

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

Scientific Name: *Echium vulgare* L.

Synonyms: *E. asturicum* Lacaita, *E. hispanicum* Asso, *E. lacitae* Sennen, *E. lycopsis* L., *E. pustulatum* Sibth. & Sm., *E. tuberculatum* Gilib., *E. vulgare* subsp. *asturicum* (Lacaita) Klotz, and *E. vulgare* var. *pustulatum* (Sibth. & Sm.) (all in Klemow et al. 2002).

Common Name: blueweed, blue echium, blue thistle, blue-devil, viper's-bugloss, snake-flower

Family: Boraginaceae

Legal Status: Class B noxious weed in 1988



Images: left, *Echium vulgare* in full bloom; center: flowers blooming near stem tips, image by Robert Vidéki Kft., Bugwood.org; right, blooming infestation, left and right image by Stevens County Noxious Weed Control Board.

Description and Variation:

The genus can be traced back to the Greek physician Dioscorides, meaning “viper”, who thought there was a resemblance between the shape of the plants seeds (nutlets) and a viper’s head (Pusateri and Blackwell 1979 in Klemow et al. 2002). Historically it was thought that the plant could prevent and cure snake bites, particularly the European speckled viper (Leyel 1952 in Pusateri and Blackwell 1979).

Overall habit:

Echium vulgare is a biennial or short-lived monocarpic perennial herb that develops a rosette the first year and the next year produces stems with inflorescences of purple-blue flowers. Plants are covered in two types of hairs—short appressed hairs and longer, bristle-like hairs.



Image: left, *Echium vulgare* basal rosette taproot; center, rosette; right, developing flower stems of *E. vulgare*; all images Stevens County Noxious Weed Control Board.

Roots:

Echium vulgare has a sparsely branched taproot that may exceed 3.3 feet (1 meter) in length (Albertson 1921 in Klemow et al. 2002).

Stems:

Echium vulgare stems are typically erect and grow up to 3.3 feet (1 meter) tall, though sometimes taller (Zhu et al. 1995). One to multiple stems grow from the base and are branched (Zhu et al. 1995). Stems have spreading, bristly hairs that come out from red, purple or black postulate bases and look like dots on the stems (Klemow et al. 2002). As they age, these hairs tend to become prickly and brittle from their calcified walls (Hofler et al. 1956 in Klemow et al. 2002). The plant also has a layer of fine appressed hairs (Zhu et al. 1995).

Leaves:

Echium vulgare has basal leaves that form a rosette and stem leaves that alternate up the flowering stems.

The basal leaves in the rosette radiate outward, are 2.4 to 9.8 inches (6 to 25 cm) long by 0.2 to 1.2 inches (0.5 to 3 cm) wide, including the petiole (Hitchcock et al. 1959). Basal leaves are oblanceolate (widest above the middle), with smooth edges and are single-nerved (Klemow et al. 2002). Stem leaves are linear-lanceolate, sessile and decrease in size going up the stem with uppermost leaves becoming bract-like (Zhu et al. 1995). As with the stems, the leaves are covered with small appressed hairs and long, bristly, white hairs.

Flowers:

Upper parts of the stems to the tips have many short helicoid cymes, more or less aggregated in an elongated inflorescence (Hitchcock et al. 1959). Stems can produce up to 50 cymes, with the cyme starting as a coil and then straightening as flowers bloom, developing sequentially (Klemow et al. 2002). Plants can produce hundreds of flowers, but only a small number of each cyme (usually two to three), are open at a specific moment of time (Rademaker et al. 1999). The flowers within each cyme are showy, sessile, and each is subtended by a narrow bract, 0.16 to 0.60 inches (4 to 15 mm) long (Klemow et al. 2002). The calyx (sepals collectively) is green, 5-parted to the base, and about 6 mm in length (Zhu et al. 1995). Inflorescence stems, bracts and calyxes are also covered in bristly hairs.

The corolla (petals collectively) is 0.4 to 0.8 inches (1 to 2 cm) long and bilateral in symmetry, with the upper lobes being slightly larger and longer than the lower (Klemow et al. 2002). The corolla is blue-purple (pink and white in some forms) and covered with short appressed hairs on the outside (Zhu et al. 1995). Flowers that bloom early in the season (starting in June) have an open, funnel-like corolla with an oblique throat, while those produced late summer to early fall can have a less open, more tubular corolla (Klemow et al. 2002).

