

Oregon Department of Agriculture
Plant Pest Risk Assessment for
Paterson's Curse, *Echium plantagineum*
2004 (Revised 2010)

Name: Paterson's curse, salvation Jane, *Echium plantagineum*
Family: Borage, *Boraginaceae*

Findings of This Review and Assessment: Paterson's curse has been determined to be a category of an "**A**" listed noxious weed as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination is based on a literature review and analysis using two ODA evaluation forms. Using the Noxious Qualitative Weed Risk Assessment v.3.8, Paterson's curse scored **69** indicating an "**A**" and a score of **17** with the Noxious Weed Rating System v.3.2. Paterson's curse is one of the highest ranked weeds due to its drought tolerance, ease of spread and impacts on agriculture.

Introduction: Paterson's curse is a showy ornamental named for the Paterson family of southern Australia who allegedly introduced the plant in the 1800's as a garden ornamental. Since then, the plant has spread over millions of acres in New South Wales, Western Australia and Victoria provinces. Annual losses for livestock producers are estimated at \$30 million annually (Smyth 1999). To some producers it is considered a blessing. Early season growth contains high levels of protein and the species does provide forage during dry years when other forage is limited. Older growth though is far less palatable and competes for water with more valuable grass forage species. In Oregon, *Echium p.* was first identified in 2003 by an Oregon farmer, at a site one mile north of Lebanon in Linn County.



Paterson's curse infestation in Douglas County in 2004, photo by Ken French, ODA

Growth Characteristics: Paterson's curse is an erect, annual plant, generally 1-3' tall at maturity. Plants are often multi-branched with an abundance of stout hairs arising from the base. The flower head is curled (scorpioid cyme) and unrolls as the flowers open. Flowers are 5-petaled and blue-purple but many are pink or white. Each flower produces four nutlets surrounded in a 0.5-inch husk covered in bristles giving the plant a fuzzy appearance.



Paterson's curse flowers, photo by Ken French, ODA



Paterson's curse seed head, photo by Tom Forney, ODA

Nutlets are moderately small and produced in abundance over a long period from spring through late fall as long as insect pollination can occur. Seedling survival is measurably higher in non-native areas compared to native areas. This may account significantly to the overall dominance of *Echium* in non-native areas (Grigulis 2001) Dispersal is predominantly through agricultural activities and movement of livestock though wildlife may also play a contributing factor.

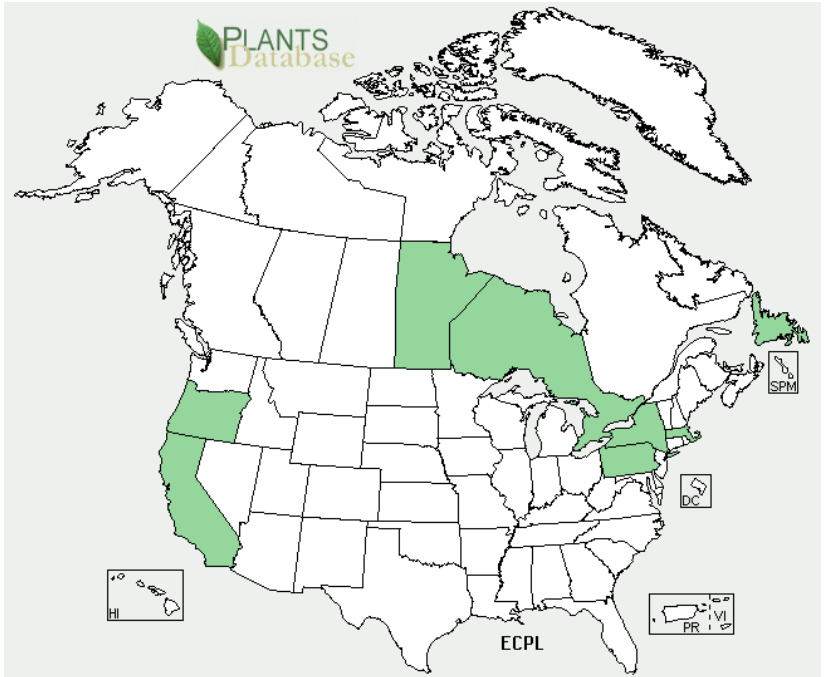
Adaptability to a wide range of environmental conditions is evident in Oregon populations. The species tolerates the wet conditions of the Willamette Valley as well as the drier hillside pastures of Douglas County. Drought tolerance is significant with prolonged flowering and new flushes of seedlings being produced all summer long. Because of its great adaptability and phenotypic plasticity (Sharma and Esler 2008), the potential range of Paterson's curse is quite large and will expand greatly if no control efforts are employed.

