The Washington Invasive Ranking System (WIRS)

A standardized tool for assessing the ecological impact of non-native plants in Washington

EPA Wetland Program Development Grant CD-01J68901

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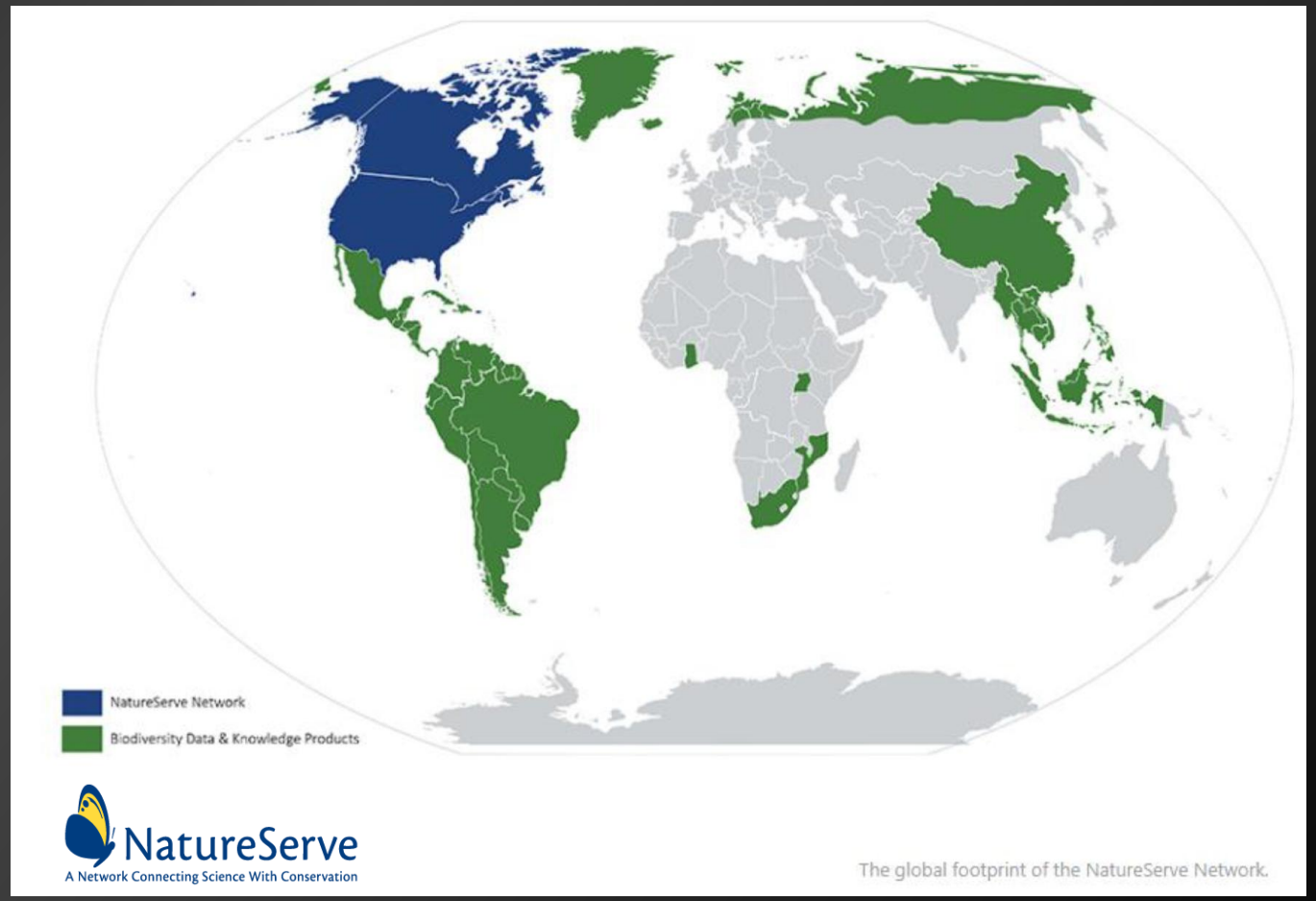
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Photos by Joe Rocchio and Tynan Ramm-Granberg