Each flower has five, red, exserted stamens that are unequal in length, with one being shorter than the other 4 (Klemow et al. 2002). The filaments are 0.4 to 0.5 inches (1 to 1.2 cm) long and have oblong anthers (Zhu et al.

1995). Stamens are inserted near the base of the corolla, opposite the corolla lobes (Klemow et al. 2002). Most flowers of *E. vulgare* are perfect but a small percentage of plants produce male-sterile flowers (Klinkhamer et al. 1994).



Images: left, blooming inflorescence of *Echium vulgare*, image by Stevens County NWCB; center, *E. vulgare* flower showing the two upper petal lobes longer and larger than the lower three, image by Rob Routledge, Sault College, Bugwood.org; right, flowering stem showing reddish-purple bases of stem hairs (Stevens County NWCB).

Fruit:

Echium vulgare's calyx expands to about 0.4 inches (1 cm) when in fruit. Each flower can form four gray to brown, 1-seeded nutlets. The nutlets are ovoid-pyramidal, 0.09 x 0.06 x 0.06 inches (2.4 x 1.6 x 1.5 mm) in size (Klemow et al. 2002). The outer surface is rough and slightly bumpy (Zhu et al. 1995).

Similar species:

| Species | Habit and stems | Leaves | Flowers |
|---|--|---|--|
| <i>Echium vulgare</i> , blueweed, Class B noxious weed | Typically biennial; 100 cm tall, potentially taller; fine hairs under the overlying layer of spreading hairs | Oblanceolate; single-nerved; rosette leaves with shorter petioles | Petals fused at the base, with 5 unequal lobes; 2 upper lobes larger and longer than other 3; all stamens exserted, extending past petals, though one shorter than other 4 |
| <i>Anchusa arvensis</i> , annual bugloss, Class B noxious weed | Annual; 10 to 30 cm tall | Lanceolate leaves with wavy margins | Radial symmetry; flowers with 5 equal petals; petals fuse to form a bent tube |
| <i>Anchusa officinalis</i> , common bugloss, Class B noxious weed | Perennial; 30 to 80 cm tall, tap-rooted | Lower oblanceolate, upper becoming lanceolate; leaves not wavy | Radial symmetry; flowers with 5 equal petals; petals fuse to form a straight tube |
| <i>Echium plantagineum</i> , Paterson's curse, | Annual, biennial; 40 to 80 cm tall; Stems lack fine hairs under the | Oblong to oval basal leaves, prominently 3-veined with pronounced | +/- bilateral symmetry; petals are reddish, becoming purplish-blue, |

| | | | |
|--|------------------------------------|----------|---|
| not listed as a noxious weed in WA; listed in OR | overlying layer of spreading hairs | petioles | 15–20 mm long; two stamens are short-exserted, other 3 included |
|--|------------------------------------|----------|---|

(Klemow et al. 2002; Kelley et al. 2013, Hitchcock et al. 1959)

Habitat:

Echium vulgare grows well in poor soils and a variety of other conditions including glacial outwash, sandy soil, gravelly soil, alkaline soils and as well as acidic soils (Graves et al. 2010). Plants are found in disturbed areas including roadsides, waterways and overgrazed pastures. *Echium vulgare* can also grow in irrigated pastures, lawns and gardens (Graves et al. 2010). It has also been noted to grow poorly with dense vegetation or in very arid regions. Graves et al. (2010) reports that research from Canada and Europe found that *E. vulgare* was easily outcompeted by other plants when grown in cultivation and flower production was inhibited with increased soil nutrients.

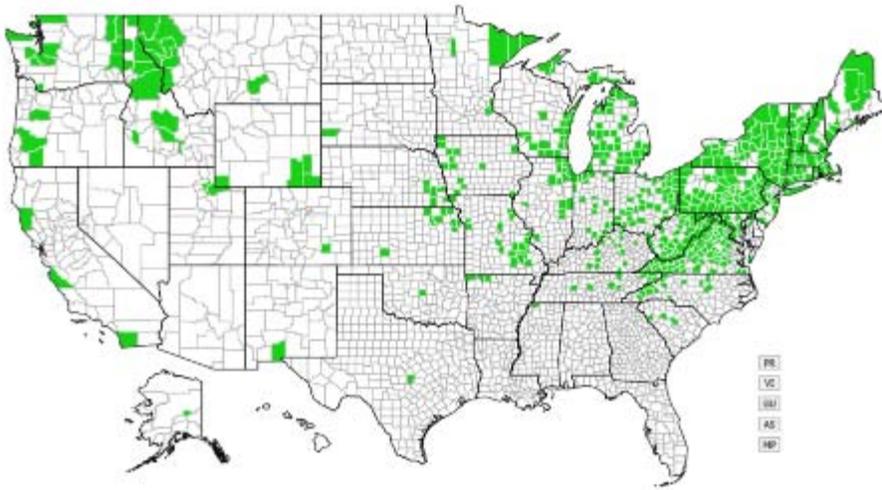
Geographic Distribution:

According to the USDA GRIN database, (USDA ARS 2015), *Echium vulgare* is native to parts of Asia and Europe, specifically:

- Asia: Cyprus Turkey, Armenia, Azerbaijan, Georgia, Russian Federation, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, China
- Europe: Denmark, Ireland, Sweden, United Kingdom, Austria, Belgium, Czech Republic, Hungary, Netherlands, Poland, Slovakia, Switzerland, Belarus, Estonia, Latvia, Lithuania, Moldova, Ukraine, Albania, Bulgaria, Greece, Italy, Romania, France, Portugal, Spain

Pusateri and Blackwell (1979) conducted a survey of herbarium records and determined that *Echium vulgare*, as an escaped weed, became established in the United States in the early to mid-1800s. Mack (2003) reports that in 1842, the botanist Asa Gray wrote about *E. vulgare* occurring throughout the Shenandoah Valley in Virginia, occupying many sites including cultivated fields but had not noticed it being as common further north, just along some roadsides. In 1859, Darlington wrote that it was in considerable abundance in Maryland and New York (Mack 2003). Currently, USDA GRIN database (USDA ARS 2015) lists *E. vulgare* naturalized in:

- Africa: South Africa and Lesotho
- Australia
- New Zealand
- Europe: Finland, Norway, Germany, Croatia, Serbia, Slovenia
- Canada: New Brunswick, Nova Scotia, Ontario, Quebec, Alberta, British Columbia, Manitoba, Saskatchewan
- United States: Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oklahoma, South Dakota, Wisconsin, Colorado, Idaho, Montana, Oregon, Washington, Wyoming, Arkansas, Delaware, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, New Mexico, Texas, California, Utah
- South America: Argentina, Chile



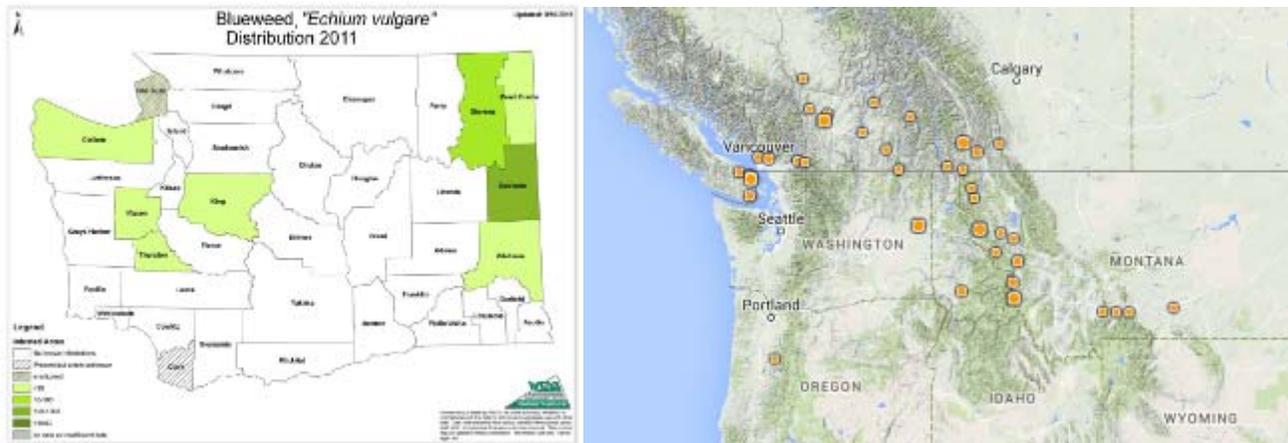
Map: County presence/absence map of *Echium vulgare* in the United States, map by EDDMapS 2015.

