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The PPQ Weed Risk Assessment

Introduction and Overview

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Who am I?

United States Department of Agriculture (USDA)

- Animal and Plant Health Inspection Service (APHIS)
  - Plant Protection and Quarantine (PPQ)
    - Science & Technology
      - » Plant Epidemiology and Risk Analysis Lab (PERAL)

- » Tony Koop (Plant ecologist, risk analyst)
- » Special projects coordinator for the PERAL Weed Team

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APHIS regulates weeds

- Federal Noxious Weeds – Species that can not be imported into or moved through the U.S.
- Noxious Weed Seeds – Species that either have no tolerance or some tolerance in vegetable and agricultural seed
- NAPPRA Plants – Not Authorized Pending Pest Risk Assessment.

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What is Weed Risk Assessment?

WRA: An evaluation of the probability of the entry, establishment, and spread of a plant, and its potential consequences, helping us to make informed management decisions that will prevent or reduce the economic and ecological harm caused by weedy and invasive plants

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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

	Question ID	Question	Answer	Uncer-tainty	Score	Notes (and references)
3						
4						
5	**Establishment / Spread Potential**					
6	ES-1	Select one: (A) Introduced elsewhere long ago (>75 years) but not escaped; (B) Introduced recently (<75 years) but not escaped; (C) Never introduced elsewhere; (D) Escaped/Casual; (E) Naturalized; (F) Invader.			???	
7	ES-2	Is the species highly domesticated (y, n, or ?).			???	
8	ES-3	Congeneric weed (y, n, or ?).			???	
9	ES-4	Shade tolerant at some stage of life cycle (y, n, or ?).			???	
10	ES-5	Climbing or smothering growth habit (y, n, or ?).			???	
11	ES-6	Forms dense thickets (y, n, or ?).			???	
12	ES-7	Aquatic (y, n, or ?).			???	
13	ES-8	Grass (y, n, or ?).			???	
14	ES-9	Nitrogen-fixing woody plant (y, n, or ?).			???	
15	ES-10	Produces viable seed or spores (y, n, or ?).			???	
16	ES-11	Self-compatible or apomictic (y, n, or ?).			???	
17	ES-12	Requires specialist pollinators (y, n, or ?).			???	
18	ES-13	Minimum generative time (A) less than 1 (multiple generations per year), (B) 1 year (annual-1 gen per year),			???	
19	ES-14	Prolific seed/spore production (see scoring guide) (y, n, or ?).			???	
20	ES-15	Propagules likely to be dispersed unintentionally by people (y, n, or ?).			???	
21	ES-16	Propagules likely to disperse in trade as contaminants and hitchhikers (y, n, or ?).			???	
22	ES-17	No. natural dispersal vectors	0		-4	
23	ES-17a	Propagules adapted to wind dispersal (y, n, or ?).			???	
24	ES-17b	Propagules water dispersed (y, n, or ?).			???	
25	ES-17c	Propagules bird dispersed (y, n, or ?).			???	
26	ES-17d	Propagules dispersed by other animals (externally) (y, n, or ?).			???	
27	ES-17e	Propagules dispersed by other animals (internally) (y, n, or ?).			???	
28	ES-18	Evidence that a persistent propagule bank (e.g., seed bank)			???	
29	ES-19	Tolerates/benefits from mutilation, cultivation or fire (y, n, or ?).			???	
30	ES-20	Is resistant to some herbicides or has potential to acquire			???	
31	ES-21	Number of USDA cold hardiness zones suitable for survival	0		-1	
32	ES-22	Number of climate types suitable for survival	0		-2	
33	ES-23	Number of precipitation bands suitable for survival	0		-1	
34						
35						
36	**Impact Potential**					
37	*General impacts*					
38	Imp-G1	Allelopathic (y, n, or ?).			???	

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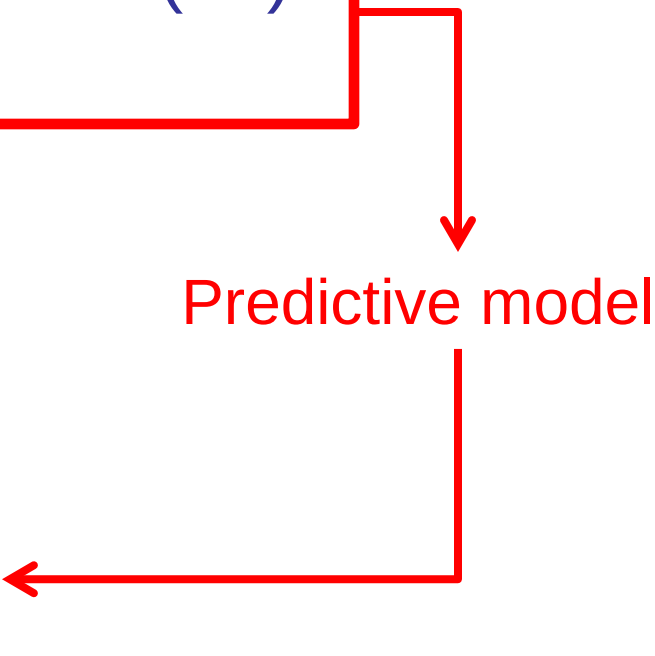
Risk Elements in the WRA

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



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The Final Product

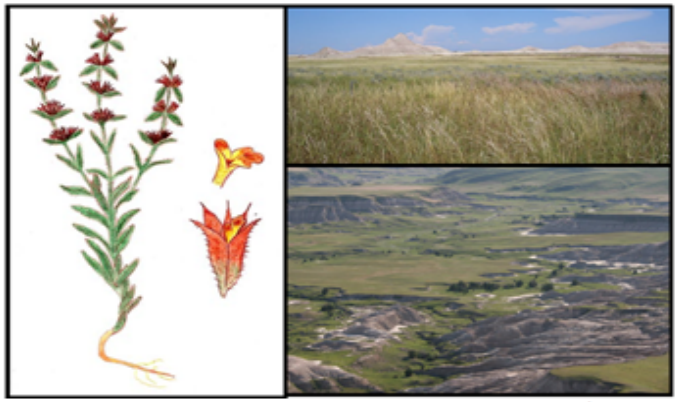
3 - 4 page summary
- Background/Initiation
- Risk element summary
- Data and figures
- Discussion/Conclusion

References

~10 page excerpt of the questions, answers, uncertainty, and evidence

USDA

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



Left: A drawing of *Sideritis montana* (source: http://www.agroatlas.ru/en). Right: The habitat and landscape in which *S. montana* occurs in the United States. The upper photograph is of Oglala National grassland in northwestern Nebraska (source: Brian Kell, http://en.wikipedia.org/). The bottom photograph is the grassland ecosystem of Conata Basin, South Dakota (source: http://www.nature.org/).

