Oregon Department of Agriculure
Plant Risk Assessment for **Silverleaf Nightshade**
Solanum elaeagnifolium Cav.
February 2011

Name: Silverleaf nightshade (*Solanum elaegnifolium Cav.)* aka. White horsenettle, silverleaf nettle, tomato weed, tomatillo, Texas blueweed
Family: Solanaceae (potato family)

Findings of this review and assessment:
Silverleaf nightshade, *Solanum elaegnifolium*, was evaluated and determined to be a category "_A_" rated noxious weed, as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination was based on a literature review and analysis using two ODA evaluation forms. Using the Noxious Qualitative Weed Risk Assessment v. 3.6, silverleaf nightshade scored _64_ indicating a Risk Category of _A_; and a score of _21_ with the Noxious Weed Rating System v. 3.1, indicating a "_A_" rating.

photo by Joseph A. Marcus

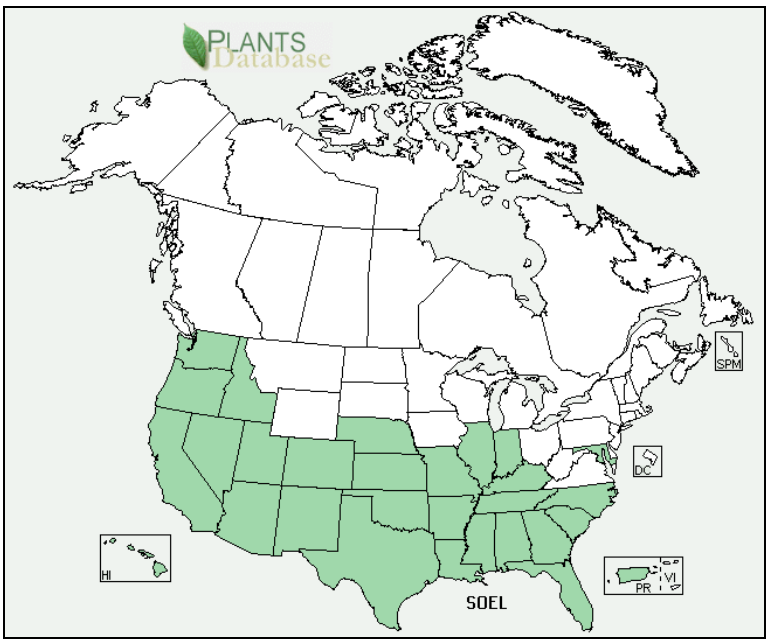
Introduction: Silverleaf nightshade(*Solanum elaegnifolium Cav.)* is a member of the Solanaceae or potato family and was first reported in 1795 (Keefe, 1966) from the warm regions of the Americas. It is listed as a noxious weed in 29 states and many countries and is considered one of the most widely dispersed agricultural noxious weeds in the world. It is highly adaptable to a wide range of soil types, thriving in semi-arid climates, due to it's deep, extensive root system. Silver nightshade is also extremely toxic to most livestock except goats and would reduce the value of rangeland should it become well established. It is not currently found in Oregon.

Growth Habits, Reproduction, and Spread: Silverleaf nightshade is a branched perennial herb that grows from 1 to 3 feet tall, with the top drying out after maturing. Mature plants break off after drying and will tumble throughout the landscape, spreading berries but leaving a deep root system that will re-grow early in the spring. It has star-shaped violet to blue flowers, with bright yellow stamens in their center. The fruits are smooth globe-shaped berries about 1/2 inch in diameter that ripen to a yellow-dull orange color. Roots can grow to a depth of 10 feet with lateral rhizomes at a depth of 3 feet spreading 6 feet or more.

Silverleaf nightshade reproduces by seeds, rhizomes, and root fragments. Dense stands of silverleaf nightshade in Texas are reported to have produced over 1 million seeds per acre. The most prevalent method of spread within a field is from buds on the roots and rhizomes of silverleaf nightshade. Tillage chops the root systems into fragments and disperses them around a tilled field. Plants can grow from root fragments as small as 1 cm.

Native Range: It is unclear whether silverleaf nightshade originated in North America or South America, but is generally thought to be native to the southwestern United States or northern Mexico (Keefe 1996).

Distribution in North America: Silverleaf nightshade is found throughout the southern states of the United States and in northern Mexico. It appears to have adapted to a wide range of climates but favors the semi-arid zones. In the west it is found in California, Idaho, and in Washington in Asotin and Walla Walla counties. In Oregon, silverleaf nightshade was reported in Umatilla County in 1975 but is now eradicated.



Habitat availability: Silverleaf nightshade can thrive in dryland and irrigated croplands, range, riparian and other natural areas. The amount of susceptible land in Oregon is quite large.

