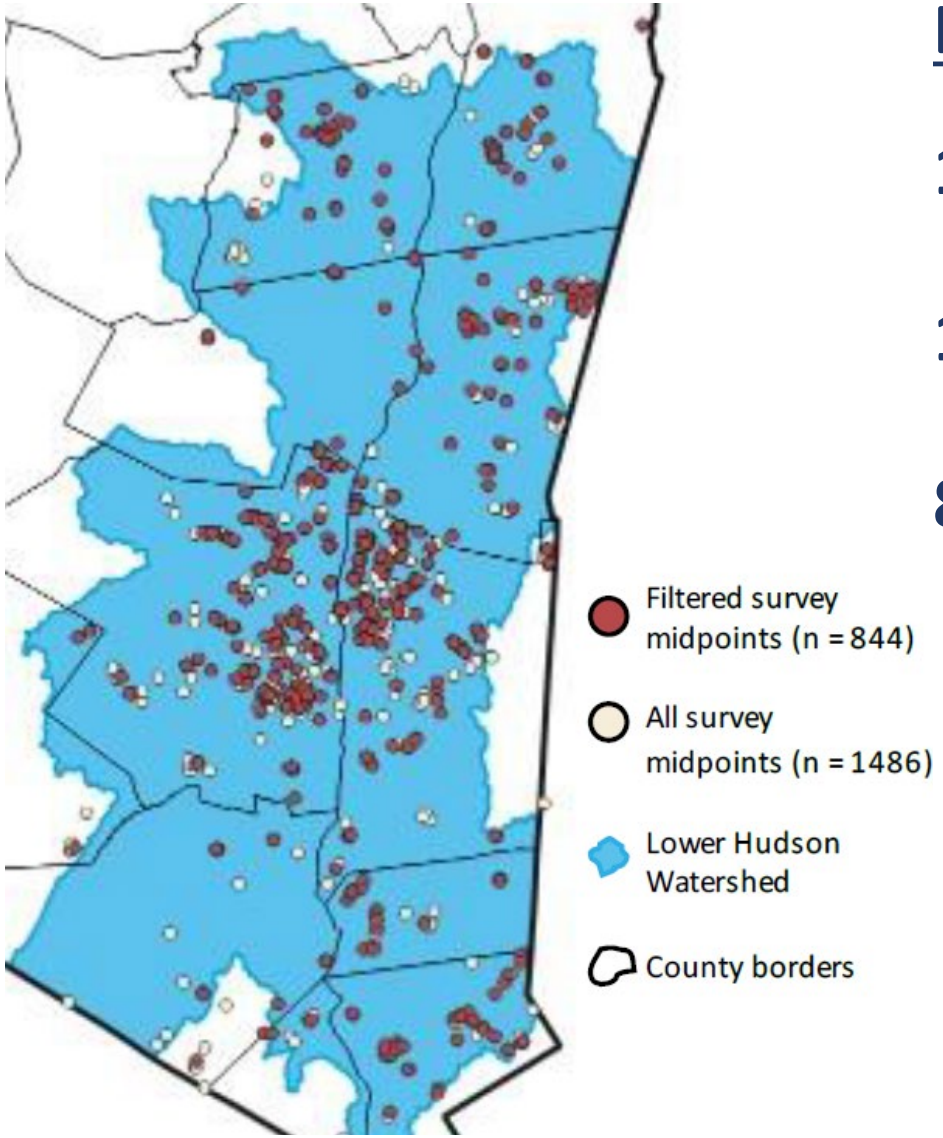

Photo by Josh Hunn


Photo by Laura Heady


Photo by Brian Houser


Photo by Laura Heady

Preliminary “Important Areas” Modeling



Data Filtration Process

1,486 surveys (cleaned data provided to NYNHP)

