2000

Profiles of the Highly Invasive Plants in Oregon Including Lists of Oregon's Invasive and Naturalized Plants

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THESIS APPROVAL

The abstract and thesis of Rebekah Jane Harper for the Master of Science in Biology were presented March 15, 2000, and accepted by the thesis committee and the department.

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ABSTRACT

An abstract of the thesis of Rebekah Jane Harper for the Master of Science in Biology presented March 15, 2000.

Title: Profiles of the Highly Invasive Plants in Oregon including lists of Oregon's Invasive and Naturalized Plants.

The study and control of invasive species are important issues in restoration ecology and land management. Invasive species are among the top contributors to habitat degradation worldwide. Unfortunately, information concerning invasive species and methods for their control is limited and widely scattered throughout the literature.

A comprehensive list of the naturalized and invasive species found in Oregon is important for monitoring invasive and potentially invasive species. It also provides a base of information for people interested in investigating invasive species; however, no such state-wide list existed for Oregon before this work.

Profiles for highly invasive species should provide information concerning each species' history, range, spread, ecological effects, and control. This information is valuable for land managers attempting to prevent or control invasive species. It is also important for ecologists and others interested in Oregon ecosystems and their constituent species because it

offers insights into how these introduced species interact and change natural and managed habitats. These changes not only alter community structure and function, but may also lead to a uniform world in which unique habitats give way to a cosmopolitan blend of dominating species.

PROFILES OF THE HIGHLY INVASIVE PLANTS IN OREGON INCLUDING LISTS OF OREGON'S INVASIVE AND NATURALIZED PLANTS

by

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A thesis submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE
in
BIOLOGY

Portland State University
2000

Acknowledgments

I would like to thank my thesis committee, Dr. Robert Tinnin, Dr. Richard Forbes, Dr. Mark Sytsma, Dr. Richard Petersen, and Dr. Teresa Bulman, for the guidance, review, and support they provided.

I would also like to thank Scott Sundberg of the Oregon Flora Project, Tim Butler from the Oregon Department of Agriculture, and Ed Alverson from The Nature Conservancy for providing lists of plants found in Oregon.

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Abbreviations

adj--adjacent
Afr--Africa
agricult--agricultural
ann--annual
Atl--Atlantic coast
Austr--Australia

BC--British Columbia

c--central
C.Am--Central America
Can--Canada
Cas--Cascades
co(s)--county(ies)
com--common
CR--Columbia River
CRG--Columbia River Gorge
cult--cultured, cultivar, etc

e—east, eastern, etc
e.e.--expected elsewhere
elev--elevation(s)
esc--escape, escaped, etc
esp--especially
Eur--Europe

freq--frequently

gen--generally

hort--horticultural, etc

intro--introduced, introduction, etc
irrig--irrigation, irrigated

Medit--Mediterranean
Mex--Mexico
mid--middle
mtn(s)--mountain(s)

n--north, northern, etc
N.Am--North America

occas--occasionally, occasional, etc
orn--ornamental

PNW--Pacific Northwest
poss--possibly
prob--probably

RM--Rocky Mnts
RMS--Rocky Mnt. States

s--south, southern, etc
S.Am--South America
sp--species, singular
spp--species, plural
SR--Snake River
SRC--Snake River Canyon
ssp--subspecies

temp--temperate
Trop.Am--Tropical America

uncom--uncommon
uncult--uncultivated
unirrig--unirrigated
US--United States

var(s)--variety(s)
veg--vegetable
VI--Vancouver Island

w--west, western, etc
wdsp--widespread
WV--Willamette Valley
ww--world wide

yr(s)--year(s)

Symbols

+/- more or less

~ approximately

❊ information in this area is lacking

✎ herbicide availability and regulations change often; for relevant information, refer to the current issue of *The Pacific Northwest Weed Control Handbook* which is updated annually (Published by Oregon State University).

▲ important information about this species is included in a Genus profile that discuses characteristics similar to each profiled species in the Genus.

Introduction

Invasive and naturalized plant species

Humans have traveled across mountains, oceans, and other natural barriers for thousands of years, barriers that prevented most plant (and many animal) species from spreading. However, humans seldom traveled alone; they were often accompanied by plant (and animal) species (Vitousek et al. 1987). Plants sometimes were carried intentionally, and sometimes accidentally, as seeds, or vegetative propagules. Some of these plants were able to make a new home for themselves, but many were unable to find a suitable habitat for their survival. A few plant species were able to survive only under the care of humans, making them garden or agricultural species. Some species were able to survive and reproduce in new habitats without special human care; these plants became naturalized. A naturalized species is one that has been transported either intentionally or accidentally across a natural barrier, and is able to survive and reproduce in a new location without direct assistance from humankind (Hitchcock and Cronquist 1973; Hickman 1996; Allaby 1998; Lincoln et al. 1998).

Some species were able to survive and reproduce so well in these new locations that they were able to grow to large populations and displace native species. Sometimes they grew to form large monospecific colonies. Aggressive, naturalized species that can reduce native populations are called invasive species (Franklin and Dyrness 1988; Cronk and Fuller 1995; Hickman 1996; Royer and Dickinson 1999; KCDNR).

This thesis focuses on the highly invasive plants in Oregon. It describes them and discuss their history, the effects they have on the ecosystems they invade, and methods for their control.

Arrival and spread

Transportation of species between sites suitable for the species' growth occurs frequently. Wetland and open water species have been transported in the ballast of ships (Wilcox 1989). Plants or seeds are often transported as contaminants in commercial shipments. Species can travel in packing material (sometimes, as with *Spartina* species, they were even used as packing material), stuck to the fur or hooves of animals, in the digestive tracts or bedding of animals, as contaminants in commercial seed or plants, and on people's clothing or vehicles.

Transportation can occur intentionally. This is usually the case with horticultural plants, which are often chosen for the very reasons that make them highly invasive; they are hardy, disease resistant, insect resistant, and easily propagated (Harty 1993, Malecki 1995). Whether a plant will become invasive is often not considered when people or industries choose horticultural plants; however, awareness of this problem is rising (Harty 1993). Several naturalized species were introduced by settlers who brought with them food, medicinal, ornamental, and dye plants for their new homes (Vitousek et al.

1987). Horticultural plants have been introduced throughout U.S. history. We introduce plants for aquariums such as Brazilian waterweed, sod, windbreaks, erosion control, and habitat restoration projects as well as for cosmetic and domestic uses.

Once a species has been introduced, further spread may require disturbance regimes, suitable migration routes, continued physical transport between sites or a combination of the three (Wilcox 1989; Larson 1993). This physical transportation between sites can occur accidentally or intentionally, just like the initial introduction. Horticultural plants will spread as their popularity and use increase. Other species can spread with them as associated contaminants, or they can be spread as contaminants in hay, straw, manure, and packing materials, or on equipment, animals, people, vehicles, and boats.

Once an invasive plant is transported to a suitable site, human-caused disturbance such as agriculture or the control of water levels can lead to its dominance or spread in the community (Wilcox 1989; Welling and Becker 1990; Silvertown et al. 1994; Malecki 1995; Wilcox and Meeker 1995). Disturbance can occur in many ways (logging, grazing, farming, fire suppression, mining, damming, road/trail building, species removal, pollution, etc.), creating alterations both to the biotic community and to abiotic factors such as soil, hydrology, nutrients, and salinity. These disturbances disrupt natural processes allowing introduced species to gain a foothold in the community. Sometimes even natural disturbances can favor an introduced species, such as when soil disturbance caused by gopher activity can favor the establishment of Scotch broom.

After establishment, characteristics such as high seed production, vegetative propagation, the ability to resprout from root parts left in the ground, long seed viability, and effective dispersal can lead to the quick spread of an invasive species through the community. Migration along waterways, highways, and railroads furthers the spread of invasive plants (Wilcox 1989; Malecki 1995).

Human-caused disturbances can also lead to invasions by native plants that are better suited to dealing with disturbance, especially continued disturbance, than other species in the community. A disturbance-adaptive native can become dominant in the altered habitat. It can start to displace other species in the habitat sometimes creating large monospecific stands. One such species in Oregon is reed canarygrass (*Phalaris arundinacea* L.). It is an invasive wetland grass that current authorities consider to be native (Hickman 1996). Following the recent (last 100 years) degradation of wetlands and the regulation of water levels, reed canarygrass has spread rapidly. It is expanding its range in disturbed systems, creating dense stands and often excluding other species. It has also been planted as part of many restoration projects, which has helped expand its range. Other native species that are considered invasive are yellow nutsedge (*Cyperus esculentus* L.), grassleaf rush (*Juncus marginatus* Rostkov), longspine sandbur (*Cenchrus longispinus* (Hack.) Fern.), field horsetail (*Equisetum arvense* L.), and giant horsetail (*E. telmateia* Ehrh.) (ODA 1997 a; PNWEPPC 1997 Aug). Fire suppression and grazing are helping to expand native juniper and sagebrush populations in eastern Oregon (Agee 1993), and bracken fern (*Pteridium aquilinum* (L.) Kuhn) has become more common in response to logging (Franklin and Dyrness 1988).

Competitive Advantages

The introduction of just one exotic species can significantly change an ecosystem (Vitousek 1990; Dillenburg et al. 1993; Burdon and Chilvers 1994); and yet most introduced species fail to cause much change in natural communities (Johnson and Steeve 1974; Kareiva 1996). The ability of an introduced species to invade a community is directly related to the species' ability to compete with established members of the community. In order to maintain its position in a community, an exotic species must find a niche in which it is not displaced. This can be done by utilizing a combination of resources that are not already exploited, known as the empty niche theory (Johnstone 1986), or by using a portion of the resources utilized by established plants. This would create a niche for the introduced species that overlaps or reduces the niches of established plants. Most naturalized species reduce some populations of native species, but they do not eliminate the species completely.

An invasive species typically has one or more competitive advantages over some of the native species occupying the community being invaded. Many things can lead to this competitive advantage, such as high seed production, fast growth rate, ability to withstand disturbance, resistance to toxicity, production of toxins (allelopathy), and vegetative propagation. A competitive advantage may allow the invasive species to dislodge native species and dominate the community (Larson 1993). This could produce an especially strong impact in communities that include rare or endangered species. These species are often restricted to few populations, sometimes only one, and the loss of a population due to an invasive species could make recovery for these species impossible.

Sometimes herbivores and parasites favor native species over introduced species giving the introduced species a competitive advantage (PNWEP 1991 Nov f; PNWEP 1992 Jun c; Williams 1997). This competitive advantage allows introduced species to assume dominance or simply stay in the community (Johnstone 1986). A good example of this was the introduction of tansy ragwort (*Senecio jacobaea*) in 1922. It became a serious problem west of the Cascades by invading crop and pasture land where it poisoned livestock. One of the reasons tansy ragwort could compete so well with the native grasses was because it lacked predators. After biological control agents (cinnabar moth, ragwort seed fly, and tansy ragwort flea beetle) were introduced, tansy ragwort populations declined, saving roughly $5,000,000 annually in crop, pasture, and livestock losses (PNWEP 1997 July). Almost $1,000,000 are saved annually in control costs (PNWEP 1997 July).

Typically, an invasive species is a threat to some communities but not to all. A good example of this is the invasion of diffuse knapweed (*Centaurea diffusa*) into the dry interior of British Columbia where its competitive advantages are expressed within a limited moisture range. In communities with low June precipitation, diffuse knapweed invasion can be suppressed by strong competitors such as crested wheatgrass (*Agropyron cristatum* (L.) Gaertner); however, in communities with ~12 cm of early summer rainfall, diffuse knapweed is highly invasive. More than ~12 cm of early summer rainfall and diffuse knapweed's competitive abilities decrease (Berube and Myers 1982).

<u>Ecological Effects</u>

The introduction and establishment of an invasive species can have long-lasting effects on an ecosystem (Johnson and Steeve 1974; Vitousek et al. 1987; Vitousek 1990; Kareive 1996) by causing significant modifications to natural systems (Vitousek 1990; Harty 1993; Larson 1993) and changing the community structure of a habitat by eliminating native species from that community. Highly invasive species can create dense, monospecific stands of limited use to the native wildlife (Crockett 1977; Weinmann et al. 1984; Wilcox 1989; Welling and Becker 1990; Hight 1993; Larson 1993; Pojar and MacKinnon 1994; Edsall et al. 1995; Malecki 1995).

Loss of native species can alter trophic interactions and decrease biodiversity in the system (Garton et al. 1993). The change in community structure can affect abiotic factors such as hydrology, evapotranspiration, and water quality (Vitousek et al. 1987; Vitousek 1990; Malecki 1995). Plants such as purple loosestrife and *Spartina* species can cause accelerated sedimentation rates in wetlands because their roots retain soil more effectively than the roots of the native species that they replace. Annual grassland and rangeland plants such as knapweeds and star-thistles can dramatically increase erosion because their taproots do not hold the soil like the native perennial bunch grasses (Williams 1997). Soil erosion can, in turn, degrade streams and rivers, and harm fish and aquatic wildlife.

Invasive species can dramatically affect nutrients and soil moisture (Vitousek et al. 1987; Vitousek 1990). They can also cause changes to natural successional stages (Vitousek et al. 1987). Cheatgrass (*Bromus tectorum*), Kentucky bluegrass (*Poa pratensis*), and medusahead (*Taeniatherum caput-medusae*) have permanently altered disturbed and undisturbed grassland and shrubland in Eastern Oregon, and have become part of the climax vegetation in these habitats (Franklin and Dyrness 1988).

Not only are invasive species detrimental to natural areas, where they displace native plants, modify ecosystems, reduce wildlife, and diminish biodiversity; but they can also be detrimental to areas heavily modified and utilized by humans. Many invasive species are a major problem in cropland.

They reduce yields, reduce sale value of crops due to contamination, and increase costs by requiring control measures. Heavily disturbed range and pastureland are readily invaded by introduced plants (some introduced for forage such as redstem filaree) (Gaines and Swan 1972; Randall 1993; Pojar and MacKinnon 1994; Cooke 1997). Invasive plants reduce the forage value of the land and, in the extreme, can render the land useless. In some low-value rangeland, it is more economical for ranchers to abandon or sell the land to developers than to pay for control measures. When some invasive species such as knapweeds or yellow starthistle are left unchecked vast biological wastelands containing very few plant or animal species can form (Williams 1997).

Invasive species can also interfere with recreation. Some aquatic species such as Eurasian watermilfoil (*Myriophyllum spicatum*) can make fishing, boating and other water sports difficult or impossible to enjoy. They can make swimming dangerous by entangling swimmers. Puncture vine (*Tribulus terrestris*) thorns can injure hikers and their pets as well as flatten bicycle tires. The long, sharp spines of gorse (*Ulex europaeus*) can make trails and picnic areas inaccessible. Wetland plants such as purple loosestrife (*Lythrum salicaria*) can affect fishing, hunting, swimming, and boating, and reduce habitat quality for wildlife and fish.

Control Methods

Considerable effort goes into trying to control the spread of invasive species (Harty 1993). The goal is to eradicate invasive species from the communities they invade. However, this goal is rarely achieved, and the focus quickly becomes trying to stop the spread of invasive species and keeping the invaders from dominating the habitats in which they already exist (Wilcox 1989; Welling and Becker 1990; Hight 1993; Bjergo et al. 1995; DEA 1995 Oct).

Several methods are used in trying to eradicate or control non-native species. Often an integrated approach that combines more than one method is most effective, such as the integrated use of cultivation, herbicides, and the planting of competitive crops. The most appropriate methods to use depend on the invading species, the age and size of the population, the habitat, the existing community, and the goals of the land manager. Each method has its benefits and its drawbacks.

Hand pulling is often used in small, young stands (Wilcox 1989; DEA 1995 Oct; Malecki 1995). Sometimes managers will use this method for larger more mature stands if they want to keep damage to the native vegetation to a minimum; however, this requires more manpower and time than most managers have. Hand pulling will not work for some species that regenerate well from roots or rhizomes that break and are left in the ground (Wilcox 1989; DEA 1995 Oct).

Mechanical cutting of aerial parts is sometimes used to control invasive species (Wilcox 1989; DEA 1995 Oct; Malecki 1995). Cutting can be done individually or by mowing large monotypic stands. Sometimes cutting is followed by an herbicide spray to keep roots from resprouting (DEA 1995 Oct). The problem with this is that most herbicides are not species specific, harming many non-target plants and some animals that come into contact with them (Crockett 1977; Wilcox 1989; Malecki 1995). Mowing is also nondiscriminatory and leads to large patches of disturbed ground. Disturbance is one of the human influences that leads to the spread and dominance of invasive species (Wilcox 1989; Welling and Becker 1990). Large bare patches also encourage germination of the seed bank which is often dominated by the invasive species that was just removed (Wilcox 1989; Welling and Becker 1990). Sometimes this is an effective way to exhaust the seed bank of the invasive species by continually removing the seedlings until there are no longer any seeds remaining (Welling and Becker 1990). Usually this method is only moderately successful because the constant disturbance leaves the habitat vulnerable to further invasions and the seed bank is often so large that exhausting it is virtually impossible (Welling and Becker 1990).

Cultivation/tillage/disking are also used by some land managers to control large patches of invasive species (Wilcox 1989; DEA 1995 Oct). These methods are especially important in areas which are already highly disturbed by cropping and grazing. However, these methods can cause more damage than good, especially if the invasive plant regenerates well from vegetative parts. Tilling can chop the plants up and spread them over a large area. It can also bury roots and rhizomes deeper in the soil making them harder to remove or control in the future (DEA 1995 Oct). Bare patches of ground are also vulnerable to invasion from nearby invasive plants.

Crop management practices including rotations, fallows, and herbicide use are important tools in controlling invasive species. These management practices vary depending on the type of crop, the climate, and the invasive species that are a problem. One of the most important management tools in all crop and pasture situations is limiting the introduction of invasive species. Therefore, it is important to plant seed free of contaminants; to use equipment, hay, straw, and manure that are free of weed contaminants; and to control nearby populations of invasive species that act as a seed source.

Water level manipulation is a form of control used in some wetland systems. This method changes the water level of a site in order to make it unsuitable for the invasive species (DEA 1995 Oct). This procedure can be costly and requires repeated applications which can continue for several years (Wilcox 1989). Although this procedure may control some species, it may contribute to the dominance and spread of other invasive species. Even if this method is effective, reinvasion can occur after water levels are returned to normal. Often the seed bank survives water level manipulation; therefore, this method is most effective when used in conjunction with other methods. Many ecosystem functions besides plant interactions, such as affects to fish and mosquito populations, should be considered when choosing an appropriate control program.

Fire is a method that can be used with caution. It can be a semi-effective tool for controlling invasive species that do not reproduce vegetatively from stored underground energy resources. Burns must occur before the invasive species sets seed, and burns must be done regularly until the seed bank is depleted. However, fires create a patchy, disturbed system that is vulnerable to invasion by undesirable species (DEA 1995 Oct). A better way to use fire as a control tool is by reinstating natural fire regimes in areas where fire has been suppressed for several decades. Sometimes restoring such factors as hydrology, natural fire cycles, or key native species will eliminate invasive species without the use of direct control measures (Randall 1993). Some organizations and agencies attempting to restore habitats to pre-European compositions, such as the Nature Conservancy, have made reestablishing natural fire regimes a top management priority in many of their preserves (Randall 1993).

Many of Oregon's grasslands have been degraded by a combination of the suppression of natural fire patterns and the intense grazing of domestic livestock (Randall 1993). Fire may be an important factor in the reestablishment of native bunchgrasses. It seems that fire breaks large bunches of the perennial grasses into smaller clumps. This promotes vegetative growth which makes these species more competitive.

Our native grasses were not adapted to heavy grazing, so heavy grazing by domestic livestock has created large disturbed patches in Pacific Northwest grasslands. This allowed introduced and ruderal species to invade rangeland throughout the state. Now, grazing can be used as a tool to control invasive species. Grazing can reduce litter material and the seed of introduced annual species, both of which are detrimental to native bunchgrasses (Randall 1993). Grazing can also be used to target specific invasive species; however, this must be done cautiously and with intensive management. Grazing is a difficult method to use for controlling invasive species because it requires a great deal of knowledge and attention to be effective. Often, if used incorrectly, grazing will make invasions worse because most invasive species are less palatable than the desired forage species. Some invasive species, such as poison hemlock, tansy ragwort, halogeton, and leafy spruge, are toxic to livestock (Gilkey 1957; USDA 1971; Taylor 1990; UICA 1991 Sept; Hickman 1996; Whitson 1996; PNWEP 1997 July; KCDNR).

For larger stands of invasive plants, managers often resort to the use of herbicides (Wilcox 1989; DEA 1995 Oct). Herbicides can kill invasive and native species unless the herbicide, or dose of the herbicide, is species specific for the invasive species. Herbicides can be spread by water so poisoning of non-target species is a risk in wetlands (Crockett 1977; DEA 1995 Oct). Herbicide use is rarely completely effective in one application. It often reduces the invasive population but does not fully eradicate it unless several applications are used (Wilcox 1989; Malecki 1995). Herbicides do not kill seeds, so treatments need to be repeated until the seed bank is depleted (Wilcox 1989).

Biological controls are often used to control invasive species that have become abundant over large areas (Drea 1993; Hight 1993; Malecki 1995). Using biological control involves releasing one or more host specific herbivores into a community. Typically, biological control agents are insects. Biological control requires extensive research before the control agent(s) can be released. Scientists and managers must be sure that the biological control agent is host specific and will not move on to native plants once the exotic plant becomes scarce (Drea 1993; Hight 1993; Malecki 1995). This process involves releasing more non-native species into the system, so there are risks. The testing needed prior to release of the control agent takes a long time. The demand for biocontrol agents is rising since they can be a very effective and a relatively inexpensive way of dealing with large invasion problems (Drea 1993; Hight 1993; Malecki 1995); however, funding is low for biocontrol research. Underfunding could lead to the premature release of biocontrol agents that could cause problems in natural systems (Drea 1993). Biological controls typically do not eliminate a targeted plant population, but they can reduce pest populations and the threat these populations pose to the community (Hight 1993; Malecki 1995). In ideal situations, the ecosystem will return to near pre-invasion composition and function.

Sometimes fish are used to control wetland or aquatic invasive species; however, they are not host specific. They graze aquatic plants much the same way livestock graze in a meadow. This makes their use appropriate in limited situations only, such as in unnatural systems like irrigation canals where the goal is the elimination of all vegetation (Sytsma 1996 Oct; Sytsma and Parker 1997 Dec; OFWC 1998 July 24). In Oregon, a permit is required for the use of fish (grass carp) in this manner.

Shading can be an effective way to control some invasive species. Native trees and shrubs can be used to shade out intolerant invasive species (DEA 1995 Oct). Planting native species after a disturbance can reduce the germination of invasive species' seeds (Wilcox 1989) and can help reduce a site's vulnerability to invasion from nearby invasive species. Plants can be planted near aquatic systems to shade out aquatic weeds (Sytsma and Parker 1997 Dec). Some unnatural systems, such as irrigation canals, can be completely enclosed or covered to eliminate aquatic pest species (Sytsma and Parker 1997 Dec). Some invasive species, such as Eurasian watermilfoil and Brazilian waterweed, can be controlled with water column dyes which tint the water reducing the light available for aquatic plants (Gibbons et al. 1999).

The reduction of disturbance is one of the best methods for reducing the spread of invasive plants (Wilcox 1989). Monitoring programs to find invading individuals before they establish a large seed bank is also important (Bjergo et al. 1995). Eliminating the use of exotic species for landscaping is needed as are improved regulations and monitoring programs for finding product contaminants (Harty 1993). Controlling invasive species in low priority habitats, such as waste areas and roadsides, can eliminate a seed source for invasion into higher priority habitats that are nearby.

Some governmental policies regulate which species can be planted in certain areas, such as the Portland Street Tree List which regulates which trees can be planted along city streets. Changing the required plants on these lists to native species instead of introduced species would reduce the chance of escape of non-native plants into surrounding habitats.

Finding ways to reduce introductions of exotic species should be a priority. Keeping human caused disturbance to a minimum, in order to maintain a communities' normal interactions, is another important management tool. An undisturbed system is much more resistant to invasion (Simon 1995; Planty-Tabacchi et al. 1996).

Why a list of invasive plant species is important

Current information about invasive species is sparse and what does exist is spread throughout the literature. Some of this information is easily accessible and some is obscure. A comprehensive list of invasive and naturalized species is not available for Oregon. A few species have been extensively studied, but there are many species that have the potential of becoming invasive that have not been studied. All of these species need study because each species has unique features that define its invasive potential and that contribute to its control. Methods of control must be species specific to be most effective.

This thesis is designed to provide pertinent information on highly invasive plant species in Oregon as well as a comprehensive list of the invasive (appendix A) and naturalized (appendix B) plants in Oregon. The goal is to make more people aware of invasive species and what they do to our ecosystems. If more people are aware of the problems and their possible solutions, the control of invasive species could become more effective. This work will be a source of information for people trying to control invasive species and a window of insight for people interested in local ecosystems, flora, and fauna.

Cronk and Fuller (1995) provide a detailed discussion of plant invasions of natural habitats on a worldwide scale. They discuss many of the issues briefly covered in this introduction, such as the nature of plant invasions and their control. They also provide profiles of some highly invasive plants that have invaded different parts of the world. One species they profile, *Clematis vitalba* L., is invasive in Oregon. This would be an excellent resource for further information on invasive plants. This thesis differs by providing information and species profiles relevant to invasions in Oregon and the Pacific Northwest.

Sources of information

<u>Lists</u>

Preliminary lists of invasive species were compiled from *Flora of the Pacific Northwest* (Hitchcock & Cronquist 1973), and *The Jepson Manual: Higher Plants of California* (Hickman 1996). Each species that was not native to the Pacific Northwest or to California, depending on the source, was listed. Hitchcock & Cronquist (1973) did not always list species' origins, so some non-native species were overlooked in that source. Hickman (1996) was a better source of information because non-native species were clearly indicated.

The list compiled from Hitchcock & Cronquist (1973) contained 671 species that had been introduced into the Pacific Northwest. This list was incomplete due to the difficulty of extracting the information from the keys, the book only covering the northern half of Oregon, and the book being 25 years out of date. Several species could have been introduced to Oregon during those years. The second list, which was a list of species naturalized into California, was more complete and reflective of the present composition of the flora in California. The list for California was used to adjust the Oregon list by first ignoring all the species that were naturalized only in the central to southern part of California. This left 644 species, of which 136 were said to occur north of the California border. Of the remaining 508 species, range information was recorded from each resource. Range information on each species was augmented by referring to lists available from the Oregon Flora Project, the Oregon Department of Agriculture (ODA), the Pacific Northwest Exotic Pest Plant Council (PNW-EPPC), the Nature Conservancy's Willow Creek Natural Area, and the U.S. Army Corps of Engineers Research Natural Area in Eugene. The following books were also consulted for range confirmation: *Wildflowers of the Columbia Gorge* (Jolley 1988); *Plants of the Pacific Northwest Coast* (Pojar and MacKinnon 1994); *Common Weeds of the United States* (USDA 1971); *Lewis Clark's Field Guide to Wild Flowers of Field and Slope in the Pacific Northwest* (Clark 1974a); *Lewis Clark's Field Guide to Wild Flowers of Forest and Woodland in the Pacific Northwest* (Clark 1974b); *Lewis Clark's Field Guide to Wild Flowers of Marsh and Waterway in the Pacific Northwest* (Clark 1974c); *Lewis Clark's Field Guide to Wild Flowers of the Arid Flatlands in the Pacific Northwest* (Clark 1975a); and *Lewis Clark's Field Guide to Wild Flowers of the Mountains in the Pacific Northwest* (Clark 1975b). Species that remained questionable remained on the list along with all of the information available.

The resulting list contained 714 exotic plant species now known or believed to occur in Oregon. From this list those species that could be considered invasive were identified. Four possible categories of importance were recognized: **Highly Invasive**, the most invasive, widespread, and damaging of the naturalized species in Oregon; **Invasive**, invasive but not as widespread as the Highly Invasive species; **Naturalized**, naturalized but yet to become invasive; and **Invasive in Neighboring States** (appendix C), invasive and occurring in a bordering state but not yet found in Oregon.

Species that had invaded large areas of Oregon were considered to be **Highly Invasive**--that is, "regionally abundant" by Oregon Department of Agriculture (ODA) standards and "most widespread and damaging" by Pacific Northwest Exotic Pest Plant Council (PNW-EPPC) standards. Also on this list were species that were listed by the ODA as "target weeds". **Highly Invasive** species need not appear on all three of the source lists. A listing of a species on any one of the source lists placed the species in the **Highly Invasive** category.

The **Invasive** category contained any species that was listed by ODA or PNW-EPPC as invasive but failed to make the designation of **Highly Invasive**. This list includes species that are invasive but presently occupy a limited area. If a species is not known to be invasive, it was listed it as **Naturalized.**

Some species that have been assigned to the **Invasive** category based on ODA standards might actually be more invasive than some species in the **Highly Invasive** category. These species may be less widespread because of a more recent or less frequent rate of introduction.

Highly Invasive species profiles

Profiles were compiled for each of the species classified as Highly Invasive. Each profile, to the extent of available information, states: where the species invaded, its range, the type of habitat that was invaded, how and why the species was introduced, how it spreads, how it affects the habitats it invades, and how to control the species. All of the common and scientific names that were found for the species were included to aid in proper identification of each of the listed species.

Range information for the Highly Invasive species in Oregon was often imprecise. One might assume that if these species where highly invasive in Oregon they would be easy to find. My experience proved otherwise. Many factors played a part in making some species difficult to find. The imprecision of distributional information was a big factor. Knowing that there is an invasive species in northeastern Oregon does little to help locate specific populations. Many invasive species grow with crops so are difficult to see even when one is in the correct geographic area. Some "target" species are not widespread in Oregon, but they have the potential to be highly invasive. These species are not easily found at present, but are of great concern.

I want to draw special attention to *The Pacific Northwest Weed Control Handbook*. This book is updated and published annually by the Oregon State University Extension Service. It discusses the best herbicides to use in specific situations and for specific species, and it outlines possible alternative control methods to the use of chemicals. Herbicide regulations and chemical availability change often so this resource is valuable. Note: Taxonomic nomenclature for biocontrol agents was taken from the 1997 edition (William et al. 1997).

Profiles of the Highly Invasive Plants in Oregon

Trees

Black Locust

Family: Fabaceae Species: *Robinia pseudoacacia* L.

Season

Leaves appear late, fall-off early. Flowering: May-June. Pods can persist through winter.

Habitat Invaded

Favorite habitat conditions: open, dry to moist areas near settlements with well drained soils, esp. on fertile, moist, limestone soils

Favorite habitat types: waterways & bottomlands, roadsides, abandoned farms, old settlements, city streets & parks, canyon & mtn slopes, open woods & borders, pastures, fencerows, waste areas.

Range

Native to the Appalachian & Ozark mnts.

Widely naturalized throughout OR, esp. e Cas; wdsp in the West, e US, s Can, and sw Eur.

Distinguishing Characteristics

Its definite tree form and white flowers distinguish it from other highly invasive shrubs in the Fabaceae. Its white pea-like flower, odd-pinnate leaves, and paired thorns distinguish it from other trees in the PNW.

History

Settlers planted black locust throughout the US as an ornamental. They enjoyed its foliage and fragrant pea-like flower. It is also very tolerant growing under many adverse conditions such as poor soil and low water. It has escaped from these plantings spreading by seeds which can remain viable for several years and by root sprouts which can result in large colonies.

The tree is cultivated in the e US. It is used as an ornamental and street tree. The strong, hard wood makes it ideal for many uses (fence posts, wood pegs, ship timbers, insulator pins, piles, railroad ties, wagon wheel hubs, firewood, tool handles, mine timbers). It is used to restore poor or reclaimed soil (strip mines, gravel pits) because it has root nodules that contain nitrogen fixing bacteria. Black locust is also used for erosion control because of its extensive root system. Its value has declined in recent years due to its susceptibility to several insect pests, esp the locust borer beetle which can ruin its wood for everything but fence posts. It has also been used for windbreaks and bee forage; however, it is toxic and the honey produced by bees foraging on it is sometimes considered toxic. Black locust has been cultivated in Europe since ~1600 and has escaped widely in sw Eur as well as in s Canada.

Ecological Effects

The value of *Robinia pseudoacacia* to wildlife is limited. Its seeds are eaten by some birds and small mammals, usually when little else is available. Bees get nectar from the flowers which might taint the honey for human use. Larger mammals such as deer browse on the leaves; however, domestic livestock can be poisoned by eating the twigs, bark, or young shoots. People have also been poisoned by ingesting parts of the plant (seeds, leaves, twigs, bark). It has been reported that the strong fragrance of the flowers can cause headaches in some people.

Control Methods

Mature trees can be killed by girdling, and young plants can be killed with herbicides.

Species Status

EPPC- A-1

Synonyms

R. p. var. *rectissima* (L.) Raber

Other Common Names

yellow locust, false acacia

References

Crockett 1977; Elias 1980; Farrar 1995; Fernald 1989; Foster and Duke 1990; Harlow 1957; Harrar and Harrar 1962; Harty 1993; Hickman 1996; Hitchcock and Cronquist 1973; Hylander 1953; Jensen et al. 1995; Mabberley 1989; McMinn and Maino 1963; Metcalf 1968; Petrides 1993; Phillips 1978; Platt 1952; Randall et al. 1981; Watts 1973

Shrubs

Scotch Broom

Family: Fabaceae Species: *Cytisus scoparius* (L.) Link

Season

Deciduous. Flowering: April-June.

Habitat Invaded

Favorite habitat conditions: typically in open, dry, disturbed areas at low elevations; but also invades natural areas.

Favorite habitat types: roadsides, cult & abandoned fields, timber harvest sites, ditchbanks, stream courses, clearings, pastures, rangeland.

Range

Native to Eur & n Afr.

Widespread w of the Cas from BC to CA, scattered e of the Cas with an increasing range. Also naturalized along the East Coast plain from Nova Scotia to VA, and in GA.

Distinguishing Characteristics

There are several shrubs from the Fabaceae introduced into Oregon.

Table 1 Distinguishing characteristics between introduced brooms and gorse

Species	Pods	Flowers	Leaves	Branches
Scotch broom (Cytisus scoparius)	2.5-4 cm long; flattened; hairy margins	~2 cm long; blooms: April-June	Sparse; lower with 3 leaflets, upper simple	unarmed; loosely branched; 5-ridges
Portuguese broom (C. striatus)	1.5-4 cm long; inflated; densely hairy	1-2.5 cm long	Sparse; lower with 3 leaflets, upper simple	unarmed; loosely branched; 8-10 ridges
French broom (Genista monspessulana)	1.5-2.5 cm long; flattened; densely hairy	1-1.5 cm long; blooms: March-May	very leafy; all with 3 leaflets	unarmed; much branched; slightly ribbed
Spanish broom (Spartium junceum)	5-10 cm long; flattened; slightly hairy	2-2.5 cm long	almost leafless; simple leaves	unarmed; no ridges
gorse (Ulex europaea)	1-2.5 cm long; flattened; densely hairy	1-2 cm long; main bloom: April-May	simple (sometimes with 3 leaflets); age to spines	spiny; densely branched; ribbed

White Spanish or Portugal broom (*C. multiflorus* (L'Heritier) Sweet) can be distinguish from the above (all yellow flowered) by its white flowers.

Indigobush (*Amorpha fruticosa* L.) can be distinguished by its purple flowers and leaves with 9-31 leaflets.

History

Scotch broom was first planted as an ornamental by early settlers of the Pacific Coast. Colonies have spread throughout the Pacific Coast from early plantings, such as those planted on Vancouver Island by Captain Walter Colquhoun Grant in 1850 (Pojar and MacKinnon 1994), and from continued introductions. Scotch broom has been used as a medicinal plant and to protect one from witchcraft. In the middle ages, its branches were used to sweep houses. The seeds have been used as a coffee substitute, the pickled buds as a caper substitute, and the pickled flowers to make wine. Internal uses for food and medicine are quite risky, however, due to toxins in the plant.

The plant has been used extensively as a soil binder along roads and in fills. It has root nodules with nitrogen fixing bacteria, so it is considered to be a good choice for barren soils. However, the broom plants use most of the fixed nitrogen, releasing it into the environment only after they die (PNWEP 1994 July d).

Scotch broom reproduces by producing an abundant supply of seeds. At maturity, these seeds are thrown from their bursting pods, and can land considerable distances from the plant. This, as well as seed dispersal by ants and birds (PNWEP 1994 July d), along with a lack of biological restraints (herbivores, disease) allows Scotch broom to form extensive monocultures. Only established forest seems to halt the spread of Scotch broom; however, it has started to invade forested areas interfering with the establishment of tree seedlings. Scotch broom appears to have allelopathic properties allowing only other Scotch broom plants to grow near it. Seeds can remain viable in the soil 50-80 yrs. Therefore, once a population has been established, active control measures are the only way to rid the area of broom. Broom seeds have been carried long distances on vehicles or equipment, or in infested soil or gravel.

Ecological Effects

This highly invasive species can form dense monospecific stands that crowd out native vegetation. This modifies wildlife habitat significantly reducing its usefulness, changes natural ecosystem functions, and endangers many native species unique to the area. Besides eliminating vegetation in natural and waste areas, these dense stands also form in logged sites halting natural succession back to forest habitat. Pastures, rangeland and parks become invaded by Scotch broom reducing recreation and grazing area. It is sometimes toxic to livestock and, possibly, children; however, few poisoning cases have been reported in the U.S. Although Scotch broom facilitates nitrogen fixation, little nitrogen is available to neighboring native vegetation.

Control Methods

Prevention: Keep soil disturbance to a minimum. Prevent the movement of seed from infested to uninfested sites. Clean equipment and boots when leaving infested sites. The early detection of broom in previously uninfested sites is critical. Remove the broom within the first two years of establishment to prevent seed bank development.

Mechanical: Hand removal is the best form of control for broom plants. Mature plants should be cut or pulled when the plants are at their weakest. For Scotch broom, this would be either in the spring when root resources are down, or in August when under water stress. Plants can resprout from the root. To prevent resprouting, cut the stem at or below ground level. Stems can be wiped with herbicide after cutting to further reduce sprouting. Continue to cut the plants until shoots no longer appear (0-3 yrs). Plants can also be hand pulled which is more effective. Older plants can be pulled with the use of a "weed wrench". If removed before seed pod formation, plants can be left on site since they do not reroot. However, plants with seeds should be handled carefully to prevent further spread. Sometimes, piling them in one location is the best way to limit seed spread, especially if the seeds have not fully matured.

Cultivation can help control Scotch broom when it invades large areas such as pasture or perennial crops. Grow cultivated crops in the area for a couple of years before returning to perennial crops or pasture. This eliminates the adult broom plants in the area; however, the seed bank will continue to produce seedlings. Therefore, continued control is needed either by hand pulling, cultivation, or herbicides. This is a long term process due to the long seed viability (50-80 yrs); however, if seedlings are consistently removed before they set seed, the seed bank might deplete itself after about 10 years. I suggest treating seedlings about every 2 years. At this interval, plants are large enough to be easily seen but not large enough to produce seed.

Mowing and fire are ineffective controls for broom species.

Chemical✎: Herbicides can provide excellent control if applied properly. Typically the best time to apply herbicides is in the spring when plants are actively growing. Follow-up treatments are required for control.

Biological: The establishment of a canopy layer may help control broom species by shading them. Planting native plants after removal of the mature broom may help control seedling establishment. Goats may also help control broom if the plants are not too tall.

Three biocontrol agents are available for Scotch broom; however, none offer significant control, especially when used alone. The most effective agent is a seed weevil, *Apion fuscirostre*. Its larvae consume Scotch broom seed, which can reduce spread but will not control established plants. The other two biocontrol agents were accidentally introduced into Oregon. *Agonopterix nervosa* is a shoot tip leaf tying moth that also occurs on gorse (*Ulex europaea*) and offers poor control. *Leucoptera spartifoliella* is a twig mining moth. It was introduced intentionally in the 1970s, although it was already in the state. It has become virtually ineffective as a control agent due to parasitism by a small wasp.

Species Status

A-1, ODA-B

Synonyms

Sarothamnus scoparius (L.) Wimmer ex Koch; *C. s.* (L.) link var. *s.*

Other Common Names

Scot's broom

References

Alden et al. 1998; Bianchini and Corbetta 1975; DEA 1995 Oct; Fernald 1989; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Mabberley 1989; McMinn 1951; PNWEP 1994 July d; Pojar and MacKinnon 1994; Randall et al. 1981; Strickler 1993; Taylor 1990; TNC 1986 Sept; Whitson 1996; William et al. 1997

Portuguese Broom

Family: Fabaceae | Species: *Cytisus striatus* (Hill) Rothm.

Season

Deciduous

Habitat Invaded

Disturbed areas; it is likely to occupy similar habitats as Scotch broom *(C. scoparius)*.

Range

Native to Spain and Portugal.

The range of Portuguese broom is probably similar to that of Scotch broom (*C. scoparius*). *C. striatus*, however, is not as abundant, and it is thought to be uncom in the West. Several populations thought to be Scotch broom might turn out to be Portuguese broom upon closer inspection.

Distinguishing Characteristics

Refer to the chart on page 27 to distinguish Portuguese broom from similar species.

History

Portuguese broom is one of the four main broom species introduced into the PNW. Currently, it is thought to have a very limited distribution in Oregon. However, its actual distribution might be larger, since this species can be mistaken for the much more widespread Scotch broom.

Ecological Effects

The ecological effects of Portuguese broom have received little study; however, they are probably similar to those of Scotch broom.

Control Methods

Control using the methods outlined for Scotch broom (p. 26); the species are very similar and probably respond similarly to these methods. An extensive, long-lasting seed bank will produce seedlings for many years; therefore, control measures must continue for many years.

Species Status

NMI, ODA-B

Synonyms✱

Other Common Names

striated broom

References

Hickman 1996; PNWEP 1994 July d

French Broom

Family: Fabaceae Species: *Genista monspessulana* (L.) L. Johnson

Season

Evergreen. Flowering: March-May (April).

Habitat Invaded

Habitat information for French broom is lacking, but it probably establishes itself better in disturbed areas.

Range

Native to the Medit, the Azores, & possibly the Canary Islands.

Populations are scattered w of the Cas from BC to CA. It is the most wdsp broom in CA.

Distinguishing Characteristics

There are several other introduced shrubs from the Fabaceae in OR. Refer to the chart on page 27 to distinguish between them.

History

This introduced ornamental shrub has been cultivated extensively in CA since 1871. It escaped cultivation in the mid-1940s and is now the most wdsp broom in CA. It is possible that most of the naturalized French broom in CA is actually a hybrid between several *Genista* spp. (*G. monspessulana*, *G. canariensis* L., and *G. stenopetala* Webb & Berth.). Its spread n of CA has been much slower and seldom gets farther north than sw OR; however, it is found w of the Cas all the way to BC.

French broom spreads by seed. It can resprout if damaged or partially removed. It produces an abundant amount of hard coated seeds that probably remain viable for many years.

Ecological Effects

The flowers are toxic, causing nausea and vomiting when eaten by children. Other parts of the plant may by toxic as well.

This species creates vast monocultures crowding out native species. Native species can not recolonize until the broom is removed from the habitat.

Control Methods

See Scotch broom (p. 26) for appropriate broom control methods. Biocontrol agents for French broom are not available.

Species Status

EPPC-A-2, ODA-B

Synonyms

Teline monspessulana (L.) K. Koch, *Cytisus monspessulanus* L.

Other Common Names✱

References

Hickman 1996; Hitchcock and Cronquist 1973; McMinn 1951; PNWEP 1994 July d; TNC 1986 Sept.

Spanish Broom

Family: Fabaceae

Species: *Spartium junceum* L.

Season✱

Habitat Invaded

Favorite habitat conditions: disturbed areas.

Favorite habitat types: along roadsides, mountain highways.

Optimal habitat conditions and types are possibly similar to Scotch broom (*Cytisus scoparius*).

Range

Native to the Medit region and the Canary, Madeira, & Azores Islands.

Currently known in only five sites in OR, all are w of the Cas; com in CA coastal cos.

Distinguishing Characteristics

There are several other introduced brooms in OR; however, they all contain at least some compound leaves and ribbing on the stems. The one-lipped calyx is unique to Spanish broom. The chart on page 27 differentiates between these introduced shrubs.

History

This is the first broom introduced into CA. It was offered as an ornamental shrub in San Franciscan nurseries as early as 1856. It was planted along s CA mountain highways in the 1930s. Although it is a common species in CA, it is not as big a problem as French or Scotch broom have become; and it is not common in OR. It has traditionally been used as fiber, and the flowers make a yellow dye.

Spanish broom reproduces by seed. The stump of damaged plants can resprout. Seed/Seedling information is limited for Spanish broom; however, it is thought that the plentiful, hard seeds can remain viable for many years. This is also the most drought resistant of our broom species

Ecological Effects

Specific ecological effects have not been thoroughly investigated since it does not seem to be as aggressive as other broom species. It might contain similar toxins as Scotch broom and, therefore, would be avoided by livestock. This would mean grazing in areas of Spanish broom could encourage its spread and growth.

Control Methods

See Scotch broom (p. 26) for appropriate broom control methods. Biocontrol agents for Spanish broom are not available.

Species Status

NMI, ODA-B

Synonyms✱

Other Common Names✱

References

Hickman 1996; PNWEP 1994 July d; TNC 1989 Mar.

Gorse

Family: Fabaceae Species: *Ulex europaea* L.

Season

Evergreen. In some locations, gorse can bloom throughout the year, but its main blooming season is in early spring (April-May). This is when the plants can have a solid covering of flowers. Flowers are much less dense at other times of the year.

Habitat Invaded

Favorite habitat conditions: open, disturbed areas at low elevations, typically near the ocean. It favors sandy or gravelly soils with mild winters & plenty of moisture.

Favorite habitat types: fence rows, roadsides, river banks, old fields, pastures, rangeland, agricultural land, recreational areas.

Range

Native to w Eur.

Found along the coast from the Olymipic Peninsula in WA to n CA; reported inland in Douglas & Clackmas cos, OR. Also found along the east coast from se MA to VA.

Distinguishing Characteristics

The spines distinguish gorse from other shrubs introduced from the Fabaceae.

History

Introduced into Oregon from Europe as an ornamental shrub, gorse has also been cultivated as a cover for wildlife and as a sand-binder. Its root nodules have nitrogen fixing bacteria, so it can grow well in nutrient poor soils. It is well adapted to the Oregon coastal environment and has escaped cultivation. It has established itself over thousands of acres and is still expanding its range.

Gorse mainly reproduces by an abundant production of seed. These hardy seeds can remain viable in the soil for years. When the pods are mature, they burst open throwing their seeds several feet. Ants collect the seeds spreading them further as do water, machinery, and other animals.

Ecological Effects

Once gorse is established, it spreads quickly forming dense thickets that eliminate all other plants except the largest trees. Its sharp thorns make gorse thickets impenetrable and useless to most wildlife. Recreational habitats taken over by gorse are often abandoned. It even becomes a serious pest on agricultural lands and rangeland.

Gorse is highly flammable, even when green, making it a serious fire hazard. Its presence led to the burning of Bandon, OR, in 1936. Seeds germinate rapidly after a fire creating dense thickets and eliminating natural succession.

Control Methods

The control of gorse is vital for Oregon coastal communities, but doing so is very difficult. Gorse needs to be controlled in two stages. First, the mature plants need to be removed, which can be difficult due to its waxy cuticle. Secondly, seedlings emerging from the extensive seed bank need to be controlled. Seeds forming this seed bank can remain viable for 30 yrs or more. Effective control methods will vary depending on the type of land infested; however, control will probably require a combination of mechanical, chemical, and biological methods.

Prevention: Prevent the establishment of gorse in new areas. Monitor areas suseptable to invasion, and control new plants before they can produce seeds. Limit disturbance and overgrazing, and maintain soil fertility, especially in pastures.

Mechanical: Any method that does not target the root system will be ineffective. Therefore, simple cutting or burning will not work alone but can be effective when combined with herbicide use or cultivation of the roots.

One of the easiest ways to control large stands of gorse is by a combination of burning, bulldozing and herbicide use. Gorse is highly flammable, and seed germination is induced by fire; therefore, control by burning needs to be handled properly. It is best to consult an expert before burning. A good resource would be your local OSU extension agent.

Cultivation is another effective way to control large stands of gorse. When cultivating, gorse crowns must be brought to the surface. This kills mature plants. Then, plant annual crops for at least 2-3 years in order to reduce seedling establishment.

In pastures or rangeland, mowing small plants should be sufficient to allow grazing on new shoots. However, grazing does not kill plants but encourages new growth; therefore, this method is not advised.

Chemical✎: There are several herbicides that can control gorse if used appropriately. It is important to choose an appropriate herbicide and thoroughly wet the foliage. Applying just after blooming is also helpful.

Biological: Once mature plants are controlled, seedlings can be controlled with herbicides and/or with planting or grazing techniques. Small seedlings (2-3" in height) will be grazed if the area is heavily stocked; however the disturbance caused by heavy grazing can lead to invasion by other species. Planting species appropriate to the area controlled (i.e., pasture grass, crops, trees) can help control gorse seedlings. When planting, keep disturbance to a minimum. When planting trees, try to plant the largest ones possible.

A seed weevil, *Exapion ulicis,* was classically introduced in 1956. It is now widespread in gorse's range and is effective in reducing seed production. However, it does not control mature plants, and the seed bank in most areas is so extensive it has yet to affected gorse concentrations. This species is available for redistribution.

Three other species are being studied to evaluate their control abilities: *Sericothirips staphylinus*, a thrip; *Agonopterix nervosa*, an accidentally introduced shoot tip moth; and *Tetranychus lintearius*, a classically introduced spider mite. The last two are currently available for redistribution, especially in Oregon.

Species Status

EPPC-A-2, ODA-B

Synonyms

Ulex europaeus L.

Other Common Names✱

References

Alden et al. 1998; Fernald 1989; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Howes 1974; Mabberley 1989; McMinn 1951; Muzik 1970; OSUES 1995 Jan; PNWEP 1991 Dec b; Pojar and MacKinnon 1994; Randall 1993; Randall et al. 1981; Taylor 1990; Whitson 1996; William et al. 1997

Vines and Brambles

English Ivy

Family: Araliaceae Species: *Hedera helix* L.

Season

Evergreen. Flowering: Sept.-Nov.; flowers only form on portions of the plant that are well illuminated; therefore, they are rarely seen in the PNW where flower production typically occurs high in the tops of trees.

Habitat Invaded

Favorite habitat conditions: dry to moist (but not wet) soils in sunny to shady locations; typically in disturbed areas.

Favorite habitat types: woodland, abandoned homesites, yards.

Range

Native to Eur.

Wdsp w of the Cas from WA to CA.

Distinguishing Characteristics

There are few species that could be confused with English ivy which is an evergreen vine with simple, leathery, lobed leaves. Traveler's joy (*Clematis vitalba* L.) is a woody invasive vine that can be found in Oregon; however, it is deciduous and its leaves are compound with 3-9 leaflets. Poison oak (*Toxicodendron diversilobum* (Torrey & A. Gray) E. Greene), a native woody species, is sometimes vine-like and may contain leaves that look lobed; however, the leaves are thin, not leathery, and deciduous.

History

English ivy is a common ornamental vine that is used in landscaping and often escapes into waste and natural areas. Seeds are widely spread by birds that eat the berries. Vegetative parts are widely spread by people and water. These vegetative pieces can reroot and create new English ivy colonies.

English ivy has several traditional medicinal uses. It was used to ward off the plague, as an antiseptic, and as an ingredient in an anaesthetic. It was also used to help depression, relieve the spleen, and for swollen feet and corns. (Bianchini and Corbetta 1975)

Ecological Effects

The berries provide winter food for many birds; however, the berries and leaves can cause poisonings and contact dermatitis in humans.

This plant spreads very aggressively reducing habitat diversity. It grows over many plants eliminating them from the habitat. This degrades the habitat to a point where many animals are excluded as well. A study in Forest Park in the Portland area showed a lack of reptiles and amphibians in ivy-dominated sites (THPRD).

