Developing a Biological Control Program for Invasive Knotweeds

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Japanese knotweed
Fallopia japonica
(*Polygonum cuspidatum*)

Giant knotweed
Fallopia sachalinensis
(*Polygonum sachalinense*)

Bohemian knotweed - hybrid
Fallopia x bohemica
(*Polygonum x bohemicum*)

Himalayan knotweed
Persicaria wallichii
(Polygonum polystachyum)

Knotweed in Japan

Classical Biological Control of Weeds

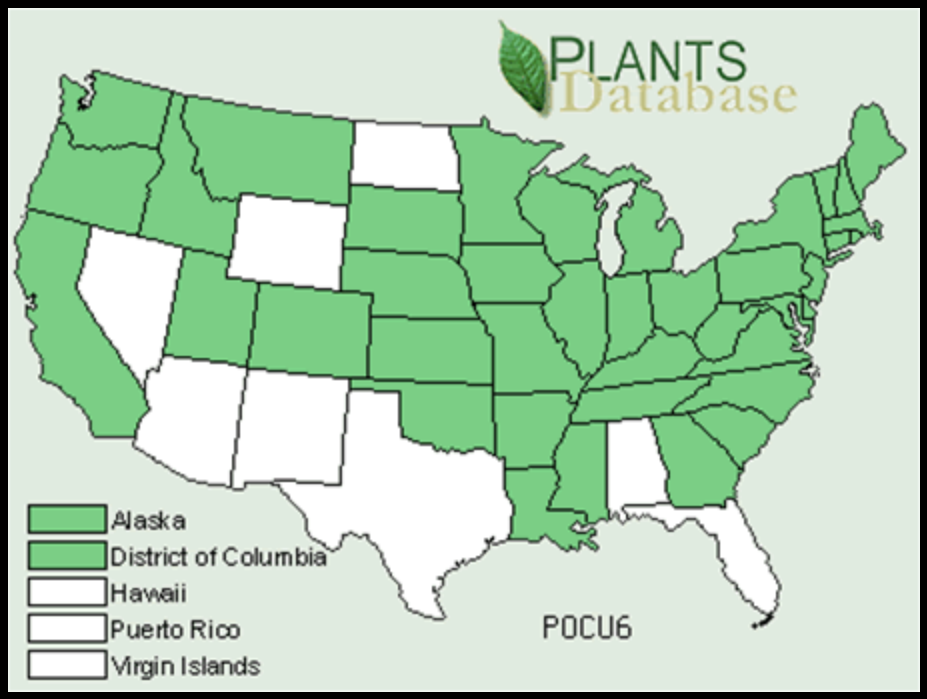
1. Identifying the problem
2. Exploration for natural enemies
3. Develop plant test list
4. Host specificity testing
5. Review by Technical Advisory Group
6. Obtaining federal and state permits
7. Release and monitoring

1. Identifying the problem

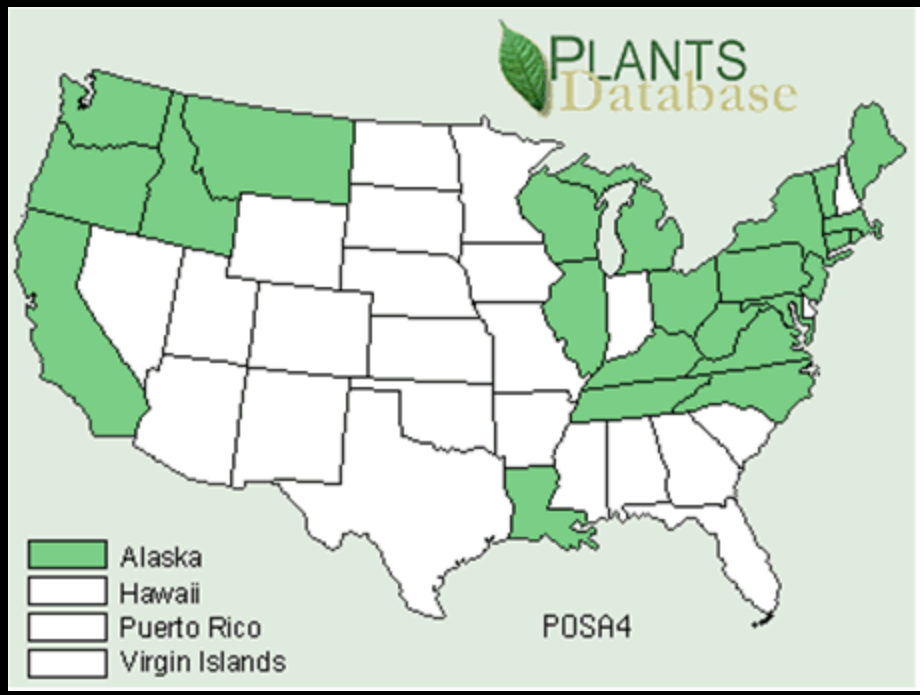
- Displaces native plants
- Reduces quality of wildlife habitat
- Limits recreational access
- Damage to buildings, road surfaces
- Causes erosion

- One of “World’s Worst Invaders”, IUCN
- Listed Noxious in 7 States
- Active control programs in Oregon and Washington

