Species Risk Assessment Tools: Science and Policy Applications

Friday, October 3, 2014
12:00pm-2:00pm Eastern Time
(speaking will begin at 12:15)

Co-hosted by the Environmental Law Institute &
The National Invasive Species Council

This webinar is made possible by the generous support of the Turner Foundation.

To join the ELI Invasive Species Seminar Series mailing list, please email subramanian@eli.org
Species Risk Assessment Tools: Science and Policy Applications

Friday, October 3, 2014 • 12:00pm-2:00pm ET

Now Speaking:

Stas Burgiel
Assistant Director for Prevention and Budgetary Coordination, National Invasive Species Council (NISC)

Stas serves as the NISC policy lead on issues related to preventing the introduction and spread of invasive species with a focus on the pathways for their movement. He coordinates a prevention committee convened jointly with the Aquatic Nuisance Species Task Force and also oversees the collation of information on NISC member agency budgets related to invasive species issues. Key areas of interest and activity include the role of trade agreements, links to climate change and multi-level stakeholder coordination.

Stas received his Ph.D. in international service from the American University and a B.A. in political science from Swarthmore College. He has worked and consulted for a range of nongovernmental, governmental and intergovernmental organizations, including the Global Invasive Species Programme, the Nature Conservancy, the UNEP/World Conservation Monitoring Centre and the New Zealand government, on invasive species and other environmental policy issues.
Species Risk Assessment Tools: Science and Policy Applications

Friday, October 3, 2014 • 12:00pm-2:00pm ET

INTRODUCING:

Anthony Koop
Ecologist and Risk Analyst, Plant Epidemiology and Risk Analysis Laboratory, Animal and Plant Health Inspection Service

Tony is a risk analyst with the Plant Epidemiology and Risk Analysis Laboratory (PERAL) of the Animal and Plant Health Inspection Service. As the team lead for the PERAL Weed Team, he coordinates most day-to-day activities of the team, including weed prioritizations, pest plant datasheets, and weed risk assessments (WRA). Over the last ten years he has prepared and reviewed several hundred WRAs, helped develop the foundation and structure of the team’s processes, organized three WRA training workshops, and worked on other weed issues related to biofuels, genetically engineered plants, herbicide resistance, and international standards. He also led the development of the predictive model of the new PPQ WRA. Prior to his work on weeds, Tony prepared commodity and pest risk assessments for PERAL. Tony is a plant ecologist with bachelors, masters, and doctorate degrees in biology. He has been working on invasive plant issues for over 20 years.

Questions for the panelists? Submit via the “Questions” box
The PPQ Weed Risk Assessment

An Introduction

Anthony L. Koop,
Leslie Newton, Barney Caton, Lisa Kohl, Larry Fowler
(USDA-APHIS)

Species Risk Assessment Tools: Science and Policy Applications
ELI / NISC Webinar
October 3, 2014
What is a Risk Assessment?

**Risk Assessment:** Likelihood and consequences of an event

**Invasive Species RA:** Evaluation of the likelihood of the entry, establishment, and spread of a pest, and its potential consequences (harm & impacts)

Decision making - Broad range of types
Risk Assessment in PERAL

- USDA-APHIS-Plant Protection and Quarantine (PPQ)
- Plant Epidemiology and Risk Analysis Laboratory (PERAL)
  - Conduct a variety of risk analyses
    - Pest screening & prioritization
    - Pest risk assessment
    - Pathway analyses
    - Quantitative pest modeling
    - Economic analyses
    - Commodity import analyses
    - Geospatial analyses, …
The PPQ WRA: Style of the assessment

- Mostly Yes/No questions; a few multiple choice
- Record uncertainty: negligible, low, moderate, high, max
- Evidence, supporting documents, and reasoning are recorded for each
Risk Elements in the WRA

- Establishment / Spread Potential (23)
- Impact Potential (18)
- Geographic Potential (36)
- Entry Potential (14)

Predictive model
Uncertainty Analysis
The Final Product

3 - 4 page summary
– Background/Initiation
– Risk element summary
– Data and figures
– Discussion/Conclusion

References

Appendix: questions, answers, uncertainty, and evidence

Weed Risk Assessment for *Sideritis montana* L. (Lamiaceae) – Mountain ironwort

Agency Contact:

