

**WRITTEN FINDINGS OF THE
WASHINGTON STATE NOXIOUS WEED CONTROL BOARD
Updated 2015**

Scientific Name: *Hyoscyamus niger* L.

Synonyms: *Hyoscyamus agrestis* Kitaibel ex Schultes, *Hyoscyamus bohemicus* F. W. Schmidt, *Hyoscyamus niger* var. *annuus* Sims, *Hyoscyamus niger* var. *chinensis* Makino.

Common Name: Black henbane, common henbane, henbane, hog's-bean, stinking-nightshade

Family: Solanaceae

Legal Status: Class C noxious weed in 1988



Images: left, flowering plant habit, image by Stevens County Noxious Weed Control Board; center, infestation along the edge of a pasture and near a road; right, flowering stems beginning to develop fruit, center and right image by WSNWCB.

Description and Variation:

Overall habit:

Hyoscyamus niger is an herbaceous annual or biennial with a gray-green color that grows to around 3.3 feet tall. It has a foul odor and is covered in sticky, glandular hairs. Racemes of cream to light yellow flowers with purple veins bloom along tips of stems and form capsules of small seeds.

Roots:

Hyoscyamus niger forms a stout, fleshy taproot, 0.8 to 1.2 inches (2 to 3 cm) in diameter (Zhang et al. 1994). Mature plants in Saskatchewan were noted to have a typical taproot system, with slender branches that can extend horizontally up to 6 feet long (Selleck 1964).

Stems:

Stems grow up to 3.3 ft. (1 meter) tall, though occasionally reach up to 6 feet, and are covered with sticky, glandular hairs (DiTomaso et al. 2013, Zhang et al. 1994). The stems are thick, branched or unbranched and are almost woody (Bureau of Land Management Wyoming n.d.).

Leaves:

Plants develop a rosette of basal leaves and have alternate leaves on flowering stems, all covered in sticky, glandular hairs. The basal leaves have an ovate-lanceolate to oblong leaf blade and are up to around 8 inches

(20 cm) long. Leaf margins are coarsely dentate and/or have triangular lobes and have acute tips (Zhang et al. 1994). Lower stem leaves have petioles while upper stem leaves are sessile (Burrows and Tyrll 2013). Stem leaf blades are ovate to deltate-ovate 1.6 to 3.9 inches (4 to 10 cm) long by 0.8 to 2.4 inches (2 to 6 cm) wide (Zhang et al. 1994). The sessile leaves are nearly clasping to somewhat cuneate at the base (Zhang et al. 1994). The leaf margins are lobed or may range to nearly entire (Zhang et al. 1994).



Images: left, *Hyoscyamus niger* stem leaf showing lobed leaf edges and hairs; right, sessile leaves with somewhat clasping leaf bases and alternate arrangement on flowering stem, both images by Mary Ellen (Mel) Harte, Bugwood.org.

Flowers:

Inflorescences are in leafy terminal racemes or spikes, are somewhat one-sided, and coiled at the tip (Burrows and Tyrll 2013, DiTomaso et al. 2013). The flowers are subsessile or on pedicels that are 0.12 to 0.20 inches (3 to 5 mm) long (Zhang et al. 1994). The calyx (sepals collectively) is fused at the base, tubular-campanulate (urceolate), with deltate lobes that are mostly erect, unequal, 0.4 to 0.6 inches (1 to 1.5 cm) (Zhang et al. 1994). The flower's five petals are fused and funnel-shaped, slightly zygomorphic with unequal, spreading petal lobes (DiTomaso et al. 2013). The petals are pale yellow to greenish in color and have purple veins and throat (base of petals) (DiTomaso et al. 2013). The petals are twice as long as the calyx, 0.8 to 1.2 inches (2 to 3 cm) long and have exserted stamens (Zhang et al. 1994).



