Advancing a National Early Detection and Rapid Response Framework for Invasive Species

A Department of the Interior Priority to Strengthen Tools, Capacity, and Communications for Effective Action

US Department of the Interior: Hilary Smith

US Fish and Wildlife Service: Craig Martin, Susan Pasko

US Geological Survey: James English, Cindy Tam, Kaylin Clements

National Invasive Species Council: Angela McMellen Brannigan

US Department of the Interior Invasive Species Task Force: National Bureau Representatives

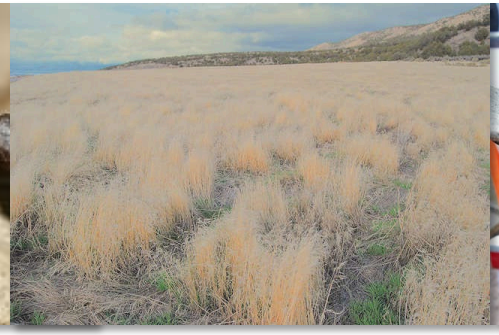
Project Leads: Bureau Representatives

WHY IS THIS IMPORTANT?

Global annual costs of biological invasions are estimated to exceed $423 billion.*

Invasive Carp

Whitenose Syndrome



Cheatgrass

Quagga/Zebra Mussels

Burmese Python

Feral Swine

Brown Treesnake

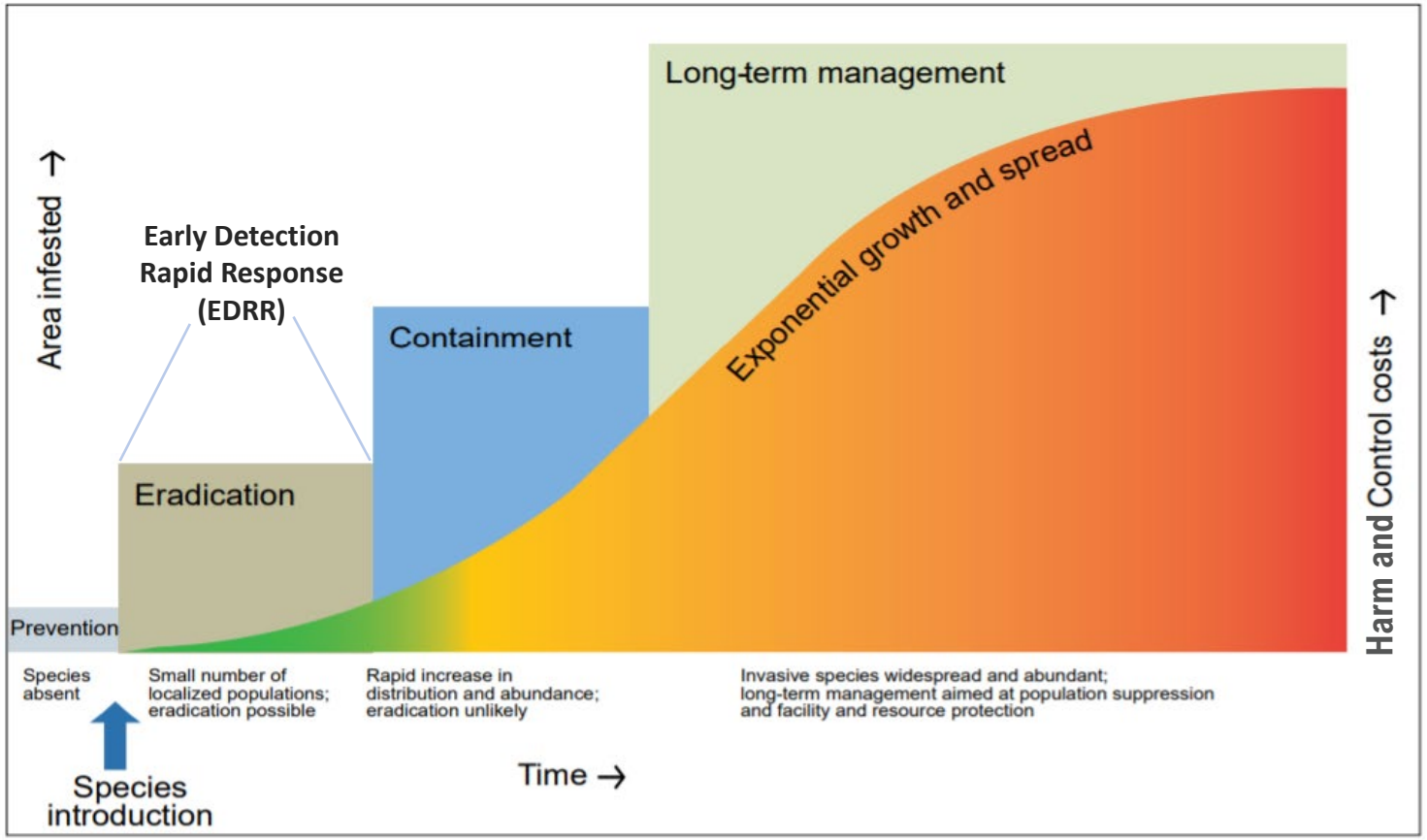
Lionfish

**PBES (2023). Summary for Policymakers of the Thematic Assessment Report on Invasive Alien Species and their Control Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy et al.*