In forested habitats, the ivy grows over seedlings, eliminating the natural succession of deciduous forest to conifer forest. Not only does it prevent the seedlings from growing, but it eventually kills the mature trees. Ivy seeks areas of light. When it can not find enough light, it will readily grow up tree trunks into upper tree crowns. As it climbs the tree, it can damage the bark with its anchoring roots. Upon reaching the upper tree crown, the ivy grows out along the branches which harms the tree by shading the tree's leaves. This competition for light will eventually lead to the tree's death.

English ivy has a shallow root system. This accelerates erosion in heavily infested areas on steep slopes. It also forces competing trees to develop shallow root systems expanding the problem.

Control Methods

Unfortunately control measures for English ivy have not been well studied.

Prevention: Prevention is difficult for this species because birds are responsible for much of its spread. However, steps can be taken to reduce its spread. Intentional ivy plantings should be stopped, and previously planted ivy should be removed. When ivy is trimmed or removed, the waste piecies must be disposed of appropriately. Several ivy colonies have gotten their start from discarded yard debris.

Mechanical: Hand removal is the main control method used. Plants growing up trees are clipped off at ground level and the stem pulled from the tree if possible. Stems that are growing along the ground are pulled, removing as many of the roots as possible. Vines are piled and left to degrade. If native plants still grow amongst the ivy, pull the ivy when the least amount of damage to these native plants will occur (i.e., early spring or late fall). Repeated trips to the site are necessary to remove plants growing back from roots or debris piles.

Species Status

EPPC-A-1

Synonyms✱

Other Common Names✱

References

Bianchini and Corbetta 1975; Durkee and Broshot 1997; Hickman 1996; Hitchcock and Cronquist 1973; KCDNR; THPRD

Field Bindweed

Family: Convolvulaceae Species: *Convolvulus arvensis* L.

Season

Perennial—plants emerge mid-spring then bloom ~4 weeks later continuing until fall frost (June-Oct). Seeds start to mature ~3 weeks (occas 10 days) after blooming begins.

Habitat Invaded

Favorite habitat conditions: typically in moist, rich, deep, disturbed soils from low to mid (high) elevations; however, growth occurs in a wide range of conditions & soil types.

Favorite habitat types: hedgerows, roadsides, orchards, gardens, cult fields, pastures, dry prairies, wetlands, thickets.

Range

Native to Europe & Asia.

Wdsp throughout the PNW (OR, WA, CA, ID, BC) and temp N.Am (all the U.S. except the extreme se, sw Can, & Mex).

Distinguishing Characteristics

Hedge bindweed (*C. sepium* L.), which is very similar to field bindweed, occurs w of the Cas in similar habitats. It is a twining rhizomic perennial vine with very similar flowers. The main differences are flower size, and the size and location of the bracts. Hedge bindweed flowers are much larger, 4-7 cm long, with 2 large, heart-shaped bracts located at the base of the flower enclosing the calyx while field bindweed flowers are 1-2.5 cm long, with 2 small linear bracts located well below the flower about midway on the flowering stalk.

Another similar species is annual morning-glory (*Ipomoea purpurea* (L.) Roth). However, this species rarely escapes from cultivation in the PNW, and its large, showy flowers come in various colors.

Night-blooming morning-glory (*C. nyctagineus* Greene) is a native perennial with similar flowers; however, its stems are erect or trailing not twining like field bindweed's.

Wild buckwheat (*Polygonum convolvulus* L.), has twining stems and leaves similar to field bindweed, but it is an annual, has clusters of very small inconspicuous flowers, the leaf tips always end in long slender points, and leaf stocks have a thin papery covering where they attach to the stem.

History

Field bindweed was introduced from Europe into the US (Virginia) in 1739 and began its spread across the contry. All western states contained it by 1900. It was probably spread here as a seed contaminant, which is the main way seeds are spread long distances, however, they can also travel in animal's digestive tracts. Once seed is spread to a new site, field bindweed has little trouble establishing itself and creating a large colony, especially in cultivated fields. Not only does it produce a large amount of long lasting seed (viable up to 50 yrs), but it spreads quickly and extensively by underground rhizomes. Field bindweed colonies can grow 2 to 3 meters in diameter a year from rhizome growth alone. It regrows from rhizome pieces as small as 3 cm long; therefore, tilling a patch can scatter the species throughout a field and spread it to new fields if equipment is not cleaned immediately.

Field bindweed has been spreading rapidly into pastures and rangeland; however, healthy perinneal grasses can keep its populations low. Overgrazing or other disturbances that harm the perennial grasses can contribute to an explosion of bindweed growth.

Ecological Effects

Field bindweed twines around existing vegetation, eventually smothering it. In habitats suitable for heavy growth (disturbed wetlands, cultivated fields, orchards, gardens), it forms dense mats aboveground that out compete existing vegetation for light and masses of roots underground which readily absorb soil water and nutrients. This highly competitive underground system can ruin young and old orchards, and reduce crop yields by 50-60%.

It poses other problems in crops besides its competitive ability and fast spread. Its seed is hard to separate from crop seed, and the vines clog tilling and harvesting machinery. There are laws requiring control of field bindweed and banning transport of seed or roots. Resale value of agricultural land infested with field bindweed is noticably reduced, and field bindweed is still expanding its range. In Idaho, cropland infested rose from 140,000 acres in 1955 to 500,000 acres in 1989.

In 1989, a similar amount of Idaho's pasture and range land were infested with field bindweed. It is not a productive forage and can be toxic to livestock in high concentrations. Sheep have been known to graze it, cattle avoid it, and hogs have been reported to be poisoned by it. Other members of this family are known to be poisonous; therefore, grazing heavily infested areas could be a risk to livestock. Besides, heavy grazing will increase field bindweed populations.

Control Methods

Field bindweed is extremely difficult to control. It is a prolific seed producer and its seeds remain viable for 50 years. Its massive underground system can grow 3 meters deep with extensive lateral rhizomes. The rhizomes store vast quantities of back-up resources, and even small fragments can grow into new plants. Aboveground growth intertwines with desirable species making it difficult to target the bindweed. However, control and eventual eradication is possible with consistent, vigilant efforts.

First, seed production and vegetative growth must be controlled; this will lead to the death of the underground system after a few years. At this stage, competition with crops and desired species is virtually eliminated, but continued control is required for seedlings until the seed bank is exhausted.

Prevention: Prevention starts with eliminating the spread of seed. Avoid the use of contaminated crop seed or animal feed. Avoid running harvesting equipment over patches of field bindweed because it can scatter the seed. Do not allow equipment from an infested site onto uninfected sites without a thorough cleaning, which also helps prevent the spread of root and rhizome fragments.

Tillage spreads root and rhizome fragments, so avoid cultivating infested areas unless following specific control methods. Buy nursery stock with soil free of field bindweed seed or plants.

Pull or till seedlings immediately in previously uninfected areas; spray with herbicides if seedlings are over 6 weeks old. In established patches, control aboveground growth to prevent seed production and kill roots. Then, control seedling growth until the seed bank is exhausted. Integrate control methods to create a program best suited to your needs.

Mechanical: Plants can be removed by hand but this is only feasible for small patches or if the bindweed is near sensitive plants (rare, endangered, favored garden specimen). Aboveground parts can be clipped as they emerge, or the roots and rhizomes can be dug out as thoroughly as possible and all regrowth removed. All parts of the plant can resprout so pulled plants and roots must be disposed of appropriately. Regrowth must be clipped back at least every 14 days or the roots will never die; vigilant cutting will kill the root system in 3 to 5 years.

For larger infestations in crops, controlling by tillage is possible but only when used with specific methods. Regular tilling in crops can do more damage than good by spreading the roots and rhizomes, and it does not eliminate competition between field bindweed and the crop. In order to control the bindweed, fields must be tilled every 14 days for 3-5 growing seasons. If this routine is followed consistently, the roots will be killed, and the easier task of controlling seedlings begins. No crops can be grown during this 3-5 year time frame, but alfalfa/grass or green manure cover crops can be planted after fall freezing to reduce erosion and add organic material to the soil. A more detailed description of this method is given in the Cooperative Extension pamphlet on field bindweed (UICA 1990 Dec).

Burning and mowing are only effective when used with other treatments such as herbicides or cultivation.

Seedlings are easily controlled with tillage until they grow rhizomes (at about 6 weeks). After 6 weeks of age, control with herbicides.

Flooding works to control field bindweed plants; however, the seeds can withstand immersion for several years. Flooding is most effective in sandy soils.

Chemical✎: Seedlings under 2-3 years old are easily controlled with herbicides; however, herbicides often can not control the underground system of mature plants. Applying just before flowering often helps. The Cooperative Extension pamphlet on field bindweed (UICA 1990 Dec) can provide helpful information. It is best to rotate the type of herbicides used because field bindweed resists repeated applications of the same or similar herbicides.

Biological: Grazing is not an effective control for field bindweed. Heavy grazing by sheep can reduce field bindweed populations if the grazing is concentrated in an area for several years; however, this also destroys the desirable species in this area, and the bindweed will recover after grazing is stopped. Grazing can also scatter the seed of field bindweed creating a larger problem. A better solution is to establish healthy perennial grasses on range or pasture land. Once established, these grasses can compete with field bindweed and keep populations small.

This same idea can be applied to crops. Alfalfa will not eliminate field bindweed but competes well with it and is a good soil building crop when using other methods to control bindweed.

Biocontrol with parasitic organisms will likely prove ineffective because of the extensive underground system; parasites that attack the leaves will probably be ineffective in killing the plant. Also, general farming practices, such as using insecticides and tilling, are harmful to most biocontrol agents. Biocontrol agents are being studied. The most likely places for their use would be in noncrop areas such as pasture, rangeland, or forest.

Species Status

LIS, ODA-B

Synonyms

C. ambigens House; *C. incanus* auct. non Vahl; *Strophocaulos a.* (L.) Small

Other Common Names

orchard morning-glory, field morning-glory, morning-glory, wild morning-glory, bindweed, small bindweed, corn-bind and creeping Jenny

References

Alden et al. 1998; Crockett 1977; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; KCDNR; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; RDFG 1998; Taylor 1990; UICA 1990 Dec; USDA 1971; Whitson 1996; William et al. 1997

Himalayan Blackberry

Family: Rosaceae

Species: *Rubus discolor* Weihe & Nees

Season

Semi-evergreen. Flowers: June-August. Berries: July-September.

Habitat Invaded

Favorite habitat conditions: dry to moist areas at low elevs, often disturbed & open.

Favorite habitat types: woodland edge moving inward, riparian corridors, wetlands, meadows, pastures, burned or logged areas, roadsides, railroads, fence rows.

Range

Probably native to Eurasia.

Wdsp w of the Cas from BC to CA with scattered patches e of Cas (e.g., along the CR & the SR in OR, WA, & ID). Also found in n ID, nw MT, and is wdsp throughout the US.

Distinguishing Characteristics

There are only three common blackberry species in the PNW. The native trailing blackberry (*R. ursinus* Cham. & Schldl.) is a smaller plant than the introduced species. It has delicate trailing vines, smaller berries, and only three leaflets with the terminal leaflet having three lobes. *R. discolor* may have three leaflets but it typically has five, and none of the leaflets are lobed. The second most common blackberry in the PNW is the invasive species evergreen blackberry (*R. laciniatus* Willd.). The main difference between it and the more common Himalayan blackberry is in the leaflet. The leaflets of *R. laciniatus* are irregularly jagged and deeply incised giving them more of a mapleleaf shape while the leaflets of *R. discolor* are more oval and resemble a hazelnut or birch leaf. *R. laciniatus* leaflets are green-hairy on the underside not fuzzy-white, and its prickles are more curved or hooked than those of *R. discolor*.

History

There is some controversy concerning the origin of this species, but it is probably native to Asia. It spread through Europe and was introduced from England to N.Am as a crop plant for its delicious berries. It soon escaped from cultivation. Its seeds spread in the feces of birds and animals. It also spreads through underground growth and the rooting of vines as they touch the ground. It spreads rapidly in w OR and w WA which have ideal growing conditions for this species. This rapid growth and spread along with the thorny branches has discoraged its use for cultivation; however, it is now firmly established in the PNW. Its berries are still popular among birds, animals, and humans who use them in a variety of ways.

Ecological Effects

This is an aggressive species that grows over native vegetation killing it by shading or crushing. It creates impenetrable, monotypic stands that reduce habitat function. It also reduces runoff filtering and increases erosion due to the exposed soil under its branches. For a few species of animals, it provides some food and shelter.

Control Methods

R. discolor is a difficult species to control. Its thorns make it difficult to handle, it resprouts from an extensive root system, and in moist environments the cut vines can reroot.

Mechanical: In small or young patches, hand cutting the vines as they regrow can deplete the root system after 3 years and kill the plant. For faster control, supplement hand cutting by winter removal of the roots then replant with fast-growing native shrubs.

Hand removal is possible but very difficult and time consuming for large patches of *R. discolor*. When hand cutting, be sure to remove vines so that they do not resprout, especially in wet habitats.

Fire is an ineffective control. It either leaves the root system intact or it is so hot that the soil is left barren and open to further invasion.

Chemical✎: A more effective but potentially dangerous method for removal would be to use herbicides. Several herbicides can be effective. Appropriate precautions are essential near streams and wetlands.

Biological: Grazing by goats can keep canes suppressed but will not eliminate them.

There are currently no biological controls available for *R. discolor*, but a rust species may be available in the future.

Species Status

EPPC-A-1

Synonyms

Rubus fruticosus, Rubus procerus auct. non P.J. Muell. ex Genev

Other Common Names✱

References

Alden et al. 1998; DEA 1995 Oct; Fernald 1989; Furlong and Pill 1974; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; Pojar and MacKinnon 1994; Randall et al. 1981; Taylor 1990; William et al. 1997

Herbs/Flowers

Poison Hemlock

Family: Apiaceae Species: *Conium maculatum* L.

Season

Biennial. Flowering June-Aug.

Habitat Invaded

Favorite habitat conditions: open to shady, typically moist (can tolerate dry) disturbed areas at low elevation in rich, gravelly, or loamy soils.

Favorite habitat types: roadsides, ditches, stream banks, borders of pastures & cropland (gradually invading perennial crops), meadows, abandoned fields, gardens, parks.

Range

Native to Europe.

Along the West Coast, It is mainly located west of the Cas & the Sierra Nevada, where it is wdsp. Found throughout temp N.Am (US except an area between c MT & ne MN, sw Can) and Mex.

Distinguishing Characteristics

White flowered umbels, compound leaves and tuberous roots are common characteristics in this family so other factors are important in distinguishing poison hemlock from many other Apiaceae species. The following characteristics set poison hemlock apart from the rest: 1-large size (0.5-3 m tall) 2-purple splotched and streaked stem 3-musty-mousey odor 4-very finely divided leaves.

Queen Anne's lace (*Daucus carota* L.), a common invasive species that can be confused with poison hemlock, is typically found in much drier areas, is smaller (<1.5 m) with an unsplotched stem, and a denser umbel that often contains a purple central flower among the white ones.

The native, water hemlock (*Cicuta maculata* L.), is a similar species that also occupies wet areas; however, its leaves are not as finely dissected, it has a chambered base, and it has a cluster of fleshy roots opposed to a single fleshy taproot.

Species of the genus *Angelica* such as kneeling angelica (*A. genuflexa* Nutt.) can be distinguished by the once-divided leaflets. Kneeling angelica has a bend in the leaf stalk where the leaves attach, and it lacks the purple-splotched stem and musky odor.

Sium spp. have once-divided leaflets that are very narrow and lance-shaped. *Oenanthe* spp. grow in standing water, are without purple splotches on the stem, and have fibrous roots.

History

Poison hemlock was introduced as a garden ornamental for its size, attractive flowers and leaves, and its ability to grow under a variety of conditions. However, this plant is highly poisonous. In ancient times it was used to kill criminals, kings, politicians, philosophers and other enemies (Gilkey 1957; Bianchini and Corbetta 1975; Hickman 1996). It was a main constituent of the poisonous drink that killed Socrates.

It is an ancient Anglo-Saxon medicinal herb that was used as a sedative, to control muscle spasms, and for the sense organs (eyes, ears, nose) (Bianchini and Corbetta 1975). It has also been used to treat cancer, and as an anti-aphrodisiac and narcotic. Native Americans used the herb to bring good luck (Cooke 1997). The plant reproduces and spreads by seed. It easily escapes from gardens into natural and waste areas.

Ecological Effects

Poison hemlock will invade perennial fields, pastures, and meadows as well as parks. It is a hazard in public areas since it looks like many edible plants but is one of the most poisonous plants in the world. People often mistake it for parsley or other herbs. Children have been poisoned by using the hollow stem as a blow gun or whistle. Just handling the plant can cause contact dermatitis.

The plant is toxic to livestock, but is rarely grazed when other forage is available. However, cattle have been poisoned by eating the rosettes, and pigs have died from eating the roots.

Control Methods

Due to the plant's toxins, always wear gloves and protective clothing (long sleeves and pants); wash thoroughly after handling the plant.

Mechanical: The plant, along with its root, can be dug up. Removed plants should be placed in a plastic bag before being discarded.

Chemical✎: There are several appropriate herbicides that can control poison hemlock. Applications may need repeating.

Biological: *Agonopterix alstroemeriana*, a defoliating moth, has been accidentally introduced into the PNW. It effectively controls the foliage of poison hemlock and is widely distributed throughout the range of this species. The moth is available in mass collections for redistribution.

Species Status

EPPC-A-2, ODA-B

Synonyms✱

Other Common Names✱

References

Alden et al. 1998; Bianchini and Corbetta 1975; Clark 1974a; Cooke 1997; Foster and Duke 1990; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; KCDNR; Neihaus and Ripper

1979; Pojar and MacKinnon 1994; Polunin 1972; RDFG 1998; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Common Ragweed

Family: Asteraceae Species: *Ambrosia artemisiifolia* L.

Season

Annual—seedlings appear in early spring. Flowering: July-Oct.; with seeds maturing by Oct.

Habitat Invaded

Favorite habitat conditions: disturbed, open, often dry sites.

Favorite habitat types: vacant lots, roadsides, along ditches, old pastures, fields, cultivated ground, meadows, ocean beaches.

Range

Native to the e & nc states of the US.

Occas found in the PNW, e & w of the Cas, and is com throughout the western US. Wdsp in N.Am, especially in its native range.

Distinguishing Characteristics

Common ragweed is 0.7-2.5 m tall with 2- to 3-pinnately lobed leaves. Western ragweed (*A. psilostachya* DC.), a shorter (0.3-2 m) native, is very similar; however, western ragweed is a perennial with 1- to 2-pinnately lobed leaves and creeping roots that is common on rangeland and in perennial crops. The common ragweed has a taproot and is rarely in these habitats.

Giant ragweed (*A. trifida* L.) is also found in our area, but it is much larger (5 m or taller) and the leaves are palmately lobed with (0) 3 (5) lobes.

History

Common ragweed is a highly variable species in its native habitat. One form (var. *elatior*) is spreading rapidly in our area. It reproduces by seed.

Ecological Effects

Common ragweed is highly palatable to pigs and sheep; however, it can taint the milk of dairy cows with a disagreeable odor and/or flavor. It is not a severe threat to crops or rangeland due to its low competitive ability in these habitats. However, its growing numbers and range can be a tremendous problem to allergy sufferers. In the late summer, it produces a tremendous amount of highly allergenic pollen. Since our native allergy causing species release pollen in the spring and early summer, this extends our allergy season considerably.

Control Methods

Mechanical: Plants can be hand pulled. Try to remove as much of the root system as possible because root fragments left in the ground can form new plants. Repeated pulling will eventually kill the plant.

Chemical✎: Herbicides such as 2,4-D can kill the plant, but repeated applications may be necessary.

Species Status

LIS, ODA-B

Synonyms

Ambrosia elatior

Other Common Names

annual ragweed, hogweed, Roman wormwood

References

Crockett 1977; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; RDFG 1998; USDA 1971; Whitson 1996; William et al. 1997

Carduus species

Habitat Invaded

Favorite habitat conditions: uncultivated, open, especially grazed or otherwise disturbed, land.

Favorite habitat types: pastures, meadows, roadsides.

Distinguishing Characteristics

Table 2 Distinguishing characteristics between introduced *Carduus* species

Species	Flower Heads	Involucral bracts
musk thistle (*C. nutans*)	1, large & drooping	2-8 mm wide
Italian thistle (*C. pycnocephalus*)	(1)2-5, slender & densely clustered	<2 mm wide, woolly
slender-flowered thistle (*C. tenuiflorus*)	5-20, slender & densely clustered	<2 mm wide, generally hairless
plumeless thistle (*C. acanthoides* L.)	1-5, loosely clustered	<2 mm wide

Plumeless thistle and musk thistle can hybridize creating plants with intermediate characteristics. Plumeless thistle is not found in Oregon, but is found in e WA, n CA, ID, CO, and WY.

Italian thistle and slender-flowered thistle are very similar and are sometimes considered the same species. The two species can hybridize but rarely do so.

Cirsium is a similar genus, but the pappus of *Cirsium* thistles is branched (plumed).

Ecological Effects

These highly aggressive plants crowd out desirable species and form dense stands, especially following such disturbances as overgrazing. Along with reducing forage species, the plant's spiny stems and leaves keep livestock and wildlife from grazing nearby desirable plants. Spines also hinder livestock management, and restrict recreational activities in parks.

Control Methods

Small infestations can be removed mechanically or chemically. Controlling larger infestations often takes a combined approach of land enhancement through good management practices and chemical or mechanical removal of the infestation.

<u>Prevention</u>: Prevention can be taken in two steps. First, keep land well managed and healthy to resist invasion by *Carduus* species. Keep disturbances to a minimum—do not overgraze, burn, trample, or otherwise harm competitive species or expose the soil. The second step is to keep from

introducing *Carduus* seed. Use certified crop seed and clean hay, bedding and equipment. If there is a patch of *Carduus*, do not allow animals or vehicles in the area. Control plants before seeds develop--seeds can stick to equipment and clothing, furthering *Carduus* spread.

When a new infestation is found, remove the plants before any seeds are produced. Continue to check the area for thistles throughout the season--marking the boundaries of the infestation can be helpful.

<u>Mechanical</u>: The best form of control is to cut the stem below ground level before the seeds mature. Small infestations can be removed by digging.

Regular cultivation controls *Carduus* species.

Mowing *Carduus* thistles before they set seed might control the species if mowing is repeated until the seed bank is exhausted. Mowing procedures must be modified when used in conjunction with the biocontrol agent. Mowing at thistle bud stage can damage the weevil population. If using weevils and mowing to control thistles, mow in strips. This may concentrate weevils on the strips of remaining thistles.

Fire can be used as a management tool in heavy infestations. It will kill plants and exposed seeds; however, seeds protected in cracks and grooves will have ideal germinating conditions, so continued management is essential.

<u>Chemical✎</u>: The best time to apply herbicides is in the fall during seedling and rosette growth. Rosettes larger than 6" may be difficult to control with herbicides. Herbicides can also be effective in the spring just before flowering.

Repeated treatments will be necessary to control seedlings and missed plants. Herbicide use can be helpful in heavy infestations when used in conjunction with biological control options such as pasture improvement and management.

Biological: Create and maintain healthy pasture vegetation, especially a good stand of grass. This can prevent thistle invasion and even reduce thistle numbers in infested areas. Grow quick germinating, rapidly growing grasses by broadcast sowing in the fall. Annual overseeding can also control thistles in disturbed areas like livestock bedding areas. Applying a nitrogen fertilizer can increase grass in pastures managed for clover.

Rhinocyllus conicus, a seed head weevil, is the only biocontrol agent currently available. It is widely distributed, infesting large populations of musk, Italian, slender-flower, and plumeless thistles throughout the PNW. The weevil reduces spread by eating the seed; however, chemical or mechanical control is necessary to eliminate thistle populations.

Musk Thistle▲

Family: Asteraceae Species: *Carduus nutans* L.

Season

Biennial or winter annual. Flowering: June-Oct.

Habitat Invaded

Invades ditch and stream banks, fields, and forests, as well as the other areas invaded by the genus.

Range

Native to s Eur & w Asia.

Widely but sparingly introduced into the PNW. It is spreading rapidly in the Rocky Mnt States and is widespread in the US, Mex, & s Can.

History

Musk thistle was introduced into the U.S. in the early 1800s, and has spread rapidly. It reproduces only by seed.

Ecological Effects

The large flower heads provide nectar for insects.

Control Methods

Biological: Along with the introduced musk thistle seed weevil (*Rhinocyllus conicus*), two other biocontrol agents are found in the PNW, mainly in ID. They are *Casida rubiginosa*, a leaf beetle, and *Trichosirocalus horridus*, a root/crown weevil.

Species Status

LIS, ODA-B

Synonyms✱

Other Common Names

nodding thistle, nodding plumeless thistle

References

Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1992 Dec b; RDFG 1998; Taylor 1990; USDI; Whitson 1996; William et al. 1997

Italian Thistle▲

Family: Asteraceae Species: *Carduus pycnocephalus* L.

Season

Annual (sometimes a biennial)--seedlings germinate and develop a rosette in fall. Flowering: late spring (May-June). Seeds develop by mid July and the plant starts to die.

Range

Native to the Medit from s France to Turkey.

In Oregon, it can dominate foothill pastures in Douglas Co. Smaller infestations are located in Coos, Curry, Linn, Lane, Marion, and Yamhill cos. In WA, it is found in Whitman Co. It is also found in CA, TX, Argentina, Austr, and New Zealand.

History

Introduced into Oregon in the 1920s, it now infests 80,000 to 100,000 acres of pasture in Douglas Co alone. In 1991, it was found in a hay stackyard in Whitman Co, WA, probably introduced in contaminated hay from ID. It reproduces and spreads by seed, often as a contaminant in commercial seed such as ryegrass, tall fescue, and meadow fescue. Seed can also spread by sticking to animals and equipment.

Italian and slender-flowered thistle plants can produce large numbers of seeds. Each flower head produces two types of seed. The seeds of the outer flowers lack a sticky surface and pappus. They disperse with the old flower head as it decays. These seeds can remain dormant in the soil for up to 7 years, but typically germinate within 3 years. The seeds of the inside flowers are more plentiful (11-12 per head vs. 2-3). They have a pappus and a sticky surface to aid in their dispersal. These seeds germinate when there is sufficient water and do not typically have a long dormancy period.

In Oregon and California, Italian and slender-flowered thistles mainly invade annual rangelands. Disturbance such as overgrazing, trampling, and fire allow it to spread rapidly by exposing the soil and reducing competition. This is especially true in rangelands consisting of annual grasses and subterranean clover.

Species Status

LIS, ODA-B

Synonyms✱

Other Common Names

compact-headed thistle, Italian plumeless thistle

References

Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1992 Dec b; Whitson 1996; William et al. 1997

Slender-flowered Thistle▲

Family: Asteraceae Species: *Carduus tenuiflorus* Curtis

Season

Annual (sometimes a biennial)--seedlings germinate and develop a rosette in fall. Flowering: late spring. Seeds develop by summer.

Range

Native to c Eur and the w Medit. Its range overlaps that of Italian thistle in s France, Spain, & Italy.

Slender-flowered thistle's invaded range is similar to that of Italian thistle (p. 68); however, in WA, it is found in Thurston Co not Whitman Co.

History

Slender-flowered thistle was first collected in Oregon in 1939 and in Thurston Co, Washington in 1991. In Oregon and California, it grows in mixed stands with Italian thistle. It reproduces and spreads by seed, often as a contaminant in commercial seed such as ryegrass, tall fescue, and meadow fescue. Seeds can also spread by sticking to animals and equipment.

Plants produce two types of seed which have different dispersal methods and dormancy times. See Italian thistle (p. 68) for a detailed description.

Species Status

LIS, ODA-B

Synonyms

Carduus tenuifolius

Other Common Names

winged plumeless thistle

References

Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1992 Dec b; Whitson 1996; William et al. 1997

Distaff Thistle

Family: Asteraceae Species: *Carthamus lanatus* L.

Season

Winter annual. Germination: fall-early winter. Rosette formation: winter-late spring; the rosette dies when the flowering stem develops. Flowering: late spring-summer (May-Aug); the flowering stems stay upright and stiff through winter.

Habitat Invaded

Favorite habitat conditions: disturbed ground with heavy to light soils, esp in areas with 16-24" of annual rainfall.

Favorite habitat types: pastures, rangeland, winter crops.

Range

Native to the Medit region.

There are scattered populations located in Douglas Co, OR. It is also found in CA, e US, and Austr.

Distinguishing Characteristics

Yellow flowers with red veins distinguish this thistle from all other common thistles in the PNW.

History

It was probably introduced into Douglas Co from imported Californian livestock. It reproduces and spreads by seed. The heavy seeds either fall to the ground near the plant or stay in the old flower heads, allowing them to spread farther distances on animals or equipment. Seeds can remain viable for 8 years, but they typically germinate within 2 years. Healthy perennial pastures resist infestations; however, disturbance and cropping, with exposed ground in between rows, allow distaff thistle to spread rapidly. It seems to be gaining ground in the PNW and has the potential to become one of our worst annual thistle invaders.

Ecological Effects

Disturbances, such as heavy grazing, reduces the competitive efficiency of native species and allow distaff thistle to spread rapidly. This can result in dense thistle patches which are avoided by livestock and wildlife. Animals that are unable to avoid distaff thistle can be injured by the spiny leaves and bracts; the eyes and mouths of grazing animals are especially vulnerable to injury.

Distaff thistle has the potential to become a serious problem in crops with exposed soil between the rows which it can invade readily. Regulations in

Oregon require the control of distaff thistle; therefore, having this weed requires an expenditure of time and money.

Control Methods

Prevention: Keep disturbances to a minimum: do not overgraze or leave bare patches in between crop plants during thistle germination (fall-early winter). Keep pasture vegetation vigorous, and avoid introducing distaff thistle seed. If a patch of distaff thistle occurs, eliminate the production of seed immediately to halt further spread.

Mechanical: In small patches, stems can be cut below ground level and then removed. Larger patches can be mowed. Patches should be mowed just before the flower bud is formed. If mowed too early, the plants can form new flower stems. If mowed too late, the plants have enough reserved energy to still create viable seed.

Chemical✎: When using herbicides, it is best to control plants in the seedling or rosette stage. Mature plants are much more difficult to control with herbicides. There are several herbicides available.

Biological: Creating and maintaining vigorous pasture vegetation or crops is essential to any control program used.

Species Status

EPPC-NMI, ODA-A

Synonyms✵

Other Common Names

safflower, woolly distaff thistle

References

Cousens and Mortimer 1995; Hickman 1996; PNWEP 1992 June c; Whitson 1996

Centaurea species

Distinguishing Characteristics

There are several *Centaurea* species introduced into the PNW. The most reliable method to differentiate between the knapweeds is to observe the bracts in the involucre. Plant form and seeds can be used to double check identification. Flower color, in general, is too variable to use as a main diagnostic. A helpful key, "Identification of Knapweeds and Starthistles in the Pacific Northwest (PNWEP 1993 Jan)," is available through the OSU extension service.

Control Methods

<u>Prevention</u>: New infestations must be detected early and controlled before they can spread. Avoid contaminated hay or crop seed and disturbances such as overgrazing which increase the chance for invasion. Control plants established along roadsides (etc.) because they are the main source of invading seed. Maintaining healthy, vigorous vegetation in pastures and rangeland can slow invasion by knapweeds.

Chemical✎: When using herbicides, it is best to spray plants in the seedling or rosette stage. Mature plants are more difficult to control. Regrowth and seedling growth often occur; therefore, herbicides must by reapplied annually for several years. Establishing a cover of perennial grasses will help reduce *Centaurea* regrowth and seedling establishment. Several herbicides are available.

Diffuse Knapweed ▲

Family: Asteraceae Species: *Centaurea diffusa* Lam.

Season

Typically a biennial, but can range from an annual to a short-lived perennial. Flowering: June-Sept.; or later in a mild, wet year. Stems die after seeds mature. These pale colored, dead stems remain standing for some time, eventually breaking off and tumbling around in the wind.

Habitat Invaded

Favorite habitat conditions: dry, disturbed areas.

Favorite habitat types: roadsides, cultivated fields, grasslands, pastures, and rangeland.

Range

Native to se Eur and w Asia.

In OR, it mainly occurs in the ne and nc cos, but it is also found in Jackson and Multinomah cos and is spreading rapidly. It is wdsp e of the Cas in WA, n into BC & e through ID into w & c MT. It is also found in CA, NV, WY, NE, IA, IL, MI, MA, CT, RI.

Distinguishing Characteristics

Diffuse and spotted knapweeds can be confused. This is because diffuse knapweed bracts can have the spotted appearance normally associated with spotted knapweed, and spotted knapweed can lack its spotted coloring. Diffuse knapweed bracts always have a long sharp terminal spine, and spotted knapweed bracts always have a soft terminal projection that is shorter than the marginal projections.

History

Diffuse knapweed was introduced in the early 1900s, possibly as a contaminant in alfalfa seed. It is highly efficient at spreading its seed. The seeds remain on the plant when the stem dies. When the stem breaks off at ground level, it tumbles along in the wind depositing seed as it goes. Partly because of this tumbleweed capability, it has spread rapidly in the PNW and is still expanding its range.

Ecological Effects

Diffuse knapweed can spread rapidly in rangeland, especially in overgrazed and disturbed areas where it can eliminating desirable species and drastically reduce the value of the land. As it invades, unpalatable species like itself, other knapweeds, Dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*), and medusahead rye (*Taeniatherum caput-medusae*) take over rangeland, sometimes making the land unusable for grazing (Williams 1997). Diffuse knapweed also invades croplands. It is a highly competitive plant and not only threatens disturbed communities but also invades grasslands, threatening the composition of natural communities as well as the productivity of agricultural land.

Control Methods

Mechanical: Small patches can be controlled by hand pulling individual plants. It is important to control when the plants are young and to remove all of the major roots. Pulling must be repeated for many years before plants and seeds are eliminated.

Biological: There are several biocontrol agents for diffuse knapweed in Oregon. There are three agents that are widely available for distribution: two seed head gall flies (*Urophora affinis* and *U. quadrifasciata*) and one root boring/gall weevil (*Sphenoptera jugoslavica*). The gall fly larvae reduce seed heads thereby slowing spread, and the root weevil larvae feed in the taproot causing a gall to form and stress the plant which reduces productivity. Two seed head weevils *(Bangasternus fausti* and *Larinus minutus)* are effective biocontrol agents, but have a limited availability. *Pterolonche inspersa*, a root boring moth, has also been classically introduced, but it is still being studied. A rust fungus (*Puccinia jaceae* var. *diffusae*) has been found on diffuse knapweed in Oregon; it might prove to be an effective control in the future.

Species Status

EPPC-A-2, ODA-B

Synonyms

Acosta diffusa (Lam.) *Sojak*

Other Common Names

tumble knapweed, spreading knapweed, white knapweed

References

DEA 1995 Oct; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; Muzik 1970; PNWEP 1993 Jan; Taylor 1990; USDA 1971; William et al. 1997; Williams 1997

Spotted Knapweed▲

Family: Asteraceae   Species: *Centaurea maculosa* Lam.

Season

Short-lived perennial. Rosettes appear in early spring the first year. Flowering stems appear the second spring. Flowering: July-Oct.; longer in a mild, wet year, shorter in a dry, hot year.

Habitat Invaded

Favorite habitat conditions: open, disturbed ground at low elevations, esp where dry.

Favorite habitat types: roadsides, high floodplains, fields (cultivated & abandonded), gravelly or sandy pastures, rangeland, open forests, sagebrush prairies.

Range

Native to Eur.

In OR, it is mainly found e of the Cas but travels farther west along the CRG. It is found e of the Cas from s BC to s CA, and is wdsp in nc US, esp in MT, & is spreading (ID, UT, WY, ND, SD). It is found throughout the e US, excluding the s states, and in s Can.

Distinguishing Characteristics

Confusion can occur between diffuse and spotted knapweeds (p. 76).

History

Spotted knapweed was introduced to the w U.S. from Europe in the early 1900s, probably as a seed contaminant in alfalfa and clover seed. It reproduces by seed, which can be accidentally carried by people and vehicles or as a contaminant in commercial seed. This species is very aggressive. It has spread through 4 million acres in Montana alone. The herbicide injunction in 1984 for Forest Service and BLM lands in Oregon allowed spotted knapweed to spread unchecked into previously unoccupied habitats such as Hells Canyon along the Dug Bar Road. After the injunction was lifted in 1989, progress, though difficult and costly, has been made in halting the spread of spotted knapweed and reclaiming some of the invaded land (Williams 1997).

In an exchange program offered by the Oregon State Department of Fish and Wildlife, spotted knapweed infestations have been reduced by about 80% in the Blue Mountains of Oregon. Landowners allow hunting on their property in exchange for habitat improvement typically in the form of spotted knapweed removal. This benefits both livestock and wildlife in the area. (Williams 1997)

Ecological Effects

This aggressive species is highly competitive. It establishes itself on disturbed soils, grows in early spring when water and nutrients are available, and is possibly allelopathic. It spreads rapidly into natural communities and rangeland. It is Montana's worst rangeland weed, sometimes eliminating all forage; forcing ranchers to subdivide and sell to developers (Williams 1997). Bunchgrass has been reduced by 97.8% in western Montana, eliminating forage for elk, deer, big horn sheep, and other grazers (Williams 1997). This loss of habitat also effects small and mid-sized mammals, reptiles, and birds. Loss of habitat due to invasion by spotted knapweed and sulfur cinquefoil (*Potentilla recta*) is eliminating the U.S.' last Columbian sharptailed grouse (Williams 1997). Six of 21 plant species were reduced to "rare" status in Glacier National Park after just 3 years of invasion from spotted knapweed (Williams 1997). It accelerates erosion by reducing native perennial grasses which contain earth clinging fibrous roots (Williams 1997). Along the Snake River and its tributaries, this can further the decline of troubled aquatic species such as bull trout, steelhead, and Chinook and sockeye salmon.

Control Methods

Mechanical: Small patches can be easily pulled by hand. The plants can then be stacked and burned.

Biological: There are 11 biocontrol agents for spotted knapweed in Oregon. Five of these agents are widely available for redistribution: two seed head gall flies (*Urophora affinis* and *U. quadrifasciata*), a root boring moth (*Agapeta zoegana*), a seed head moth (*Metzneria paucipunctella*), and a seed head weevil (*Larinus minutus*). All can slow the spread of spotted knapweed. Three biocontrol agents have a limited availablity: a seed head weevil (*Bangasternus fausti*) and a root boring/gall beetle (*Sphenoptera jugoslavica*) that provide good control, and a root boring/gall weevil (*Cyphocleonus achates*) whose control abilities are unknown. The other biocontrol agents are unavailable for redistribution, and their effectiveness is unknown. These species compose of two seed head flies (*Chaetorellia acrolophi* and *Terellia virens*), a seed head weevil (*Larinus obtusus*), and a root boring moth (*Pterolonche inspersa*).

Species Status

EPPC-RA, ODA-B

Synonyms

C. m. auct. non Lam., *C. biebersteinii* DC., *Acosta maculosa* auct. non Holub

Other Common Names✵

References

Alden et al. 1998; Clark 1975a; Cousens and Mortimer 1995; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Jolley 1988; Muzik 1970; PNWEP 1993 Jan; RDFG 1998; Taylor 1990; USDA 1971; USDI; Whitson 1996; William et al. 1997; Williams 1997

Meadow Knapweed ▲

Family: Asteraceae   Species: *Centaurea pratensis* Thuill. non Salisb.

Season

Perennial. Flowering: July to Sept, into Nov. w of the Cascades.

Habitat Invaded

Favorite habitat types: roadsides, fields, and pastures.

Range

Native to Eur.

In OR, it is com w of the Cas, esp in the WV. It is found from BC to n CA, and e to ID & MT.

Distinguishing Characteristics

Meadow knapweed is a hybrid between black knapweed (*C. nigra* L.) and brown knapweed (*C. jacea* L.) and can, therefore, be quite variable. In general, its foliage, bract color, and enlarged outer flowers are similar to brown knapweed; however, the deep fringing of the bracts is closer to black knapweed.

History

Meadow knapweed is a hybrid between black knapweed (*C. nigra*) and brown knapweed (*C. jacea*). It originated in Europe, and is self-perpetuating.

Ecological Effects

Meadow knapweed occupies habitats similar to those of the other highly invasive knapweeds in Oregon; therefore, it is possible that its effects on the environment are similar as well.

Control Methods

Biological: Establishing a perennial grass cover will help reduce regrowth and seedling establishment, especially when used with chemical control measures.

One biocontrol agent, *Urophora quadrifasciata*, an accidentally introduced seed head gall fly, has a limited availability in the PNW.

Species Status

A-2, ODA-B, LIS

Synonyms

C. nigra L. X *jacea* L., *C. debeauxii* Gren. & Godron, *C. d.* ssp. *thuillieri* Dostal

Other Common Names

Protean knapweed, hybrid knapweed

References

Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1993 Jan; Whitson 1996; William et al. 1997

Russian Knapweed ▲

Family: Asteraceae Species: *Centaurea repens* L.

Season

Long-lived perennial. Flowering: June-Sept.

Habitat Invaded

Favorite habitat conditions: disturbed areas, tolerates drought.

Favorite habitat types: roadsides, irrigation ditches, meadows, pastures, hay fields, cultivated crops.

Range

Native to the Caucasus mnt system that is located between the Caspian and Black seas in ne Eur.

In the PNW, it is located mainly e of the Cas from BC to CA. It is found throughout the w & central US and adj Can (ID, MT, Alberta, CO, WY, UT, ND, & SD).

History

Russian knapweed was introduced from its native homeland to North America around 1898, probably as a seed contaminant. It spreads from rhizomes and from seeds which it produces in abundance. Spreading rhizomes can form dense colonies. Seeds can spread in old plants after they are broken off and tumble around in the wind. They can also spread in hay and commercial seed.

Ecological Effects

This weed is unpalatable and avoided by grazers; therefore, overgrazing an area infested with Russian knapweed increases its competitive advantage. It invades crop land, becoming especially noxious in corn, alfalfa, sugar beats, and forage-seed crops.

Control Methods

Prevention: Russian knapweed is very difficult to control after it is established due to its deep, creeping underground system and abundant production of seeds.

Mechanical: Flooding controls Russian knapweed; however, it is most effective in sandy soils.

Biological: Oregon has one biocontrol agent for Russian knapweed, *Subanguina picridis*, a stem/leaf gall nematode. It has a fair ability to control Russian knapweed; however, it is not widely distributed or available for redistribution.

Species Status

EPPC-A-2, ODA-B

Synonyms

Acroptilon repens (L.) DC., *Centaurea picris* Pallas ex Willd.

Other Common Names

Turkestan thistle, hardheads

References

DEA 1995 Oct; Gaines and Swan 1972; Gilkey 1957; Hitchcock and Cronquist 1973; Jaques 1959; Muzik 1970; Neihaus and Ripper 1979; PNWEP 1993 Jan; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Yellow Star-thistle ▲

Family: Asteraceae
Species: *Centaurea solstitialis* L.

Season

Annual (occas biennial). Seedlings may appear in early spring, but most germinate in fall. Rosettes form from March-May. Plants bloom from June-Aug (Sept. in moist sites). Plants die in the fall leaving a leafless, silver-gray skeleton with cottony seed heads that gradually lose their spines through the winter.

Habitat Invaded

Favorite habitat conditions: typically found in disturbed sites with various soils at low elevations.

Favorite habitat types: roadsides, cultured and fallow fields, rangeland, pastures, disturbed and natural grasslands (esp. perennial grasslands), disturbed woodlands, disturbed desert shrub communities,.

Range

Native to Medit Eur and n Africa.

In the PNW, it is found mainly e of the Cas from BC to CA. It is also found in ID, MT, CO, UT, and s Can; and is scattered throughout the rest of the US.

Distinguishing Characteristics

Yellow star-thistle is one of the easier knapweeds to identify because of its woolly-gray appearance, yellow flowers, and the long sharp terminal spine on the bracts that is round in cross section. There is one similar species in Oregon and California, Malta star-thistle (*C. melitensis* L.). The long terminal spine on Malta star-thistle's main bracts is flattened and hemispherical in cross section. This spine is branched with two lateral spines near its top and two pair of lateral spines near its base. Yellow star-thistle's long central spine is unbranched but has two pair of lateral spines near the base.

Sicilian star-thistle (*C. sulphurea* Willd.) is another yellow star-thistle occurring in California. It has a hemispheric shaped terminal spine that is dark brown or purple instead of straw-colored, and it is unbranched with 3-4 pairs of small spines at its base.

Two other star-thistles occur in the west, each with purple flowers, purple star-thistle (*C. calcitrapa* L.) and Iberian star-thistle (*C. iberica* Spreng.); however, neither are known to occur in Oregon.

History

Yellow star-thistle was probably first introduced into North America in contaminated crop seed, possibly alfalfa. This is the likeliest method of introduction into California, which occurred by the early 1800s. Yellow star-thistle seeds have been found in adobe bricks dating from the early 1800s and are included in university plant collections dated from the mid and late 1800s. It was first reported in the PNW at the turn of the century in Walla Walla, WA. By the 1920s, it started spreading into PNW grasslands. It has spread to more than 1 million acres in CA, 300,000 acres in ID, 150,000 acres in WA, and 150,000 acres in OR. It seems to have reached its northern and southern limits in the west, but it is still spreading within these boundaries at rates of 7,000-20,000 acres per year. (OSUES 1995 May; ODA 1997 b)

An example of how it spreads into an area can be seen at Fairfield Osborn Preserve in California. It first entered into this grassland and oak savanna preserve along trails. Soon, it started invading undisturbed grasslands, and within a few years, it became dominant over large sections of the 210 acre preserve (Randall 1993).

Yellow star-thistle reproduces and spreads by seed which it produces in abundance. Under ideal conditions, a single plant can produce 150,000 seeds; however, seed production varies widely depending on plant density, spring precipitation, and soil nutrients. Dense stands produce 20-120 seeds per plant or 5,000-21,000 seeds per square yard with as many as 60% viable at maturity, and 10% of these can remain viable in the soil for up to 10 years. (OSUES 1995 May; ODA 1997 b)

Plants produce two types of seed: plumed and plumeless. The majority of seeds are plumed. These are released from the plant after they reach maturity (July-Sept.). Plumeless seeds stay on the plant much longer and disperse long after the plant has died (Nov.-Feb.). It is typically the plumeless seeds that are long-lived, remaining in the seed bank for many years.

About 90% of the seeds land within 2 feet of the parent plant creating a slow but constant line of invasion (OSUES 1995 May; ODA 1997 b). Seeds can also be dispersed long distances. Birds eat the seeds which may occasionally pass through their system unharmed. Other animals, humans, wind, and vehicles can also aid in long-distance dispersal.

Contamination in crop seed allows star-thistle to start infestations in several different locations. Contaminated grass seed was planted in the Wallowa Whitman National Forest in ne Oregon after a fire in 1988. The star-thistle could have been easily eliminated at this early stage with herbicides, but the herbicide injunction enacted in 1984 for Forest Service and BLM lands in Oregon prevented this action. Consequently weed has spread and is now a major problem in this area. (Williams 1997)

Ecological Effects

Yellow star-thistle has been spreading rapidly in rangeland and disturbed areas throughout the west. It can invade disturbed areas like desert shrub and annual or perennial grasslands with shallow soils; however, it prefers grasslands (disturbed or not) with deep loamy soils. South facing slopes and 12-25" of winter/spring precipitation are also conditions optimal for yellow star-thistle growth. Yellow star-thistle germinates quickly and grows faster than most of the species in these habitats giving it a competitive advantage. It grows a long taproot allowing it to get to and use resources before its competitors, which is especially advantageous in deep soils or with annual grasses or young perennial grasses. Healthy, established perennial grasses can limit yellow star-thistle invasion. Winter/spring precipitation and good light allow seedlings to become established during the plant's most vulnerable time. Star-thistle can become a permanent member of dense, shallow soiled communities, or a dominant member of deep soiled communities.

Often, it will spread through pasture and rangeland reducing forage value. The spines can injure livestock and wildlife trying to graze it. Horses can be poisoned by it causing "chewing disease" which permanently affects the nervous system. It eliminates habitat for large to small mammals, reptiles, and birds which are eliminated from areas dominated by yellow star-thistle. It even affects fish like bull trout, steelhead, and Chinook and sockeye salmon which are harmed by the large amounts of sediments washed from sites previously occupied by native perennial grasses. These native grasses have fibrous root systems that hold the soil in place, unlike the taprooted star-thistle. As star-thistle crowds out native plants, it not only eliminates habitat for livestock and wildlife, but can also endanger rare species of plants. In southern Oregon, it is endangering some of our rarest species such as *Lomatium cookei* an umbel found only in a few sw Oregon sites (Randall 1993).

It takes a considerable amount of time and money to control yellow star-thistle. Efforts are being made to find biological control agents which could relieve high cost control efforts like those done atop Weissenfels Ridge along the Snake river in Washington. Here, herbicides must be sprayed by helicopter which costs at least $25 an acre over land worth no more than $75 an acre. These high costs keep land owners from providing control so the Federal government assumes control responsibility. (Williams 1997)

Control Methods

Prevention: Prevent the establishment of yellow star-thistle, because once it is established, control requires a long-term commitment and total eradication is probably not possible. Prevent the establishment of seed by cleaning equipment and purging animals coming from infested areas; check hay, grain, and commercial seed for star-thistle seed before purchase and transport. Maintain healthy, vigorously growing perennial grasses in pasture and rangeland, and keep disturbance to a minimum.

Even with optimal range management, invasion can occur; therefore, a good monitoring program is also required. Regularly monitor susceptible areas and roads and trails that lead to these areas. If a new infestation is found, eliminate it immediately before a seed bank can form. If established infestations exist, eliminate spread from their boundaries and control with one or more of the following methods.

Mechanical: Hand pulling is used to control yellow star-thistle. It can be quite effective; however it takes a long-term time commitment in order to deplete the seed bank. For example: 700 yellow star-thistle plants were found in the Pueblo Mountains in se OR in 1992. These were immediately hand pulled. When rechecked the next year, 2000 plants where found and pulled. The next year (1994) only six plants where found and pulled; 30 plants were pulled in 1995 and 3 in 1996 (Williams 1997).

Hand pulling is not always this effective. Volunteers can get discouraged when they return to the same site year after year and a new patch of star-thistle is always waiting for them. In this case, it is good to remind them that they are making a difference by eliminating the seed bank. It may take several years to see the results, but the seeds are only viable in the soil for up to 10 years.

Chemical: Herbicides are typically used to control yellow star-thistle infestations, and can be very effective when controlling plants in the seedling or rosette stage (spring and early summer). Small new infestations can be eliminated with herbicide use, larger well established infestations will probably never be completely eradicated but can be contained. Herbicides need to be reapplied annually for several years because of the extensive seed bank.

Biological: There are 6 biocontrol agents for yellow star-thistle in Oregon. All of these agents are widely available for redistribution: a seed head gall fly (*Urophora sirunaseva*), three seed head weevils (*Bangasternus orientalis, Larinus curtus,* and *Eustenopus villosus*), and two seed head flies (*Chaetorellia australis* and *C. succinea*). The last three have an excellent ability to prevent or reduce seed production in yellow star-thistle while the others have a good ability for control.

Biocontrol agents are an excellent choice for locations difficult or too costly to control with other means. However, when used alone, such agents will take a decade or more to reduce populations, and they will never eradicate a population.

Species Status

EPPC-A-2, ODA-B

Synonyms

Leucantha solstitialis (L.) A. & D. Love

Other Common Names

St. Barnaby's thistle, Barnaby's thistle, tocalote

References

Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Jolley 1988; Muzik 1970; Neihaus and Ripper 1979; ODA 1997 b; OSUES 1995 Jan; OSUES 1995 May; PNWEP 1993 Jan; Polunin

1972; Randall 1993; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997; Williams 1997

Squarrose Knapweed▲

Family: Asteraceae   Species: *Centaurea squarrosa* Willd.

Season

Long-lived perennial. Plants can stay in the rosette stage for several years before growing a flowering stem, especially under unfavorable conditions. Flowers occur from June through August and seeds disperse from August through winter. Dead stems persist even after seed dispersal is finished.

Habitat Invaded

Favorite habitat conditions: disturbed or rocky/degraded sites.

Favorite habitat types: shrub steppe or open wooded rangeland.