Images: examples of flowers in bloom, left image by Joseph M. DiTomaso, U. of California-Davis, Bugwood.org and right image by WSNWCB; right, botanical illustration of flowers and other plant parts by Franz Eugen

Köhler, public domain, see: http://commons.wikimedia.org/wiki/File:Hyoscyamus_niger_-_K%C3%B6hler%E2%80%93s_Medizinal-Pflanzen-073.jpg

Fruit:

Each flower develops a capsule that is mostly covered by its urn-shaped calyx, 0.8 to 1 inch (2 to 2.5 cm) long by 0.4 to 0.6 inches (1 to 1.5 cm) wide and has noticeable glandular hairs at its base (DiTomaso et al. 2013, Zhang et al. 1994). Calyx lobes are mostly erect and have a mucronate (abruptly-pointed) tip and strongly veined margins (Zhang et al. 1994). The capsule is ovoid to round, around 0.6 inches (1.5 cm) long by 0.5 inches (1.2 cm) wide, two-celled, and separates into two sections (dehiscent by an operculum, which looks like a small lid) when mature (Kozloff 2005, Zhang et al. 1994). Capsules contain many small seeds, about 1 mm in size, which are hard, pitted and yellow-brown, brown or gray in color (Zhang et al. 1994, Mitich 1992).



Image: left, calyx with glandular hairs at the base and immature capsule inside (not visible), image by WSNWCB; center broken apart capsule with remnant calyx and seeds; right, mature seeds in old calyx still attached to stem, center and right images by Jan Samanek, State Phytosanitary Administration, Bugwood.org.

Similar species:

This is the only species of *Hyoscyamus* naturalized in North America (Burrows and Tyrl 2013). Other genera that are introduced in Washington in the Solanaceae family, including species in the genera *Datura*, *Physalis*, and *Solanum*, are easy to distinguish from *Hyoscyamus niger* when comparing foliage, flowers and fruit.



Images: left, *Physalis* sp. in flower and with developing fruit; right, *Physalis* sp. fruit, both images by Ohio State Weed Lab Archive, The Ohio State University, Bugwood.org.



Images: left, *Datura* sp. with its white, trumpet-like flowers, image by Joy Viola, Northeastern University, Bugwood.org; right, spiny fruit of *Datura stramonium*, image by Phil Westra, Colorado State University, Bugwood.org.

Solanum rostratum, buffalobur, and *Solanum elaeagnifolium* are two species that are also on Washington State's noxious weed list. *Solanum rostratum* traits that differentiate it from *Hyoscyamus niger* include its spiny stems, lobed and spiny leaves, yellow flowers and spiny fruit. *Solanum elaeagnifolium* is silver-green in color with smaller, narrower leaves, purplish to violet to rarely white flowers and its fruit is a small berry, not a capsule like *H. niger*.



Images: left, yellow flowers of *Solanum rostratum*, image by WSNWCB; center, *Solanum elaeagnifolium* in flower and in fruit (right), center and right images by Joseph M. DiTomaso, University of California-Davis, Bugwood.org.

The rosettes of *Hyoscyamus niger* have large, lobed to toothed leaves that may resemble thistles but lack spines (MSU Extension 2014).

Habitat:

Hyoscyamus niger prefers sandy to well-drained soils with moderate fertility but can survive in most soil types (MSU Extension 2014, DiTomaso et al. 2013). Its growth is enhanced with soil nitrogen (Bureau of Land Management Wyoming n.d.). It is commonly found in disturbed and overgrazed areas including riparian areas, roadsides, fence rows, waste areas, pastures, meadows, abandoned gardens, and other non-crop areas (DiTomaso et al. 2013, WSNWCB 1988). Plants are noted to not tolerate shade (Bureau of Land Management Wyoming n.d.).