We can avoid impacts, management burdens, and costs by preventing the establishment of new invasive species.

Zebra and Quagga Mussels

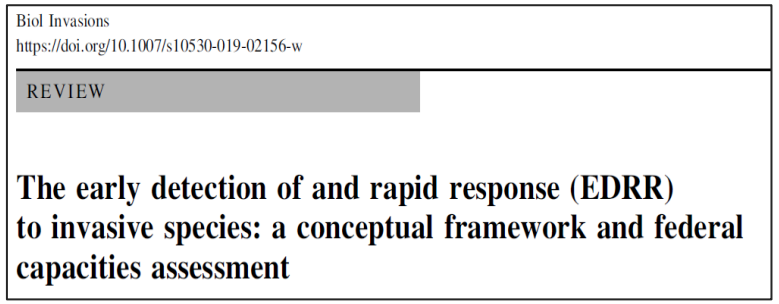
Wels catfish



Adapted from Rodgers. 2010. Invasive Plants and Animals Policy Framework. State of Victoria, Department of Primary Industries

Advancing a National Early Detection and Rapid Response Framework is supported in plans and the scientific literature.

"Work with tribes, states, and other partners to implement a National EDRR Framework"


Biol Invasions
https://doi.org/10.1007/s10530-019-02156-w

REVIEW

The early detection of and rapid response (EDRR) to invasive species: a conceptual framework and federal capacities assessment

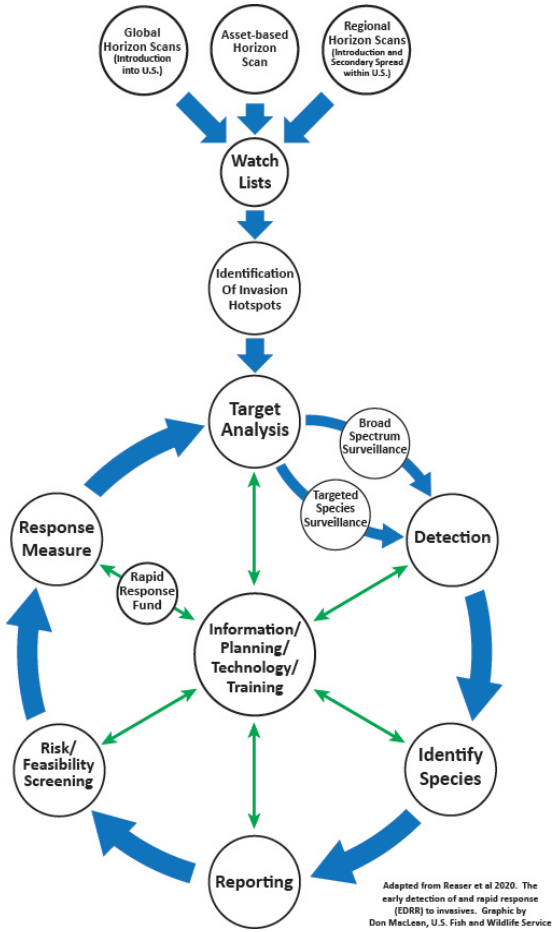
12 papers published in Biological Invasions (2020) "A blueprint for a national program for the EDRR to invasive species"

EDRR NATIONAL FRAMEWORK™

The mission of the National Early Detection and Rapid Response Framework is to find and eradicate invasive species new to the United States or those demonstrating secondary spread by coordinating across federal and non-federal partners and investing in innovative approaches for surveillance, data integration, and response capabilities for natural resource management.