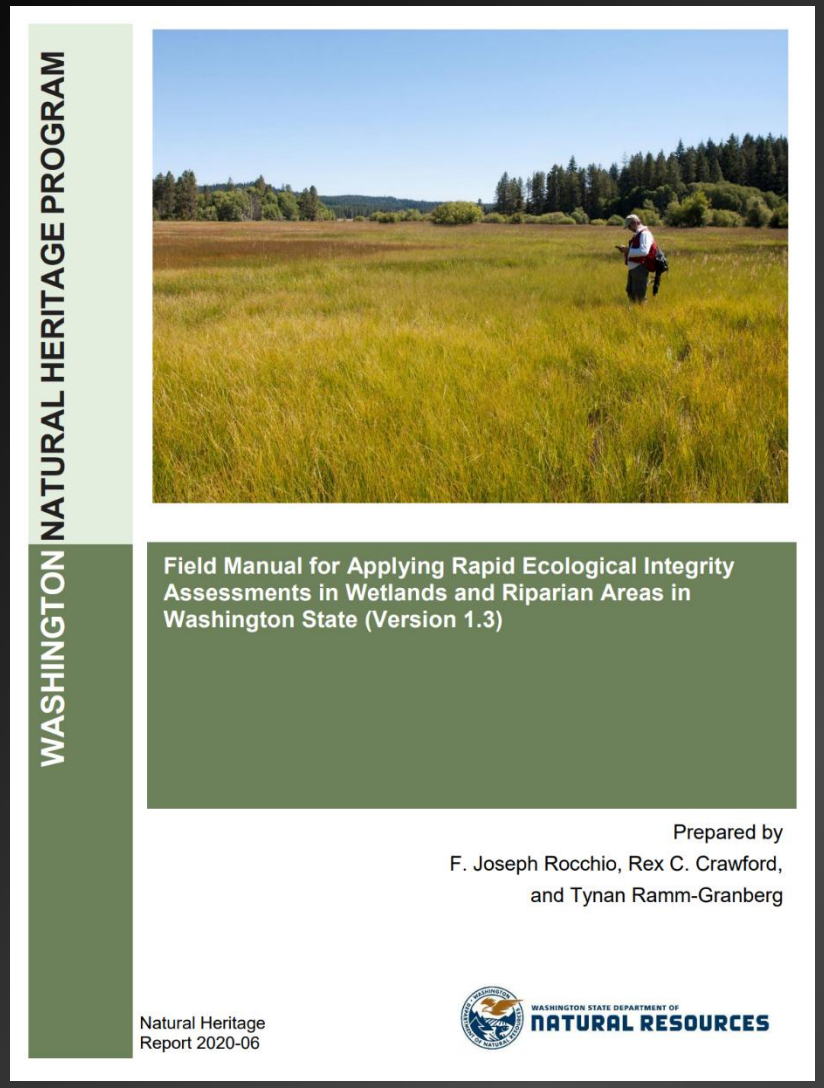
Washington Natural Heritage Program

- Classify Biodiversity
- Map Biodiversity
- Assess Biodiversity Status & Threats
- Set Conservation Priorities
- Distribute Data



Assess

Ecological Integrity Assessments



Wetland / Riparian Metrics

Level 2 EIA

Rank Factor	Major Ecological Factor	Metric Name
Landscape Context	Landscape Context	LAN1. Contiguous Natural Land Cover
		LAN2. Land Use Index
	Buffer	BUF1. Perimeter with Natural Buffer
		BUF2. Width of Natural Buffer
		BUF3. Condition of Natural Buffer
Condition	Vegetation	VEG1. Native Plant Species Cover
		VEG2. Invasive Nonnative Plant Species Cover
		VEG3. Native Plant Species Composition
		VEG4. Vegetation Structure
		VEG5. Woody Regeneration
		VEG6. Coarse Woody Debris, Snags, Litter
	Hydrology	HYD1. Water Source
		HYD2. Hydroperiod
		HYD3. Hydrologic Connectivity
	Soil	SOI1. Soil Condition
Size	Size	SIZ1. Comparative Size (Patch Type)
		SIZ2. Change in Size (optional)

Regional Data Gap

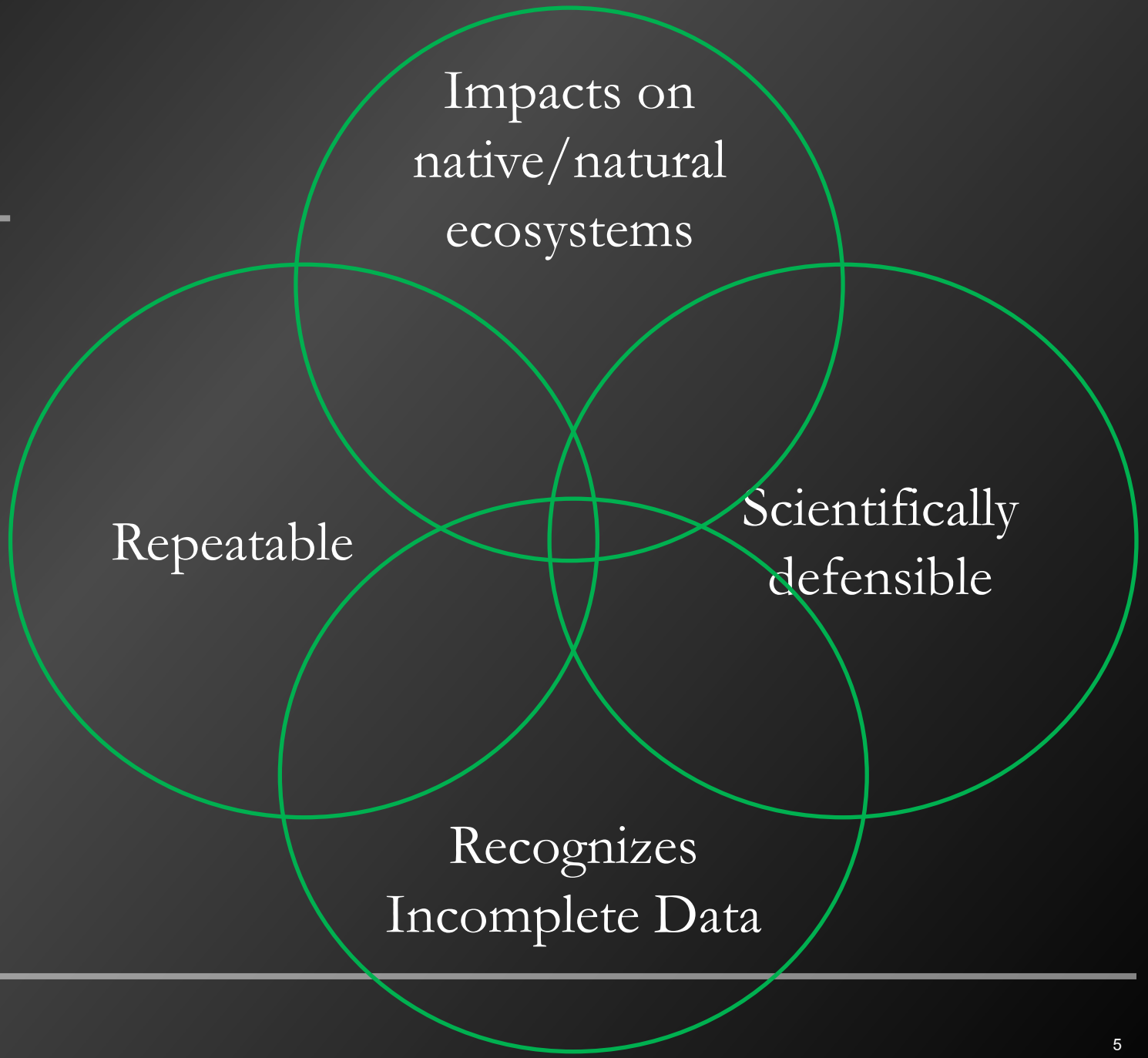
Need for a standardized method to assess nonnative plants relative to their impact on biodiversity and ecosystem condition