Agency Contact:

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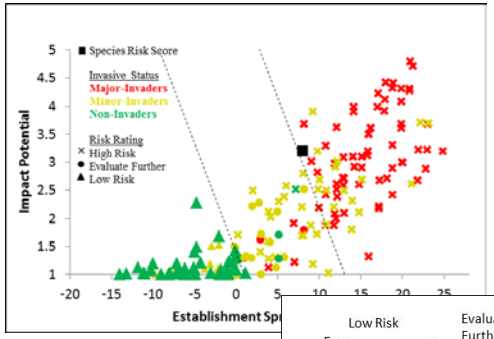
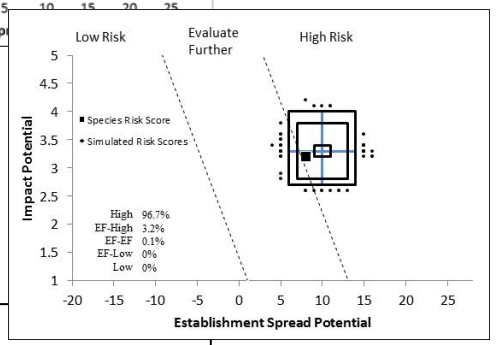
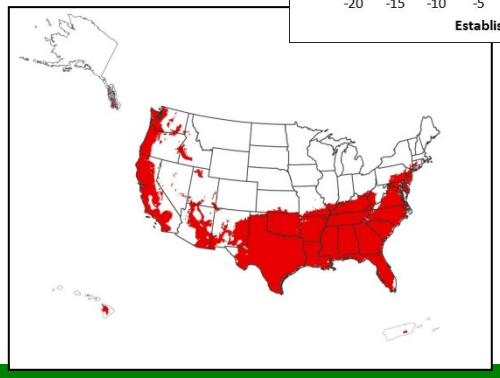
The WRA's core analyses & results

- Risk potential
- Uncertainty analysis
- Geographic potential







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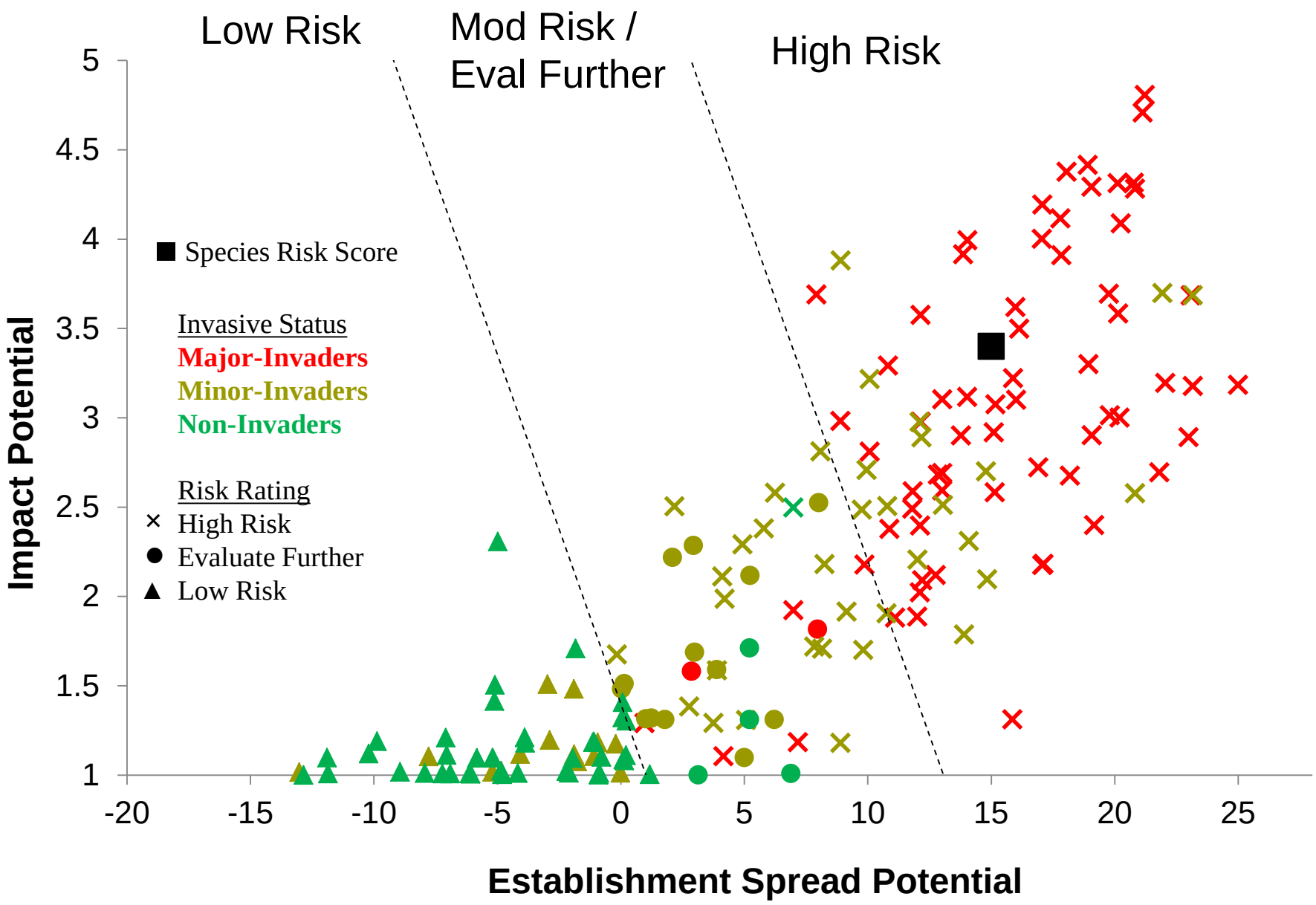
1) Risk Potential

