WRITTEN FINDINGS OF THE
WASHINGTON STATE NOXIOUS WEED CONTROL BOARD
(Updated 2/2000)

Scientific Name: *Abutilon theophrasti* Medic.

Common Name: velvetleaf

Family: Malvaceae

Legal Status: Class A

Description and Variation: Velvetleaf is a summer annual that reproduces by seed. Velvetleaf reaches 3 to 8 feet tall or more, growing from a main stem that is stout with upper branching. As the common name implies, the entire plant is velvety and soft and is completely covered with short, fine hairs. The leaf arrangement is alternate. The large heart-shaped leaves are usually 2 to 5 inches wide, but they can be as large as 10 to 12 inches across. Each leaf is pointed at the tip. A slender petiole supports each leaf. The flowers are solitary or in small clusters, and they are found on short stalks in the upper leaf axils. Each yellow to yellow-orange flower is about ¾ inch wide, with 5 sepals, 5 petals and many stamens which fuse to form a tube. The cup shaped seed pod is 1 inch in diameter, and it is composed of 5 to 15 hairy beaked carpels arranged in a disc. The carpels split at maturity, and each carpel contains 2 to 9 seeds. The hairy, dull seeds are grey-brown, rough and flattened and strongly notched. Each seed is about 1/8 inch in diameter. Velvetleaf grows from a strongly developed, slender white taproot with many smaller branches.

Economic Importance:
Detrimental: 1982 control costs of velvetleaf in North America were estimated at $343 million, and where there is no control, millions more were lost (Spencer 1984; Warwick and Black 1988). Velvetleaf causes the most concern in row crops, mainly soy bean, corn and cotton, where this fast growing late season annual will quickly grow and thrive after the last cultivation. In 1978, sampled fields averaged 27 million seeds per acre. An estimated 1 million seeds germinated, leaving a seed bank viable for 50 plus years. Seed bank establishment makes eradication difficult. Velvetleaf outcompetes the strongest cultivated plants for water and soil nutrients. (Roeth et al. 1983).

Beneficial: Velvetleaf was used as a fiber crop in China since 2000 B.C. The stem and branches of velvetleaf produce long strong fibers used for cord, rope, binder twine, fishing nets, coarse cloth, paper and a caulk for boats (Mitich 1991; Spencer 1984). The seeds are eaten in China and Kashmir (Spencer 1984).

Habitat: Adapted to cropland throughout most of the U.S. (Roeth et al. 1983), velvetleaf grows the best in rich soils of cattle yards and feed lots. Velvetleaf is a common weed of waste areas, roadsides, vacant lots, fence rows and around farmsteads where it is found in barnyards, cultivated fields and gardens. Velvetleaf is most troublesome in Midwestern row crops (mainly soy bean and corn), but it will also grow in sugar beets, dry beans, alfalfa, tobacco and peanuts (Mitich 1991). Velvetleaf is not found in high elevation prairies with dry climate, where the stress of high evaporation restricts growth (Lindsay 1953 as cited in Warwick and Black 1988). It is moving northward into Canada, however velvetleaf did not produce seeds in Alaska, where the frost free growing season was only 88 days long (Andersen et al. 1985 as cited in Warwick and Black 1988).

Geographic Distribution:
Velvetleaf is native to China and India (as cited in Warwick and Black 1988). The colonists cultivated velvetleaf fiber for needed rope and cloth (Spencer 1984). Velvetleaf was probably introduced to the U.S. before 1700, as it was widespread on the east coast in the early-1700's. The economic gains did not materialize, but farmers continued to cultivate it for 100 years (Mitich 1991). Velvetleaf is now widely distributed and considered a major weed of croplands in the U.S., particularly the Midwestern states, and in eastern Canada (as cited in Warwick and Black 1988). Herbarium records indicate that velvetleaf was first identified in eastern Canada in the 1860s, and until 1950 populations of velvetleaf were small, and found in waste places and gardens. From 1950 to 1985 velvetleaf spread to all but three Ontario counties, and it is considered a weed of cultivated lands. The spread was attributed to contaminated seed of corn and soybeans, and movement by harvesting equipment (as cited in Warwick and Black 1988). Velvetleaf is found sparingly in WY and UT; reported from the Pacific coast; found as an orchard weed in southern CA. . In Montana velvetleaf was first recorded in 1956, and it is a weed of gardens and disturbed areas. Velvetleaf is spreading, worldwide. This species is common in the Mediterranean countries, where it reduces crop yields. It was reported in the Netherlands in 1981.

Velvetleaf is a Class A noxious weed in WA. It is a noxious weed in British Columbia, where it was discovered in 1990 in corn and raspberry plantings. Velvetleaf is also a noxious weed in Colorado, Iowa, Michigan, Minnesota, Oregon, Quebec, and Vermont (Invaders data base).

