WRITTEN FINDINGS OF THE
WASHINGTON STATE NOXIOUS WEED CONTROL BOARD
(December 1999)

Scientific Name: *Solanum elaeagnifolium* Cav.

Common Name: Silverleaf nightshade

Family: Solanaceae

Legal Status: Class A

Description and Variation: Silverleaf nightshade is a branched, deep-rooted, perennial herb, 1 to 4 feet tall. Slender, yellow spines occur on the stems or leaf ribs of the plant. The lance-shaped leaves are 1 to 4 inches long by 1 inch wide, with wavy margins; they are covered with short, silvery-white, star-shaped hairs that give the plant a dusky or silvery-gray color. The blue, violet or rarely white flowers have 5 fused petals, ¾ inch across, with bright yellow stamens. Flowers grow on stalks in clusters or singly at the end of stems or branches. The fruits are yellow to brownish, juicy berries, ½ inch in diameter. Seeds are flat, brown and 1/10 to 1/5 inch long (Boyd et al. 1984; Gunn and Gaffney 1974; Roche 1991; Rutherford 1978).

The Solanaceae includes food plants, poisonous and medicinal plants, ornamentals, and several noxious weeds (Boyd et al. 1984).

Economic Importance: *Beneficial:* Silverleaf nightshade is rich in solasodine, a chemical used in the manufacture of steroidal hormones. A protein-digesting hormone resembling papain is present in its fruits. Pima Indians added crushed berries to milk when making cheese. The Kiowa Tribe combined silverleaf nightshade seeds with brain tissue and used it for tanning hides (Boyd et al 1984).

Detrimental: Silverleaf nightshade lowers crop yield through competition (Boyd and Murray 1982b). The plant grows in the early spring due to food reserves in its well-developed root system. The roots grow deeper than those of associated crops. These traits may give it an advantage over agricultural species, including wheat, alfalfa, cotton, peanuts, and grain sorghum (Boyd et al. 1984; Roche 1991). In addition, the plant's spiny leaves and coarse stems may lower the quality of hay taken from infested fields (Boyd et al. 1984).

The species is also toxic to livestock. Silverleaf nightshade contains toxic alkaloids that combine with sugars to produce glycoalkaloids that irritate the gastrointestinal tract; within the tract, these compounds may be hydrolyzed to release alkalids or alkamines that are nerve toxins (Boyd et al. 1984). Cattle that consume 0.1% to 0.3% of their body weight in ripe berries display moderate poisoning symptoms, which may include: rapid, labored breathing; salivation and slobbering; nasal discharge; yellow discoloration of the skin in light-colored animals; weakness and lack or coordination; trembling of muscles in back legs; anemia; and increased

heart rate (Buck et al. 1960). Sheep are more resistant to the toxins and goats are unaffected (Boyd et al. 1984).

Silverleaf nightshade can also harbor plant pests, such as lygus bugs, Colorado potato beetle, and leafspot (Boyd et al. 1984; Roche 1991).

Geographical Distribution: *Solanum elaeagnifolium* is native to the Americas, although it is unclear whether it originated in North America or South America; Spanish or Portuguese colonists may have moved the species from North America to South America or vice versa. However, the most likely center of geographic origin is the southwestern U.S. or northern Mexico (Boyd 1984). Interest in the plant increased in the 1970's as silverleaf nightshade spread outside its native range. It is known from Australia, Egypt, Greece, India, Israel, Zimbabwe, Sicily, South Africa, Morocco and Spain (Boyd et al. 1984; Bouhache and Tanji 1985). It is a listed noxious weed in 21 states (Roche 1991). In the Pacific Northwest, the plant has been introduced to Umatilla County, Oregon; Idaho County, Idaho; and Asotin and Walla Walla counties, Washington (Roche 1991; Washington State Noxious Weed Control Board, unpublished data).

Habitat: Silverleaf nightshade is adapted to semi-arid regions with 12 to 23 inches of annual rainfall. The plant typically occurs on coarse-textured, sandy soils (Molnar and McKenzie 1976 cited in Boyd et al. 1984). In its native range, silverleaf nightshade is a problem in areas where the vegetation has been removed, such as roadsides, construction sites, livestock feeding and watering areas, and cultivated fields. It is considered a problem in cereal grain, alfalfa, grain sorghum and cotton. In California, where the plant was introduced, it occurs in orchards, agronomic and vegetable crops, roadsides, pastures, and vacant lots (Roche 1991).