⬇

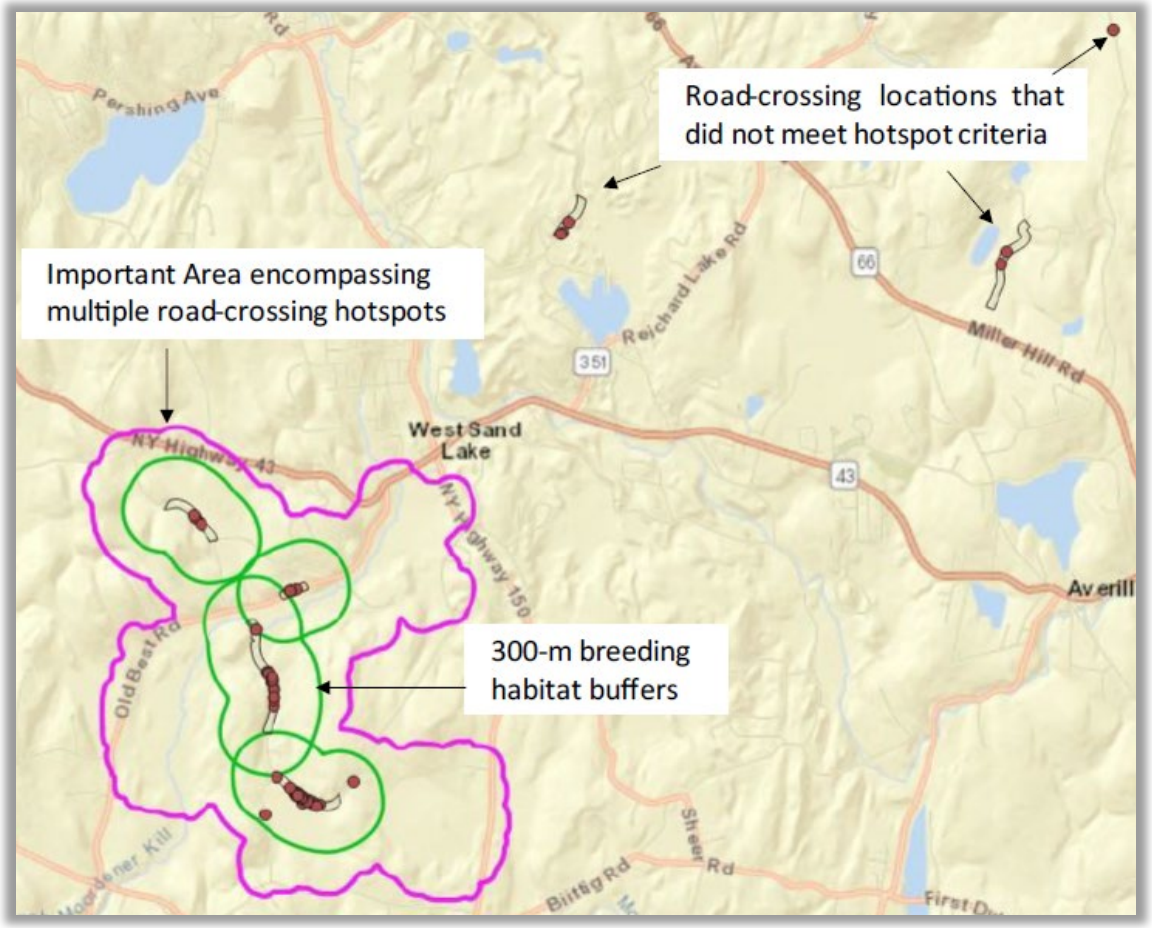
1,237 surveys (removed 249 surveys with no VP species)

⬇

844 surveys (removed 128 surveys with single individual obs. and 265 surveys with unreliable distance)

Preliminary “Important Areas” Modeling

- What could be considered a “hot spot?”
  - >= 1 survey with 50+ individuals of focal taxa (or combo)
  - >= 2 years of survey
- How to combine survey points into a “hot spot?”
  - “road sausage factory”
- How will breeding and non-breeding habitat be factored in?
  - buffered hotspots by 300m



Preliminary “Important Areas” Modeling

Creating the “Important Areas”