Japanese knotweed and hybrid



Giant knotweed



2. Exploration for Natural Enemies

- CABI- Bioscience, University of Kyushu
- 175 herbivores identified

Aphalara itadori – sap-sucking psyllid

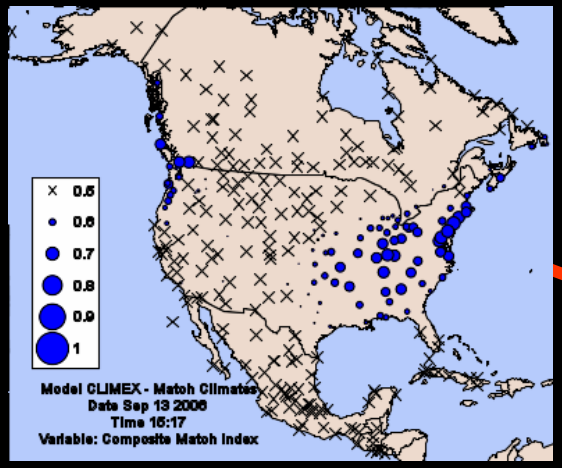
Lixus impressiventris
Stem-boring weevil

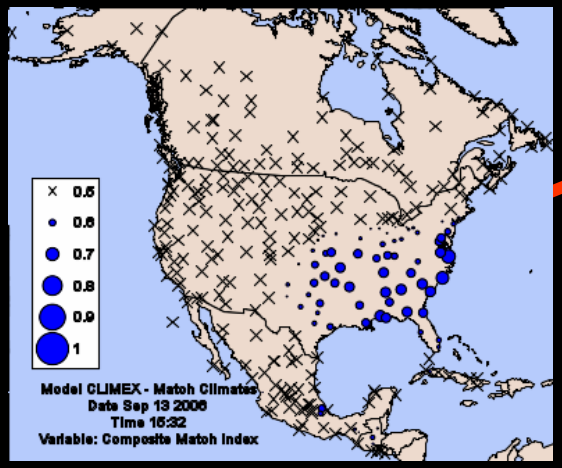
Gallerucida bifasciata
Leaf beetle

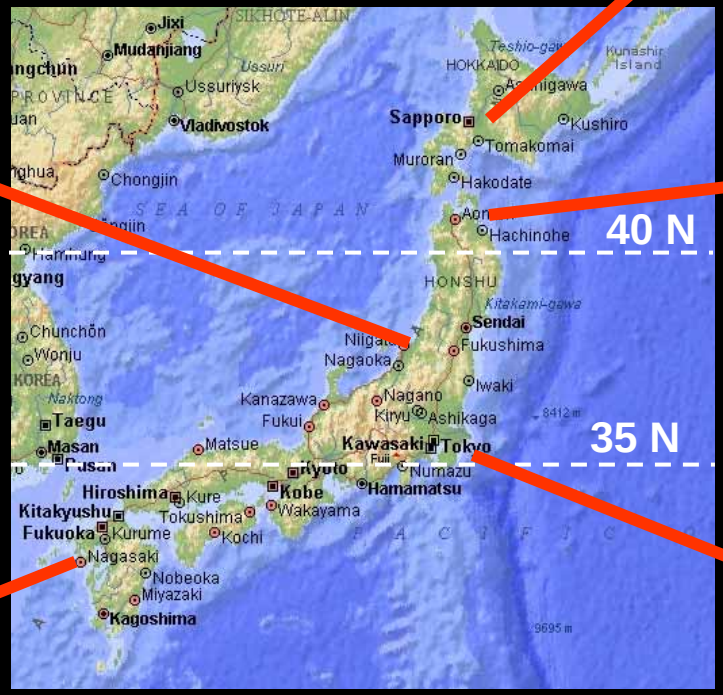
Allantus luctifer
Sawfly

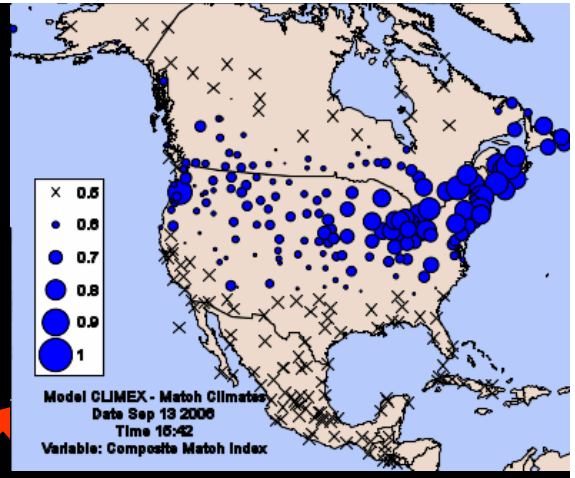
***Mycosphaerella* spp.**
Leafspot pathogen