Geographic Distribution:

According to the USDA GRIN database, (USDA ARS 2015), *Hyoscyamus niger* is native to parts of northern Africa, Asia and Europe. Specifically the database lists:

- Northern Africa: Algeria, Morocco, and Tunisia
- Asia: Afghanistan, Iran, Iraq, Lebanon, Turkey, Armenia, Azerbaijan, Georgia, Russian Federation, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, China, Nepal, and Pakistan
- Europe: Denmark, Ireland, Sweden, United Kingdom, Austria, Belgium, Czech Republic, Germany, Hungary, Netherlands, Poland, Slovakia, Switzerland, Belarus, Estonia, Latvia, Lithuania, Moldova, Ukraine, Albania, Bulgaria, Croatia, Greece, Italy, Malta, Romania, Serbia, Slovenia, France, Portugal, and Spain

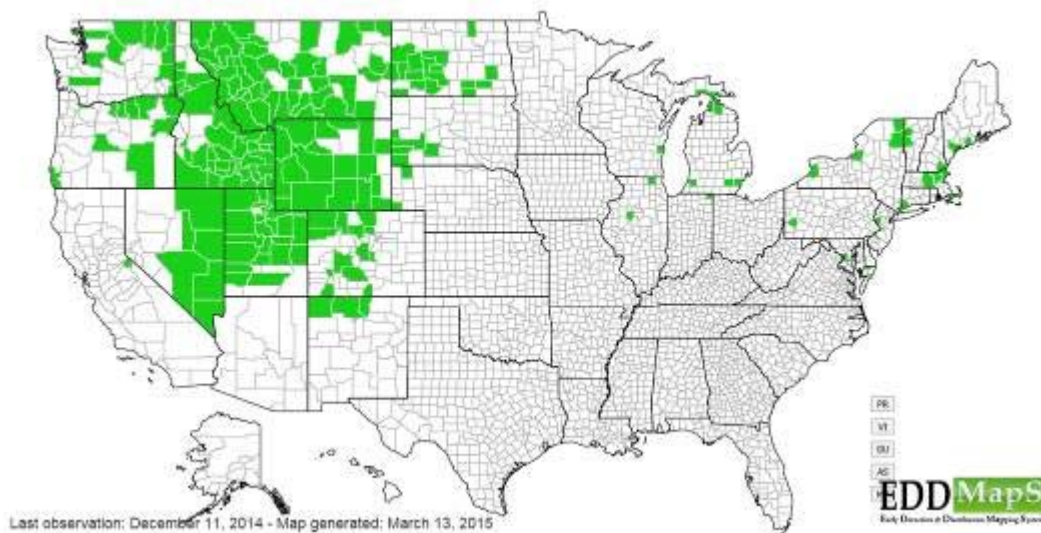
Hyoscyamus niger was introduced to the United States as a cultivated medicinal and ornamental plant from Europe, likely in the 17th century (Pokorny et al. 2010). USDA PLANTS database (USDA NRCS 2015) and EDDMapS (2015) lists *Hyoscyamus niger* naturalized in North America, specifically in:

- Canada: Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Nova Scotia, New Brunswick, Prince Edward Island
- United States: Washington, Oregon, California, Nevada, Idaho, Montana, Wyoming, Utah, New Mexico, Colorado, Nebraska, South Dakota, North Dakota, Iowa, Wisconsin, Michigan, Illinois, Indiana, Maryland, Pennsylvania, New Jersey, New York, Connecticut, Massachusetts, Vermont, New Hampshire, and Maine.

Listings:

Hyoscyamus niger is listed as a noxious weed or on a regulated list in Washington, California, Colorado, Idaho, New Mexico, Nevada, South Dakota, Wyoming (USDA ARS 2015, National Plant Board 2015). *Hyoscyamus niger* is also on a number of county weed lists in Montana (MSU Extension 2014).

