



Paterson's Curse

Echium plantagineum

in the Pacific Northwest

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Other common names: Salvation Jane, Riverina bluebell, Lady Campbell weed, purple viper's bugloss, viper's bugloss

Paterson's curse is a member of the borage family (Boraginaceae). It is native to Mediterranean Europe and North Africa but has spread to southern Africa, South and North America, Australia, and New Zealand. Outside of its native habitat, it is an aggressive, drought-tolerant plant that adapts to many soil moisture levels, enabling it to readily inhabit disturbed areas. It is purportedly named after an Australian family, the Patersons, who planted it in their garden in the 1880s and watched helplessly as it took over the landscape.

Pyrrolizidine alkaloids produced by Paterson's curse, similar to toxins produced by tansy ragwort (*Senecio jacobaea*), cause chronic liver damage and sometimes death when livestock, especially horses and cattle, graze the plants continually.

This weed is a major problem in Australia, primarily because it excludes beneficial forage species and degrades the quality of pasture land. Paterson's curse is estimated to infest 82 million acres in Australia and costs the Australian sheep and

cattle industry approximately \$250 million annually due to pasture land degradation, associated management costs, and contamination of wool by seeds (see "Australian resources," back page).

Paterson's curse has been found in two locations in Oregon. It was first documented in Linn County as a roadside infestation in 2003 (Figure 1). Upon investigation, it was concluded that the seeds were introduced as part of a wildflower seed mix. The weed currently covers a linear area of less than 1 acre at that location and is being managed by hand pulling and spot applications of herbicide.

In 2004, a larger site—previously misidentified as a related species—was documented in Douglas County (Figure 2). The infested site covers about 300 acres of hillside pasture, and Paterson's curse covers approximately 100 net acres. Weeds at this site are being managed with herbicides.

There are no documented infestations in Washington or Idaho, but populations do exist along the central

and southern coast of California and in several eastern states.

In addition to pasture lands, oak savanna habitat in western Oregon is particularly vulnerable to invasion, as it is similar to the native habitat of Paterson's curse and may provide an excellent environment for this species.

This weed has the potential to severely degrade agricultural and native habitats but can still



Figure 1. A Linn County roadside infestation in 2003.



Figure 2. A large site in Douglas County in 2004.

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be contained and eradicated in the Pacific Northwest because of its limited distribution.

Description

Management efforts require early and accurate identification. Paterson's curse is an erect winter annual or biennial; seeds usually germinate in early autumn, but can germinate throughout the year when environmental conditions are favorable. Blooming generally starts in June in Oregon, but flowering plants can be found throughout the year.

Paterson's curse should not be confused with another weedy species, *Echium vulgare*, most commonly known as blueweed, but also known as viper's bugloss in some parts of the United States.

Leaves and rosettes

Leaves are alternate, generally green to light green, and hairy. Basal and rosette leaves range from oval to elongated, with distinct lateral veins and wavy margins (Figure 3). Basal leaves may be more upright in dense populations. Rosettes are approximately 4 to 14 inches in diameter and may resemble those of other rosette-forming species such as broadleaf plantain (*Plantago major*). Leaves on the stems are narrow, smaller, and thinner than rosette leaves.

Stems

The stems are erect, light green, and hairy. Plants bolt in spring and produce one to many stems that range from 8 inches to 6 feet tall (Figure 4).

Flowers

The flowers have five petals, are trumpet shaped, and are approximately 1 inch long (Figure 5). They are most commonly bluish-purple, but

can be pink or white. Flowers are borne at the tip of each fiddleneck-like inflorescence. Two of the five stamens protrude significantly from the corolla. In contrast, all five stamens of blueweed, a species commonly confused with Paterson's curse, protrude from the corolla.

Seeds

Each flower produces four brown or gray "nutlet" seeds, which are surrounded by a bristly husk (Figures 6 and 7). An Australian report states that an individual plant can produce up to 10,000 seeds, although seed production decreases to 15 to 250 seeds per plant where grazing occurs. Data from the same report suggest that seeds recovered from the soil seedbank were still viable after 11 years.

Habitat

Paterson's curse grows well in temperate climates with cool, wet autumns and springs. Its native habitat in Mediterranean Europe is open woodlands dominated by evergreen oak trees, a habitat similar to western Oregon's oak savanna habitat.

Where it has been introduced, Paterson's curse is found mostly in pastures, where it is very competitive. Best growth occurs on heavier soils, but Paterson's curse also can be found growing in sandy soils. Although it is problematic mainly in pastures, it also may occur in agricultural fields and disturbed areas, such as roadsides.

Dispersal mechanisms

Paterson's curse reproduces and spreads via seeds. The seeds are spread to new

locations mainly by contaminated wool and fur, hay, equipment, and seed, including wild bird feed and wildflower seed mixes. Paterson's curse can also be transported via runoff water. Transport by wind is unlikely because the seeds are heavy and are not wind-borne.

Management strategies

Similar to other invasive species, Paterson's curse seems to thrive in disturbed environments outside its native range. Paterson's curse has a deep taproot, which allows it to take advantage of resources, such as soil moisture, that other species cannot reach.

A study comparing Paterson's curse populations found increased seedling establishment rates in highly disturbed sites when compared to areas with intact native vegetation (Grigulis et al. 2001). The species community composition in native regions generally is more diverse than in areas where Paterson's curse has invaded, suggesting that plant competition in its native habitat results in lower establishment rates of Paterson's curse.

Several studies have found that the number of established seedlings in invaded sites decreased significantly in the absence of grazing. This may occur in part because preferential grazing of desirable forage species might create enough space to give Paterson's curse a competitive advantage.