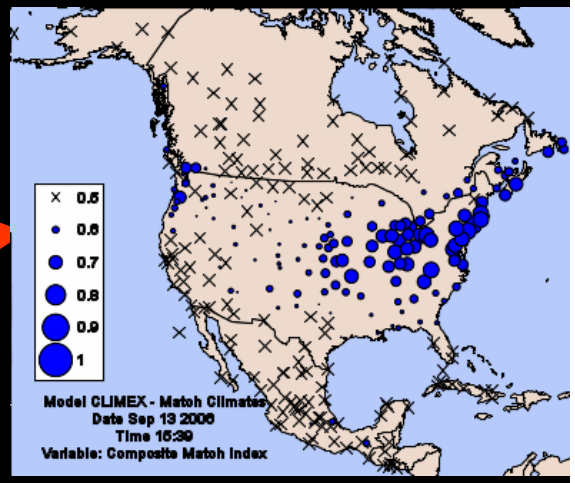
Climate Match to Japan using CLIMEX

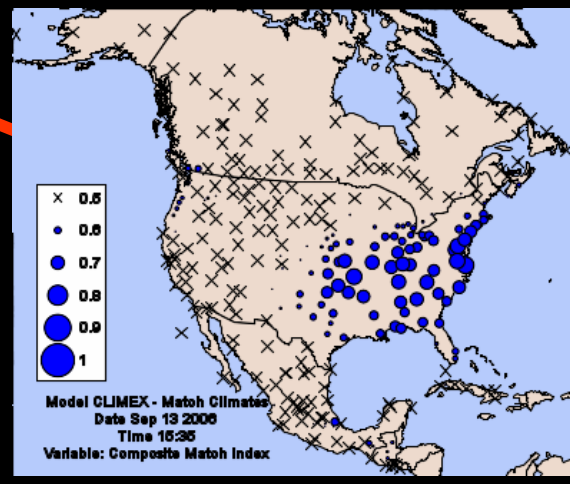












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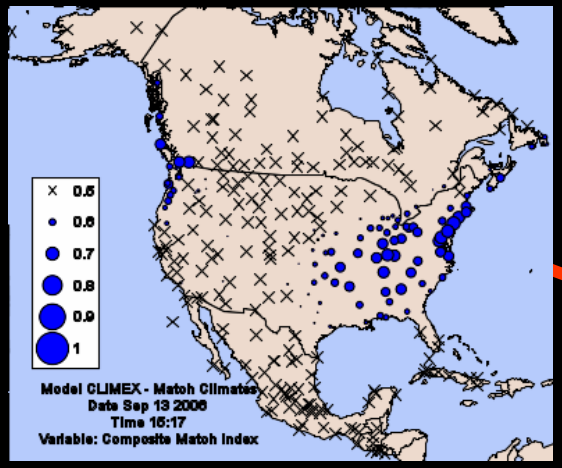