- Calculate risk scores for Establishment/Spread & Impact of plant species
  - Higher values indicate greater capacity
- Calculate Probability(Major), P(Minor), & P(Non-Invader) with logistic-regression model
  - *Invasiveness broadly defined to incorporate concepts of escape, naturalization, spread, and impact*
  - All 3 probabilities sum to 1
- Determine the final conclusion
  - High Risk, Low Risk, or Evaluate Further


Low Risk
Mod Risk /
Eval Further
High Risk
Species Risk Score
Invasive Status
Major-Invaders
Minor-Invaders
Non-Invaders
Risk Rating
High Risk
Evaluate Further
Low Risk
Impact Potential
Establishment Spread Potential
5
4.5
4
3.5
3
2.5
2
1.5
1
-20
-15
-10
-5
0
5
10
15
20
25

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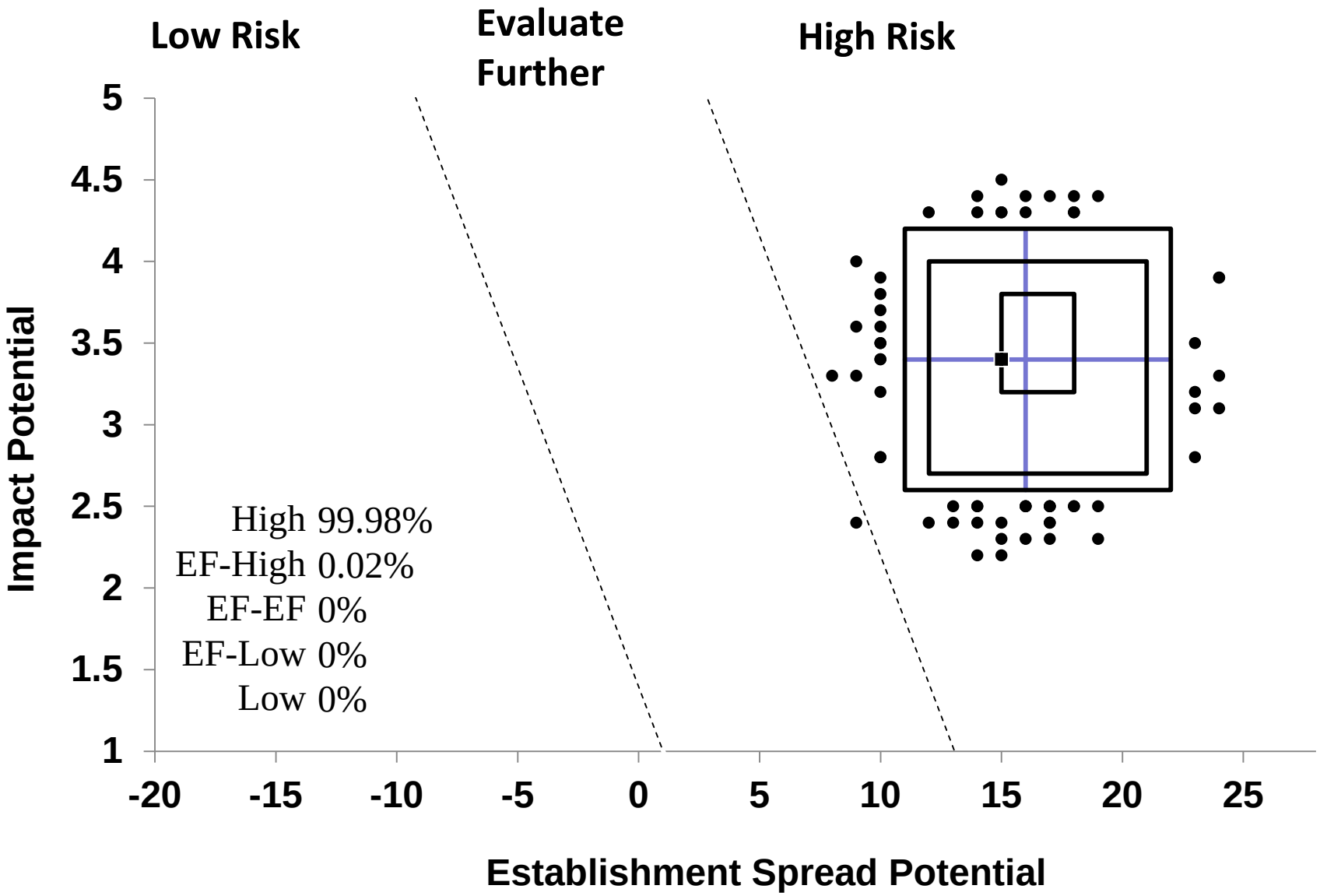
2) Uncertainty analysis

- 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


Low Risk
Evaluate Further
High Risk
Impact Potential
5
4.5
4
3.5
3
2.5
2
1.5
1
-20
-15
-10
-5
0
5
10
15
20
25
Establishment Spread Potential
High 99.98%
EF-High 0.02%
EF-EF 0%
EF-Low 0%
Low 0%