Range

Native to sw Asia and the Mid East

In OR, it is known from Grant Co and near the Malheur River in Malheur Co. It is also found in CA (Lassen, Modoc, Shasta, and Siskiyou cos), and w UT (Juab, Tooele, Millard, Utah, and Sanpete cos).

Distinguishing Characteristics

Squarrose knapweed can be confused with diffuse knapweed; however, squarrose knapweed heads are narrower, and contain fewer flowers and recurved spines. Squarrose knapweed seed heads fall off soon after maturity, leaving a headless skeleton, while diffuse knapweed heads remain longer.

History

It is not known how squarrose knapweed was originally introduced into n CA and UT; but, by the early 1950s, it was an established weed. A large infestation was found in Grant Co., OR in 1988 (600 acres), and more was found near the Malheur River, Malheur Co, OR in 1991. It is reported in approximately 1,600 acres in n CA, and over 100,000 acres in UT; however, it is probably more widespread (esp in s UT and e OR) than has been reported because of the abundance of diffuse knapweed which it can be mistaken for.

It is a long-lived perennial, able to stay in the rosette form until conditions are favorable. It spreads by seed. The seeds stay in the seed head which start to fall from the plant in late summer. Some seed heads stay on the plant through the winter into early spring, allowing a long window for dispersal. Most of the heads fall near the plant; however, the recurved spines allow the seed heads to attach to passing animals, people, vehicles, or other machinery for long range dispersal. The main spread through n CA and UT has been along sheep trails where seeds disperse by traveling in the sheep's wool. Likely places to find squarrose knapweed are along past and present sheep trails and in areas receiving range products from n CA or UT.

Ecological Effects

Squarrose knapweed is a highly competitive plant in rangeland. It crowds out native species and planted range grasses like crested wheatgrass. This reduces forage materials for livestock and wildlife because mature knapweed plants are unpalatable. It also reduces biodiversity and modifies wildlife habitat which leads to fewer species of birds and other animals.

Control Methods

Prevention: It is unknown how long seeds remain viable in the soil, but buried seeds probably last longer than unprotected seeds.

Mechanical: Hand pulling is not effective because the roots break off and can produce new plants. Cultivation or grubbing can work for small infestations. The plants must be cut off a least 8" below the soil and intact rosettes with roots must be removed. Disking more than once can reduce the number of intact rosettes.

Chemical: Herbicides can be used for small infestations or combined with improved range management techniques for large infestations.

Biological: There are two biocontrol agents for squarrose knapweed in Oregon. They are both seed head gall flies (*Urophora affinis* and *U. quadrifasciata*) which are biocontrol agents for diffuse and spotted knapweeds as well. Their availability for squarrose knapweed populations is limited because their control ability for this species is undetermined; however, they do reduce seed production.

Species Status

EPPC-RA, ODA-A

Synonyms

C. virgata Lam. var. *squarrosa* (Willd.) Boiss., *C. v.* Lam., *C. variegata* Lam., *C. variegata* var. *squarrosa* (Willd.) Boiss., *C. triumfettii* All.

Other Common Names✵

References

Hickman 1996; Muzik 1970; OSUES 1995 Jan; PNWEP 1993 Jan; PNWEP 1996 Jan; Whitson 1996; William et al. 1997

Pineapple Weed

Family: Asteraceae — Species: *Chamomilla suaveolens* (Pursh) Rydb.

Season

Annual. Flowering: May-Oct.

Habitat Invaded

Favorite habitat conditions: esp com in disturbed sunny areas with compacted soils at low to mid elevations.

Favorite habitat types: vacant lots, trails, roadsides, railroad embankments, lawns, gardens, cultivated fields, farm yards, grazed areas, clearings, burns, sand bars, river banks.

Range

Native to nw N.Am &/or ne Asia.

It is possibly a native species to Oregon. It is com throughout Oregon and the West (AK to Baja CA, e to MT & AZ). It is found throughout N.Am and Eur.

Distinguishing Characteristics

Pineapple weed is short (10-20 cm) with finely dissected leaves, yellow button-like flower heads that lack ray flowers, and a fresh pineapple scent. The leaves of pineapple weed resemble mayweed chamomile (*Anthemis cotula* L.), but mayweed has white ray flowers and an unpleasant odor.

Pineapple weed could be mistaken for common tansy (*Tanacetum vulgare* L.) because of the similar flower heads and leaves; however, tansy is much larger (0.5-2 m tall) and lacks the pineapple sent.

Two other rarely introduced species that are similar are scentless mayweed (*Matricaria maritima* L.) and wild chamomile (*Matricaria chamomilla* L.). However, both of these species have white ray flowers. Scentless mayweed is scentless, and wild chamomile is aromatic.

History

Pineapple weed appears to be native to our area and introduced into Europe. It reproduces by seed.

Pineapple weed has been used traditionally as a kind of cure-all. It is used for several medicinal purposes, for cosmetic purposes, and as a food and tea item. It is used in pillows and sent sachets, and the tea can be used externally to repel insects. (Schofield 1989, Foster and Duke 1990, Pojar and MacKinnon 1994) It can also be used as a substitute for wild chamomile in herbal remedies (Schofield 1989).

Ecological Effects

This is not an aggressive weed; however, it can cover large areas of disturbed compacted soils where there is limited competition. From these areas, it can move into yards, gardens, and cultivated fields.

Some people are allergic to it. Their skin can be irritated from handling it. It can also cause stomach irritation and vomiting if frequent, large quantities are consumed.

Control Methods

Mechanical: Cultivation will control pineapple weed, mowing will not.

Chemical✎: There are several herbicides available that will control pineapple weed. Several applications might be required.

Biological: Planting competitive grasses in areas like orchards achieves a fair amount of control.

Species Status

EPPC-A-1

Synonyms

Matricaria matricarioides auct. non (Less.) Porter, *M. discoidea* DC., *M. suaveolens* (Pursh) Buch., non L., *Tanacetum s.* (Pursh) Hook., *Santolina s.*

Pursh, *Lepidotheca s.* (Pursh) Nutt., *Lepidanthus s.* (Pursh) Nutt., *Artemisia m.* Less., A. m. auct. non Less.

Other Common Names

wild chamomile, dog fennel, disc mayweed

References

Cousens and Mortimer 1995; Crockett 1977; Foster and Duke 1990; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; Polunin 1972; RDFG 1998; Schofield 1989; Taylor 1990; Whitson 1996; William et al. 1997

Rush Skeleton-weed

Family: Asteraceae Species: *Chondrilla juncea* L.

Season

Perennial. Rosette from taproot or seed: fall-early spring. Flowering stem: mid April-early June. Bloom & seed production: July-Sept.

Habitat Invaded

Favorite habitat conditions: typically disturbed areas with well-drained, sandy or gravelly soils.

Favorite habitat types: rights-of-way, roadsides, cropland, grain fields, pastures, rangeland, grasslands, open forests.

Range

Native to w Eur, n Africa, and c Asia.

It is found in n OR from Hood River Co to Wallowa Co, and in Malheur and Douglas cos. It is found in 17 of the 20 e WA cos plus one co w of the Cas. In ID, populations are centered around Coeur d' Alene, Boise, and Idaho Falls. It is found in CA, and in the e US.

Distinguishing Characteristics

Hairless leaves that have backward pointed or curved teeth and milky sap distinguish rush skeleton-weed rosettes from all other rosettes but the dandelions. Rush skeleton-weed's branched flowering stem with red bristly hairs at the base distinguish it from dandelion.

There are three biotypes of rush skeleton-weed in the PNW which differ in plant height, amount of branching, and flowering time. The Post Falls and Banks, ID biotypes are very similar. They start flowering in mid-July, are much branched, and grow to 0.6-1 m tall. The Post Falls biotype resists infection by *Puccinia* rust. The Spokane, WA biotype starts flowering early-mid August, is sparsely branched, and grows up to 1.3 m tall.

History

In the early 1800s, rush skeleton-weed was introduced into the eastern U.S. from its native range. In 1938, it was first found in the PNW near Spokane, WA. Now it has spread throughout e WA and into OR, ID, and CA, occupying several million acres in the PNW. It has the potential to become one of the PNW's worst weeds.

It reproduces by seed, slowly growing lateral roots, and root fragments. Seed production can be prolific, 250-20,000 seeds per plant per year; however, seeds are not long-lived and do not persist in the soil for more than 18 months. Seeds are wind dispersed. They can also be spread in hay, livestock feed and manure, and by animals and farm machinery.

Ecological Effects

Rush skeleton-weed is spreading rapidly in rangeland and grain fields where it can reduce range productivity, reduce crop yields by 70%, and entangle itself in harvesting equipment.

Control Methods

Prevention: Rush skeleton-weed is very difficult to control once established due to its deep roots; therefore, it is important to detect and control new infestations early while plants are still young. Limit disturbance, and prevent seed introduction by avoiding contaminated hay, feed, manure, or equipment. Do not till established plants. This spreads viable root fragments throughout the tilled area.

Mechanical: Cultivating will spread an established infestation; however, it will help prevent establishment in areas that are currently free of rush skeleton-weed.

Chemical✎: A few herbicides are available for control of rush skeleton-weed. The best time to treat is immediately before or during bolting, but applications are possible from late fall to early spring. Rosettes can loose their leaves, giving the appearance of eradication, but return the next year; therefore, it is important to mark treated areas and continue to check for regrowth.

Biological: Sheep will graze the rosettes reducing seed production. Subterranean clover pasture can suppress rush skeleton-weed; however, wheatgrass is not competitive enough to suppress it.

There are three biocontrol agents for rush skeleton-weed in the PNW. One is a rust fungus (*Puccinia chondrillina*) which can kill 90% of seedlings and reduce flower production and seed viability in established plants. The Banks, ID biotype is highly susceptible, the Spokane, WA biotype is moderately susceptible, and the Post Falls, ID biotype is resistant. The other two biocontrol agents are insects that will affect all biotypes: a stem/leaf gall midge (*Cystiphora schmidti*) and a bud gall mite (*Eriophyes chondrillae or Aceria chondrilla*). *Cystiphora schmidti* larvae can reduce flower production by 60%. *Aceria chondrilla* can stunt and deform plants and stop seed production.

Species Status

A-2, ODA-B & T

Synonyms✸

Other Common Names

yellow-flowered skeleton-weed, skeleton-weed, hogbite

References

Gaines and Swan 1972; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1993 Oct b; Taylor 1990; Whitson 1996; William et al. 1997

Cirsium species

Distinguishing Characteristics

There are approximately 15 spp of *Cirsium* in the PNW two of which are introduced, Canada thistle and bull thistle.

Table 3 Distinguishing characteristics between Canada and bull thistles

Species	Head	Leafs Upper Surface	Root System	Stem
Canada thistle (C. arvense)	1.5-2.5 cm wide; mainly spineless	smooth	rhizomes	mainly wingless & non-spiny
bull thistle (C. vulgare)	3-5(8) cm wide; very spiny	bristly hairy	taproot	spiny with large wings

Ecological Effects

It provides a good source of nectar for bees and butterflies, especially late in the season when other sources are scarce. The seeds are eaten by birds such as goldfinches, and the mature pappus is used for nesting material.

Control Methods

Chemical✎: Herbicides can be used for small infestations or combined with improved range or crop management techniques for large infestations. Regrowth often occurs, so herbicides must be applied annually for several years. Several herbicides are available.

Canada Thistle

Family: Asteraceae Species: *Cirsium arvense* (L.) Scop.

Season

Perennial. Rosette: early spring. Flowering: (June) July-Aug. (Sept.).

Habitat Invaded

Favorite habitat conditions: open, disturbed areas at low to mid elevations in various soils, mainly in uplands but also in wetlands.

Favorite habitat types: clearings, roadsides, ditch banks, stream courses, crops, pastures, meadows.

Range

Native to se Eur & adj Asia.

It in every co in OR and is wdsp in temp N.Am (n US-s Canada) as well as temperate areas world wide.

Distinguishing Characteristics

Canada thistle has much smaller heads than other thistles in the PNW. It is also the only one with male and female flowers in separate heads. It is highly variable; however, its slender, mostly non-spiny or winged stems, clustered somewhat spineless heads, and extensive spreading root system distinguish it from all other thistles in the PNW.

History

Early settlers had introduced this thistle into Canada as a contaminant in commercial seed by the early 1700s. In the late 1700s, it was introduced into

New England either from its native range or from Canada. It was restricted by the American government by 1795, but that did not stop its continued introduction and spread.

Canada thistle spreads long distances by seed, but its main spread once established is by its underground root/rhizome system. This underground system grows rapidly sending up new stems and forming dense colonies. These colonies will often be male or female making it impossible for the plants to produce viable seed. When viable seed is produced, it usually is not spread by the wind. Typically, the pappus falls off and blows away before the seed is released from the seed head.

The stems and roots have been peeled and eaten in emergencies (Pojar and MacKinnon 1994). The leaves and roots have been used for several herbal remedies from skin rashes and ulcers to bowel tonics and dewormers (Foster and Duke 1990).

Ecological Effects

Canada thistle is one of the most serious agricultural weeds world wide. It was recognized as a problem in Europe even before the American continents were discovered. Canada thistle causes severe problems for farmers, land owners, land managers, foresters and grounds keepers. It reduces crop yields and interferes with harvesting, especially in hand harvested crops. It aggressively invades logged forest and pastureland where it forms dense and persistent populations. It is not palatable so its numbers increase dramatically in overgrazed areas.

Control Methods

Prevention: Canada thistle is extremely difficult to eradicate once established due to its extensive underground system that contains an immense store of energy. Avoid crop seed that could be contaminated with the seed of Canada thistle and use proper crop rotations. Control populations in waste areas that are able to produce viable seed.

Frequent mowing will help to prevent it from becoming established.

Mechanical: Hand removal is not feasible except for very small patches near important plants that should not be disturbed (i.e., rare/endangered/sensitive species, a favorite garden plant). The stem can be continually cut back as it emerges. It will take repeated treatments for several years, but the plant will eventually deplete its energy reserves and die.

Cultivation alone is not effective and tends to make infestations worse by breaking up the rhizomes and spreading them. These rhizome bits grow into new plants which, if left alone, create new colonies with even deeper root systems. However, tillage followed by herbicide use can be highly effective, especially when followed with the planting of a competitive crop or pasture grass. Tillage creates plants with a small ratio of root to aboveground mass. This makes them more susceptible to herbicides. The best results seem to occur with early spring through summer tillage, a period of plant growth, and herbicide use when the plants reach the early bud stage.

Fire is a useless technique because fires hot enough to damage the underground system will sterilize the soil making it susceptible to further invasion by weeds.

Biological: Planting competitive crop and forage species like soybeans, alfalfa, Sudan grass, or forage sorghum will help reduce thistle regrowth when controlling with herbicides.

Grazing is not a viable option for control since Canada thistle is unpalatable. As grazers eat the desirable species, Canada thistle is able to spread even faster.

There are 4 biocontrol agents for Canada thistle in Oregon; however, none seem to offer an effective means of control. *Ceutorhynchus litura*, a crown/root weevil, offers the best control, but it has a limited availability and distribution. The other 3, two seed head weevils (*Larinus planus* and *Rhinocyllus conicus*) and a stem gall fly (*Urophora cardui*), provide fair control and are available for redistribution.

Species Status

EPPC-A-1, ODA-B

Synonyms

Cirsium a. var. *a, C. a.* var. *argenteum* (Vest) Fiori, *C. a.* var *horridum* Wimmer & Grab., *C.a.* var *integrifolium* Wimmer & Grab., *C. a.* var. *mite* Wimmer &

Grab., *C. a.* var. *vestitum* Wimmer & Grab., *Cirsium setosum* (Willd.) Bess. ex Bieb., *Cirsium incanum* (Gmel.) Fisch., *Carduus arvensis* (L.) Robson, *Serratula arvensis* L.

Other Common Names

Canadian thistle, creeping thistle

References

Alden et al. 1998; Clark 1974a; Cooke 1997; Cousens and Mortimer 1995; Crockett 1977; DEA 1995 Oct; Foster and Duke 1990; Gaines and Swan 1972; Gilkey 1957; Harty 1993; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; Muzik 1970; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; RDFG 1998; Strickler 1993; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Bull Thistle

Family: Asteraceae Species: *Cirsium vulgare* (Savi) Ten.

Season

Biennial—forms a rosette the first year, the second year it forms the flowering stem. Flowering: July-Sept.

Habitat Invaded

Favorite habitat conditions: open, disturbed areas.

Favorite habitat types: roadsides, fence rows, burns, clearings, farmyards, non-cultivated fields, early meadows, pastures.

Range

Native to Eurasia.

It is wdsp in OR, the PNW, and throughout N.Am.

History

Bull thistle was introduced into N.Am several times as a contaminant in commercial seed. It reproduces by seed which is spread by the wind.

Ecological Effects

It is a highly competitive weed that infests many disturbed sites. This can make it a problem in overgrazed areas because it is avoided by many grazers due to its spiny nature. Horses are an exception; they will brave the spiny involucral bracts to get the sweet nectar in the flower heads. Bull thistle is a problem in other disturbed areas such as burns and logged areas; however, it will eventually give way to succession if the site is not continually disturbed. It is not a problem in cultivated fields.

Control Methods

Biological: One biological agent is available in Oregon and Washington, *Urophora stylata* a seed head gall fly. It offers good control in Oregon and fair control in Washington.

Species Status

LIS, ODA-B

Synonyms

Cirsium lanceolatum (L.) Scop., non Hill (some say misapplied), *C. l.* (L.) Scop. var. *lypoleucum* DC., *Carduus lanceolatus* L., *Carduus vulgaris* Savi

Other Common Names*

References

Alden et al. 1998; Cooke 1997; Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; RDFG 1998; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Common Spikeweed

Family: Asteraceae

Species: *Hemizonia pungens* (Hook. & Arn.) Torrey & A. Gray

Season

Annual. Flowering: July-Sept.

Habitat Invaded

Favorite habitat conditions: alkaline soils below 1000 ft.

Favorite habitat types: roadsides, grain fields, rangeland, grasslands.

Range

Native to CA.

Ssp. *pungens* is found in a few scattered locations in OR & WA; ssp. *septentrionalis* is com around Walla Walla, WA and in adj Umatilla Co, OR.

Distinguishing Characteristics

There are 4 subspecies of *H. pungens*, two have been found in Oregon. The main differences between the two are found in the leaves and bracts. The leaves and bracts of ssp. *pungens* are rough with very short stiff hairs. The bracts of ssp. *septentrionalis* are smooth as are the leaves with the exception of a few scattered long, soft hairs.

History

Common spikeweed reproduces by seed which it produces in abundance. Under favorable conditions, it spreads to form large colonies.

Ecological Effects

Due to its spiny nature it is unpalatable and avoided by livestock.

Control Methods✱

Species Status

LIS, ODA-B

Synonyms✱

Other Common Names

common tarweed

References

Hickman 1996; Hitchcock and Cronquist 1973; Neihaus and Ripper 1979; Whitson 1996

Hairy Cat's Ear

Family: Asteraceae Species: *Hypochaeris radicata* L.

Season

Perennial. The first year it forms a rosette only. In following years it blooms from May-Oct.

Habitat Invaded

Favorite habitat conditions: disturbed areas at low elevations in/near populated areas, shade to full sun.

Favorite habitat types: roadsides, lawns, pastures, meadows, gardens, cultivated fields.

Range

Native to Eur.

It is wdsp w of the Cas from BC to CA, but is less com e of the Cas. It is also found in n ID, and is wdsp in the ne US & s Canada.

Distinguishing Characteristics

Hairy cat's ear can be distinguished from the many yellow flowered dandelion-like plants by its hairy rosettes, unbranched stems with minute scale-like bracts, and long beaked achenes with feathery (branched) pappus hairs.

Dandelions grow in similar habitats and contain only basal leaves, but the leaves are hairless. Dandelions' stems are unbranched; they are also thicker, and lighter in color (almost translucent, often with a pinkish cast) than the thin dark green stems of hairy cat's ear. Dandelion pappus bristles are unbranched.

There is another introduced cat's ear in our area that occupies disturbed areas, smooth cat's ear (*H. glabra* L.). However, it is an annual, its leaves lack hair, its flower heads are smaller, and the outer fruits lack a beak. Hairy cat's ear flowers are open in sunny and cloudy weather, while smooth cat's ear flowers only open in full sun.

Smooth hawksbeard (*Crepis capillaris* (L.) Wallr.) can be distinguished from hairy cat's ear by its leafy stems and unbranched pappus hairs.

Leontodon spp. have unbeaked achenes. Also, their involucre does not enlarge when the plants are in fruit like involucre of hairy cat's ear. Autumn hawkbit (*L. autumnalis* L.) is very similar to hairy cat's ear and is introduced into similar habitats; however, it is not as common. Hairy hawkbit (*L. taraxacoides* (Villars) Merat) is also found in the same habitats. Its flowering stem is not branched, containing only one flower head and no bracts along its length.

History

The seeds are spread by the wind.

Ecological Effects

Hairy cat's ear's thick rosette of leaves smother grass and other species. This makes it particularly unpleasant in lawns, especially since mowing typically will not harm it.

Control Methods

Mechanical: Cultivation and mowing are not effective control methods for hairy cat's ear. However, cultivation or hand removal of the above- and below-ground materials will eventually kill the plant after 2 or more years if removal is repeated every 2-3 weeks.

Chemical✎: There are several herbicides available that will control hairy cat's ear. Hairy cat's ear populations can become resistant if the same or similar herbicides are continually used to treat them.

Species Status

EPPC-A-1

Synonyms✱

Other Common Names

spotted cat's ear, rough cat's ear, false dandelion

References

Alden et al. 1998; Cooke 1997; Franklin and Dyrness 1988; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; Taylor 1990; Whitson 1996; William et al. 1997

Prickly Lettuce

Family: Asteraceae Species: *Lactuca serriola* L.

Season

Annual, winter annual, or biennial. Flowering: July-Sept.

Habitat Invaded

Favorite habitat conditions: disturbed soils.

Favorite habitat types: dumps, fills, roadsides, railroads, sidewalks, fence rows, yards, gardens, cultivated fields (esp. alfalfa), abandoned fields, pastures, orchards, vineyards, forests, shrublands, grasslands.

Range

Native to Eur.

It is wdsp throughout the US except for the n tip of ME and the s tip of FL.

Distinguishing Characteristics

Prickly lettuce can be differentiated from the other lettuce species by its yellow flowers and prickly lower stem. Wall lettuce (*L. muralis* (L.) Fresen.) also has yellow flowers but its stems are hairless. Blue lettuce (*L. tatarica* (L.) Meyer ssp. *pulchella* (Pursh) Stebb.) and tall blue lettuce (*L. biennis* (Moench) Fern.) both have blue flowers. Tall blue lettuce can have white flowers.

Prickly lettuce can hybridize with cultivated lettuce (*L. sativa* L.) producing plants with intermediate characteristics.

History

Prickly lettuce was introduced from Europe. It spreads by underground rhizomes and by prolific seed production; the seeds are widely distributed by the wind.

The plant was used by Native Americans and by settlers for medicinal and food purposes. The leaves have been used in salads and as cooked greens, the roots provided a type of chewing gum. The milky sap was used for skin irritations and as an opium substitute, while tea made from the leaves were used as a diuretic, to stimulate lactation, and as a sedative or pain reliever.

Ecological Effects

Prickly lettuce is a weed in many maintained areas (crops, orchards, vineyards, gardens, yards, overgrazed pastures). It is also toxic to cattle if their diet is limited to prickly lettuce. The seeds are eaten by many types of birds (pheasants, grouse, goldfinches, and bluebirds).

Control Methods

Prevention: Prickly lettuce can develop a resistance to certain herbicides; therefore, it is best to prevent establishment by avoiding the introduction of prickly lettuce seed. If the weed is established, prevent seed development and dispersal. Seeds are not long-lasting in the seed bank.

Mechanical: Cultivation is an effective form of control in appropriate areas such as orchards and tree farms. Mowing is also an effective control option but not as effective as tillage.

Chemical✎: There are several herbicides available that will control prickly lettuce. Prickly lettuce populations can become resistant if the same or similar herbicides are continually used to treat them.

Species Status

EPPC-A-1

Synonyms

Lactuca scariola L.

Other Common Names

China lettuce, wild lettuce

References

Cousens and Mortimer 1995; Foster and Duke 1990; Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Johnson 1993; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Ox-eye Daisy

Family: Asteraceae — Species: *Leucanthemum vulgare* Lam.

Season

Perennial. Flowering: (May) June-Aug. (Oct.)

Habitat Invaded

Favorite habitat conditions: open, moist, disturbed areas mainly at low elevations.

Favorite habitat types: roadsides, fields, pastures, meadows, clearings, oil fields, gardens.

Range

Native to Eur.

It is wdsp throughout the PNW, but it is particularly com w of the Cas and in the Willamette Valley. It is found throughout most of the US & s Canada.

Distinguishing Characteristics

There are several daisy-type plants in the PNW. Ox-eye daisy can be distinguished from them by its tall (0.2-1 m) stem; small, toothed leaves; and 2-5 (7) cm wide flower heads with 15-30 ray flowers. The English daisy (*Bellis perennis* L.) is a short (~7.5 cm tall) creeping plant that has leafless stalks and more than 30 ray flowers per head. Mayweed chamomile (*Anthemis cotula*) is a bushy annual with very finely divided leaves, ~12 ray flowers per head, and a strong offensive smell. Feverfew (*Tanacetum parthenium* (L.) Schultz-Bip.) has much smaller flowers and yellowish, strong-smelling leaves.

History

Ox-eye daisy was introduced as a garden ornamental and, possibly, as a contaminant in commercial seed. It has escaped from gardens, spreading slowly by short rhizomes, and much more effectively by an abundant supply of seed.

The young leaves have been used in salads and the flower heads made into a wine. It has been used medicinally for whooping cough, other coughs, asthma, and for the relief of spasms.

Ecological Effects

This highly competitive plant spreads rapidly in manipulated and natural areas, out competing native and forage plants. It is avoided by grazing livestock making it especially competitive in heavily grazed areas. It will often form large patches. In fertile habitats, it looses its competitive advantage to perennial grasses.

Control Methods

Prevention: Keep perennial grass fertilized. This allows it to resist invasion by ox-eye daisy. Ox-eye daisy and related garden varieties should not be used for landscaping. The small achenes contaminate commercial seed, so avoid use of seed sources that could be contaminated.

Mechanical: Pull or dig out the plant, including all of the roots and rhizomes. This is best done before the flowers form. To reduce the spread of seed to new locations, carefully dispose of flowering plants.

Chemical✎: There are several herbicides available that will control ox-eye daisy.

<u>Biological</u>: Adding fertilizer can increase the competitive ability of desirable species (esp. perennial grasses) which can lead to the reduction of ox-eye daisy populations.

Species Status

EPPC-A-1

Synonyms

L. v. var. *pinnatifidum* (Lecoq & Lamotte) Moldenke, *Leucanthemum leucanthemum* (L.) Rydb., *Chrysanthemum leucanthemum* L., *C. l.* var. *boecheri* Boivin, *C. l.* var. *pinnatifidum* Lecoq & Lamotte

Other Common Names

marguerite, moon-daisy

References

Alden et al. 1998; Clark 1974a; Crockett 1977; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Jolley 1988; KCDNR; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; Polunin 1972; RDFG 1998; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Scotch Thistle

Family: Asteraceae Species: *Onopordum acanthium* L.

Season

Biennial. Flowering, in its second year: June-Sept.

Habitat Invaded

Favorite habitat conditions: disturbed areas.

Favorite habitat types: roadsides, fields, grasslands, sagebrush.

Range

Native to Eur and e Asia.

Sporadic populations are found e of the Cas, esp in the Snake River drainage.

It is wdsp but not com throughout the middle latitudes of N.Am.

Distinguishing Characteristics

In *Onopordum,* the cup that holds the flowers (receptacle) is fleshy and honeycombed or deeply pitted with 0 to few short bristles on the ridges. This distinguishes *Onopordum* species from *Cirsium* species which have flat receptacles with dense long bristles.

Scotch thistle is similar to bull thistle (*Cirsium vulgare*) with both having large, spiny wings and leaves, and purple, thistle-type flower heads. However, the shallowly lobed to irregularly toothed, soft hairy leaves, and 3-7 cm wide spherical involucre of Scotch thistle distinguishes it from bull thistle which has deeply lobed leaves with bristly hairs, and a narrower (2-4 cm wide) cone-shaped involucre.

History

Scotch thistle spreads rapidly. In one year, it can spread up to 5 m from the parent plant.

Ecological Effects

Scotch thistle is highly competitive and can form dense stands that are impenetrable to livestock. It provides a good source of nectar for bees and butterflies, especially late in the season when other sources are scarce.

Control Methods

Mechanical: Plants can be removed by hand. Several acres in ID have been controlled by volunteers using this method.

Chemical✍: There are several herbicides available that will control Scotch thistle. It is easiest to control in the rosette stage, otherwise apply chemicals when the plant is actively growing in the spring but before flower buds form. Repeated applications will be required to control new seedlings.

Species Status

EPPC-A-2, ODA-B

Synonyms❋

Other Common Names

cotton thistle, Scotch cottonthistle

References

Cousens and Mortimer 1995; Gaines and Swan 1972; Hickman 1996; Hitchcock and Cronquist 1973; Taylor 1990; Whitson 1996; William et al. 1997; Williams 1997

Tansy Ragwort

Family: Asteraceae Species: *Senecio jacobaea* L.

Season

Short-lived perennial. Seed germination: fall or early winter. Rosette: until late spring. Flowering: mid July- mid Oct.

Habitat Invaded

Favorite habitat conditions: grasslands and disturbed areas at low elevations under a wide range of soil, moisture, and temperature conditions; esp in sparsely vegetated areas or areas heavily disturbed by rodent activity.

Favorite habitat types: roadsides, railroads, perennial crop fields, grasslands, pastures, rangeland, logged areas.

Range

Native to the drier regions of Eur and Asia.

In OR, it is com between the coast and the crest of the Cas, and it has started to spread into areas e of the Cas. It is spreading rapidly and has the potential to spread throughout OR. It is wdsp w of the Cas and Sierra Nevada ranges from BC to CA with populations spreading e. It is also found in Benewah & Bonner cos, ID; and throughout N.Am (except the sw) and Can.

Distinguishing Characteristics

Tansy ragwort is very difficult to identify in the seedling stage; however, it can be easily distinguished from similar species when it is older. Its conspicuous (~2.5 cm) flower heads with ~13, 4-13 cm long ray flowers, and ~13, black-tipped bracts in the involucre distinguish it from the other *Senecio* spp. that occupy disturbed sites.

Common groundsel (*S. vulgaris* L.) is typically much smaller (1-5 dm tall vs. 6-13 dm tall) with smaller leaves. It has hollow stems, and the rayless flower heads, that do not fully open, are surrounded by ~21 black-tipped bracts.

Woodland groundsel (*S. sylvaticus* L.) has small inconspicuous flower heads with <2 mm long ray flowers, and woolly, greenish-gray leaves.

Sticky ragwort (*S. viscosus*) stems and leaves are covered with sticky glands. The ray flowers are also glandular and only 1-4 mm long. The involucral bracts lack the black tips.

Common tansy or ragwort (*Tanacetum vulgare*) lacks ray flowers and the leaves are larger, aromatic, and more fern-like.

History

Tansy ragwort was first found in OR in 1922. It arrived first in seaports and then traveled inland. It now infests millions of acres west of the Cascades and is starting to move into the eastern parts of the western U.S. It was found in Benewah Co, ID in 1987, then in Bonner Co in 1994.

It has been spreading rapidly in the west and has the potential to survive throughout much of our range. It spreads by seeds and by root fragments. A single plant can produce up to 150,000 seeds in one season. About 60% of the seeds land within 3 m of the parent plant but some of the seeds can be carried up to 36 m by the wind. The seed can remain viable in the soil for 15 years. Seeds are spread long distances in contaminated straw used by hunters and construction workers.

A biocontrol project started in the 1970s reduced established populations by about 90% in 5 years.

Tansy ragwort has been used in several different ways in the past. It was used medicinally even though caution was required to avoid fatal poisoning. It was used as a yellow dye, in burial rites, and as an insect repellent.

Ecological Effects

It is toxic to livestock, especially cattle and horses. Sheep are resistant to the toxins. The toxins cause irreversible liver damage and death. Livestock tend to avoid the plant when possible; however, small or dried plants will be eaten. Pulled or sprayed plants should be removed from the grazing area, and silage and hay should be kept free of tansy ragwort contaminants. A small amount can cause death (3-7% of body weight). Young animals are even more susceptible than adults and can possibly be poisoned from a mother's tainted milk. Common groundsel (*S. vulgaris*) can cause similar effects.

Tansy ragwort is also poisonous to people. People have been poisoned by tainted milk or honey, and by flour contaminated with tansy ragwort seed.

Tansy ragwort's rapid spread in rangeland and pastureland is a problem due to its toxicity, and because it reduces valuable forage. It spreads into perennial crops reducing yields, and reduces wildlife habitat. It has caused millions of dollars in losses from these effects, and thousands of dollars are spent annually on control measures. It is estimated that Oregon's biocontrol program saves at least 4.34 million dollars annually just by controlling tansy ragwort. (PNWEP 1997 July).

Control Methods

Prevention: Tansy ragwort is very difficult to control once established so, prevention is imperative. The seedlings and rosettes are difficult to identify, but this is the stage when they should be controlled. Mature plants are very difficult to control. If mature plants are found, control seed production immediately because seeds can remain viable for 15 years in the soil. Mark the spot and return early to control new seedlings and rosettes. Control methods need to continue for several years in order to exhaust the seed bank and eliminate the rootstocks of adult plants that resisted earlier control measures. Another thing making tansy ragwort difficult to control is its ability to regenerate from root fragments left in the soil, and its established roots' ability to resist herbicides.

Tansy ragwort can invade disturbed or unproductive land quickly; therefore, it is important to limit disturbance and keep land as productive as possible. Good pasture management, maintaining fertile soils, and over-seeding with desirable forage species are all effective measures.

It is also important to eliminate the introduction of tansy ragwort seed. Keep equipment and vehicles clean and free of seed contaminants; only use hay, straw, etc. free of tansy ragwort contaminants; and clean animals, inside and out (digestive tract, fur, hooves), before moving them from an infested area to an uninfested area.

Mechanical: Pulling can be effective for small and new infestations. The whole root must be pulled because even a small fragment left in the ground can produce a new plant. This along with the long-lived seed bank makes it necessary to mark the spot and return for several years to control regenerating and new plants. Pulled plants need to be removed from livestock areas because cattle will be more prone to graze the plants once they are dead. It is necessary to be very careful when disposing of plants with developed or developing seed heads so that the seeds are not spread. The cut stem might have enough energy to finish maturation of the seed. The cut plants can be burned. Treating the soil with herbicides after pulling can reduce growth from root fragments and from seed.

If cultivation can be repeated yearly, it effectively eliminates tansy ragwort. That is why tansy ragwort is not a problem in cultivated crops. However, tansy ragwort comes back quickly once perennial crops or pasture is grown. Cultivation might be useful if the goal is to prevent seed production in the beginning stages of a control program. Root fragments will produce new plants, so cultivation might just exacerbate the problem if not followed up with herbicides.

Chemical✎: Herbicides are most effective on seedlings and rosettes. Herbicides often will not kill the rootstock when used on older plants; however, they should kill the aboveground material eliminating seed production for that year. The site can then be marked; in late fall and/or the next spring seeds, seedlings, and rosettes can be controlled. Treatments will need to be repeated until the seed bank is eliminated. The plants die slowly after treatment and dead and dying plants are poisonous to livestock, so do not introduce livestock for 4-6 weeks after spraying.

Biological: Healthy, productive land will not only resist invasion but is also an essential component in any control program. Establish competitive plants by reseeding, fertilizing, and using good pasture/crop/etc. management practices.

Grazing is often not an effective control due to the plant's toxicity and ability to grow back vigorously after being damaged. However, a rest/rotation system might be effective when used with biocontrol agents. Sheep can help prepare a pasture for other livestock.

There are three biocontrol agents available in Oregon and Washington. All are widely distributed and available for redistribution. The cinnabar moth (*Tyria jacobaeae*) and tansy ragwort flea beetle (*Longitarsus jacobaeae*) provide excellent forms of control. The ragwort seed fly (*Pegohylemyia seneciella*) is ineffective by itself, but complements the others.

Cinnabar moth larvae feed on the leaves, buds, and flowers, sometimes causing complete defoliation. This moth is most effective in areas of heavy tansy ragwort infestation. Tansy ragwort flea beetle larvae feed on the roots which can kill the plant. The adults feed on the leaves. Ragwort seed fly larvae feed on the seeds.

Biocontrol is recommended for areas west of the Cascades when more intensive control efforts are not feasible. Biocontrol agents are not effective east of the Cascades. It is best to use control methods aimed at eradication in areas where populations are still isolated, such as populations east of the Cascades.

Once biocontrol agents are introduced, it takes several years for the populations to become established and for tansy ragwort populations to start to decline. For example, the tansy ragwort flea beetle can reduce populations by 90% in 5-6 years.

Species Status

EPPC-A-1, ODA-B

Synonyms✱

Other Common Names

stinking willie

References

Cousens and Mortimer 1995; DEA 1995 Oct; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; KCDNR; Muzik 1970; Neihaus and Ripper 1979; PNWEP 1997 July; Pojar and MacKinnon 1994; RDFG 1998; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Milk Thistle

Family: Asteraceae

Species: *Silybum marianum* (L.) Gaertner

Season

Winter annual (sometimes a biennial). Flowering: late April-Aug. Seed germination: late summer through winter.

Habitat Invaded

Favorite habitat conditions: esp in fertile soils.

Favorite habitat types: roadsides, ditch banks, gardens, edges of cultivated fields, barnyards, pastures.

Range

Native to the Mediterranean region of Eur.

It is abundant in sw OR, scattered throughout the WV, and in Umatilla Co east of the Cascades. It is also abundant in CA, esp in the coastal cos; and in Clark, Cowlitz, and Klickitat cos in WA. It has not been found in ID, but populations have been found in Canada, New Zealand, Austr, South Africa, Chile, and Argentina.

Distinguishing Characteristics

The dark, shiny, green leaves with white marbling along the main veins distinguishes milk thistle from other PNW plants from an early age.

History

Milk thistle is a cultivated ornamental and medicinal plant that has escaped cultivation. It reproduces and spreads by seed which it produces in abundance. Plants produce an average of 6,350 seeds in a season. The seeds are heavy and fall mainly near the base of the plant, creating dense patches in following seasons. Seeds can spread long distances on vehicles and animals or in agricultural products including flower seed packages. Seeds remain viable in the soil for up to 9 (27) years.

The plant has been used as a vegetable, and medicinally to treat digestive problems and liver damage. It dramatically improves liver regeneration after injury by toxins or disease (Foster and Duke 1990). It is used today in Europe to treat mushroom poisoning.

Ecological Effects

Milk thistle creates dense patches that reduce desirable plants such as native species and forage species. Its spines also limit the availability of forage materials adjacent to thistle plants and cause injuries to grazing animals. Milk thistle is toxic and can be lethal to cattle and sheep, although they seldom graze it. However, livestock have a tendency to graze milk thistle when it is wilted.

Control Methods

Prevention: Prevent the introduction of milk thistle seed. If a patch is found eliminate seed production immediately; the seeds can remain viable in the soil up to 9+ (27) years. Continue to eliminate seed production until seedlings no longer emerge.

Mechanical: Small infestations can be dug out so long as the plant is removed at least 4 cm below the soil surface. It is best to remove plants while still in the rosette stage. If flower heads or fully formed buds have developed they must be removed from the stems of controlled plants, so that seeds do not continue to develop from reserved energy stored in the stem. To prevent poisonings, keep livestock away from spaded and wilting plants.

Mowing is not an effective control option. If plants are mowed early (before bud formation), the plants will typically regrow. If mowing is delayed until flower buds start to develop, mowed plants may still develop seeds.

Cultivation is an option for controlling dense stands of milk thistle, but it must be followed up with the establishment of a healthy perennial crop or pasture which will resist re-invasion. One strategy is to prevent seed production the first year, then cultivate and plant the pasture/crop the second year. Continue to control thistle seedlings in following years until the pasture/crop is established.

Chemical✎: There are several herbicides available that will control milk thistle. Repeated applications will be required annually to control new seedlings. To prevent poisonings, keep livestock away from treated and wilting plants.

Biological: Establish healthy perennial plants that have a high winter density. These will effectively compete with milk thistle seedlings, reducing their numbers.

A seed head weevil (*Rhinocyllus conicus*), is available for milk thistle in Oregon. There is also a fungal disease (*Septoria silybi*), that might be available in Oregon. Both of these will reduce, but not eliminate, milk thistle in managed pastures.

Species Status

EPPC-NMI, ODA-B

Synonyms

Mariana mariana (L.) Hill, *Carduus marianus* L.

Other Common Names

blessed milkthistle

References

Foster and Duke 1990; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Neihaus and Ripper 1979; PNWEP 1991 Nov e; Polunin 1972; Whitson 1996; William et al. 1997

Common Dandelion

Family: Asteraceae   Species: *Taraxacum officinale* Wigg.

Season

Perennial. Flowering & seed production: March-Dec., all year during warm winters.

Habitat Invaded

Favorite habitat conditions: grows in most habitats, dry to wet, at low to high elevations; but mainly in disturbed areas.

Favorite habitat types: roadsides, lawns, gardens, fields, hay fields, pastures, meadows, prairies, swamps, woods, sagebrush deserts.

Range

Native to Eur and maybe Asia.

It is wdsp and com throughout OR, N.Am, and the world.

Distinguishing Characteristics

There are several yellow flowered dandelion-like plants; however, few have a single, naked, unbranching flower stalk that is thick, light colored, and somewhat transparent like the true dandelion (*Taraxacum* spp.).

Identification within the genus *Taraxacum* can be confusing, however, because there is debate as to how many species should be recognized. In general, common dandelion can be distinguish from other dandelions by its involucral bracts, achene, and the enlarged terminal segment on its leaves. The outer involucral bracts of common dandelion are curved downward towards the stem. Its inner bracts are linear, and erect without a horn or hood at the tip. Its achene is grayish or straw-colored to olive brown with a beak that is 2-4 times longer than the achene.

Red-seeded dandelion (*T. laevigatum* (Willd.) DC.), which also occurs in Oregon, has achenes that are reddish-brown in color with a beak 1-2 times longer than the achene. Its inner involucral bracts have tips that are usually shaped into a horn or hood, and outer bracts that are mainly erect. The terminal segment of the leaves is not enlarged.

Hairy cat's ear (*Hypochaeris radicata*) has dark green, typically branched, stems with scattered scale-like bracts along it. The leaves have stiff hairs along the margins and on both surfaces unlike the hairless leaves of common dandelion.

History

Common dandelion was introduced into N.Am by the fist European ships, either accidentally and/or intentionally as a medicinal and garden herb. It has food and medicinal value that is still used today. Young leaves are used as a pot herb and in salads. The roots can be roasted then eaten as a vegetable or ground into a coffee substitute. Flowers are made into dandelion wine, and the whole plant is used to make beer and tea. It has a wide range of medicinal uses from a diuretic and laxative to treating skin disorders and vitamin deficiencies. The milky sap can be make into rubber.

It reproduces from seed and from a spreading root system. Fragments of the root will develop into a new plant. A plant starts producing seeds early in the season and can continue to produce new flower heads throughout the year resulting in the release of hundreds of seeds. The seeds can stay airborne until humidity changes create optimal germinating conditions. Seeds can spread long distances in the wind but often land near the parent plant.

Ecological Effects

Common dandelion is a highly competitive plant that crowds out native species and lawn grasses. Besides being able to shade out grasses and other herbaceous species, its leaves produce ethylene, a gas that discourages other species from growing near it.

Common dandelion causes hayfever; however, people tend to consider it a pest only when it is in yards and gardens, perhaps because it is such a useful plant. Besides the medicinal and nutritional value it has for people, common dandelion is also a good forage species and nectar source. Sheep and cattle favor it, and it is a ready resource for bees early in the season when little else is blooming.

Control Methods

Prevention: Limit disturbances and overgrazing.

Mechanical: Cut off the leaves before flowers can form. This will need to be repeated throughout the year until the roots are depleted of energy. Digging the roots out will speed up this process; however, check for and remove any regrowth from root fragments.

Regular mowing can help control common dandelion by making the turf dense.

Chemical✎: There are several herbicides available that will control common dandelion. Repeat applications as necessary to control regrowth and seedlings.

Species Status

A-1

Synonyms

T. o. G.H. Weber ex Wiggers, Taraxacum *vulgare, Leontodon taraxacum*

Other Common Names

dandelion

References

Alden et al. 1998; Cooke 1997; Crockett 1977; Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Kadans 1970; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; RDFG 1998; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Meadow Salsify

Family: Asteraceae

Species: *Tragopogon pratensis* L.

Season

Biennial. Flowering: June-Sept.

Habitat Invaded

Favorite habitat conditions: Typically in somewhat moist, disturbed areas.

Favorite habitat types: roadsides, fields.

Range

Native to Eur.

It is mainly found e of the Cas in OR & WA. It is also found in ID & CA.

Distinguishing Characteristics

Meadow salsify can be distinguish from the other *Tragopogon* spp. by its yellow ray flowers that are longer than the involucral bracts.

The invasive yellow salsify (*T. dubius* Scop.) has ray flowers that are shorter than the involucral bracts. It is often found in drier sites, is more robust, and the stalk is swollen just below the flower. Meadow salsify's stock is not enlarged just below the flower.

Purple salsify (*T. porrifolius* L.) is also very similar, but the ray flowers are purple instead of yellow.

The three species hybridize; two new species originated in the US from this process and are found in e WA and n ID.

History

Meadow, yellow, and purple salsify were all introduced from Europe. The seeds spread in the wind, carried by their large pappus.

Ecological Effects✱

Control Methods

Chemical✎: There are several herbicides available that will control meadow salsify. Repeat applications as necessary to control regrowth and seedlings.

Species Status

EPPC-A-1

Synonyms✱

Other Common Names

yellow goat's beard, Jack-go-to-bed-at-noon

References

Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Taylor 1990; Whitson 1996; William et al. 1997

Spiny Cocklebur

Family: Asteraceae Species: *Xanthium spinosum* L.

Season

Annual. Flowering: April-Oct.

Habitat Invaded

Favorite habitat conditions: often in dry, disturbed areas.

Favorite habitat types: roadsides, barnyards, pastures, fields, along streams.

Range

It is thought to be native to parts of the US, such as in CA; it is also said to come from S.Am, and Eur.

It is now found in the w US, e US, and world wide.

Distinguishing Characteristics

Spiny cocklebur is distinguished from common cocklebur (*X. strumarium* L.) by its long, stiff spines, as well as its lance- or triangular-shaped leaves with woolly-white undersides. Common cocklebur lacks spines and the woolly-white hairs. Its leaves are also rounder, more heart-shaped.

History

It is hard to say how spiny cocklebur was introduced or where it was introduced from. It is probably native to South America and up into California, and could have been introduced from there. Whitson (1996) says it was introduced from Europe. The burs of spiny cocklebur get tangled in animals' hair. There is a recorded case of this species being introduced into Australia from burs tangled in the tails of horses shipped from Chile. Therefore, it is possible that the species was introduced on imported animals such as sheep, cattle, or horses.

A single plant can produce up to 150 seeds, which can be transported long distances on animals or people.

Ecological Effects

The burs mat in sheep fleece and horse manes and tails. The seeds and seedlings are poisonous to animals including livestock and fowl.

Control Methods

Chemical: There are several herbicides available that will control spiny cocklebur. Repeat applications as necessary to control regrowth and seedlings.

Species Status

EPPC-A-2, ODA-B

Synonyms

X. s. var. *inerme* Bel., *Acanthoxanthium spinosum.* (L.) Fourr.

Other Common Names✱

References

Cousens and Mortimer 1995; Gaines and Swan 1972; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Polunin 1972; Whitson 1996; William et al. 1997

Common Hound's Tongue

Family: Boraginaceae Species: *Cynoglossum officinale* L.

Season

Biennial. Flowering: May-Aug.

Habitat Invaded

Favorite habitat conditions: disturbed areas.

Favorite habitat types: roadsides, fields, pastures, meadows.

Range

Native to Eur.

In the PNW it is found in OR, WA, ID, and extreme n CA. It is found throughout N.Am, excluding the sw.

Distinguishing Characteristics

There are four *Cynoglossum* spp. in the PNW—common hound's tongue and three native species. The inflorescence of common hound's tongue emerges from the leaf axils, and the outside edge of its nutlets are flattened. The native *Cynoglossum* spp have rounded outside edges on their nutlets, and their inflorescence extends only from the top of the stem.

History

Common hound's tongue has been used medicinally to treat skin diseases and superstitiously to keep strange dogs from barking at or biting a person.

The plant reproduces and spreads by seed. The nutlets easily break from the plant and the hooks along their surface cling to feathers, hair, clothing, camping gear, etc. spreading seed long distances.

Ecological Effects

The seeds cling in animal's hair, especially the wool of sheep, and to clothing and camping gear, making removal tiresome. The plant is toxic to livestock, especially cattle and horses. Animals can live for 6 months after consuming a lethal amount.

Control Methods

Prevention: It is important to keep pastureland free of common hound's tongue because it can spread so rapidly on animals and because it can be toxic to them. Follow proper maintenance practices for pastureland to keep it healthy and more resistant to invasion.

Mechanical: Mowing prior to seed production will help prevent seed spread and wool contamination.

Chemical✎: Herbicides are most effective when used on plants in the rosette stage of their first year of growth.

Species Status

LIS, ODA-B

Synonyms✱

Other Common Names

hound's tongue, gypsyflower

References

Gaines and Swan 1972; Hickman 1996; Hitchcock and Cronquist 1973; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; RDFG 1998; Taylor 1990; USDI; Whitson 1996; William et al. 1997

Cardaria species

Season

Perennial. Rosettes: autumn-early spring (whenever warm enough).

Flowering: May-early June. Seed set: late June-Aug.

Distinguishing Characteristics

Many mustards lack the persistent style of *Cardaria* spp. There are three *Cardaria* spp. in our area, and all are very similar, being differentiated mainly by their seed pods.

Table 4 Distinguishing characteristics between introduced *Cardaria* species

Species	Pod	# Seeds/Pod
lens-podded hoary cress (*C. chalepensis* (L.) Hand.-Mazz.)	hairless; oval- to football-shaped	2
heart-podded hoary cress (*C. draba*)	hairless; kidney- to heart-shaped	4
hairy whitetop (*C. pubescens*)	finely hairy; globe-shaped	4

Heart-podded hoary cress and lens-podded hoary cress seem to hybridize, creating the plants often referred to as *C. d.* var. *repens* (Shrenk) O. Schulz.

Table 5 Distinguishing characteristics between *Cardaria* species and similar white-flowered herbs

Species	Bloom Time	Leaves	Inflorescence
Cardaria spp.	spring (May-June)	entire to toothed	corymb
common yarrow (*Achillea millefolium* L.)	late spring-summer	finely divided	small composite heads in a corymb
Queen Anne's lace (*Daucus carota* L.)	May-Oct.	finely divided	umbel

Ecological Effects

Heart-podded hoary cress and hairy whitetop invade several crops and rangeland. They can be highly competitive when established, creating dense patches and reducing native, crop, and pasture species. Several states, including OR, WA, and ID, have designated them as noxious weeds requiring control measures to be taken and making them illegal to transport. Any crop seed contaminated with *Cardaria* seed may not be sold for any purpose.

Control Methods

Prevention: These *Cardaria* species are very difficult to control once established; therefore, it is important to limit disturbances and treat invasions as soon as possible. Establishing and keeping healthy, competitive vegetation is important in resisting and reducing invasions. Well established perennial grass can be especially competitive. Grazing reduces the competitive ability of grass, so eliminating grazing is ideal. However, if this is not practical, reducing it to appropriate levels will slow invasion and spread.

Mechanical: When used properly, cultivation can eliminate *Cardaria* populations. Cultivate fallow ground as plants emerge (within 10 days of emergence) throughout the season. Cultivation can be integrated with other control measures such as herbicide usage. Sources such as the OSU extension publication on hoary cress and related whitetops (PNWEP 1991 Nov b) can be consulted to develop an integration program right for your situation. Cultivating once in the spring, before plants bloom, can reduce seed production and slow spread.