Hyoscyamus niger

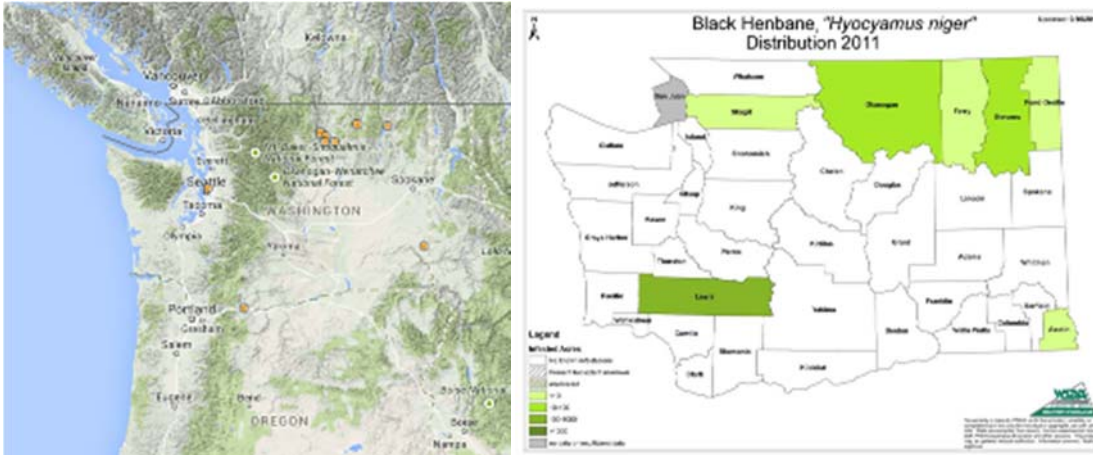


Map: *Hyoscyamus niger* presence/absence county map of the United States by EDDMapS (2015).

Washington:

The earliest herbarium records of *Hyoscyamus niger* in Washington include a collection from Klickitat County from 1911 (WS138833), a collection from Okanogan County in 1919 (OSC 18556), a collection from Whitman County in 1921 (WS 37304), and a collection from Stevens County in 1923 (WS 66086). From Western Washington, the earliest online collection is from King County, Washington, collected in 1938, from a newly seeded lawn (WTU 17494). Overall, most records and observations of *H. niger* are from eastern Washington

though some counties in western Washington have had plants occur (see WSDA county distribution map 2011). For example, in Clark County, one plant was discovered and pulled a couple years ago on a roadside near a port area (Glenn Lebsack pers. comm.).



Maps: left, map of herbarium records of *Hyoscyamus niger* in Washington, northern Oregon, southern British Columbia and western Idaho (Consortium of Pacific Northwest Herbaria 2015); right, 2011 county level distribution map of *H. niger* in Washington State by the Washington State Department of Agriculture (2015).

Growth and Development:



Above image: old flowering stems of *H. niger* with flowering plant in background, image by Stevens County NWCB.

Seeds germinate in the late spring and form rosettes (Pokorny et al. 2010). In Saskatchewan, Selleck (1964) reports that seed germination begins in May and can continue until August or September, while Fetting and Hufbauer (2014) report that seed germination begins in June in Colorado, Wyoming and Montana (C. Fetting, unpublished data). *Hyoscyamus niger* can grow as an annual, a winter annual or as a biennial. Research by Fetting and Hufbauer (2014), analyzing seeds collected from four locations in the United States (Colorado, two locations in Wyoming, and Montana), found that populations from these locations are dominated by biennial plants.

Laboratory research by Schläppi (2011) on annual and biennial *H. niger* plants found that biennial plants have a requirement for vernalization (an extended cold period) for plants to grow stems and flower while annual plants do not. Schläppi (2011) also looked at hybrids between biennial and annual *H. niger* plants and found that they were converted into late-flowering winter annuals.

Hyoscyamus niger's range in the United States appears to be mainly in areas where plants receive vernalization, so these populations suggest vernalization is required, and supports the theory that these populations are dominated by biennials (Fetting and Hufbauer 2014). While vernalization is not absolutely required in every instance for biennial plants to form stems and flower, the need for vernalization may limit the establishment of seeds brought to habitats where they would not experience needed cold temperatures. In Washington State, this need for vernalization may mean that biennial plants would have a harder time establishing in parts of the state where winter temperatures are not low enough. If *H. niger's* annual form were present though, it could establish in warmer areas in Washington and other parts of the U.S. as it does not need a vernalization period to reproduce (Fetting and Hufbauer 2014).