- NYNHP modified its IA model for palustrine wetlands, using the 300-m buffered ‘hot spot’ as input data, instead of a wetland

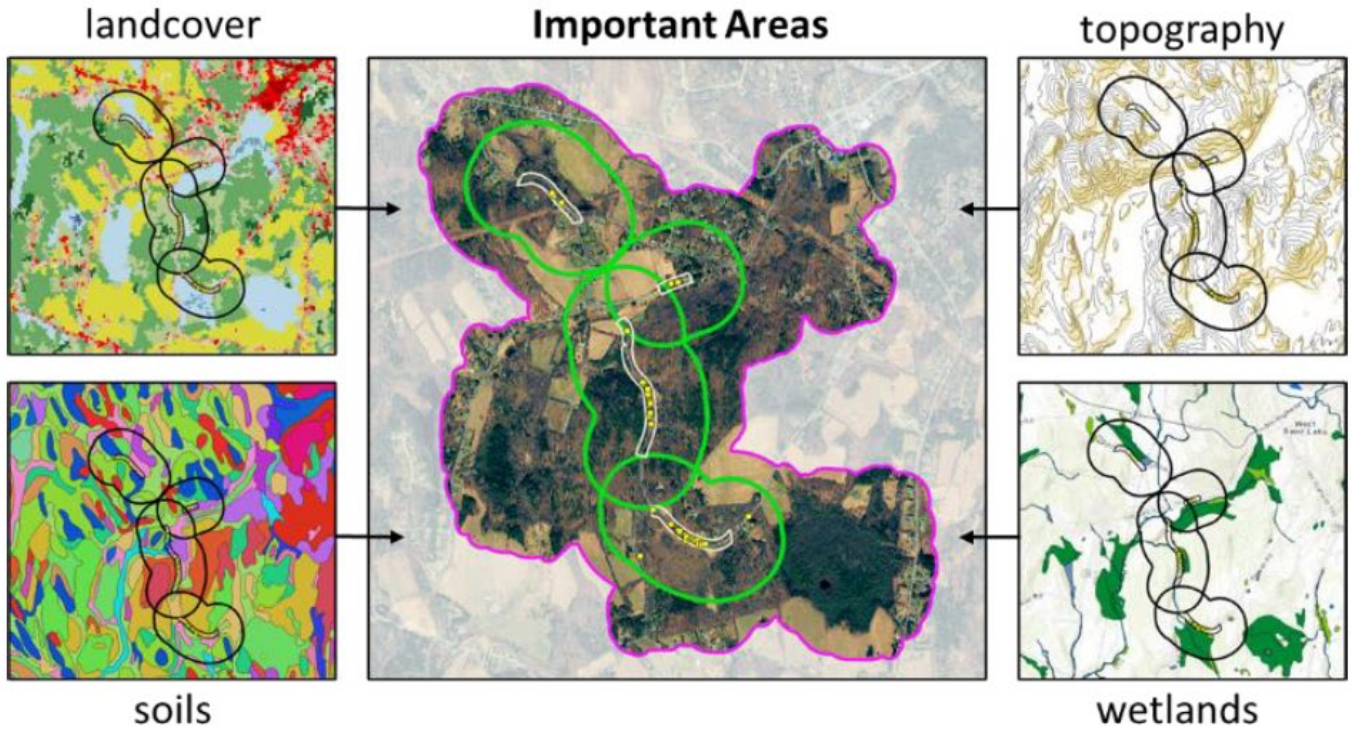


Figure 1. Conceptual model of the inputs and output for our Important Area models of vernal pool breeding amphibians. IAs are not simple buffers, but models based on local landscape configuration and programmed logic based on ecological interactions and the natural history of target organisms. Basemaps: ESRI World Topography, Google Satellite.

Preliminary “Important Areas” Modeling

Preliminary Results

- Identified 39 Important Areas (IAs) with 50+ observations of focal taxa
- The IAs overlapped with protected areas as well as private lands and could be valuable for identifying priorities in need of conservation.