Negative Economic Impacts: In Australia, Paterson curse has been labeled either a curse or a salvation. Sheep grazers find that it makes a drought tolerant feed due to high protein levels during the early season. Unfortunately it contains pyrrolizidine alkaloids similar to those found in tansy ragwort causing chronic liver damage when consumed by susceptible livestock (Tazmania 1998). Field and confined feeding trials demonstrate that sheep fed on Paterson's' curse put on less weight and produced less wool (Grigulis 2001). Losses do occur mainly from the buildup of copper poisoning in the liver (Seaman 1987). Horses are the most sensitive (Canberra 1999).

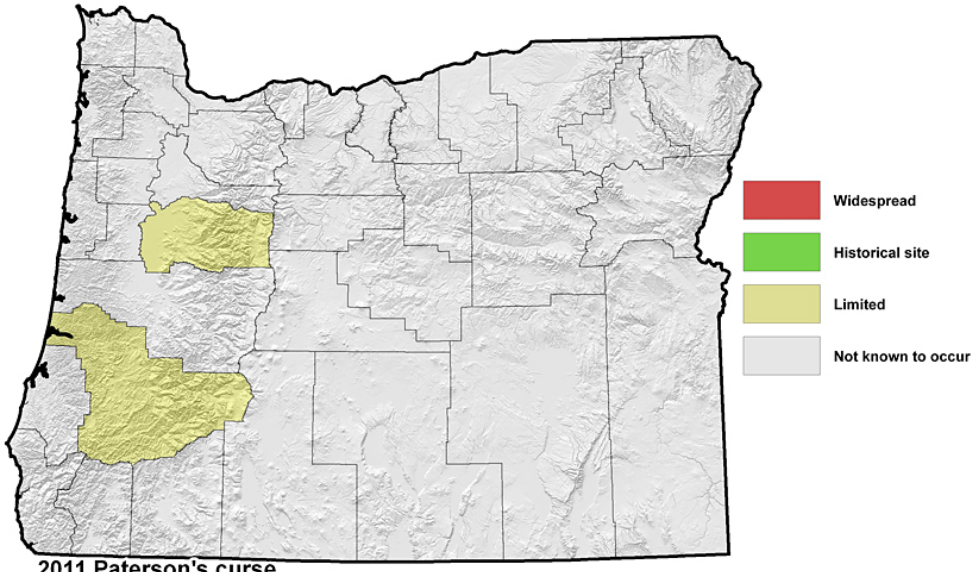
Pastures, especially those in higher rainfall regions can be completely overrun by Paterson's curse, reducing yield or becoming a contaminant in hay. Because the seeds last in the soil for 10 years, a higher level of grazing management or chemical controls are needed to eradicate this plant. Because of its limited range in Oregon, economic losses to Paterson's curse have been limited to control expenses but this would be expected to change if more acreage became infested.

World Distribution: Paterson's curse is native to the Mediterranean region and to Western Europe. As a showy and drought tolerant plant, Europeans found it desirable for gardening and sheep forage and have transported it to Australia where it can be found in every state except tropical Queensland. It has spread extensively in South Africa and occupies a variety of habitats there (Sharma and Esler 2008)

U.S. Distribution: Outside Oregon, escaped populations have been identified in several other states including New York, California, Massachusetts and Pennsylvania (USDA Plants database).