History: There is no record of how silverleaf nightshade was introduced to Washington. In California, the plant became established along railroad tracks after it was swept from railcars with bedding material (Roche 1991).

Growth and Development: Silverleaf nightshade is a summer-growing perennial plant, with an extensive root system. Roots can grow very deep (6 to 10 feet) and extend horizontally to produce shoots 6 feet away from the parent plant (Roche 1991; Davis et al. 1945). Shoots start to emerge from established plants as the soil warms in late March to early April. Plants may begin to flower in early May (Cooley and Smith 1971). Ripe fruits may be present in June, and some seeds are viable the season they are produced. Seedlings may appear in August and September in flooded areas. Plants die back in winter and reappear from roots in the spring (Davis et al. 1945).

Reproduction: *Solanum elaeagnifolium* can spread by seed, rhizomes, and/or root fragments (Boyd and Murray 1982b). Flowers are cross-pollinated by insects (Buchmann and Cane 1989). Individual berries produce 24 to 149 seeds (Boyd and Murray 1982b), which can add up to 5 million to 100 million seeds per acre (Cooley and Smith 1971). Seeds may be dispersed by wind, water, machinery, agricultural produce or animal feces; studies indicate that 10% of seed is still viable after passing through sheep. Dried plants may also blow like tumbleweeds, spreading seed along the way (Boyd et al. 1984).

Seeds require fluctuating temperatures to germinate. Boyd and Murray (1982b) obtained a maximum germination rate of 57% when they germinated seeds at 20° C for 16 hours and 30° C for 8 hours; light and dark had no effect. They also found that a pH of 6 or 7 was optimal for germination. Other work indicates that immersing seeds in running water for relatively long periods may improve germination rates (Rutherford 1978).

Plants may also spread by rhizomes or root fragments. Local distribution of the plant's vegetative propagules is usually the result of tillage and the creeping nature of the rhizomes (Boyd et al. 1984). Rhizomes may extend 6 feet from the parent plant (Molnar and McKenzie 1976 cited in Boyd et al. 1984). Root fragments as small as 0.4 inches can regenerate (Richardson and McKenzie 1981), and sections of taproot may maintain their viability for up to 15 months (Molar and McKenzie 1976 cited in Boyd et al. 1984).

Response to Mechanical Control Methods: Plants can regrow after being clipped (Cooley and Smith 1971). Removing plant tops by mowing results in a loss of apical dominace that causes multiple shoots to re-sprout (Boyd and Murray 1982b). Removing above-ground parts every 2 weeks can prevent seed production (Roche 1991).

Response to Cultural Control Methods: Cultivation will not readily kill silverleaf nightshade (Richardson and McKenzie 1981). Only frequent, thorough cultivation can be effective. Reduced tillage agriculture produces longer root fragments, which result in more shoots and faster growth. As a result, there is more interference with crop production, and it is more difficult to control the weed (Boyd and Murray 1982a).

Shade from crop canopies can be an effective control tool. However, silverleaf nightshade must be restrained in some other way until crop canopy formation is complete. Otherwise, the weed will mature first and be less impacted by shade. Shade levels between 63% and 92% are needed to prevent seed production. Shade from crop canopies decrease silverleaf nightshade's photosynthetic rate, which may make it a less vigorous competitor (Boyd and Murray 1982a). In Arizona, eradication was achieved in 3 years by hoeing silverleaf nightshade to the ground until grain sorghum formed a dense canopy (Roche 1991).

Response to Herbicides: The plant is difficult to control with herbicides because the root system is widespread and connects to adjacent above-ground growth (Richardson 1979). Studies in California and Greece indicated that glyphosate and picloram provide consistent control of this weed (Eleftherohorinos et al. 1993). California growers have used soil fumigation to eradicate small infestations (Roche 1991). For specific herbicide recommendations, refer to the *Pacific Northwest Weed Control Handbook.*

Biocontrol Potentials: In Arizona, New Mexico, and Texas, part of the plant's native range, 116 insects were collected on silverleaf nightshade. However, it is still weedy in these areas (Goeden 1971). Several biocontrol agents have been investigated. The most promising organism is a foliar nematode, *Orrina phyllobia*, which causes leaf and stem galling (Roche 1991).

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