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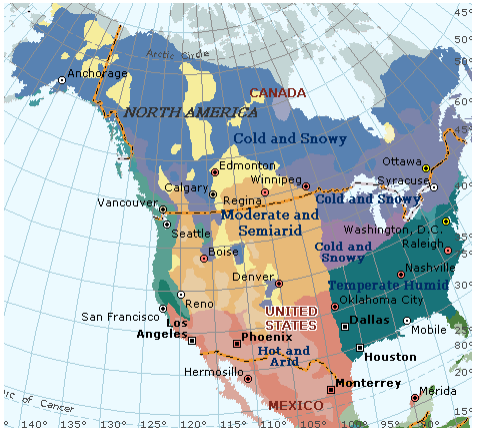
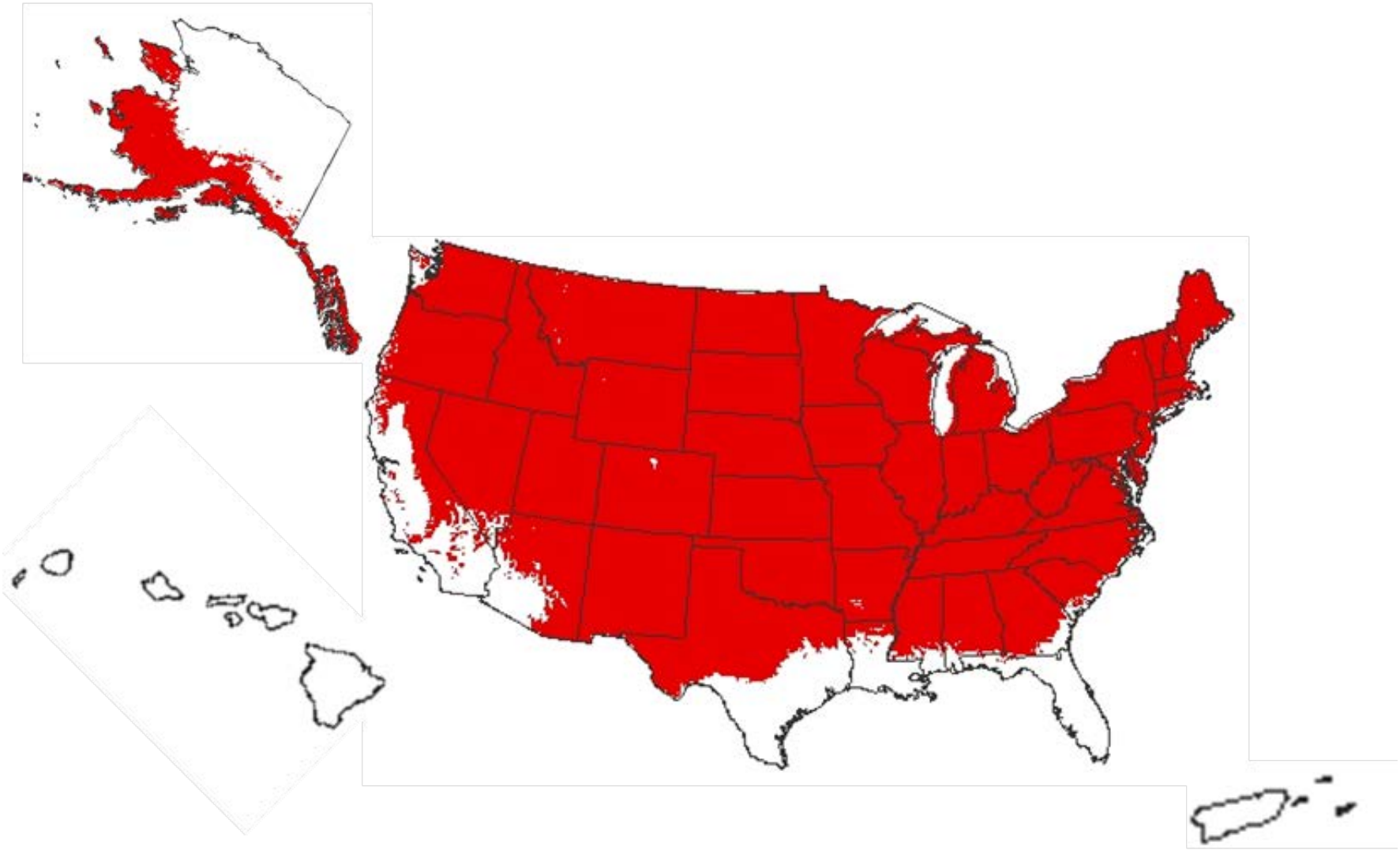
3) Geographic potential

- Geo potential evaluated separately
- Simple analysis that matches on and overlays
  - Cold hardiness zones
  - Annual precipitation
  - Climate classes





Representing areas where all three climatic variables are suitable for its survival

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Species Assessed with the New Model

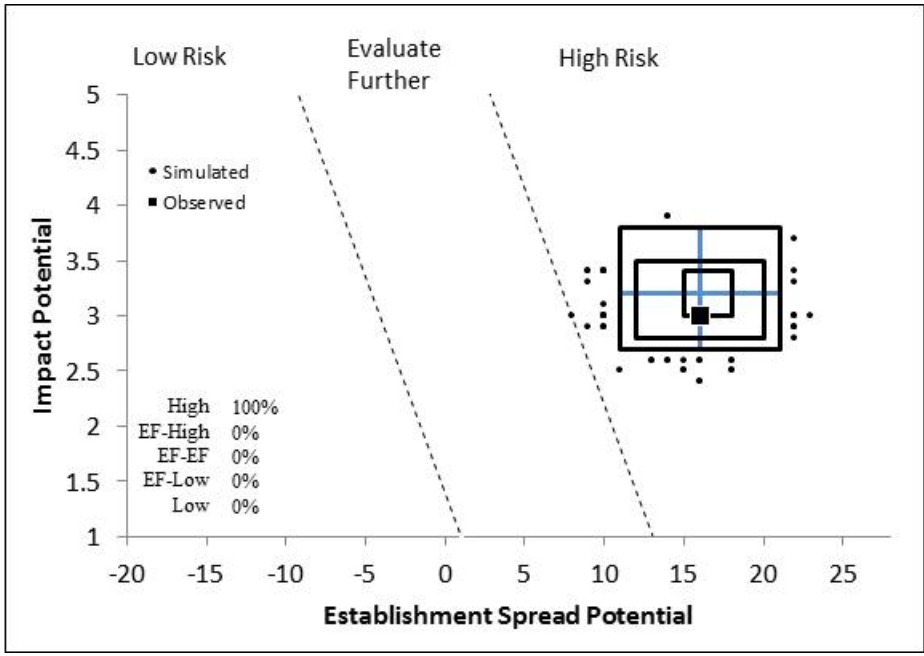
- Completed WRAs
  - 2010: 11
  - 2011: 16
  - 2012: 27 (+6 revisions)
  - 2013: 2 (+1 revision)
- In queue: ~12
- Many more on a prioritized list