**working mission statement*

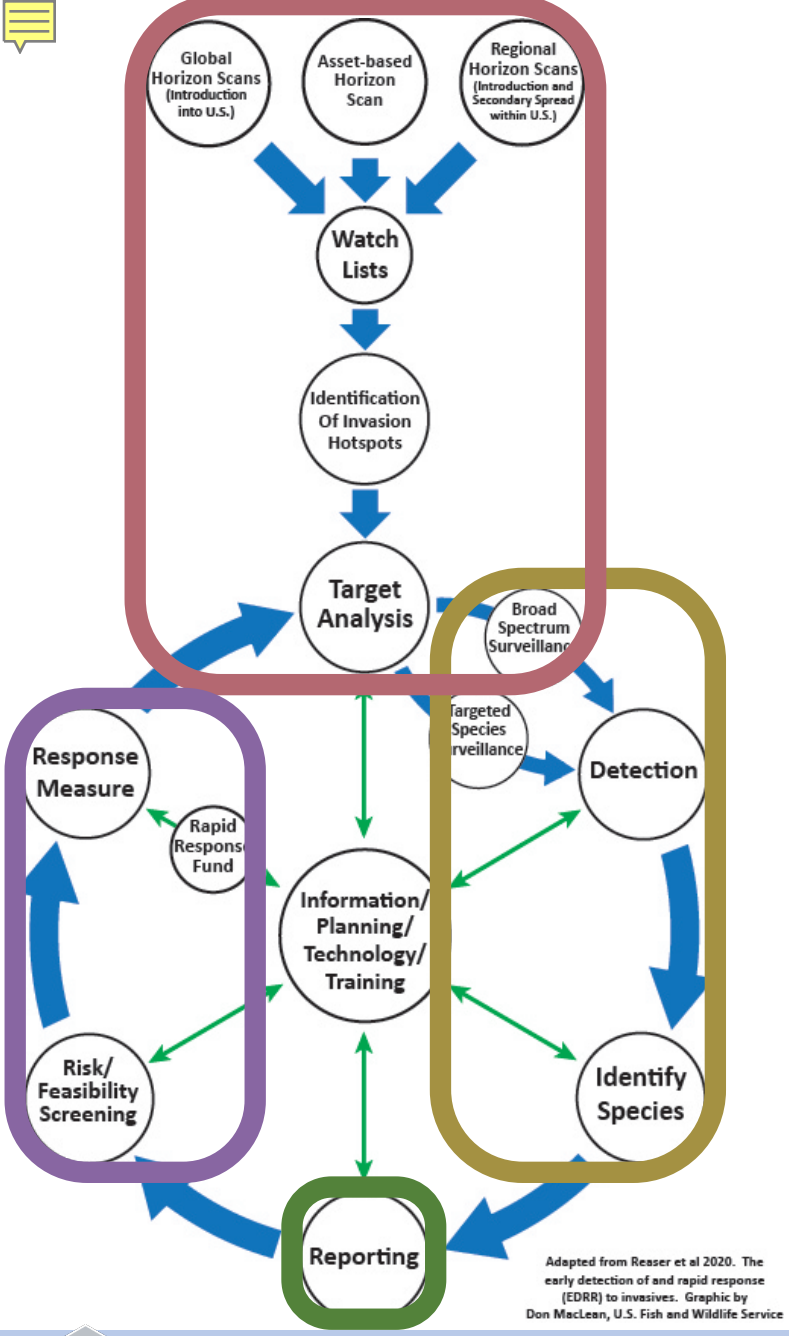
EDRR NATIONAL FRAMEWORK™



The National EDRR Framework is a sequence of coordinated and strategic actions that focuses capacity and investments on the right species, in the right place, at the right time, with the right tool.

Comprehensive EDRR Workflow

PLAN
DETECT
REPORT
RESPOND



Adapted from Reaser et al 2020. The early detection of and rapid response (EDRR) to invasives. Graphic by Don MacLean, U.S. Fish and Wildlife Service

EDRR
NATIONAL FRAMEWORK™

Federal Agency Contributions to a National EDRR Framework

Federal agencies have the ability to:

- assess invasive species risks internationally, nationally, and regionally.
- facilitate communication across jurisdictions where others may be limited.
- invest in cutting edge technology that promotes innovation and efficiency that is available to all.
- create systems, processes, and funding that are available interjurisdictionally and throughout the nation.