Next Steps

- Revisit methodology, adjust as needed
- Add (screened*) 2024-2026 surveys to the model
- Finalize output to share for conservation planning



Applying Data to Wildlife Assessment: SWAP Species Distribution

NEW YORK STATE WILDLIFE ACTION PLAN

DRAFT

July 2025

Species Status Assessment

Common Name: Four-toed salamander **Date Updated:** March 12, 2025

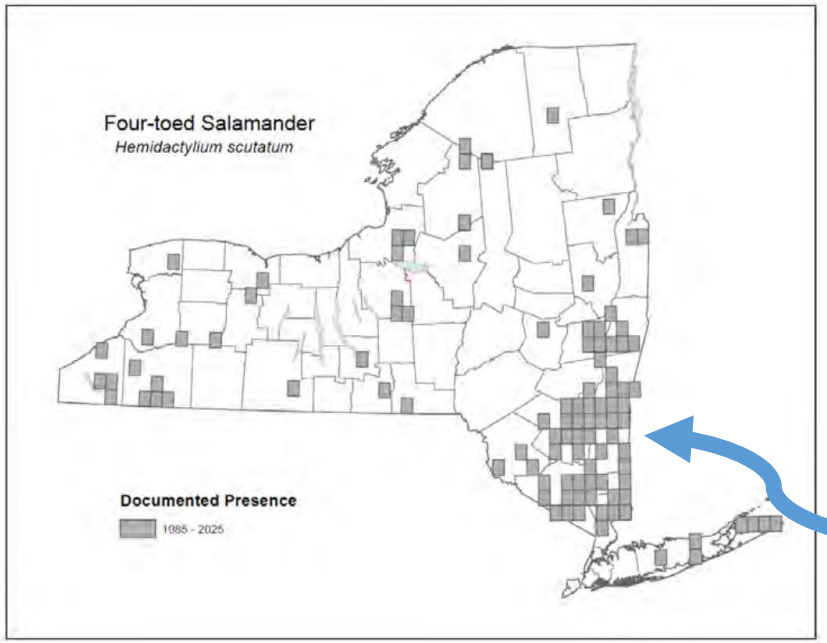
Scientific Name: *Hemidactylium scutatum* **Updated By:** L. Pipino, C. Macklem

Class: Amphibia

Family: Plethodontidae

Species Synopsis:

The four-toed salamander, *Hemida*
idactylium genus, which
se salamanders absorb
raphy of the four-toed sa
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NA
6).



High Priority SGCN

"challenging to find…and estimates of abundance and population trends remain unknown."

Since 2000, 28 new quads added (prev. 76/979 quads), including 18 from AM&RC volunteer data.


Photo by Laura Heady

Closing Thoughts and Questions

If the goal is to use volunteer migration data to inform local conservation planning, policy, and possibly even land protection, we need to consider:

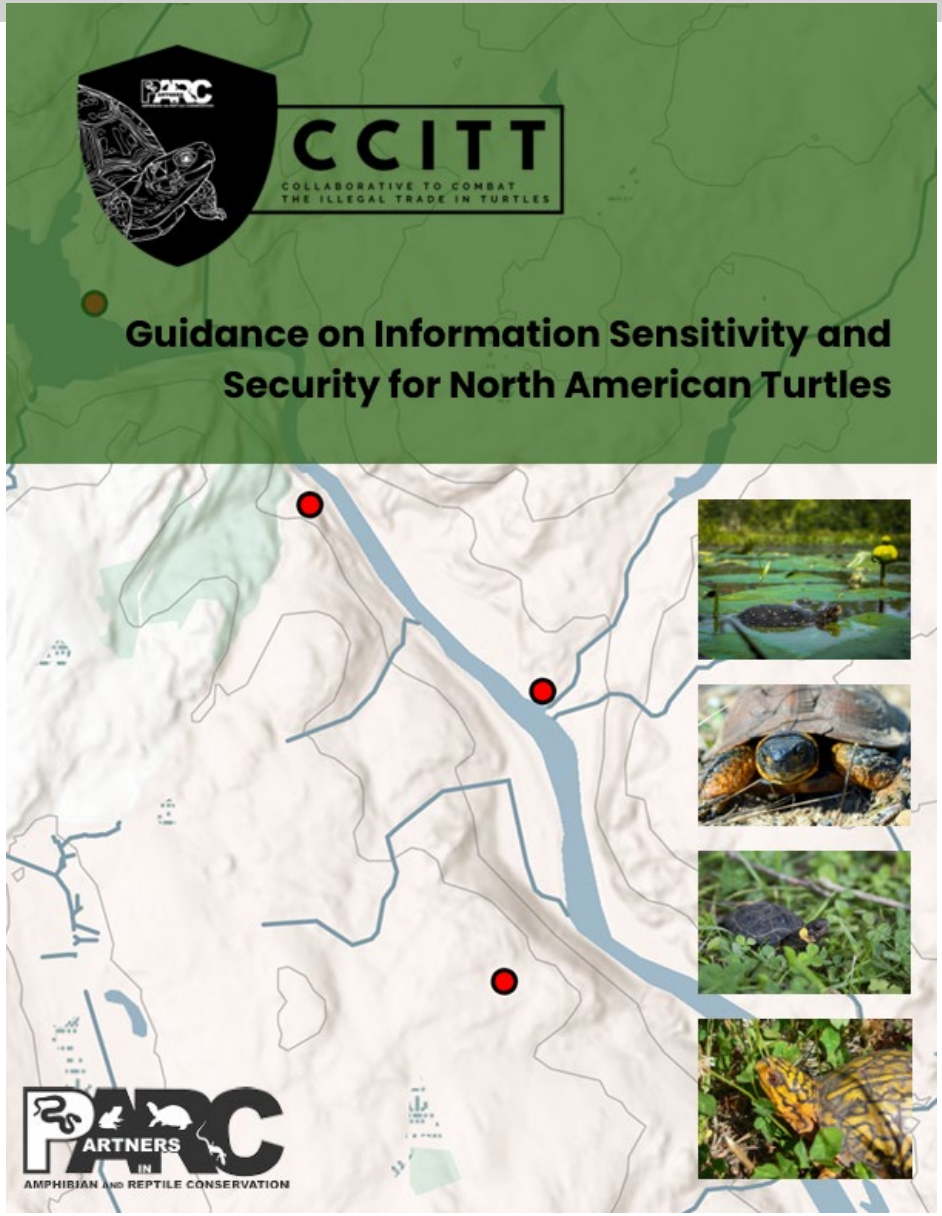


Photo by E. Schilmeister

- not all volunteers submit data
- confidence in surveys is variable – how to improve with limited resources…?
  - *require training?*
  - *require species validation?*
  - *ground truthing?*
- how best to share IA data with decision-makers?

Stay tuned!

Additional Closing Thoughts…on collection



"Sharing certain information about turtles, **even with good intentions**, can inadvertently assist those engaged in illegal collection and trade or encourage others to participate.

For example: *Posting information about the locations of wild turtle observations on digital platforms, including social media,* ***puts individual turtles and their populations at risk of illegal collection***."

Additional Closing Thoughts…on avoiding “doing more harm than good”



THE HIDDEN RISKS OF SHARING YOUR OBSERVATIONS: SAFEGUARDING WILDLIFE IN THE DIGITAL AGE

“When I first realized that the information I was sharing could be exploited by poachers, I felt conflicted.”

Nancy Karraker wasn’t talking about contributing to Endangered species databases or wildlife law enforcemen
networks. She was talking about social media posts. Community science platforms. Research publications.