US distribution of Paterson's curse on USDA Plant Database



2011 Paterson's curse

Oregon's distribution of Paterson's curse on WeedMapper.org

Positive Economic Impacts: Beekeepers praise the plant for its capacity to produce a surplus of clear honey (Harrison 2005). Australian beekeepers have access to vast acreages of Paterson's curse and can harvest larger surpluses for sale. Vegan and health food advocates tout the lipid reducing capacity of *Echium* oil when used as a dietary supplement. *Echium* oil is rich in Omega-3 and Omega-6 fatty acids as serves as a replacement for fish oil (Mir 2008). Europe is the leader in commercial *Echium* oil production. *Echium plantagineum* is also marketed as an ornamental in the gardening trade under the name "Dwarf Blue Bedder" (Michigan 1999).

Environmental Impacts: The greatest environmental impacts could be expected to come from reductions in species diversity and natural forage production in seasonally dry land environments. It is not clear if it would invade Northern Great Basin rangelands.

Control: Grazing and mowing can reduce plant size but seed production often is unaffected due to late season regrowth (Grigulis et. al. 2001). Mowed plants regrow and set seed even in very dry soils. Several growth regulator type herbicides are effective at controlling seedlings and rosettes though later season growth is very resistant to herbicide effects. In rangeland, control costs can often exceed the value of the forage produced.

Noxious Weed Qualitative Risk Assessment

Oregon Department of Agriculture

Common name: Paterson's curse
Scientific name: *Echium plantagineum*
Family: Borage, *Boraginaceae*

For use with plant species that occur or may occur in Oregon to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: 69 **Risk Category: A**

GEOGRAPHICAL INFORMATION

1) 6 **Invasive in Other Areas**

- 0 Low- not known to be invasive elsewhere.
- 2 Known to be invasive in climates dissimilar to Oregon's current climates.
- 6 Known to be invasive in geographically similar areas.

Comments: Highly invasive in Australia, South Africa.

2) 6 **Habitat Availability:** Are there susceptible habitats for this species and how common or widespread are they in Oregon?

- 1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
- 3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
- 6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).

Comments: Highly adaptable to a variety of climates.

3) 0 **Proximity to Oregon:** What is the current distribution of the species?

- 0 *Present* – Occurs within Oregon.
- 1 *Distant* – Occurs only in distant US regions or foreign countries.
- 3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
- 6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.

Comments: Found in two populations in Oregon.

4) 10 **Current Distribution:** What is the current distribution of escaped populations in Oregon?

- 0 *Not present* – Not known to occur in Oregon.
- 1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
- 5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
- 10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).

Comments: Limited to two populations in state.

BIOLOGICAL INFORMATION

- 5) 4 **Environmental Factors:** Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).
- 1 *Low* – Severely confined by abiotic factors.
 - 2 *Medium* – Moderately confined by environmental factors
 - 4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments: Highly adapted to a wide range of conditions.

- 6) 5 **Reproductive Traits:** How does this species reproduce? Traits that may allow rapid population increase both on and off site.
- 0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.
 - 1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.
 - 3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).
 - 3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).
 - 5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).
 - 6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Many seeds of moderate longevity.

- 7) 4 **Biological Factors:** Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)
- 0 *Negligible* – Host plant not present for parasitic species.
 - 1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).
 - 2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.
 - 4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: No natural enemies have been found in North America.

- 8) 4 **Reproductive Potential and Spread After Establishment - Non-human Factors:** How well can the species spread by natural means?
- 0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).
 - 1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).
 - 3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed).
 - 5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: High potential for natural spread by and animals and moving water. Not wind dispersed.

- 9) 5 **Potential of Species to be Spread by Humans.** What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.
- 1 *Low* – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).
 - 3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).
 - 5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: Seeds could be quickly dispersed in hay, cereal grains, livestock and vehicles.

IMPACT INFORMATION

- 10) 8 **Economic Impact:** What impact does/can the species have on Oregon's agriculture and economy?
- 0 *Negligible* – Causes few, if any, economic impacts.
 - 1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).
 - 5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).
 - 10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Plant has significant potential to invade and dominate dry land pastures statewide. Economic costs would run in the millions.

- 11) 4 **Environmental Impact:** What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.
- 0 *Negligible* – None of the above impacts probable.
 - 1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.
 - 4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).
 - 6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Plant would invade dry woodlands and grasslands competing with native flora.