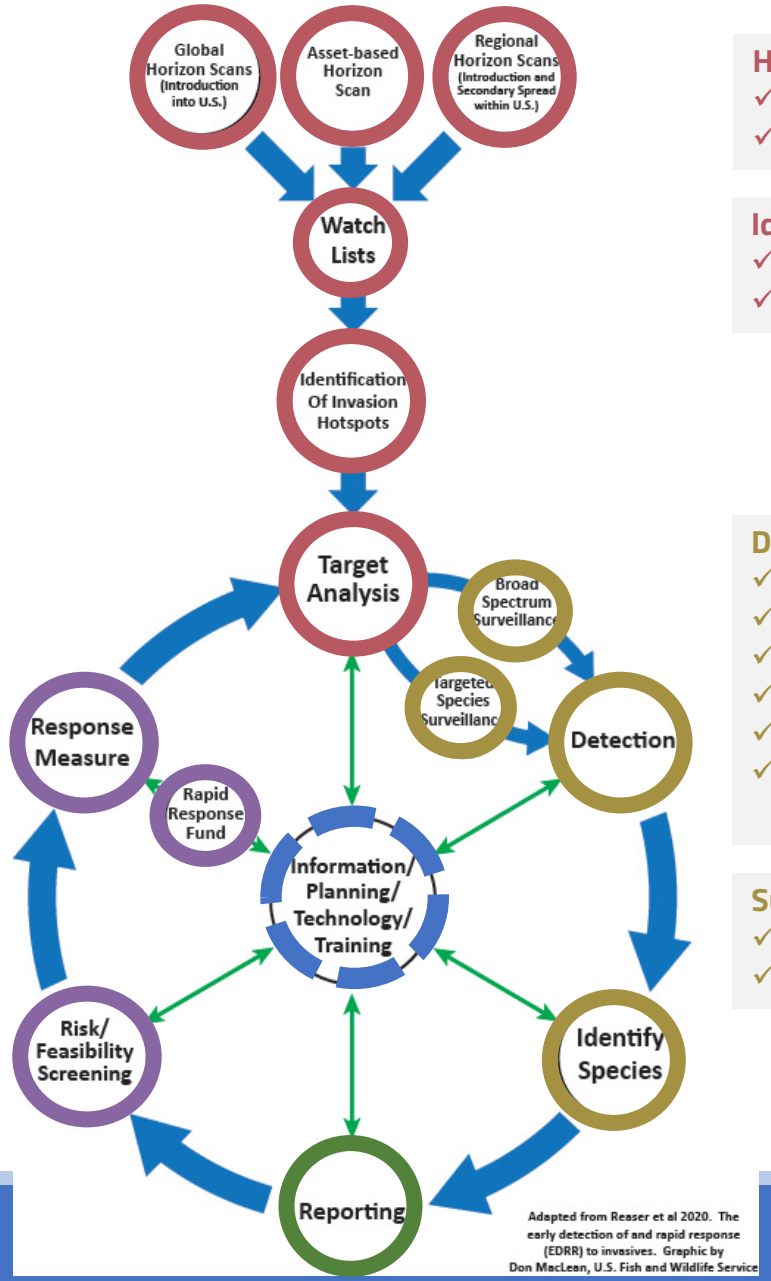
DOI Primary Programs and Activities

Siren: the National EDRR Information System
- ✓ Knit local, regional, and national EDRR efforts into one accessible online tool

National EDRR Framework Coordinator
- ✓ Facilitate Framework planning and implementation

Rapid Response Funding and Capacity
- ✓ Rapid Response Fund for Aquatic Invasive Species
- ✓ DOI Interjurisdictional Invasive Species Rapid Response Team pilot program

Reporting
- ✓ Utilize existing national, regional, and local occurrence reporting databases
  - ➢ E.g., NAS, EDDMaps, iMapinvasives, Wild Spotter
  - ➢ NAS metabarcoding



Horizon Scans and Watch Lists
- ✓ Global, Regional, Assets
- ✓ Invertebrates, vertebrates, and plants

Identification of Invasion Hotspots
- ✓ Streams, Lakes, Terrestrial tools
- ✓ Invasive Species Habitat Tool (INHABIT)