Listings:

Echium vulgare is listed as a noxious weed and/or on a regulated plant list in Washington, Idaho, Montana, and Wyoming (National Plant Board 2015). It is also listed as a noxious weed in Manitoba, Alberta and a regional noxious weed in British Columbia (Cranston et al. 2002). Beyond North America, *E. vulgare* is also listed as a noxious weed in parts of Australia and New Zealand.

Washington:

The first herbarium record of *Echium vulgare* in Washington is from 1937, collected in Spokane on dry gravelly soil (WTU 48349). The original written findings by WSNWCB from 1988 report at that time an infestation of *E. vulgare* centered near Nine Mile Falls (Spokane County) extended in all directions for about 3 miles, growing mostly on road shoulders and disturbed sites. There was also a 500 acre patch growing just south of Rutter Parkway. Since then, *E. vulgare* has been found primarily in northeastern Washington with some scattered plants occurring elsewhere, see WSDA 2011 distribution map (below).



Maps: left, county level abundance distribution map of *Echium vulgare* in Washington from 2011, map by the Washington State Department of Agriculture (WSDA 2011); right, herbarium records of *E. vulgare* in the Pacific Northwest, map by Consortium of Pacific Northwest Herbaria (2015).

Growth and Development:

Echium vulgare typically grows as a biennial but it can also be a short-lived, monocarpic perennial depending on environmental conditions. From a study in New York, seedling came up in a flush in spring (April-May) and

then had a second, smaller flush in late summer (August to September) (Klemow and Raynal 1985). Seedlings develop a sparsely branched taproot and short (0.4 inches/1 cm) cotyledons that are hairy and obtuse-ovate (Klemow et al. 2002). Plants grow a rosette of basal leaves and overwinter. After winter, plants grow stems from the rosette and flower and fruit during the summer to late summer and early fall (Graves et al. 2010). A second, later blooming period may also occur from August to October (Graves et al. 2010). Each flower is protandrous—the anthers first present the ripe pollen before the flower’s stigma is elongated, and then after about one day, the stigma elongates and is receptive to pollination (Mesler et al. 1999). In total, flowers last two to three days. During the male phase, the first day, the flowers present a higher nectar reward and were more frequently visited by pollinators than during the female phase, the second day (Klinkhamer et al. 1994). Flowers are pollinated typically by bees, but can be pollinated by other insects as well (Graves et al. 2010). A small number of seeds produced by a plant may be from pollen from another flower on the same plant, moved by a pollinator visiting a number of flowers on the same plant (Rademaker et al. 1999).

Reproduction:

Echium vulgare reproduces by seed. Plants produce an average of 1800 seeds, but this amount can widely vary. In a study at an old limestone mine in New York, plants from a sparsely vegetated area and a densely vegetated area produced on average 333-409 seeds per plant respectively, and each had germination rates above 90% (Klemow and Raynal 1985). Each flower can produce four 1-seeded nutlets, but it is rare for all 4 nutlets to fully mature (Nicholls 1987). Flowers from plants in a study in the Netherlands, within its native range, had a mean seed set between one and two (A. van Breemen, pers. comm. in Klinkhamer and de Jong 1990). Some flowers may not produce any seeds (Klinkhamer et al. 1994). Seeds can be viable for up to 3 years depending on environmental conditions and how deeply they are buried in the soil (Graves et al. 2010). Seeds buried 6 inches (15 cm) deep have a germination rate of 70%, whereas those tested at shallower depths had lower germination rates (Graves et al. 2010).

Echium vulgare seeds are dispersed by wind (limited) and water and by animals and humans. The rough surface of the nutlets allow them to get caught in fur and fabrics, aiding in dispersal to new locations. Stems may also break off and cause the plant to be blown like a tumbleweed, spreading its seeds (Graves et al. 2010). Seeds can also be moved to new locations as a contaminant in hay and grains as well as by being lodged in equipment and vehicles (Graves et al. 2010).

Economic Importance:

Detrimental:

Echium vulgare infests pastures, other non-cultivated areas and a range of habitats on a variety of soils. While *E. vulgare* is generally not a serious competitor with cultivated crops (Royer and Dickinson 1999 in Klemow et al. 2002), it is detrimental for other attributes. Plants contain hepatotoxic pyrrolizidine alkaloids that can be toxic when consumed in large amounts, its hairs can cause contact injury, and it also serves as an alternate host for fungal pathogens (Klemow et al. 2002).