Plant Epidemiology and Risk Analysis Laboratory
Center for Plant Health Science and Technology

Plant Protection and Quarantine
Animal and Plant Health Inspection Service
United States Department of Agriculture
1730 Varsity Drive, Suite 300
Raleigh, NC 27606
The WRA’s core analyses & results

• Risk potential

• Uncertainty analysis

• Geographic potential
1) Risk Potential

- Calculate risk scores for Establishment/Spread & Impact of plant species
  - Higher values indicate greater capacity

- Determine the final conclusion
  - High Risk, Low Risk, or Evaluate Further

- Species with moderate scores (EF) → secondary screening tool
### Species Risk Score

- **Low Risk**: Evaluate Further
- **Moderate Risk**: Eval Further
- **High Risk**: Establish Spread Potential

#### Invasive Status
- **Major-Invaders**
- **Minor-Invaders**
- **Non-Invaders**

#### Impact Potential

- **Species Risk Score**:■ ▲ ● ×
- **Establishment Spread Potential**:■ ▲ ● ×
- **Invasive Status**:■ ▲ ● ×
### Model Performance
(validation dataset, N=102)

<table>
<thead>
<tr>
<th>Test</th>
<th>Accuracy</th>
<th>Error</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Maj-Invaders (True +)</td>
<td>Non-Invaders (True -)</td>
</tr>
<tr>
<td>US – PPQ WRA</td>
<td>0.941</td>
<td>0.971</td>
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<tr>
<td>US - Aus WRA</td>
<td>0.971</td>
<td>0.794</td>
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<tr>
<td>Mean (8 other AUS tests)</td>
<td>0.936</td>
<td>0.715</td>
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</tbody>
</table>

- Overall accuracy is higher than the Australian WRA
- Non-invader and major-invader performance similar
2) Uncertainty analysis

• Summarize & describe uncertainty for each risk element

• Evaluate the sensitivity of the risk scores to uncertainty using a Monte Carlo simulation
  • what would the risk score be if…
  • N = 5,000
Impact Potential vs. Establishment Spread Potential

- Low Risk
- Evaluate Further
- High Risk

- High 99.98%
- EF→High 0.02%
- EF→EF 0%
- EF→Low 0%
- Low 0%
Uncertainty over time

0 Hrs

1 Hr

7 Hrs

9 Hrs
3) Geographic potential

• Geo potential evaluated separately

• Simple analysis that matches on and overlays
  • Plant hardiness zones
  • Annual precipitation
  • Climate classes
Representing areas where all three climatic variables are suitable for its survival
## Validating the climate matching model

<table>
<thead>
<tr>
<th>Model</th>
<th>Predicted Prevalence</th>
<th>Sensitivity</th>
<th>Critical Success Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPQ model</td>
<td>0.670</td>
<td>0.956</td>
<td>0.264</td>
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<tr>
<td>MaxEnt</td>
<td>0.448</td>
<td>0.852</td>
<td>0.257</td>
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<tr>
<td>Climex</td>
<td>0.538</td>
<td>0.920</td>
<td>0.249</td>
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</tbody>
</table>

- The PPQ model predicts a wider area as climatically suitable
- Other performance measures similar
Other potential “risk elements” for WRA

- Extent of U.S. cultivation
- Feasibility of control
- Extent of current and potential range
- Biomass/biofuels
- GE species
84 Species Assessed with the New Model

Impact Potential vs. Establishment Spread Potential

- High Risk
- Evaluate Further
- Low Risk

Legend:
- High Risk
- EF-HR
- EF-EF
- Low Risk
Anubias barteri

- Aquatic ornamental
- Tropical aroid
- No evidence of impact or invasiveness elsewhere.
Geranium lucidum

- Shade-adapted winter annual
- 1st recorded 1971 in a cow pasture
- Dominates forest understories.
- Persistent seed bank
- Spreading
Triplaris melaenodendron

- First US detection in Fl in 2010.
- First time outside of native range
- Called “novice tree”
Many potential weeds

What we can do for you

– Share completed WRAs
  • APHIS – FNW Program Website – WRA

– Train & mentor you [WRA-101 (Feb 24-27, 2015)]
  • WRA Guidelines
For more information or to submit requests for WRA

Tony Koop
Plant Epidemiology and Risk Analysis Laboratory
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Raleigh, NC 27606-5202