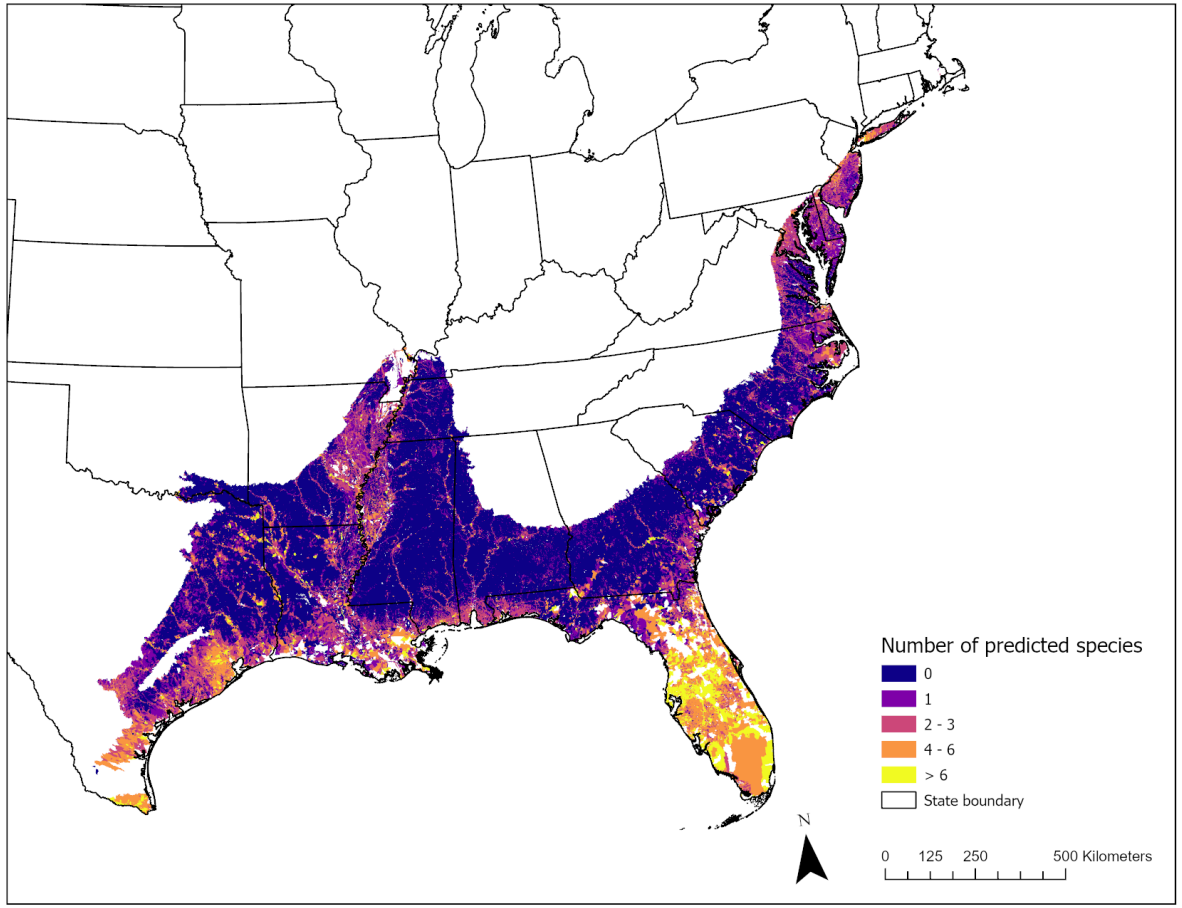
Detection Tools and Services
- ✓ Genetic Repository and Sharing Network
- ✓ Genetic marker development
- ✓ Managers eDNA Toolbox
- ✓ Point-of-use eDNA detection tools
- ✓ READI-Net automated eDNA sampling
- ✓ Molecular Lab Network (MLN) including Science Support, Lab Info Management System (LIMS)

Surveillance Capacity
- ✓ DOI asset-based protection, including citizen science
- ✓ Invasion hotspot surveillance pilot efforts

Case Study: Southeast Pilot - Streams

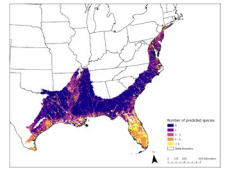
PLAN

Use hotspot analysis to inform which regions to pilot implementation in coordination with management authorities.



Adapted from Daniel and Galvez

Case Study: Southeast Pilot – Streams cont.



Lead management authorities use hotspot analysis to identify right places for early detection surveillance.

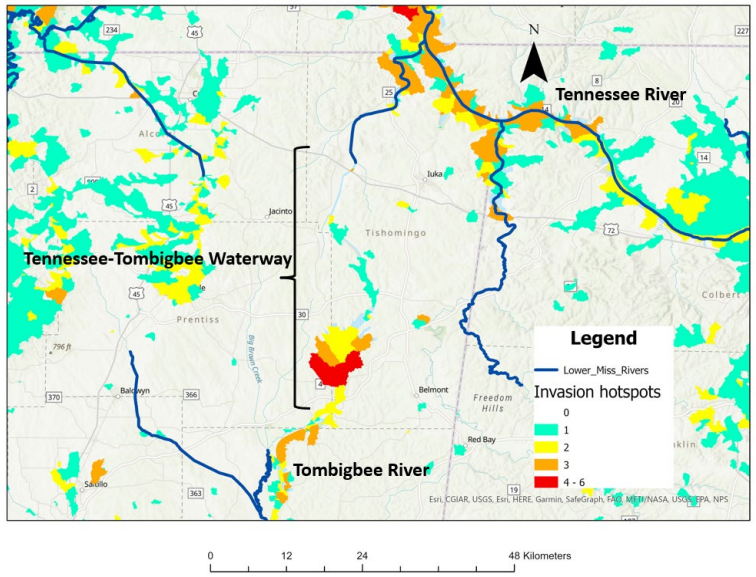


Figure 1. Invasion hotspots in the Tennessee-Tombigbee Waterway and Tennessee River.