PPQ's scope: Weeds not yet here or with limited U.S. distribution

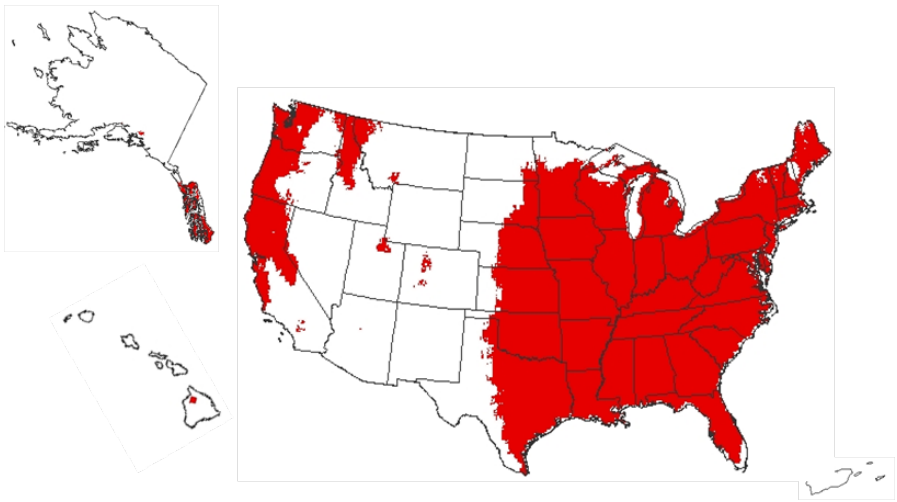
- Identified by PPQ staff
- Proposed for state lists
- Detections of new species
- Concern to others (e.g., TNC)

Vitex rotundifolia

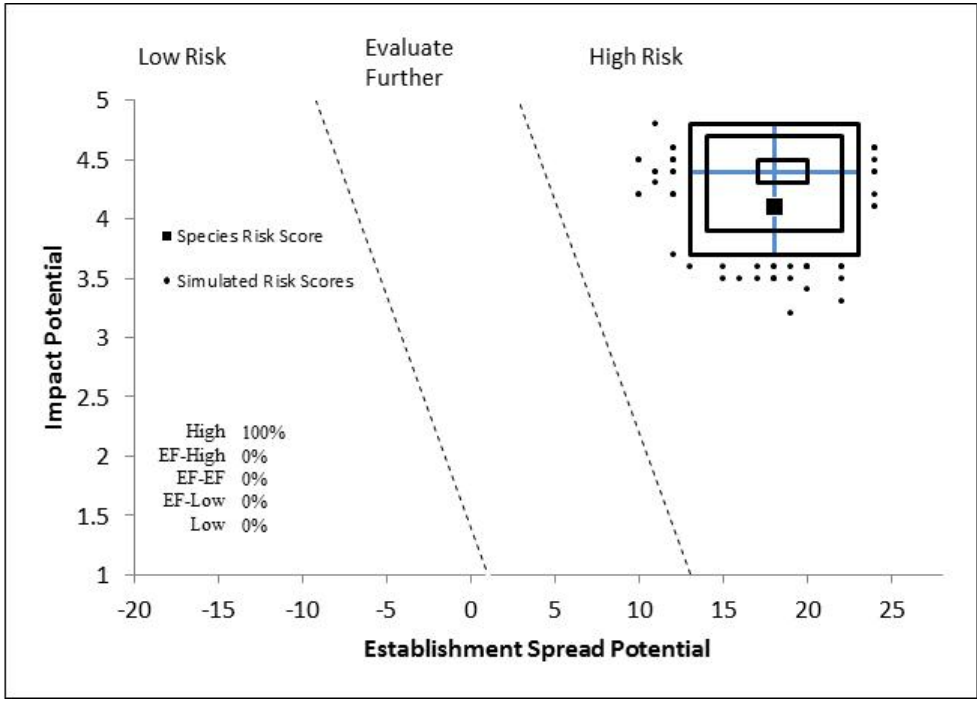
- Ornamental promoted for beach erosion control in 1980's
- Primarily naturalized in coastal NC & SC
- Forms blankets, excludes natives, threatens T&E species, etc.