Animal Conservation

Zoological Society of London

LETTER FROM THE CONSERVATION FRONTLINE OPEN ACCESS

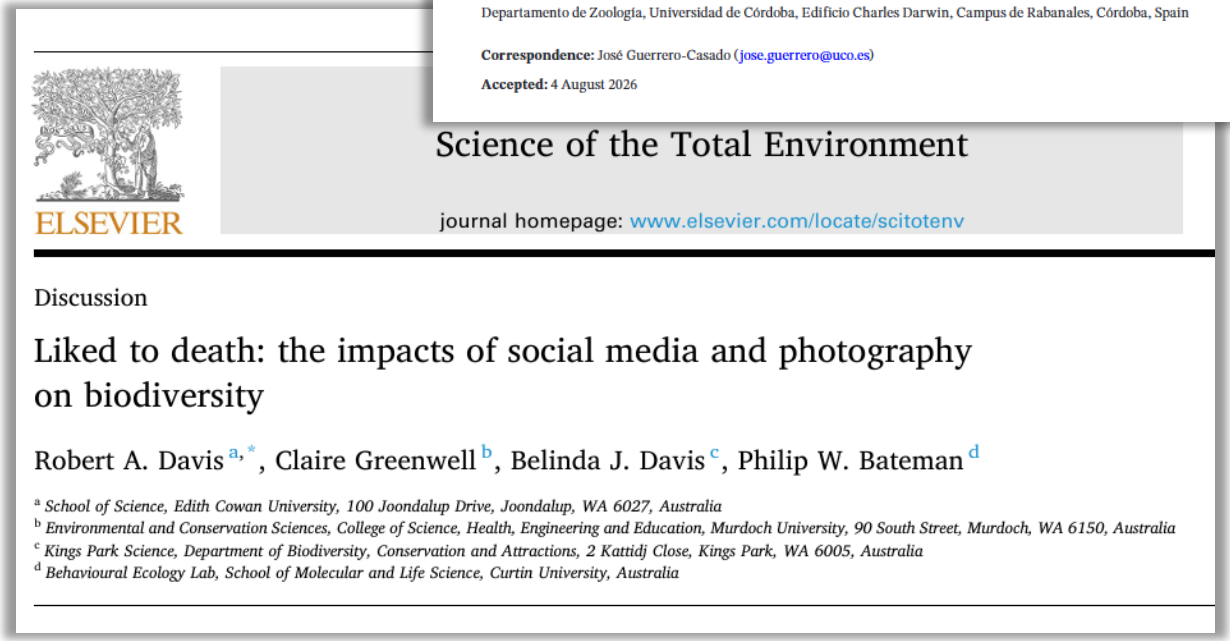
Dear Influencers: Don't Disturb Amphibians and Reptiles for More Followers

José Guerrero-Casado | Ricardo Reques

Departamento de Zoología, Universidad de Córdoba, Edificio Charles Darwin, Campus de Rabanales, Córdoba, Spain

Correspondence: José Guerrero-Casado (jose.guerrero@uco.es)

Accepted: 4 August 2026



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Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Discussion

Liked to death: the impacts of social media and photography on biodiversity

Robert A. Davis [a,*], Claire Greenwell [b], Belinda J. Davis [c], Philip W. Bateman [d]

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[b] Environmental and Conservation Sciences, College of Science, Health, Engineering and Education, Murdoch University, 90 South Street, Murdoch, WA 6150, Australia
[c] Kings Park Science, Department of Biodiversity, Conservation and Attractions, 2 Kattidj Close, Kings Park, WA 6005, Australia
[d] Behavioural Ecology Lab, School of Molecular and Life Science, Curtin University, Australia

As practitioners of community science that often involves vulnerable wildlife, I think we also need to consider the possible harm or negative impacts our projects might have, and course correct as needed.

Acknowledgements

NYNHP:
John Vanek
Hollie Shaw
Amy Conley
Tim Howard
Matt Schlesinger

NEW YORK STATE | Hudson River Estuary Program
A Program of the New York State Department of Environmental Conservation

Cornell University

Estuary Program and Cornell:
Penny Adler-Colvin
Emma Clements
Elise Edwards
Madeline McDonald
Meredith Hunn
Lan Tran
Nicole Guido



Photo by L. Heady

Thank you!

Laura Heady
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NYSDEC Hudson River Estuary Program
& Cornell University

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Photo by N. Nardi-Cyrus

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