Mowing will not eliminate *Cardaria* populations, but it can reduce seed production and thus slow spread. Mowing will delay flowering and seed production of *Cardaria* plants.

Flooding works to control heart-podded hoary cress, and possibly other *Cardaria* species, in extreme situations; however, it is most effective in sandy soils, and it may not kill seeds.

Small infestations can be dug or hoed. Remove plants within 10 days of emergence and continue to remove regrowth throughout the season.

Chemical✎: Herbicides are most effective on rosettes and growing plants prior to flowering. It is best to treat rosettes in early spring and then to repeat treatments later in the spring or in the fall if new growth appears. Treating fallow cropland can be effective; however, treatment in actively growing crops can not be done in high enough concentrations to eliminate *Cardaria* species. Herbicide use can be integrated with other control methods such as cultivation and the planting of competitive species.

Biological: There are no biological control agents currently available in the U.S.; however, planting competitive species can help reduce *Cardaria* populations, especially when used with herbicides, fertilizers, and proper land management practices.

Heart-podded Hoary Cress ▲

Family: Brassicaceae Species: *Cardaria draba* (L.) Desv.

Habitat Invaded

Favorite habitat conditions: esp in disturbed, alkaline soils.

Favorite habitat types: roadsides, cultivated fields (grains, alfalfa, vegetables), grasslands, meadows, rangeland.

Range

Native to central Eur and w Asia.

It is found in the Pacific states from CA to Canada and throughout much of temp N.Am (absent from the southern border of west-south central U.S.).

History

Probably introduced into the U.S. as a contaminant in ballast. West and east coast seaports had established colonies by 1889. From here, the plants spread inland, often traveling along roadsides and as a contaminant in crop seed. Plants spread by seed, rhizomes, and root fragments.

Species Status

EPPC-A-1, ODA-B

Synonyms

Lepidium draba L.

Other Common Names

hoary cress, whitetop

References

Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Muzik 1970; Neihaus and Ripper 1979; PNWEP 1991 Nov b; Polunin 1972; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Hairy Whitetop▲

Family: Brassicaceae

Species: *Cardaria pubescens* (C. Meyer) Jarmol.

Habitat Invaded

Favorite habitat conditions: saline soils.

Favorite habitat types: ditchbanks, cultivated fields (grains, alfalfa, vegetables), rangeland.

Range

Native to Asia.

It is wdsp in N.Am but prob is not as com as heart-podded hoary cress (*C. draba*).

History

Hairy whitetop was introduced into the U.S. after heart-podded hoary cress (*C. draba*) was introduced. Plants spread by seed and by rhizomes. Seeds can spread as contaminants in crop seed.

Species Status

EPPC-NMI, ODA-B

Synonyms

C. p. var. *elongata* Rollins, *Hymenophysa pubescens* C.A. Mey.

Other Common Names✱

References

Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1991 Nov b; William et al. 1997

Dyer's Woad

Family: Brassicaceae | Species: *Isatis tinctoria* L.

Season

Winter annual, biennial, or short-lived perennial. Seedling-rosette: fall-early spring. Flowering: April-May. Seed: June-Aug. Plants typically die after releasing seeds.

Habitat Invaded

Favorite habitat conditions: dry areas, especially in light sandy and gravelly soils; it originates in disturbed areas and can then spread into relatively undisturbed, well vegetated areas.

Favorite habitat types: roadsides, railroads, fields (hay, crops), rangeland.

Range

Native to se Russia.

Heavy infestations occur in Jackson Co, OR, and scattered ones in south Lake Co. Rangeland in ID, n CA, UT, MT, & WY are heavily infested; and one population has been found in Kittitas Co, WA. It is also found in the e US.

Distinguishing Characteristics

The seed pods help to distinguish dyer's woad from the other mustards. Most mustards have a pod that splits open at maturity releasing the seeds. Dyer's woad pods drop to the ground intact. The coloring of the pods as well as their abundant numbers make a patch of dyer's woad very noticeable in summer. They can make a field look ash colored as if burned in a fire.

History

Although native to se Russia, it was introduced into eastern N.Am from Europe by colonists cultivating it for a blue dye source. In the west, it was introduced into California from Ireland as a seed contaminant in alfalfa seed. It has spread throughout the west from there.

Dyer's woad spreads by seed and by roots. Plants can resprout when damaged and completely defoliated. A plant can produce 350-500 seeds. These seeds detach from the plant mainly during the summer. Wind and rain assist in their spread. Seeds can spread as far as 2.5 m in summer winds, but most seeds (95%) land within 0.5 m of the parent plant. Some seeds do not disperse until winter, when they can travel much farther by blowing along the surface of crusted snow. Seed can spread long distances in animal feed and bedding, as a contaminant in crop seed, and on animals, vehicles, and flowing water.

Seeds are not dormant, but the pod provides some dormancy. Studies need to be conducted to determine how long seeds, still enclosed in the pod, can remain viable in the soil.

Ecological Effects

Dyer's woad is highly competitive; and although it initially establishes itself in disturbed areas such as roadsides and railroads, it spreads to adjacent cropland, rangeland, and even healthy relatively undisturbed habitats, threatening native plant communities and the animals that depend on them. A chemical in the seed pod hinders germination and root growth of some plant species which can give dyer's woad seedlings a competitive advantage. It is unpalatable to livestock, reducing forage in the pasture and range land that it invades.

Control Methods

Prevention: Dyer's woad can be difficult to eradicate. It has a thick 1-1.6 m long taproot, and plants regrow from this root when above-ground foliage is removed. Patches in waste areas and along roadsides must be controlled because seeds spread from here into areas of greater concern. Keep seed from current infestations from developing. This will eventually eliminate the population since plants, and most likely seeds, have a short life span.

Mechanical: Cutting is not effective because plants will regenerate from the root; however, repeated mowing in areas with a sod cover (like an orchard) can control infestations if mowing is repeated until the seed bank is depleted. Cutting can delay flowering time so continue to check for plants past the normally recognized season.

For small infestations, hand pulling or digging will work as long as it is repeated 2-3 times a year for 2-3 years.

When controlling with cultivation, early spring plants need to be cultivated before seed production, and seedlings need to be cultivated in the fall.

Chemical✎: Herbicides are most effective when used on seedlings/rosettes. Common herbicides are ineffective when used after the flowering stems start to develop. Repeated applications may be necessary in the same year.

Biological: In 1978 a pathogen (*Puccinia thlaspeos*) was discovered in ID which might help control dyer's woad. An attempt was made to control dyer's woad with grazing sheep, but this proved ineffective. The grazing rates needed to effect dyer's woad cause severe damage to the habitat.

Species Status

A-2, ODA-B

Synonyms✱

Other Common Names✱

References

Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Neihaus and Ripper 1979; PNWEP 1992 June d; Taylor 1990; Whitson 1996; William et al. 1997

Perennial Pepperweed

Family: Brassicaceae Species: *Lepidium latifolium* L.

Season

Perennial. Flowering: early summer-fall.

Habitat Invaded

Favorite habitat conditions: mainly in wet areas with saline soils.

Favorite habitat types: ditches, roadsides, irrigated cropland, beaches, tidal shores.

Range

Native to s Eur and w Asia.

Populations are found in s OR (Klamath Co and adj areas), Umatilla Co, and possibly elsewhere in OR. Populations are also found in e WA, ID, CA, MT, and throughout the US.

Distinguishing Characteristics

This plant can be distinguished from the other whitetops (*Cardaria* spp.) by its height. *Cardaria* spp. are 1-5 dm tall while perennial pepperweed is 3-20 dm tall. The stem leaves of *Cardaria* spp. clasp the stem while perennial pepperweed leaves do not.

History

The first known introduction into Oregon was in 1937 in Umatilla Co. It was possibly introduced as a contaminant in crop seed, such as beets, which is probably how it was introduced into California as well. Since then, it has been introduced into southern Oregon and is starting to spread.

It spreads by seed and by rhizomes. It is a prolific seed producer, and it can form dense colonies from its spreading rhizomes.

Ecological Effects

It is a designated noxious weed in several western states. It invades croplands, forming dense patches.

Control Methods

Prevention: It is important to prevent the introduction of perennial pepperweed because its spreading rhizomes and herbicide resistant waxy covering make it difficult to control once established.

Chemical✎: It can be controlled with herbicides, but its waxy covering makes it difficult. Apply herbicides to young plants and repeat as needed.

Biological: Planting and maintaining a good grass cover can help control perennial pepperweed.

Species Status

EPPC-RA, ODA-B

Synonyms

Cardaria latifolia (L.) Spach

Other Common Names

tall whitetop, Virginia pepperweed, broad-leaved pepperweed, broad-leaved peppergrass

References

Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Whitson 1996; William et al. 1997

Yellow Fieldcress

Family: Brassicaceae

Species: *Rorippa sylvestris* (L.) Besser

Season

Perennial

Habitat Invaded

Probably found in moist to marshy places.

Range

Native to Eur.

It is rare in the PNW, but it is found in the Willamette Valley in Oregon, and the Olympic Peninsula in WA.

Distinguishing Characteristics✱

History✱

Ecological Effects✸

Control Methods

Chemical✎: Refer to container labels for current information on herbicides available for use around water.

Species Status

EPPC-NMI, ODA-B

Synonyms

Radicula sylvestris (L.) Druce

Other Common Names

creeping yellowcress

References

Hitchcock and Cronquist 1973; William et al. 1997

Tumble Mustard

Family: Brassicaceae Species: *Sisymbrium altissimum* L.

Season

Annual or winter annual. Flowering: May-Sept. Breaks off & becomes a tumbleweed: autumn.

Habitat Invaded

Favorite habitat conditions: disturbed areas.

Favorite habitat types: roadsides, cultivated land (grain fields, gardens, etc.), abandoned fields, abused prairies, rangeland.

Range

Native to Eur.

It is found throughout OR, but is much more com e of the Cas. It is found throughout N.Am, esp in e OR, e WA, & ID.

Distinguishing Characteristics

Tumble mustard can be distinguish from the similar but smaller Hedge mustard (*S. officinale* L.) by its 5-8 mm long petals, and 5-10 cm long pods that extend rigidly from the stem. The petals of hedge mustard are 4 mm or less; the pods are up to 1.5 cm long and tightly pressed to the stem.

History

Tumble mustard is a long established weed in N.Am. It is thought to have been introduced into the West by James Hill, a railroad builder.

Tumble mustard spreads by seed which it produces in abundance. It can spread its seeds long distances as a tumbleweed. The plant breaks off at ground level, then, its basically round form rolls around in the wind loosing seeds as it goes. In large open areas, such as those found east of the Cascades, it can spread its seeds very long distances.

Some PNW Indian tribes have used the young leaves as a potherb.

Ecological Effects✱

Control Methods

Mechanical: Seedlings can be controlled by cultivation. Mowing can also control populations if it is done regularly throughout the season and continued each season until the seed bank is depleted.

Chemical✎: Herbicides can effectively control tumble mustard.

Species Status

EPPC-A-1

Synonyms

Norta altissima (L.) Britt.

Other Common Names

Jim Hill mustard, tall tumble mustard, Italian weed

References

Clark 1975a; Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Neihaus and Ripper 1979; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Halogeton

Family: Chenopodiaceae

Species: *Halogeton glomeratus* (M. Bieb.) C. Meyer

Season

Annual. Flowering and seed production: fall.

Habitat Invaded

Favorite habitat conditions: disturbed alkaline soils of semi-arid to high-desert habitats.

Favorite habitat types: roadsides, railroads, sheep trails, areas where livestock congregate, rangeland, cultivated fields, barren and eroded or burned-over areas, dry lake beds.

Range

Native to Asia.

It is found from se OR & e CA to CO & WY.

Distinguishing Characteristics

Russian thistle (*Salsola tragus* L.), which is similar at some stages and occupies similar habitats, can be confused with halogeton. The leaves that Russian thistle gets later in the season are similar to those of halogeton (short, fleshy, awl-shaped, and have a needle-like point); however, the plant's first leaves are long, soft, and string-like which is quite different from halogeton leaves. Russian thistle also does not have cottony hairs in the leaf axils like halogeton, and its stems are striped red. When fruiting, Russian thistle can be distinguished by its slender spiny appearance. Halogeton looks almost fluffy when it is covered with seed cases.

History

Halogeton was introduced from Siberia into the western U.S. around 1930. It spread quickly in the west. Because of its toxic properties, Oregon watched its boarders carefully to keep it from spreading into the state; however, in 1953, halogeton was found in Oregon and has spread throughout its southeastern region.

One plant can produce several thousand seeds. Plants produce two kinds of seed. One kind has winged bracts that help spread the seed in the wind. The other kind is able to remain dormant in the soil for many years. Plants break off and tumble around in the wind distributing seeds long distances.

Ecological Effects

Halogeton is not extremely competitive; however, it will quickly invade disturbed ground like overgrazed rangeland and cultivated cropland. Its tendency to invaded grazed areas, and other areas heavily disturbed by livestock, combined with its poisonous properties, makes it especially bad for ranchers. Livestock readily graze it at times, even though it is poisonous to them. It is especially poisonous to sheep and cattle. Thousands of poisonings have been attributed to halogeton.

A number of rodents eat the seeds.

Control Methods

Chemical: Herbicides can control halogeton; however, chemical use often is not considered economically feasible for low-value rangeland. Desirable, quick growing species must be planted immediately to keep halogeton from returning to controlled areas. Apply herbicides to actively growing plants before blooming starts, and do not allow grazing until plants have completely dried up.

Biological: Testing to find effective biocontrol agents is in progress. Establishing/maintaining healthy vegetation should prevent invasion by halogeton and help eliminate it if it is established.

Species Status

EPPC-A-1, ODA-B

Synonyms✱

Other Common Names

saltlover

References

Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Muzik 1970; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Kochia

Family: Chenopodiaceae Species: *Kochia scoparia* (L.) Schrad.

Season

Annual. Seedlings: very early spring. Flowering & fruiting: July-Oct.

Habitat Invaded

Favorite habitat conditions: mainly in open or disturbed areas, especially where irrigated but also tolerates drought.

Favorite habitat types: ballast grounds, rights-of-way, roadsides, ditchbanks, gardens, cultivated fields, pastures, rangeland.

Range

Native to Asia.

It is found e of the Cas in OR, as well as in WA, CA, s ID. It is found throughout N.Am & Eur.

Distinguishing Characteristics

Five-hook bassia (*Bassia hyssopifolia* (Pallas) Kuntze) is almost identical to kochia except for its fruits. Bassia has 5 curved or hooked spines while kochia has 5 papery wings.

History

Although native to Asia, kochia was introduced into the US as an ornamental from Europe in the early 1900s. Its seeds have been sold widely and it has often escaped from culture. It spread throughout the Great Plains moving west and east, and has been widespread in s ID since the 1960s. Populations became established in Oregon by the early 1970s and were widespread in Washington by the late 1970s.

Plants reproduce and spread by seed which are produced in abundance. An average plant produces 23,000 seeds, but 50,000 seeds can be produced by one plant. In an established infestation, 230,000 seeds can be produced per square foot of soil. Most seeds only remain viable for one year, but buried seeds can remain viable longer. In 10 cm of soil, 2% of the seeds can remain viable for 3 years (PNWEP 1993 Oct a). Kochia is a tumbleweed; therefore, seeds can be spread for long distances as the plant breaks off and is tumbled by the wind.

Ecological Effects

Kochia residue seeps chemicals that inhibit the growth of other plants. This gives kochia a competitive advantage once it is established. It can significantly reduce crop yields. Currently, kochia is mainly a problem in irrigated fields; however, it is very drought tolerant and is becoming a problem in dry crops as well. Kochia can send roots over 3 m laterally and 3 m deep, and it is very efficient with a small amount of water. Kochia "uses 33% less water than puncture vine (*Tribulus terrestris*) and 85% less water than barnyardgrass (*Echinochloa crus-galli* (L.) P. Beauv.) to grow a plant of equal weight" (PNWEP 1993 Oct a).

Kochia has forage value and was promoted for use with cattle and sheep; however, it can be toxic. Symptoms for cattle include weight loss, weakness, photosensitization, and even death; however, animals will recover if kochia is removed from their diet. (PNWEP 1993 Oct a; Whitson 1996)

Control Methods

Prevention: Control infestations in waste areas, along ditches, fence lines, roadways, etc., because seeds spread from these areas quickly. On rangeland, it is important to keep healthy perennial plants which will help suppress invasions. In cropland, perennial crops and winter wheat suppress invasion better than spring cereals. Kochia seed has a short life span if it is not buried deep in the soil. Therefore, it is important to keep established populations from producing seed, and it is important not to deeply till an infested area. Kochia should not be used as forage. Besides its toxic properties, some seeds can remain viable after passing through an animals digestive system or after ensiling, helping to spread the seed.

Mechanical: In small infestations, kochia plants can be removed by pulling or hoeing. Larger infestations can be shallowly cultivated. Cultivation practices can delay herbicide resistance, and it can bring seeds to the surface. At the surface, seeds will loose their viability and either sprout or decay within one year. Avoid any deep cultivation practices.

Mowing will not help control kochia populations because plants regrow from the stem and seeds will still be produced.

Chemical✎: Herbicide resistance is a problem with kochia, especially herbicides in the triazine and sulfonylurea families. It is best to rotate herbicides and to spray kochia in the early spring when still in the seedling stage.

Biological: No biocontrol agents for kochia currently exist.

Grazing is not an effective form of control. Plants will regrow from damaged stems and still produce seeds.

Maintaining a healthy, competitive plant cover not only resists invasion, but it can suppress the growth and spread of established kochia populations.

Species Status

EPPC-A-1, ODA-B

Synonyms

K. s. var. *culta* Farw., *K. s.* var. *pubescens* Fenzl, *K. s.* var. *subvillosa* Moq, *K. s.* var. *trichophila* (Stapf) Bailey, *Kochia alata* Bates, *Kochia sieversiana* (Pallas) C.A. Mey., *Kochia trichophila* Stapf, *Bassia sieversiana* (Pallas) W.A. Weber, *Bassia scoparia* (L.) A.J. Scott

Other Common Names

summer cypress, mock cypress, burning-bush, Mexican-fireweed

References

Cousens and Mortimer 1995; Gaines and Swan 1972; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; PNWEP 1993 Oct a; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Leafy Spurge

Family: Euphorbiaceae Species: *Euphorbia esula* L.

Season

Perennial. Flowering: late May-July.

Habitat Invaded

Favorite habitat conditions: ranges from semi-arid to shallow aquatic (up to 6 dm), mainly in grasslands; gravelly mountain soils are best but does well in most soil types.

Favorite habitat types: roadsides, pastures, rangeland, fields, sandy banks.

Range

Native to Eur.

It is found e of the Cas in OR. In the west, it is mostly found in ID, WA, & MT. It is found throughout most of the n U.S. and adj Can.

Distinguishing Characteristics

Leafy spurge has many varieties in N.Am, probably due to natural selection and/or cross breeding; however, they all have similar features. Stockless leaves that are long (2-7.5 cm), narrow (3-8 mm), and droopy are a very good diagnostic tool.

There are several *Euphorbia* spp. in the West, and a couple look similar to leafy spurge. Cypress spurge (*E. cyparissias* L.) is similar, but shorter (1.5-5 dm vs. 2-10 dm) with shorter (1-2.5 cm), less dense leaves along the stem. Also, the seeds are light colored instead of brownish-purple.

Petty spurge (*E. peplus* L.) is branched throughout, with egg-shaped leaves. The lower, alternate leaves have short stalks.

History

Leafy spurge was first introduced in Massachusetts around 1827 as a seed contaminant. Since then, it has spread westward infesting almost 2.7 million acres in northern N.Am and southern Canada. It was first found in Idaho in the early 1900s, and is now widespread in Idaho. In 1957, its range was limited in the PNW, but is has spread quickly.

It spreads by prolific seed production and by an extensive horizontal root system that can form dense colonies. Seed capsules explode when ripe flinging seeds up to 6.6 m.

It is often spread as a contaminant in livestock feed. Seeds remain viable after passing through an animal's digestive tract, which can distribute seeds long distances. Seeds can also float down streams and establish plants along downstream banks. From there, they can spread inland. Long distance spread of seed and roots is also helped by tillage and vehicular transport. Seeds can remain viable in the soil for at least 8 years.

Ecological Effects

Leafy spurge is a Federal noxious weed as well as a noxious weed in several states, regulating its spread as a seed contaminate and its control. Its establishment and spread in N.Am has resulted in millions of dollars of damage. North Dakota State University estimated a total annual cost of $144.3 million due to control costs and losses in agricultural production for MT, ND, SD, and WY alone. Money spent on necessary control costs reduces expenditures for other needs such as recreation. An estimated $2.9 million a year in wildland recreation expenditures has been lost in N.D. due to leafy spurge. (Williams 1997)

It competes so well in the PNW that it often forms dense colonies that crowd out other plants, excluding all but established woody vegetation. Not only is it competitive due to its aggressive root system and far spreading seed, but it produces chemicals that inhibit the growth of grasses and other plants. This reduction of native plants leads to a reduction in wildlife, seriously changing native ecosystems. Lawns that have been invaded will eventually become a dense mass of leafy spurge without proper control measures because mowing will not stop seed or root production.

The milky sap of leafy spurge is toxic. It is a severe irritant to the mouth, throat, digestive tract, and skin of cattle. It can even cause death. It also enhances the effects of cancer causing compounds. In humans, the sap irritates the skin, mouth, and eyes, even causing blindness. Native grazers, from insects to mammals, find it unacceptable due to its toxic compounds. Cattle also tend to avoid grazing it. However, sheep and goats will develop a taste for it, and can graze it without ill effects.

Control Methods

Prevention: Leafy spurge is very difficult to eradicate once established. It has an extensive horizontal and vertical root system that creates dense stands and stores a large nutrient reserve. Seeds can remain viable in the soil for at least 8 years. These qualities require long term control efforts for any established stand; therefore, it is important not to let it become established. If introduced, seedlings need to be controlled within 4 weeks to keep roots from expanding and storing reserves.

It is especially important to keep leafy spurge from becoming established along waterways, where it can easily spread downstream and then inland.

Riparian areas are also harder to control due to herbicide and grazing restrictions. Forested areas are very difficult and expensive to control once leafy spurge has become established because treatments must be done very carefully to prevent damage to the trees.

Protect uninfested areas from nearby populations by establishing tall, dense, healthy vegetation in the form of grasses, trees and shrubs, or crops. Keep this vegetation strong with adequate soil nutrients and reduced or eliminated grazing. Forest habitat with a dense, high canopy can suppress or even exclude leafy spurge invasion; however, the canopy of ornamental plantings typically are not dense enough to suppress invasion.

Keep established populations from spreading to nearby areas by following several precautions. Reduce grazing by cattle, which selectively eat the desirable species thereby making the leafy spurge more competitive. Contain livestock in a small spurge free area until any ingested seeds have passed through their digestive system before moving them to uninfested pasture or range. Mow or treat leafy spurge with herbicides, at least a 30 ft wide border, between infested and uninfested areas to reduce seed production and root growth. If control measures are not taken to eradicate the leafy spurge populations, this treatment will have to be continued forever (as long as leafy spurge exists, and there is still uninfested land to protect.) Therefore, it is important to control leafy spurge populations because spread is so efficient. Eliminating it from roads, waste areas, etc. is essential.

Combining different control methods is more effective in controlling leafy spurge than using just one. Publications like the Cooperative Extension pamphlet, "Leafy spurge" (UICA 1991 Sept), has detailed information on controlling the species.

Mechanical: In very small patches, repeated hand cutting (~ every 14 days) can eventually deplete the root reserves and kill the plant; however, cutting must be consistent and continued each season for 3-4 years until the plants fail to reemerge.

Leafy spurge can not survive in areas that are regularly cultivated. Therefore, in the right situations, cultivation can be an effective form of control. Shoots must be cultivated to around 10 cm deep every 14 days for 3-4 growing seasons to completely eradicate the population. The cultivator must be sharp and not spread roots around because root fragments will grow into new plants. Therefore, improper cultivation practices can make things worse, especially if not repeated every 14 days because the roots will not be depleted of energy reserves. The last cutting of the season is especially important in depleting reserves. Do not omit it!

Crops can not be grown for the 3-4 years it takes to eliminate the infestation, making this technique inappropriate for highly erodible land. However, cultivation can be used with other control/management methods to control leafy spurge while growing annual crops. These techniques include using herbicides and competitive crops.

Mowing will not reduce or eliminate leafy spurge populations and is often impractical; however, it can slow its spread. Mowing will reduce seed production if it is repeated several times during the growing season. Seeds will still be produced, however, because mowed plants will produce flowers and seeds very close to the ground.

Chemicals✎: Herbicides are available to control leafy spurge; however, any program aimed at eradication, will be a long term process. Successful eradication requires sticking to a program year after year until the population is eliminated. For example, a 7,500 square foot infestation in Ashly National Forest, UT, was eradicated after six consecutive years of picloram treatments (Williams 1997).

Repeated applications will be necessary for control. Even after established plants are killed, seedlings need to be controlled until the seed bank is depleted. It is important to control seedlings before 4 weeks of age so the roots can not build up energy stores. Herbicides are useful in integrated control programs combined with methods like cultivation, managed grazing, biocontrol, and use of competitive species. Refer to the Cooperative Extension publication "Leafy spurge" (UICA 1991 Sept) for current information on herbicides and integrated control programs.

Biological: There are 9 biocontrol agents for leafy spurge; however, none offer complete control. The best four at this point are root/defoliating flea beetles (*Apthona cyparissiae, A. czwalinae, A. lacertosa,* and *A. nigriscutis*). These species have high infestation rates and excellent control abilities. They are available for redistribution along with a stem boring beetle (*Oberea erythrocephala*). Biological control should be used with other techniques such as herbicides, fertilizers, seeding, and grazing management techniques. Refer to the *Pacific Northwest Weed Control Handbook* and the Cooperative Extension publication "Leafy spurge" (UICA 1991 Sept) for more information on biocontrol agents for leafy spurge.

Typically grazing expands leafy spurge populations; however, sheep and goats will selectively graze leafy spurge. Once accustomed to it, sheep and goats prefer leafy spurge to grasses. Grazing must be carefully managed to be effective. Heavy to moderate stocking rates are necessary to control leafy spurge, and intense grazing must be continued throughout the growing season to deplete root reserves. Animals must be removed once leafy spurge is depleted so that the remaining grasses are not overgrazed. When moving animals from an infested site to an uninfested site, they must be confined to a small area without leafy spurge until all seeds have passed through their system.

Tall, dense, healthy grass crops can compete with leafy spurge if used with herbicides and no more than moderate grazing.

Species Status

EPPC-RA, ODA-B

Synonyms

Euphorbia virgata Waldst. & Kit. non Desf., *Euphorbia intercedens* Podp.

Other Common Names

wolf's milk

References

Cousens and Mortimer 1995; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; OSUES 1995 Jan; Taylor 1990; UICA 1991 Sept; USDA 1971; USDI; Westbrooks 1993; Whitson 1996; William et al. 1997; Williams 1997

Swainsonpea

Family: Fabaceae Species: *Sphaerophysa salsula* (Pall.) DC.

Season

Perennial. Flowering: May-July. Seed pod formation: mid-summer.

Habitat Invaded

Favorite habitat conditions: disturbed areas.

Favorite habitat types: roadsides, fences, cultivated fields.

Range

Native to Asia.

It is well established in some e OR locations. It is also found in c WA, CA, and sporadically throughout the w US.

Distinguishing Characteristics

There are several species in the PNW from the pea family that have compound leaves containing several opposite leaflets; however, swainsonpea's brick to orange-red flowers with white markings and, especially, its oval, translucent, inflated bladder-like pods set it apart from the rest.

Vetch (*Vicia* spp.) plants are common and have compound leaves; however, they have a more climbing, viney habit and flattened, more linear pods.

Lambert or silky crazyweed (*Oxytropis sericea* Nutt.) has compound leaves, and purple-pink flowers with white stripes along the throat of the banner, yet it is quite different from swainsonpea. Its flowers are borne on long stalks rising much higher than the leaves, which seem to be mainly coming out of the ground. Pods are leather-like and hairy.

Wild licorice (*Glycyrrhiza lepidota* Pursh) is a native with a growing form and leaves similar to those of swainsonpea, but the flowers are greenish-white to white, and the pods are bur-like covered with hooked spines.

Milkvetches (*Astragalus* spp.), and sweet-peas (*Lathyrus* spp.) all have similar leaves; however, pods lack the oval, translucent, inflated bladder-like characteristics.

History

Swainsonpea was introduced from Asia. It reproduces and spreads by seed and rhizomes. It often spreads as a contaminant in alfalfa seed. Most known infestations in California have been eradicated.

Ecological Effects

The seed is very difficult to separate from alfalfa seed due to their similar size, shape, and weight. Therefore, it is a threat in alfalfa producing areas, and can lead to contaminated batches of crop seed.

Control Methods

Chemical✎: Control with herbicides is possible. The best time for treatment is in the early bloom stage of growth. Follow-up treatments may be required for control.

Species Status

EPPC-RA, ODA-B

Synonyms

Swainsona salsula (Pallas) Taubert, *Phaca salsula* Pallas, *Astragalus iochrous*, *Astragalus violaceus*.

Other Common Names

Austrian peaweed, swainsona, alkali swainsonpea

References

Hickman 1996; Hitchcock and Cronquist 1973; Whitson 1996; William et al. 1997

Redstem Filaree

Family: Geraniaceae Species: *Erodium cicutarium* (L.) L'Her. ex Ait.

Season

Annual, winter annual, or perennial. Flowering: March-Aug.

Habitat Invaded

Favorite habitat conditions: open, disturbed areas, mostly at low elevations on dry soil.

Favorite habitat types: hard-packed roadsides, railroads, lawns, gardens, fields, pastures, grasslands, shrublands, clearings.

Range

Native to Eur or Eurasia.

It is found throughout OR, but is esp com e of the Cas in valleys and foothills.

It is found from se AK to CA, throughout N.Am, and throughout the world.

Distinguishing Characteristics

Redstem filaree can be distinguished from similar species by its finely pinnately divided, fern-like leaves, and the abrupt little point or bristle at the tip of the sepals. *Geranium* spp. have flowers and fruit similar to filaree, but their leaves are palmately lobed or divided. Two other *Erodium* spp., *E. moschatum* (L.) L'Her. and *E. aethiopicum* (Lam.) Brumh., have been reported for our area. They can be distinguished from redstem filaree by their leaves, which are less finely divided, and by their sepals, which lack the bristly tip, but can have a slightly pointed tip.

History

Redstem filaree is introduced and widely established as a forage species, especially east of the Cascades in valleys and foothills. Often, it is not considered a problem unless it crowds out more valuable forage species.

It reproduces and spreads by seed which can be propelled from the plant. Ejected seeds can land 54 cm away from the parent plant, but 34 cm is typical when there is surrounding vegetation (Cousens and Mortimer 1995). The persistent style, attached to the seed, coils when dry and straightens when damp. This helps it work the seed into the ground. Little barbs on the style allow it to travel only in one direction; so each time the humidity changes, the seed goes a bit further into the ground until it reaches an area where moisture levels are steady. This coiled style can even help the seed attach to animals, etc. to aid in long distance dispersal.

Although introduced for forage, redstem filaree has also been used medicinally. It has been used to induce sweating, to allay uterine hemorrhage, for gout and rheumatic diseases, as a diuretic, and as a source of vitamin K.

Ecological Effects

Although this plant has been widely introduced for forage, livestock may avoid it unless nothing else is available. It has a strong odor that cam repel herbivores. This may be one reason it has been able to invade grasslands so readily, making entire hillsides rose-colored from the abundance of its flowers. It can also become a troublesome weed in other areas such as early gardens.

Control Methods

Prevention: Redstem filaree is probably not good forage, so avoid introducing it and try to prevent and control populations that are already established. Grazing and fire suppression have allowed annuals like redstem filaree to dominate western perennial grasslands. Carefully managed grazing practices, where grazing is allowed for short periods in the early spring and summer, along with prescribed fires will help native bunchgrasses compete with redstem filaree and other weedy annuals.

Mechanical: Cultivation can control seedlings. Mowing is ineffective.

Prescribed burning can help native bunchgrasses compete. The fire breaks large clumps of bunchgrass into smaller bunches, and this increases their ability to reproduce vegetatively. Vegetative reproduction after a fire may be vital for bunchgrass dominance in western grasslands (Randall 1993).

Chemical✎: Herbicides are available to control redstem filaree.

Biological: Planting and establishing a grass cover with only offer fair control.

Managed grazing can help control redstem filaree. Limit grazing to short periods in early spring and summer. This will reduce seed production and reduce the amount of mulch produced by the annuals when they die. The heavy mulch produced by annuals inhibits the germination and establishment of native perennial bunchgrasses.

Species Status

EPPC-A-1

Synonyms

E. c. (L.) L'Her. ex Ait. ssp. *c.*

Other Common Names

stork's bill, redstem stork's bill

References

Alden et al. 1998; Cousens and Mortimer 1995; Foster and Duke 1990; Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Muzik 1970; Neihaus and Ripper 1979; Pojar and MacKinnon 1994; Randall 1993; Taylor 1990; Whitson 1996; William et al. 1997

St. John's Wort

Family: Hypericaceae Species: *Hypericum perforatum* L.

Season

Perennial. Flowering: June-Sept. The rusty, brown, dead stems remain standing until new growth forms in the spring. Old seed pods, and often shriveled petals, stamens, and even leaves, will remain on the dead stems through the winter.

Habitat Invaded

Favorite habitat conditions: mainly in dry, disturbed areas, esp in sandy or gravelly soils.

Favorite habitat types: roadsides, nursery farms, tree farms, orchards, pastures, rangeland, old or neglected fields, prairies, meadows, most WV grasslands, headlands, open woods. It is not found in cultivated crops.

Range

Native to Eur.

It is most com w of the Cas where it is wdsp, but it is also establishing itself rapidly e of the Cas. It is found from BC to CA, and throughout much of N.Am (excluding the extreme sw); but is esp com in the PNW. It is also found in Austr.

Distinguishing Characteristics

There are native St. John's wort species in the PNW that might be confused with common St. John's wort; however, the linear- to lance-shaped sepals that are ~1/2 as long as the petals, and its tall (3-10 dm) erect stems distinguish it from the others.

The sepals and petals of Bog St. John's wort (*H. anagalloides* Cham. & Schldl.) are almost equal in length, and the petals lack the black dots (glands) that are found along the petal margins of common St. John's wort.

Western St. John's wort (*H. formosum* Kunth) is found in wet areas verses the dry areas common St. John's wort typically grows. It is a tiny (< 30 cm tall), mat-forming plant with individual or few-flowered clusters. The sepals are wider than common St. John's wort and triangular to egg-shaped, and the seeds are yellowish and net-veined not pitted.

History

Common St. John's wort was originally introduced into California from Europe and spread into the PNW. It was found around 1900 in California and by the early 1900s had made its way into eastern Washington. It has been used extensively in Europe as a medicinal herb and was possibly introduced for this purpose. Today it is used widely in the U.S. and Europe as an herbal treatment for depression, and it is being studied as a treatment for AIDS. In ancient times, it was used to protect against evil sprits, to reduce pain, for treatment of skin injuries, deep wounds, parasites, bacterial/viral infections, depression and madness, and several other things. Some people are sensitive to it and are susceptible to dermatitis, skin burns, and open sores, especially when exposed to sunlight.

It reproduces and spreads mainly by seed which it produces in abundance, even without fertilization. It can also spread by short creeping runners that are produced above and below ground level. The seeds have a sticky surface when they get wet. This allows them to spread long distances by sticking to animals, people, vehicles, etc. when wet from early morning dew; and then, falling off later in the day as they dry.

Ecological Effects

Common St. John's wort is a serious competitor in open grassland, displacing native and forage species. Before the introduction of biological control agents, it was a serious weed in pasture and range land in the PNW and California.

It contains toxic compounds which are poisonous to livestock as well as people. White haired cattle, sheep, and horses are the most susceptible. They can suffer weight loss, hair loss, itchy inflamed skin, blisters, and open sores, especially when exposed to bright sunlight.

Fortunately, livestock avoid eating it when other forage is available. However, selective grazing of everything except common St. John's wort increases its competitive advantage and makes infestations worse. If St. John's wort is cut into hay, animals will eat it and are exposed to its toxic compounds.

Control Methods

Prevention: Once established, common St. John's wort is difficult to eradicate. Therefore, it is important to use good grazing management practices because grazing can promote the establishment and spread of this weed. Continued overgrazing and poor land management will lead to the establishment of other invasive species after St. John's wort is controlled, especially if control is obtained through the use of biocontrol agents.

Mechanical: Common St. John's wort is not a problem in cultivated crops because it can not survive regular cultivation. Therefore, rotating pasture or perennial crops to cultivated crops for 1-2 years will keep St. John's wort populations low.

Repeated mowing reduces spread by preventing seed formation.

Chemical✎: Herbicides are available to control common St. John's wort. Repeated applications may be necessary. Control in pure grass stands is easier than in grass-broadleaf (legume) mixes. Herbicide use may not be economically feasible in low value rangeland.

Biological: Biocontrol agents have significantly reduced common St. John's wort populations in the PNW and California. In California, populations have been reduced by more that 99%. Biocontrol agents often offer the best form of control, if reduction without eradication is acceptable.

There are four biocontrol agents available for common St. Johns wort in the PNW. Two defoliating beetles (*Chrysolina quadrigemina* and *C. hyperici*) offer the best control. They are widespread in the PNW and feed on the foliage. They reduce the plant's competitive and survival abilities, killing plants directly, and indirectly by making them susceptible to environmental stresses such as summer drought. Unfortunately, the insects avoid shade, and are ineffective in controlling populations under trees.

A root boring beetle (*Agrilus hyperici*) and a defoliating moth (*Aplocera plagiata*) have limited distributions in Oregon. *Agrilus hyperici* is established in e WA and n ID and has an excellent ability to control. *Aplocera plagiata* is established in n WA and has a good ability to control. The climate of ne WA limits beetle populations, making control less effective.

Species Status

EPPC-A-1, ODA-B

Synonyms✱

Other Common Names

Klamathweed, goatweed.

References

Alden et al. 1998; Bianchini and Corbetta 1975; Cooke 1997; DEA 1995 Oct; Drea 1993; Foster and Duke 1990; Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Jolley 1988; Johnson 1993; Muzik 1970; Neihaus and Ripper 1979; PNWEP 1993 Mar c; Pojar and MacKinnon 1994; Polunin 1972; RDFG 1998; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Mediterranean Sage

Family: Lamiaceae   Species: *Salvia aethiopis* L.

Season

Biennial, or short-lived perennial. Seed germination: spring or fall (when moisture is adequate). Rosette: through the 2nd year. Flowering: early June-late July.

Habitat Invaded

Favorite habitat conditions: disturbed open areas, typically in warm, dry sites with sandy soils and little perennial competition.

Favorite habitat types: roadsides, fields (hay, vacant, and occas alfalfa & grain), meadows, pastures, rangeland, less disturbed sagebrush & bunchgrass. Mainly a rangeland weed.

Range

Native to s & se Eur as far n as Czechoslovakia & sc Russia & e into Iran. It is found in se OR: 90% of the Mediterranean sage in OR is located around Lakeview in s Lake Co, smaller scattered populations are located in Klamath, Harney, Malheur, Baker, Grant, & Wheeler cos. North central ID & n CA (adjacent to the Lakeview population) also have large populations. Small populations exist in Columbia & Klickitat cos in WA, and in AZ, CO, & TX.

Distinguishing Characteristics

The white to yellowish flowers and stalked, woolly gray-green leaves that are toothed to lobed distinguish Mediterranean sage from similar species. Woolly or common mullein (*Verbascum thapsus* L.) leaves resemble Mediterranean sage rosettes; however, common mullein leaves are yellowish and lack teeth, stalks, and the strong sage-like odor.

Meadow sage (*S. pratensis* L.) is similar to Mediterranean sage; however, the flowers are typically blue and the hairs are coarser.

History

Mediterranean sage was first found near Susanville, California around 1892. It was probably introduced as a contaminant in alfalfa seed. It has also been used as a garden flower and escaped cultivation. It spread through n CA into se OR and nc ID. It became a problem in OR by 1940. In 1957, it infested about 200,000 acres, and in 1989, it infested about 500,000 acres in OR (7,000 acres in n CA, and 4,000 acres in n ID in 1989) (PNWEP 1995 Aug). It was found in se WA in 1951 and has the potential to invade much of the Salmon River and Snake River watersheds.

It reproduces and spreads by seed which it produces in abundance. A single plants can produce 50-100,000 seeds which are spread as the flowering top breaks off then blows along the ground depositing seeds as it goes. Seed is also spread by vehicles, agricultural equipment, animals, and in contaminated soil and hay.

Populations seem to be declining since the biocontrol agent, *Phrydiuchus tau*, has been introduced into OR, CA, and ID.

Ecological Effects

Mediterranean sage has invaded hundreds of thousands of acres of rangeland in se OR. It is not poisonous, but it is not palatable and displaces desirable forage and native species. Removal is expensive and difficult.

Control Methods

Prevention: Mediterranean sage is difficult and expensive to control by conventional chemical and mechanical methods. Biocontrol has reduced populations; however, it can never eradicate a population. Therefore, it is important to prevent the spread of seed into uninfected areas, and control small infestations immediately before they can spread. Good management practices for rangeland and improving impoverished areas is essential. This will reduce the chances that Mediterranean sage or other invasive weeds will invade the land. It will also help control invasions that have already occurred. It is unknown how long Mediterranean sage seeds remain viable in the soil.

Mechanical: Control with traditional mechanical methods is difficult and expensive for large infestations. It does not grow in sites suitable for cultivation, and mowing is ineffective and counterproductive. Mowing will not cut the low-lying rosettes, and it can spread seeds.

For small infestations, individual plants can be dug out by cutting the taproot 5-7.5 cm (2-3") below the crown. If plants are dug just as the stem starts to extend from the rosette, most resprouting is eliminated. Plants need to be removed each year until the seed bank is depleted.

Chemical✎: Control with herbicides is difficult and expensive. The woolly fuzz on the leaves and stem repels most herbicides, requiring the use of adjuvants.

Biological: There is one biocontrol agent available, the crown/root weevil *Phrydiuchus tau.* It has a good ability to control Mediterranean sage, and it is widespread in OR, and is available for redistribution. It will not eradicate a population of Mediterranean sage, but it seems to be reducing some of the PNW's main infestations. It will require about 3 years at a site to become established. A second release, a year after the first, aids in establishment. A dense patch of Mediterranean sage with minimal disturbance is required for insect establishment. Biocontrol should not be used for small infestations. The PNW Extension publication, "Biological control of Mediterranean Sage" (PNWEP 1994 Aug), has more detailed information.

Species Status

EPPC-RA, ODA-B

Synonyms✱

Other Common Names

African sage

References

Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Neihaus and Ripper 1979; PNWEP 1991 Nov d; PNWEP 1994 Aug; Whitson 1996; William et al. 1997

Purple Loosestrife

Family: Lythraceae | Species: *Lythrum salicaria* L.

Season

Perennial. Flowering: mid to late June-early to mid Sept. Seeds: as early as July

Habitat Invaded

Favorite habitat conditions: fresh or brackish, moist to wet, marshy areas (wetlands) at low elevations.

Favorite habitat types: swampy meadows, wet gardens, ditches, irrigation canals, cranberry bogs, wild rice beds, sloughs, stream & river banks, pond & lake edges, shrub-swamps.

Readily invades disturbed area, but can move into undisturbed areas as well.

Range

Native to Eurasia.

Found in 25 of OR's 36 cos with concentrations along the Columbia River, n coast, WV, sw OR, and in n Malheur Co. Also found in WA, CA, w ID, the ne U.S, the Midwest, s Canada, and worldwide.

Distinguishing Characteristics

Several plants can be mistaken for purple loosestrife; however, it is the only plant that creates vast magenta flowered monocultures in wetlands. It is easiest to identify when blooming because the long slender spike of 1-2 cm wide flowers with 5 sepals and 5-7 petals is unique. The opposite (sometimes whorled), lance-shaped leaves with a rounded to heart-shaped clasping base, as well as the woody, angular stems and the persistent, dead stalks are helpful in identification.

The native, Douglas spiraea (*Spiraea douglasii* Hook.), occurs in similar wetland habitats and has masses of pink-purple flowers in terminal spikes. However, its flowers are tiny (~5 mm wide), the inflorescence is often branched with a wider base, and the oval leaves are alternate.

The native, fireweed (*Epilobium angustifolium* L.), can occur in dry as well as moist sites. Its pink-purple flowers, which are borne in a long terminal spike, are larger (2-4 cm wide) with 4 sepals and petals. Its lance-shaped, stalkless leaves and unbranched stem are similar to those of purple loosestrife making them hard to differentiate when not in bloom; however, the stem is round and non-woody, and the leaves are alternate.

Watson willow herb (*E. ciliatum* Raf.) leaves and stems also are similar to those of purple loosestrife, but the stems are round and never woody. The few small (2-8 mm long) flowers are inconspicuous.

Tufted loosestrife (*Lysimachia thyrsiflora* L.) is another invasive species of wetlands with similar leaves and stems; however the flowers are in smaller, yellow clusters emerging form the leaf axils mid-stem.

History

Purple loosestrife was first introduced to the east coast of N.Am before 1831 which is when it was first recorded by an herbarium. The first introductions to

N.Am were by settlers bringing the rootstocks and seed for their gardens, or as a contaminant in ballast; most likely both occurred. Other possible introductions could have been in livestock bedding and forage, and in wool.

It spread from eastern estuaries inland making its way across northern N.Am and the Midwest traveling along the canals of the Great Lakes and along ditches of the major interstate highways. Purple loosestrife was also used widely as a garden ornamental across the country. It escape from these gardens into nearby wetlands. This is probably how it was introduced into the PNW.

It was first found in the Puget Sound region of WA, in 1929. Plants readily escape from gardens into nearby wetlands and spread from there, so the sale of purple loosestrife was banned. Unfortunately, some gardeners still plant it and give samples to friends. The sale of horticultural varieties that are considered sterile is still legal; however, these varieties are able to cross pollinate with escaped populations of purple loosestrife, aiding in its spread.

Purple loosestrife spreads mainly by seed which it produces in abundance. A healthy, mature plant can produce 2.7 million seeds annually which can spread long distances by floating downstream. Seeds are as small as a grain of sand, so they can spread long distances by floating on water, and by traveling on waterfowl, wildlife, highway and recreational vehicles, wind, clothes, and sporting equipment. Besides its intentional spread by gardeners, seed is spread when flowers are picked for floral arrangements. Seed is also present in some wildflower mixes. Seeds can remain viable in the soil for several years.

Plants can also spread by small root, rhizome, stem, and seed head fragments. These fragments can float downstream and start a new colony. Rhizomes are present, but they are not a real a factor in colony spread.

Besides being used as a garden ornamental, traditional medicinal uses of purple loosestrife have been for diarrhea, dysentery, sore throats. It has also been used to stop bleeding and as an astringent, insect repellent, and hair dye. Today it is known to be an astringent and antidiarrheic, and it can stop bleeding.

Ecological Effects

Purple loosestrife has no food value for N.Am wildlife. Its dense, impenetrable stands seem to be unsuitable for cover or nesting and are avoided by wildlife. Its prolific seed production and its lack of predators in N.Am allows it to spread rapidly in our wetlands, creating large monocultures that eliminate native wetland species such as cattails, Douglas spiraea, sedges, rushes, and grasses. The reduction in these beneficial native species reduces aquatic biodiversity by 50% and visiting wildlife by 60% in invaded habitats (OSUES 1998).

Unfortunately, purple loosestrife will rapidly colonize sites downstream reducing native plant diversity throughout a watershed. Dense stands of purple loosestrife, with their persisting dead stems, collect organic material quickly and fill in the wetland faster than native plants would. This alters the system faster than native plant and wildlife species can adjust to, and is very detrimental to fish, waterfowl, reptiles, amphibians, and mammals dependent on emergent wetlands.

A major initiative to control purple loosestrife has been underway for many years, especially in the east and Midwest. Control efforts are costly, requiring large investments of time and money. Purple loosestrife's economic impact is in the millions of dollars annually (OFAH).

Dense stands in canals and ditches can impede water flow. Dense stands can also harm recreational activities such as waterfowl hunting, fishing, boating, and swimming, and impede normal wetland functions such as flood control and water filtration.

Control Methods

Prevention: Once established purple loosestrife is very hard to control. If an infestation is large, it is nearly impossible to eradicate because of the plant's ability to resprout from root and stem fragments, its resistance to herbicides that are permitted for wetland use, its dense root mass that makes pulling difficult, and the large seed bank that can remain viable for 10 years. Preventing populations from spreading requires close monitoring and immediate control of new infestations. Therefore, it is important to keep purple loosestrife from becoming established.

Limit the introduction of seed from upstream infestations and gardens by eradicating these populations if possible. Do not plant horticultural variations, which are sold under a variety of names including: modern pink, modern rose, modern gleam, Dropmore purple, rose gleam, *Roseum superbum*, rosy glow, rosy gem, rose queen, brightness, pink spire(s), purple spire(s), purple dwarf, Columbia pink, Lady Sackville, the beacon, atropurpureum, flashfire, fire candle, florarose, happy, the rocket, floralie, gypsy blood, Robert('s), Mr. Robert's, and tomentosum. Do not use wildflower seed mixes that contain purple loosestrife seed. Avoid moving any part of the plant from an infestation site on purpose (e.g., for floral arrangements) or by accident (e.g., before leaving a site, brush off all clothing and equipment).

Report purple loosestrife populations to appropriate agencies such as the Oregon Department of Agriculture or the OSU extension agent in your county. Disturbed wetlands are readily invaded and act as starting points for purple loosestrife to invade less disturbed areas, so it is important to limit disturbance in emergent wetlands that are subject to seed dispersal from other sources.

<u>Mechanical</u>: It is best to control purple loosestrife from late June to early August, when the flowers make it easy it identify but seeds have not yet started to form. Seeds develop first at the bottom of the flower spike. It is best to check for mature seed before starting a control program. If seeds have started to form or the bottom flower's petals have started to fall off, it might be best to postpone mechanical control until the following year to eliminate seed

spread. If done very carefully, plants with mature seed can be controlled. The seed heads must be gently bent over a plastic bag and cut off. Once seed heads have been removed, further control methods can be employed (pulling, digging, cutting). Be sure seed heads and other removed plant parts are properly disposed of.

The best form of disposal is burning. Dry plants in an area where pieces or seeds can not spread, then burn. Make sure all plant matter is destroyed by the fire. Otherwise, plants should be packaged into plastic bags and deposited into a landfill that does not require composting of the material. Composting is not an effective disposal procedure because the woody stems and seeds can be spread through the composting medium.

Limit disturbance during control. Even small disturbances can cause dormant seed to germinate. This, along with the likely regrowth of roots and rhizomes left in the ground, make it important to continue to monitor the site for regrowth for several years. Control regrowth and seedlings immediately. It is also important to make sure all bits of plants are removed appropriately since each bit can form a new plant, and dropped pieces can easily travel downstream.

Pulling and digging are appropriate for low density and small infestations. They are often used to control small patches or isolated plants that have spread from large uncontrollable populations upstream. It is important to remove all parts of the plant and root system to minimize resprouting.

Pulling is easiest on young plants and plants growing in sandy soil. Established plants are difficult to pull because of the dense root/rhizome mass.

The surest form of control is by removing the underground system by digging, but it is important to remove as much as possible. Roots can extend into the soil for 3 dm (1'). Often the underground system can be eased out with a garden fork.

When digging is not an option and for larger infestations, flower heads can be cut to limit seed bank accumulation and spread. The previous year's seed heads can still contain seed so cutting them as well can be beneficial.

Cutting stems at ground level can inhibit growth, but mowing in most situations is not advisable because stem fragments can spread and produce new plants. If done appropriately in a suitable location where stems dry quickly, frequent mowing can prevent seed production.

Annual cultivation will control purple loosestrife; however, due to its habitat preferences this option is seldom available.

Dense patches can be burned to remove old stems which may open the patch enough for some wildlife use.