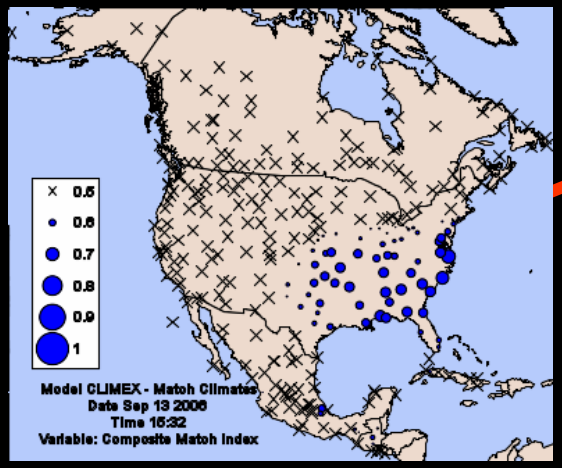

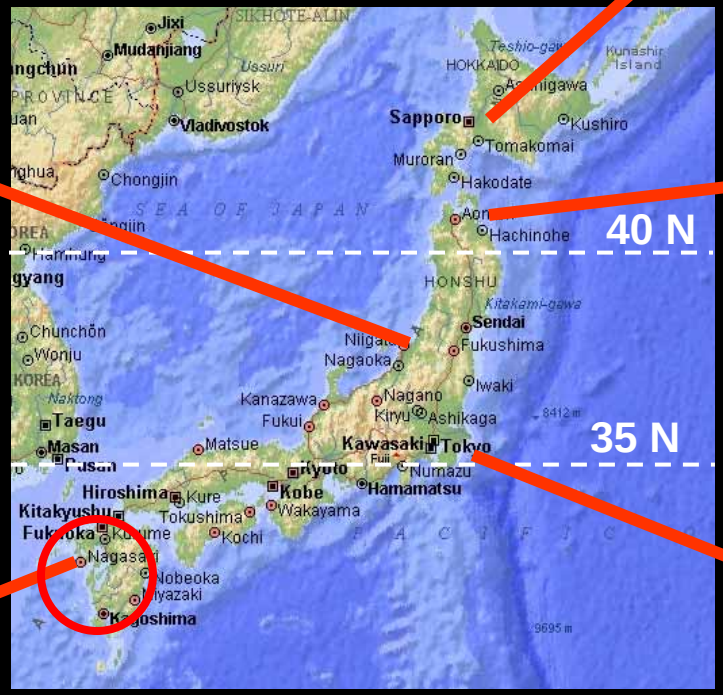

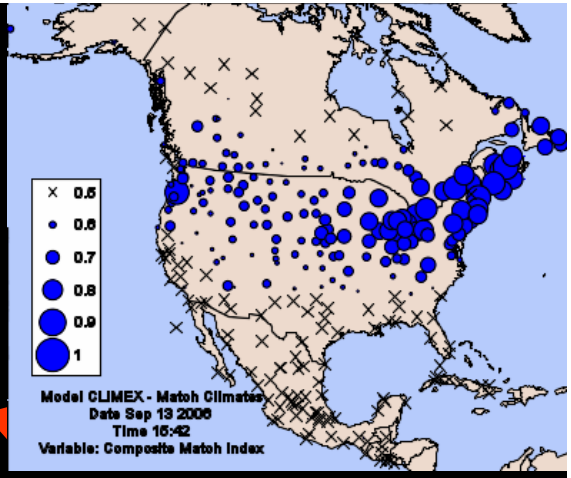

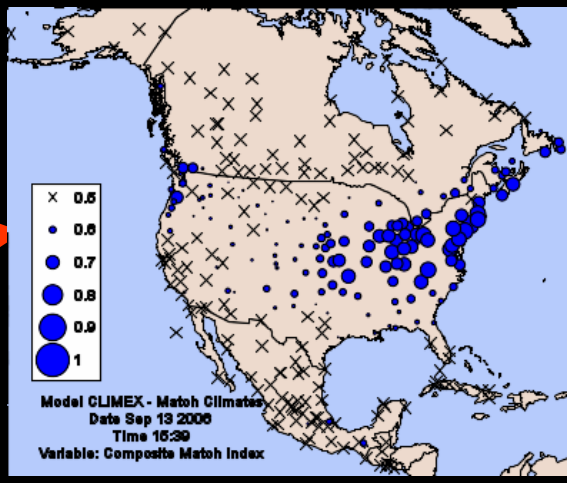

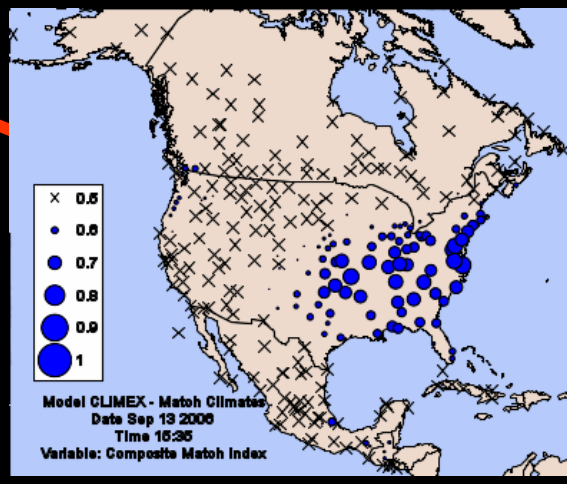

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