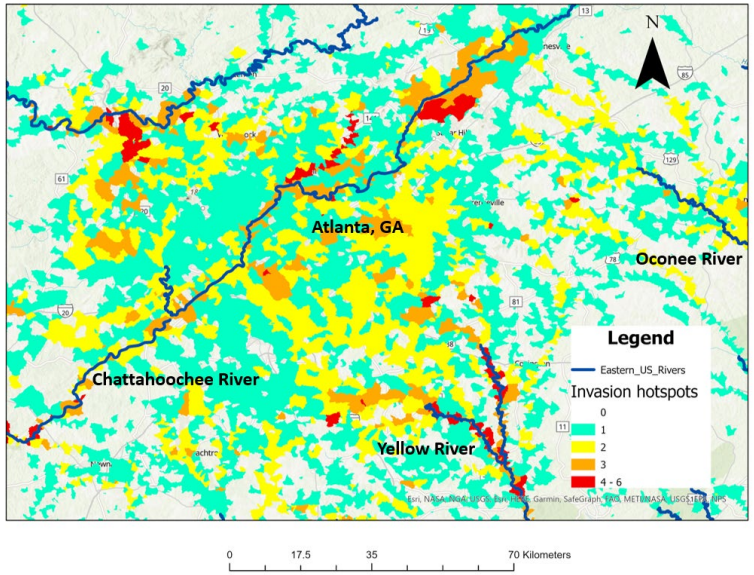


Figure 2. Invasion hotspots on the Apalachicola (Chattahoochee River) and Altamaha (South and Yellow Rivers) drainages near Atlanta, GA.

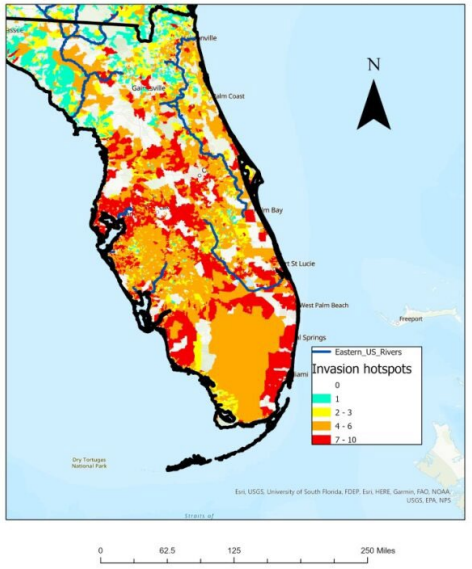
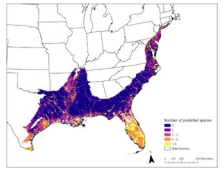


Figure 3. Invasion hotspots in Florida.

Adapted from Daniel and Galvez

Case Study: Southeast Pilot – Streams cont.

PLAN



Lead management authorities use global and regional scans and local knowledge to identify right species for early detection surveillance.

Global Scans (Fish)

Examples of high and medium-risk non-native fishes identified from the global horizon scan (Daniel et al. In review).

Aequidens tetramerus

Rutilusa aula

Prochilodus lineatus

Regional Scans (Plants)

Examples of high-risk exotic plants identified from the regional horizon scan (Himes and Wyman-Grothem 2022).

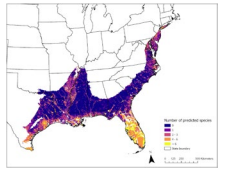
European frog-bit

African elodea

South American spongeplant

Case Study: Southeast Pilot – Streams cont.

DETECT



Lead management authorities identify the right tools and conduct early detection surveillance.