***Bromus tectorum* (Cheatgrass)**
Not listed on 2025 Washington State Noxious Weed List

Photo by Thurman Johnson
https://www.inaturalist.org/observations/186062175

Goals

- **Develop a systematic protocol for assessing ecological impact of Washington's nonnative flora:**



Goals

- **Prediction tools**
  - If it gets here, will it be invasive?
- **Information tools**
  - what do we know?
- **Prioritization tools**
  - what is the ecological impact?

Sidalcea nelsoniana (G2/S1; State Endangered) co-occurring with *Leucanthemum vulgare* (Moderate Ecological Impact).
Photo by Molly Wiebush.

Protocol Design

1. Screening
2. Ecological Impact Assessment
3. Supplementary Information
   a) Management Difficulty
   b) Biological Characteristics
   c) Distribution and Abundance

Metric Design

Q18: Impact on Ecosystem Abiotic Processes (9 pts)

Scoring Guidance

What is the impact of the plant on abiotic processes and attributes in the ecosystem?

- **High**: The plant causes major, potentially irreversible, alteration or disruption of abiotic ecosystem processes and attributes.
- **Moderate**: Moderate impacts to abiotic ecosystem processes and attributes.
- **Low**: Perceivable, but minor impacts to abiotic ecosystem processes and attributes.
- **Insignificant**: No measurable impact on abiotic ecosystem processes and attributes.
- **Unknown**: Not enough information.
- **Not Rated**: Did not consider this question.

Q18 Rating *

○ High ○ Moderate ○ Low ○ Insignificant ○ Unknown ● Not Rated

Q18 Confidence *

Leave confidence as "Not Rated" if assigned score above is either "Unknown" or "Not Rated"

○ High Confidence ○ Moderate Confidence ○ Low Confidence ● Not Rated

Amorpha fruticosa

Photo by Lexi Menth
https://www.inaturalist.org/observations/164306543

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Screening

Erechtites minimus (Low Ecological Impact) in Clallam County.
Photo: Erin Burke, WNHP.

Screening

If you are evaluating a plant from the provided priority list, you may skip this section. Otherwise, answer these questions to determine if this protocol is appropriate for the nonnative plant under consideration.

Screening #1: Established in Washington?

○ Yes ○ No

If Yes go to Screening #2.

If No, do not evaluate this plant

Screening #2: Occurs in natural ecosystems?

○ Yes ○ No

If Yes, proceed with your evaluation

If No, do not evaluate this plant

(van der Maarel, 2005; Faber-Langendoen et al., 2014)

Amorpha fruticosa

- Native to midwestern North America, earliest wild record in Washington from 1973
- Class B, Washington State quarantine list

Photo by Lexi Menth
https://www.inaturalist.org/observations/164306543

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Ecological Impact

Photo courtesy of USDA/NRCS

Ecological Impact
Impact on Ecosystem Abiotic Processes (9 pts)
Impact on Ecosystem Structure (12 pts)
Impact on Ecosystem Composition (9 pts)
Impact on Particular Native Species (3 pts)
Observed Ability to Invade Undisturbed Ecosystems (15 pts)
Observed Ability to Invade Naturally Disturbed Ecosystems (3 pts)

Amorpha fruticosa

Ecological Impact			
Impact on Ecosystem Abiotic Processes (9 pts)		**Moderate** (High Confidence)	
Impact on Ecosystem Structure (12 pts)	**Low** (Moderate Confidence)		
Impact on Ecosystem Composition (9 pts)			**High** (Moderate Confidence)
Impact on Particular Native Species (3 pts)	**Unknown**		
Observed Ability to Invade Undisturbed Ecosystems (15 pts)		**Moderate** (Moderate Confidence)	
Observed Ability to Invade Naturally Disturbed Ecosystems (3 pts)			**Yes** (High Confidence)