Chemical✎: In Canada, no chemical controls are available; however, development and testing is being done to gain chemical control measures. In the U.S., chemical control in or near water is possible with a permit. Since it is a wetland plant, herbicides need to be used with great care.

Apply herbicides to actively blooming, established plants or early in the season to seedlings. It is quite resistant to many chemicals.

Biological: There are four biocontrol agents available in the PNW for purple loosestrife. *Galerucella calmariensis* and *G. pusilla* are leaf-eating beetles that feed on the leaves and new shoot growth. They can seriously reduce growth and seed production. The larvae of *Hylobius transversovittatus*, a root boring weevil, develop in the roots creating severe damage if in high enough numbers or if the plant is subjected to them for several years. *Nanophyes marmoratus*, a flower bud weevil, can reduce seed production.

For large infestations, the use of biocontrol agents will be the most effective and inexpensive control method available, especially where mechanical and chemical control methods can cause serious damage to the habitat. The goal for biocontrol is to reduce purple loosestrife populations in N.Am by 70-80%; however, this is a long term goal. It will take 10-20 years for biocontrol agent populations to increase to numbers large enough to control purple loosestrife at this level. Shady sites are unsuitable for control with these insects because they avoid shade; however, purple loosestrife does not grow in large numbers in the shade. Control of shaded plants can be done by hand either with pulling or cutting.

Grazing can be detrimental to purple loosestrife control because livestock only eat early foliage which gives purple loosestrife a competitive advantage over more palatable species.

Revegetating areas following control activities, especially mechanical removal, can help discourage regrowth and seedling establishment of purple loosestrife.

Species Status

A-2, ODA-B

Synonyms

L. s. var. *gracilior* Turcz., *L. s.* var. *tomentosum* (P. Mill.) D.C., *L. s.* var. *vulgare* DC.

Other Common Names

purple lythrum, spiked willow-weed

References

Alden et al. 1998; Bianchini and Corbetta 1975; Cooke 1997; Crockett 1977; DEA 1995 Oct; DU; Foster and Duke 1990; Garton et al. 1993; Harty 1993; Hickman 1996; Hight 1993; Hitchcock and Cronquist 1973; Jolley 1988; Johnson and Lees 1988; KCDNR; Mitsch and Grosselink 1993; MDNR 1995; Neihaus and Ripper 1979; ODA a; OFAH; OSUES 1995 Jan; OSUES 1998; PNWEP 1992 June g; Pojar and MacKinnon 1994; Polunin 1972; RDFG 1998; Stuckey 1980; Taylor 1990; THPRD; Weinmann et al. 1984; Whitson 1996; William et al. 1997

Velvet-leaf

Family: Malvaceae Species: *Abutilon theophrasti* Medik.

Season

Summer annual. Seed germination: throughout the growing season.

Flowering & seed production: June-Oct.

Habitat Invaded

Favorite habitat conditions: disturbed areas, esp on rich or sandy soil.

Favorite habitat types: vacant lots, railroad loading stations, fence rows, gardens, row crops (asparagus, vegetable, raspberry, strawberry, oat, & esp. corn & soybean), barnyards, pastures.

Range

Native to Asia.

In OR, it is found in the WV (Washington, Yamhill, Polk, & Benton cos) & in Jefferson Co. Scattered populations exist throughout the West: w & c WA plus Spokane & Stevens cos., w 1/2 of ID (Lewis, Idaho, Payette, Ada & Gooding cos), and CA. It is esp com in the Midwest, but is, basically, found throughout the US. It is also found in the Mediterranean Region of Eur.

Distinguishing Characteristics

The yellow to yellow-orange flowers and heart-shaped leaves can distinguish velvet-leaf from two similar weedy mallows: Venice mallow (*Hibiscus trionum* L.) and common mallow (*Malva neglecta* Wallr.). Both are introduced from Europe. Venice mallow's flowers are a softer pale yellow with a dark center, and its leaves are deeply lobed rather than heart-shaped. Common mallow has more rounded leaves with heart-shaped bases, but no abruptly pointed tip. The flowers are white to lavender, and the fruit pods lack a spiny tip.

History

Introduced into N.Am in the mid-1700s as a potential fiber crop. Initial populations in the PNW, like the one in Klickitat Co, WA in 1885, were mostly eradicated or died out on their own. However, new populations, that seem to be more suited to the PNW, are found scattered throughout the area today. These were, most likely, introduced from the Midwest in seed screenings and contaminated commercial seed. Seed is also spread in contaminated manure and silage.

Velvet-leaf reproduces and spreads by seed, which it produces in abundance. With competition, plants can produce around 1600 seeds each. Without competition, plants produce 2800-17000 seeds each. Seed can stay viable in the soil for over 50 years. A hard seed coat also allows seeds to survive the digestive tracts of animals (PNWEP 1991 June f). For example, the killdeer (*Charadrius vociferus*), a migratory bird that eats the seed, can pass viable seeds 77 hours after eating them, potentially spreading the seeds a considerable distance (Cousens and Mortimer 1995). Seeds can also spread long distances on field equipment, animals, and people.

The Chinese make rope, bags, fishing nets, and paper from velvet-leaf fiber (PNWEP 1991 June f). They have also traditionally used it to treat dysentery, fevers, ulcers, urinary incontinence, and stomachaches. It has been found to depress the central nervous system in mice (Foster and Duke 1990).

Ecological Effects

Velvet-leaf tends to mainly be a problem in cultivated fields where it reduces crop yields and is very difficult to control once established. Seedlings emerge throughout the season, monopolize soil nutrients, and develop seed even under a crop's canopy; however, it grows taller than most crops in favorable weather. Its seeds contain a chemical that can inhibit the germination of some crop seeds.

Control Methods

Prevention: Velvet-leaf is very difficult to eradicate and control once established; plus, it is self-pollinating, so one plant can create an infestation. Thus, it is important to prevent introduction. One plant can produce many seeds which can remain viable in the soil for over 50 years; therefore, if a velvet-leaf plant is found, action must be taken immediately. If plants can not be completely removed, blooming must be controlled. Detection is difficult because seeds germinate throughout the season and are often under the canopy of a crop.

Mechanical: Pulling or cutting plants will destroy them. Remove plants before flower development. It removed after flower development, burn all seedpods because even immature seed heads can mature after removal.

Cultivation will kill plants but it will also bury seed, increasing dormancy. The most effective way to control this species in a cultivated field is to leave the field fallow. The lack of competition will increase the number of seeds germinating depleting the seed bank. It also makes seedlings easier to find and control.

Chemical✎: Several herbicides are reported to control velvet-leaf, but testing is lacking in the PNW.

Biological: Alfalfa is the most competitive crop tested; however, fewer velvet-leaf seeds germinated in alfalfa, making seed bank removal slower. Tillage damages the seed coat reducing dormancy. The order of competitiveness of other crops tested is: maize/sorghum rotation, continuous maize, continuous oats. (Cousens and Mortimer 1995)

Species Status

EPPC-A-2, ODA-B

Synonyms

Abutilon abutilon (L.) Rusby, *Abutilon avicennae* Gaertn.

Other Common Names

butterprint, piemaker

References

Cousens and Mortimer 1995; Foster and Duke 1990; Gilkey 1957; Hickman 1996; Jaques 1959; PNWEP 1991 June f; RDFG 1998; USDA 1971; Whitson 1996; William et al. 1997

Polygonum species

Season

Perennial

Distinguishing Characteristics

Table 6 Distinguishing characteristics between introduced *Polygonum* species

Species	Plant Height	Leaf Length	Leaf Shape
Japanese knotweed (*P. cuspidatum*)	1-3 m	10-15 cm	egg-shaped with an abruptly pointed tip & flattened base
Himalayan knotweed (*P. polystachyum*)	1-2 m	10-20 cm	lance-shaped with a tapered or heart-shaped base
giant knotweed (*P. sachalinense*)	3-4 m	15-35 cm	+/- narrow heart-shaped

Japanese knotweed is the only one with separate male and female flowers. Giant knotweed flowers are greener than the others. The papery sheaths at the leaf axils in Japanese knotweed fall off mid-summer while those of giant knotweed usually remain on the stem.

History

Polygonum species were introduced as ornamental and garden plants. They have escaped cultivation, and spread by an extensive rhizome system.

Ecological Effects

Polygonum species have little or no value as forage.

Control Methods

<u>Prevention</u>: The underground system is very difficult to remove by digging or with herbicides; therefore, it is important to prevent introduction. If plants are

found, control them soon, before an extensive underground system can develop.

Mechanical: It is best to remove plants by hand. Cut stems at ground level, and continue to cut often throughout the season as shoots emerge. Continue this for three seasons or more until the underground system is killed. Setting down a double layer of black plastic or planting/encouraging shrubs can help kill the rhizomes and roots. Mowing is ineffective.

Chemical✎: There are several herbicides that control knotweeds.

Japanese Knotweed▲

Family: Polygonaceae

Species: *Polygonum cuspidatum* Siebold & Zucc.

Season

Flowering: July-Sept. Stem die-back: Fall.

Habitat Invaded

Favorite habitat conditions: disturbed areas, especially open areas with rich moist soil.

Favorite habitat types: roadsides, ditchbanks, streambanks, emergent wetlands, neglected gardens, pastures.

Range

Native to Japan (Asia).

Populations are found from WA to CA, esp w of the Cas, to e N.Am.

History

Japanese knotweed was introduced into N.Am shortly after 1864. It can be eaten; boiled young shoots reportedly taste like asparagus. It reproduces and spreads by seed and rhizomes.

Ecological Effects

Japanese knotweed forms tall, dense colonies that shade then crowd out herbs and shrubs. Its aggressive growth displaces species in both horticultural and natural habitats.

Species Status

EPPC-RA; ODA-B

Synonyms

P. c. var. *compactum* (Hook f.) Bailey, *Polygonum zuccarinii* Small, *Pleuropterus z.* (Small) Small, *Polygonum cuspidatus* (Sieb. & Zucc.) Moldenke, R*eynoutria japonica* Houtt., *Fallopia japonica* (Houtt.) Dcne.

Other Common Names

fleece-flower, Japanese fleece-flower

References

Cooke 1997; Crockett 1977; Fernald 1989; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; KCDNR; Pojar and MacKinnon 1994; Taylor 1990; Whitson 1996; William et al. 1997

Himalayan Knotweed▲

Family: Polygonaceae

Species: *Polygonum polystachyum* Meissner

Habitat Invaded

Favorite habitat conditions: moist, disturbed areas.

Favorite habitat types: marshes.

Range

Native to sc Asia.

It is found in several areas w of the Cas. It is also found from the n to nc coast of CA.

History

Himalayan knotweed was introduced from Asia. It is now established in several areas along the west coast. It may or may not produce seed in the PNW. In California, escaped plants do not seem to be able to produce seed.

Species Status

EPPC-RA, ODA-B

Synonyms

P. p. Wallich ex Meisn., *Aconogonum p.* (Wallich ex Meisn.) Haraldson

Other Common Names

cultivated knotweed

References

Hickman 1996; Hitchcock and Cronquist 1973; Pojar and MacKinnon 1994; William et al. 1997

Giant Knotweed ▲

Family: Polygonaceae

Species: *Polygonum sachalinense* Maxim.

Habitat Invaded

Favorite habitat conditions: disturbed areas at low elevations, esp near settlements.

Favorite habitat types: ditches, moist ravines.

Range

Native to Japan & Sakhalin Island.

It is found mostly w of the Cas, and in n CA.

History

Giant knotweed was introduced as an ornamental and forage species. It is edible. The young roots are reported to taste somewhat like rhubarb, and it can be used as a potherb; however, large portions can be somewhat toxic.

Ecological Effects

It was soon abandoned as a forage species. It is an aggressive plant that can form dense stands spreading beyond intended boundaries and crowding out other species.

Species Status

EPPC-RA, ODA-B

Synonyms

P. s. Schmidt, *P. s.* Schmidt ex Maxim., *Reynoutria sachalinensis* (F. Schmidt ex Maxim.) Nakai, *Fallopia sachalinensis* (F. Schmidt ex Maxim.) Dcne.

Other Common Names

sacaline

References

Cooke 1997; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Pojar and MacKinnon 1994; William et al. 1997

Red Sorrel

Family: Polygonaceae Species: *Rumex acetosella* L.

Season

Perennial. Flowering: May-Sept.

Habitat Invaded

Favorite habitat conditions: disturbed areas at low to mid elevations, esp on acidic soils.

Favorite habitat types: pathways, roadsides, lawns, gardens, cultivated & abandoned fields, pastures, meadows, burns, clear cuts, beaches, open forests.

Range

Native to Eur.

It grows throughout the PNW, and throughout N.Am.

Distinguishing Characteristics

Although there are many species of *Rumex* in the PNW, red sorrel is easy to distinguish. Its arrowhead-shaped leaves with the 2 basal lobes pointing somewhat outward separate it from all but one other *Rumex*. Green sorrel (*R. acetosa* L.) has similar leaves but they are smaller (1-5 cm vs. 1-10 cm long) and the plant is taller (3-10 dm vs. 1-4(6) dm). The papery sheaths on red sorrel's stem will separate it from other species in different families whose members might have similar leaves.

History

Red sorrel was introduced into N.Am long ago, possibly as a garden herb or vegetable. Its sour leaves are used as a potherb, and as a salad and sandwich fixing. It is rich in vitamin C, and backpackers use it to make a sort of wilderness lemonade. Its seeds have been used for seasonings, snacks, hot cereal, and as a flour extender.

Medically, it has been used to treat warts, bruises, acne, scurvy, fevers, inflammation, excessive menstrual bleeding, diarrhea, tumors, cancer, and as a diuretic. Although it has been used extensively for food and medicinal purposes, it can only be consumed in small quantities. It contains oxalic acid that can be toxic in larger doses. Red sorrel has also been used as a dye.

It reproduces and spreads by seed and by rhizomes that can form large colonies, especially in poor, acidic soils. Seeds stay viable in the soil for a long time and are able to form new colonies whenever soil is disturbed. The rhizomes are fragile and can easily break off when disturbed. These fragments can form new plants and colonies.

Ecological Effects

Red sorrel reproduces and spreads so well that it can become a troublesome pest. Even though wildlife eat it, it can become toxic to livestock in large amounts; however, they rarely eat it. Its shallow, fragile rhizomes are easily damaged and spread, especially in fields, where they can do the most economic damage. If it spreads into clover fields grown for seed, it is especially troublesome, because commercial seed cleaners can not distinguish between the seeds.

Control Methods

Prevention: Red sorrel is difficult to eradicate once established due to the fragile rhizomes that easily break off and the seed bank that can remain viable for long periods of time. Therefore, it is important to keep this weed from becoming established. Chances of it becoming established can be reduced by limiting disturbance and keeping soil fertile. Adding fertilizers or lime to increase the pH of the soil can reduce red sorrel populations once established.

Mechanical: Hand pulling, digging, or removal with a potato fork are excellent ways to control small patches. Increased cultivation can control large populations. This can be done is several ways. Perennial or pasture crops can be switched to annual crops for some years before returning it to perennial crops or pasture. A 4 year rotation includes a clean-cultivated crop followed by a grain crop, cover crop, or clover then returning to the perennial crop or pasture. To control it with repeated cultivation during the dry season, allow 5-8 cm (2-3") of shoot to grow then cultivate. Repeat throughout the growing season to deplete the root reserves. (PNWEP 1993 Mar b)

Chemical✎: There are several herbicides that control red sorrel. Controlling in pure grass is easier than controlling where there are desirable broadleaf species. In both situations, repeated applications will likely be necessary.

Biological: Competition from competitive plants can help control red sorrel. Sometimes adding nitrogen will help other plants compete with red sorrel as will adding lime to help raise the pH of the soil.

Species Status

EPPC-A-1

Synonyms

R. a. ssp. *angiocarpus* (Murb.) Murb., *R. a.* var. *pyrenaeus* (Pourret) Timbal-Lagrave, *R. a.* var. *tenuifolius* Wallr., *Rumex tenuifolius* (Wallr.) A. Love, *Rumex angiocarpus* Murb., *Acetosella acetosella* (L.) Small, *Acetosella tenuifolia* (Wallr.) A. Love, *Acetosella vulgaris* (Koch) Fourr.

Other Common Names

common, sheep, horse, field, mountain, and cow sorrel; sour dock; sourweed; common sheep sorrel

References

Clark 1974a; Cooke 1997; Cousens and Mortimer 1995; Crockett 1977; Foster and Duke 1990; Franklin and Dyrness 1988; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Neihaus and Ripper 1979; PNWEP 1993 Mar b; Pojar and MacKinnon 1994; Schofield 1989; Taylor 1990; USDA 1971; William et al. 1997

Sulfur Cinquefoil

Family: Rosaceae Species: *Potentilla recta* L.

Season

Short-lived perennial. Flowering: May-July.

Habitat Invaded

Favorite habitat conditions: esp in disturbed areas with stony, gravely, &/or impoverished soils, but also in undisturbed areas.

Favorite habitat types: roadsides, dry fields, pastures, meadows.

Range

Native to Eurasia.

It has invaded the ponderosa pine zone in the PNW (the e Cas range spreading into sc OR, & parts of the Blue Mnts). It is also found in CA, the n Rockies, and throughout N.Am.

Distinguishing Characteristics

Cinquefoils are often confused with buttercups (*Ranunculus* spp.); however, they can be easily distinguished when looking at the flower. Buttercups do not have the cup-like hypanthium or the 5 bracts below the sepals that *Potentilla* has. Another way to distinguish between the genera is to check for leafy appendages where the leaf stalk attaches to the stem. Buttercups do not have these while cinquefoils do.

There are many native and several introduced cinquefoils in the PNW; however, sulfur cinquefoil is distinguished from the others by its stiff bristly hairs, and leaves that are only sparsely hairy and pale green on the underside, whereas most cinquefoils are silvery on the underside of the leaf. Its narrow, lance-shaped leaflets with uniform teeth also help distinguish it from the others.

Sulfur cinquefoil is most often confused with slender cinquefoil (*P. gracilis* Hook.) which has soft hairs, leaves with paler undersides and less uniform teeth, more basal leaves, darker petals, and rhizomes. The leaves of slender cinquefoil are not erect like those of sulfur cinquefoil.

History

Sulfur cinquefoil was introduced over 100 years ago from either Europe, Asia, or n Africa. Its seeds were possibly introduced as a contaminant in commercial products, or the plant was introduced as an ornamental species. It reproduces and spreads by seed. Spread can also occur when root fragments are moved by cultivation or soil-moving equipment. The seeds are tiny and can be spread long distances by animals (on them or in their digestive tracts), vehicles, equipment, clothing, and people. Seeds can be accidentally transported in mud.

Ecological Effects

Sulfur cinquefoil is an aggressive species that forms dense populations once established, excluding native and forage species. It has little to no grazing value, so these stands offer little to wildlife and livestock. Rare species, such as the Columbian sharptailed grouse, are losing vital habitat to sulfur cinquefoil, pushing them to the brink of extinction.

Control Methods

<u>Prevention</u>: Prevent it from becoming introduced. Clean animals and equipment before moving them from an infested site. Move animals to a contained area without sulfur cinquefoil for 5 days to allow any seed in their digestive tract to pass through before moving them into uninfested pasture or range. Keep the land and vegetation healthy and well nourished because poor or infertile soils are more likely to become invaded.

It is important to monitor land so that populations can be found when still small and easier to control. In the ponderosa pine zone of the PNW, monitoring is limited and sulfur cinquefoil is spreading quickly. Small populations can be eradicated, but large populations can only be managed. Reduce disturbance and eliminate overgrazing in areas that contain sulfur cinquefoil. Anything more than light grazing will benefit sulfur cinquefoil by reducing its competition.

Mechanical: Mowing is not advised. It tends to just make plants lower and branched with more bulky, spreading roots (PNWEP 1991 Nov f).

Chemical: Typically sulfur cinquefoil is controlled with herbicides used along with land management practices and fertilizers. Small populations can be eliminated with these techniques. Large populations can be controlled with herbicides but eradication is impractical. Herbicide treatment used with fertilization and managed grazing can reduce populations considerably. Treatments will need to be repeated every few years.

Biological: Fertilization will help reduce populations if used in conjunction with herbicides. Overgrazing will quickly result in dense populations of sulfur cinquefoil; however, controlled grazing can occur in managed areas with sulfur cinquefoil. Make sure forage grasses remain healthy and competitive. Allowing 10-15 cm (4-6") of regrowth at the end of the season will help keep grasses competitive. (PNWEP 1991 Nov f)

Species Status

EPPC-A-2, ODA-B

Synonyms

P. r. var. *obscura* (Nestler) W.D.J. Koch, *P. r.* var. *pilosa* (Willd.) Ledeb., *P. r.* var. *sulphurea* (Lam. & DC.) Peyr.

Other Common Names

erect cinquefoil, rough-fruited cinquefoil, tormentil

References

Crockett 1977; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; PNWEP 1991 Nov f; Taylor 1990; USDA 1971; Whitson 1996; Williams 1997

Linaria species

Habitat Invaded

Favorite habitat types: roadsides, railroads, pastures, rangeland, meadows, fields, field edges, and gardens.

Distinguishing Characteristics

Table 7 Distinguishing characteristics between Dalmatian and yellow toadflax

Species	Leaf Shape	Seed Shape
Dalmatian toadflax (*L. genistifolia* ssp. *dalmatica*)	broad & egg-shaped with a pointed end & wide, +/- clasping base	+/- pyramidal
yellow toadflax (*L. vulgaris*)	+/- linear to lance-shaped with points at both ends	flattened with a papery circular wing

The flowers of yellow toadflax are smaller (18-32 mm vs. 20-50 mm long) and paler yellow with a darker throat.

Dalmatian toadflax is taller, more robust, and more branched at the top than yellow toadflax.

Yellow toadflax grows in dense patches while Dalmatian toadflax populations are more scattered.

Control Methods

Prevention: *Linaria* is very difficult to control once established due to rhizome or lateral root production and prolific seed production. The control difficulties of Dalmatian toadflax is increased by its long seed bank viability (10 yr.) and waxy leaf coating. Therefore, it is important to identify and remove these species as soon as possible before populations start to expand. Prevent the introduction of seed or root/rhizome fragments by using only clean equipment and uncontaminated manure. Maintaining competitive plants, both in pastures and crops, and reducing disturbance can help prevent seedlings from becoming established.

Mechanical: Hand removal works well if feasible. Remove the plant and as much of the rhizome and roots as possible before flowers form. If removal is done after flower formation, carefully place entire flower head in a plastic bag before removing the plant. This will limit seed spread (KCDNR).

Low repeated mowing can effectively control Dalmatian toadflax (KCDNR).

Cultivation can control large patches. Start cultivating in early June and repeat after about 7 days of visible growth (never later than 10 days of visible growth). This will require 8-10 cultivations the first year and 4-5 cultivations the second year. Cultivation might be needed in following years depending on the extent of the population and the consistency of previous cultivations.

Chemical✎: It is best to use herbicides when energy reserves are at their lowest. This is just as flowers are beginning to bloom (May for Dalmatian toadflax, and June for yellow toadflax). Repeated applications may be needed for 2-3 years.

Dalmatian Toadflax▲

Family: Scrophulariaceae

Species: *Linaria genistifolia* (L.) Miller ssp. *dalmatica* (L.) Maire & Petitm.

Season

Perennial. Flowering: May-Aug.

Habitat Invaded

Favorite habitat conditions: esp disturbed, but also undisturbed areas at low elevations.

Range

Native to the Medit.

It is found on both side of the Cas range, but is most com e of the Cas. It is found throughout the n & w US, esp in range country.

History

Dalmatian toadflax was introduced around 1900 as an ornamental species. Its popular use as an ornamental accounts for its wide spread throughout the West as it escaped cultivation.

It spreads by seed and, somewhat, by creeping rootstocks and root fragments. A mature plant can produce 500,000 seeds a year, and seeds can remain viable in the soil for up to 10 years. Seeds are spread by animals and the wind.

Ecological Effects

Dalmatian toadflax is not yet an extensive problem in the West; however, its aggressive nature and widespread introduction makes it a concern. It can be a problem in pasture and range land, where it can quickly exclude desirable forage species without adding any forage value of its own.

Control Methods

Biological: There is a biocontrol agent for Dalmatian toadflax, but it is not yet available in Oregon. This defoliating moth, *Calophasia lunula*, has been widely introduced in Washington. It is giving good control and is widely available in Washington.

Species Status

EPPC-A-1, ODA-B

Synonyms

Linaria dalmatica ssp. *dalmatica* (L.) P. Mill.

Other Common Names✱

References

Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; KCDNR; Muzik 1970; Neihaus and Ripper 1979; PNWEP 1994 Nov; Pojar and MacKinnon 1994; Polunin 1972; Taylor 1990; USDA 1971; USDI; Whitson 1996; William et al. 1997

Yellow Toadflax▲

Family: Scrophulariaceae Species: *Linaria vulgaris* Miller

Season

Perennial. Flowering: June-Sept.

Habitat Invaded

Favorite habitat conditions: disturbed, open areas at low to mid elevations, esp in gravelly or sandy soils.

Range

Native to Eurasia.

Populations are scattered throughout the PNW. It is found throughout N.Am, but it is most com in e N.Am.

History

Yellow toadflax was introduced into Delaware from Wales by Ranstead, a Welsh Quaker, in the mid 1800s. It was spread widely in N.Am as an ornamental and escaped frequently. The Mennonites and other immigrants used it as a source of yellow dye. It has been known in the PNW for more than a hundred years.

It reproduces and spreads by seed and by extensive rhizomes. It can produce an abundance of seeds which spread easily in the wind because each has a large papery wing. Its rhizomes allow it to form dense colonies.

Ecological Effects

It is an aggressive invader that can form dense colonies that exclude native, forage, and crop species. It may be mildly poisonous to livestock, but it is avoided due to a disagreeable odor and, possibly, taste. Therefore, reports of poisonings by this species are rare. It serves as a nectar source for bumblebees and some moths.

Control Methods

Biological: Two biocontrol agents have a limited availability in Oregon, Washington, and Idaho: *Brachypterolus pulicarius*, a flower beetle; and *Gymnetron antirrhini*, a seed head weevil. Both were accidentally introduced. *B. pulicarius* has a fair ability for control, and the effectiveness of *G. antirrhin* is unknown in Oregon and Idaho but is good in Washington. A defoliating moth (*Calophasia lunula*) was classically introduced in Idaho. It has a limited availability for redistribution and a fair ability for control.

Species Status

LIS, ODA-B

Synonyms

L. v. Hill, *Linaria. linaria* (L.) Karst.

Other Common Names

butter-and-eggs, common toadflax, wild snapdragon

References

Alden et al. 1998; Crockett 1977; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; PNWEP 1994 Nov; Pojar and MacKinnon 1994; RDFG 1998; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Buffalobur

Family: Solanaceae Species: *Solanum rostratum* Dunal

Season

Annual. Flowering: April-Oct. Fruit: seeds mature shortly after flowering.

Habitat Invaded

Favorite habitat conditions: disturbed areas, especially in sandy soils.

Favorite habitat types: roadsides, gardens, fields, dry pastures, rangeland, prairies, stockyards, shearing pens.

Range

Native to the Great Plains and c Mex.

It has been repeatedly introduced, but is not yet established, in OR, ID, and WA. It is found in CA, Penticton BC, N.Am, the former Soviet Union, & Austr.

Distinguishing Characteristics

Its spiny fruits and large yellow flowers distinguish it from our other *Solanum* spp. which have round smooth berries and white or purple flowers with yellow centers.

Common evening primrose (*Oenothera biennis* L.) has large yellow flowers and a fuzzy stem; however, it has 4 petals which are not fused (unlike buffalobur's 5 fused petals), and the fuzz is very different from buffalobur's sharp yellow spines.

History

Buffalobur has been repeatedly introduced into the PNW in vegetable and flower seed, and sometimes with tomato seedlings. It was introduced into Penticton, B.C. when rangeland was reseeded. Even though it is frequently introduced (it is the 3rd most submitted weed for identification to PNW extension services), it has not yet become established in the PNW. However, with its tolerance to drought, self-compatibility, and high seed production, it could create large populations rapidly if allowed to remain at a suitable site.

It reproduces and spread solely by seeds which it produces in abundance (8500 seeds per plant annually). Plants break off at ground level when seeds are mature and tumble in the wind, distributing seeds as they go. Seeds can also be spread as a contaminant in bird seed, commercial seed, and seed screenings that are fed to livestock.

Ecological Effects

It is not overly aggressive and can be controlled; however, it is drought tolerant and can compete with native, forage, and crop species. It is not typically grazed because of its sharp spines; however, when it is grazed, its spines can cause injuries, and the leaves, fruit, and roots are poisonous. Hogs have been poisoned, and sheep get the burs tangled in their wool reducing its value. It is a host for the Colorado potato beetle.

Its seeds can be a source of oil for food or other purposes.

Control Methods

Prevention: Since one plant is self-compatible and can produce a large amount of seed which stays viable in the soil for several years, it is important to limit its introduction. Destroy spiny "tomato" seedlings, and remove any suspicious seedlings around bird feeders or planted crops. Any control method that prevents established plants from producing seed will eventually eliminate the seed bank and, therefore, the population.

Mechanical: Pull, dig, or hoe small infestations before flower production. Cultivation will eliminate larger infestations. Mowing can also prevent seed production. Repeat control methods until the seed bank is exhausted.

Chemical✎: Buffalobur can be easily controlled with herbicides, although herbicide information is lacking for the PNW. Applications need to be repeated until the seed bank is exhausted.

Species Status

ODA-B

Synonyms

Androcera rostrata (Dunal) Rydb., *Solanum* cornutum auct. non Lam.

Other Common Names

buffalobur nightshade, buffalo berry.

References

Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1991 June b; RDFG 1998; Whitson 1996; William et al. 1997

Puncture Vine

Family: Zygophyllaceae Species: *Tribulus terrestris* L.

Season

Summer annual. Flowering: July-Sept. Seeds: through Oct.

Habitat Invaded

Favorite habitat conditions: disturbed areas, esp in warm, dry regions and sandy soils.

Favorite habitat types: vacant lots, playgrounds, parks, ball (etc.) fields, parking lots, roadsides, railroads, airport runways, trails, field edges, fields (esp. in perennial crops), pastures, barnyards.

Range

Native to the Mediterranean region.

It is found mainly e of the Cas in the PNW. It has been established from WA & ID into the s US, and is esp com in the sw, but it is found throughout the US except along most of the n boundary.

Distinguishing Characteristics

It is sometimes mistaken for milk-vetch due to the compound leaves; however, milk-vetch has showy, pea-shaped flowers and pod-like fruits, while puncture vine has small regular-shaped flowers and hard, spiny, bur-like fruits.

History

Puncture vine was possibly first introduced into the U.S. as burs in the wool of imported sheep. It was first found in California in 1902, and it probably entered the PNW along freeways and railroads. The first reporting of it in the PNW was in eastern Washington in 1924 along some railroad tracks at Wawawai in Whitman Co. First introductions also frequently occur in the cracks of airport runways where burs have been knocked off the tires of airplanes.

Plants reproduce and spread by seed. The spines of the bur are arranged so that there are always some facing upwards. These spines attach the bur to fur, clothing, shoes, feet, tires, even skin of passing animals, and vehicles. Seed is also transported in contaminated hay, straw, manure, and commercial seed. Seeds can remain viable in the soil for 4-5 years. Although not considered a prolific seed producer, under ideal conditions, one plant can produce over a million seeds (PNWEP 1990 Apr b).

Ecological Effects

Puncture vine can decrease recreation in invaded parks, trails, playgrounds and fields. The sharp spines of the burs can puncture bicycle tires and inflated balls and injure the feet of children and animals. The sharp spines also penetrate car and airplane tires but only puncture them if they are thin and weakened.

The spines injure livestock and wildlife, nearly eliminating grazing in infested areas. The plant contains toxins that can poison cattle and sheep; fortunately, livestock avoid puncture vine.

It does not regularly invade cultivated crops, but it can pose a problem in some crops such as lima beans or peas since its burs are hard to separate from the crop seed. It can also become a serious pest in perennial crops such as asparagus, tree, and vine crops (PNWEP 1990 Apr b). It contaminates hay and damages and devalues the wool of sheep.

Control Methods

Prevention: Seeds remain viable in the soil for 4-5 years; therefore, it is important to keep seeds from being introduced. The burs spread long distances on vehicles, animals, and the clothing and shoes of people, as well as in contaminated hay, straw, manure, and crop seed.

If plants are found, control them immediately so that a large seed bank does not develop. New seedlings will emerge after each spring shower or irrigation; therefore, it is important to control them each time until the seed bank is exhausted. If burs are present (both mature and immature), dispose of them appropriately, preferably by burning, to prevent further spread. (PNWEP 1990 Apr b; Whitson 1996)

Mechanical: Plants can be easily controlled by hoeing or shallow tillage if the treatment occurs before burs start to form. Check for seedlings after each spring shower or irrigation. Control will need to be repeated until the seed bank is depleted. (PNWEP 1990 Apr b)

Chemical: Several herbicides are available to control puncture vine. Treatment will need to be repeated until the seed bank is eliminated. Soil-applied herbicides may reduce the number of times per year treatment is needed; however, timing is important for effective control. February to early March is often the best time to apply herbicides, but this varies depending on the circumstances. (PNWEP 1990 Apr b)

Biological: In the sw U.S., two weevils are proving to be effective biocontrol agents. They, however, are not easily becoming established in the PNW. No weevils released into Washington or Idaho have survived, and the first weevils released into Oregon in 1963 failed to become established. However, introductions were made into Oregon again in 1983 (Jackson, Wheeler, Malheur, Grant, and Wallowa cos) and the Jackson County population is now thriving. So, biocontrol in Oregon might be available in the future. The two weevils currently used are *Microlarinus lareynii*, which attacks the seed, and *M. lypriformis*, which attacks the stems. (PNWEP 1990 Apr b)

Species Status

LIS, ODA-B

Synonyms✱

Other Common Names

tackweed, puncture weed, Mexican sandbur, burnut, goathead.

References

Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Neihaus and Ripper 1979; PNWEP 1990 Apr b; USDA 1971; Whitson 1996; William et al. 1997

Grasses and Grass-like plants

Jointed Goatgrass

Family: Poaceae Species: *Aegilops cylindrica* Host.

Season

Winter annual. Flowering & seed production: May-July

Habitat Invaded

Favorite habitat conditions: disturbed, dry areas.

Favorite habitat types: roadsides, railroads, fence rows, cultivated fields (esp. wheat), alfalfa fields, pastures, grasslands.

Range

Native to Eur, & maybe w Asia.

It is wdsp in winter wheat producing areas in the PNW (OR, WA, ID). It is also found in CA, the Great Plains, Mex, and is spread throughout N.Am in most winter wheat growing areas.

Distinguishing Characteristics

Jointed goatgrass looks very much like wheat, but there are major differences in the seed head. The seed head of jointed goatgrass is compact with the spikelets compressed against the stalk and the awns mainly extending just from the terminal spikelets. Wheat's seed head is open sticking out from the stalk with long awns extending from spikelets all along the seed head. When trying to identify seedlings, dig up the young plant and look at the seed from which it grew.

History

Jointed goatgrass was introduced into N.Am in the early 1900s, probably in contaminated wheat seed. It was first collected in the PNW in eastern Washington in 1917. It was first collected in Oregon in 1956 near Baker.

It reproduces and spreads by seed. It is mainly spread from wheat field to wheat field as a seed contaminant or by custom combiners. One survey in Oregon found that farmers were planting 20% of their land with contaminated seed (PNWEP 1984 July). It can then escape and spread into nearby roadsides and waste areas. It can also spread long distances in sheep's wool, equipment, hay, clothing, etc.

Ecological Effects

The long awns can injure grazing animals, and they can get caught in sheep's wool; however, the biggest problem with jointed goatgrass is in winter wheat fields where it competes for nutrients, sun, and moisture, reducing yields significantly. Just one jointed goatgrass per square foot can reduce yields by 3-5%, and 10 per square foot by 30-50% (PNWEP 1984 July). This creates a significant reduction in yields across winter wheat growing areas since most fields contain jointed goatgrass. Jointed goatgrass seed can not be effectively separated from the wheat seed, causing contamination to the harvested grain. Contaminated grain can not be certified which makes it very hard to sell.

Control Methods

Prevention: Jointed goatgrass is difficult to control, especially in crops of winter wheat; therefore, it is important to prevent its introduction. Carefully check seed to make sure it is free of jointed goatgrass seed; also be careful to use only uncontaminated hay, straw, and equipment. Keep populations in waste areas and along fences and roadsides from going to seed. Since jointed goatgrass is an annual, it is important to keep any established populations from producing seed. This will eventually eradicate the plant as long as seed is not reintroduced from an outside source.

Mechanical: In waste areas and along fences and roadways, mowing can be effective as long as it is done often enough to prevent seed from forming. It is also helpful to plant competitive species such as perennial grasses in these areas.

When controlling infestations in crop fields, the following procedures can reduce jointed goatgrass populations:

1-Rotate to a spring crop such as barley. Two or more spring crops in a row are needed to deplete most of the goatgrass seed bank. Spring barley is especially good to use. Follow the barley crop with a summer fallow before planting winter wheat.

2-When harvesting the winter wheat, cut low and reduce the air on the combine. This keeps most of the goatgrass seed from falling to the soil. Make sure chaff and straw are disposed of appropriately to reduce spread.

3-Delay fall planting as long as possible, and control goatgrass seedlings just before planting. This will reduce the number of goatgrass plants competing with the crop. (PNWEP 1984 July).

Chemical✎: Most herbicides will not control jointed goatgrass in wheat, or they control it only when applied in dosages that harm the crop. Metribuzin and paraquat, however, seem to work, with the proper application procedures. Refer to the OSU extension pamphlet, "Jointed goatgrass" (PNWEP 1984 July) for current herbicide information and application procedures. It is best to apply herbicides to young plants.

Species Status

LIS, ODA-B

Synonyms

Triticum cylindricum (Host) Ces., Pass. & Gib.; *A. c.* Host var. *rubiginosa* Popova; *A. tauschii* auct. non Coss.; *Cylindropyrum cylindricum* (Host) A. Love

Other Common Names✵

References

Gaines and Swan 1972; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1984 July; USDA 1971; Whitson 1996; William et al. 1997

Sweet Vernal grass

Family: Poaceae Species: *Anthoxanthum odoratum* L.

Season

Perennial. Flowering: early spring. Withers: by midsummer.

Habitat Invaded

Favorite habitat conditions: disturbed areas, often where somewhat moist.

Favorite habitat types: roadsides, lawns, pastures (unimproved, native) , meadows, open forests.

Range

Native to Eur.

It is found throughout OR, but it is mostly located w of the Cas. It is found from AK to CA, mostly w of the Cas, and is wdsp in temp N.Am.

Distinguishing Characteristics

Its shortness, vanilla scent, sweet-tasting stems, and compacted bronze to golden colored inflorescence distinguish it from other grasses in our area. A similar species is annual vernal grass (*A. aristatum* Bioss.) which is an annual and located in similar but drier habitats.

History

Sweet vernal grass was introduced as a component in hay pastures because of its sweet smell; however, it is not highly productive or palatable. Coumarin, the compound that gives sweet vernal grass its sweet smell, can become toxic when the hay rots; therefore, the use of sweet vernal grass for hay has declined. It is used in some wetland restoration projects.

Ecological Effects

It has been used for forage, but it creates a toxin that inhibits blood clotting when it rots.

Control Methods✸

Species Status

A-1

Synonyms✸

Other Common Names✸

References

Cooke 1997; Hickman 1996; Hitchcock and Cronquist 1973; Pojar and MacKinnon 1994

Smooth Brome

Family: Poaceae Species: *Bromus inermis* Leys. ssp. *i.*

Season

Perennial

Habitat Invaded

Favorite habitat conditions: disturbed areas from low elevations to subalpine slopes.

Favorite habitat types: ditches, streambanks, fields (old), meadows, pastures, hay fields.

Range

Native to Eur.

Scattered populations are found from AK to CA, and throughout N.Am except possibly the extreme north.

Distinguishing Characteristics

There is a native soft brome in the PNW, *B. i.* ssp. *pumpellianus*. It is very similar to the European soft brome; however, the native species has hairier nodes, leaves, and lemmas. The European species is mainly hairless in these areas. The native species has 2-4 stem leaves with auricles typically present, and ligules mostly 1-2 mm long. The European species has 4-6 (7) stem leaves that typically lack auricles, and have ligules that are seldom greater than 1 mm long. The spikelet of the native species is typically a deep purple color, with glumes broadened at the base. European spikelets are greenish to purple-tinged and are narrow with the 1st glume tapered from the base.

California brome (*B. carinatus* Hook. & Arn.) resembles smooth brome, but it has compressed spikelets with keeled backed lemmas.

History

Soft brome has been widely introduce for forage in pastures and hayfields. It is also cultivated for revegetating areas after a fire.

Ecological Effects

It is a highly palatable species that is often used for forage.

Control Methods

Chemical✎: herbicides are available to control *Bromus* species.

Species Status

A-1

Synonyms

B. i. var. *villosa*.

Other Common Names✵

References

Hickman 1996; Hitchcock and Cronquist 1973; Pojar and MacKinnon 1994

Japanese Brome

Family: Poaceae

Species: *Bromus japonicus* Thunb. ex Murr.

Season

Annual, or winter annual. Germination: typically in fall. Main growth: spring. Flowering: June-Aug.

Habitat Invaded

Favorite habitat conditions: open & dry, disturbed areas, esp where soils are shallow.

Favorite habitat types: roadsides, rangeland, fields (hay, grain), meadows, pastures, open pine forests, ballast.

Range

Native to Eurasia.

It is found mainly e of the Cas (esp. in the north), but it is also found on ballast in Portland, and in WV grasslands. It is wdsp in the West and throughout most of the US.

Distinguishing Characteristics

The drooping inflorescence branches and the bent awns at maturity distinguish Japanese brome form the other annual bromes in the PNW.

Table 8 Distinguishing characteristic between similar, common, annual bromes in the PNW

Species	Awns	Inflorescence Branches	Spikelet Length
Japanese brome (*B. japonicus*)	5-12 mm; bent to twisted	drooping	~13 mm
cheatgrass (*B. tectorum*)	10-15 mm; straight	drooping	15-20 mm
rattlesnake brome (*B. briziformis* Fishcher & C. Meyer)	awnless	drooping	~25 mm
hairy cress (*B. commutatus* Schrad.)	7-9 mm; straight	ascending to drooping	10-25 mm
soft chess (*B. mollis* L.)	6-13 mm; straight	erect	10-22 mm
ripgut brome (*B. rigidus* Roth)	up to 57 mm; straight	spreading to drooping	32-38 mm
barren brome (*B. sterilis* L.)	18-30 mm; straight	ascending to drooping	>25 mm

History

Japanese brome has been introduced from Europe, possibly as a contaminant in things such as ballast. It reproduces and spreads by seed.

Ecological Effects

Although highly palatable in the spring, its awns can cause considerable damage to grazers once seeds have matured. It can be highly aggressive in disturbed areas that are dry and open with shallow soils. Its seed is eaten by chukars, quail, sparrows, gophers, and mice.

Control Methods

Prevention: Maintaining healthy, vigorous perennial grasses with sound management practices is the best way to prevent invasion from annual bromes.

Mechanical: Cultivation can control annual bromes. Cultivate just before maturity to prevent seed from entering the seed bank. Repeat until the seed bank is depleted.

Mowing is not an effective form of control.

Chemical✎: Herbicides are available for brome control.

Biological: Competition from established grass only offers fair control once brome populations have become established. It is best to discourage invasion by keeping perennial grasses healthy and competitive.

Species Status

EPPC-A-1

Synonyms

B. j. var. *porrectus* Hack., *Bromus patulus* Mert. & Koch

Other Common Names✸

References

Cousens and Mortimer 1995; Franklin and Dyrness 1988; Hickman 1996; Hitchcock and Cronquist 1973; Johnson 1993; USDA 1971; Whitson 1996; William et al. 1997

Cheatgrass

Family: Poaceae — Species: *Bromus tectorum* L.

Season

Winter annual (annual). Flowering: April-June.

Habitat Invaded

Favorite habitat conditions: disturbed and undisturbed areas with 6-22" of annual precipitation, especially in disturbed areas with dry, sandy, or gravelly soils.

Favorite habitat types: roadsides, railroads, pastures, rangeland, crops (cult, winter wheat, perennial grass seed, alfalfa), fence rows, meadows, stony hillsides, gravelly banks, clear cuts, burned areas, sagebrush habitat, open pine, juniper, & Douglas-fir forests.

Range

Native to Eurasia.

Found throughout OR, but it is esp prominent e of the Cas. Found throughout the US, except in the extreme se, but it is most com in the West and in the n Great Plains. Found in dry areas worldwide.

Distinguishing Characteristics

The drooping inflorescence branches and the 10-15 mm straight awns distinguish it form the other annual bromes in the PNW. See Japanese brome (p. 239) for some of the main differences between similar, common, annual bromes in the PNW .

History

Cheatgrass was introduced from the Mediterranean region, possibly in packaging material received in Denver, CO. It has spread westward (and eastward, but, possibly, started in the east where it was identified in 1861), heavily occupying most of the inland PNW, intermountain west, and n Great Plains region. It was first found in eastern WA around 1890 and is now one of our most abundant and widespread plants.

It reproduces and spreads by seed which it can produce in abundance (over 125 million per acre in ideal conditions) (PNWEP 1994 Oct). Even on very poor sites, it will produce some viable seed. Most seeds germinate after a short rest period, but some can remain viable for up to 3 years. East of the Cascades it has spread extensively along roads and in heavily grazed areas until it has become one of our most common species. It is a common crop seed contaminant.

Ecological Effects

When natural habitats are disturbed by factors such as overgrazing or fire, cheatgrass can displace natives and most other species, becoming a permanent dominant in the habitat. Its early growth and maturity along with its extensive fibrous root growth allows it to take advantage of early season moisture and nutrients. Its high seed output and germination also increase its competitiveness. It has even entered remote and undisturbed habitats, but in smaller numbers and with dwarfed plants. Once established in a disturbed area, cheatgrass often will not relinquish its dominant position after the disturbance has been stopped. This is unlike other early successional species, which slowly give way to other species once the disturbance stops.

Control efforts are sometimes the only way to restore a habitat's natural processes and species.

Early in the season cheatgrass provides good forage for livestock and wildlife, sometimes providing the main green forage. However, since it is an annual, its production is not as stable as that of native perennials because it is much more dependent on the weather. It also decreases in quality once it matures. Its protein content drops by 97%, and it becomes dangerous to graze. The mature awns can injure grazing animal's mouths and eyes sometimes leading to severe infections and even death. These early maturing plants also create a serious fire hazard throughout the summer. Being an annual makes the roots of cheatgrass less able to reduce erosion than those of native perennial bunchgrasses.

It is also a problem in crops, esp. winter wheat, perennial grass seed, and alfalfa. Its seed is very difficult to separate from other grass seed; it reduces crop production; and it responds so positively to fertilizers that it can eliminate all benefits of fertilizer application to the crop.

Control Methods

Prevention: It can be very difficult to control. This is especially true in winter wheat because the two species are genetically very similar which makes selective herbicidal control difficult. In winter wheat, infestations are controlled mainly by a change in rotations to spring crops that often give less yield. Spring rotations/fallows are necessary for at least two years in a row in order to deplete the cheatgrass seed bank enough to make winter wheat rotations profitable. Two years are necessary because cheatgrass seed remains viable in the soil for 2-3 years. Brome seedlings must be controlled with herbicides or by mechanical means during these rotations in order to deplete the seed bank. This prevents new seed production, and possibly eliminates cheatgrass from the field. Detailed information concerning control and management of cheatgrass in winter wheat can be found in the publication, "Managing Downy Brome under Conservation Tillage Systems in the Inland Northwest Crop-Fallow Region," published by PNW Conservation Tillage Handbook Series (chapter 5, No. 15). (PNWEP 1994 Oct)

Cheatgrass can also become so dominant in places such as rangeland that control can be daunting if not completely unfeasible; therefore, it important to properly manage rangeland. Maintaining healthy stocking rates and keeping desired perennial grasses and forbs strong and healthy will reduce the amount of cheatgrass invading rangeland.

Mechanical: Cultivation can provide good control for cheatgrass. It is important to remove plants before seed is produced in order to prevent further establishment of the seed bank. Traditionally, a deep cultivation (moldboard plowing) is carried out after the fall harvest. This results in limiting cheatgrass because it buries the seed too deep to germinate; however, it also results in increased soil erosion and reduced moisture retention in the soil for future crops. It is better to leave the crop stubble through the winter then control brome seedlings in the spring, either chemically or mechanically. If fall precipitation cooperates, it is good to let brome seedlings germinate and then shallowly till them before planting winter wheat.

Fire is often used as a control method in rangeland.

Chemical✎: Several herbicides are available to control cheatgrass. Often techniques like chemical fallowing are used to control cheatgrass in crops, but difficulty arises with winter wheat which is so similar genetically.

Species Status

EPPC-A-1

Synonyms

Anisantha tectorum (L.) Nevski, *B. t.* L. var. *glabratus* Spenner, *B. t.* L. var. *hirsutus* Regel, *B. t.* L. var. *nudus* Klett & Richter

Other Common Names

downy brome

References

Alden et al. 1998; Cousens and Mortimer 1995; Crockett 1977; Franklin and Dyrness 1988; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Johnson 1993; Muzik 1970; PNWEP 1994 Oct; Pojar and MacKinnon 1994; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Quackgrass

Family: Poaceae Species: *Elytrigia repens* (L.) Nevski

Season

Perennial. Flowering: June-Aug.

Habitat Invaded

Favorite habitat conditions: disturbed areas, esp at low elevations near settlements.

Favorite habitat types: roadsides, lawns, gardens, cultivated fields, pastures, meadows, stream banks.

Range

Native to Eurasia.

It is wdsp in much of temperate and subarctic N.Am.

Distinguishing Characteristics

Agropyron spp., which are very common in our region, are very similar to *Elytrigia* spp. Many sources, like *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973), combine both groups into the genus *Agropyron*. About half of these species, including quackgrass, are rhizomatous mat-formers; the rest are bunch grasses. Quackgrass's broad, flat, drooping, and slightly hairy blade along with its yellowish-white rhizomes and widely spaced leaf veins should help distinguish it from similar species. Another distinguishing feature is its constricted leaf tips in young plants.

History

Quackgrass was a widely used medicinal herb up to the First World War. It has been known in the U.S. for 150 years or more. It is not known how it was first introduced, but it has probably been introduced to N.Am several times in various ways. It is used as a medicinal herb, a lawn grass, for forage, and as a soil binder. It is also transported accidentally in commercial seed, hay, straw, manure, wool, fur, and clothing.

It reproduces and spreads by seed, rhizomes, and rhizome fragments. It produces high numbers of viable seed; however, large, dense mats are produced mainly by underground growth. Its underground system is extensive, and it is able to send up new shoots at every node. If rhizomes are disturbed and broken, each fragment can create a new plant which can eventually growing into a new colony.

Ecological Effects

Quackgrass's aggressive nature and harmful qualities outweigh its benefits as a forage species and as an effective soil binder. It forms large, dense colonies that crowd out native, crop, and pasture species. It is among our most troublesome weeds because it can crowd out almost any competitor. Its rhizomes produce chemicals that have an inhibiting effect on the growth of other plants. It can seriously reduce crop yields and becomes a pest in yards and gardens. It is especially important to keep it out of crops which can be contaminated with its seed during harvesting, since it is illegal to transport quackgrass seed.

Control Methods

Prevention: It is important to prevent the establishment of quackgrass because its extensive underground root system makes it extremely difficult to eradicate. The rhizomes are extensive and store large quantities of energy where even tiny fragments can grow into a new plant. The rhizomes are also very tough, being able to penetrate hard soils and get into difficult places like the root systems of trees and shrubs and under walkways and roads, making them almost impossible to pull without leaving fragments.

Use proper managing techniques to keep healthy yards, gardens, pastures and crops. Limit quackgrass introductions by using clean seed, straw, hay, manure, and equipment. Control introductions quickly before an extensive underground system can develop.