National EDRR Framework Toolbox

Traditional Methods

Genetic Methods

Resource Managers eDNA Toolbox

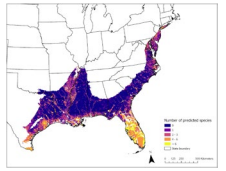
Genetic Repository and Sharing Network

Genetic marker development

Point of Use eDNA detection tools

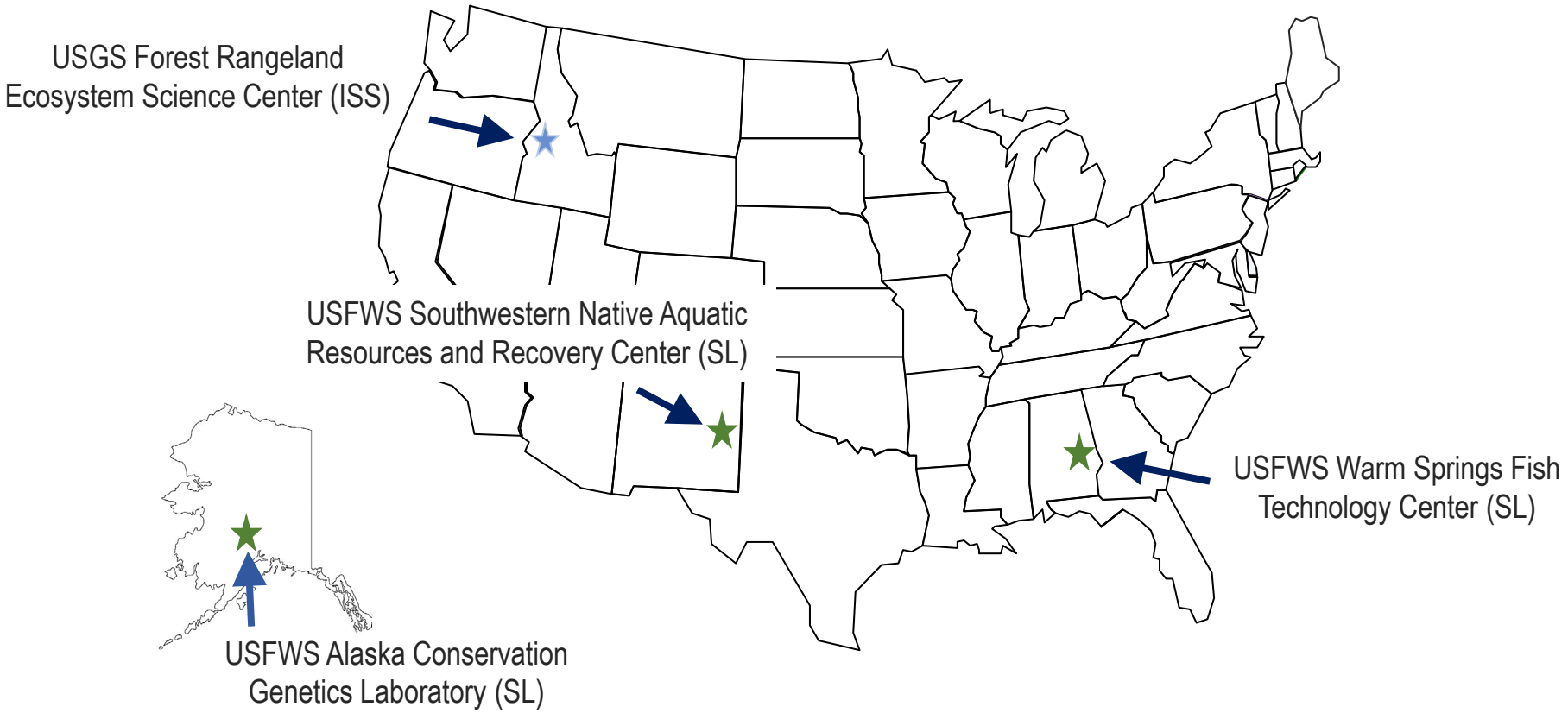
Automated robotic eDNA sampling tools

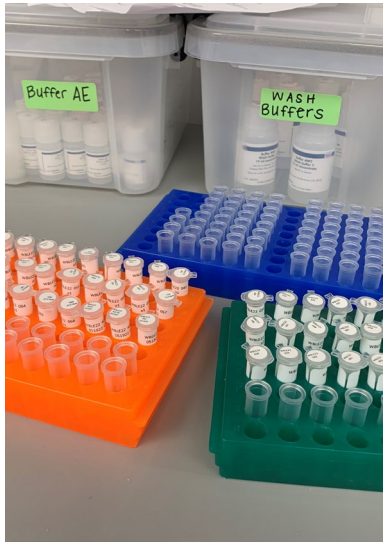
Case Study: Southeast Pilot – Streams cont.



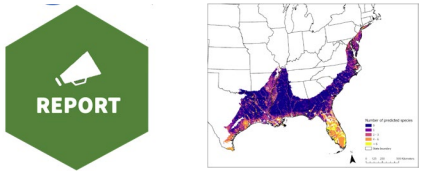
Lead management authorities determine whether to use the Molecular Lab Network for sample processing.

INITIAL MOLECULAR LAB NETWORK: Surveillance (SL) and Implementation Science Support Labs (ISS)





Case Study: Southeast Pilot – Streams cont.



Lead management authorities report confirmed detections to their preferred reporting platform.

Report Species Occurrences to Existing Platforms

EDDMapS find · map · track

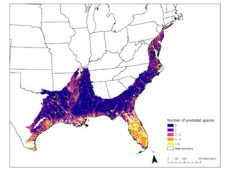
NAS

iMapInvasives

WILD SPOTTER
Mapping Invasives in America's Wild Places

Other Primary Reporting Platforms

Case Study: Southeast Pilot – Streams cont.