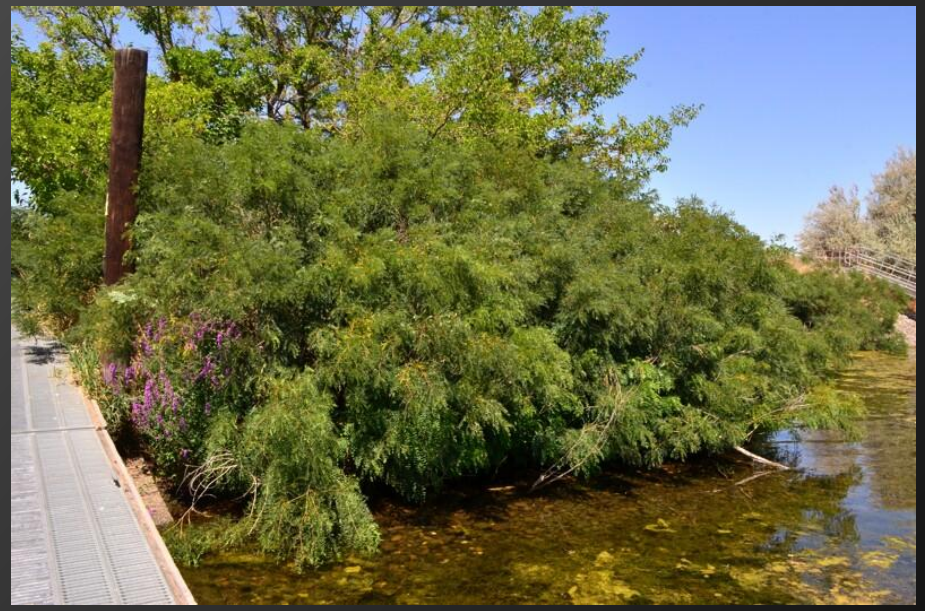

Photo: Gabriel Campbell, WNHP.

Amorpha fruticosa

Ecological Impact			
Impact on Ecosystem Abiotic Processes (9 pts)		**Moderate** (High Confidence)	
Impact on Ecosystem Structure (12 pts)	**Low** (Moderate Confidence)		
Impact on Ecosystem Composition (9 pts)			**High** (Moderate Confidence)
Impact on Particular Native Species (3 pts)	**Unknown**		
Observed Ability to Invade Undisturbed Ecosystems (15 pts)		**Moderate** (Moderate Confidence)	
Observed Ability to Invade Naturally Disturbed Ecosystems (3 pts)			**Yes** (High Confidence)

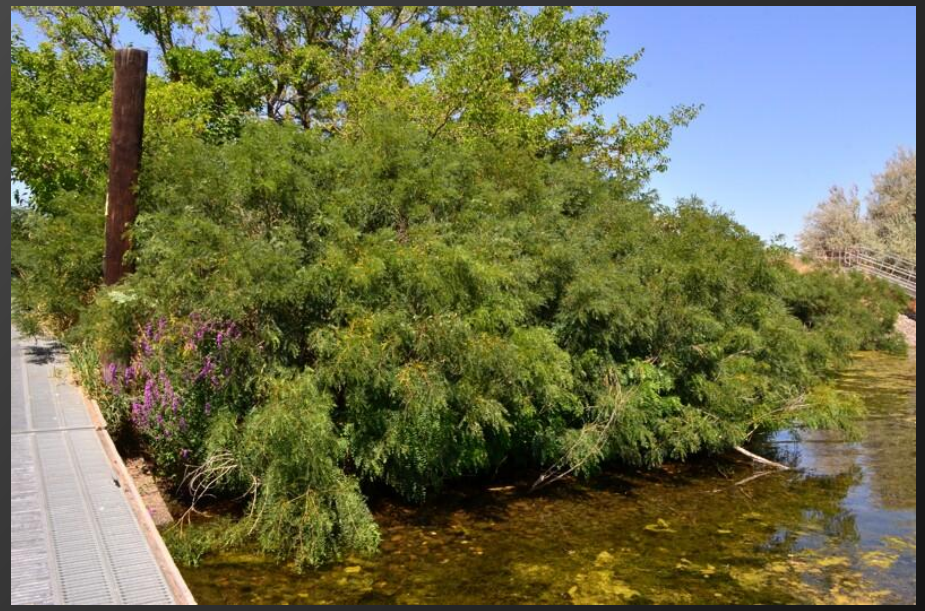

Photo: Gabriel Campbell, WNHP.

Ecological Impact = Moderate (67%) (Moderate Confidence)

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Supplementary: Management Difficulty

Photo by Stephen Keith

Management Difficulty
General Management Difficulty (18 pts)
Minimum Time Commitment (15 pts)
Impact of Management on Native Species (15 pts)
Accessibility of Invaded Areas (3 pts)
Sociopolitical Implications of Management (6 pts)

Amorpha fruticosa

Management Difficulty			
General Management Difficulty (18 pts)		**Moderate** (Moderate Confidence)	
Minimum Time Commitment (15 pts)		**Moderate** (Moderate Confidence)	
Impact of Management on Native Species (15 pts)	**Low** (High Confidence)		
Accessibility of Invaded Areas (3 pts)		**Moderate** (Moderate Confidence)	
Sociopolitical Implications of Management (6 pts)	**Moderate/Low** (Low Confidence)		

Management Difficulty = Moderate (54%) (Moderate Confidence)

