

Oregon Department of Agriculture
Plant Pest Risk Assessment for
Indigo Bush (*Amorpha fruticosa* L.)
February 2010

False indigo bush, Bastard Indigo, Desert False Indigo, Indigo bush
Amorpha fruticosa L.
Family: Fabacea

Findings of this review and assessment: *Amorpha fruticosa*, has been determined to be a potential “B” listed noxious weed as defined in the ODA Noxious Weed Policy and Classification System. This determination is based on two independent risk assessments following a literature review. Using the ODA rating system 3.6, indigo bush scored 47 out of a potential score of 90. Using the ODA Noxious Weed Rating system 3.1, indigo bush scored 15, again indicating a “B” rating. With this weed rating, indigobush will receive increased scrutiny as an invasive species allowing cooperators to develop plans for its containment.

Jennifer Anderson. United States, IA, Scott Co., Davenport, Nahant Marsh. 2002.

Introduction: Indigo bush is a perennial leguminous shrub native to the Great Plains and eastern half of North America. Used for soil stabilization and wildlife plantings nation-wide, it is now established across the majority of the United States. Common along streams and prairie draws, it forms dense thickets outside of its native range excluding native vegetation, recreation and river access (Halse, Roche 1992). Once established at high densities, it is difficult and expensive to control.

Biology and Ecology: Indigo bush is a fast-growing leguminous shrub forming dense thickets along waterways and draws. It reaches a height of up to 12 feet. As a legume, the plant produces its own nitrogen in nodules attached to the roots giving it an advantage in low nitrogen environments. Leaves are compound, pinnate with 9-31 leaflets arranged much like those on a black locust tree. Flowers are showy, lavender colored, densely arranged on a raceme and



uniquely possess only a single petal, which is wrapped around the stamens and pistil. The fruit is a small, straight to curved pod with one to two seeds within.

Plants shed pods over a long time period dispersing them primarily in water with the pods remaining buoyant for over a week (Halse, Roche 1992). Once grounded, seeds germinate rapidly.

Indigo bush is well adapted in seasonally to continually wet streambanks, seeps, ponds and moist draws. Rip-rap, sandbars, gravel and cobbles provide excellent substrate for this species (Glad, Halse 1992). It is not limited to alkaline soils as it thrives well in lower Columbia River soils in Western Washington.

Economic impact: Evidence of economic impact in the Pacific Northwest is very limited to lacking. Thickets of indigo bush may serve as physical barriers to water recreation and fishing on the Snake and Upper Columbia River tributaries in Idaho and Malheur county Oregon. Indigo removal costs on wildlife refuges are expensive due to restrictions on herbicide use or the volumes of woody debris that must be treated and removed.

Positive economic attributes: Indigo bush has an extensive root system effectively holding soils against the effects of wave action and bank erosion. This soil holding capacity is very useful along steep-banked waterways and along reservoirs with fluctuating water levels. Conservation plantings along the Payette and Boise rivers in Idaho during the 1930's may have contributed greatly to the spreading infestation in the Snake and Columbia River systems (Glad, Halse 1992).