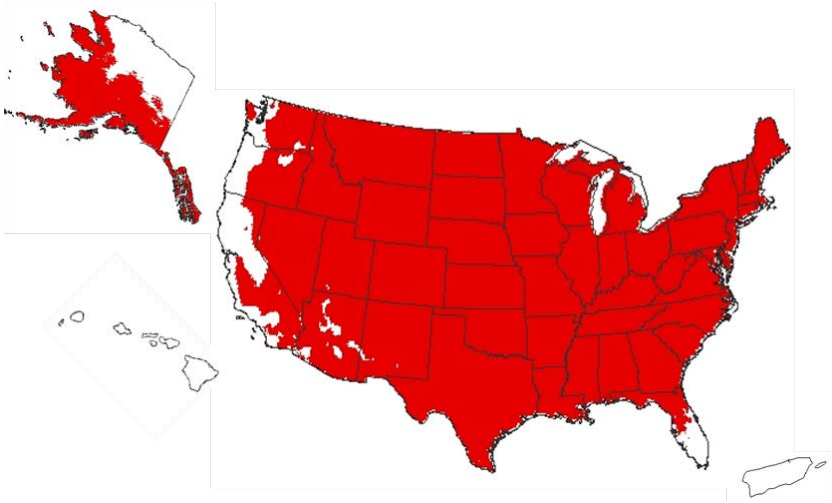
Nymphoides peltata



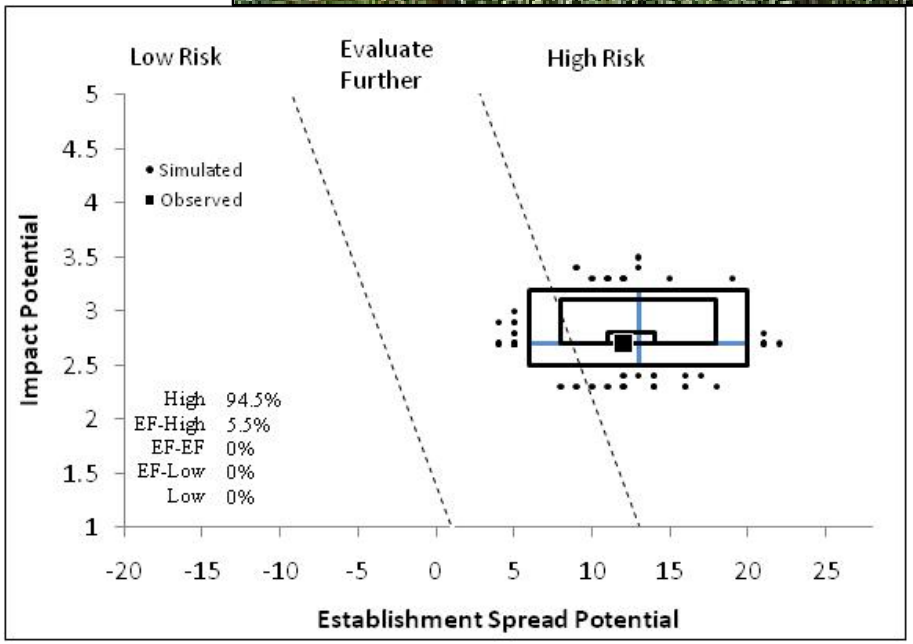
- Widely cultivated in the U.S., sporadically naturalized
- Threatens aquatic bodies, where it forms dense mats on the water surface, reducing biodiversity, changing community structure, and reduces oxygen levels in the water



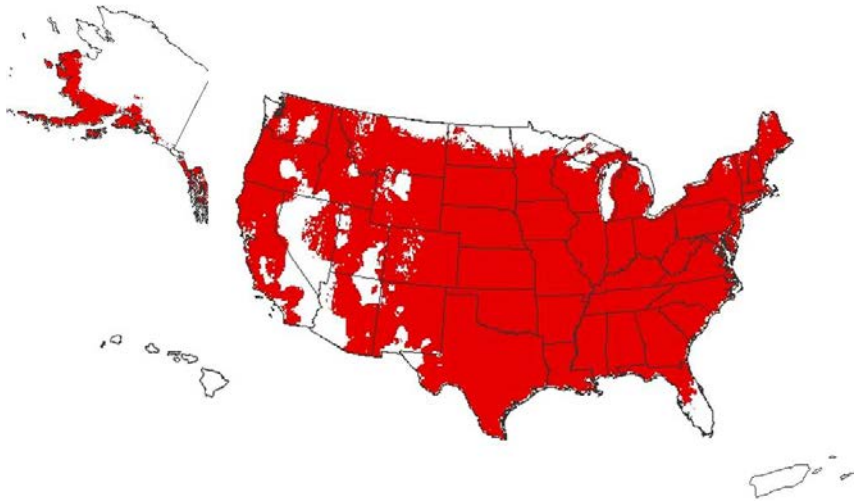
Hippophae rhamnoides



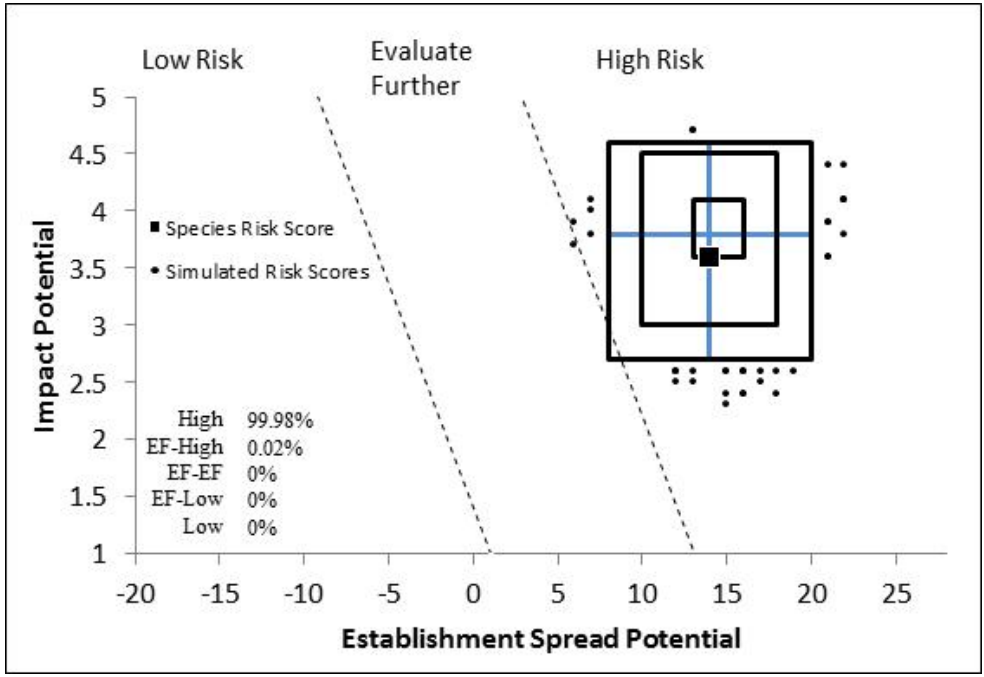
- Cultivated in the U.S., naturalized in 2 WY counties
- Become invasive in Canadian prairies
- Forms dense thickets, N-fixer, alters natural habitats, reduces access