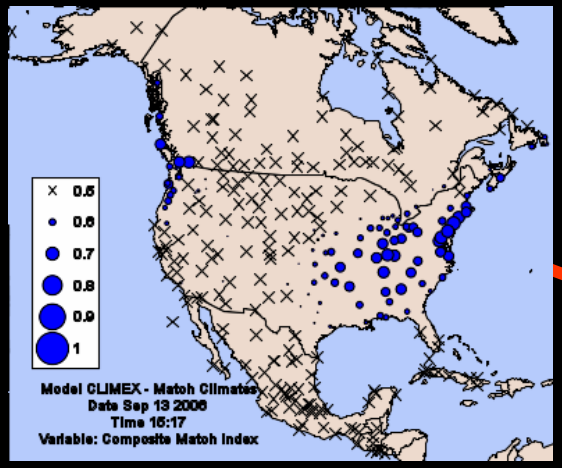
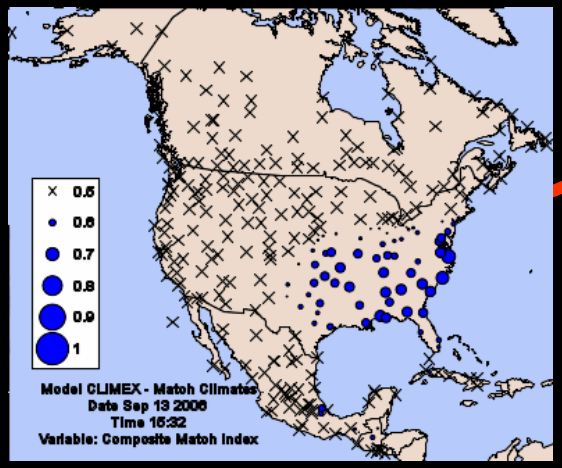
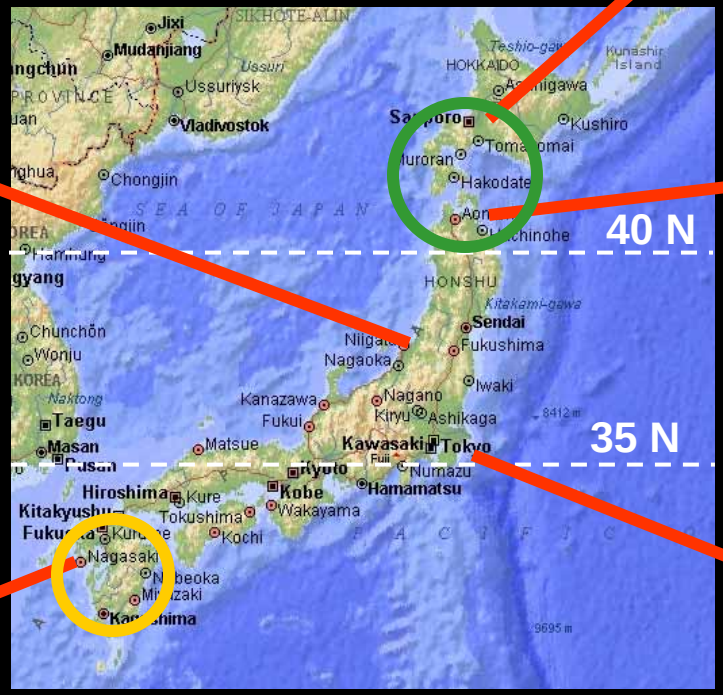
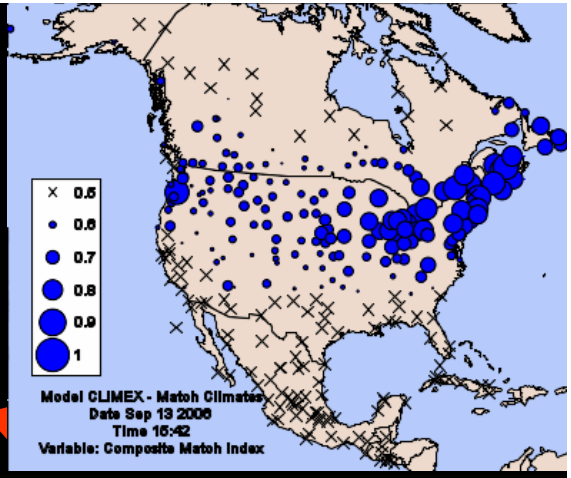
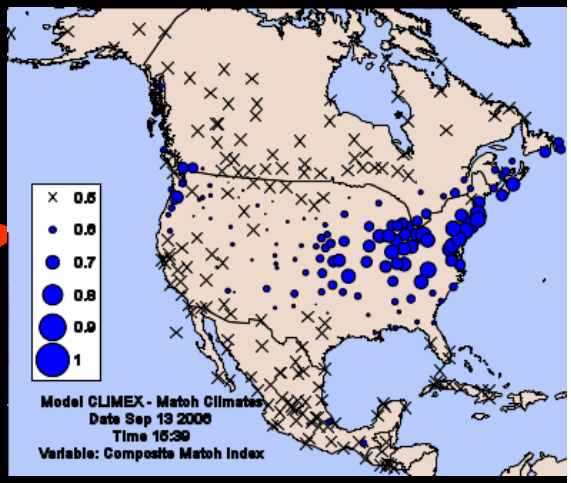
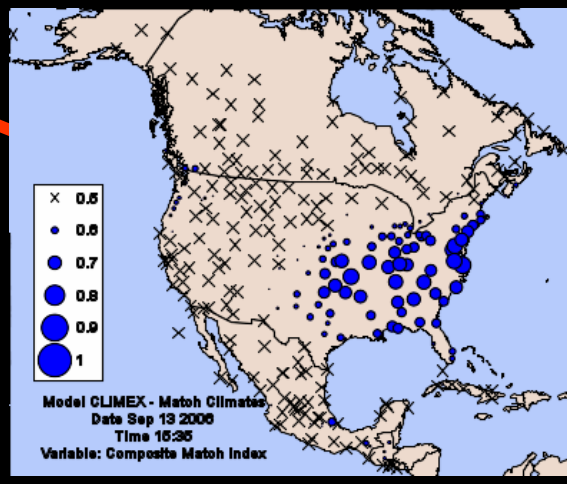