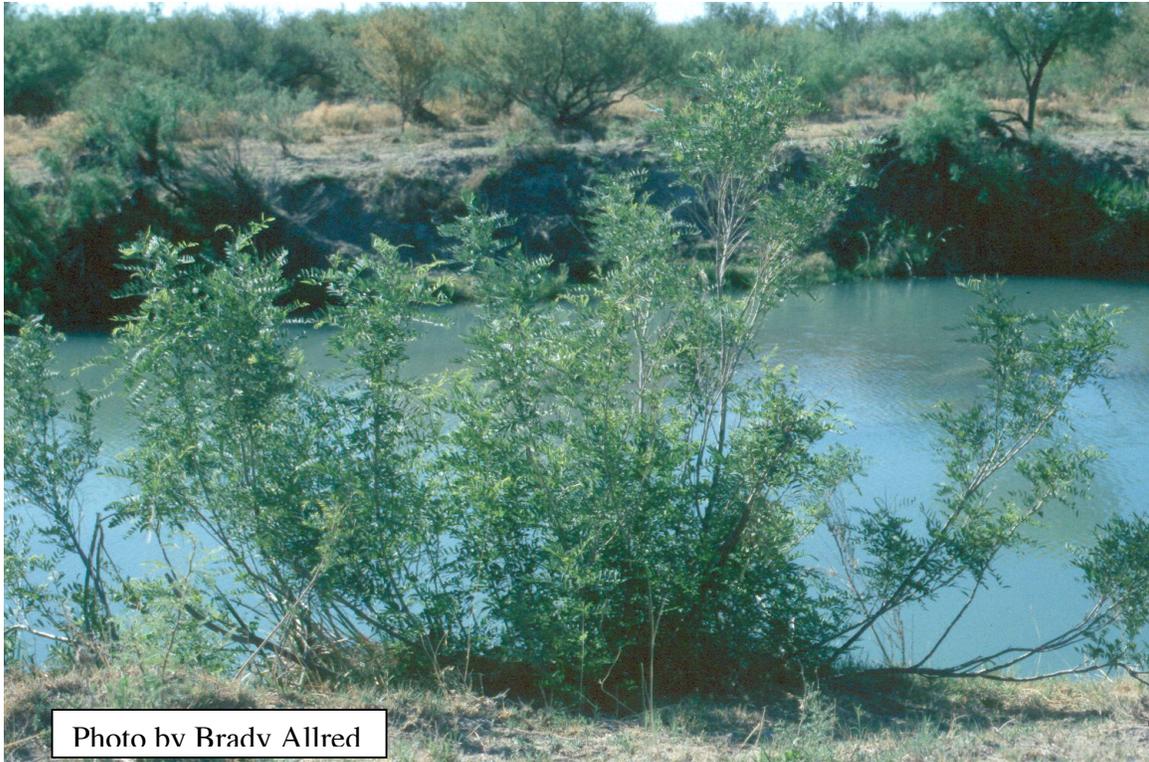
Ecological impacts: Indigo bush aggressively colonizes river banks and riparian zones, canyons and seeps. In some locations, native vegetation becomes excluded impacting animals dependent on and associated with native species. According to Joseph Engler, Assistant Regional Refuge Biologist for the US Fish and Wildlife Service, "Amorpha showed up en masse along the lower Columbia River (Ridgefield NWR) after the 1996 floods, presumably from seeds, twigs, etc from eastern WA/OR. It has since taken over entire shorelines and crowded out both native and non-native vegetation, particularly disturbed sites that were formerly matted with canary grass."

The plant's infestations are most prolific in the willow zone, negatively impacting willow-dependent wildlife, such as yellow warblers and willow flycatchers which presently suffer from continued loss of habitat (per. Comm. Mary Logalbo 2010). On the positive side, butterflies and other pollinators are strongly attracted to the flowers as a nectar source though this aspect can be negated by the lack of food plants for developing larvae.

Reproduction and dispersal: Indigo bush reproduces entirely by seeds. Scarification or deterioration of the seed coat must occur before germination can begin. Dispersal is primarily by moving water though the seed pods are coated with sticky glands that easily attach to bird feathers, animal fur or humans. They can also attach to equipment and become transported to distant locations. The use of indigo bush has been facilitated by its propagation and plantings throughout the west into regions to where it is not native.

Control: No specific information was found. Aquatic labeled herbicides would be effective but extreme care would be needed when applying them in riparian zones.