Phone: (919) 855-7429
Email: anthony.l.koop@aphis.usda.gov

Barney Caton (PERAL Asst. Dir.) – Barney.P.Caton@aphis.usda.gov
Species Risk Assessment Tools: Science and Policy Applications

Friday, October 3, 2014 • 12:00pm-2:00pm ET

INTRODUCING:

Kerrie Kyde
Invasive Plant Ecologist, Maryland Department of Natural Resources

Kerrie Kyde is the Invasive Plant Ecologist for the Maryland Department of Natural Resources, Wildlife and Heritage Service, and a member of the Natural Heritage Program staff. She is responsible for invasive plant assessment and control in ecologically sensitive areas on 475,000 acres of state lands. She has been involved in invasive plant species work professionally and personally for 20 years. Before joining DNR, Ms. Kyde worked at the USDA biocontrol lab in Frederick on the genetics of the invasive weed Mile-a-minute and the host range and epidemiology of the Sudden Oak Death pathogen, Phytophthora ramorum.

Ms. Kyde was a founding member of the Maryland Invasive Species Council, and is chair of the Maryland Invasive Plant Advisory Committee charged with implementing Maryland’s new Invasive Plant Law. She was the founding president of the Mid-Atlantic Invasive Plant Council, and is currently a member of DNR’s Invasive Species Matrix Team, which advises Secretary Gill on invasive species science and policy.

Ms. Kyde holds a MS in Environmental Biology from Hood College.

Questions for the panelists? Submit via the “Questions” box
Putting Prevention First:
Maryland’s IPAC at Work

Kerrie L. Kyde
Invasive Plant Ecologist
MD Natural Heritage Program,
Dept. of Natural Resources
Talk Outline

- Need
- Motivation
- Legislation
- Implementation
2010 Maryland Code AGRICULTURE
TITLE 9 - REGULATION AND SUPERVISION OF SEEDS, TURF GRASS, SOD, 
POTTATOES, GINSENG AND NOXIOUS WEEDS
Subtitle 4 - Weed Control
§9-401. Noxious plants.
(a) Declaration of certain species as noxious.- The existence of growth of certain species of plants is declared to be noxious.
(b) Enumeration.- The following plants are considered to be noxious weeds in the State:
   (1) Thistles belonging to the asteraceae or compositae family, including Canada,
musk, nodding, plumeless, and bull thistle;
   (2) Johnson grass (sorghum halepense) or hybrids that contain Johnson grass as a 
parent; and
   (3) Shatter cane and wild cane (sorghum bicolor).
H.B. 1360

- Named 45 species as invasive
- Banned sales or use in commercial landscape planting unless plants were labeled
- Required permanently affixed labels, supplied by MDA, reading

“INVASIVE PLANT SPECIES – HARMFUL TO THE ENVIRONMENT”
HOUSE BILL 831

Jake Robinson – our secret weapon!
Md. AGRICULTURE Code Ann. § 9.5-101-306

- Defines “Invasive plant”
- Establishes an Invasive Plant Advisory Committee (IPAC), its membership and terms
- Requires the Secretary to Agriculture to promulgate regulations within one year that adopt a weed risk assessment system
- Requires the Secretary of Agriculture to promulgate regulations within two years that classify assessed plants as Tier 1 or Tier 2.
- Sets out exceptions to prohibited activities and penalties for violation
"Invasive plant" means a terrestrial plant species that:

(1) did not evolve in the state; and

(2) if introduced within the state, will cause or is likely to cause, as determined by the secretary:
   (i) economic harm;
   (ii) ecological harm;
   (iii) environmental harm; or
   (iv) harm to human health.

http://www.lexisnexis.com/hottopics/mdcode/
IPAC Membership

- The Secretary or designee from (ex officio):
  - Department of Agriculture
  - Department of Natural Resources
  - Department of Transportation
  - Department of the Environment
  - Dean of the University of Maryland College of Agriculture and Natural Resources

- Appointed by Sec. of Agriculture, with DNR
  - One individual from the landscaping industry
  - One individual from the plant industry
  - One individual from an NGO advocacy organization
  - Two individuals with experience with invasive plants, gardening, conservation or other relevant experience
  - One consumer

- Serves to advise the Secretary of Agriculture
IPAC Uses APHIS’ Weed Risk Assessment

