



Nebraska Invasive Species Council

Prepared by
Nebraska Invasive
Species Council

Weed Risk Assessment for *Lespedeza cuneata* G. Don (Fabaceae) – Chinese bush-clover

May 30, 2012
Version 1

APHIS Weed Risk
Assessment Model

United States
Department of
Agriculture

Animal and Plant
Health Inspection
Service



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Introduction Plant Protection and Quarantine (PPQ) regulates noxious weeds under the authority of the Plant Protection Act (7 U.S.C. § 7701-7786, 2000) and the Federal Seed Act (7 U.S.C. § 1581-1610, 1939). A noxious weed is “any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment” (7 U.S.C. § 7701-7786, 2000). We use weed risk assessment (WRA) —specifically, the PPQ WRA model¹—to evaluate the risk potential of plants, including those newly detected in the United States, those proposed for import, and those emerging as weeds elsewhere in the world.

Because the WRA model is geographically and climatically neutral, it can be used to evaluate the baseline invasive/weed potential of any plant species for the entire United States or any area within it. A climate matching tool is used in the WRAs to evaluate those areas of the United States that are suitable for the establishment of the plant. A Monte Carlo simulation is also used to evaluate the consequences of uncertainty on the outcome of the risk assessment. For more information on the PPQ WRA process, please refer to the document, *Introduction to the PPQ Weed Risk Assessment Process*, which is available upon request.

Species *Lespedeza cuneata* G. Don – Chinese bush-clover

Family: Fabaceae

Information Initiation: In December, 2011, members of the Nebraska Invasive Species Council alerted the Council of continued and increasing concern over the invasive plant (and noxious weed in seven Nebraska counties), *Lespedeza cuneata*. Given the infestation level of the species in the southeastern portion of the state, The Council decided to evaluate this species’ risk potential (impact and geographic distribution) of the species. The Council received much help from the Plant Epidemiology and Risk Analysis Laboratory of USDA-APHIS-PPQ throughout the development of this risk assessment.

Foreign distribution: *Lespedeza cuneata* is native to Australia, China, India, Japan, Korea, Taiwan and may also be native to Butan, Indonesia, Democratic People’s Republic of Myanmar (Burma), Nepal, Pakistan, Papua New Guinea, and the Philippines (Stevens 2002, GBIF 2011). It has been introduced to Brazil, Canada, Mexico, South Africa, and the United States (Stevens 2002, GBIF 2011).

U.S. distribution and status: *Lespedeza cuneata* is present in 32 states. It was initially planted in the United States in the late 1800’s for forage and soil conservation (Ohlenbush et al. 2007). It is listed as a noxious weed in Kansas and Colorado (PLANTS 2011).