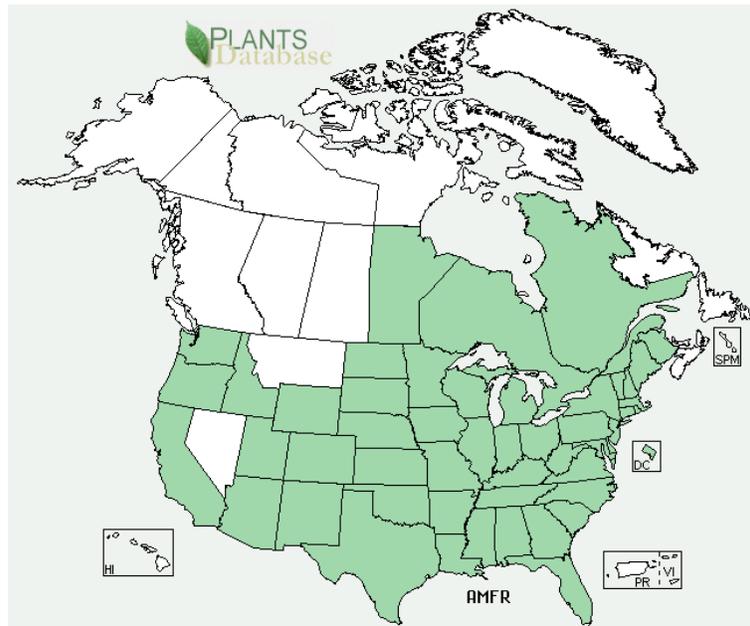
Alternatively, early detection of single plants followed by cutting and root removal could prevent colonization of refuges and high value areas. Early detection surveys would be needed yearly to locate plants while they are still small. On a landscape level, a combination of treatment types would be needed. Cutting with stump herbicide treatments can reduce overall herbicide use and eliminate drift.



Impact in the Pacific Northwest: The Ridgefield National Wildlife Refuge Complex supports stands of indigo bush at all four units within the Complex. The species occurs predominantly along the shorelines of the Columbia River in the three Refuges in the Gorge (Pierce NWR, Steigerwald LakeNWR, and Franz Lake NWR). Some stands are present within the interior of the refuges, but these occurrences are small and scattered. There is no evidence that these small occurrences are having a significant impact on wildlife or habitats, but should these occurrences increase in size, they would compete with native plant species and reduce habitat quality for waterfowl and grassland bird species. Indigo bush can impact the State-listed threatened Columbia yellowcress, which is present along the Columbia River shoreline at Pierce NWR. The Refuge, with help from partnering agencies and volunteers, is controlling indigo bush in this area to protect Columbia yellowcress. Indigo bush also forms dense stands along portions of the sloughs of the Columbia River at the Ridgefield NWR. Some small scattered occurrences have been documented interior to the dikes at the Refuge. Refuge staff are attempting to eradicate populations

within the diked areas to prevent the population from increasing and reducing the habitat quality for waterfowl (particularly dusky Canada geese) and grassland birds such as western meadowlark and northern harrier. The scattered dense stands of indigo bush along Lake River and Bachelor Slough have impacted plantings of native vegetation (willows, dogwood, and Oregon ash) established by the Refuge to enhance riparian habitat. Indigo bush can prevent native woody vegetation from regenerating by crowding and shading seedlings. The Refuge, with help from volunteers and partner agencies, has removed some of these stands along Lake River to protect these plantings and provide riparian habitat for species such as kingfisher, osprey, bald eagle, which use mature trees along the sloughs for perching and foraging; and species such as song sparrow and willow flycatcher which forage in the riparian shrubland habitat. (per. Com. Alex Chmielewski Wildlife Biologist Ridgefield NWRC 2010)

Native range: The Northern Great Plains to Mexico, west to California, east to Florida. From Florida to Ontario (Glad, Halse 1992).



From USDA Plants database³.

Pacific Northwest distribution: Indigo bush grows abundantly along the Columbia River from Portland and upstream to where the Columbia leaves Oregon. It occurs in the Coyote willow zone (roots in the water) and is probably displacing that species and has certainly spread beyond a quantity where we could remove it from the Columbia shoreline." (Kathy Pendergrass per. Comm. 2009). The West Multnomah SWCD has documented and implemented treatment of this plant along Sauvie Island's riparian zones along the Columbia and into the interior parcel of ODFW's Sauvie Island Wildlife Area throughout rivers and channels and lining interior wetlands. The plant has been observed along Washington's Snake River near the eastern edge of the state. Pierce Dunwiddle has noted the infestation at The Nature Conservancy's Pierce Island Preserve since 1996 with

a population boom of indigo bush around 2000 - since that time Dunwiddle has been controlling the plant at the preserve in an effort to keep it from crowding out native plants. In the early 2000's, it started making its way up some of the connected tributaries and in the past 3-4 years it started moving in upland sites (i.e. sites off the floodplain behind high dikes); in one case plants were observed approximately 1 mile from the river in spots that haven't flooded since 1996. Therefore, it is finding an alternate means of dispersal aside from water flow." (Pierce Dunwiddle per. Comm 2009)