- 12) 2 **Impact on Health:** What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms).
- 0 *Negligible* – Has no impact on human or animal health.
 - 2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge).
 - 4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).
 - 6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock).

Comments: Both pollen and windblown plant hairs create allergy conditions in Australia.

CONTROL INFORMATION

- 13) 7 **Probability of Detection at Point of Introduction:** How likely is detection of species after introduction and naturalization in Oregon?
- 1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).
 - 5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).
 - 10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Showy but may appear in areas of limited access or remote locations.

- 14) 4 **Control Efficacy:** What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?
- 1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).
 - 2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).
 - 4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents ineffective.
 - 6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable. Political or legal issues may prevent effective control.

Comments: Per acre control costs expensive and long term. Plants are immune to herbicides in dry season yet continue to set seed.

Category Scores:

22 Geographic score (Add scores 1-4)

22 Biological Score (Add lines 5-9)

14 Impact Score (Add lines 10-12)

11 Control Score (Add Lines 13-14)

69 Total Score (Add scores 1-14 and list on front of form)

Risk Category: 55-89+ = **A** 24-54 = **B** < 24 = unlisted.

This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species.

1/15/2013 v.3.8

Oregon Department of Agriculture
Noxious Weed Rating System

Common Name: Paterson's curse
Scientific Name: *Echium plantagineum*

Points: 17 Rating: A

- 1) 4 **Detrimental Effects:** Circle all that apply, enter number of circles.
1. *Health:* causes poisoning or injury to humans or animals
 2. *Competition:* strongly competitive with crops, forage, or native flora
 3. *Host:* host of pathogens and/or pests of crops or forage
 4. *Contamination:* causes economic loss as a contaminate in seeds and/or feeds
 5. *Interference:* interferes with recreation, transportation, harvest, land value, or wildlife and livestock movement
- 2) 3 **Reproduction & Capacity for Spread:** Circle the number that best describes, enter that number.
1. Few seeds, not wind blown, spreads slowly
 2. Many seeds, slow spread
 3. Many seeds, spreads quickly by vehicles or animals
 4. Windblown seed, or spreading rhizomes, or water borne
 5. Many wind-blown seeds, high seed longevity, spreading rhizomes, perennials
- 3) 3 **Difficulty to Control:** Circle the number that best describes, enter that number.
1. Easily controlled with tillage or by competitive plants
 2. Requires moderate control, tillage, competition or herbicides
 3. Herbicides generally required, or intensive management practices
 4. Intensive management generally gives marginal control
 5. No management works well, spreading out of control
- 4) 5 **Distribution:** Circle the number that best describes, enter that number.
1. Widely distributed throughout the state in susceptible habitat
 2. Regionally abundant, 5 or more counties, more than 1/2 of a county
 3. Abundant throughout 1- 4 counties, or 1/4 of a county, or several watersheds
 4. Contained in only 1 watershed, or less than 5 square miles gross infestation
 5. Isolated infestation less than 640 acres, more than 10 acres
 6. Occurs in less than 10 acres, or not present, but imminent from adjacent state
- 5) 2 **Ecological Impact:** Circle the number that best describes, enter that number.
1. Occurs in most disturbed habitats with little competition
 2. Occurs in disturbed habitats with competition
 3. Invades undisturbed habitats and crowds out native species
 4. Invades restricted habitats (i.e. riparian) and crowds out native species

17 TOTAL POINTS

Note: Noxious weeds are non-native plants with scores of 11 points or higher. Any plants in 4.1, 4.2, and 4.3 should not be classified as "A" rated weeds. Ratings: 16+ = A, 15 – 11 = B
ODA Weed Rating System 8/30/2012 v.3.2

RA produced by Glenn Miller and Tom Forney, ODA
Updated by Glenn Miller, ODA, 2010

References

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Seaman J.T. 1987. Pyrrolizidine alkaloid poisoning of sheep in New South Wales. Australian Veterinarian Journal 64(6) pp. 164-167

USDA Plants Profile for *Echium plantagineum*: Salvation Jane [map cited 01/16/08]
<http://plants.usda.gov/java/profile?symbol=ECPL>

Attachment A