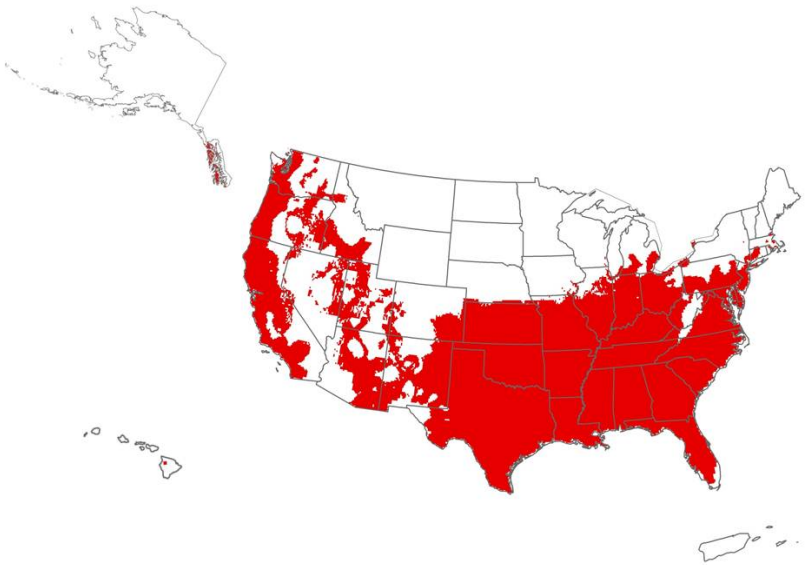
Falcaria vulgaris



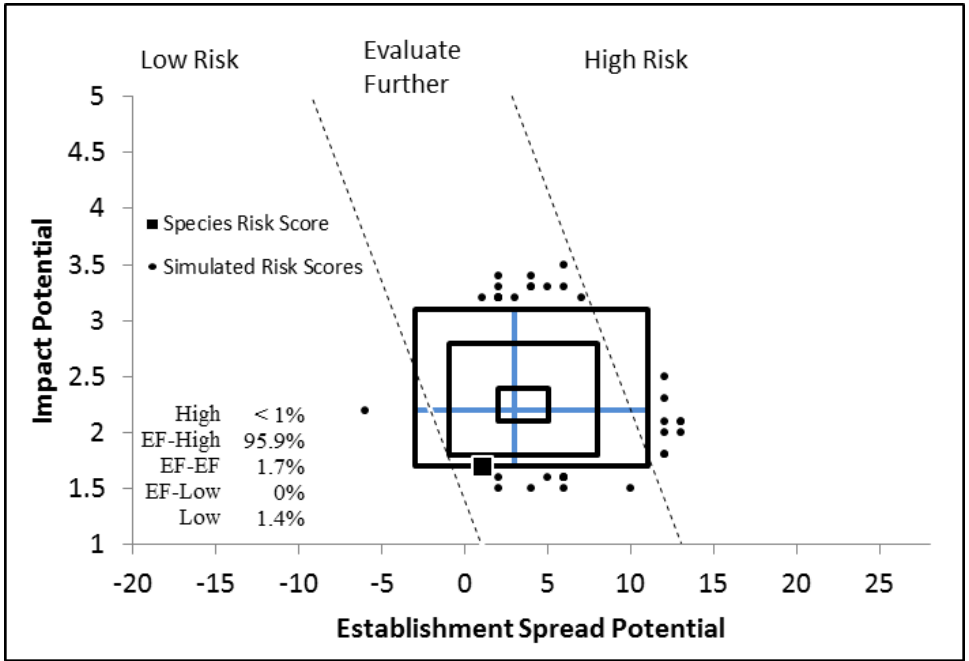
- First reported in 1923
- Few naturalized populations in plains. But in last 10-15 years one population has rapidly expanded.
- Forms dense monocultures, root fragments resprout. Difficult to control. *Maybe* a threat for some NC grain growers.