Mechanical: In small areas, pulling and digging can control quackgrass if done properly. The quackgrass needs to be pulled often (every 2-3 weeks), before new shoots can supply energy to the underground system. This will eventually deplete root reserves and kill the plant (after 2 or more years).

Cultivation, in large patches, often does more harm than good. Cultivation breaks up the rhizomes and scatters them over large areas. This helps the infestation spread. Only careful cultivation techniques, often used in conjunction with herbicides, will help control quackgrass. The best form of control is to break the underground system into tiny fragments; then, control new growth, either mechanically or chemically, before it can add energy to the underground fragment. This will eventually deplete the underground reserves and kill the plant.

Chemical✎: There are several herbicides that can control or suppress quackgrass. Repeated applications may be necessary for complete control. Often, when done correctly, herbicides are more effective when used in conjunction with mechanical control methods.

Species Status

EPPC-A-1, ODA-B

Synonyms

Agropyron repens (L.) Beauv., *A. r.* var. *subulatum* (Schreb.) Roemer & J.A. Schultes, *A. leersianum* sensu Rydb., *E. r.* (L.) Desv. ex B.D. Jackson, *Elytrigia r.* var. *r.* (L.) Desv. ex B.D. Jackson, *Elytrigia r.* var. *vaillantiana* (Wulfen & Schreb.) Prokudin, *Elytrigia vaillantiana* (Wulfen & Schreb.) Beetle, *Elymus r.* (L.) Gould, *Triticum r.* L., *Triticum vaillantianum* Wulfen & Schreb.

Other Common Names

couch grass, quitch, twitch grass

References

Bianchini and Corbetta 1975; Cooke 1997; Cousens and Mortimer 1995; Foster and Duke 1990; Gaines and Swan 1972; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Kadans 1970; Muzik 1970; Pojar and MacKinnon 1994; Taylor 1990; USDA 1971; Whitson 1996; William et al. 1997

Common Velvetgrass

Family: Poaceae Species: *Holcus lanatus* L.

Season

Flowers: May-Sept.

Habitat Invaded

Favorite habitat conditions: disturbed, moist areas at low elevations, esp near settlements.

Favorite habitat types: roadsides, railroads, lawns, gardens, fields (cultivated), pastures, meadows, grasslands, coastal headlands, open woods.

Range

Native to Eur.

It is esp com w of the Cas from AK to CA, but it is also found e of the Cas and in n ID & MT. It is wdsp in N.Am & S.Am.

Distinguishing Characteristics

The soft, velvety stems and leaves are distinctive for velvetgrass. Many bromes have hairy stems, but they are rarely as soft. Brome spikelets can have several florets with awned lemmas, but the sheaths are closed unlike the open sheaths of velvetgrass.

German velvetgrass (*H. mollis* L.) is very similar to common velvetgrass. The main difference is that German velvetgrass is not quite as hairy as common velvetgrass, which makes it look greener. German velvetgrass stems are only hairy at the nodes (joints), and the blades can be hairless. It is much less common (w of Cas only) and is rhizomatous. Its awn is bent but not hooked like in common velvetgrass.

History

Common velvetgrass was probably introduced as a pasture grass, although it is not overly palatable. It spreads by seed and, sometimes, by aboveground runners (stolons). It is unclear how most seeds get into lawns and meadows. They could be a contaminant in seed mixes, already in the seed bank, or travel in on animals, equipment, or the wind.

Ecological Effects

Common velvetgrass has become abundant in disturbed grasslands, displacing natives and valuable forage species. In lawns, it creates noticeable patches of thick, grayish grass. It has developed a tolerance to the heavy metals that are left behind in toxic concentrations in mine tailings. It is only moderately effective in controlling erosion.

Control Methods

Prevention: Common velvetgrass is almost impossible to keep out of turf; and once it establishes, almost the only way to get rid of it is to kill the whole lawn and start over. Therefore, it is important to prevent introduction as much as possible, and to treat new plants immediately before they become established. When installing a new lawn in an area with common velvetgrass in its seed bank, it is advisable to prepare a good bed then allow the seed bank to germinate. Kill weeds before planting the lawn; this may delay planting until spring in order to allow time for an effective reduction of the seed bank. A good time to identify velvetgrass is in the early morning dew which is very distinctive on the hairy foliage. Patches can be marked at this time and treated later.

Mechanical: Sometimes cultivation, with 1-2 years of cropping, can be used to control velvetgrass. Pasture can then be replanted if desired.

Regular mowing can keep seeds from being added to the seed bank, but it will not control established plants.

Chemical✎: Herbicides can control velvetgrass; although, it is almost impossible to control infestations in lawns with chemicals. Seedlings can be controlled with spot treatments. Herbicides work well in waste areas and along fences. Controlling these areas helps to keep seed out of managed turf.

Biological: Intense grazing can help reduce seed production, but it needs to be carefully managed and it will not control established plants. Competition with established grasses does not work to control velvetgrass.

Species Status

EPPC-A-1

Synonyms

Nothoholcus lanatus (L.) Nash

Other Common Names

Yorkshire fog

References

Alden et al. 1998; Cooke 1997; Cousens and Mortimer 1995; Franklin and Dyrness 1988; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; PNWEP 1993 Mar a; Pojar and MacKinnon 1994; Whitson 1996; William et al. 1997

Wild-proso Millet

Family: Poaceae Species: *Panicum miliaceum* L.

Season

Summer annual. Flowering & seed production: July-Sept.

Habitat Invaded

Favorite habitat conditions: disturbed areas.

Favorite habitat types: roadsides, railroads, abandoned fields, field entrances and borders, row crops.

Range

Native to Eurasia.

In OR, it is mainly found in the WV. It is also found in sc WA, sw & sc ID, c & s CA, and throughout the n US & s Can.

Distinguishing Characteristics

The seedlings can be confused with several other grass seedlings and corn. Corn and barnyard grass (*Echinochloa crus-galli*) seedlings lack hairs on their stems and leaves, whereas wild-proso millet seedlings have them. Barnyard grass seedlings also lack ligules unlike wild-proso millet seedlings.

The seedlings and mature plants of both witchgrass (*P. capillare*) and domestic proso millet are easily confused with wild-proso millet. The best way to distinguish between them is to dig up the seed from which the plant came, which does not deteriorate after germinating. Wild-proso millet seeds are olive-brown to black, domestic proso millet seeds are yellow to light-brown, and witchgrass seeds are green or grayish and do not remain attached to the root. Witchgrass is smaller than wild-proso millet at every growth stage.

History

Wild-proso millet probably evolved from proso millet (PNWEP 1992 June m) which is thought to be the first cultivated grain; however, its exact origin is unknown. It was probably introduced from Asia or Europe and has been grown for forage, seed, and food in the U.S.

It reproduces and spreads by seed. Without competition, it can produce more than 170 million seeds per acre. In competitive situations, it produces much less. It can not tolerate shade. (PNWEP 1992 June m) Seeds spread no farther than the parent plant is tall (Cousens and Mortimer 1995). Seeds can be carried long distances in uncomposted manure and by birds, small animals, and irrigation water (Whitson 1996). In the PNW, the main form of long distance spread is by harvesting equipment (PNWEP 1992 June m; Cousens and Mortimer 1995; Whitson 1996). Seeds can remain viable in the soil for over 8 years (PNWEP 1992 June m)

Ecological Effects

Wild-proso millet has become a serious problem in crops, especially row crops like corn. If two plants per square foot are allowed to compete with corn throughout the season, yields are reduced by almost 40% (PNWEP 1992 June m). If wild-proso millet plants are not removed within the first 4-5 weeks, crops will suffer significant losses. Unfortunately, wild-proso millet is difficult to control because seeds continue to germinate throughout the season and there are no effective herbicides for control in corn fields.

Control Methods

Prevention: It is important to prevent wild-proso millet seed from entering crop fields since plants can produce so many seeds and reduce yields significantly. Therefore, it is important to control infestations along roadsides, in waste areas, and along field boundaries. It is also important to use clean seed, manure, and equipment.

Inspect fields for wild-proso millet seedlings and control immediately before seed heads form. Even one plant can cause big future problems with its abundant seed production and long seed viability. Wild-proso millet is not highly competitive in solid-seeded crops due to shading; therefore, crop rotations including these crops can help control populations. A rotation of broadleaf crops is also helpful because it makes control with herbicides easier. In row crops, it is important to keep row spacing as narrow as possible. Earlier planted grains are often able to compete better than late-planted grains because they can grow fast enough to shade wild-proso millet.

Mechanical: Row cultivation can help control wild-proso millet, but it is more effective when used in conjunction with other control methods. Cultivation can be effective when the whole plant (seedling) is buried or when done just before a dry spell.

Chemical: Several herbicides can be used to control wild-proso millet. Chemical control is most effective in broadleaf crops. Control with herbicides in corn is often not effective; therefore, a rotation of corn with broadleaf crops can keep wild-proso millet populations manageable.

Species Status

EPPC-CNL, ODA-B

Synonyms

(?) *P. m.* L. ssp. *miliaceum*

Other Common Names

broomcorn millet

References

Cousens and Mortimer 1995; Crockett 1977; Hickman 1996; Hitchcock and Cronquist 1973; PNWEP 1992 June m; Polunin 1972; Whitson 1996; William et al. 1997

Kentucky Bluegrass

Family: Poaceae Species: *Poa pratensis* L.

Season

Perennial. Flowering: April-June (Aug.).

Habitat Invaded

Favorite habitat conditions: open, disturbed or undisturbed areas, either dry or moist, from low to mid elevations, and esp com near settlements.

Favorite habitat types: roadsides, lawns, gardens, cultivated fields, rangeland, pastures, meadows, prairies, streambanks, emergent wetlands, open woods, clearings, thickets.

Range

Ssp. *pratensis* is native to Eurasia.

It is wdsp and com in much of temp N.Am.

Distinguishing Characteristics

Poa is a very large and diverse genus, with over 50 species in the PNW. Most *Poa*s are very similar, making it hard to identify specific species. There are three subspecies of *P. pratensis*; at least one of them is native. When identifying *Poa* species, it is best to use a good taxonomic key and use the lowest spikelet florets for identification purposes.

History

Kentucky bluegrass is very tolerant of close grazing and mowing and has been widely used as a pasture and lawn grass. It escapes from pastures and lawns into neighboring areas and spreads from there, making it one of the most widespread weeds in temperate North America. It spreads by seed and by aggressive rhizomes.

Ecological Effects

It provides valuable forage to livestock and wildlife, and can be excellent for erosion control, but it is very aggressive. It spreads into gardens, landscaped yards, cultivated fields, and natural areas often becoming a nuisance and excluding native species.

Control Methods

Prevention: Do not introduce this species for forage or landscaping, and avoid accidental introductions because it is very hard to control once established. It resists treatments by herbicides, close mowing, and grazing.

Chemical✎: It is tolerant to several herbicides.

Species Status

A-1

Synonyms

P. p. ssp. *p.* & *P. p.* ssp. *angustifolia* intro., *P. p.* ssp. *agassizensis* prob native; *Poa agassizensis, Poa peckii*

Other Common Names✱

References

Alden et al. 1998; Cooke 1997; Hickman 1996; Hitchcock and Cronquist 1973; Pojar and MacKinnon 1994; Taylor 1990; William et al. 1997

Johnsongrass

Family: Poaceae

Species: *Sorghum halepense* (L.) Pers.

Season

Perennial. Flowering: late July-frost.

Habitat Invaded

Favorite habitat conditions: disturbed, open areas, esp where moist.

Favorite habitat types: roadsides, ditches, fields.

Range

Native to the Mediterranean region.

Scattered populations are found throughout OR: Milton-Freewater area in the ne, scattered along the I-5 corridor, s WV, & occas in Malheur Co. Scattered populations are also found in CA (w CA, & the central valley along irrigated ditches), WA (esp. the warmer sc area), ID (Snake river in Idaho Co. & near Caldwell in Canyon Co.), and throughout much of the US.

Distinguishing Characteristics

Johnsongrass resembles cultivated sorghum except that Johnsongrass has scaly nodes on its rhizomes. Another similar species that becomes a problem in fields is shattercane or Sudan grass (*S. bicolor* (L.) Moench). It probably originated from crosses of Johnsongrass and cultivated sorghum. It is an annual instead of a perennial so it does not reproduce from rhizomes. Another difference is in the tip of the stalk that bears the seed. On Johnsongrass, it is knob-shaped; and on Sudan grass, it is rectangular.

History

In the 1830s, Johnsongrass seed was brought to the southern U.S. from Turkey as a potential crop. A planter named Johnson planted it, and it was soon spread throughout the South as a forage and hay crop. It has been repeatedly introduced into the PNW since 1890, and it is still being promoted for forage improvement (USDA 1971, Harty 1993, Hickman 1996). It is sold under different names, confusing well intentioned buyers (Jaques 1959).

It reproduces by seed, by extensive and aggressive rhizomes, and by root fragments or stems that have been cultivated into moist soil. The seeds can be produced in large amounts (28,000 per plant), and can remain dormant in the soil for years (PNWEP 1991 Nov c). Rhizomes can grow an average of 3.4 m in 2.5 years, sending up new plants along their length and creating colonies occupying, on average, 17 square meters (Cousens and Mortimer 1995). This underground system stores an enormous amount of food for reproductive purposes.

Ecological Effects

Although Johnsongrass is a good source of fodder, it has been ranked as the 6th worst weed in the world because of its many bad qualities. Whenever stressed by frost of drought, it produces toxic compounds which can poison grazing livestock or wildlife. Its height creates visibility problems along roads.

It is highly competitive. Its extensive root system out-competes crops and native species for nutrients and water, while its height allows it to effectively compete for light. The large rhizomes can also crowd out or even damage (distort) the roots of neighboring plants. Its pollen can contaminate cultivated sorghum grown for seed, and it serves as a host for several crop pests and diseases (witchweed, *Striga asiatica*; sorghum midge; corn stunt disease; and sugar cane mosaic virus).

Control Methods

Prevention: It is very difficult to control once established. This is because of its large production of seeds, which can remain viable in the soil for years, and especially because of its extensive rhizomes which can spread rapidly, store abundant resources, and grow into new plants even when cut into tiny pieces.

To help prevent its introduction, use seed, manure, hay, soil, or rock free of its seed, root, or rhizome fragments. It is also important to clean equipment and livestock when moving either from an infested area to an uninfested area. Livestock should be confined to a controlled area until all seeds pass through their digestive system.

Infestations usually start with a few scattered plants. It is important to control these plants early before they can create large colonies or seed banks. Ideally, individual plants would be removed by hand. Freezing temperatures kill the plants and their rhizomes; however, some plants act as annuals by producing seed the first year in cold climates. Freezing temperatures, along with crop rotations, cultivation, mowing and grazing, can be used to weaken large infestations prior to intensive control efforts.

Mechanical: For individuals or small isolated patches, it is best to remove the plant(s) by hand (pulling, digging, hoeing, etc.). Make sure all underground and aboveground parts are removed, then mark the area. The area will need to be checked for several years, so that plants emerging from missed rhizomes and seed can be pulled.

Cultivation can break up rhizomes and widely scatter the population; it can also bury stems, which can then sprout new plants in moist soil. However, with proper techniques, cultivation is a good, and sometimes the only, means for control. It is important to cultivate so that rhizomes are broken into small fragments, then, allow the fragments to use up their reserved energy and dry out. This is done by switching between disking and springtooth harrowing every 4-5 weeks. The disking breaks up the rhizomes, the 4-5 weeks allows new plants to develop which deplete the rhizome energy stores, and the springtooth harrowing brings fragments to the surface to dry out.

Fall plowing is also a good control tool by making rhizomes become active and more susceptible to freezing.

Mowing can help to weaken the plant, but it is not an effective control method.

Chemical✎: Herbicides will often leave parts of the extensive underground system unharmed. Therefore, it is hard to effectively control infestations with herbicides alone. Infestations will need to be checked for regrowth every 4-5 weeks or so during the season for several years.

Biological: Grazing can be used to weaken infestations, but it is not an effective method for control.

Species Status

EPPC-A-2, ODA-B

Synonyms

Sorghum miliaceum (Roxb.) Snowden, *Holcus halepensis* L.

Other Common Names✵

References

Cousens and Mortimer 1995; Gaines and Swan 1972; Gilkey 1957; Harty 1993; Hickman 1996; Hitchcock and Cronquist 1973; Jaques 1959; Muzik 1970; PNWEP 1991 Nov c; USDA 1971; Westbrooks 1993; Whitson 1996; William et al. 1997

Salt-meadow Cordgrass

Family: Poaceae

Species: *Spartina patens* (Aiton) Muhlenb.

Season

Perennial. Flowering: late summer.

Habitat Invaded

Favorite habitat conditions: coastal salt marshes, preferring the high or irregularly flooded zone.

Favorite habitat types: moist sand flats, swale grasslands, emergent wetlands, coastal scrublands, and sometimes sand dunes & the depressions between them.

Range

Native along the Atl and the Gulf coast from MA to TX.

In OR, it is located on Cox Island in the Siuslaw Estuary and is reportedly located at an island w of Cox Island. A few scattered populations have been established elsewhere in the PNW: Whatcom, Skagit, Wahkiakum, & Pacific Cos in WA; the San Francisco Bay area in CA; and north of Nanaimo on VI in BC. Populations have also been established in China and the Medit.

Distinguishing Characteristics

Two other cordgrass species found along our coast are *S. alterniflora* Lois. (smooth cordgrass), *S. anglica* C. E. Hubbard. Both have flat leaves that contain fine hair-like ligules (0.7-2 mm & 2-3 mm long respectively). The leaves of saltmeadow cordgrass are rolled to folded and lack a ligule (ligule ≤0.5 mm long). Smooth cordgrass often grows in lower (more flooded) tidal zones. Smooth cordgrass and *S. anglica* are more robust plants than saltmeadow cordgrass. Smooth cordgrass has a 5-14 mm diameter at its stem base (SBD) while *S. anglica* has a 5 mm SBD and saltmeadow cordgrass has a 1.5-4 mm SBD.

Two cordgrasses are found e of the Cascades: Alkali cordgrass (S. *gracilis* Trin.), and prairie cordgrass (*S. pectinata* Link). Location is the most obvious factor distinguishing them from salt-meadow cordgrass. Alkali cordgrass is slender with flat blades, and prairie cordgrass is larger with flat leaf blades rolled only at the tip.

History

Salt-meadow cordgrass was probably introduced to Cox Island in the early 1900s with discarded packing material (Mumford et al. 1991). It has been expanding rapidly since 1939.

Salt-meadow cordgrass reproduces and spreads by seed and by rhizomes which form dense circular colonies. In the Siuslaw Estuary, the main form of spread is through clonal growth (Mumford et al. 1991). The occurrence of isolated patches suggests that spread by seed occurs; however, viable seeds have not been found.

S. alterniflora is a much larger problem than *S. patens* for the rest of the PNW; however, the *Spartina* problem in Oregon seams to be localized in the Siuslaw Estuary (Mumford et al. 1991, Miller 1994) where the *S. patens* population is much more extensive.

Ecological Effects

Salt-meadow cordgrass provides habitat for wildlife which use it for cover, nesting, and hunting (Cooke 1997). It is also effective in binding the soil and reducing erosion, making it an important species in its native habitat; however, the coastal habitats of the PNW have moving dunes and gradually sloping tidal areas because they evolved without species that effectively collect and hold the soil. Introduced species like salt-meadow cordgrass dramatically change the habitat by holding the soil in place and collecting silt and debris. Salt-meadow cordgrass forms dense colonies that exclude native species, and it collects silt and plant matter which significantly changes tidal areas by filling them in and accelerating succession. Its growth habits "could seriously damage oyster, Dungeness crab, clam, salmon and other fishery industries" (PNWEP 1992 June h) by changing the habitat's geology, hydrology, and native vegetation (Mumford et al. 1991).

Control Methods

Prevention: It is important to prevent new introductions because salt-meadow cordgrass is so difficult to control once established. Identifying new infestations and eradicating them before they are 3 years old is very important.

Large infestations should be contained until extensive control efforts can be made.

Mechanical: Digging can control individual plants and small infestations, but it is a labor-intensive and can be expensive for larger patches over 3 years old. To be effective, the whole plant must be removed, including all of the root and rhizome.

Control methods that disturb the colonies (rotovating, harrowing, dredging) will make infestations worse by creating and spreading rhizome fragments, each of which can produce a new plant and colony.

If performed properly and under the right conditions, crushing, mowing, or grazing can temporarily suppress salt-meadow cordgrass' growth. If done incorrectly, it will stimulate salt-meadow cordgrass' growth.

Smothering with black plastic was unsuccessful at Cox Island (Mumford et al. 1991). The use of rock salt and burning where also unsuccessful.

Flooding is not an effective means of control because it kills all of the plants in the area not just the cordgrass.

Chemical✎: Herbicide treatments of *S. patens* with glyphosate (Roundup) have not been very successful in the Siuslaw Estuary (Mumford et al. 1991); however, Rodeo has successfully killed *S. alterniflora* in Willapa National Wildlife Refuge in WA (Mumford et al. 1991). To make treatment more effective, wash debris and silt off of plants before treatment and allow at least 6 hours before the next inundation of tide water or precipitation. Apply to actively growing plants (late June-first frost). Treatments will need to be repeated to control regrowth from rhizomes, and the site monitored for new introductions. Controlling *Spartina* species with herbicides is possible but requires adequate funds and dedicated, well-informed workers.

Species Status

RA, ODA-B

Synonyms

S. p. var. *juncea* (Michx.) A.S. Hitchc., *S. p.* var. *monogyna* (M.A. Curtis) Fern.

Other Common Names*

References

Cooke 1997; Hickman 1996; Miller 1994 Sept 28; Mumford et al. 1991; Pfauth and Sytsma 1998 Jan; PNWEP 1992 June h; William et al. 1997

Medusahead

Family: Poaceae

Species: *Taeniatherum caput-medusae* (L.) Nevski

Season

Winter annual. Flowering & seed production: May-June.

Habitat Invaded

Favorite habitat conditions: open, esp semi-arid areas.

Favorite habitat types: roadsides, rangeland, sagebrush, grassland.

Range

Native to Eur.

In OR, it is found e of the Cas and in the Willamette, Umpqua, & Rouge valleys. It is found from c CA to BC, and in the intermountain west (to the RM).

Distinguishing Characteristics

The dense heads with long curved awns that occur during the growing season and the persisting heads with awn-like glumes that stand throughout the winter distinguish it from other PNW grasses.

Seedlings can be mistaken with cheatgrass, except cheatgrass is much hairier. Older plants are sometimes mistaken for the perennials foxtail barley (*Hordeum jubatum* L.) or squirreltail (*Elymus elymoides* (Raf.) Swezey). Both have larger spikes (3-10 cm & 2.5-15 cm long vs. 1-5 cm long), and the heads break apart when mature. Foxtail barley lacks auricles (some leaves might have some that are < 0.5 mm long), and squirreltail auricles are < 1mm long. The auricles of medusahead are <3 mm long.

History

Medusahead was first collected in e WA in 1901 near Steptoe. In 1914, it was spreading rapidly in the area. Today it occupies millions of acres of PNW semi-arid rangeland. It reproduces and spreads by seed.

Ecological Effects

Medusahead is very aggressive, producing a thick thatch that crowds out all other species in disturbed arid land, even highly invasive species such as cheatgrass (*Bromus tectorum*). It is unpalatable except for a very short time very early in the season, and reduces forage for livestock and wildlife by 40-75 % on some ranges (Whitson 1996).

Control Methods

Prevention: It is important to control small infestations before a large population can be established.

Mechanical: Fire can be an effective method of control. Burn stands before seeds are dispersed.

Chemical✎: Several herbicides can be used to control grasses; however, specific information dealing with medusahead is lacking.

Biological: Squirreltail is a native successional species in sagebrush-bunchgrass communities that might be able to displace medusahead. Therefore, establishing populations of squirreltail in medusahead infested sites might enable natural successional processes to resume (TNC 1994).

Species Status

EPPC-A-1, ODA-B

Synonyms

Taeniatherum crinitum var. *caput-medusae* (L.) Wipff, *Taeniatherum asperum* auct. non (Simonkai) Nevski, *Elymus caput-medusae* L.

Other Common Names✱

References

Franklin and Dyrness 1988; Gaines and Swan 1972; Hickman 1996; Hitchcock and Cronquist 1973; Muzik 1970; TNC 1994; USDA 1971; Whitson 1996

Aquatics

Watercress

Family: Brassicaceae | Species: *Rorippa nasturtium-aquaticum* (L.) Hayek

Season

Perennial. Flowering: March-Oct.

Habitat Invaded

Favorite habitat conditions: emergent or shrub-scrub wetlands to moist areas. Favorite habitat types: slow shallow streams, springs, ditches, ponds, lake edges, marshes.

Range

Native to Eur & maybe Asia, Jepson lists it as native to CA.

It is found throughout nw OR and prob elsewhere in the state. It is wdsp in temp N.Am, and is found in Mex, the West Indies, and S.Am.

Distinguishing Characteristics

Watercress has white flowers; all the other *Rorippa* spp. growing in moist PNW habitats have yellow flowers. Western yellow cress (*R. curvisiliqua*

(Hook.) Britton) grows in moist areas but has yellow flowers. Persistent-sepal yellow cress (*R. calycina* (Engelm.) Rydb.) is a n WA yellow-flowered cress that grows in similar habitats. Marsh yellow cress (*R. islandica* (Oed.) Borbas) and *R. obtusa* (Nutt.) Britt. are uncommon yellow-flowered cresses that can grow in our area.

Some white-flowered *Draba* or *Cardamine* spp. can grow in moist areas; however, they are small (< 10 cm tall) annuals with basal rosettes not a mat-forming perennial like watercress.

History

It was probably introduced by settlers as a garden plant, as it was in Australia. It is widely used as a salad green, and has been cultivated in cool waters throughout N.Am. It reproduces by seed and by freely rooting stems.

Ecological Effects

It provides habitat for amphibians and aquatic insects, and is an effective wetland filter. Its aggressive growth, however, can block streams and small ponds, exclude other species, and catch unusually high amounts of silt. This can lead to rapid habitat changes and the filling-in of wetland areas.

Control Methods

Chemical✎: Refer to container labels for current information on herbicides available for use in and around water.

Species Status

EPPC-A-1

Synonyms

R. n.-a. (L.) Schinz & Thell., *Sisymbrium nasturtium-aquaticum* L., *Nasturtium officinale* Ait. f., *N. o.* var. *siifolium* (Reichenb.) W.D.J. Koch, *Nasturtium nasturtium-aquaticum.* (L.) Karsten.

Other Common Names✱

References

Clark 1974c; Cooke 1997; Cousens and Mortimer 1995; Hickman 1996; Hitchcock and Cronquist 1973; Jolley 1988; Neihaus and Ripper 1979; Taylor 1990; USDA 1971; William et al. 1997

Eurasian Watermilfoil

Family: Haloragaceae Species: *Myriophyllum spicatum* L.

Season

Perennial; roots overwinter in the sediment with short stems attached. Rapid vegetative growth starts in early spring. Flowering: June-Aug. (Sept.)

Habitat Invaded

Favorite habitat conditions: in shallow, still, or slow-moving water less that 5 m deep from low to mid elevations, sometimes in brackish water.

Favorite habitat types: ditches, sloughs, streams, ponds, lake margins, deep marshes.

Range

Native to Eurasia and n Afr.

It is wdsp in w OR, esp near Eugene, and in some parts of the Columbia Basin. It is found from BC to CA, mainly w of the Cas, but also along some parts of the CR and Columbia basin. It is wdsp throughout the northern US.

Distinguishing Characteristics

It is very difficult to distinguish between the different watermilfoil species in the PNW. Eurasian watermilfoil and the native species Siberian watermilfoil (*M. sibiricum* V. Komarov), western watermilfoil (*M. hippuroides* Torrey & A. Gray), and verticillate watermilfoil (*M. verticillatum* L.) are all very similar. Most keys use the number of leaflets on submerged leaves, which is very plastic, and the bracts on the flower stalks, which are very small (1-15 mm long), to distinguish between the species. It is often best to send a sample to an expert for identification. Experts can be found in the Oregon Department of Agriculture's Noxious Weed Program (503-986-4621), or at the Portland State University Center for Lakes and Reservoirs (503-725-3833).

Parrotfeather (*M. aquaticum* (Vell. Conc.) Verdc.) is an introduced watermilfoil from S.Am that has both submerged and emergent leaves.

Bladderworts (*Utricularia* spp.) are aquatic plants of shallow and slow-moving water with thread-like leaves that may also be confused with watermilfoil. Their leaves are alternate on the stem (not whorled) and have several "bladders" attached to them. Their yellow flowers are larger (1-2 cm long) and pea-like.

History

Eurasian watermilfoil was introduced into N.Am from Europe. It was first collected in Washington, D.C. in 1942. It spread inland as fragments traveled on boat trailers, boats, and other water equipment as well as on waterfowl. Accidental and intentional spread also occurred with fishermen, worm farmers, and aquarium dealers. It became established in the Midwest between the 1950s and 1970s, reaching WA in the 1960s and OR in the 1970s. It has spread rapidly in the PNW and is becoming a problem, especially in parts of Washington. By 1985, it was known to be in 33 states, Washington D.C., and 3 Canadian provinces (Couch and Nelson 1985).

It reproduces and spreads by seed, stem fragments, rhizomes, and axillary buds. Its main form of long distance spread is by fragments that get caught on boat trailers and other aquatic equipment. Fragments can also form naturally and move freely throughout a water system (lakes, streams, etc.). Once introduced into a river system, it is virtually impossible to restrict downstream spread.

Ecological Effects

It can aggressively spread in lakes, creating dense mats of tangled stems below the surface. These dense mats interfere with recreational activities such as swimming, fishing, and boating. They can pose a threat to navigation and flood control, and they exclude important native plants, reducing habitat used by fish and other aquatic species, especially salmonid fish and waterfowl.

Large infestations can cause depressed dissolved oxygen levels, and year end die back significantly contributes to phosphorous levels.

Control Methods

Choosing the best control methods to use requires an insight into the habitat features (water conditions, type of water body, local flora and fauna, etc.) and social uses for the infested area as well as adjoining and interlinked areas. *The Guide for Developing Integrated Aquatic Vegetation Management Plans in Oregon* (Gibbons et al. 1999), provides valuable information for designing an integrated plan for various habitat types. It also covers in detail physical, chemical, and biological control methods appropriate for aquatic systems. *Aquatic Vegetation Management in Southern Oregon Irrigation Canals* (Sytsma and Parker 1997 Dec), provides valuable information for controlling aquatic plants in irrigation canals, including detailed information on physical, chemical, and biological control methods.

Prevention: Clean boats, trailers, and all other aquatic equipment, preferably at the infested site, before moving them to an area free of watermilfoil. Boat trailers are the main form of spread for Eurasian watermilfoil.

It is also important to keep natural vegetation healthy. Mechanically clearing vegetation along beaches and docks opens the area up for invasion. Eurasian watermilfoil can become established and form dense tangled mats in these highly disturbed areas.

Mechanical: Hand removal is effective for the selective removal of small patches; however, this is very labor intensive and costly. Diver operated suction dredging is also very selective and can be used for larger areas. It is also very labor intensive and costly and can temporarily increase turbidity. It is best used for small, sparse populations and can reduce these populations by 85-97%.

Bottom barrier placement can effectively reduce Eurasian watermilfoil populations. Bottom barriers can also reduce the fragmentation typically caused by mechanical removal and thereby reduce spread, but they also eliminate all vegetation in the treated area; therefore, they work best around docks and other areas where any vegetation can be a nuisance.

Bottom tillage can help control large watermilfoil populations that have spread throughout a water body. Tillage reduces the density of populations which can enhance recreational activities. Tillage can create stem fragmentation, so this is not a viable option when reduction of spread to uninfected areas is critical.

Water column dyes such as Aquashade can control populations in closed, shallow systems. It works best when used early in the growing season; if plants are within 2 feet of the surface, they need to be controlled before the dye is used. It is reported to be non-toxic to humans and other animals.

Water level manipulation can be effective in controlling populations of watermilfoil; however, draw-down needs to be significant (>2 m) and last for more than 3 weeks (Bates, Burns, and Webb 1985). Flooding during times of auto-fragmentation can strand fragments on the shore. Water level manipulation affects all perennial macrophytes.

Chemical✎: Eurasian watermilfoil is susceptible to several herbicides. Floridone has provided good control, and Diquat, Endothall, and 2,4-D have provided excellent control. With the proper herbicide selection, dose, and application, fairly selective control of Eurasian watermilfoil can be possible. The triethylamine salt formation of triclopyr is being tested in WA and shows high selectivity against watermilfoil. It is not currently available in OR.

Biological: In 1986, an experimental introduction of grass carp (*Ctenopharyngodon idella* Val.) into Devils Lake, Lincoln City, OR, occurred in an effort to control Eurasian watermilfoil. Initially, watermilfoil populations were reduced and recreational activities in the lake were improved; however, bird populations declined and the highly invasive Brazilian waterweed (Egeria densa) invaded. Carp populations were supplemented in 1993 which resulted in the complete eradication of all submerged vegetation which radically affected the abiotic and biotic functions of the lake. Studies indicate that when the carp populations are gone Eurasian watermilfoil as well as native species populations will return. (Sytsma 1996 Oct)

Grass carp have recently been approved for limited use in Oregon. They are only appropriate when total eradication of all vegetation is the management goal, such as in irrigation canals. They are restricted for used in bodies of water >10 acres, and they are not appropriate for use in natural areas. Permits as well as detailed information on using grass carp can be obtain from the Oregon Department of Fish and Wildlife. (Sytsma 1996 Oct, OFWC 1998 July 24)

Grass carp is not an effective control for Eurasian watermilfoil. The carp will selectively graze native vegetation before eating watermilfoil; therefore, carp introduction can initially increase watermilfoil populations.

The native weevil *Euhrychiopsis lecontei* is found in the ne US and in WA. In the ne US, it has had an impact on Eurasian watermilfoil populations; however no impacts have been found to occur in WA. No *E. lecontei* populations have been found in OR, and since control is variable, their use is not recommended. (Gibbons et al. 1999)

Species Status

A-2, ODA-B

Synonyms✱

Other Common Names

Eurasian milfoil, spiked watermilfoil

References

Bates et al. 1985; Cooke 1997; Couch and Nelson 1985; Franklin and Dyrness 1988; Gibbons et al. 1999; Hickman 1996; Hitchcock and Cronquist 1973; KCDNR; MDNR 1995; Mumford et al. 1991; Newroth 1985; OFWC 1998 July

24; Pojar and MacKinnon 1994; Sytsma 1996 Oct; Sytsma and Parker 1997 Dec; USDA 1971; Weinmann et al. 1984; William et al. 1997

Brazilian Waterweed

Family: Hydrocharitaceae Species: *Egeria densa* Planchon

Season

Perennial; roots overwinter in the sediment with rapid vegetative growth in the spring. Flowering: late spring-early summer.

Habitat Invaded

Favorite habitat conditions: fresh, quiet water, but it tolerates a wide range of light levels and sediment and water types.

Favorite habitat types: ponds, lakes, ditches, sloughs, streams.

Range

Native to S.Am (Argentina).

Scattered populations exist w of the Cas in OR & WA. It is also found in CA, sc-se US, & Eur.

Distinguishing Characteristics

Brazilian waterweed has larger (2-4 cm long, 2-3(5) mm wide), denser leaves with more per whorl (whorls of 4's, 6's, or 8's) than the other waterweeds in the PNW (*Elodea* spp.). Long-sheath waterweed (*Elodea longivaginata* St. John) leaves are mostly opposite and 2-2.6 cm long by 1-2 (2.5) mm wide. Common waterweed (*Elodea canadensis* Rich.) has 3 leaves per whorl which are 6-17 mm long and 1-4 (average 2) mm wide. Nuttall's waterweed (*Elodea nuttallii* (Planchon) St. John) also has 3 leaves per whorl that are 6-13 mm long, but they are only 0.3-2 mm wide.

Hydrilla (*Hydrilla verticillata*) is a highly invasive species that has been found in WA lakes. It has 5 leaves per whorl, spines on the leaf midvein, small prickly hairs along the leaf margins, and small tubers (5-13 mm long). If found, a sample should be sent to the Oregon Department of Agriculture's Noxious Weed Program immediately along with the location found.

History

Brazilian waterweed was introduced well before 1957, cultivated for aquariums and water gardens. Sometimes it escaped or was planted into quiet ponds, lakes, or streams. So far only male plants have been found in the U.S.; therefore, spread is through vegetative means only. Fragments can travel from infested areas to new habitats on boats, trailers, and other water equipment.

Ecological Effects

It can aggressively spread in quiet water, forming dense, tangled mats of vegetation below the surface. These dense mats interfere with recreational activities such as swimming, fishing, and boating. The canopy formed at the surface also shades out important native plants reducing habitat used by fish and other aquatic species.

Control Methods

The control section of Eurasian watermilfoil (p. 276) provides information in selecting the best control options for different situations.

Prevention: It is important not to spread fragments of the plant form one area to another. Clean boats, trailers, and all other water equipment, preferably at the infested site, before moving them to an area free of Brazilian waterweed. If a new infestation is found, report it to the proper authorities such as the Oregon Department of Agriculture.

Mechanical: Bottom barrier placement and diver-dredging can be effective against small-scale infestations. However, many mechanical methods can create fragments that increase the spread Brazilian waterweed.

Chemical: Brazilian waterweed is susceptible to several herbicides. Diquat and Floridone have provided good control, and Endothall has provided excellent control. Endothall and Diquat provide short-term control but have less risk of drift to non-target areas. Floridone can kill roots providing more long-term affects, but can only be used in areas with little water movement. It stays active much longer and can drift to non-target areas.

Biological: Brazilian waterweed seems to be a preferred species grazed by grass carp (Gibbons et al. 1999); however, the use of grass carp is limited in Oregon. See the biological control section of Eurasian watermilfoil (p. 278) for more information.

Species Status

EPPC-NMI, ODA-B

Synonyms

Elodea densa (Planch.) Caspary, *Anacharis densa*(Planch.) Vict., *Philotria densa* (Planch.) Small & St. John.

Other Common Names

South American waterweed, dense-leaved elodea, waterweed

References

Gibbons et al. 1999; Gilkey 1957; Hickman 1996; Hitchcock and Cronquist 1973; OFWC 1998 July 24; Sytsma 1996 Oct; Sytsma and Parker 1997 Dec; USDA 1971; William et al. 1997

References

Cited References

Agee, JK. 1993. Fire ecology of Pacific Northwest forests. Covelo, California: Island Press. 493 p.

Alden P, Gregoret A, Keen R, Mathews D, Oches EA, Paulson D, Sundstorm R, Zomlefer WB. 1998. National Audubon Society field guide to the Pacific Northwest. New York: Alfred A. Knopf, Inc. 448 p.

Allaby M, editor. 1998. A dictionary of ecology. 2nd ed. Oxford, New York: Oxford University Press. 440 p.

Bates AL, Burns ER, Webb DH. 1985. Eurasian watermilfoil (*Myriophyllum spicatum* L.) in the Tennessee-Valley: an update on biology and control. In: Proceedings of the 1st international symposium on watermilfoil (*Myriophyllum spicatum*) and related Haloragaceae species; 1985, July 23-24; Vancouver (Canada). Aquatic Plant Management Society. p 104-115.

Berube DE, Myers JH. 1982. Suppression of knapweed invasion by crested wheatgrass in the dry interior of British Columbia. Journal of Range Management 35:459-461.

Bianchini F, Corbetta F. 1975. The complete book of health plants: atlas of medicinal plants. Dejey MA, translator. New York: Crescent Books. 242 p. Translation of: Le piante della salute.

Bjergo C, Boydstun C, Crosby M, Kokkanakis S, Sayers R Jr. 1995. Non-native aquatic species in the United States and coastal waters. In: LaRoe ET, Farris GS, Puckett CE, Doran PD, Mac MJ, editors. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. Washington, DC: U.S. Department of the Interior, National Biological Service. p 428-431.

Burdon JJ, Chilvers GA. 1994. Demographic changes and the development of competition of a native Australian eucalypt forest invaded by exotic pines. Oecologia 97:419-423.

Clark LJ. 1974a. Lewis Clark's field guide to wild flowers of field & slope in the Pacific Northwest. Seattle: University of Washington Press. 72 p.

Clark LJ. 1974b. Lewis Clark's field guide to wild flowers of forest & woodland in the Pacific Northwest. Seattle: University of Washington Press. 76 p.

Clark LJ. 1974c. Lewis Clark's field guide to wild flowers of marsh and waterway in the Pacific Northwest. Sidney (B.C., Canada): Gray's Publishing Limited. 59 p.

Clark LJ. 1975a. Lewis Clark's field guide to wild flowers of the arid flatlands in the Pacific Northwest. Sidney (B.C., Canada): Gray's Publishing Limited. 76 p.

Clark LJ. 1975b. Lewis Clark's field guide to wild flowers of the mountains in the Pacific Northwest. Seattle: University of Washington Press. 78 p.

Cooke SS, Editor. 1997. A field guide to the common wetland plants of western Washington & northwestern Oregon. Seattle: Seattle Audubon Society. 417 p.

Couch R, Nelson E. 1985. *Myriophyllum spicatum* in North America. In: Proceedings of the 1st international symposium on watermilfoil (*Myriophyllum spicatum*) and related Haloragaceae species; 1985, July 23-24; Vancouver (Canada). Aquatic Plant Management Society. p 8-15.

Cousens R, Mortimer M. 1995. Dynamics of weed populations. Great Britain: Cambridge University Press. 332 p.

Crockett LJ. 1977. Wildly successful plants: a handbook of North American weeds. New York: Macmillan Publishing Co, Inc. 268 p.

Cronk QCB, Fuller JL. 1995. Plant invaders: the threat to natural ecosystems. Cambridge: Chapman & Hall. 241 p.

[DEA] David Evans and Associates, Inc. 1995 Oct. Sandy River Delta plan: Columbia River Gorge National Scenic Area. Portland (OR): United States Department of Agriculture, Forest Service (Pacific Northwest Region). 63 p.

Dillenburg LR, Whigham DF, Teramura AH, Forseth IN. 1993. Effects of below- and aboveground competition from the vines *Lonicera japonica* and *Parthenocissus quinquefolia* on the growth of the tree host *Liquidambar styraciflua*. Oecologia 93:48-54.

Drea JJ. 1993. Classical biological control: an endangered discipline? In: McNight BN, editor. Biological pollution: the control and impact of invasive exotic species. Indianapolis: Indiana Academy of Science. p 215-222.

[DU] Ducks Unlimited (Canada). [date unknown]. Purple loosestrife [pamphlet]. Canada: Ducks Unlimited Canada. 8 p.

Durkee A, Broshot N. 1997. Growth patterns of an exotic species, *Hedera helix* (English ivy), in the Pacific Northwest. Presentation at: Natural Areas Association Conference and Exotic Pest Plant Council Conference; 1997 Aug. 27-30.

Edsall TA, Mills EL, Leach JH. 1995. Exotic species in the Great Lakes. In LaRoe ET, Farris GS, Puckett CE, Doran PD, Mac MJ, editors. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. Washington, DC: U.S. Department of the Interior, National Biological Service. p 442-444.

Elias TS. 1980. The complete trees of North America: field guide and natural history. New York: Book Division, Times Mirror Magazines, Inc. 948 p.

Farrar JL. 1995. Trees of the northern United States and Canada. Ames (IA): Iowa State University Press. 502 p.

Fernald M L. 1989. Gray's manual of botany. 8th ed. Portland (OR): Dioscorides Press. 1632 p.

Foster S, Duke JA. 1990. A field guide to medicinal plants: eastern and central North America. New York: Houghton Mifflin Company. 366 p.

Franklin JF, Dyrness CT. 1988. Natural vegetation of Oregon and Washington. Corvallis (OR): Oregon State University Press. 452 p.

Furlong M, Pill V. 1974. Wild edible fruits and berries. Healdsburg (CA): Naturegraph Publishers, Inc. 63 p.

Gaines XM, Swan DG. 1972. Weeds of eastern Washington and adjacent areas. Davenport (WA): Camp-Na-Bor-Lee Association, Inc. 349 p.

Garton DW, Berg DJ, Stoeckmann AM, Haag WR. 1993. Biology of recent invertebrate invading species in the Great Lakes: the spiny water flea, Bythotrephes cederstroemi, and the zebra mussel, Dreissena polymorpha. In McNight BN, editor. Biological pollution: the control and impact of invasive exotic species. Indianapolis: Indiana Academy of Science. p 63-84.

Gibbons MV, Rosenkranz MG, Gibbons HL Jr, Sytsma MD. 1999. Guide for developing integrated aquatic vegetation management plans in Oregon. Portland (OR): Center for Lakes and Reservoirs, Portland State University. 108 p.

Gilkey HM. 1957. Weeds of the Pacific Northwest. Corvallis (OR): Oregon State College. 441 p.

Harlow WM. 1957. Trees of the eastern and central United States and Canada. New York: Dover Publications Inc. 288 p.

Harrar ES, Harrar JG. 1962. Guide to Southern trees. New York: Dover Publications, Inc. 709 p.

Harty FM. 1993. How Illinois kicked the exotic habit. In: McNight BN, editor. Biological pollution: the control and impact of invasive exotic species. Indianapolis: Indiana Academy of Science. p 195-209.

Hickman JC, Editor. 1996. The Jepson manual: higher plants of California. 3rd edition. Berkeley and Los Angeles: University of California Press. 1400 p.

Hight SD. 1993. Control of the ornamental purple loosestrife (Lythrum salicaria) by exotic organisms. In: McNight BN, editor. Biological pollution: the control and impact of invasive exotic species. Indianapolis: Indiana Academy of Science. p 147-148.

Hitchcock CL, Cronquist A. 1973. Flora of the Pacific Northwest. Seattle: University of Washington Press. 730 p.

Howes FN. 1974. A dictionary of useful and everyday plants and their common names. Cambridge: Cambridge University Press. 290 p.

Hylander CF. 1953. Trees and trails. New York: the Macmillan company. 237 p.

Jaques HE. 1959. How to know the weeds. Dubuque (IA): WM. C. Brown Company. 230 p.

Jensen EC, Ross CR, Duddles RE, Campbell III A, Torres L. 1995. Trees to know in Oregon. Corvallis (OR): Oregon State University Extension Service and Oregon Department of Forestry. 123 p.

Johnson CG Jr. 1993. Common plants of the inland Pacific Northwest. Washington: U.S. Government Printing Office. 389 p.

Johnson LB, Lees CB. 1988. Wildflowers across America. New York: Abbeville Press, Inc. 309 p.

Johnson WH, Steeve WC, editors. 1974. The environmental challenge. New York: Holt, Rinehart and Winston, Inc. 357 p.

Johnstone IM. 1986. Plant invasion windows: a time-based classification of invasion potential. Biological Reviews of the Cambridge Philosophical Society 61:369-394.

Jolley R. 1988. Wildflowers of the Columbia Gorge. Portland: Oregon Historical Society Press. 331 p.

Kadans JM. 1970. Modern encyclopedia of herbs. West Nyack (NY): Parker Publishing Co, Inc. 256 p.

Kareiva P. 1996. Introduction for special feature: developing a predictive ecology for non-indigenous species and ecological invasions. Ecology 77:1651-1652.

[KCDNR] King County Department of Natural Resources. [date unknown]. Noxious weeds: a guide to invasive non-native plants [pamphlet]. [publisher unknown]. 24 p.

Larson GE. 1993. Aquatic and wetland vascular plants of the northern Great Plains. General Technical Report. Fort Collins: Rocky Mountain Forest and Range Experiment Station, Department of Agriculture, Forest Service. RM – 238. 681 p.

Lincoln R, Boxshall G, Clark P. 1998. A dictionary of ecology, evolution and systematics. 2nd ed. Cambridge: Cambridge University Press. 361 p.

Mabberley DJ. 1989. The plant book: a portable dictionary of the higher plants. Cambridge: Cambridge University Press. 706 p.

Malecki R. 1995. Purple loosestrife. In: LaRoe ET, Farris GS, Puckett CE, Doran PD, Mac MJ, editors. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. Washington, DC: U.S. Department of the Interior, National Biological Service. p 458-459.

McMinn HE. 1951. An illustrated manual of California shrubs. Berkeley and Los Angeles: University of California Press. 663 p.

McMinn HE, Maino E. 1963. An illustrated manual of Pacific coast trees. Berkeley and Los Angeles: University of California Press. 409 p.

[MDNR] Minnesota Department of Natural Resources. 1995. A field guide to aquatic exotic plants and animals [pamphlet]. St. Paul (MN): Minnesota Department of Natural Resources, Minnesota Sea Grant, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers. 8 p.

Metcalf W. 1968. Introduced trees of central California. Berkeley and Los Angeles: University of California Press. 159 p.

Miller, G. 1994 Sept 28. Spartina alterniflora and its potential for invasion into Oregon coastal bays and estuaries. 13 p.

Mitsch WJ, Gosselink JG. 1993. Wetlands. New York: Van Nostrand Reinhold. 722 p.

Mumford TF Jr., Peyton P, Sayce JR, Harbell S, editors. 1991. *Spartina* workshop record. Washington: Washington Sea Grant Program. 73 p.

Muzik TJ. 1970. Weed biology and control. New York, San Francisco, St. Louis, Toronto: McGraw-Hill Book Company, Inc. 273 p.

Neihaus TF, Ripper CL. 1979. A field guide to Pacific States wildflowers. Boston: Houghton Mifflin Company. 432 p.

Newroth PR. 1985. A review of Eurasian water milfoil impacts and management in British Columbia. In: Proceedings of the 1st international symposium on watermilfoil (*Myriophyllum spicatum*) and related Haloragaceae species; 1985, July 23-24; Vancouver (Canada). Aquatic Plant Management Society. p 139-153.

[ODA] Oregon Department of Agriculture, Noxious weed Control Program. [date unknown] a. Purple loosestrife, a weed from Europe, is invading our state... [pamphlet]. Oregon State University, Oregon Department of Agriculture, Oregon Division of state Lands, Yamhill County Soil and

Water Conservation District, Northwest Resource Conservation and Development. 7 p.

[ODA] Oregon Department of Agriculture, Noxious Weed Control Program. 1997 a. Noxious weed policy and classification system. Oregon. 8 p.

[ODA] Oregon Department of Agriculture, Noxious Weed Control Program (Gilliam Co, Grant Co, Morrow Co, Sherman Co, Wasco Co), Bonneville Power Administration. 1997 b. Yellow starthistle, *Centaurea solstitialis* [pamphlet]. Oregon: Regional Strategies Program, Bonneville Power Administration. 4 p.

[OFAH] Ontario Federation of Anglers & Hunters. [date unknown]. Purple loosestrife: what you should know, what you can do [pamphlet]. Peterborough (Ontario): Ontario Federation of Anglers & Hunters. 7p.

[OFWC] Oregon Fish and Wildlife Commission. 1998 July 24. Wildlife integrity rules—classification of nonnative species. Oregon: Oregon Fish and Wildlife. 18 p.

[OSUES] Oregon State University Extension Service, Oregon Department of Agriculture. 1995 Jan. Noxious weeds my be pretty, but...[pamphlet]. Corvallis (OR): Oregon State University Extension Service, Oregon Department of Agriculture. 7 p.

[OSUES] Oregon State University Extension Service. 1995 May. Yellow starthistle: ecology and management on Pacific Northwest rangelands [pamphlet]. Oregon State University. EM 8580. 4 p.

[OSUES] Oregon State University Extension Service. 1998. Fair Exhibit Poster.

Petrides GA. 1993. Peterson first guide to trees. New York: Houghton Mifflin Company. 128 p.

Pfauth M, Sytsma M. 1998 Jan. Key to West Coast *Spartina* species: based on vegetative characters [pamphlet]. Oregon: Portland State University Lakes and Reservors Program. 9 p.

Phillips R. 1978. A photographic guide to more than 500 trees of North America and Europe. New York: Random House Inc. 224 p.

Planty-Tabacchi AM, Tabacchi E, Naiman RJ, Deferrari C, Decamps H. 1996. Invisibility of species-rich communities in riparian zones. Conservation Biology 10:598-607.

Platt R. 1952. American trees: a book of discovery. New York: Dodd, Mead & Company. 256 p.