- Evaluates four risk factors
- Uses logistic regression to score species’ invasion probability
- Further evaluates moderate risk species with secondary screening
- Employs Monte Carlo simulation as “uncertainty” check
- IPAC applies “Maryland Filter” to WRA High Risk species to classify as Tier 1 or Tier 2

http://www.dsd.state.md.us/comar/SubtitleSearch.aspx?search=15.06.04.*
MARYLAND SPECIALTY CROP BLOCK GRANT PROPOSAL: Identify plant species likely to become invasive by conducting a Weed Risk Assessment and summarizing information about the species in an easy to interpret, user friendly document format to provide a scientifically determined basis for establishing regulated species lists and disseminating to appropriate specialty crop stakeholders.
IPAC Uses APHIS' Weed Risk Assessment
- Evaluates four risk factors
- Uses logistic regression to score species' invasion probability
- Further evaluates moderate risk species with secondary screening
- Employs Monte Carlo simulation as "uncertainty" check
- IPAC applies "Maryland Filter" to WRA High Risk species to classify as Tier 1 or Tier 2

DRAFT - Maryland Tier Filter for High Risk Plants

1. Is the plant a sterile cultivar or used for root stock only? 
   - no 
   - yes

2. What is its potential distribution in Maryland? 
   - Wide
   - Narrow

3. How feasible is control? 
   - easy
   - difficult

4. Does it threaten T/E species or ecosystems? 
   - no
   - yes

5. Is added propagule pressure from sales significantly increasing potential for persistence and spread? 
   - no
   - yes

6. Tier I
   - Tier II
   - Tier I
   - Tier II
Putting Prevention First:
Maryland’s IPAC at Work

Kerrie L. Kyde
Invasive Plant Ecologist
MD Natural Heritage Program
Dept. of Natural Resources
kerrie.kyde@maryland.gov
301/948-8243

THANKS!
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INTRODUCING:

Reuben Keller
Ecologist and Risk Analyst, Plant Epidemiology and Risk Analysis Laboratory, Animal and Plant Health Inspection Service

Reuben Keller is an Assistant Professor in the Institute of Environmental Sustainability at Loyola University Chicago. He began working on invasive aquatic species during his undergraduate degree in Australia, where he spent a year researching the impacts of the invasive oriental weatherloach fish on local ecosystems. In 2001 he moved to the U.S. to begin his Ph.D. in David Lodge’s lab at the University of Notre Dame. While there, his work focused on the development of risk assessment tools for aquatic species, and the integration of these tools with economic models to determine best policy.

After completing his Ph.D. in 2006 Keller held post-doctoral positions at Cambridge University, Notre Dame, and the University of Chicago. In 2011 he began as faculty at Loyola University Chicago. His research is focused on identifying the ways that non-native freshwater species are moved across the globe and how species invasions can be prevented. He works extensively with economists to integrate the ecology of invasions with information about trade so that the most rational solutions for invasion prevention can be found. He also works closely with managers to ensure that the results of his work are useful and can be implemented.

Questions for the panelists? Submit via the “Questions” box
Risk Assessment For Invasive Aquatic Species in the Great Lakes

Reuben Keller
Loyola University Chicago
rkeller1@luc.edu

David Lodge, Lindsay Chadderton, Pat Charlebois, Crysta Gantz, Erin Grey, Danielle Hilbrich, Greg Hitzroth, Jennifer Howeth, Reuben Keller, Nick Mandrak, Kristin TePas
Aquatic Organisms in Trade in Great Lakes Region

• Hundreds of species in trade, including (at least) 126 plants, 826 fishes, 87 mollusks

• Unknown numbers of other species (crayfishes, amphibians, reptiles)

• Many species already invasive, and more are being introduced through trade
## Regulatory Response