Supplementary: Biological Characteristics

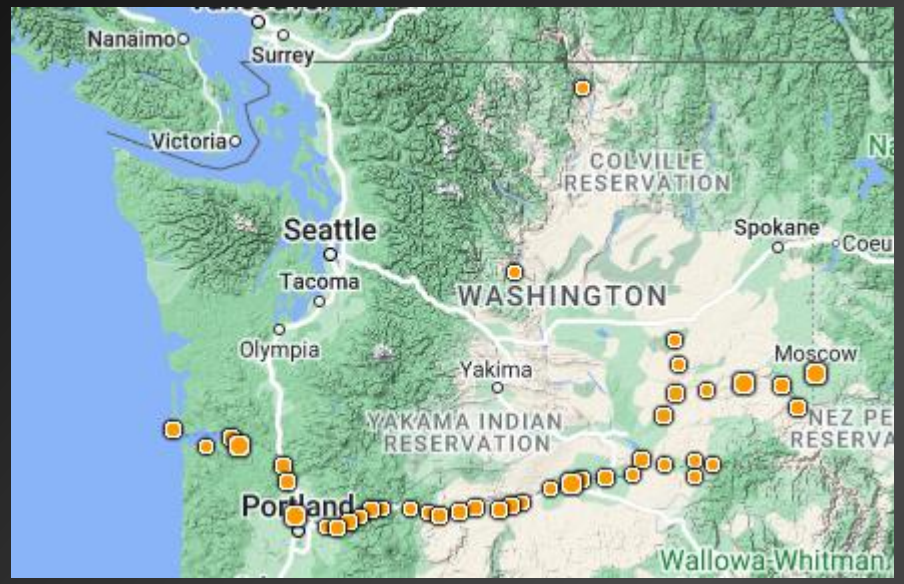
Biological Characteristics	
Aggressive Mode of Reproduction (3 pts)	Germination Requirements (3 pts)
Innate Potential for Long-Distance Dispersal (3 pts)	Invasiveness of Other Plants in Genus (3 pts)
Potential to be Spread by Human Activities (3 pts)	Shade Tolerance (2 pts)
Allelopathy (1 pt)	Disturbance Tolerance (2 pts)
Competitive for Limiting Abiotic Factors (4 pts)	Propagule Persistence (3 pts)
Growth Form (2 pts)	Palatability (1 pt)

Amorpha fruticosa

Biological Characteristics					
Aggressive Mode of Reproduction (3 pts)		**Yes** (High Confidence)	Germination Requirements (3 pts)		**Yes** (High Confidence)
Innate Potential for Long-Distance Dispersal (3 pts)		**Yes** (High Confidence)	Invasiveness of Other Plants in Genus (3 pts)	**No** (High Confidence)	
Potential to be Spread by Human Activities (3 pts)		**Yes** (High Confidence)	Shade Tolerance (2 pts)	**Not Rated**	
Allelopathy (1 pt)		**Yes** (Moderate Confidence)	Disturbance Tolerance (2 pts)	**No** (Low Confidence)	
Competitive for Limiting Abiotic Factors (4 pts)		**Yes** (High Confidence)	Propagule Persistence (3 pts)	**Not Rated**	
Growth Form (2 pts)		**Yes** (High Confidence)	Palatability (1 pt)	**No**, plant is palatable (High Confidence)	

Photos: Gabriel Campbell, WNHP.

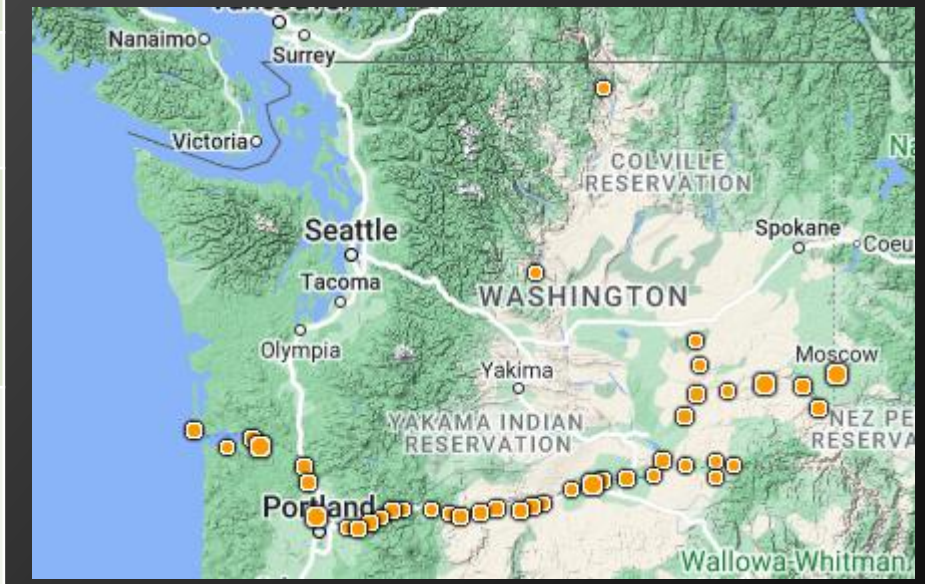
Supplementary: Distribution & Abundance



Distribution and Abundance
Current Range Size in Washington (15 pts)
Current Trend in Total Range (12 pts)
Proportion of Potential Range Currently Occupied (3 pts)
Local Range Expansion or Change in Abundance (12 pts)
Diversity of Ecosystems Invaded (3 pts)

Amorpha fruticosa

Distribution and Abundance			
Current Range Size in Washington (15 pts)		**Moderate** (High Confidence)	
Current Trend in Total Range (12 pts)		**Moderate** (High Confidence)	
Proportion of Potential Range Currently Occupied (3 pts)		**Moderate** (Moderate Confidence)	
Local Range Expansion or Change in Abundance (12 pts)		**Moderate** (Moderate Confidence)	
Diversity of Ecosystems Invaded (3 pts)	**Low** (Moderate Confidence)		



Results

- Ecological Impact Rank
- Management Difficulty Rank
- Supplementary Biological Characteristics and Distribution/Abundance information
- A report summarizing all collected information.

Washington Invasive Ranking System

Washington Natural Heritage Program

Amorpha fruticosa (Indigobush)

Assessed by

Emily Stevenson (Program Coordinator, Skamania County Noxious Weed Control Program)
Walter Fertig (Collections Manager, Marion Ownbey Herbarium, Washington State University)
29 December 2023 (WIRS Version 1.5)

Ecological Impact Rank: **Moderate** (67)	Confidence: **Moderate** (58)
Management Difficulty Rank: Moderate (54)	Confidence: Moderate (50)
Biological Characteristics of Invasiveness: High (76)	Confidence: High (71)
Concern Related to Distribution and Abundance: Moderate (64)	Confidence: High (70)

Photo Credit: Thayne Tuason 2013, used under Creative Commons license (Burke Herbarium, University of Washington, 2024).