In Europe, *Echium vulgare* has been identified as a secondary host to three species of wheat rust (*Puccinia* spp.), but it isn’t known if it serves as a secondary host in Canada and the United States (Hermansen 1968, Heywood 1973 in Klemow et al. 2002). *Echium vulgare* is a natural host for the alfalfa mosaic virus, cabbage black ring spot and tobacco mosaic virus (Royer and Dickinson 1999 in Klemow et al. 2002).

Toxicity:

The genus *Echium* has been found to be rich in pyrrolizidine alkaloids, which can have negative effects such as being hepatotoxic (El-Shazly et al. 1996). In a study on *E. vulgare* from Germany, 18 different alkaloids (or their isomers) were identified (El-Shazly et al. 1996). A study reported in Graves et al. (2010) by Pederson (1975),

found that fresh plant tissue of *E. vulgare* contained 0.055% alkaloid and dried plant material contained 0.25% alkaloid, being among the highest alkaloid content of 20 species in the Boraginaceae family tested.

Nectar is thought to contain pyrrolizidine alkaloids, and pollen of *Echium vulgare* has been shown to also contain pyrrolizidine alkaloids and can contaminate honey (Bopre 2005). So far, *Echium* is documented as causing disease problems in other parts of the world but not yet in North America (Burrows and Tyrl 2013). Toxicity from *E. vulgare* could become an issue if plant populations become large (Burrows and Tyrl 2013).

Livestock:

Generally, plants are considered unpalatable by animals but may serve as a food source if other food sources are scarce. It causes disease similar to other members of the same family containing toxic pyrrolizidine alkaloids (Seaman and Walker 1985, Seaman 1987 in Burrows and Tyrl 2013). Acute and chronic poisoning can occur, with symptoms including constipation, diarrhea, anorexia, lethargia, general deterioration of the animal's condition, chewing, wandering and liver failure (Graves et al. 2010). Symptoms may take weeks to appear (Graves et al. 2010), though in horses onset can be quick (Burrows and Tyrl 2003). It appears to be a marginal risk for sheep, as studies resulted in only a few animals being affected (Burrows and Tyrl 2013). Toxicity problems were documented with horses in Australia (Sharrock 1969, Seaman 1978 in Burrows and Tyrl 2013). A case was found in Spain where ten fighting bulls out of 700 died from grazing on a field comprised of 80% *E. vulgare* and 15% *Senecio vulgaris* (Moyano et al. 2006). Both species contain hepatotoxic pyrrolizidine alkaloids, but *S. vulgaris* is less toxic than *E. vulgare* (Moyano et al. 2006). Symptoms lasted several weeks, beginning with diarrhea followed by constipation, pale mucous membranes, weakness, depression, tenesmus, rectal prolapse and emaciation (Moyano et al. 2006). Check with a veterinarian for questions and further information about poisoning by pyrrolizidine alkaloids (Graves et al. 2010).

Human poisoning:

Klemow et al. (2002) points out that exposure to pyrrolizidine alkaloids can occur from eating honey from bees that visited *Echium plantagineum*, which has many of the same alkaloids as *E. vulgare* (Culvenor et al. 1981, Culvenor 1985). Pyrrolizidine alkaloids can also be excreted in milk, providing another potential way for chemicals to be ingested by people (Keeler 1983, Peterson 1985 in Klemow et al. 2002).

Injury:

The stiff, spine-like hairs on the leaves and stems, upon contact, often produce dermatitis, including inflammation and itching (Muenscher 1951; Gibbs 1974; Cox 1985; Alex 1992 all in Klemow et al. 2002). Dead plants may be the most troublesome as the hairs are stiff and break off easily (K. Klemow, P. Threadgill, pers. obs. in Klemow et al. 2002). Skin irritation is thought to be from the physical effect of hairs lodging in the skin, rather than any chemical effect (Lewis and Elvin-Lewis 1977 in Klemow et al. 2002).

Beneficial:

Historically *Echium vulgare* was used in ornamental plantings (von Miklos and Fiore 1969; Hellyer 1971 in Klemow et al. 2002). It is also used for many medical purposes, including treatments for colds, fevers, water retention, kidney stones, on reddened skin and boils, and more (Klemow et al. 2002). It is said to have fallen out of use, partly due to lack of interest and also to its toxic pyrrolizidine alkaloids (Plants for a Future n.d.). Though it does contain these toxic compounds, beneficial therapeutic effects have been found in its extracts, which had an anticonvulsive effect in rats and mice (Atanasove-Shopova et al. 1969 in Klemow et al. 2002). Its root extracts can have antimicrobial agents, reduce tissue swelling, and have antitumor activity (Robinson 1967; Sherbaniv'skii 1971, Peter et al. 1968, 1970, Papageorgiou 1980; Wang et al. 1988, Hayashi 1977a, b, c; Lin et al. 1980; Tanaka et al. 1986 all references in Klemow 2002).