Assessing Pest Risk

Noxious Weed Qualitative Risk Assessment 3.6

Oregon Department of Agriculture

Common name: Indigo bush
Family: Fabaceae
Scientific name: *Amorpha fruticosa*

For use with plant species that occur or may occur in Oregon to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase the value of important factors over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: 47 **Risk Category: B**

GEOGRAPHICAL INFORMATION

- 1.4** **Invasive in other areas**
- 0 Low- not known to be invasive elsewhere
 - 2 Known to be invasive in climates dissimilar to Oregon's current climates.
 - 6 Known to be invasive in geographically similar areas.
- Comments: Native to North America, has a wide geographic distribution.
- 2.6** **Habitat availability:** Are there susceptible habitats for this species and how common or widespread are they in Oregon?
- 1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
 - 3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
 - 6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).

Comments: Habitat includes large areas of the Columbia River and other major rivers.

- 3.0** **Proximity to Oregon:** What is the current distribution of the species?

- 0 *Present* – Occurs within Oregon.
- 1 *Distant* – Occurs only in distant US regions or foreign countries.
- 3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
- 6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.

Comments: Occurs within Oregon.

4.5 **Current distribution:** What is the current distribution of escaped populations in Oregon?

- 0 *Not present* – Not known to occur in Oregon.
- 1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
- 5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
- 10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).

Comments: Abundant along Columbia River east of Portland.

BIOLOGICAL INFORMATION

5.3 **Environmental factors:** Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).

- 1 *Low* – Severely confined by abiotic factors.
- 2 *Medium* – Moderately confined by environmental factors
- 4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments: Requires open streambanks to establish Prefers gravelly soils.

6.5 **Reproductive traits:** How does this species reproduce? Traits that may allow rapid population increase both on and off site.

- 0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.
- 1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.
- 3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).
- 3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).
- 5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).
- 6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Produces many moderately lived seeds.

7.4 Biological factors: Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)

- 0 *Negligible* – Host plant not present for parasitic species.
- 1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).
- 2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.
- 4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: Plant appears to be highly resistant to Northwest herbivores and insects.

8.3 Reproductive potential and spread after establishment - Non-human factors: How well can the species spread by natural means?

- 0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).
- 1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).
- 3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed)
- 5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed)

Comments: Plant primarily moved by water and perhaps animals.

9.2 Potential of species to be spread by humans. What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.

- 1 *Low* – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).
- 3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).
- 5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant)

of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: No longer planted for bank stabilization. Not in nursery trade.

IMPACT INFORMATION

10.2 Economic impact: What impact does/can the species have on Oregon's agriculture and economy?

- 0 *Negligible* – Causes few, if any, economic impacts.
- 1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).
- 5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).
- 10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: May cause economic impact at Columbia River recreation sites and around waterfront infrastructure due to removal costs.

11.5 Environmental Impact: What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.

- 0 *Negligible* – None of the above impacts probable.
- 1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.
- 4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).
- 6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Causes impacts to waterfowl nesting habitat. Outcompetes native willow, reducing food for beaver. Invades wetlands.

12.0 Impact on Health: What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms)

- 0 *Negligible* – Has no impact on human or animal health.
- 2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge)

- 4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).
- 6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock)

Comments: No impact

CONTROL INFORMATION

13.5 **Probability of detection at point of introduction:** How likely is detection of species after introduction and naturalization in Oregon?

- 1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).
- 5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).
- 10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Easily identified by professionals. General public not aware of species.

14.3 **Control efficacy:** What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?

- 1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).
- 2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).
- 4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents ineffective.
- 6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable.

Comments: Control is costly and time consuming. Herbicides effective but often applied next to water.