Section 1: Distribution and Abundance

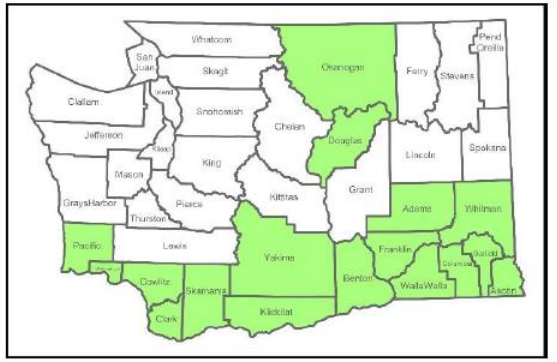


Figure 1. Distribution of counties where *Amorpha fruticosa* has been documented in Washington State (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024).

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Results

- Database of species assessments
- https://www.dnr.wa.gov/natural-heritage-program

WA Invasive Ranking System

The presence and abundance of invasive plants are frequently used in function
Existing state lists of noxious weeds and invasive species serve valuable purpose
impacts and other values that don't always identify the plant species that are m
natural ecosystems. With the assistance of regional experts, Washington Natural
working to assemble a consistent, defensible list of the most ecologically impac
Washington State.

The Washington Invasive Ranking System (WIRS) is a method for assessing the e
plant species in natural ecosystems of Washington State. The primary output of
rank, which indicates the degree of ecological degradation caused by a given pl
it is found. WIRS also produces supplementary information related to each plant
biological characteristics, and distribution and abundance.

For complete results for all plants assessed to date, see:

- WIRS Database (Excel)

To access individual species assessments, click on the hyperlinked scientific nam

Scientific Name	Common Name	
Acer negundo	Box elder	Low
Ailanthus altissima	tree of Heaven	Moderate
Alliaria petiolata	garlic mustard	High
Alopecurus pratensis	field meadow-foxtail	Moderate
Amorpha fruticosa	Indigobush	Moderate
Anthoxanthum odoratum	sweet vernalgrass	Moderate

Washington Invasive Ranking System
Washington Natural Heritage Program

Amorpha fruticosa (Indigobush)

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Section 1: Distribution and Abundance