The following year, after vernalization, biennial plants bolt, developing erect flowering stems (Mitich 1992). Plants bloom May to September and fruit July to October (Zhang et al. 1994, MSU Extension 2014). Old fruiting stems may remain upright into the next year.



Images: left, germinating *Hyoscyamus niger* seed with cotyledons, image by Jan Samanek, State Phytosanitary Administration, Bugwood.org; center, small rosette, image by Stevens County Noxious Weed Control Board; right, large rosette, image by Jan Samanek, State Phytosanitary Administration, Bugwood.org.

Reproduction:

Hyoscyamus niger only reproduces by seed (DiTomaso et al. 2013). Plants are prolific seed producers and estimates of production range between 10,000 to 500,000 seeds per plant (Pokorny et al. 2010). Under field conditions, seeds are observed to be viable for up to 4 or 5 years (DiTomaso et al. 2013, Pokorny et al. 2010). Seeds spread by falling at the base of the plant and can also be transported in stems that are included in baled forage.

Economic Importance:

Detrimental:

Hyoscyamus niger is noted as being invasive and opportunistically spreading in disturbed areas, but information is lacking on its impacts as an invader into native plant communities (LaFantasie and Enloe 2011). *Hyoscyamus niger's* primary, and most researched impact, is its toxicity, as it contains tropane alkaloids (hyoscyamine, scopolamine, and atropine) and low levels of calystegin B₂ (Burrows and Tyrl 2013, DiTomaso et al. 2013). Hyoscyamine and scopolamine occur in similar amounts in the leaves, while the seeds are said to have the highest concentration of alkaloids (DiTomaso et al. 2013, Hocking 1947, Oshima et al. 1989 in Burrows and Tyrl 2013).

Toxicity is typically more of a problem for humans than animals, as the plant's bad odor and its texture usually deter animals from grazing on plants unless other forage isn't available (Burrows and Tyrl 2013). Occasional livestock poisonings have occurred over the years (Mitich 1992). Toxic effects vary among species. Cattle typically avoid *Hyoscyamus niger* but may unintentionally consume plants that are included in baled forage (Bureau of Land Management Wyoming n.d.). This is a concern for grazers as dried plant matter can retain its toxic properties (Bureau of Land Management Wyoming n.d.). Hogs can be killed by consuming the roots of *H. niger* (Darlington 1859 in Mitich 1992). Rabbits and guinea pigs are also affected by eating plants (Burrows and Tyrl 2013). The significance of the calystegin B₂ content risk for livestock is unknown (Burrows and Tyrl 2013).

Humans are more commonly poisoned by *Hyoscyamus niger* by either accidental overdoses, consumption by children, or abuse of the plant for neurological effects (DiTomaso et al. 2013, Mitich 1992). Abuse of the plant, and subsequent toxicity, can occur from chewing the flowers or other plant parts (Sands and Sands 1976 in Burrows and Tyrl 2013). Symptoms are similar to *Datura* poisoning and include nervous stimulation with restlessness, pupillary dilation, increased heart rate, labored respiration, excitement, dry mouth, bloat, delirium, hallucinations, seizures, coma and death (Burrows and Tyrl 2013, Plants for a Future n.d.). Generally,

the effects produced by plants in the genus *Hyoscyamus* are not lethal, but children are more vulnerable to the toxic effects and could be killed from ingesting plant parts (Burrows and Tyrl 2013, WSNWCB 1988).

Beneficial:

Hyoscyamus niger has a long history of being used medicinally and has been planted as an ornamental. It has commonly been used as a sedative, painkiller, a tranquilizer, as a muscle relaxer and even in a pill for sea sickness (LeStrange 1977 in Mitich 1992).

Plants for a Future (n.d.) provides an extensive listing of ways *H. niger* is used medicinally, including its use in treatment for Parkinson's disease, for whooping cough, kidney stone pain, asthma, and dental and rheumatic pains (Chevallier 1996, Brown 1995). As noted by Plants for a Future (n.d.), *H. niger* is a very poisonous plant and should be used medicinally with great care and only under the supervision of a qualified practitioner (Lust 1986, Brown 1995).