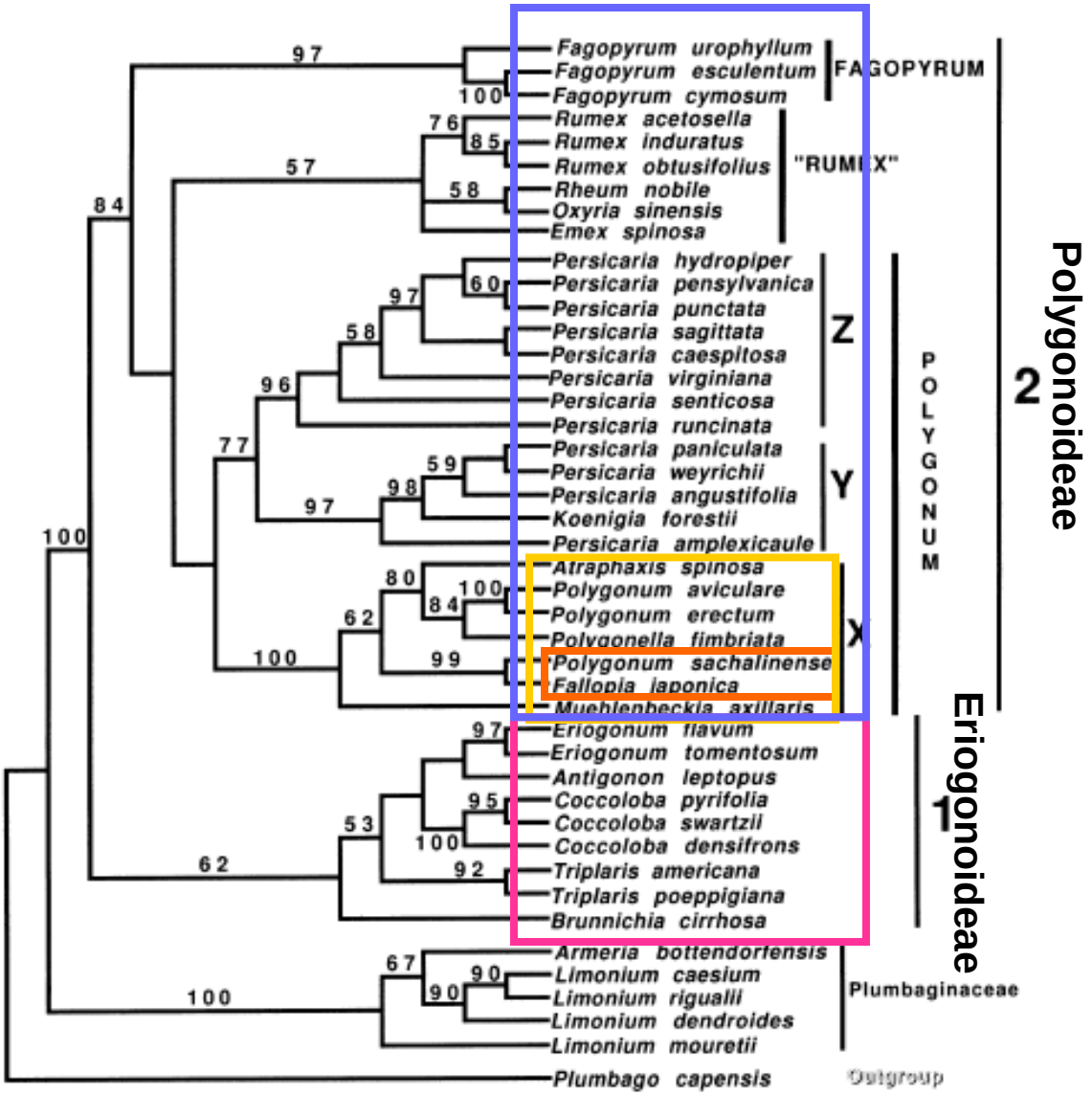




3. Develop plant test list

Technical Advisory Group (TAG)
Categories of Plants to be Tested

1. Genetic types of the target weed
2. Same genus as target weed
3. Ecologically or economically important in the same family
4. Threatened and endangered species in the family
5. Same order with phylogenetic, morphological, or biochemical similarities
6. Different orders with phylogenetic, morphological, or biochemical similarities
7. Species previously reported to be used by the candidate agent or close relatives



Polygonaceae 485 species in North America

from Lamb Frye and Kron 2003

Plant Test List

- 63 species
- U.S. and Canada interests
- Soon to be reviewed by TAG
- Most plants in stock

Fallopia scandens

F. cilinodis

Rheum rhabarbarum
(Rhubarb)

Fagopyrum esculentum
(Buckwheat)

5. Host Specificity Testing

- Takes place in native range or approved quarantine facility
- “No-choice” tests

  → most likely hosts first

  → then the others, if needed
- Host preference (“choice”) tests can provide further resolution

European Results

- Sawfly (*Alantus luctifer*)—**Rejected**

- Aphid (*Machiatella itadori*)—**Rejected**
- Rust (*Puccinia polygoni-amphibii* var. *tovariae*)—**Possible**