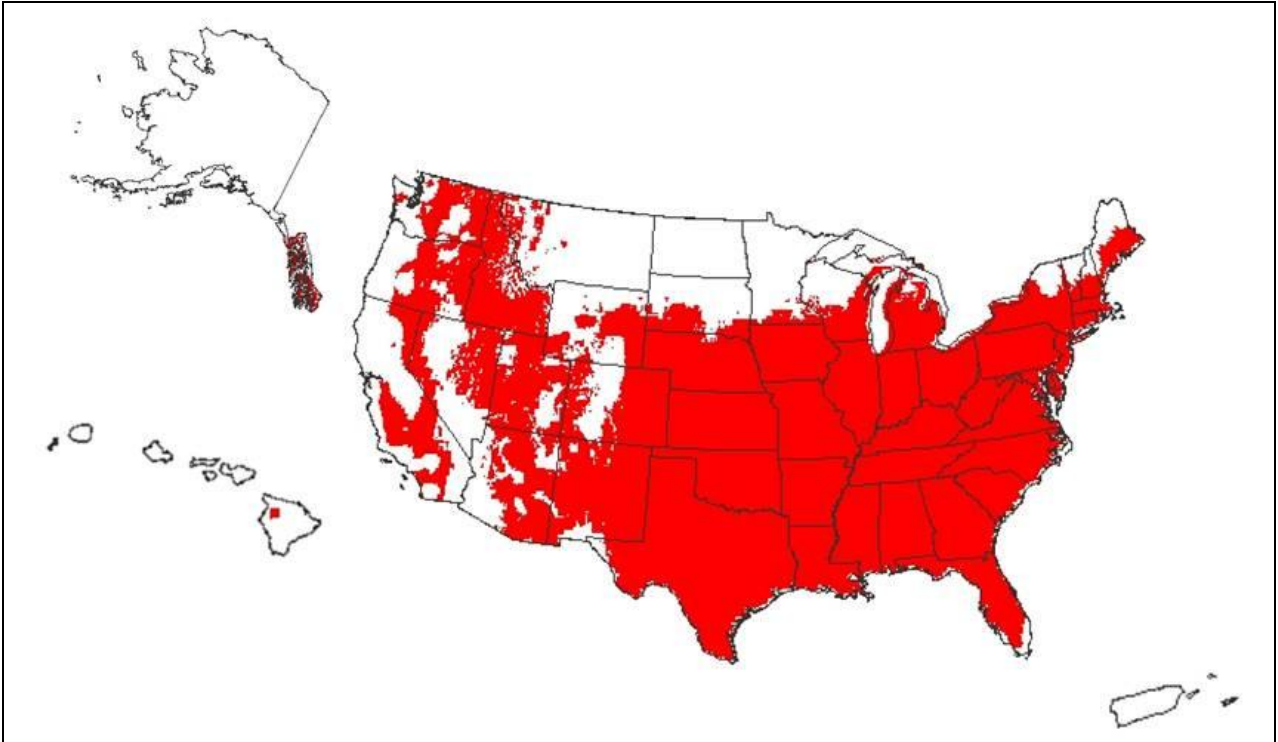
WRA area: Entire United States, including territories

¹ Koop, A., L. Fowler, L. Newton, and B. Caton. 2012. Development and validation of a weed screening tool for the United States. *Biological Invasions* 14(2):273-294. DOI:10.1007/s10530-011-0061-4

1. *Lespedeza cuneata* analysis

- Establishment/Spread Potential** *Lespedeza cuneata* is a long-lived perennial forb that grows well in grasslands, pastures, roadsides, drainage areas, fencerows and in other disturbed areas. Seed production through sexual or self fertilization; **Risk Score = 24** reproduction can exceed 1,500 seeds on a single stem or ramet (Ohlenbusch et al. 2007, Rossow 2009), and seed banks may remain viable for 20 years (Smith 1993, Ohlenbusch et al. 2007). Seeds dispersal occurs through water (Eddy et al. 2003, Rice 2008), animals (Eddy et al 2003, Duncan et al. 2004, Guker 2010), or humans in contaminated hay (Remaley 2006, Ohlenbusch et al. 2007) or in agricultural equipment (Eddy et al. 2003). *L. cuneata* can also sprout from root crowns (Remaley 2007, Bargeron et al. 2008, Gucker 2010). Because it has established in several other countries and regions of the U.S. (South Africa, Brazil, Canada, and Mexico; Stevens 2002, GBIF 2011), this species appears adaptable to a variety of climates and habitats. The abundance of information on this species resulted in a low amount of uncertainty for this risk element.
- Uncertainty Index = 0.04**
- Impact Potential** *Lespedeza cuneata* forms dense stands that crowd out native species (Ohlenbusch et al. 2007), changes community composition (Eddy and Moore 1998), and alters habitat structure (Jorgensen 1985). It has also shown allelopathic tendencies (Kalburtji et al. 2001). As such, it is likely to affect globally outstanding ecoregions such as the Central Tall Grasslands (Ricketts et al. 1999) and affect some Threatened and Endangered species in the United States. *L. cuneata* is identified as a weed in production systems and can reduce grass production by 92% (Eddy and Moore 1998). This species may potentially displace desirable plants in landscapes of urban areas, however information is limited. There was a low to moderate amount of uncertainty associated with this risk element.
- Risk Score = 3.7**
- Uncertainty Index = 0.12**
- Geographic Potential** We estimate that about 61 percent of the United States (including Alaska and Hawaii) is suitable for the establishment of *L. cuneata* (Fig. 1). We based that on the species' known distribution elsewhere in the world and includes point-referenced localities and areas of occurrence obtained primarily from GBIF (2011). The map for *L. cuneata* represents the joint distribution of Plant Hardiness Zones 5-11, areas with 10-90 inches of annual precipitation, and the following Köppen-Geiger climate classes: steppe and desert (with high uncertainty), humid subtropical, marine west coast, humid continental warm summers, and humid continental cool summers.
- Entry Potential** We did not assess this species entry potential because *L. cuneata* has been in the United States since the late 1800's and occurs in 32 states including Nebraska (Stevens 2002, GBIF 2011).