Category Scores:

15 Geographic score (Add scores 1-4)
17 Biological Score (Add lines 5-8)
7 Impact Score (Add lines 9-11)
8 Control Score (Add Lines 12-13)

47 **Total Score** (Add scores 1-14 and list on front of form)

Risk Category: 55-90 = **A** 24-54 = **B** < 24 = unlisted.

This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species
Vers. 3.6 12/2/2010

Noxious Weed Qualitative Risk Assessment 3.1

Oregon Department of Agriculture

Common name: Indigo bush Scientific name: Amorpha fruticosa

OREGON DEPARTMENT OF AGRICULTURE NOXIOUS WEED RATING SYSTEM 3.1

<u>Indigo bush</u>	<u>Amorpha fruticosa</u>
Common Name	Scientific Name

Point categories:

1. 2 **Detrimental Effects:** Circle all that apply, enter number of circles
1. Health: Causes poisoning or injury to humans or animals
 2. **Competition: strongly competitive with crops, forage, or native flora**
 3. Host: host of pathogens and/or pests of crops or forage
 4. Contamination: causes economic loss as a contaminate in seeds and/or feeds
 5. **Interference: interferes with recreation, transportation, harvest, land value, or wildlife and livestock movement**
2. 4 **Reproduction and Capacity for spread** Circle the number that best describes
1. Few seeds, not wind blown, spreads slowly
 2. Many seeds, slow spread
 3. Many seeds, spreads quickly by vehicles or animals
 4. **Windblown seed, or spreading rhizomes, or water borne**

5. Many wind-blown seeds, high seed longevity, spreading rhizomes, perennials

3. 3

Difficulty to Control Circle the number that best describes, enter

1. Easily controlled with tillage or by competitive plants
2. Requires moderate control, tillage, competition or herbicides
3. **Herbicides generally required, or intensive management practices**
4. Intensive management generally gives marginal control
5. No management works well, spreading out of control

4. 2

Distribution Circle the number that best describes, enter

1. Widely distributed throughout the state in susceptible habitat
2. **Regionally abundant in a part of the state, 5 or more counties, more than 1/2 of a county**
3. Abundant throughout 1-4 counties, or 1/4 of a county, or several watersheds
4. Contained in only 1 watershed, or less than 5 square miles gross infestation
5. Isolated infestation less than 640 acres, more than 10 acres
6. Occurs in less than 10 acres, or not present, but imminent from adjacent state

5. 4

Ecological Impact Circle the number that best describes, enter

1. Occurs in most disturbed habitats with little competition
2. Occurs in disturbed habitats with competition
3. Invades undisturbed habitats and crowds out native species
4. **Invades restricted habitats (i.e., riparian) and crowds out native species**

 15 **TOTAL POINTS**

Note: Noxious weeds are those non-native plants with total scores of 11 points or higher. Any plants in 4.1, 4.2, and 4.3 should not be classified as "A" rated weeds. Ratings: 16+ = A, 15 – 11 = B

References:

1. Halse R., Roche C. *Amorpha fruticosa*: Weeds PNW 430 1992
2. Glad J., Halse R. 1992 Invasion of *Amorpha Fruticosa* L. Leguminosae along the Columbia and Snake Rivers in Oregon and Washington. *Madrona* Vol 40 No 1 pp 62-65 1993

3. *Amorpha fruticosa* USDA Plants database. [Internet] [Cited January 6, 2010] from www.pants.usda.gov/java/profile?symbol=AMFR
4. Cover photo . [Internet] [Cited January 6, 2010] from www.pants.usda.gov/java/profile?symbol=AMFR
5. Additional photo . Brady Allred, from Riparian Plants of New Mexico [Internet] [Cited January 6 2010] Available from <http://aces.nmsu.edu/riparian/AMFR.html>
6. Jennifer Anderson USDA Plants Database.
7. Kathy Pendergrass Natural Resource Conservation Service Plant Specialist for the U.S. Department of Fish and Wildlife.
8. Pierce Dunwiddle Nature Conservancy
9. Alex Chmielewski Wildlife Biologist Ridgefield NWRC
10. Mary Logalbo West Multnomah Soil and Water Conservation District.