<table>
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<tr>
<th>Species</th>
<th>IL</th>
<th>IN</th>
<th>MI</th>
<th>MN</th>
<th>NY</th>
<th>OH</th>
<th>ON</th>
<th>PA</th>
<th>WI</th>
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<tbody>
<tr>
<td>Bighead carp (<em>Hypophthalmichthys nobilis</em>)</td>
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<td>Bitterling (<em>Rhodeus sericeus</em>)</td>
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<td>Black carp (<em>Mylopharyngodon piceus</em>)</td>
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<td>Chinese weatherloach (<em>Misgurnus anguillicaudatus</em>)</td>
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<td>Eastern banded killifish (<em>Fundulus diaphanus</em>)</td>
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<td>Grass carp, triploid (<em>Ctenopharyngodon idella</em>)</td>
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<td>Grass carp, diploid (<em>Ctenopharyngodon idella</em>)</td>
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<td>Ide/Orfe (<em>Leuciscus idus</em>)</td>
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<td>Mosquitofish, eastern (<em>Gambusia holbrooki</em>)</td>
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<td>Mosquitofish, western (<em>Gambusia affinis</em>)</td>
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<td>Piranha (<em>Multiple genera</em>)</td>
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<td>Round goby (<em>Neogobius melanostomus</em>)</td>
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<td>Rudd (<em>Scardinius erythrophthalamus</em>)</td>
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<td>Ruffe (<em>Gymnocephalus cernuus</em>)</td>
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<td>Sea lamprey (<em>Petromyzon marinus</em>)</td>
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<td>Silver carp (<em>Hypophthalmichthys molitrix</em>)</td>
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<td>Snakehead, giant (<em>Channa micropeltes</em>)</td>
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<td>Snakehead, northern (<em>Channa argus</em>)</td>
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<td>Snakehead family</td>
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<td>Red shiner (<em>Cyprinella lutrensis</em>)</td>
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<td>Three spine stickleback (<em>Gasterosteus aculeatus</em>)</td>
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<td>Tubenose goby (<em>Proterorhinus marmoratus</em>)</td>
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<td>Walking catfish (<em>Family Clariidae</em>)</td>
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<td>Walking catfish (<em>Clarias batrachus</em>)</td>
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<td>White perch (<em>Morone americana</em>)</td>
<td>X</td>
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<td>Zander (<em>Sander lucioperca</em>)</td>
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*Data from Lindsay Chadderton, TNC*
The Need for Risk Assessment

• Efforts to prevent new invaders are only as good as the least effective regulations/enforcement

• Coordination is essential to meet goals of preventing new invaders from arriving

• Risk assessment has been shown to have environmental and economic benefits
Risk Assessment for Invasive Species

Goal of RA is to identify establishers/invaders prior to introduction

Non-native species pool

- Transport
- Introduced
- Reproduction
- Established
- Spread, impacts
- Invasive
Risk Assessment for Invasive Species

Non-native species pool

Transport

Introduced

Reproduction

Established

Spread, impacts

Invasive

RA tools need to be:
- Accurate
- Transparent
- Repeatable
- Low Cost
- Peer Reviewed
Our Project

• Develop Risk Assessment Tools that can be applied across Great Lakes states for aquatic plants, fishes, mollusks, amphibians, and reptiles

• Assess species currently in trade

• Make all results available to managers, policy-makers, and the public
Stakeholder Process

• Worked throughout with *Management Transition Board* to ensure that our work meets the needs of state policy-makers

• Training for completed tools

• Notre Dame STAIR tools (*Science-based Tools for Assessing Invasion Risk*) will soon be published on [www.takeAIM.org](http://www.takeAIM.org)
Developing Risk Assessment Tools

Gather species data and look for patterns explaining success.

3 Invasion Process
   Species Elsewhere
   Introduced
   Established
   Invasive
Invasion Process
Species Elsewhere

1. Gather species lists
2. Gather trait data
3. Analyze data

STAIRplants

Introduced (n=84)
Established (n=40)
Invasive (n=16)
STAIRplants questions and scoring

- 38 questions in 12 categories with scores summed
  - Climate/distribution
  - Invasiveness elsewhere
  - Habitat breadth
  - Potential for spread
  - Generation time
  - Reproductive capacity
  - Competitive ability
  - Impacts to water flow
  - Impacts to water chemistry
  - Impacts to native systems
  - Other negative impacts
  - Response to management

- AqWRA score
  - Range of possible scores 3 to 91
  - Thresholds can be found to distinguish invaders from others
STAIRplants Scores

Not established
Established, not invasive
Established, invasive
STAIRplants Scores

- Not established
- Established, not invasive
- Established, invasive
STAIRplants Scores

Not established
Established, not invasive
Established, invasive

Scores
Sec. 23. (a) The following are prohibited invasive aquatic plants and are declared pests or pathogens regulated under this section:

1. Azolla pinnata (mosquito fern).
2. Butomus umbellatus (flowering rush).
3. Caulerpa taxifolia (caulerpa or Mediterranean killer algae).
4. Egeria densa (Brazilian elodea, Brazilian waterweed, Anacharis, or Egeria).
5. Eichhornia azurea (anchored water hyacinth).
6. Hydrilla verticillata (Hydrilla or water thyme).
7. Hydrocharis morsus-ranae (European frogbit or common frogbit).
8. Hygrophiila polysperma (miramar weed, Indiana swampweed, or hygro).
9. Ipomoea aquatica (Chinese waterspinach or swamp morning-glory).
10. Iris pseudacorus (yellow flag iris or tall yellow iris).
11. Lagarosiphon major (oxygen weed or African elodea).
12. Limnophila sessiliflora (Asian marshweed or ambulia).
13. Monochoria hastata (monochoria, arrowleaf, or false pickerelweed).
14. Monochoria vaginalis (heartshape or false pickerelweed).
15. Myriophyllum aquaticum (parrot feather or parrot feather watermilfoil).
17. Najas minor (brittle naiad or brittle water nymph).
18. Nymphoides peltata (yellow floating heart).
19. Ottelia alismoides (duck lettuce).
20. Potamogeton crispus (curlyleaf pondweed).
21. Sagittaria sagittifolia (arrowhead).
22. Salvinia auriculata (giant salvinia).
23. Salvinia biloba (giant salvinia).
25. Salvinia molesta (giant salvinia).
27. Trapa natans (water chestnut).
3 **Invasion Process**

Species Elsewhere

- Introduced (n=?)
- Established (n=18)
- Invasive (n=5)

1. Gather species lists
2. Gather trait data
3. Analyze data
Previous Risk Assessment for Mollusks

All species (5 nuisance, 10 benign)

Fecundity < 162

- 0 nuisance
- 9 benign

Fecundity > 162

- 5 nuisance
- 1 benign

14/15 (93%) assigned correctly

Keller et al. 2007
1. Does the species currently exist in hardiness zones of ≤7? If yes, continue, if no, species is unlikely to establish.
2. Is the annual fecundity (per female) of the species >158?
3. Is the species invasive elsewhere? If yes, describe.
4. Does the species carry parasites or pathogens of concern?
5. Any other reasons for concern?
STAIRmollusks

1. Does the species currently exist in hardiness zones of \( \leq 7 \)?
   If yes, continue, if no, species is unlikely to establish.

2. Is the annual fecundity (per female) of the species >158?

3. Is the species invasive elsewhere? If yes, describe.

4. Does the species carry parasites or pathogens of concern?

5. Any other reasons for concern?

1 = ‘Yes’, Any of 2-5 indicate harm, treat species as ‘High Risk’

1 = ‘Yes’, 2-5 indicate acceptable risk of harm, treat species as ‘Low Risk’, unless establishment without impacts is undesirable.
Invasion Process
Species Elsewhere

1. Gather species lists
2. Gather trait data
3. Analyze data

Introduced (n=65)
Established (n=37)
Invasive (n=12)

1. Gather species lists
2. Gather trait data
3. Analyze data

STAIRfish
<table>
<thead>
<tr>
<th>Life-history</th>
<th>Habitat preference</th>
<th>Phylogenetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body size</td>
<td>Macrohabitat preference</td>
<td>Phylogeny</td>
</tr>
<tr>
<td>Egg size</td>
<td>Salinity tolerance</td>
<td>Relatedness</td>
</tr>
<tr>
<td>Fecundity</td>
<td>Temperature tolerance</td>
<td></td>
</tr>
<tr>
<td>Larval size</td>
<td></td>
<td>Trophic ecology</td>
</tr>
<tr>
<td>Longevity</td>
<td><strong>Invasion risk</strong></td>
<td>Diet breadth</td>
</tr>
<tr>
<td>Maturation size</td>
<td>Climate similarity</td>
<td>Trophic guild</td>
</tr>
<tr>
<td>Reproductive guild</td>
<td>Prior invasion success</td>
<td></td>
</tr>
<tr>
<td>Spawning frequency</td>
<td></td>
<td>Native range</td>
</tr>
</tbody>
</table>

**Native range**

**Size of range**
STAIRfish: Introduced to Established

Species Introduced
(n=65)