Figure 1. Predicted distribution of *Lespedeza cuneata* in the United States. Map insets for Alaska, Hawaii, and Puerto Rico are not to scale.



2. Results and Conclusion

Model Probabilities: P(Major Invader) = **97.7%**
P(Minor Invader) = 2.2%
P(Non-Invader) = 0.1%

Risk Result = **High Risk**
Secondary Screening = N/A

Figure 2. *Lespedeza cuneata* risk score (black box) relative to the risk scores of species used to develop and validate the WRA model (other symbols). See Appendix A for the complete assessment.

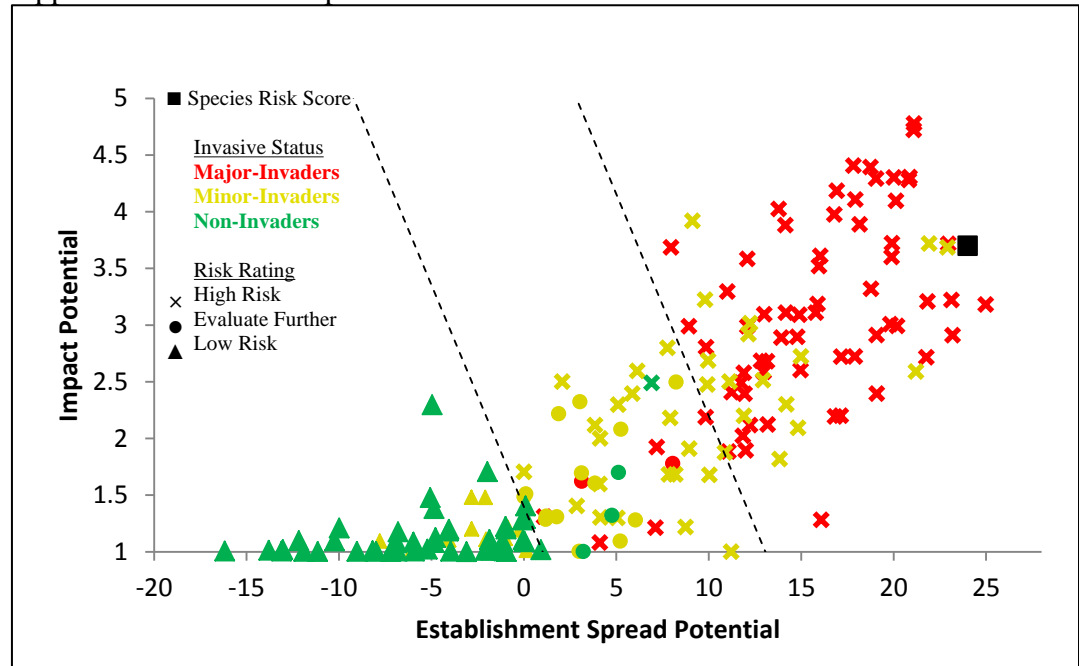
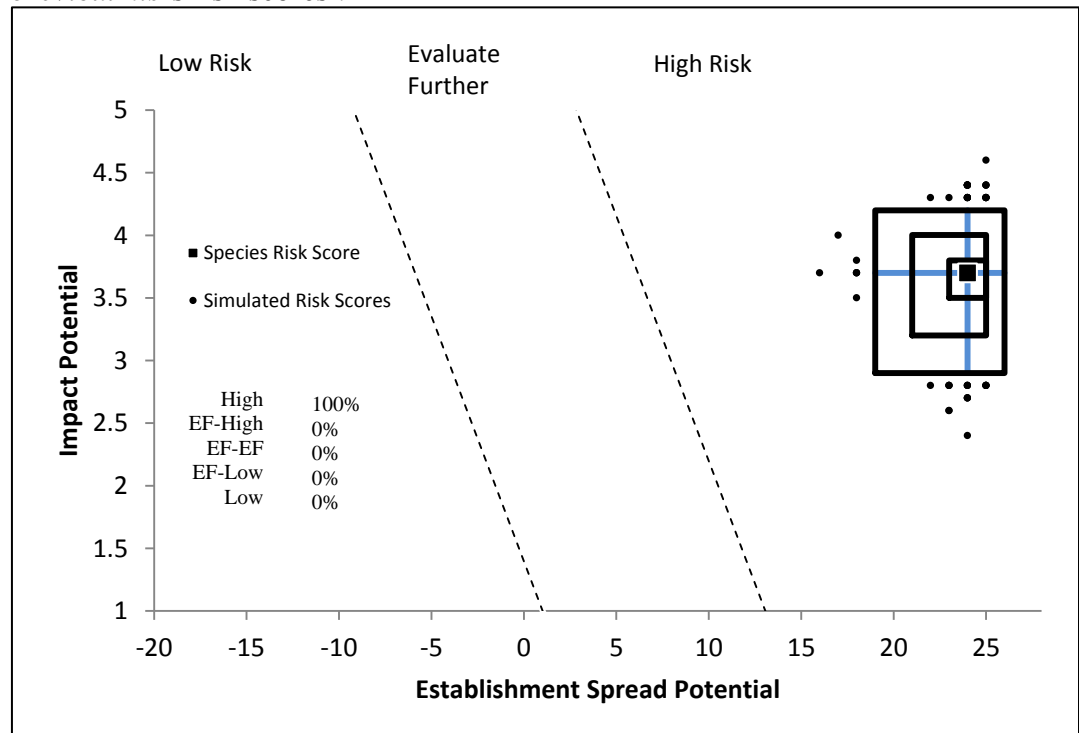