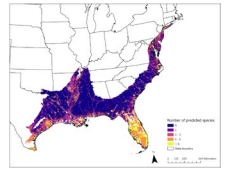


Lead management authorities determine whether a response is necessary and additional resources are needed.

Rapid Response Fund for Aquatic Invasive Species

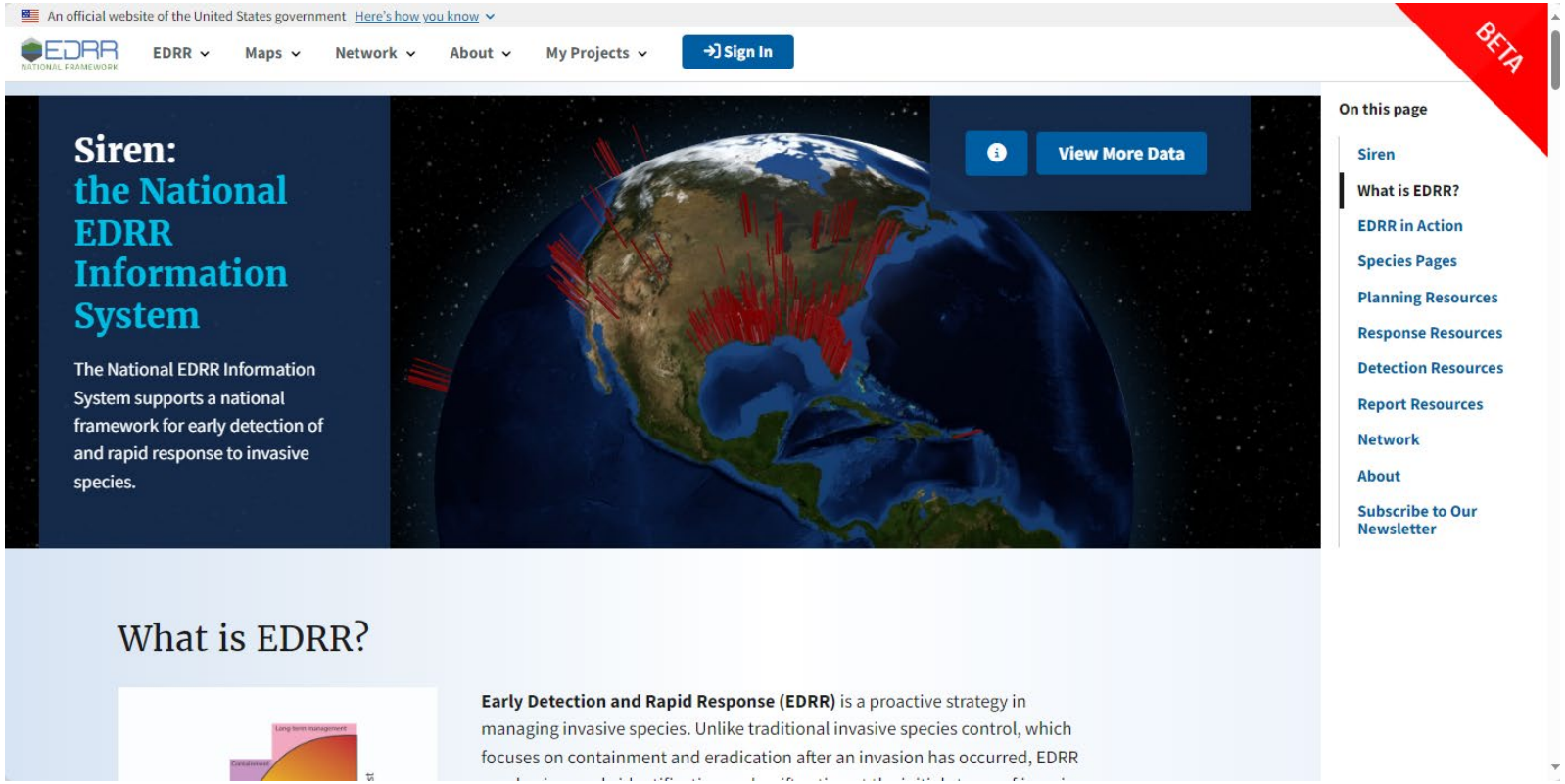
DOI Interjurisdictional Invasive Species Rapid Response Team (IInSRRT)

Case Study: Southeast Pilot – Streams cont.



Lead management authorities can access and share information throughout the EDRR process as needed.

Siren



Benefits of a National EDRR Framework At-A-Glance

Invasive Species Manager Access To

- Tools and Technology
- EDRR Information
- Rapid Response Funding
- Surveillance and Response Capacity
- A National Network

A Framework Built To Last Through Collaboration and Partnerships

US Army Corps of Engineers®