Echium vulgare is also used as a source of nectar for honey (Klemow et al. 2002). It is valued for honey production in many countries but it does contain pyrrolizidine alkaloids, making it potentially unsuitable for long-term consumption (Culvenor et al. 1981 and Culvenor 1985 in Klemow et al. 2002).

It has also been used as a source of red dye, as an insecticide and for research into removing heavy metals from contaminated soils (Marie-Victorin 1995, Mell 1940; Papageorgiou 1980, Chiej 1984, Sulaiman and Navqui 1978, Giasson and Jaouich 1998, all in Klemow et al. 2002).

Control:

When working around *Echium vulgare*, wear gloves and cover legs and arms for protection from the plant's stiff hairs that can cause skin irritation. Monitor areas frequently for a minimum of three years from when the plants have gone to seed, given the longevity of seeds in the seedbank. Monitor areas closely where soil is disturbed.

Mechanical Control:

Individual plants and small infestations can be dug up, making sure to remove the taproots. Taproots left in the soil can resprout (Graves et al. 2010). It is easiest to dig up the roots when soil is moist. If plants have already flowered and are developing seed, either bag or burn pulled plants to prevent seed spread. Make sure to check with local authorities for safe burning practices, permits or restrictions that may be in place.

Plants can be cut back prior to seed development for short-term control, but plants can resprout and reflower close to the ground making future cutting difficult (Graves et al. 2010). Regularly monitor cut plants and control resprouts and seedlings.

Cultural Control:

Echium vulgare thrives in disturbed areas with low-fertility soil and lack of plant competition (Graves et al. 2010). Managing pastures and grazing areas to prevent over-grazing and maintaining a healthy vegetation layer is helpful in reducing the success of *E. vulgare* establishment. Fertilization and seeding of native and non-invasive plants will help maintain healthy conditions and minimize invasion possibilities (Graves et al. 2010).

Graves et al. (2010) reported of burn trials conducted in Montana that found *E. vulgare* did not burn well as it could not dry out enough. Only plants that were pulled and left to dry for a few days successfully burned.

Biocontrol Control:

There are no approved biological control agents for *Echium vulgare*.

Herbicide Control:

Currently there isn't information on *Echium vulgare* in the Pacific Northwest Weed Management Handbook, but check back for information as it is continually being updated. <http://pnwhandbooks.org/weed/control-problem-weeds>

In general, use herbicide control in combination with other control methods to reduce usage when possible. When using a foliar spray, treat plants when pollinators are not present or are the least active. Treating plants before they develop flowers will prevent harming insects that would be visiting the plant when in bloom. Herbicide application alone will create open areas that are vulnerable to reinvasion by *E. vulgare* and other weeds (Graves et al. 2010). Follow herbicide treatment with seeding of native and/or non-invasive plant species to create plant competition.

Other sources provide herbicide information on *Echium vulgare* control. Always read and follow the herbicide label instructions. Check with your local county noxious weed control board to discuss treatment options.

Graves et al. (2010) report that herbicide options for *Echium vulgare* control include:

- metsulfuron (Escort) at one ounce product/acre (on rangeland), applied to rosette stage in spring or fall
- chlorsulfuron (Telar) at 1 ounce product/acre (on rangeland), applied to rosette stage in spring or fall
- combination of metsulfuron and chlorsulfuron, one half ounce of each product/acre (on rangeland) to rosette stage in spring or fall
- pasture formulations containing 2,4-D LVE at one to two quarts/acre, applied to rosette stage
- 2,4-D + triclopyr (Crossbow) (for pasture use), foliar broadcast as a one percent mixture applied at one quart/acre during active growth

More than one application may be needed to ensure control of this species.

Stevens County Noxious Weed Control Board recommends treating plants in the spring while they are rosettes and using an adjuvant to help the herbicide penetrate through the hairs. Also, they have had success using glyphosate or 2,4-D alone on small plants or in combination with wither dicamba or metsulfuron when plants are older (SCNWCB n.d.).

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