The seed oil of *Hyoscyamus niger* can be used for soap making (Zhang et al. 1994).

Control:

When working with and handling *Hyoscyamus niger*, make sure to wear gloves and other protective clothing to prevent skin irritation (MSU extension 2014). A key factor to controlling *H. niger* is to prevent plants from going to seed. Also, providing competition with non-invasive and native plants can help reduce *H. niger* infestations and seed germination.

Mechanical Control:

Hand pulling and digging up plants can provide effective control. It is important to control plants prior to seed production. Make sure to remove the taproot when controlling plants; this is easiest done when the soil is moist. If the entire taproot cannot be pulled out, make sure to remove at least the top two inches of the taproot to help prevent resprouting (DiTomaso et al. 2013). If plants already have seeds on them, carefully bag plants including the seeds, seal the bags and dispose of them to prevent further seed dispersal.

Cultivation can also be used to control *Hyoscyamus niger*. Fall tillage will control rosettes and prevent them from overwintering (Selleck 1964). Cultivation should be done prior to seed production to prevent adding seeds to the seedbank. Also, cultivation should be repeating annually until the seedbank is depleted (Pokorny et al. 2010).

Mowing can also be used to control infestations (DiTomaso et al. 2013). Mowing may be difficult with large plants when they have thick, tough stems (Bureau of Land Management Wyoming n.d.). As with cultivation, mow plants prior to seed production and repeat as needed to exhaust the seedbank (DiTomaso et al. 2013).

Cultural Control:

Plants are found in disturbed, overgrazed areas—so preventing and minimizing disturbance and overgrazing can help prevent invasion (Colorado Weed Management Association n.d.).

Plants that already have mature fruits can be burned to kill seed (DiTomaso et al. 2013).

Planting native or non-invasive plants can reduce *Hyoscyamus niger* infestations. In a study by LaFantasie and Enloe (2011) of the competitive ability of *H. niger* with grasses, *H. niger* was found to be a poor competitor. All of their measures of *H. niger* growth were significantly lower when *H. niger* was grown with a mature grass. For example, total biomass of *H. niger* was up to 99% lower when grown with mature grasses. They concluded that *H. niger* is not well-suited to compete with mature grass stands, but they also found it may negatively influence some perennial grass seedlings in restoration situations. LaFantasie and Enloe's (2011) study

specially studied *H. niger*'s interactions with Sandberg bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*) and western wheatgrass (*Pascopyron smithii*). Of these three species, only western wheatgrass seedlings were negatively affected by *H. niger*. Once all three grass species were established, they strongly suppressed *H. niger*. When native grasses are lost to intense disturbances, *H. niger* can opportunistically invade. LaFantasie and Enloe (2011) recommend planting multiple grass species to suppress *H. niger* in reclamation areas (such as under gas lines) and for restoration projects.

Biological Control:

There are no approved biological control agents for *Hyoscyamus niger* (DiTomaso et al. 2013). Grazing as a control method is not recommended due to *H. niger*'s toxic properties. Overall, grazing animals tend to avoid the plants anyway (MSU Extension 2014).

Herbicide Control:

A number of herbicides can be used to control *Hyoscyamus niger*. Please refer to The Pacific Northwest Weed Management Handbook for information on timing, herbicides and herbicide rates to use for *H. niger* control. <http://pnwhandbooks.org/weed/control-problem-weeds>

In general, use herbicide control in combination with other control methods to reduce usage when possible. If using a foliar spray, treat plants when pollinators are not present or are the least active.

Bureau of Land Management Wyoming (n.d.) notes the following herbicides can be used on *Hyoscyamus niger* prior to bloom: dicamba, metsulfuron, 2,4-D and glyphosate. Make sure to carefully read and follow herbicide labels. Contact your county noxious weed coordinator for more information about how to control *H. niger*.

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