[PNWEP] Pacific Northwest Extension Publication. 1984 July. Jointed goatgrass [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 0256. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1990 Apr b. Puncturevine [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 133. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June b. Buffalobur (*Solanum rostratum* Dunal) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 366. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June f. Velvetleaf (*Abutilon theophrasti* Medic.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 368. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Nov b. Hoary cress and related whitetops (*Cardaria draba, C. pubescens and C. chalapensis*) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 359. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Nov c. Johnsongrass (*Sorghum halepense* (L.) Pers.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 383. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Nov d. Mediterranean sage (*Salvia aethiopis* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 381. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Nov e. Milk thistle (*Silybum marianum* (L.) Gaertn.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 382. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Nov f. Sulfur cinquefoil (*Potentilla recta* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 376. 3 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Dec b. Gorse (*Ulex europaeus* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 379. 3 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June c. Distaff thistle (*Carthamus lanatus*) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 420. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June d. Dyers woad (*Isatis tinctoria* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 384. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June g. Purple loosestrife (*Lythrum salicaria* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 380. 3 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June h. Saltmeadow cordgrass (*Spartina patens* (Ait.) Muhl.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 416. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June m. Wild proso millet, *Panicum miliaceum*. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 419. 3 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 Dec b. Slender flower thistle (*Carduus tenuiflorus* Curt.), Italian thistle (*C. pycnocephalus* L.), plumeless thistle (*C. acanthoides* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 431. 6 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Jan. Identification of knapweeds and starthistles in the Pacific Northwest [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 432. 22 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Mar a. Common velvetgrass & German velvetgrass, *Holcus lanatus* L. and *H. mollis* [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 441. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Mar b. Red sorrel, *Rumex acetosella* L. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 446. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Mar c. St. Johnswort, *Hypericum perforatum* L. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 442. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Oct a. Kochia (*Kochia scoparia* L. Schrad.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 460. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Oct b. Rush skeletonweed (*Chondrilla juncea* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 465. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1994 July d. Scotch broom, *Cytisus scoparius* (L.) Link. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 103. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1994 Aug. Biological control of Mediterranean sage: collection and redistribution of the Mediterranean sage root-crown weevil [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 473. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1994 Oct. Downy brome, *Bromus tectorum* L. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 474. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1994 Nov. Yellow toadflax and Dalmatian toadflax, *Linaria vulgaris* Hill and *Linaria dalmatica* (L.) Mill. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 135. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1996 Jan. Squarrose knapweed, *Centaurea virgata* Lam. ssp. *squarrosa* Gugl. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 422. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1997 July. Tansy ragwort, *Senecio jacobaea* [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 175. 8 p.

[PNWEPPC] Pacific Northwest Exotic Pest Plant Council. 1997 Aug. Non-native pest plants of greatest concern in Oregon and Washington as of August 1997. Seattle (WA). 7 p.

Pojar J, MacKinnon A, editors. 1994. Plants of the Pacific Northwest coast: Washington, Oregon, British Columbia & Alaska. Vancouver (B.C.): B.C. Ministry of Forests and Lone Pine Publishing. 527 p.

Polunin O. 1972. The concise flowers of Europe. London: Oxford University Press. 107p.

Randall JM. 1993. Exotic weeds in North American and Hawaiian natural areas: the Nature Conservancy's plan of attack. In: McNight BN, editor.

Biological pollution: the control and impact of invasive exotic species. Indianapolis: Indiana Academy of Science. p 159-172.

Randall WR, Keniston RF, Bever DN, Jensen EC. 1981. Manual of Oregon trees and shrubs. Corvallis (OR): Oregon State University Book Stores, Inc. 305 p.

[RDFG] Reader's Digest Field Guide. 1998. North American wildlife: wildflowers. Pleasantville (NY): The Reader's Digest Assocation, Inc. 468 p.

Royer F, Dickinson R. 1999. Weeds of the northern U.S. and Canada. Renton (WA) and Edmonton (Alberta): Lone Pine Publishing and the University of Alberta Press. 434 p.

Schofield JJ. 1989. Discovering wild plants: Alaska, western Canada, the Northwest. Anchorage and Seattle: Alaska Northwest Books. 354 p.

Silvertown J, Lines CE, Dale MP. 1994. Spatial competition between grasses-rates of mutual invasion between four species and the interaction with grazing. Journal of Ecology 82:31-38.

Simon N. 1995. Nature in danger: threatened habitats and species. New York: Oxford University Press. 240 p.

Strickler D. 1993. Wayside wildflowers of the Pacific Northwest. Columbia Falls (MT): Flower Press. 272 p.

Stuckey RL. 1980. Distributional history of *Lythrum salicaria* (purple loosestrife) in North America. Bartonia 47:3-20.

Sytsma MD. 1996 Oct. Devils Lake revegetation and water quality study final report. Portland (OR): Portland State University Lakes and Reservoirs Program Publication No. 96-3. 16 p.

Sytsma MD, Parker M. 1997 Dec. Aquatic vegetation management in Southern Oregon irrigation canals. Oregon: Talent Irrigation District and U.S. Bureau of Reclamation. 75 p.

Taylor RJ. 1990. Northwest weeds: the ugly and beautiful villains of fields, gardens, and roadsides. Missoula (MT): Mountain Press Publishing Company. 177 p.

[TNC] The Nature Conservancy. 1994. A note from the editor [memorandum]. In: VDP update, April-June 1994, vol. 1 no. 2. p 1-4.

[TNC] The Nature Conservancy. 1986 Sept. Element stewardship abstract for *Cytisus scoparius*. The Nature Conservancy. 25 p.

[TNC] The Nature Conservancy. 1989 Mar. Element stewardship abstract for *Spartium junceum*. The Nature Conservancy. 18 p.

[THPRD] Tualatin Hills Park and Recreation District, Natural Resources Office. [date unknown]. Invasive plants: a guide for dealing with non-native species. Beaverton (OR): Tualatin Hills Park and Recreation District. 7 p.

[UICA] University of Idaho College of Agriculture, Cooperative Extension System. 1990 Dec. Field bindweed: biology and management [pamphlet]. University of Idaho. Bulletin No. 719. 8 p.

[UICA] University of Idaho College of Agriculture, Cooperative Extension System, Agricultural Experiment Station. 1991 Sept. Leafy spurge: biology and management [pamphlet]. University of Idaho. Series No. 877. 5 p.

[USDA] United States Department of Agriculture, Agricultural Research Service. 1971. Common weeds of the United States. New York: Dover Publications, Inc. 463 p.

[USDI] United States Department of the Interior, Bureau of Land Management. [date unknown]. Noxious weeds: a growing concern. United States Department of the Interior, Bureau of Land Management. 7 p.

Vitousek PM. 1990. Biological invasions and ecosystems processes: towards an integration of population biology and ecosystem studies. Oikos 57:7-13.

Vitousek PM, Loope LL, Stone CP. 1987. Introduced species in Hawaii: biological effects and opportunities for ecological research. Trends in Ecology and Evolution 2:224-227.

Watts T. 1973. Pacific coast tree finder. Berkeley: Nature Study Guild. 59 p.

Weinmann F, Boule M, Brunner K, Malek J, Yoshino V. 1984. Wetland plants of the Pacific Northwest. Seattle: U.S. Army Corps of Engineers (Seattle District). 85 p.

Welling CH, Becker RL. 1990. Seed bank dynamics of *Lythrum salicaria* L.: implications for control of the species in North America. Aquatic Botany 38: 303-309.

Westbrooks RG. 1993. Exclusion and eradication of foreign weeds from the United States by USDA APHIS. In: McNight BN, editor. Biological pollution: the control and impact of invasive exotic species. Indianapolis: Indiana Academy of Science. p 225-241.

Whitson TD, editor. 1996. Weeds of the West. 5th ed. Newark (CA): The Western Society of Weed Science, Western United States Land Grant Universities Cooperative Extension Services. 630 p.

Wilcox DA. 1989. Migration and control of purple loosestrife (*Lythrum salicaria* L.) along highway corridors. Environmental Management 13:365-370.

Wilcox DA, Meeker JE. 1995. Wetlands in regulated Great Lakes. In: LaRoe ET, Farris GS, Puckett CE, Doran PD, Mac MJ, editors. Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. Washington, DC: U.S. Department of the Interior, National Biological Service. p 247-249.

William RD, Ball D, Miller TL, Parker R, Yenish JP, Callihan RH, Eberlein C, Lee GA, Morishita DW, compilers. 1997. Pacific Northwest weed control handbook. Corvallis (OR): Oregon State University. 373 p.

Williams T. 1997. Killer weeds. Audubon 99: 24-31.

References Cited in Appendixes Only

Bailey LH. 1958. Manual of cultivated plants: most commonly grown in the continental United States and Canada. New York: The Macmillan Company. 1116 p.

Brayshaw TC. 1996. Trees and shrubs of British Columbia. Vancouver: UBC Press. 373 p.

McKnight BN, editor. 1993. Biological pollution: the control and impact of invasive exotic species. Indianapolis: Indiana Academy of Science. 261 p.

Niering WA, Olmstead NC. 1979. The Audubon Society field guide to North American wildflowers, eastern region. New York: Knopf: distributed by Random House. 863 p.

[ODA] Oregon Department of Agriculture, Noxious Weed Program. [date unknown] b. Help halt hydrilla [pamphlet]. Salem (OR): Oregon Department of Agriculture. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1990 Mar. Purple starthistle (*Centaurea calcitrapa* L.) and Iberian starthistle (*Centaurea iberica* Trev. ex Sprengel) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 350. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1990 Apr a. Lepyrodiclis (*Lepyrodiclis holosteoides* (C.A. Meyer) Fenzl ex Fisch. and Mey.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 349. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June a. African Rue (*Peganum harmala* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 369. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June c. Silverleaf nightshade (*Solanum elaeagnifolium* Cav.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 365. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June d. Syrian bean-caper (*Zygophyllum fabago* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 370. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June e. Texas Blueweed (*Helianthus ciliaris* D.C.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 364. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June g. Wild chervil (*Anthriscus sylvestris* (L.) Hoffm.) [pamphlet]. Washington State

University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 367. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 June h. Wild Four O'Clock (*Mirabilis nyctaginea* (Michx.) MacM.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 363. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Nov a. Dwarf snapdragon (*Chaenorrhinum minus* (L.) Lange) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 378. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1991 Dec a. Bighead knapweed (*Centaurea macrocephala* Puschk.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 386. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 Jan a. Blackgrass (*Alopecurus myosuroides* Huds.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 377. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 Jan b. Creeping buttercup (*Ranunculus repens* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 399. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 Jan c. Curly dock and broadleaf dock (*Rumex crispus* L. and *R. obtusifolius* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 398. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June a. Austrian fieldcress (*Rorippa austriaca* (Crantz) Besser) [pamphlet]. Washington State University Cooperative Extension, Oregon State University

Extension Service, University of Idaho Cooperative Extension Service. PNW 411. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June b. Devil's-claw (*Proboscidea louisianica* (Mill.) Thellung) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 413. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June e. Hedgeparsley (*Torilis arvensis* (Hudson) Link) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 418. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June f. Mouse-ear hawkweed (*Hieracium pilosella* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 409. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June i. Short-fringed knapweed (*Centaurea nigrescens* Willd., *C. dubia* Suter in *Flora of the Pacific Northwest*) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 417. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June j. Skeletonleaf bursage (*Ambrosia tomentosa* Nutt.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 410. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June k. Small bugloss (*Anchusa arvensis* (L.) Bieb., *Lycopsis arvensis* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 415. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 June l. Venice mallow (*Hibiscus trionum* L.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 412. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1992 Dec a. Giant hogweed (*Heracleum mantegazzianum* Somm. and Lev.) [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 429. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Mar d. Tuber oatgrass [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 445. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Mar e. Wild carrot, *Daucus carota* L. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 447. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Mar f. Wild garlic, *Allium vineale* L. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 444. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1993 Oct c. Russian thistle (*Salsola iberica* Sennen and Pau). [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 461. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1994 July a. Blue mustard, *Chorispora tenella (*Pall.) DC [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 471. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1994 July b. Bulbous bluegrass, *Poa bulbosa* L. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 467. 2 p.

[PNWEP] Pacific Northwest Extension Publication. 1994 July c. Common groundsel, *Senecio vulgaris* L. [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 466. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1995 Feb a. Annual and perennial sowthistles, *Sonchus oleraceus, S. asper, S. uliginosus, S.*

arvensis [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 476. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1995 Feb b. The speedwells [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 396. 4 p.

[PNWEP] Pacific Northwest Extension Publication. 1997 Sept. Hawkweeds, *Hieracium aurantiacum, H. pilosella, H. pratense, H. floribundum, H. piloselloides* [pamphlet]. Washington State University Cooperative Extension, Oregon State University Extension Service, University of Idaho Cooperative Extension Service. PNW 499. 4 p.

St. John H. 1963. Flora of southeastern Washington and of adjacent Idaho. Escondido (CA): Outdoor pictures. 583 p.

Thompson JD. 1991. The biology of an invasive plant: what makes *Spartina anglica* so successful? BioScience 41: 393-401.

[TNC] The Nature Conservancy. 1991 Feb. Element stewardship abstract for *Ammophila arenaria*. The Nature Conservancy. 8 p.

[UICA] University of Idaho College of Agriculture, Cooperative Extension System, Agricultural Experiment Station. 1990 Mar. Creeping bellflower [pamphlet]. University of Idaho. Bulletin No. 855. 2 p.

Zim HS, Martin AC. 1950. Flowers: a guide to familiar American wildflowers. New York: Golden Press, Inc. 157 p.

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Appendix A

Invasive Plants in Oregon as of 1997

Disclaimer: Parts of the comments in this list are taken directly from the references. To make the section easier to read, quotation marks were omitted.

Trees

Family	Species	Common Name	References	Comments
Aquifoliaceae	*Ilex aquifolium*	English holly	2, 3, 4, 8, 14, 17, 22, 23	cult orn & Christmas decoration crop; cool wooded areas on good soil, along fences & hedges; seeds spread by birds; sw BC, OR, CA; native to Eur, w Asia, & China.
Elaeagnaceae	*Elaeagnus angustifolia*	Russian-olive, oleaster	1, 8, 14, 15, 17, 26, 27, 49	cult orn & windbreak; adaptable to a wide range of conditions; disturbed, sometimes moist places: low-lying pastures, meadows, or waterways, irrig steppe; can become a serious weed problem; comm rural e OR; w N.Am; native to w Asia.
Rosaceae	*Crataegus monogyna*	English hawthorn	14, 15, 17, 26, 44	cult orn; pastures, woods at low elev; provides food & nesting for birds & mammals; birds spread the seeds; most comm cult hawthorn in OR; mainly w of Cas s VI to CA.
Rosaceae	*Prunus avium*	bird cherry, sweet cherry, mazzard cherry	11, 14, 15	cult cherry; persisting near settlements, Or white oak forests in WV (it might even become the climax sp in some of these forests); OR, WA, CA.
Rosaceae	*Prunus cerasus*	sour cherry	14, 15, 19	cult cherry; persisting near settlements, low elev woods in the w CRG; OR, WA, CA.
Rosaceae	*Prunus laurocerasus*	cherry laurel	14. 15	cult orn; near settlements, rarely reaches maturity; spread by birds; w of Cas, OR.
Rosaceae	*Sorbus aucuparia*	European mountain-ash	14, 15, 17, 26, 44	will hybridize w/native *Sorbus* spp; cult orn; disturbed areas, gen near settlements; fruits favored by many birds & small mammals, esp in winter; native to Eur.
Salicaceae	*Populus alba*	white poplar	2, 4, 7, 9, 14, 15, 18, 22, 23, 27, 28	also called *P. a.* var. *bolleana*, *P. a.* var. *pyramidalis*; cult orn; disturbed places near settlements: roadsides, borders of fields, abandoned farm yards, parks, cemeteries; roots are invasive, destructive; spreads by suckers, broken off branches; around Portland, OR, CA, comm ID; native to w & c Eur & c Asia.
Simaroubaceae	*Ailanthus altissima*	tree of heaven	14, 15, 21, 26	also called *A. glandulosa, Toxicodendron a.*; cult orn; disturbed urban areas: waste areas, along streets & highways; spreads by seed; rapid growing even under extremely adverse

				conditions, invasive roots; poss in OR; CA; native to China.
Tamaricaceae	*Tamarix pentandra*	tamarisk, saltcedar	7, 14, 15, 21, 49	also called *T. pentandra*, & *T. chinensis* which could be considered a different spp; washes, ditches, canals, streambanks, riverbanks, reservoirs, canyons, roadsides, waste areas, thickets; OR, CA; much of the west, wdsp US; native to Eurasia.

Shrubs

Family	Species	Common Name		Comments
Asteraceae	*Artemisia absinthium*	absinth wormwood	12, 15, 45	medicinal sp; comm on roadsides & invades fields; toxic to horses; wdsp PNW, n US; Can; native to Eur +/or Eurasia.
Fabaceae	*Lupinus arboreus*	tree lupine, yellow bush lupine	1, 14, 15, 44	may be divided into different spp; widely cult sand binder; coastal dunes; toxic to livestock, esp sheep; along coast from BC to CA; native to CA, prob from Sonoma to Ventura Cos, naturalized farther north.
Grossulariaceae	*Ribes rubrum*	cultivated currant		cult; OR, WA.
Rosaceae	*Acaena novae-zelandica*	bidi-bidi	14	also called *A. sanguisorbae, A. anserinifolia*; cult; in more or less disturbed areas; OR, CA; native to New Zealand.
Rosaceae	*Rosa canina*	dog rose	14, 15, 19	generally dry, open areas: roadsides, disturbed areas; w of Cas WA to CA, n ID, e US; native to Eurasia
Rosaceae	*Rosa eglanteria*	sweetbriar	11, 14, 15	gen dry, oft disturbed, open sites: roadsides, pastures, WV grasslands, Umpqua Valley oak communities; OR, WA, CA to e N.Am; native to Eur.
Valerianaceae	*Centranthus ruber*	red valerian	14	cult; disturbed urban areas: rock or wall crevices, roadsides; OR, CA; native to Medit Eur.

Vines/Brambles

Family	Species	Common Name		Comments
Fabaceae	*Vicia caracca*	bird vetch	14, 15, 44	also called *V. cracca*; disturbed areas, openings, thickets, borders, open forest, at low to mid elev; OR, WA, CA, ID; occ in RM, from CA to ne US & e Can; native to Eur.

Fabaceae	*Vicia villosa*	hairy vetch	12, 14, 15, 19, 44, 45, 49	sometimes split into 2 ssp: *varia* & *villosa*, habitats & range are the same for both; important rotation crop; comm in disturbed areas at low elev: roadsides, waste areas, fields, railroads, fence rows; hard dormant seeds oft a problem in cropland, pods are reputed to be toxic; native to Eur.
Ranunculaceae	*Clematis vitalba*	traveler's joy, evergreen clematis	15, personal observation	prob cult orn; disturbed woodland; around Portland, OR & Puget Sound, WA.
Rosaceae	*Rubus laciniatus*	evergreen/cutleafed blackberry	14, 15, 44, 45	cult blackberry; gen in moist, disturbed areas; noxious weed although less abundant & aggressive than *R. discolor*; wdsp w of Cas, BC to CA, occ e to ID & e N.Am; Eur cultivar.

Herbs & Flowers

Family	Species	Common Name		Comments
Apiaceae	*Daucus carota*	Queen Anne's lace, wild carrot	11, 12, 14, 15, 19, 24, 39, 44, 45, 47, 49	medicinal herb, ancestor of the cult carrot; open dry rocky soils & moist areas gen at low elev: disturbed areas, roadsides, waste areas, fields, older meadows & pastures, clearings, WV grasslands; strongly discouraged by cult, but a problem weed in crops & pastures that aren't tilled annually; hybridizes w/ cult carrots; abundant seed producers; abundant w of Cas in OR & WA & locally well estab e of the Cas; wdsp N.Am; native to Eurasia.
Apiaceae	*Foeniculum vulgare*	fennel, sweet fennel	3, 10, 14, 15	cult veg & medicinal herb; disturbed areas, esp where sunny: waste areas, roadsides; at least w of Cas in the PNW; w hemisphere; native to s Eur.
Apiaceae	*Torilis arvensis*	field hedge-parsley	11, 14, 15, 32	poss seed contaminant; disturbed areas, waste areas, roadsides, dry rangelands, dry c WV white oak communities; rapidly spreading, reproduces & spreads by clingy, spiny burs; w OR including Benton, Coos, Curry, Douglas, Linn & Poke Cos; WA, CA, ID; native to c & s Eur.
Asteraceae	*Arctium minus*	common burdock	12, 14, 15, 19, 44, 45, 47, 49	veg; near settlements at low elev : disturbed areas, roadsides, ditchbanks, pastures, fields, neglected farmyards & land, waste areas (esp w/ productive undisturbed soils); not comm found in cult areas; burs spread by livestock; wdsp N.Am; native to Eurasia & poss Afr.
Asteraceae	*Centaurea jacea*	brown knapweed	14, 15, 36	disturbed places; OR, WA, BC; native to Eur.

Asteraceae	*Centaurea nigra*	black knapweed	14, 15, 36	occurs in OR, WA, BC, MT, a waif in CA.
Asteraceae	*Centaurea nigrescens*	short-fringed knapweed, Tyrol knapweed	34, 36	also called *C. dubia*; first reported in OR in 1919; orn transplanting plus unintentional seed dispersal; moist, open areas: roadsides, irrig ditches, pastures, orchards, waste ground; all reports in the PNW have come from cleared areas in forested regions; reproduces by seed; grazed but not preferred; occurs near Hood River in OR; WA, BC; n US & s Can; native to sc & e Eur.
Asteraceae	*Crupina vulgaris*	common crupina	14, 15, 21, 49	grassy, disturbed areas: fields, roadsides, rangeland; the primary PNW habitat is s slopes in steep canyon grasslands; Federal Noxious Weeds; OR, WA, CA, ID; Medit Region.
Asteraceae	*Erechtites minima*	toothed coast burnweed	14, 15	grassland, woodland, coastal scrub; occ intro along the Pacific coast in OR & CA; native to Australia.
Asteraceae	*Hieracium aurantiacum*	orange hawkweed	14, 15, 16, 43, 44, 49	garden cultivar; lawns, fields, pastures, hayfields, mnt meadows, forest clearings, abandoned farmland, roadsides; crowds out native vegetation; w of Cas OR & WA, ID, MT, e US, Can; native to Eur.
Asteraceae	*Hieracium pilosella*	mouse-ear hawkweed	15, 33, 43, 49	prob intro in packing material; open grasslands: waste areas, cemeteries, lawns, pastures, native grasslands; esp invasive on infertile, droughty soils in regions of relatively high rainfall; spreads by stolons & seeds, benefited by grazing, detrimental to native & forage spp, leads to increased soil erosion; w of Cas in the PNW, reported from Portland, Salem, & Wyeth in OR & from Thurston Co in WA; e N.Am; native to Eur.
Asteraceae	*Lactuca muralis*	wall lettuce	15, 24, 44	edible relative to garden lettuce; disturbed moist sites w/in Douglas-fir forests at low to mid elev: glades, edges, clearings, recently logged areas & roadsides; w of Cas, BC to OR.
Asteraceae	*Sonchus arvensis ssp.a.*	perennial sowthistle	12, 14, 15, 42, 44, 45, 47, 49	seed crop contaminate; first reported in OR in 1939; damp soils at low to mid elev near settlements: disturbed areas, cult lands, waste areas, roadsides, pastures, meadows, thickets, clearings, ditch banks; reproduces by wind dispersed seeds & rhizomes; in areas receiving > 10" annual rainfall in the PNW; OR, WA, CA, ID; wdsp N.Am, rarer in the s; native to Eur +/or Eurasia.
Asteraceae	*Tanacetum vulgare*	common tansy	1, 3, 6, 10, 12, 14, 15, 16, 19, 24, 45, 49	also called *T. v.* var. *crispum, Chrysanthemum v., C. uliginosum*; cult medicinal herb & orn; disturbed, gen urban areas: roadsides, streambanks, waste areas, pastures, fields; spreads by seeds & rhizomes; unpalatable, poss toxic; wdsp

				N.Am; native to Eur.
Asteraceae	*Tragopogon dubius*	western salsify	11, 12, 14, 15, 19, 24, 44, 45, 49	dry settled areas at low elev: waste areas, roadsides, fields, open slopes, Columbia Basin Province steppe associations, also in relatively little disturbed areas; more robust & comm than *T. pratensis*; OR, WA, CA, ID, wdsp temp N.Am; native to Eur.
Asteraceae	*Tussilago farfara*	coltsfoot	15, 25	medicinal herb; roadsides, waste areas; occ w of Cas, wdsp e N.Am; native to Eurasia.
Boraginaceae	*Echium vulgare*	blueweed, common viper's bugloss	6, 10, 12, 15, 16, 45, 50	medicinal herb, seed contaminant; roadsides, waste areas, poorly drained slopes, fields, meadows, & pastures on dry, sandy, or stony soil; spreads by seeds, reduces native spp, toxic; ne WA to MT (includes OR); e US; native to Eur.
Brassicaceae	*Chorispora tenella*	blue mustard, crossflower	12, 13, 14, 15, 41, 45, 49	prob seed contaminate; roadsides, waste areas, dry pastures (esp grazed areas), cult fields; reduces crop yields & quality, taints dairy products; comm e of Cas, rare w of Cas; arid west to c US; native to Russia or sw Asia.
Brassicaceae	*Descurainia sophia*	fixweed	12, 14, 15, 45, 49	also called *Sisymbrium s.*; dry disturbed areas: roadsides, fields, abused prairies, waste areas, canyon bottoms, deserts; unpalatable to cattle, harmful to native grasses & forbes; spreads by seeds & has spread very rapidly at least in e WA; AK to CA, e to Atl; native to Eur or Eurasia.
Caryophyllaceae	*Gypsophila paniculata*	baby's breath	12, 14, 15, 24, 45, 49	cult orn & bouquet sp; disturbed, dry areas: abused rangeland, pastures; forms dense stands, diff to control; prob e OR, e WA, n ID, s BC; native to Eurasia.
Caryophyllaceae	*Silene latifolia* ssp. *alba*	white champion	12, 14, 15, 19, 24, 44, 45, 47	also called *S. a.* & *Lychnis a.*, oft mistaken for *S. noctiflora*; low to mid elev in disturbed areas (fields & their borders, roadsides, waste areas) & undisturbed relatively dry areas, however it is not aggressive in these natural habitats; throughout OR; throughout temp N.Am; native to Eur.
Chenopodiaceae	*Bassia hysopifolia*	fivehook bassia	12, 14, 15, 45	irrig areas, disturbed areas, roadsides, heavily grazed areas; seeds have spines which hook onto animals, etc; e of Cas; BC to CA, ID, MT, & NV, wdsp N.Am; native to Eurasia, the country around the Caspian Sea.

Chenopodiaceae	*Salsola iberica*	Russian thistle, tumbleweed	11, 12, 14, 15, 19, 40, 45, 47, 49	also called *S. tragus, S. kali, S. k.* var. *tenuifoolia, S. k.* var. *ruthenica, S. pestifer*; 3 considers *S. i.* & *S. k.* var *t.* to be misapplied; used to make soap in the Holy land, flax seed contaminate; disturbed, noncompacted soils: cropland, abandoned fields, overgrazed rangeland & pasture, roadsides, railroad embankments, ditch banks, wasteland; reproduces by seeds which spread rapidly in tumbleweeds; throughout OR (esp ne); esp in drier parts of US, comm W & Central States less frequent but spreading eastward; native to Eur or Eurasia, intro from Russia.
Dipsacaceae	*Dipsacus sylvestris*	teasel; common, wild, or Fuller's teasel	11, 12, 14, 15, 19, 21, 24, 45, 47, 49	some sources say it's the same sp as *D. fullonum*, some say they are different spp; intro poss as orn, toy, or seed contaminant; typically in moist open areas, occ in dry sites: roadsides, cemeteries, old fields, pastures, meadows, waste areas, disturbed areas, ditches, canals; reproduces by seeds which it produces in abundance, seeds spread in floral decorations; typically creates monospecific colonies crowding out natives; not grazed; wdsp US excluding the nc states; spreading rapidly in the PNW; native to Eur.
Fabaceae	*Lotus corniculatus*	birdsfoot trefoil	14, 15, 19, 24, 44, 45	esc from cult; moist to wet, open, disturbed grassy areas at low to mid elev: roadsides, ditches, meadows; some plants toxic; OR, WA, BC, CA, ID; spreading over much of N.Am; native to Eur or Eurasia.
Fabaceae	*Melilotus alba*	white sweetclover	14, 15, 19, 24, 44, 45, 49	promoted for cover crop (soil stabilization & improvement), nectar source for honey, cult vars for forage; open disturbed sites at low to mid elev near settlements & along roads: waste places, cult & non cult land; can be toxic to cattle; aggressive sp that can spread rapidly by seeds; comm wdsp weed of N.Am; native to Eurasia.
Fabaceae	*Melilotus officinalis*	yellow sweetclover	14, 15, 44, 45, 49	*M. indica* a different spp; promoted for cover crop (soil stabilization & improvement), nectar source for honey, cult vars for forage; open, disturbed areas: roadsides, waste areas, non-cult lands; can be toxic to cattle; aggressive sp that spreads rapidly by seeds; esp abundant in the RMS, less comm w & rarely w of Cas; wdsp N.Am; native to Eurasia, perhaps the Medit Region.
Geraniaceae	*Geranium robertianum*	herb robert	14, 15, 20, 44	damp shady forests to dry open disturbed areas, mostly at low elev: open forests, clearings, meadows, grassy openings; spreads by seeds; displaces native plants, esp small, herbaceous plants in the forest understory; w of Cas, sw BC to

				CA, but rare in OR; native to Eur.
Iridaceae	*Iris pseudacorus*	yellowflag iris	5, 14, 15, 19, 44, 48	cult orn, restoration, & medicinal spp; wet places: lake & pond margins, ditches, stream banks, marshes, swamps; both sides of Cas s BC to CA; wdsp e of RM; native to Eur.
Malvaceae	*Hibiscus trionum*	Venice mallow, flower of an hour	13, 14, 15, 16, 35, 49	also called *T. t.*; oft cult orn, seed contaminate; disturbed areas: roadsides, waste areas, gardens, orchards, cult fields; sold in seed catalogs, Noxious weed, reproduces by seeds; WV, Rogue River, Hood River & Baker in OR; CA, poss in WA & ID; e States; native to e Medit Region.
Martyniaceae	*Proboscidea louisianica*	devil's claw, common unicorn plant	14, 31	3 uses ssp *l.*; widely cult as a novelty orn; open, disturbed areas: riverbanks, waste areas, pasture, rangeland; interferes w/ grazing, fruits cause injury to livestock; spread by seeds which it produces in abundance; actively spreading in US; w of Cas in OR esp sw; CA; Midwest; native to s US.
Polygonaceae	*Rumex crispus*	curly dock	12, 14, 15, 24, 44, 45, 47, 49	most wdsp *Rumex* spp; low elev to lower mnts, disturbed areas (waste areas, roadsides, meadows, pastures, cult land) & undisturbed areas (upper parts of tidal marshes, driftwood zone of beaches); oft a pernicious weed; throughout N.Am; native to Eur or Eurasia.
Scrophulariaceae	*Digitalis purpurea*	foxglove	11, 14, 15, 19, 24, 44, 45, 49	cult orn & medicinal plant; roadsides, waste areas, forest openings & edges, logged areas, open woodlands, fields, coastal pastures, disturbed areas, mostly at low elev & near settlements; source of the comm heart drug digitalis; toxic to people & livestock; comm w of Cas & occ farther e, BC to CA; native to Eur & poss Asia & nw Afr.
Scrophulariaceae	*Parentucellia viscosa*	parentucellia	14, 15, 44, 45	comm near settlements in moist grassy areas: waste areas, pastures, lowland meadows, clearings; ungrazed by cattle, therefore, overgrazing promotes its spread; w of Cas, gen near coast, WA to CA; native to the Medit.
Scrophulariaceae	*Verbascum blattaria*	moth mullein	12, 14, 19, 45, 47, 49	leaves previously used to repel cockroaches; disturbed areas: roadsides, waste areas, old fields, meadows, pastures, occ in perennial crops; comm on dry gravelly soil; not as drought tolerant as *V. thapsus*; throughout OR; wdsp N.Am; native to Eurasia.

Scrophulariaceae	*Verbascum thapsus*	wooly mullein	12, 14, 19, 44, 45, 47, 49	disturbed areas esp w/gravelly or stony soils at low elev: roadsides, waste areas, meadows, old fields, pastures, fence rows, railroad yards, deserted home sites, river bottoms; reproduces by seeds which it produces in abundance; not eaten by livestock; not aggressive but difficult to control; throughout OR; wdsp temp N.Am; native to Eurasia, or intro from Eur but native to Asia (49).
Solanaceae	*Solanum dulcamara*	bittersweet nightshade	12, 14, 15, 19, 44, 45, 49	orn esc; low elev near settlements: waste areas, roadsides, fence rows, clearings, moist thickets & open woods, along drainage ditches & waterways, marshes; occ in orchards, vineyards & residential landscapes; toxic to people (children esp attracted to fruit) & livestock; climbs over vegetation & may form large colonies or thickets; wdsp N.Am; native to Eurasia.
Solanaceae	*Solanum elaegnifolium*	silverleaf nightshade, white horsenettle	14, 15, 29, 49	dry, disturbed areas esp on coarse-textured & sandy soils: waste areas, roadsides, railways, croplands, rangeland, pastures; noxious weed in 21 states, berries & foliage poisonous to livestock, reduces crop yields; reproduces by seeds, creeping roots & root fragments, very diff to control; semi-arid regions around the world, in the PNW it has been found in Umatilla Co, OR, Asotin Co, WA, & in Idaho Co, ID; native to c US or sw US & n Mex.

Grasses & Grass-like Species

Family	Species	Common Name		Comments
Poaceae	*Agrostis capillaris*	colonial bentgrass	14, 15, 44	also called *A. sylvatica, A. tenis, A. tenuis* (several vars), *A. vulgaris, A. alba* var. *sylvatica, A. stricta*; cult lawn & pasture sp; disturbed moist, open ground at low elev, esp near settlements: permanent pastures, meadows, lawns, fields, roadsides, clearings; in the PNW mainly w of Cas, occ e to n ID & w MT; much of temp N.Am; native to Eur.
Poaceae	*Agrostis stolonifera*	creeping bentgrass	14, 15, 44	sometimes called *A. alba, A. a.* var. *s., A. a.* var. *major, A. a.* var *palustris*; hard to distinguish from *A. gigantea*; cult turf grass; occupies moist to wet habitats: lawns, fields, meadows, pond & lake edges, ditches; AK to CA, w of Cas, e to se Can & ne US, s US; prob native to Eur.

Poaceae	*Alopecurus myosuroides*	black twitch, blackgrass, slender foxtail, Pacific meadow foxtail	12, 14, 15, 30, 49	cult for forage; prefers moist soils: pastures, winter crops like wheat; abundant seed production increases its potential for rapid spread; problem in areas w/winter wheat crops, reduces crop yields; in OR it's located in WV, Yamhill Co near the border w/Polk Co; several infestations in e WA; CA; rare in the US; native to Eurasia.
Poaceae	*Ammophila arenaria*	European beachgrass	11, 44, 46	intro to stabilize coastal sand dunes in the late 1800's; modifies natural dune habitat creating fore dunes which didn't occur in OR before its introduction, these changes are detrimental to the native dune spp like the w snowy plover; along the coast BC to n CA; native to Eur.
Poaceae	*Apera interrupta*	interrupted apera, dense silkybent	14, 15	also called *Agrostis i., Agrostis spica-venti* ssp. *orvar*, poss cult for revegetation; disturbed sites, esp in dry areas & semi-waste land; e of Cas BC to CA, e to ID & MT, also near Portland, OR; native to Eur & poss Asia.
Poaceae	*Arrhenantherum elatius*	tall oatgrass	11, 14, 15, 38, 44, 49	cult meadow & pasture grass, soil stabilizer; disturbed & open sites near settlements at low elev: roadsides, fields, pastures, meadows, WV grasslands, grass balds in the OR coast range; sw BC to CA, mainly w Cas in the PNW but also e WA, nc OR & n ID; wdsp N.Am; native to temp Eur.
Poaceae	*Avena sativa*	common oat	14, 15, 44, 45	also called *A. s.* var. *orientalis, A. fatua* var. *s., A. hybrida, A. byzantina*; seed contaminant, cult for grain; disturbed areas, fallow soil, railways, roadsides, cult fields; awns can injure grazing animals, diff to eradicate from cult fields, seeds remain viable up to 75 yrs; wdsp N.Am; native to Eur.
Poaceae	*Brachypodium sylvaticum*	false-brome	15	also called *Festuca s.*; cult orn; near Corvallis, OR in the PNW; intro from Eur.
Poaceae	*Bromus brizaeformis*	rattlegrass, rattlesnake brome	11, 14, 15, 18, 45	cult orn, used in flower arrangements & dry bouquets; disturbed dry sites in grasslands & shrublands, esp on overgrazed rangeland, roadsides, waste areas; se slopes of the Wallowa Mnts, intermountain PNW; N.Am; native to Eur.
Poaceae	*Bromus sterilis*	poverty brome, barren brome	14, 15, 44	open, oft disturbed areas: roadsides, waste areas, rocky forest openings; s BC to CA, e to s RMS; to e N.Am; intro from Eur, native to Eurasia.
Poaceae	*Dactylis glomerata*	orchard-grass	11, 14, 15, 44, 45, 49	widely cult for forage, hay, soil stabilization; moist sites at low to mid elev near settlements or disturbance: roadsides, waste areas, orchards, pastures, meadows, oak savanna, WV grasslands, n OR headland prairies; wdsp N.Am; native to

				Eurasia.
Poaceae	*Elytrigia intermedia*	intermediate wheatgrass	14, 15	also called *Agropyron intermedium*; cult forage sp; open areas, slopes; BC to CA, Great Plains; native to Eurasia.
Poaceae	*Festuca arundinacea*	tall fescue	11, 14, 15, 44, 49	also called *F. elatior* var. *a.*; widely cult seed & forage crop; disturbed areas: waste areas, roadsides, ditchbanks, fallow fields, meadows, WV grasslands; sw BC to CA, mainly w of Cas; ID; to e N.Am; native to Eur.
Poaceae	*Festuca pratensis*	meadow fescue	11, 14, 15, 44	also called *F. elatior, F. e.* var. *p., F. fluitans* var. *p.*; widely cult for forage; disturbed areas: roadsides, fields, meadows, some WV grasslands; sw BC to CA, to e N.Am; native to Eur.
Poaceae	*Holcus mollis*	creeping velvet-grass, German velvetgrass	14, 15, 37, 44, 47, 49	cult meadow grass; moist areas: lawns, ditches, pastures, grass seed crops; spreading rootstock, low palatability; *H. lanatus* much more comm; w of Cas WA to CA, also in sc OR; scattered in e US; native to temp n Eur.
Poaceae	*Lolium multiflorum*	Italian ryegrass	14, 15, 44, 49	also called *L. italicum, L. m.* var. *i., L. perenne* var. *m, L. p.* var. *i, L. temulentum* var. *m.*; hybridizes w/*L.p*; cult for forage, hay, temp soil stabilizer; disturbed areas, waste areas, abandoned fields, roadsides, cult crops; wdsp PNW, AK to CA; e N.Am; native to Eur.
Poaceae	*Lolium perenne*	perennial ryegrass	11, 14, 15, 21, 44	Also called *L. p.* var. *cristatum*; hybridizes w/*L. multiflorum*; widely cult for forage, hay, lawn mixes, cover crop; low elev esp near settlements: disturbed areas, waste areas, clearings, roadsides, lawns, abandoned fields, pastures, WV & CA grasslands, WV oak savanna; reduces native bunchgrasses; throughout the PNW, AK to CA; e N.Am; native to Eur.
Poaceae	*Nardus stricta*	mat nardus grass	15	dry areas; uncomm; OR, ID; native to Eur
Poaceae	*Phleum pratense*	timothy, common or cult timothy	1, 14, 15, 44	widely cult for forage, hay (top US hay crop); low to mid elev near settlements: disturbed areas, waste areas, roadsides, clearings, fields, pastures; hayfever allergen; throughout the PNW except in dry desert; N.Am, Mex; native to Eurasia.
Poaceae	*Poa compressa*	Canada bluegrass	11, 14, 15	cult for forage, lawns; moist, oft disturbed low ground: waste areas, roadsides, gardens, meadows, WV grasslands, open woods, oak savanna; benefited by grazing; AK to CA, throughout the PNW; wdsp temp N.Am; native to Eur.
Poaceae	*Secale cereale*	cultivated rye, cereal rye	12, 14, 15, 49	cult cereal rye; disturbed areas esp w/poor dry soil: slopes, roadsides, railroads, waste areas, fallow & cult fields, open

				ranges; OR, WA, CA, ID; native to s Asia.
Poaceae	*Spartina alterniflora*	smooth or saltwater cordgrass	8, 9, 35	prob intro by the oyster industry; low salt & brackish marshes in sandy to muddy substrates; Willopa Bay, WA; CA; native to e N.Am.
Poaceae	*Spartina anglica*	cordgrass	33	an aggressive sp created from the hybridization of *S. alterniflora* & the Eur sp *S. maritima*; it formed in England & has spread widely in the British Isles, dominating tidal mud flats; spreads by seed, clonal growth, & resprouting of rhizome fragments; changes bare mud flats into dense monospecific swords; WA, CA; Eur.
Poaceae	*Vulpia myuros*	red-tailed fescue, foxtail fescue, rattail fescue	14, 15, 44, 49	2 vars: var. *hirsuta* = *Festuca megalure* which is apparently native & found in relatively dry open areas w/sandy soils: rock outcrops, rocky slopes, open forests, fields, waysides, waste or overgrazed areas; comm BC to s CA, e to NV & AZ & occ farther; prob in S.Am & Eur. It is perhaps only a phase of var. *myuros* = *F.m.* which is prob intro from & native to Eur; also found in relatively dry, open areas w/sandy soils: waste areas, fields & overgrazed areas; irregularly scattered in the w from BC to Mex; S.Am.

Other

Family	Species	Common Name		Comments
Cuscutaceae	*Cuscuta approximata*	clustered or alfalfa dodder	12, 14, 15, 21, 47	Also called *C. planiflora, C. gracilis, C. anthemi*; 3 considers *C. epithymum* the same sp, & says var. *urceolata* is misapplied; prob intro as a seed contaminate; parasite on leguminous crops esp alfalfa; Federal Noxious Weed, damages crops; nc WA to e MT, s to n NM; in the ne corner of OR; native to Eurasia & Afr.
Cuscutaceae	*Cuscuta epithymum*	clover dodder	12, 14, 15, 21	3 considers *C. approximata* the same sp; prob intro as a seed contaminate; parasite on many crops, esp Leguminosae spp; Federal Noxious Weed; both sides of the Cas; native to Eur.

References
1-Alden and others 1998
2-Bailey 1958
3-Bianchini and Corbetta 1975
4-Brayshaw 1996
5-Clark 1974a
14-Hickman 1996
15-Hitchcock and Cronquist 1973
16-Jaques 1959
17-Jensen et al. 1995
18-Johnson 1993
27-Phillips 1978
28-Platt 1952
29-PNWEP 1991 June c
30- PNWEP 1992 Jan a
31- PNWEP 1992 June b
40- PNWEP 1993 Oct c
41- PNWEP 1994 July a
42- PNWEP 1995 Feb a
43- PNWEP 1997 Sept
44- Pojar and MacKinnon 1994

6-Crockett 1977
7-Elais 1980
8-Farrar 1995
9-Fernald 1989
10-Foster and Duke 1990
11-Franklin and Dyrness 1988
12-Gaines and Swan 1972
13-Gilkey 1957
19-Jolly 1988
20-KCDNR
21-McKnight 1993
22-McMinn and Maino 1963
23-Metcalf 1968
24-Niehaus and Ripper 1979
25-Niering and Olmstead 1979
26-Petrides 1993
32- PNWEP 1992 June e
33- PNWEP 1992 June f
34- PNWEP 1992 June i
35- PNWEP 1992 June l
36- PNWEP 1993 Jan
37- PNWEP 1993 Mar a
38- PNWEP 1993 Mar d
39- PNWEP 1993 Mar e
45- Taylor 1990
46- TNC 1991 Feb
47- USDA 1971
48- Weinmann et al. 1984
49--Whitson 1996
50- Zim and Martin 1950

Appendix B

Naturalized Plants in Oregon as of 1996

Disclaimer: Parts of the comments in this list are taken directly from the references. To make the section easier to read, quotation marks were omitted.

Trees

Family	Species	Common Name	References	Comments
Aceraceae	*Acer negundo* L.	box-elder	3, 4	cult; esc to streambanks & bottom lands; native to CA
Moraceae	*Maclura pomifera* (Raf.) C. Schneider	osage orange	3, 4, 7	widely planted as living fences; now naturalized in many areas: abandoned wind-breaks, disturbed areas; native to sc US.
Rosaceae	*Prunus domestica* L.	cultivated plum	3, 4	cult for fruit; occ esc & persisting near settlements areas; PNW, CA, ne US, se Can; native to e Eur & w Asia.
Rosaceae	*Pyrus communis L.*	cult pear	4, 5	cult for fruit & occ esc; native to w Asia & China.
Rosaceae	*Pyrus malus L.*	cult apple	4, 5, 7	cult for fruit; occ esc to fence rows, abandoned fields & disturbed forest through seed dissemination by animals & birds; prob native to w Himalayas.
Salicaceae	*Salix alba* L.	white willow	3, 4, 5	cult orn; disturbed places, gen near settlements; var. *vitellina* freq seen in e OR; native to Eur
Salicaceae	*Salix babylonica* L.	weeping willow	3, 4, 5, 7	widely planted cult orn; disturbed places near settlements; roots are destructive & aggressive; native to China.

Shrubs

Family	Species	Common Name		Comments
Aizoaceae	*Carpobrotus chilensis* (Molina) N.E. Br.	sea fig	3	coastal; OR-Mex; prob native to s Afr.
Caprifoliaceae	*Lonicera tatarica* L.	Tartarian or bush honeysuckle	3, 6	promoted for wildlife habitat use; disturbed areas; takes over habitat, berries possibly toxic; native to Siberia.
Fabaceae	*Cytisus multiflorus* (L'Heritier) Sweet	Spanish or Portuguese broom	3, 4	cult orn; disturbed roadsides; w OR & w WA; native to Spain, Portugal.
Grossulariaceae	*Ribes nigrum* L.	cult black current	4	cult & occ esc
Grossulariaceae	*Ribes sativum* (Reichb.) Syme	cult red current	4	cult; bird-disseminated & esc near settlements; BC, WA, & OR.

Rosaceae	*Cotoneaster franchetii* Boiss.		3	cult orn; disturbed places near dwellings: streambanks, forest, meadows, grassland & sagebrush scrub; native to China.
Rosaceae	*Crataegus oxyacantha* L.	hawthorn	4	cult orn, esc through bird-dissemination; mainly w Cas
Rosaceae	*Prunus spinosa* L.	blackthorn, sloe	4	cult; esc to moist draws & hillsides; se WA & adj ID, poss ne OR.
Rosaceae	*Rosa* "Multiflora"	multiflora rose	6, 22	cult orn; used for gardens, fences, erosion control, wildlife food & cover, hort rootstock; animal & bird disseminated to clearings, pastures, roadsides, fence rows; woodland edges; OR, WA, ID, CA; most of US; native to e Asia; biocontrol available.
Solanaceae	*Lycium barbarum* L.	matrimony vine	3, 4	also called *L. halimifolium*; cult; occ esc to waste places, fields; native to Eurasia.
Tamaricaceae	*Tamarix parviflora DC.*	smallflower tamarisk	3, 4, 24	cult orn; arid washes & reservoirs, slopes, sand dunes, roadsides; wdsp w US in moist desert locations; in OR: Malheur Co, & along John Day river in Gilliam Co; native to se Eur.

Vines/Brambles

Family	Species	Common Name		Comments
Cannabaceae	*Humulus lupulus* L.	European hop	3, 4	widely cult orn & beer ingredient; old fields, disturbed areas; native to Eurasia.
Caprifoliaceae	*Lonicera etrusca* Santi	<honeysuckle>	3, 4	thickets along coast; disturbed areas; native to Eur.
Polygonaceae	*Polygonum convolvulus* L.	black bindweed, wild buckwheat	2, 3, 4, 19, 22, 24	comm waste areas to cult land; wdsp N.Am; native to Eur.
Rosaceae	*Rubus ulmifolius* var. *inermis* Schott/(Willd.) W.O.Focke		3	gen moist disturbed areas; Eur cultivar.
Rosaceae	*Rubus vestitus* Weihe & Nees	European blackberry	4	sparingly estab w Cas as at Salem, OR and Grays Harbor Co, WA.
Vitaceae	*Vitis riparia* Michx.	riverbank grape-vine	4	orn, grown for fall foliage; near Portland, OR & sc MT; native to e US.
Vitaceae	*Vitis vinifera* L.	cultivated grape, wine grape	3, 4	long cult for fruit; abandoned fields, roadsides; SRC, se WA, & poss near Portland, OR; native to Eur.

Herbs & Flowers

Family	Species	Common Name		Comments
Aizoaceae	*Tetragonia tetragonioides* (Pallas) Kuntze	New Zealand spinach	3	Sand dunes, bluffs, margins of coastal wetlands; native to s hemisphere.
Amaranthaceae	*Amaranthus albus* L.	Tumbleweed	2, 3, 4, 22, 24	Weed; cult or waste areas, roadsides, fields; wdsp N.Am; native to Trop.Am.
Amaranthaceae	*Amaranthus deflexus* L.		3	disturbed areas; waif in CA; poss waif in PNW; native to Eur.
Amaranthaceae	*Amaranthus hybridus* L.	smooth pigweed	2, 3	disturbed areas; occ e WA, CA; native to Eurasia.
Apiaceae	*Ammi majus* L.		3	fields, roadsides, disturbed areas; native to Eurasia.
Apiaceae	*Ammi visnaga* L.	Bisnaga	3	disturbed areas: roadsides, railroads tracks; native to Eurasia.
Apiaceae	*Anethum graveolena* L.	Dill	3	cult & widely esc; disturbed places; native to Medit.
Apiaceae	*Anthriscus caucalis* M. Bieb.	Bur-chervil	3, 4, 24	cult garden herb; moist, open oft disturbed areas; Pacific States, e US; native to EA.
Apiaceae	*Apium graveolens* L.	celery	3	widely cult garden plant; wet areas; native to Asia.
Apiaceae	*Carum carvi* L.	Caraway	4, 24	cult; mountain meadows, hayfields, roadsides, irrigation ditches; occ in PNW; n US; native to Eur.
Apiaceae	*Caucalis latifolia* L.		4	casual intro into OR; native to Eur.
Apiaceae	*Pastinaca sativa* L.	parsnip	3, 4	cult; roadsides, disturbed areas; widely naturalized, but occ in PNW; native to Eur.
Apiaceae	*Scandix pecten-veneris* L.	Venus' needle	3, 4	weed; grassy slopes, roadsides; VI to CA in PNW, sporadic US; native to Medit.
Apiaceae	*Torillis japonica* (Houtt.) DC.		4	found s OR, but prob not established.
Apiaceae	*Torilis nodosa* (L.) Gaertner		1, 3, 4	disturbed areas; WV, s OR, prob not estab; native to Eurasia, esp Medit region.
Asteraceae	*Anthemis arvensis* L.	corn chamomile	3, 4, 18, 24	cult tea herb; disturbed areas: roadsides, fields; native to Eur.
Asteraceae	*Anthemis cotula* L.	mayweed, stinkweed, dog-fennel	2, 3, 4, 18, 22, 24	J-old medicinal herb; disturbed areas: fields, barnyards, pastures, roadsides, coastal dunes; causes skin irritations & effects milk flavor of dairy stock; ww; native to Eur.
Asteraceae	*Anthemis tinctoria* L.	golden marguerite	3, 4, 18	cult; occ esc to disturbed areas, roadsides; native to s Eur & w Asia.
Asteraceae	*Arctium lappa* L.	great burdock	3, 4, 18	intro weed; disturbed areas; scattered in OR & CA; native to Eurasia.