Some management guides from Australia suggest reducing grazing intensity in the autumn to maintain a vigorous, competitive pasture plant community during the season when Paterson's curse normally would establish. However, it is not known whether this management strategy would be

effective in lowering establishment rates of Paterson's curse in the Pacific Northwest.

In Oregon, prevention, aggressive containment, and eradication of established populations are currently recommended since Paterson's curse does not infest extensive acreage.

Prevention and sanitation

It is imperative to be attentive to possible new introductions of Paterson's curse. Pathways of seed introduction include vehicle tires, soil, livestock, wild bird feed, and wildflower seed mixes. When moving vehicles or equipment from one field to another, especially if invasive weeds are present, it is important to clean farm equipment, vehicles, boots, and any surface that could spread seed. It is also crucial to communicate with neighboring property owners and other concerned groups and individuals about potential new populations of Paterson's curse.

Manual removal

Paterson's curse is spread only by seed. Manual removal of plants prior to flowering is recommended for small infestations. It is important to revisit these infested sites, especially in the spring, to ensure that seedlings are removed before flowering.

Herbicide use

Paterson's curse currently has a limited range in the Pacific Northwest, so there is little information on which herbicides can be used to effectively manage this weed. In Oregon, glyphosate is used for spot treating, but sites need to be visited repeatedly because glyphosate has no soil residual weed control effects. At the Douglas County, OR, site, where Paterson's curse covers a larger area of hillside pasture, picloram is used for management,

supplemented with 2,4-D after flowering begins. Contact your local Extension agent or state Department of Agriculture for current herbicide product registration information, product recommendations, and application rates before making any herbicide applications.

Use caution when applying herbicides, as unintended consequences can result if herbicides are used inappropriately. If all ground cover is killed using a nonselective herbicide, for example, the loss of vegetation might make the site vulnerable to invasion by another invasive weed rather than aid reestablishment of the native community (Huwet et al. 2004).

Repeated treatment of a population of Paterson's curse with herbicides of the same or similar mode of action could lead to the development of herbicide resistance in that population. Instances of herbicide-resistant populations of Paterson's curse have been reported in southern and western Australia. These two areas have reported resistance to the class of herbicides known as ALS inhibitors, specifically to chlorsulfuron and metsulfuron. It is important to use herbicides with caution, monitor their efficacy, and avoid continual use of the same mode of action.

In Australia, where Paterson's curse infests millions of acres, management with herbicides is common (see "Australian resources"). These strategies would need to be adapted for Pacific Northwest environmental conditions, but they offer insight as to how to manage this plant with herbicides on a large scale. For instance, wick applicator methods have been successful in areas with large infestations. In this method, nonselective herbicides, such as glyphosate, are mixed with water and an adjuvant and wiped onto weeds that are taller

than the crop or pasture species. Apply the herbicide as soon as Paterson's curse grows taller than the desired forage species.

Biological control

Natural insect predators may play a role in preventing native sites from being dominated by Paterson's curse. Some of these predators have been introduced to Australia as biological control agents. Paterson's curse has been reported in only a few locations in the United States, and biological control agents have not been approved for use at this time.

If you suspect a new introduction of Paterson's curse or other invasive weed, please contact your local Extension office, the state Department of Agriculture, or a contact listed below. In Oregon, a sighting report can be submitted online at www.weedmapper.org/ or by calling 1-866-INVADER. The website is a collaborative effort between several government agencies and Oregon State University.

Photo credits

All photos courtesy of Oregon Department of Agriculture Plant Division-Noxious Weed Control, Salem, OR.

Resources

Online

Oregon Department of Agriculture (ODA) Plant Division, Noxious Weed Control.
www.oregon.gov/ODA/PLANT/WEEDS/profile_pcurse.shtml
USDA plants database.
plants.usda.gov/java/profile?symbol=ECPL
Weedmapper. www.weedmapper.org/ecpl.html

Australian resources

Department of Agriculture and Food, Western Australia. http://agspsrv95.agric.wa.gov.au/dps/version02/01_plantview.asp?page=6&contentID=48&

How to Control Paterson's Curse. www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/PW/WEED/DECP/FN2006_PATERSON_CONTROL.PDF

Print

Allcock, K.G. 2002. Effects of phosphorus on growth and competitive interactions of native and introduced species found in White Box woodlands. *Australian Ecology* 27:638–646.

DiTomaso, J.M. and E.A. Healy. 2007. Weeds of California and other Western States. University of California, Agriculture and Natural Resources publication 3488.

Grigulis, K., A.W. Sheppard, J.E. Ash, and R.H. Groves. 2001. The comparative demography of the pasture weed *Echium plantagineum* between its native and invaded ranges. *Journal of Applied Ecology* 38:281–290.

Huwer, R.K., D.T. Briese, P.M. Dowling, D.R. Kemp, W.M. Lonsdale, D.L. Michalk, M.J. Neave, A.W. Sheppard, and T.L. Woodburn. 2004. Can an integrated management approach provide a basis for long-term prevention of weed dominance in Australian pasture systems? *Weed Research* 45:175–192.

Popay, I. and R. Field. 1996. Grazing animals as weed control agents. *Weed Technology* 10:217–231.

Smyth, M.J., A.W. Sheppard, and A. Swirepik. 1997. The effect of grazing on seed production in *Echium plantagineum*. *Weed Research* 37:63–70.

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Figure 3. Basal and rosette leaves range from oval to elongated and have distinct lateral veins and wavy margins.



Figure 4. Plants bolt in spring and produce one to many stems that range from 8 inches to 6 feet tall.



Figure 5. Flowers have five petals, are trumpet shaped, and are approximately 1 inch long.



Figure 6. Each flower produces four seeds, which are surrounded by a bristly husk.



Figure 7. Seeds of Paterson's curse.

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