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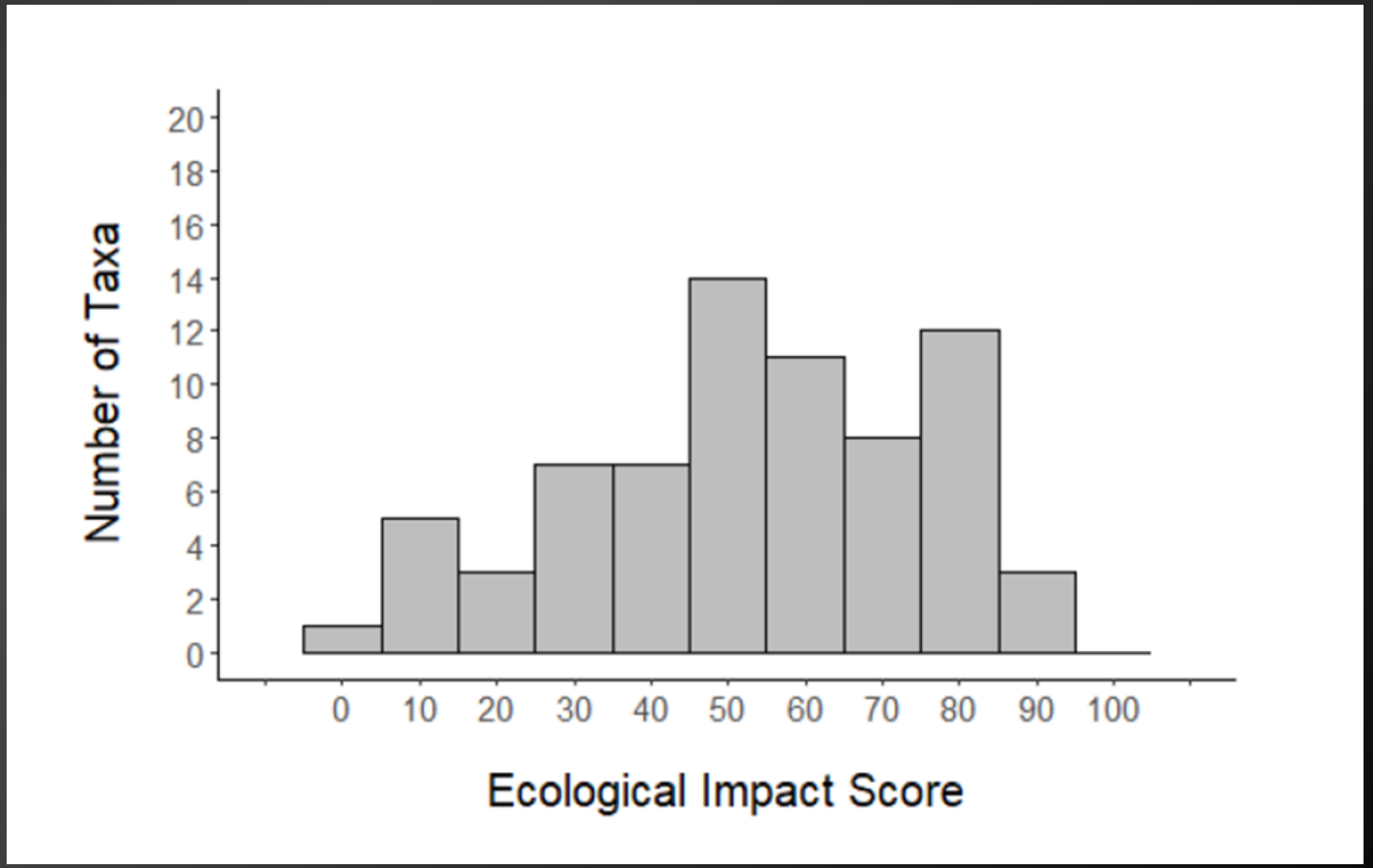
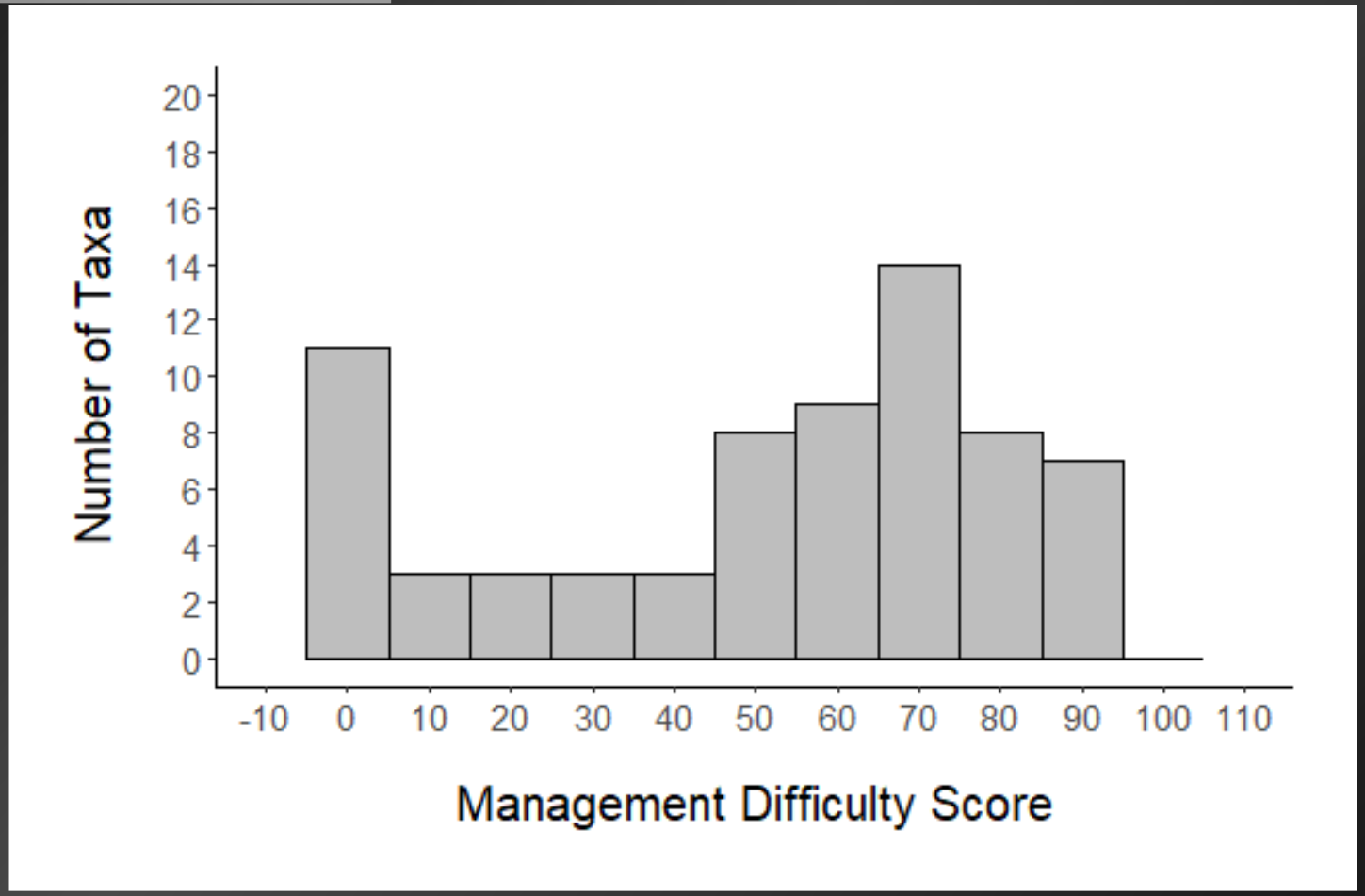
Distribution of Scores