Climate Match ≤ 71.7%
Prediction: Fail

Climate Match > 71.7%
Prediction: Establish
**STAIRfish:** Established to Invasive

- Species Established
  - (n=37)
  - Trophic Guild: Other
  - Trophic Guild: Piscivore, Invertivore/Piscivore

**Prediction: High Risk**

**Prediction: Low Risk**

- Fecundity < 1,013,000 eggs
- Fecundity > 1,013,000 eggs

**Prediction: High Risk**

- **Prediction: Low Risk**

- 826 live freshwater species in trade in US and Canada
- Seven predicted to establish in GL, four with high impacts
## Overall Progress

<table>
<thead>
<tr>
<th>Tool</th>
<th>Status</th>
<th># assessed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAIRplants</td>
<td>US model and results published, GL paper in revision, training Fall 2012</td>
<td>126</td>
</tr>
<tr>
<td>STAIRmollusks</td>
<td>Model complete, training Fall 2013</td>
<td>87</td>
</tr>
<tr>
<td>STAIRcrayfish</td>
<td>Model complete, training Spring 2014. Manuscript in review</td>
<td>230</td>
</tr>
<tr>
<td>STAIRfish</td>
<td>Model complete, training Spring 2014. Manuscript soon to be submitted</td>
<td>826</td>
</tr>
<tr>
<td>STAIRturtle</td>
<td>Model complete, Training Spring 2014</td>
<td>30</td>
</tr>
<tr>
<td>STAIRsnakes&amp;lizards</td>
<td>Model Developed</td>
<td>Not yet</td>
</tr>
<tr>
<td>STAIRamphibians</td>
<td>Model Developed</td>
<td>Not yet</td>
</tr>
</tbody>
</table>
Conclusions

• High performance risk assessment tools can be produced

• Stakeholder engagement has improved our tools and made them more relevant for managers

• Risk assessment tools are an essential component of a regional approach to invasive species prevention

• Coordinated approach is environmentally and economically rational
Species Risk Assessment Tools: Science and Policy Applications

Friday, October 3, 2014 • 12:00pm-2:00pm ET

INTRODUCING:

Craig Martin
Chief, Branch of Aquatic Invasive Species, U.S. Fish and Wildlife Service

Craig Martin received his Bachelor of Science in wildlife management from West Virginia University and Masters of Science in fish biology from Oklahoma State University. Craig has a broad experience in salmonid restoration from Chinook salmon in the Central Valley of California to Atlantic salmon in the Green Mountains of Vermont, and salmon and steelhead in the Columbia River Basin. He has been involved in the management and control of aquatic nuisance species, including the development and implementation of a long-term program of sea lamprey control in Lake Champlain. As Chief of the Branch of Aquatic Invasive Species within the Fish and Aquatic Conservation Program in the Headquarters Office, Craig oversees the Service's program to prevent, control, and manage the spread of aquatic invasive species. Craig has worked for the Service for about 20 years and has held positions as a fishery biologist at the Red Bluff Fish and Wildlife Resources Office in California, Deputy Project Leader of the Lake Champlain Fish and Wildlife Office in Vermont, assistant Fisheries Program Supervisor for Region 1's Fisheries Program in Portland Oregon, and chief of the Branch of Aquatic Invasive Species. He has been married for over 20 years to his wife Karin and has two daughters, Breanne and Kirstin. He enjoys abalone and SCUBA diving along the California Coast, bass fishing in Ontario Canada, and spending time (wherever) with family and friends.

Questions for the panelists? Submit via the “Questions” box
Integrated Pest Management

The control of pests utilizing a practical, economical, and scientifically based combination of chemical, biological, mechanical or physical, and cultural control methods. ANSTF 1994.
Biosecurity

• Utilizing a combination of measures designed to protect the environment by preventing the escape to or establishment of species in the natural environment.
Biosecurity Toolbox – Contributing to Prevention

- National/international
- Regionally-coordinated approaches
- State-led risk management actions
- Action by individual businesses
- Local - consumer awareness and responsibility
Need for Risk Screening/Risk Assessment

• National Invasive Species Management Plan: Develop screening processes to evaluate invasiveness of terrestrial and aquatic nonnative wildlife moving in trade.