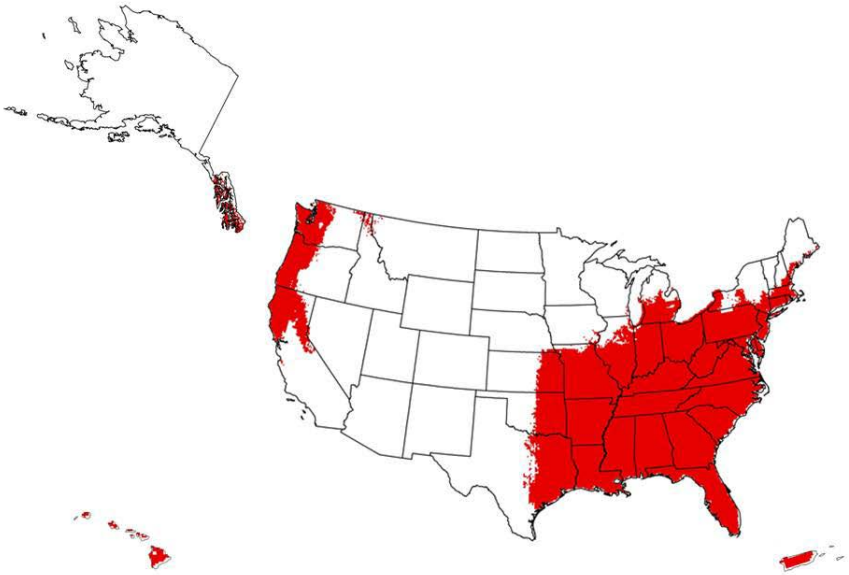
Pistacia chinensis



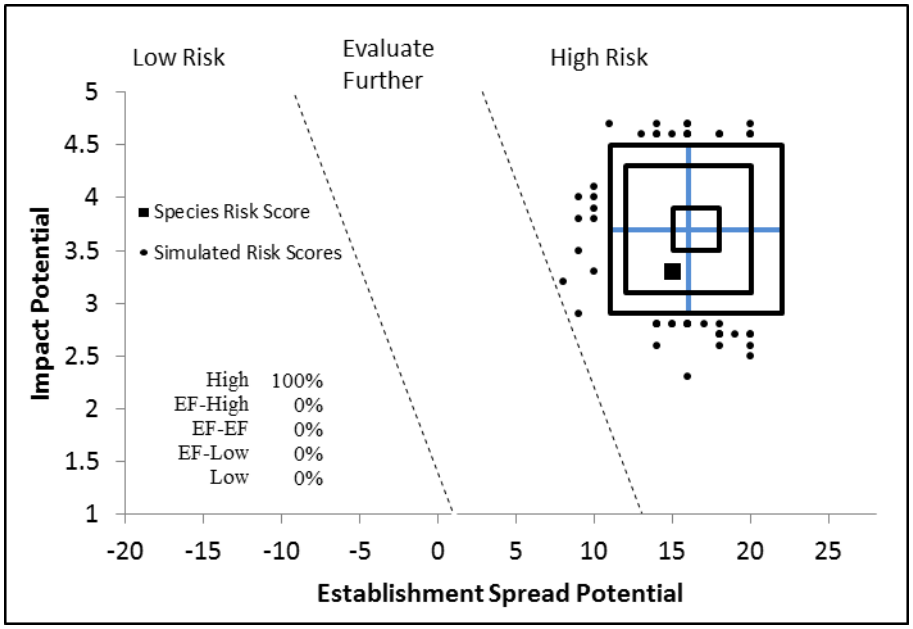
- Ornamental that is naturalized in a few places, most recently NC
- Invasive and controlled in Australia
- Displaces trees in Texas, lifts sidewalks, can cause some allergic reactions
- Much uncertainty



Oplismenus hirtellus subsp. *undulatifolius*



- Several subsp.: native, cult., invasive
- Become invasive MD and VA. Though not list as SNW, managed at a local level
- Heavy ground cover. Seeds readily attach to people and animals.



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The PPQ WRA

- Provides a standardized baseline assessment of a species' weedy/invasive potential
- Risk profile may change with additional information
- Primarily designed for pre-border and recent introductions

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Other Potential Risk Elements / Modules

- Extent of U.S. cultivation
- Feasibility of control
- Extent of current and potential range
- Biomass/biofuels

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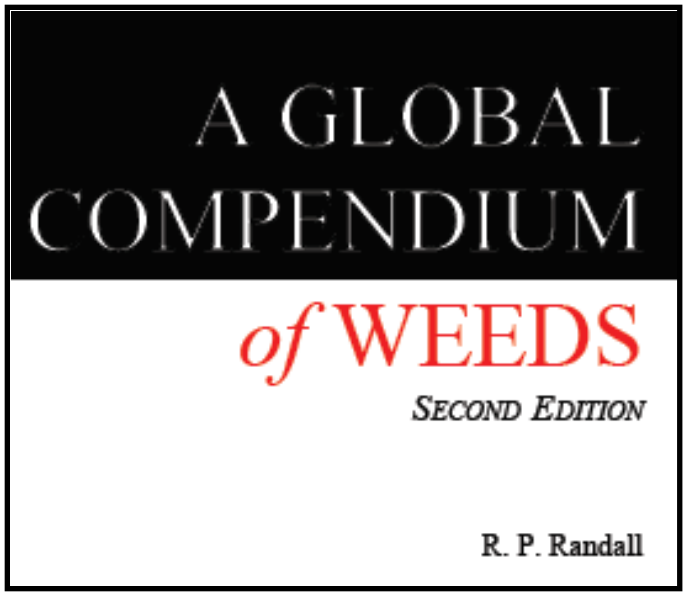
Weeds won't wait

- Lots of potential weeds
  - Some are already here
  - Others will eventually enter intentionally or accidentally
  - But which represent High Risk species?
- Limited Resources



>34,000 taxa of weeds

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Working Together

What we can do for you

- Do WRAs for some of your weeds
- Inform you when we have completed WRAs
- Train & mentor you to do your own WRAs
- Provide literature information to support your efforts

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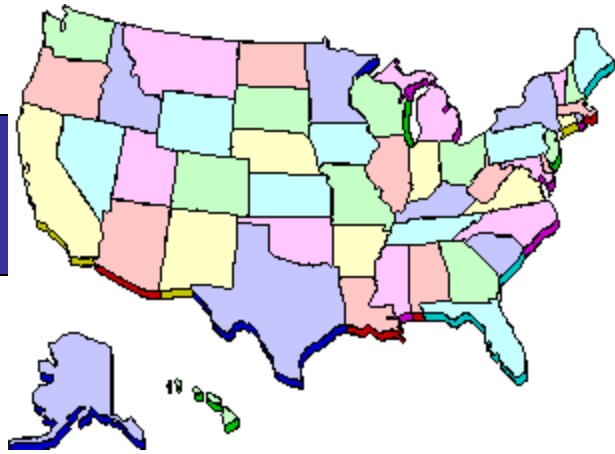
Working Together



What you can do for us

- Tell us about new and emerging weed threats
- Identify weeds not yet in the U.S. that could be problematic
- Collaborate on WRA projects (evidence, experts, review)
- Help support WRA efforts

For more information or to submit requests for WRA

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