Hardiness Zones: Silverleaf nightshade thrives in 5+ hardiness zones. See attachment 1.

Probability of detection: The species is showy and moderatly tall though not well known by ranchers, botanists or crop producers. New infestations may escape initial detection until their population size increases enough to attract attention and identification.

Human dispersal factors: Plants can be introduced through contaminated equipment, hay or crop seeds. Once introduced into a crop field, the weed finds an excellent growing environment in which to establish. Purchasing clean certified seed or quality hay can reduce the chance of contamination.

Biological factors that effect establishement and spread: There are no known insect predators or grazers that target the weed. With adequate soil moisture, plants can reach their full reproductive potential. High levels of alkaloids contained in all plant parts give the plant excellent protection from browsers. Some birds may aid seed dispersal through the ingestion of ripe berries.

Positive Economic Impact: Silverleaf nightshade berries are used for cheese production in Mexico and by the Pima Indians. The berries have also been used by Native American tribes in the tanning of animal hides.

Negative Economic Impact: Silverleaf nightshade lowers crop yield through water and growth competition. Roots grow deeper than the roots of associated crops and will

release allelopathic chemicals into the soil that inhibit desirable seed germination. Small grain yields have been reported to be lowered by 12% in Australia where adaquate herbicide control is not achieved. Rangeland value is diminished through growth competition and the potential for livestock poisoning.
All parts of the silverleaf nightshade plant contain toxic alkaloids that are poisonous to livestock and lower the quality or value of hay. Animals can be poisoned by eating as little as 0.1% to 0.3% of their body weight in ripe silverleaf nightshade berries.

Ecological Impacts: Silverleaf nightshade grows primarily in areas of reduced competition and is increased by ground disturbance such as tillage. It is mainly an agricultural crop pest and does not readily displace native vegetation in undisturbed natural settings.

Control: Mechanical control of silverleaf nightshade can be effective if seedlings are not allowed to reach maturity. The extensive per acre root volume and survivability of mature root systems make repeated tillage necessary for control. Root desication is necessary for such tillage to be successful. Mowing silveleaf nightshade stops apical dominance but stimulates the plant to form secondary rosettes and releases buds on the rhizomes to begin growing. Shading from crop canopies can keep silverleaf nightshade from seeding prolifically.

Chemical control of silverleaf nightshade is difficult because the root system is widespread and connects to adjacent above-ground weed growth (Richardson 1979). Glyphosate and picloram are effective in control of the plant but are not usable in all crop situations.

Assessing Pest Risk

Noxious Weed Qualitative Risk Assessment

Common name: silverleaf nightshade

Family: Solanaceae

Scientific name: Solanum *elaeagnifolium*

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 priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: 64 **Risk Category: A**

GEOGRAPHICAL INFORMATION

1. 6 **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: Found in adjacent states and in simialr climates in the U.S.

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: Plant well adapted to arid regions in North America.

3. 6 **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: Found adjacent to Oregon in Idaho and Washington State.

4. 0 **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: Not present in Oregon.

BIOLOGICAL INFORMATION

5. 4 **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: Highly adaptable to arid and irrigated lands in North America

6. 6 **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: Plant reproduces by seeds, roots, rhizomes.

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 not resticted by biological factors in Pacific Northwest.

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: Moderate potential for spread by water, birds.

9. 4 **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: Moderate probability to be spread during agricultural activities and commerce.

IMPACT INFORMATION

10. 7 **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: Can create negative impacts to livestock grazing and irrigated agriculture.

11. 4 **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: May be competative in natural plant communities.

12. 4 **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: Plant is toxic to grazing animals and humans if ingested.

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: Plant showy and easily identified but may grow in remote locations.

14. 5 **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: Eradication difficult once established. Chemical control marginally effective.

Category Scores:
18 Geographic score (Add scores 1-4)
21 Biological Score (Add lines 5-8)
15 Impact Score (Add lines 9-11)
10 Control Score (Add Lines 12-13)

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64 **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

Oregon Department of Agriculture
Noxious Weed Rating System

Silverleaf nightshade — ***Solanum elaeagnifolium Cav.***
Common Name — **Scientific Name**

Points: 21 Category: A

1. 5 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. 5 Reproduction & Capacity for Spread: Circle the number that best describes, enter number of circles

1. Few seeds, not wind blown, spreads slowly
2. Many seeds, slow spread
2. 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. 4 Difficulty to Control: Circle the number that best describes, enter number of circles

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. 6 Distribution: Circle the number that best describes, enter number of circles

1. Widely distributed throughout the state in susceptible habitat
2. Regionally abundant in 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. 1 Ecological Impact: Circle the number that best describes, enter number of circles

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

TOTAL POINTS: 21

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

Achnowledgments:

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Attachment 1