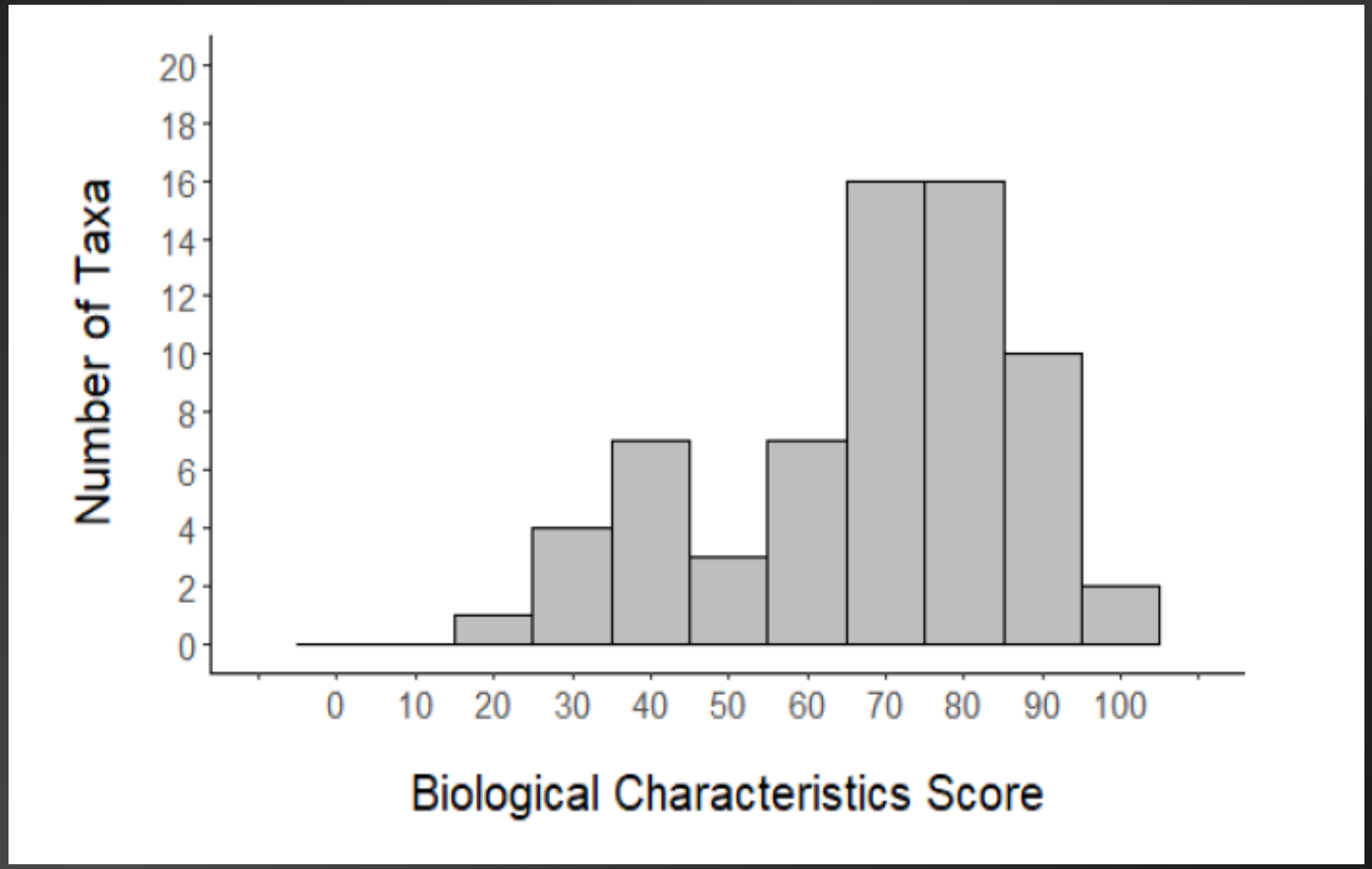
- Ecological Impact Ranks
  - High = 70 – 100 pts
  - Moderate = 50 – 70 pts
  - Low = 30 – 50 pts
  - Insignificant = 0 = 30 pts



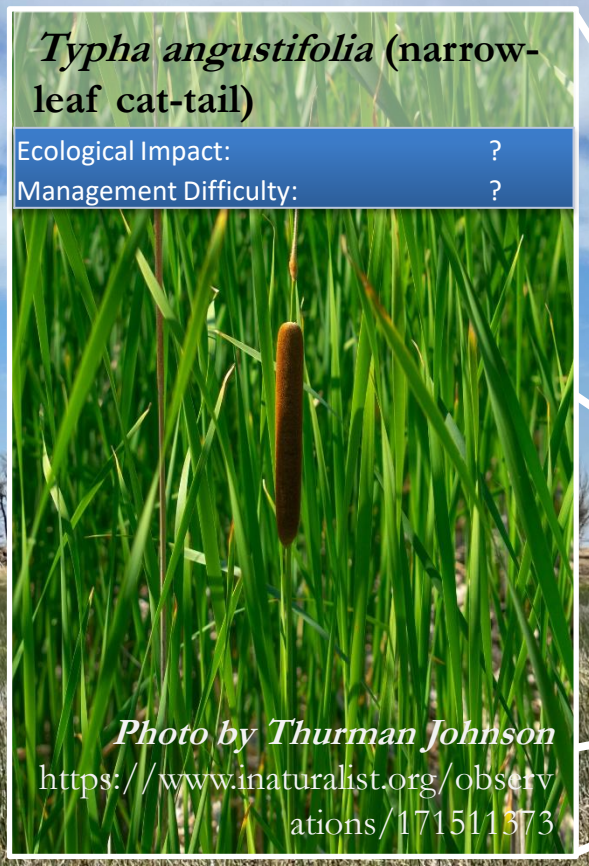
Distribution of Scores



Distribution of Scores



Applications: Prioritization



Typha angustifolia (narrow-leaf cat-tail)

Ecological Impact:	?
Management Difficulty:	?

Photo by Thurman Johnson
https://www.inaturalist.org/observations/171511373

Cirsium arvense (Canada thistle)

Ecological Impact:	High
Management Difficulty:	Moderate

Which is a higher priority for management?

Applications: Assessment

Solidago altissima (tall goldenrod)

Invasive or just nonnative?

Acknowledgements

Funding
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Letters of support
Washington Department of Ecology
Washington Noxious Weed Board
Washington Invasive Species Council

Scientific Advisory Council
Dr. David Giblin
Dr. Walter Fertig
David Wilderman
Joe Rocchio

Regina Johnson (WDNR) assessed 36 of the 71 taxa currently ranked.

https://dnr.wa.gov/natural-heritage-program/ecosystems-washington/wa-invasive-ranking-system

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