- Stem-boring weevil (*Lixus impressiventris*)—**Possible**

- Leaf spot pathogen (*Mycosphaerella* spp.)—**Promising**

- Sap-sucking psyllid (*Aphalara itadori*)—**Promising**

- Leaf Beetle (*Gallerucida bifasciata*)—**Promising**

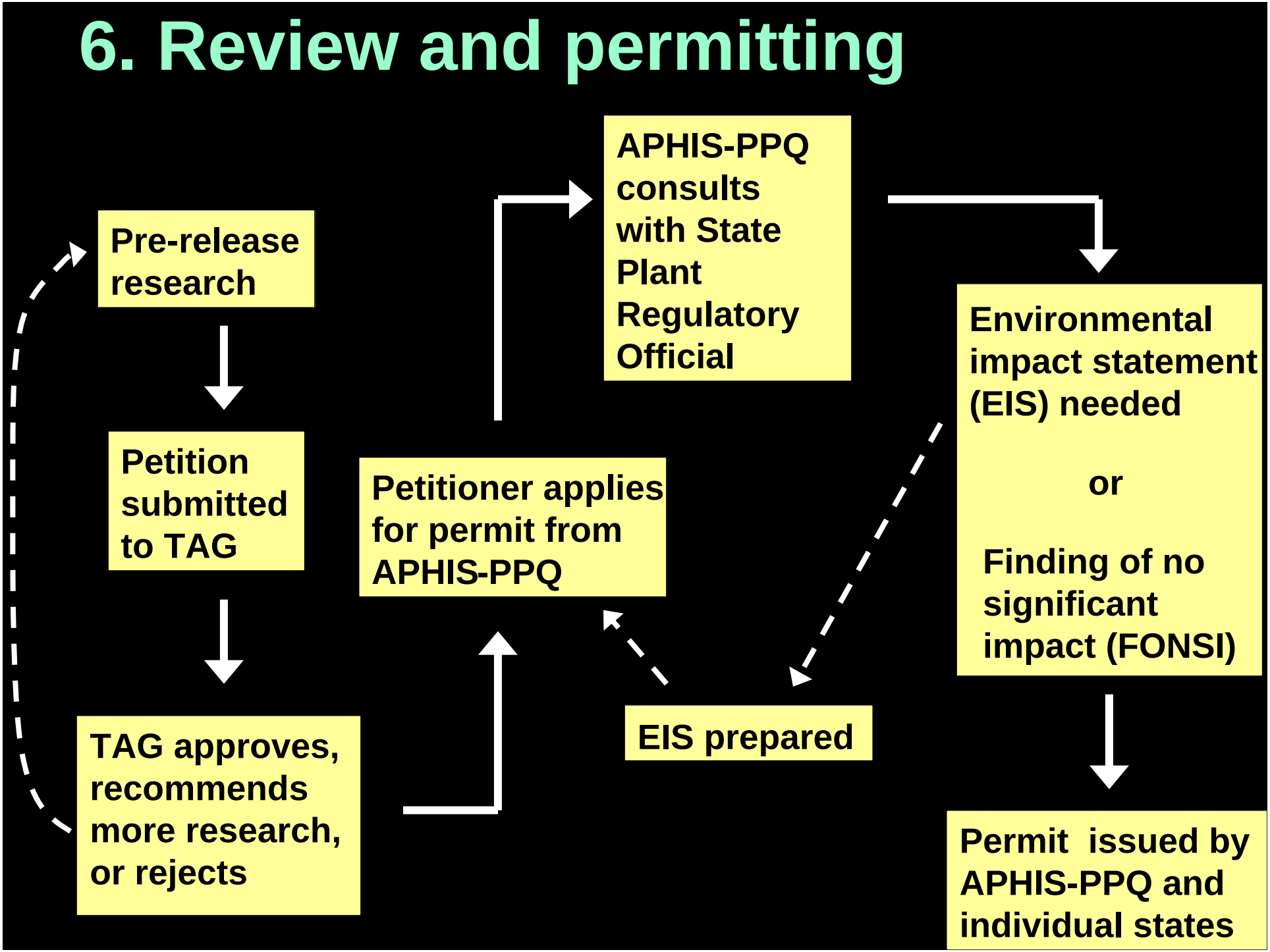
- Many more possibilities…

Source: CABI-Bioscience 2005 Report

Testing for North American Program

- Quarantine facility at Oregon State University recently approved for insects, not pathogens
- Import northern population *Gallerucida bifasciata* next month
- Testing to begin soon after
- Other candidates to be imported later

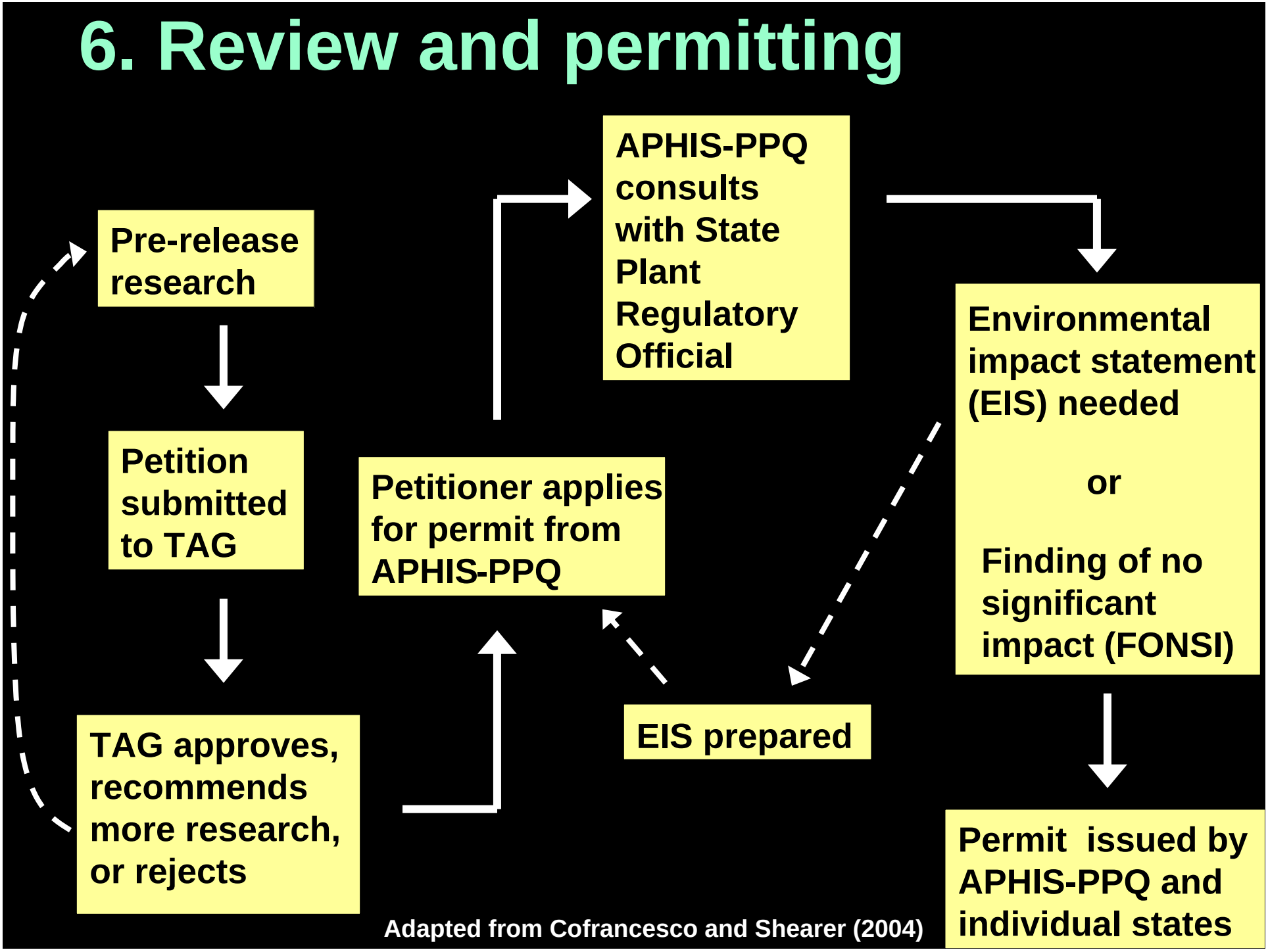
6. Review and permitting



Technical Advisory Group on Biological Control of Weeds (TAG) Member Agencies

- USDA-CSREES
- USDA-Forest Service
- USDA-Agriculture Research Service
- USDA-APHIS
- USDA-ARS Biological Documentation Center
- USDI Geological Survey
- USDI National Park Service
- USDI Fish and Wildlife Service
- USDI Bureau of Land Management
- USDI Bureau of Indian Affairs
- USDI Bureau of Reclamation
- DOD U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- Weed Science Society of America
- National Plant Board
- Canadian Representative
- Mexican Representative