Washington History:
Velvetleaf was first identified in 1885 in Klickitat County, and those populations died out (Roche' 1991). It was identified in 1988 from Thurston and Grays Harbor Counties. The source in Thurston Co. was traced to seed contaminated chicken manure from a local poultry producer, with widespread distribution to organic growers. The seed source was traced to seed screenings or grain dust from the Midwest. Individual velvetleaf plants or small group of plants were also found at railroad sidings, and this species is associated with cultivated lands and nearby non-cropland. The crops include corn, asparagus, vegetables, strawberries, raspberries and oats (Roche' 1991; WSDA correspondence 10/17/89). Velvetleaf is reported from 11 counties in Washington, with most sites estimating less than 10 acres (1999 Distribution map).

Growth and Development:
Velvetleaf is an annual, and reproduces by seeds that germinate throughout the growing season. This annual is described as a hot weather plant, and grows quickly during the hot summer months. The seedling develops a tap root immediately after emergence, and lateral roots develop 1 or 2 days later (Warwick and Black 1988). The fastest growth occurs 6 to 8 weeks after seedling emergence. By mid-season, velvetleaf will catch up and exceed crop heights. Flower and seeds are produced from July through October, depending on the area. As a late flowering summer annual, velvetleaf grows well when partially shaded, and can produce seed and infest a corn field while growing under the dense canopy. Velvetleaf is not frost tolerant, and dies with the first hard frost. The leaves and seeds have allelopathic effects that inhibit the germination and growth of crops, including alfalfa, radish, corn and turnip seedlings (Elmore 1980; Gressel and Holm 1964; Mitich 1991).

Reproduction: Velvetleaf is self-compatible. Flowering is triggered by daylength, beginning in July and continuing until frost. Flowers are pollinated the day they open and the seeds mature 2 to 3 weeks after flowering. Each plant can produce from 700 to 17,000 seeds per plant (as cited in Warwick and Black 1988). The seeds have a hard seed coat, and a period of dormancy broken by scarification. Microbial or soil action, or tillage softens the seed coat, initiating water uptake and germination. The highest germination occurs in the top 2 to 3 inches of soil, and germination does not occur below 6 inches. Seeds are viable in the soil for 50 to 60 years (Roeth et al. 1983). Seeds remain viable after passing through the digestive tracts of animals. Seeds will ripen on the plant after the plant is pulled.

Response to Herbicide: The rates for various chemical control options are found in the annually updated *Pacific Northwest Weed Control Handbook*. However, data is lacking in the Pacific Northwest.

Response to Cultural Methods: Prevention of a seed bank is essential for controlling velvetleaf. Crop rotation aids crop production and prevents yearly favorable conditions for velvetleaf. Nutrient loading is not recommended, as velvetleaf demonstrated an opportunistic response, using later applied nutrients to extend the flowering period and higher seed production (as cited in Warwick and Black 1988).

Response to Mechanical Methods: Small populations, and young plants are easy to control by hand pulling, before flower production. Velvetleaf germinates and grows later in the summer, after the last cultivation of row crops. Cultivation in row crops is effective if controlled late in the season, before seed pod production. Remaining plants should be hand pulled and removed or burned, since the seeds will ripen after the plant is pulled. Close mowing is effective if mowed prior to seed production. Seed bank tillage is also mentioned as a control method (Roeth et al. 1983).

Biocontrol Potentials: Quite a few organisms have been studied for use as biocontrol agents in the control of velvetleaf. The scentless plant bug (*Niesthrea louisianica*) reduced seed production by 98% (Patterson et al. 1987 as cited in Warwick and Black 1988). Velvetleaf is an early season host for tobacco budworm (*Heliothis virescens*) and bollworm (*H. zea*), which feed on the terminal shoots, young leaves and immature fruits (Stadelbacher 1981 as cited in Warwick and Black 1988). *Fusarium lateritium* and *Colletotrichum coccodes* are mycoherbicides studied for velvetleaf suppression. Several root nematdes (*Heterodera marioni*, *Medoidogyne* ssp.) parasitized velvetleaf under greenhouse conditions (as cited in Warwick and Black 1988).

Rationale for Listing:
Velvetleaf introductions to Washington are probably through many separate routes, including as a seed contaminant, contaminated cattle or poultry screenings, and possibly as a garden ornamental. Velvetleaf is the reason for hundreds of millions of dollars spent on control in the United States in the 1980s because of the economic impact to crop production losses in cultivated lands. The history of velvetleaf establishment in the U.S. and eastern Canada began as intentional introductions leading to eventual widespread infestations attributed to movement by contaminated seed and harvesting equipment. Velvetleaf continues to spread, worldwide.

Velvetleaf is recorded in 11 Washington counties, with most reporting less than 10 acres. The seeds are viable for 50 years or more, making prevention the preferred control method. As a Class A noxious weed, the goal is to eradicate velvetleaf from Washington, to prevent the establishment of a seed bank and to prevent any long term impacts to cultivated lands.

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