Figure 3. Monte Carlo simulation results (N=5000) for uncertainty around *Carex breviculmis*'s risk scores^a.



^a The blue “+” symbol represents the medians of the simulated outcomes. The smallest box contains 50 percent of the outcomes, the second 95 percent, and the largest 99 percent.

3. Discussion

The result of the weed risk assessment for *Lespedeza cuneata* is High Risk. Comparison of *L. cuneata* to the 204 plant species used to develop the PPQ WRA indicates that it shares many of the same traits and impacts as other high-scoring major-invaders (Fig. 2). Although a low to moderate amount of uncertainty exists for the impact potential, the Monte Carlo simulation indicates that the assessment's results is robust (Fig. 3). *Lespedeza cuneata* poses a high risk potential because of its ability to establish in a diverse set of climatic and environmental conditions (Stevens 2002, GBIF 2011). It forms dense stands capable of producing high numbers of seeds (Ohlenbusch et al. 2007, Rossow 2009) that are dispersed through a variety of means (Eddy et al. 2003, Remaley 2006). *L. cuneata* shows allelopathic properties (Kalburtji et al. 2001), outcompetes native plants, and alters community structure and composition (Jorgensen 1985, Eddy and Moore 1998).

In addition to its risk potential as an invasive weed, managers should consider the extent to which this species invades production systems (rangeland) as well as natural systems. *L. cuneata* was initially introduced to United States in the late 1800's for forage and soil conservation (Ohlenbush et al. 2007). In 1985, *Lespedeza cuneata* was planted with native grasses on crop land retired as part of the Conservation Reserve Program (CRP). In several parts of its U.S. range there are reports of increases and spread in *L. cuneata* populations. In 2003, it infested an estimated 8.6 million acres of the United States. About 15% of the U.S. Tallgrass Prairie Region was infested. As of 2005, it was estimated that *Lespedeza cuneata* occupied 5,501,400 acres (2,226,356 ha) of the mid- to southern Great Plains (Duncan 2005).

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