6. Review and permitting



- Problem cases bypassed the TAG review
  - Introduced before TAG (e.g. *Rhinocyllus conicus*)
  - Accidental introductions (e.g. *Larinus planus*)
  - Dispersal from nearby countries (e.g. *Cactoblastis cactorum*)

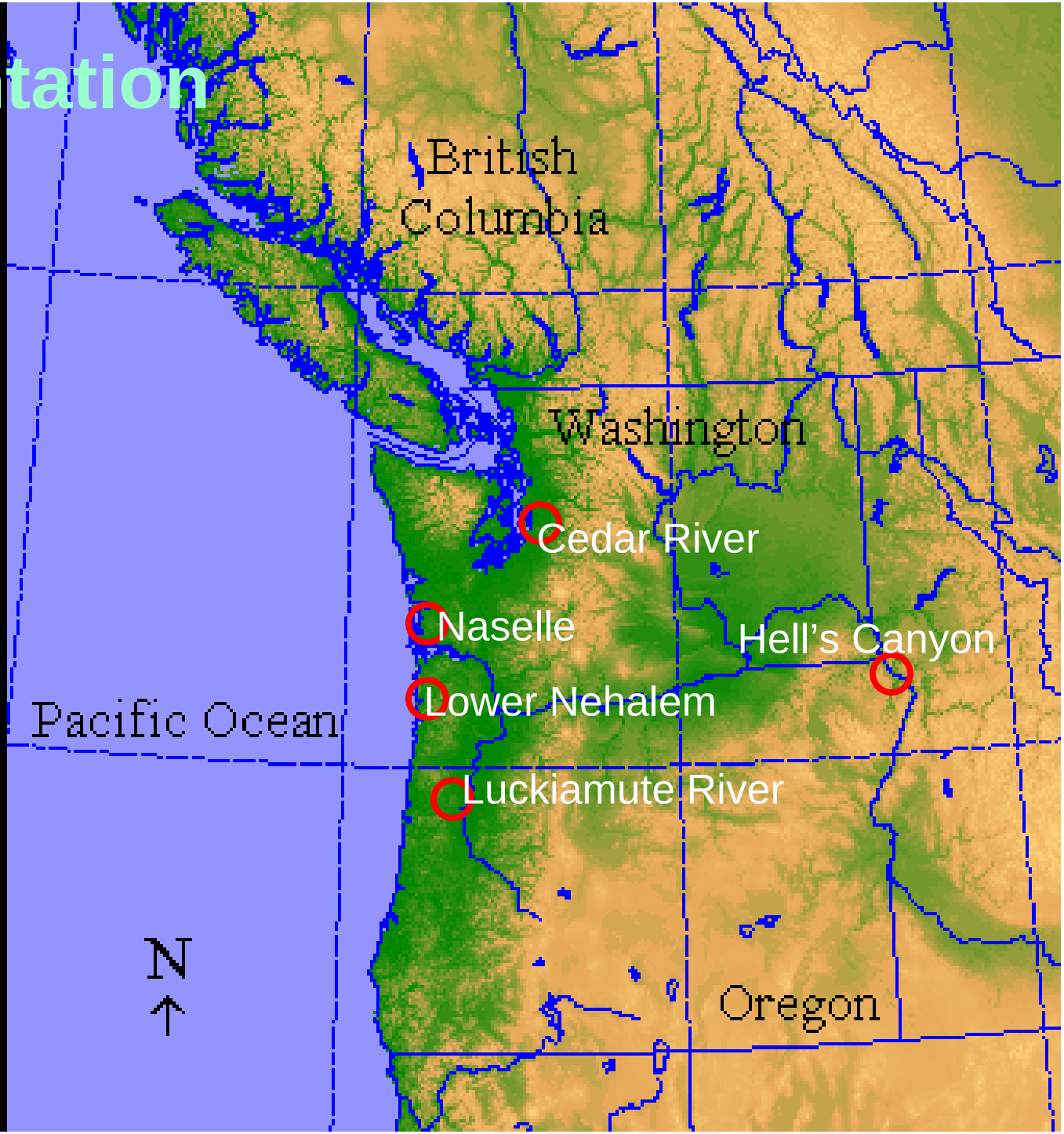
- Host specificity *is* very predictable (Pemberton 2000)

7. Implementation

Initial releases

Redistribution releases

Quantitative monitoring of agent populations and their impacts



Where we are

- Exploration for agents mostly complete, but more needed in Northern Japan
- Plant test list completed, most plants in stock, list needs final review
- Host specificity testing of northern population of *Gallerucida bifasciata* to begin this fall
- *Aphalara itadori, Lixus impressiventris* (and others?) to be imported later
- Knotweed Biocontrol Consortium forming

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