• Congressional Interest: Pre-import screening for taxa “novel” to the United States

• Title 18 Lacey Act Reforms: “[M]ake the Lacey Act a tool for 21st Century Conservation.”

• EU 9/29/2014 adopted Invasive Alien Species Regulations: based on comprehensive risk assessment and robust scientific evidence
ERSS Process

- History of invasiveness
- Climate match with the U.S.
- Certainty of assessment

Overall risk:
- High: Consider management action
- Uncertain: Further analysis required
- Low: Management not needed
Calling All Risk Assessments!

• The ERSS process is just one of many tools to assess risk for invasive species

• We encourage others to conduct their own risk screenings—we welcome collaboration!
Biosecurity Toolbox – Contributing to Prevention

• National/international

• Regionally-coordinated approaches
  – e.g., regional compacts

• State-led risk management actions
  – e.g., State regulations

• Action by individual businesses

• Local - consumer awareness and responsibility
ERSSs Available Online

ERSSs, the SOP for the ERSS process, and an email address for public comment are available online at:

http://www.fws.gov/injuriouswildlife/injurious_prevention.html
Biosecurity Toolbox – Contributing to Prevention

- National/international
- Regionally-coordinated approaches
- State-led risk management actions

- Action by individual businesses — e.g., No-trade pledge, BMPs
- Local - consumer awareness and responsibility

Scope of action

To effect a biosecurity outcome
MEMORANDUM OF UNDERSTANDING
Between
the UNITED STATES FISH AND WILDLIFE SERVICE and
the PET INDUSTRY JOINT ADVISORY COUNCIL and
the ASSOCIATION OF FISH AND WILDLIFE AGENCIES
to COLLABORATE
ON THE DEVELOPMENT OF NONREGULATORY
APPROACHES TO REDUCE THE RISK OF INTRODUCING
POTENTIALLY INVASIVE SPECIES
THROUGH INTERNATIONAL TRADE AND
TO PROMOTE VOLUNTARY NO-TRADE
IN CERTAIN SPECIES NOT PRESENTLY IN TRADE

• Reduce the risk posed by potentially invasive species that are not currently in trade in the U.S. through voluntary risk management approaches

• Cooperation and collaboration between the states, industry, USFWS and other NGOs
MOU Roles and Responsibilities

**USFWS**
- Conduct Ecological Risk Screening Summaries (ERSS) for nonnative species.

**AFWA**
- Provide a forum to nominate species to be screened.

**PIJAC**
- Engage members to conduct proactive public outreach to promote awareness of high or uncertain risk species
- Evaluate voluntary mitigation techniques and best management practices
- Encourage members to consider an environmental covenant pledge
Biosecurity Toolbox – Contributing to Prevention

• National/international
• Regionally-coordinated approaches
• State-led risk management actions
• Action by individual businesses
• Local - consumer awareness and responsibility (e.g. Habitattitude™)
• Habits
  ✓ Ensure that pets are thoughtfully chosen and well-cared for
• Habitat
  ✓ Protect the environment from the effects of unwanted pets
• Attitude
  ✓ Help pet owners find alternatives to the release of their pets

Local: Promoting environmentally sustainable business practices and hobbyist decisions
**Habits:** Ensure pets are thoughtfully chosen

*Betta splendens - Betta*

*Photo: Mandolesi, L. From EOL (2014)*

**History of invasiveness:** Low  
**Climate match:** Low  
**Certainty of assessment:** High  
**Overall Risk:** Low
**Pseudorasbora parva**—Stone Moroko

- Impacts water quality
- Decreases native minnow abundance
- Carries infectious pathogens

**History of invasiveness:** High
**Climate match:** High
**Certainty of assessment:** High
**Overall Risk:** High
Questions?

Craig Martin
USFWS, Branch of Aquatic Invasive Species
(703) 358-1932
craig_martin@fws.gov
Species Risk Assessment Tools: Science and Policy Applications

Friday, October 3, 2014 • 12:00pm-2:00pm ET

Q & A Session

Questions for the panelists? Submit via the “Questions” box or raise your hand by clicking on the hand icon.

Please visit the event page for background materials and resources.

This webinar is made possible by the generous support of the Turner Foundation.
Thank you for joining!

Please visit the event page for background materials and resources.

To join the ELI Invasive Species Seminar Series mailing list, please email subramanian@eli.org

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