Asteraceae	*Artemisia annua* L.	sweet Annie	3, 4	cult for oils; disturbed areas; occ PNW; native to Eur.
Asteraceae	*Artemisia biennis* Wild.	biennial wormwood, sagebrush	3, 4, 24	prob native; disturbed moist areas with sandy soils: streams, lakes, irrig ditches; wdsp; controversial but prob native, poss Eur.
Asteraceae	*Artemisia vulgaris* L.	mugwort	4, 22	old medicinal herb; waste areas, fields, pastures; esp on limey soils; toxic; Pacific Coast, & along WA/OR border, ne US; native to Eur.
Asteraceae	*Aster novae-angliae* L.	New England Aster	4	occ esc in PNW; native to e N.Am.
Asteraceae	*Bellis perennis* L.	English daisy	3, 4, 18, 24	cult garden plants; damp grassy areas near settlements: lawns, pastures, roadsides, waste areas; mainly w Cas in the PNW, n N.Am; native to Eur.
Asteraceae	*Bidens tripartita* L.	three-lobed beggars-tick	3, 4	freshwater wetlands; occ PNW as at Portland, OR & Bingen, WA; native to e N.Am & Eur.
Asteraceae	*Bidens vulgata* E. Greene	sticktight, spanish-needles, beggar's tick	3, 4	freshwater wetlands; wdsp weed; native to e N.Am.
Asteraceae	*Boltonia asteroides* (L.) L'Her.	boltonia	4	moist low places; occ in PNW; 2 vars: var. *recognita* (most comm) & var *latisquama*; native to e N.Am.
Asteraceae	*Centaurea melitensis* L.	tocalote	3, 4, 24	disturbed fields, open woods; invasive; mainly w Cas; native to s Eur.
Asteraceae	*Centaurea montana* L.	montane star-thistle	4, 19	garden cult; waste areas, roadsides; w Cas.
Asteraceae	*Chrysanthemum segetum* L.	corn chrysanthemum	3	cult; urban coastal areas, fields; native to Eur, sw Asia.
Asteraceae	*Cichorium intybus* L.	chicory, blue sailors	2, 3, 4, 18, 19, 22, 24	cult for food; intro into US as a coffee substitute; waste areas, roadsides, vacant fields; grazing leads to bitter dairy products; comm esp w Cas in PNW, N.Am; native to Medit.
Asteraceae	*Cnicus benedictus* L.	blessed thistle	3, 4	roadsides, fields, waste areas; estab sparingly PNW; native to Eur.
Asteraceae	*Conyza bonariensis* (L.) cronq.		3, 4, 24	disturbed gen urban sites: waste areas, cult fields; occ weed near Portland, OR; native to Trop.Am.
Asteraceae	*Coreopsis lanceolata* L.	garden coreopsis	3	cult orn; disturbed areas; native to e US.
Asteraceae	*Cotula australis* (Sieber) Hook. f.		3, 4	disturbed sites esp in urban coastal areas; Trop.Am to WV (Portland) where occ; native to Aus.
Asteraceae	*Cotula coronopifolia* L.	brass-buttons	1, 3, 4, 18, 23	beaches, tidal mudflats, coast marshes; coastal BC to CA, & up the CR to the Cas; ww; native to s Afr.
Asteraceae	*Crepis capillaris* (L.) Wallr.		3, 4, 18, 19	lawns, pastures, meadows, waste areas, roadsides at low elevations near settlements; comm w Cas; native to Eur.

Asteraceae	*Crepis nicaeensis* Balb.	French hawksbeard	4	lawns, waste areas; occ w Cas.
Asteraceae	*Crepis setosa* Haller f.		3, 4, 19	disturbed areas: lawns, waste areas; w Cas, esp upper WV; native to Eur.
Asteraceae	*Crepis tectorum* L.	annual or rooftop hawksbeard	4, 18, 19	disturbed areas: lawns, waste areas; occ in PNW, n RM; native to Eur.
Asteraceae	*Crepis vesicaria* ssp.*taraxacifolia* (Thuill.) Thell.		3	disturbed areas; native to Eur.
Asteraceae	*Erechtites glomerata* (Poiret) DC.	fireweed	3, 4	woods along the coast; Pacific Coast; native to Aus.
Asteraceae	*Erechtites hieracifolia* var.*h.* (L.) DC.	fireweed	3, 4	disturbed areas near the coast; occ w Cas; native to e N.Am & the Caribbean.
Asteraceae	*Erigeron annuus* (L.) Pers.	fleabane daisy	3, 4, 18, 22	medicinal sp; moist, disturbed areas: roadsides, waste areas; all but se OR, WA, CA; poss native to west coast, native to e US.
Asteraceae	*Erigeron strigosus* var. *s.* Willd.	fleabane daisy	3, 4, 18	disturbed sites that are drier than for *E. annuus*; comm PNW, wdsp Am Weed; native to e US.
Asteraceae	*Erigeron strigosus* var. *septentrionalis* Willd./(F...	fleabane daisy	4	disturbed areas, drier sites than *E. annuus* occupies; occ PNW; wdsp Am weed; hybridization of *E.s.* var. *s* X *E.a.*
Asteraceae	*Filago arvensis* L.	field filago	3, 4	comm on overgrazed ranges; e Cas; native to Eur.
Asteraceae	*Filago gallica* L.	herba impia	3	bare or grassy areas; native to Medit.
Asteraceae	*Filago minima* (Sm.) Pers.		3	Native to Eur
Asteraceae	*Filago vulgaris* Lam.		3	Native to Eur
Asteraceae	*Galinsoga ciliata* (Raf.) Blake.	quickweed, garden pest	4	w Cas; native to Trop.Am.
Asteraceae	*Galinsoga parviflora* var. *p.* Cav.	smallflower galinsoga	3, 22	weedy gardens, dooryards, lowland fields, & waste areas, esp in damp areas with rich soil; s OR, s & c US; native to Mex & S.Am.
Asteraceae	*Galinsoga quadriradiata* Ruiz Lopez & Pavon		3	gardens, fields; native to Mex.
Asteraceae	*Gnaphalium collinum* Labill	cudweed, everlasting	3	moist grassy areas, open woodland; native to Aus.
Asteraceae	*Gnaphalium japonicum* Thunb.	cudweed, everlasting	3	disturbed areas; native to Aus.
Asteraceae	*Gnaphalium luteo-album* L.	cudweed, everlasting	3, 4	fields, waste areas; mainly w Cas; native to Eurasia.
Asteraceae	*Gnaphalium uliginosum* L.	marsh cudweed	4, 18, 19	moist , disturbed areas like gardens; w Cas; native to Eur.
Asteraceae	*Grindelia squarrosa* var.*serrulata* (Pursh)	gumplant	2, 3, 4, 24	medicinal herb; disturbed roadsides, streamsides; toxic, undesirable

	Dunal/(Ryd...			forage; native from WY to NM.
Asteraceae	*Helianthus maximilianii* Schrader	sunflower	3, 4	cult orn; disturbed areas; sporadically intro in PNW; native to c & e N.Am.
Asteraceae	*Helianthus petiolaris* ssp. *petiolaris* Nutt.	sunflower	3, 4	disturbed areas; e Cas, less comm than *H. annuus*; native to c US.
Asteraceae	*Helianthus tuberosus* L.	Jerusalem artichoke	4	cult for food; occ intro PNW; native to c & e US.
Asteraceae	*Hemizonia pungens* ssp. *septentrionalis* (H&A)T&G/D.D.Keck	common spikeweed	3, 4, 24	alkaline soils: roadsides, fields, waste areas; avoided by livestock; OR & WA, comm around Walla Walla & adj Umatilla Co, OR; native to CA.
Asteraceae	*Hieracium vulgatum* Fries	common hawkweed	4	dry areas; at Portland, OR & e.e. w Cas; native to Eur.
Asteraceae	*Hypochaeris glabra* L.	smooth cat's-ear	3, 4, 6, 18	disturbed areas & wasteland, esp in sandy soils; mainly w Cas; native to Eur.
Asteraceae	*Inula helenium* L.	elecampane	4	cult; roadsides; w Cas; native to Eur.
Asteraceae	*Lactuca canadensis* L.	lettuce	3, 4	forests, wasteland; occ PNW; native to e N.Am.
Asteraceae	*Lactuca ludoviciana* (Nutt.) DC.	lettuce	3, 4	open, moist, waste areas; occ PNW; native to c US.
Asteraceae	*Lactuca saligna* L.	lettuce	3, 4	waste, mostly urban areas; occ w Cas; native to Eur.
Asteraceae	*Lapsana apogonoides* Maxim.	Japanese lapsana	4	cult fields & disturbed areas; w Cas; native to e Asia.
Asteraceae	*Lapsana communis* L.	nipplewort	3, 4, 18, 19, 24	shady areas, cult fields, waste areas, open forests, low to mid elev; mainly w Cas in PNW, n N.Am; native to Eurasia.
Asteraceae	*Leontodon taraxacoides* ssp. *t.* (Villars) Merat	hawkbit	3, 4, 18	disturbed habitats: lawns, waste areas; w Cas esp along coast; native to Eur.
Asteraceae	*Leucanthemum maximum* (Ramond) DC.		3, 4	cult; disturbed areas; occ w Cas; native to Eur
Asteraceae	*Matricaria chamomilla* L.	wild chamomile	4, 18	occ in PNW; native to Eur.
Asteraceae	*Matricaria maritima* L.	scentless may-weed.	4, 18	saline places esp along the seashore: disturbed areas, roadsides; occ in PNW; e US; native to Eur; inland phase: *M inodora* or *M. m.* var. *agrestis*.
Asteraceae	*Picris echioides* L.	bristly ox-tongue	3	waste areas; native to Eur.
Asteraceae	*Rudbeckia hirta* var. *pulcherrima* L. Farw.	black-eyed Susan	3, 4	cult orn; open meadows, fields, roadsides, disturbed areas; casual PNW; native to Midwestern US.

Asteraceae	*Senecio sylvaticus* L.	woodland groundsel	1, 3, 4, 18, 19, 24	rocky sites, open disturbed woodland of low to mid elev: burns, clearcuts, roadsides; mainly w Cas, coastal mnts esp in OR; native to Eur.
Asteraceae	*Senecio vulgaris* L.	common groundsel	2, 3, 4, 15, 18, 19, 24	moist disturbed sites: cult fields, gardens; toxic to livestock; wdsp, most comm w Cas; temperate regions world wide; native to Eurasia.
Asteraceae	*Soliva sessilis* Ruiz Lopez & Pavon		3	disturbed areas, esp with hard-packed soil: paths, roadsides, lawns; native to S.Am.
Asteraceae	*Sonchus asper* ssp. *a.* (L.) Hill	prickly or spiny sowthistle	2, 3, 4, 16, 18, 19, 22, 24	intro as a seed crop contaminate; slightly moist waste areas, roadsides, gardens, cult fields, & along streams at low to mid elev near settlements; in areas of >10" annual rainfall in the PNW; comm N.Am; native to Eur.
Asteraceae	*Sonchus oleraceus* L.	common or annual sowthistle	2, 3, 4, 16, 18, 19, 22, 24	intro as a seed crop contaminate; pot herb; waste areas, cult fields, gardens, roadsides, etc at low to mid elev near settlements; in areas of >10" annual rainfall in the PNW; N.Am, most comm Pacific States; native to Eur.
Asteraceae	*Sonchus uliginosus* Bieb.	marsh sowthistle	4, 16, 22, 24	also *S. arvensis* ssp. *u*, *S arvensis* var. *glabrescens*, or *S. g.*; intro as a seed crop contaminate, first reported in OR in 1950; disturbed areas: cult fields, roadsides, overgrazed pastures; in areas of >10" annual rainfall in the PNW; cosmopolitan; native to Eur.
Asteraceae	*Tanacetum balsamita* L.		4	also *Chrysanthemum b.*; occ esc.
Asteraceae	*Tanacetum parthenium* (L.) Schultz-Bip.	feverfew	3, 4, 18	also *Chrysanthemum p.*; cult medicinal & orn garden herb; disturbed urban sites, roadsides, fields; native to Eur.
Asteraceae	*Tragopogon porrifolius* L.	salsify, oyster plant	2, 3, 4, 18, 19, 24	cult; roadsides, waste areas, gen in moist soil; occ in PNW; native to Eur.
Boraginaceae	*Anchusa arvensis* (L.) M. Bieb.	small bugloss, blue-flowered tarweed	3, 12	disturbed areas: cult fields & adj land; uncomm, reproduces by long-lived seeds, can reduce crop yields; Pendleton, OR; Spokane & Whitman Cos, WA; Kootenai & Fremont Cos, ID; Midwest & ne US, & adj Can; native to Eur.
Boraginaceae	*Anchusa azurea* Miller	alkanet, bugloss	3, 4	open sites, grassland, shrubland; w Cas; native to c & s Eur.
Boraginaceae	*Anchusa officinalis* L.	common bugloss	3, 4	open sites, fields; e Cas; native to Eur.
Boraginaceae	*Asperugo procumbens* L.	madwort catchweed	2, 3, 4, 24	disturbed areas, roadsides, waste areas, ditches, fields & cult areas, gen in moist soils; e Cas; native to Eurasia.
Boraginaceae	*Borago officinalis* L.		3, 4	cult for orn, potherb, & bee nectar; open oft disturbed sites; w Cas; native to s Eur.

Boraginaceae	*Lithospermum arvense* L.	gromwell	2, 3, 4, 22, 24	prob intro as a seed contaminate in wheat seed; disturbed areas, esp. troublesome where winter grains are grown; mainly e Cas in PNW, comm US; native to Eurasia.
Boraginaceae	*Myosotis arvensis* (L.) Hill	field forget-me-not or scorpion-grass	4	Intro from Eur.
Boraginaceae	*Myosotis discolor* Pers.	forget-me-not	3, 4, 18	roadsides, moist ground, wet meadows; native to Eur.
Boraginaceae	*Myosotis micrantha* Lehm.	smallflower forget-me-not	1, 3, 4	roadsides, streambanks, disturbed open places; native to Eurasia.
Boraginaceae	*Myosotis scorpioides* L.	marsh forget-me-not	3, 4, 18	also called *M. palustris*; shallow water to moist soil from low to mid elev; comm BC southward; native to Eur.
Boraginaceae	*Symphytum asperum* Lepechin	comfrey	3, 4	cult; wet, open sites, ditches, roadsides; mainly w Cas; native to sw Asia.
Boraginaceae	*Symphytum officinale* L.	comfrey	3, 4	cult; waste areas, fields, roadsides; mainly w Cas; native to Eur.
Brassicaceae	*Alliaria officinalis* Andrz.	garlic mustard, hedge garlic	4	occ in parts of US; in PNW estab in Portland, OR; native to Old World.
Brassicaceae	*Alyssum alyssoides* (L.) L.		3, 4, 24	dry gravelly waste areas, roadsides, foothills, cropland; native to Eur.
Brassicaceae	*Alyssum desertorum* Stapf		3, 4, 24	disturbed areas, rocky sagebrush flats, waste areas; occ in c WA & OR, CA, ID, MT; native to Eur.
Brassicaceae	*Alyssum minus* ssp. *micranthum* (L.) Roth/(C.Meyer) Dudley	field alyssum	3, 24	roadcuts, waste areas, foothills, open rangeland; native to Eurasia.
Brassicaceae	*Arabidopsis thaliana* (L.) Heynh.	mouse-ear cress, thale cress	3, 4	oft used in lab experiments; disturbed open ground, esp in gardens; comm BC to OR, e to ID; native to Eur.
Brassicaceae	*Barbarea verna* (Miller) Asch.	early winter cress, scurvy grass	3, 4	cult for food; damp soils, fields, roadsides, waste areas; WA to CA; native to Eurasia.
Brassicaceae	*Barbarea vulgaris* R.Br.	common winter cress, yellow rocket	3, 4, 18, 22	wet, disturbed areas; w OR, WA, CA, e US; native to Eurasia.
Brassicaceae	*Brassica hirta* Moench	white mustard	4, 24	also known as *B. alba*; cult; waste areas, native to Eur.
Brassicaceae	*Brassica juncea* (L.) Czernov	Indian mustard	3, 4, 24	cult for seed; disturbed areas, fields, waste areas; occ in much of PNW; native to Asia.
Brassicaceae	Brassica kaber (DC.) Wheeler	charlock, wild mustard	2, 4, 22, 24	also called *B. arvensis*, *Sinapis arvensis*, & *S. kaber*, cult for oil in Eur; waste areas, roadsides, cult fields, gardens, ditch banks; throughout US; native to Eur.
Brassicaceae	*Brassica nigra* (L.) Koch	black mustard	2, 3, 4, 19, 22, 24	cult (table mustard); cult & abandoned fields, waste areas, disturbed areas, roadsides, pastures, ditches; wdsp OR, wdsp N.Am; native to

				Eur.
Brassicaceae	*Brassica rapa* L.	turnip, field mustard	3, 4, 18, 24	also called *B. campestris*; cult for food; disturbed areas low to mid elev: waste areas, roadsides, cult fields; wdsp in PNW, wdsp N.Am; native to Eur
Brassicaceae	*Cakile maritima* Scop.	European sea rocket	3, 4, 18	sandy beaches, dunes; coastal BC to CA becoming more comm southward; native to Eur.
Brassicaceae	*Camelina microcarpa* Andrz.	smallseed false flax	2, 3, 4, 22, 24	freq transported with feeds; disturbed areas: fields, roadsides, waste areas; wdsp PNW mostly in dry areas that grow flax; throughout n & c N.Am; native to Eur.
Brassicaceae	*Camelina sativa* (L.) Crantz	falseflax, gold-of-pleasure	4, 22	similar habitat & locations as *C. microcarpa* but much less comm; native to Eur.
Brassicaceae	*Capsella bursa-pastoris* (L.) Medikus	shepherd's purse	2, 3, 4, 18, 19, 22, 24	cult in Eur; most comm in moist disturbed areas: waste areas, gardens, cult fields, roadsides, etc; throughout OR, throughout N.Am; native to Eur.
Brassicaceae	*Cardamine hirsuta* L.	bitter-cress, toothwort	3	lawns, roadsides, ditches; native to Eur.
Brassicaceae	*Cardaria chalepensis* (L.) Hand.-Mazz.	lens-podded whitetop or hoary cress	3, 4, 9	disturbed gen saline soils, fields; native to e Asia.
Brassicaceae	*Conringia orientalis* (L.) Dumort.	hare's ear	3, 4, 22	dry areas, grainfields, roadsides, waste areas, gardens, open disturbed areas; less wdsp than the other Cardaria spp., mainly e Cas in the PNW, n & c N.Am; native to Eurasia.
Brassicaceae	*Coronopus didymus* (L.) Smith	wart or swine cress	3, 4	disturbed areas: gardens, fields, roadsides, waste areas; BC to CA & e to Atl; native to Eurasia.
Brassicaceae	*Erucastrum gallicum* (Willd.) O. Schulz		3, 4	disturbed areas, roadsides; prob in OR, occ in WA, ID, MT; native to Eurasia.
Brassicaceae	*Erysimum cheiranthoides* L.	wormseed mustard	3, 4, 18	moist, disturbed areas; AK to CA, e to Atl; poss native to w N.Am but prob intro from Eurasia where native.
Brassicaceae	*Erysimum repandum* L.	bushy wallflower	2, 3, 4	intro to PNW in the early 1900's; disturbed waste areas & grainfields in desert plains & lower mnts; e OR & e WA, ID, CA, scattered e to Atl; native to Eur.
Brassicaceae	*Hesperis matronalis* L.	dame's rocket	3, 4	cult orn; waste areas, roadsides, slopes; native to Eur.
Brassicaceae	*Lepidium campestre* (L.) R.Br.	field pepperweed	3, 4, 19, 22	roadsides, abused prairies, new meadows, cult fields, waste areas; Cas, e edge of OR & WA, ID, e N.Am; native to Eur.
Brassicaceae	*Lepidium perfoliatum* L.	yellow pepperweed, yellow-	1, 2, 3, 4,	intro early 1900's; overgrazed land, edges of dry fields, waste areas,

		flowered peppergrass	19, 24	roadsides; throughout w N.Am; native to Eur.
Brassicaceae	*Lepidium ruderale* L.	narrowleaved pepperweed	4	comm e US, but very occ w of the RM, near Portland, OR in PNW; native to Eur.
Brassicaceae	*Lepidium sativum* L.	garden cress	4	salad herb; occ esc OR & WA
Brassicaceae	*Lobularia maritima* (L.) Desv.	<sweet alyssum>	3, 4	orn; waste areas; native to Eur.
Brassicaceae	*Lunaria annua* L.	Honesty	3, 4	cult garden sp; disturbed urban areas, roadsides; w CRG, Puget Sound area WA, CA.
Brassicaceae	*Malcolmia africana* R.Br.	malcolm	3, 4, 24	disturbed areas, desert shrublands; (?) OR, ID, CA, Great Basin; native to Medit.
Brassicaceae	*Raphanus raphanistrum* L.	jointed charlock	3, 4, 19, 24	moist waste areas, cult fields, roadsides; casual OR, WA & CA; native to Eurasia.
Brassicaceae	*Raphanus sativus* L.	common wild radish	3, 4, 19, 24	precursor to the cult radish; moist waste areas, cult fields, roadsides; comm PNW; native to Eur.
Brassicaceae	*Rapistrum rugosum* (L.) All.	(wild turnip)	3	disturbed areas, fields; native to s Eur.
Brassicaceae	*Sisymbrium loeselii* L.	Loesel tumblemustard	3, 4, 19	abused prairies, fields, roadsides, waste areas; widely distributed in the West esp n RM, also in OR, WA, ID; US; native to Eurasia.
Brassicaceae	*Sisymbrium officinale* L.	hedge mustard	2, 3, 4, 18, 19, 22	garden herb; disturbed areas near settlements: roadsides, gardens, fields edges, waste areas; esp comm w Cas in the PNW, widely estab US; native to Eur.
Brassicaceae	*Teesdalia nudicaulis* (L.) R.Br.	shepherd's cress	4	sandy gravelly soil; w OR & w WA; native to Eur.
Brassicaceae	*Thlaspi arvense* L.	fan-weed, stinkweed, Jim Hill mustard, field penny cress	1, 2, 3, 4, 18, 19, 22	old medicinal herb, spread along transcontinental railroads & as a grain seed contaminant; disturbed areas: fields, grainfields, roadsides, etc; taints livestock products & toxic if heavily grazed; comm N.Am, PNW, low to mid elev (into lower mnts); native to Eur.
Campanulaceae	*Campanula persicifolia* L.		4	garden sp; occ intro w Cas; native to Eur.
Campanulaceae	*Campanula rapunculoides* L.	creeping or rover bellflower	2, 4, 21, 24	previously comm cult orn & garden sp; sun or shade near settlements: older gardens & yards, abandoned farmsteads; very diff to control once estab, spreads by seed, creeping lateral roots, & root fragments, seeds still sold in catalogs; occ w Cas & e WA in the PNW, e US; native to Eur.
Cannabaceae	*Cannabis sativa* L.	grass, hemp, marijuana, pot, etc.	3, 4, 22, 24	ancient & widely planted cult; disturbed areas with moist, fertile soil; waste areas, fields, ditches, roadsides; wdsp US, s OR, poss not persistent in the PNW; native to c Asia.

Caryophyllaceae	*Arenaria serpyllifolia* ssp. *s.* L.	<sandwort>	3, 4	dry to moist, barren to wooded places; comm in PNW; native to Eur.
Caryophyllaceae	*Cerastium glomeratum* Thuill.	sticky chickweed or cerastium	4	also called *C. viscosum*; dry hillsides, grassland, chaparral, disturbed areas, at low elev; mostly w Cas; native to Eur.
Caryophyllaceae	*Cerastium siculum* Guss.	Dry chickweed	3, 4, 19, 22, 24	rare PNW, found Union Co & near LaGrande in OR, Pullman in WA; native to Eur.
Caryophyllaceae	*Corrigiola litoralis* L.	strapwort	4	estab near Portland, OR; native to Eur.
Caryophyllaceae	*Dianthus armeria* ssp. *a.* L.	grass pink, Depthford pink	3, 4	garden sp; disturbed areas; OR, WA, ID, MT; native to s Eur.
Caryophyllaceae	*Dianthus barbatus* ssp. *b.* L.	sweet William	3, 4	garden sp; disturbed areas; w OR & w WA; native to s Eur.
Caryophyllaceae	*Herniaria hirsuta* ssp. *h.* L.		3	sandy flats, roadsides, woodland; native to s Eur, n Afr, & sw Asia.
Caryophyllaceae	*Holosteum umbellatum* ssp.*u.* L.	jagged chickweed	1, 2, 3, 4	disturbed areas, grainfields, stabilized sand dunes; comm PNW, but mostly along CR & SR; native to c, e, & s Eur.
Caryophyllaceae	*Lychnis alba* Mill.	white campion, evening campion, white cockle	2, 3, 4, 18, 19, 22, 24	also called *Silene latifolia* ssp. *alba*, or *S. a.*; mostly rather dry areas from low to mid elev: grain fields, roadsides, waste areas, & undisturbed habitats; n N.Am; native to Eur.
Caryophyllaceae	*Lychnis coronaria* (L.) Desr.	rose champion, mullein pink	3, 4, 18, 19	garden orn; disturbed areas: roadsides, waste areas, open slopes, at low elev; mainly w Cas; native to Eur.
Caryophyllaceae	*Lychnis dioica* L.	red campion	4	estab several areas w Cas, BC to OR; native to Eur.
Caryophyllaceae	*Moenchia erecta* ssp. *e.* (L.)P.Gaertner,Meyer&Scherb		3	disturbed areas; native to sw Eur.
Caryophyllaceae	*Petrorhagia dubia* (Raf.) G. Lpoez & Romo		3	disturbed areas, woodland savanna; native to s Eur.
Caryophyllaceae	*Sagina apetala* L.	common pearlwort	3, 4, 19	also called *s. ciliata*; garden orn; moist disturbed areas; w WA to CA; controversial: (3) considers it native while (4 & 19) considers it native to Eur or Eurasia.
Caryophyllaceae	*Sagina procumbens* L.	procumbent pearlwort	3, 4, 18, 19	garden orn; moist, disturbed areas at low elev: lawns, roadsides, gardens, sea cliffs, pond margins, waste areas; not strictly coastal, w Cas, sw BC to n CA; controversial: (3) considers it native while (4, 18, & 19) considers it intro from Eur or Eurasia.
Caryophyllaceae	*Saponaria officinalis* L.	<bouncing bet, soapwort>	2, 3, 4, 24	orn; roadsides, oak woodlands, streambeds, disturbed areas; poisonous but rarely grazed, displaces other plants; OR, WA & CA; native to s Eur.
Caryophyllaceae	*Scleranthus annuus* ssp. *a.* L.	knawel	2, 3, 4, 22	gardens, fields, waste areas, stream margins, on dry, sandy , or gravelly soils; along the Pacific coast, e N. Am; native to Eur.

Caryophyllaceae	*Silene armeria* L.	sweet William catchfly	4	orn; waste areas; native to Eur.
Caryophyllaceae	*Silene conica* L.	striated catchfly	2, 4	waste areas; along coast in PNW; native to Eur.
Caryophyllaceae	*Silene conoidea* L.	cone catchfly	2, 3, 4, 24	disturbed open areas: waste areas, fields, roadsides; Pacific coast to Latah Co, ID; native to Eur.
Caryophyllaceae	*Silene dichotoma* Ehrh.	<catchfly, campion>	3, 4	fields, roadsides, waste areas; wdsp but not comm in the PNW; native to Eur.
Caryophyllaceae	*Silene gallica* L.	small-flowered catchfly	3, 4, 18	fields, disturbed areas; WA to CA, esp w Cas; native to Eur.
Caryophyllaceae	*Silene noctiflora* L.	night-flowering catchfly	2, 3, 4, 18, 22, 24	garden plant; open, disturbed areas: cult ground, waste areas, fields; all but sw OR, n N.Am; native to Eur; oft mistaken for *Lychnis alba*.
Caryophyllaceae	*Silene vulgaris* (Moench) Garcke	bladder campion	3, 4, 18, 24	also called *S. cucubalus*; open areas, fields, roadsides, waste areas, mostly at low elev; contaminates crop seed; native to Eur.
Caryophyllaceae	*Spergula arvensis* ssp. *a.* L.	corn spurry, stickwort, starwort	2, 3, 4, 22, 24	cult fields, waste areas, open slopes, pine woods, sand dunes, esp on sandy & gravelly soils; mostly w Cas in OR, pacific states, WY, CO, parts of e US; native to Eur.
Caryophyllaceae	*Spergularia bocconii* (Scheele) Merino	<sand-spurry>	3, 4	salt marshes, alkaline areas, sandy soils; only known in the PNW from old collections near Portland, OR; native to sw Eur & Medit.
Caryophyllaceae	*Spergularia diandra* (Guss.) Bioss.	alkali sandspurry	4	also named *Arenaria d., A. salsuginea*, & *S. s.*; intro along SR & CR in OR, WA, & ID; native to Eur.
Caryophyllaceae	*Spergularia marina* (L.) Griseb.	saltmarsh sandspurry	3, 4, 18	alkaline fields, coastal mudflats & tidelands: sandy river bottoms, sandy coasts, salt marshes; sw BC to CA, inland to RMS; controversial: (3) considers it native while (4 & 18) consider it introduced from Eur.
Caryophyllaceae	*Spergularia media* (L.) Griseb.	<sand-spurrey>	3, 4	salt flats, salt marshes, sandy beaches; native to coastal Eur.
Caryophyllaceae	*Spergularia rubra* (L.) J.S. Presl & C. Presl	red sand-spurrey	3, 4, 18	open forests, gravelly glades, meadows, mud flats, gardens, waste areas, disturbed areas; comm sw BC south; native to Eur.
Caryophyllaceae	*Spergularia villosa* (Pers.) Cambess.	<sand-spurrey>	3, 4	disturbed areas, sandy slopes & bluffs, clay ridges & plains; In the PNW only near Portland, OR, CA; native to S.Am.
Caryophyllaceae	*Stellaria alsine* Grimm	bog stitchwort	4	also called *S. uliginosa*; lawns, mainly w Cas; native to Eur.
Caryophyllaceae	*Stellaria graminea* L.	<chickweed, starwort>	3, 4	disturbed areas, lawns, gardens; mostly w Cas but e to ID; native to Eur.
Caryophyllaceae	*Stellaria media* (L.) Villars	common chickweed	1, 2, 3, 4, 18, 19, 22, 24	woodlands, meadows, pastures, cult fields, lawns, gardens, waste areas; noxious weed; wdsp N.Am; native to sw Eur.

Caryophyllaceae	*Vaccaria hispanica* (Miller) Rauschert	<cow-herb, cockle>	3, 4	also called *V. segetalis*; fields, disturbed areas: railroads, roadsides, waste areas; native to Eurasia & Medit.
Chenopodiaceae	*Atriplex hortensis* L.	garden oracle	3, 4	cult; open, disturbed areas; reported from various parts of the PNW; native to Eurasia.
Chenopodiaceae	*Atriplex rosea* L.	tumbling oracle	3, 4	fields, open disturbed places esp roadsides & waste areas; BC to CA, ID & MT; mainly e Cas; native to Eurasia.
Chenopodiaceae	*Bassia hirsuta* (L.) Asch.		2, 4	has been reported in the PNW; ? in OR.
Chenopodiaceae	*Beta vulgaris* L.	cultured beet	3, 4	cult for food, sugar; oft persistent in waste areas; native to s Eur.
Chenopodiaceae	*Chenopodium album* L.	pigweed, lamb's quarters	2, 3, 4, 18, 19, 22, 24	edible; disturbed areas esp cult fields, also gardens, waste areas, & roadsides; low to mid elev; wdsp N.Am; prob native to Eur; oft confused with *C. berlandieri*, *C. missouriense*, & *C. strictum*.
Chenopodiaceae	*Chenopodium ambrosioides* L.	Mexican tea	2, 3, 4	disturbed areas; occ in OR & WA, try n OR & Whitman & Klickitat Cos in WA; native to Trop.Am.
Chenopodiaceae	*Chenopodium botrys* L.	Jerusalem oak	2, 3, 4	disturbed areas: mainly dry roadsides, also waste areas & gravelly streambanks; native to Eur.
Chenopodiaceae	*Chenopodium chenopodioides* (L.) Aellen	<pigweed, goosefoot>	3, 4	saline soils, drying ponds, mudflats, & roadsides from sagebrush desert to mnt slopes; BC to CA, e to NV, & CO; native to S.Am or Eurasia.
Chenopodiaceae	*Chenopodium foliosum* (Moench) Asch.	<pigweed, goosefoot>	3, 4	open, gravelly or sandy soils; OR, WA, CA, ID; native to Eur.
Chenopodiaceae	*Chenopodium glaucum* L.	<pigweed, goosefoot>	3, 4	open areas, drying ponds, streambanks, esp on saline or alkaline soil; in PNW mainly in se OR & lower CR, ID, MT; native to Eurasia.
Chenopodiaceae	*Chenopodium macrospermum* var. *halophilum* Hook.f./(Philippi)Standley	<pigweed, goosefoot>	3	wet places, marshes; prob native to S.Am.
Chenopodiaceae	*Chenopodium multifidum* L.	<pigweed, goosefoot>	3, 4	also called *C. multifida*; disturbed areas, in PNW mainly found on ballast & apparently not estab; native to S. Am.
Chenopodiaceae	*Chenopodium murale* L.	nettleleaf goosefoot	3, 4, 24	fields, roadsides, gardens, waste areas; wdsp N.Am; native to Eur.
Chenopodiaceae	*Chenopodium pumilio* R.Br.	<pigweed, goosefoot>	3, 4	disturbed areas, se OR & e.e. in the PNW, CA; native to Aus.
Chenopodiaceae	*Chenopodium strictum* var. *glaucophyllum* Roth/(Aellen)Wahl	<pigweed, goosefoot>	3	open, disturbed areas; native to e US; poss best considered part of *C. album*.
Chenopodiaceae	*Corispermum hyssopifolium* L.		3, 4	sandy soils, dunes; wdsp, BC to OR e past RMS & s to Mex; mainly e Cas in PNW; native to Eurasia.

Chenopodiaceae	*Corispermum nitidum* Kit.	shiny bugseed, tickseed	4	irrigated land; e OR & se WA to ID, e & s ; native to Eurasia.
Crassulaceae	*Crassula tillaea* Lester-Garl.		3	open, gravelly sites; native to Medit.
Dipsacaceae	*Dipsacus fullonum* L.	wild teasel	3, 4, 24	moist low places, esp along irrigation ditches, canals, disturbed areas, pastures & old fields; wdsp N.Am & spreading rapidly in the PNW; native to Eur.
Euphorbiaceae	*Euphorbia cyparissias* L.	cypress spurge	2, 4	orn, esp in cemeteries; roadsides, fields, gardens; spreading by seeds & roots; occ in OR, WA, ID; native to Eurasia.
Euphorbiaceae	*Euphorbia helioscopia* L.	wartweed	3, 4	waste areas; occ w Cas, more comm e N.Am; native to Eur.
Euphorbiaceae	*Euphorbia lathyris* L.	caper spurge, gopher plant	3, 4	waste areas; occ esc in PNW but prob never persistent; native to Eur.
Euphorbiaceae	*Euphorbia oblongata* Griseb.	<spurge>	3	waste areas; noxious weed; native to Eur
Euphorbiaceae	*Euphorbia peplus* L.	petty spurge	3, 4, 19	moist waste areas, cult fields, & esp gardens; mainly w Cas in PNW, comm N.Am; native to Eur.
Euphorbiaceae	*Mercurialis annua* L.	<mercury>	3	open, disturbed areas, fields, roadsides; native to Eur.
Fabaceae	*Coronilla varia* L.	crown vetch	4, 6	orn, estab parts of w OR & ID; native to the Old World.
Fabaceae	*Lathyrus angulatus* L.	<wild pea>	3	disturbed areas; seeds prob toxic to humans & livestock; uncomm; native to Eur.
Fabaceae	*Lathyrus aphaca* L.	<wild pea>	3, 4	disturbed areas; seeds prob toxic to humans & livestock; uncomm; w OR in the PNW, CA; native to Eur.
Fabaceae	*Lathyrus hirsutus* L.	caley pea	3, 4	cult; disturbed areas, wet meadows, creekbeds; estab in the WV, OR & perhaps else where in the PNW, CA; native to Eur.
Fabaceae	*Lathyrus latifolius* L.	perennial sweet pea	3, 4, 24	cult orn; disturbed areas, esp roadsides & railways; most comm weedy sweet pea.
Fabaceae	*Lathyrus pratensis* L.	meadow peavine, meadow vetchling	4	rarely esc; native to Eur.
Fabaceae	*Lathyrus sphaericus* Retz.	grass pea	1, 3, 4	disturbed areas; well estab in parts of w OR, WV, uncomm CA; native to Eur.
Fabaceae	*Lathyrus sylvestris* L.	flat, or narrowleaved everlasting peavine	4	fairly commonly estab in WA, OR, & ID; native to Eur.
Fabaceae	*Lathyrus tingitanus* L.	sweet or Tangier pea	3, 4, 19	cult orn; gen disturbed areas: roadsides & waste areas, but seldom a prob in cult fields & pastures; OR, CA esp coastal; native to Eur.
Fabaceae	*Lens culinaris* Medikus	lentil	3	cult for edible seed; disturbed areas; esp cult in WA & ID; native to Old

				World.
Fabaceae	*Lotus uliginosus* Schk.		3	wet fields, roadsides, ditches; native to Eur.
Fabaceae	*Medicago arabica* (L.) Hudson	burclover, spotted burclover	3, 4	mostly in waste places near coast; WA to CA; native to Eur.
Fabaceae	*Medicago lupulina* L.	black medick, yellow trefoil	2, 3, 4, 18, 19, 22	grown for forage; waste areas, roadsides, lawns, pastures, meadows, esp in sandy or gravelly soil & at low elev; throughout OR & N.Am; native to Eur.
Fabaceae	*Medicago polymorpha* L.	California burclover	3, 4	also called *M. hispida*; forage sp; disturbed & cult areas; spread in animal fur; widely intro w US esp w Cas; native to Medit.
Fabaceae	*Medicago sativa* L.	alfalfa, lucerne	3, 4, 18, 19	ancient cult; waste areas, roadsides; not overly aggressive; native to Eurasia.
Fabaceae	*Melilotus indica* (L.) All.	Sourclover	3, 4	open, disturbed areas; sparingly intro w OR & w WA, occ elsewhere; native to Medit.
Fabaceae	*Onobrychis viciifolia* Scopoli	saintfoin, sanfoin	3, 4, 18	cult for forage, soil improvement; disturbed waste areas; BC to nw WA, MT & prob elsewhere in the PNW, CA, N.Am; native to Eurasia.
Fabaceae	*Ononis repens* L.	restharrow	4	estab near Linnton, OR where prob not persistent, & at Bingen WA; native to Eur.
Fabaceae	*Trifolium angustifolium* L.	<clover>	3	disturbed areas; native to Medit.
Fabaceae	*Trifolium arvense* L.	rabbitfoot clover	3, 4	disturbed waste areas, old fields; mainly w Cas; native to Eur.
Fabaceae	*Trifolium aureum* Polich	hop clover	3, 4	(? *T. agrarium*); disturbed areas; native to Eur.
Fabaceae	*Trifolium campestre* Schreber	low hop clover	2, 3, 4, 18	disturbed areas, roadsides, lawns, grassy fields, meadows at low elev; VI to CA; native to Eur
Fabaceae	*Trifolium dubium* Sibth.	small or little hop clover, shamrock	2, 3, 4, 18, 19	low elev, disturbed areas: waste areas, roadsides, lawns, cult areas; wdsp N.Am; native to Eur
Fabaceae	*Trifolium fragiferum* L.	strawberry clover	3, 4	cult; waste areas, lawns, roadsides, oft in saline soil; OR, WA, ID, CA; native to Afr &/or Eur.
Fabaceae	*Trifolium glomeratum* L.		3	disturbed areas; native to Eur.
Fabaceae	*Trifolium hirtum* All.	rose clover	3	cult; disturbed areas, roadsides; native to Eurasia & n Afr.
Fabaceae	*Trifolium hybridum* L.	alsike clover	3, 4, 18	cult hybrid between *T. repens* & *T. pratense*; disturbed areas: roadsides & fields, occ in rather open grassy areas, low elev to subalpine; gen estab in w US; native to Eur.
Fabaceae	*Trifolium incarnatum* L.	crimson clover	3, 4	disturbed areas, wasteland; well estab in w OR & w WA, occ in CA &

				ID; native to s Eur.
Fabaceae	*Trifolium pratense* L.	red clover	3, 4, 18, 19	widely cult forage crop; fields, pastures waste areas, roadsides, low elev to subalpine; widely intro; native to Eur.
Fabaceae	*Trifolium repens* L.	white clover	3, 4, 18, 19	cult forage crop; thrives in most relatively moist habitats: fields, roadsides, waste areas, cult areas, mnt meadows; low elev to subalpine; most comm & wdsp clover in the PNW; native to Eur.
Fabaceae	*Trifolium subterraneum* L.	subterranean clover	3, 4	cult forage crop; meadows, roadsides, urban waste areas; toxic in excess: may sterilize livestock; estab in the PNW near CRG, Hood River Co, OR & adj WA, n to Puget Sound region & sw BC; native to s Eur & n Afr.
Fabaceae	*Vicia disperma* DC.	<vetch>	3, 4	disturbed areas; widely intro, to expected in the PNW; native to Eur.
Fabaceae	*Vicia hirsuta* (L.) S.F Gray	hairy vetch	3, 4, 18	disturbed areas, open or wooded slopes; fairly comm w OR & w WA; native to Eur.
Fabaceae	*Vicia lathyroides* L.	<vetch>	3	plants look like miniature *V. sativa* ssp. *nigra*; disturbed areas; well estab CA; native to Eur.
Fabaceae	*Vicia pannonica* Cratz	Hungarian vetch	3, 4	cult, esp in OR; disturbed areas; occ esc mostly w Cas, as in WV, OR & Pierce Co, WA; native to Eur.
Fabaceae	*Vicia sativa* ssp. *nigra* L/(L.) Erhart	narrow-leafed vetch, common vetch	3, 4, 18, 19, 22, 24	*V. sativa* oft not separated into ssp, & sometimes called *V. angustifoia*; ssp *nigra* sometimes called var *angustifolia*; long cult for fodder; disturbed areas, woodland borders, clearings; more comm & widely distributed than ssp *s.*; native to Eur.
Fabaceae	*Vicia sativa* ssp. *s.* L.	common vetch, spring vetch	3, 4, 18, 19, 22, 24	long cult for fodder; waste areas, pastures, fields, roadsides, slopes, meadows; w OR & w WA, ID in the PNW ; throughout N.Am; native to Eur.
Fabaceae	*Vicia tetrasperma* (L.) Schreber	<vetch>	3, 4	disturbed areas, woodlands or borders; native to Eur.
Fabaceae	*Vicia villosa* ssp. *varia* Roth/(Host) Corbiere	woolly or hairy vetch, winter vetch	2, 4, 18, 19, 24	not always broken into ssp; rotation crop; roadsides, fence rows, waste areas, croplands; w Cas in OR & WA, ID; native to Eur.
Gentianaceae	*Centaurium erythraea* Raf.	common or European centaury	3, 4, 18	also called *C. umbellatum*; roadsides, waste areas, fields, meadows, prairies, grasslands, clearings, gen where moist at low elev; nw WA to n CA, gen w Cas, e to ID; native to Eur.
Geraniaceae	*Erodium aethiopicum* (Lam.) Brumh.	filaree	4	reported to be estab in the PNW
Geraniaceae	*Erodium brachycarpum* (Godron) Thell.	<storksbill, filaree>	3	dry, open or disturbed areas; native to s Eur.

Geraniaceae	*Erodium moschatum* (L.) L'Her.	<storksbill, filaree>	3, 4	open, disturbed areas; reported to be estab in the PNW; native to Eur.
Geraniaceae	*Geranium columbinum* L.	long-stalked geranium	4	along the CRG, OR, & in Whatcom Co, WA in the PNW; occ in c & e US; native to Eur.
Geraniaceae	*Geranium dissectum* L.	cut-leafed geranium	1, 3, 4, 18, 19	open, disturbed areas; comm at low elev w Cas from sw BC to CA; native to Eur.
Geraniaceae	*Geranium lucidum* L.	shining crane's-bill	4	recorded from Yamhill Co, OR; native to Eur.
Geraniaceae	*Geranium molle* L.	dovefoot geranium	1, 3, 4, 18, 19	generalist, but esp comm in open, moist areas: lawns, fields, clearings, waste areas; mostly low elev but also found in grass balds on the OR coast range; mostly w Cas, sw BC to CA; native to Eur.
Geraniaceae	*Geranium pusillum* Burm. f.	<cranesbill, geranium>	3, 4	disturbed, moist, or waste areas; low elev; native to Eur.
Lamiaceae	*Glechoma hederacea* L.	ground ivy	3, 4, 18, 19, 22	garden orn; disturbed, oft moist shaded areas: open woods, thickets, clearings, lawns, waste areas; at low elev; occ in the PNW; widespread N.Am; native to Eurasia.
Lamiaceae	*Lamium amplexicaule* L.	henbit, common dead nettle	2, 3, 4, 18, 19, 22, 24	disturbed sites esp with rich soils & at low to mid elev: cult or abandoned fields, waste areas, gardens, etc; wdsp N.Am; native to Eurasia & n Afr.
Lamiaceae	*Lamium maculatum* L.	spotted dead-nettle or henbit	4	occ w Cas in the PNW
Lamiaceae	*Lamium purpureum* L.	purple or red dead nettle	2, 3, 4, 18, 19, 24	disturbed sites: cult fields, orchards, waste areas, gardens, meadows; low to mid elev; wdsp N.Am; native to Eur.
Lamiaceae	*Leonurus cardiaca* L.	Motherwort	4	casual in the PNW; native to Asia.
Lamiaceae	*Marrubium vulgare* L.	white horehound	2, 3, 4, 24	medicinal garden herb; roadsides, dry waste areas, gardens, gen overgrazed pastures; seeds spread in animal fur; casual in the PNW; world wide; native to Eur.
Lamiaceae	*Melissa officinalis* L.	bee balm	3, 4	cult; moist areas, meadows, fields, ditches, roadsides; occ in the PNW; native to s Eur.
Lamiaceae	*Mentha xpiperita* L.	peppermint	3, 4	cult hybrid between *M. aquatica* & *M. spicata*; moist places, fields; occ throughout the PNW; native to Eur.
Lamiaceae	*Mentha pulegium* L.	pennyroyal	3, 4	used for an insect repellent; disturbed moist areas, ditches; oil toxic, fatal when ingested; occ w Cas; native to Eur.
Lamiaceae	*Mentha spicata* var. *s.* L.	spearmint	3, 4	cult; there is also a var. *longifolia*; moist areas, banks of streams & ditches; throughout the PNW; native to Eur.
Lamiaceae	*Mentha suaveolens* Ehrh.	<mint>	3, 4	*M. roundifolia* used, but prob misapplied; moist areas, ditchbanks, roadsides, waste areas; mainly w Cas; native to s Eur.

Lamiaceae	*Moluccella laevis* L.	<shell flower>	3	disturbed areas, roadsides; native to s Eur.
Lamiaceae	*Nepeta cataria* L.	catnip	3, 4	cult; moist, gen shaded areas, esp in disturbed sites; wdsp US; native to Eurasia.
Lamiaceae	*Origanum vulgare* L.	oregano	3, 4	cult herb; shaded, disturbed areas, roadsides; ne US, CA, & occ w Cas; native to Medit Eur
Lamiaceae	*Prunella vulgaris* var. *v.* L.	heal-all, self-heal	3, 4, 18, 19, 22	var *lanceolata* native; old medicinal herb; disturbed sites in a wide ecological range, moist to dry, sunny to shady, low to mid elev; throughout N.Am; native to Eurasia.
Lamiaceae	*Salvia pratensis* L.	meadow sage or clary	4, 24	roadsides, disturbed areas; occ e Cas in the PNW.
Lamiaceae	*Salvia sclarea* L.	clary, clear-eye, see-bright	4	roadsides, disturbed areas; occ e Cas in the PNW.
Lamiaceae	*Thymus serphyllum* L.	thyme	3, 4	cult ground cover; occ in the PNW esp w Cas; native to Eurasia.
Liliaceae	*Allium vineale* L.	wild garlic	13	cult for food; pastures, lawns, orn beds, cult crops; taints livestock products (milk, eggs, poultry, meat); diff to control; reproduces by seed, underground bulb offsets, & aerial bulbuls; w Cas BC to nw OR.
Linaceae	*Linum bienne* Miller	<flax>	3, 4	also called *L. angustifolium*; roadsides, grasslands, woods; Lane Co, OR to coastal CA; native to Medit.
Linaceae	*Linum perenne* var. *perenne* L.	blue garden flax	4	var *lewissii* native; orn; prairies to alpine ridges, gen on dry, well-drained soil; native to Eurasia.
Linaceae	*Linum usitatissimum* L.	common flax	3, 4	cult for fiber & oil; disturbed areas; oft esc but not tending to persist in our area; native to Eur.
Lythraceae	*Lythrum hyssopifolium* L.		3, 4	marshes, drying pond margins; mainly coastal in our areas, WA to CA, e US; native to Eur.
Lythraceae	*Lythrum portula* Wallr.		3	drying ponds, lake margins; native to Eur.
Malvaceae	*Alcea rosea* L.	<hollyhock>	3	widely cult orn; disturbed gen urban places; perhaps native to Asia Minor.
Malvaceae	*Malva moschata* L.	musk mallow	4, 19	garden cult; roadsides, occ in meadows; not aggressive; occ w Cas in OR & WA; native to Eur.
Malvaceae	*Malva neglecta* Wallr.	common mallow, cheeses	2, 3, 4, 19, 22, 24	disturbed areas: gardens, lawns, cult areas, waste areas, roadsides; throughout N.Am; native to Eur.
Malvaceae	*Malva parviflora* L.	cheeseweed, little mallow	3, 4, 24	disturbed areas; wdsp, comm weed; native to Eurasia.
Malvaceae	*Malva sylvestris* L.	high mallow	3, 4	cult orn; disturbed areas; comm, wdsp weed in N.Am, mainly w Cas in the PNW; native to Eur.

Malvaceae	*Modiola carloiniana* (L.) Don		3	lawns, disturbed areas; widely naturalized; prob native to S.Am.
Onagraceae	*Epilobium leptophyllum* Raf.	<fireweed, willow herb>	3, 4	Also called E. palustre; wet soil; boggy meadows; CA, AK to the Cas of c WA, e to Atl, s in RM to CO; controversial: (4) considers it native to Eurasia while (4) considers it native to e N.Am.
Onagraceae	*Jussiaea uruguayensis* Camb.	primrose-willow	3, 4	also called *Ludwigia hexapetala*; swamps, lake margins, streams; along the CR near Portland; much of US; controversial: (3) considers it native & introduced into Eur while (4) considers it intro into much of the US.
Onagraceae	*Oenothera glazioviana* Micheli	<evening primrose>	3, 4	also called *O. erythrosepala*; comm garden hybrid poss derived in Eur from 2 N.Am spp; disturbed areas, occ BC to CA, w Cas.
Orobanchaceae	*Orobanche minor* J.E.Smith	clover broomrape	4, 22	parasitic sp, esp on clover; Federal noxious weed; w Cas, mid Atl; native to Eur or Medit.
Oxalidaceae	*Oxalis corniculata* L.	creeping woodsorrel	3, 4, 24	pernicious urban weed, lawns, gardens, waste areas; poss toxic in quantity to sheep; sw US; prob native to Old World.
Papaveraceae	*Fumaria officianalis* L.	fumitory	3, 4	disturbed areas; OR, WA, & MT; native to Eur.
Papaveraceae	*Fumaria parviflora* Lam.		3	disturbed areas; native to Eur.
Papaveraceae	*Papaver argemone* L.		2, 3, 4	cult; disturbed areas, waste areas, roadsides, fields; uncomm, occ PNW esp e Cas; native to Eurasia.
Papaveraceae	*Papaver rhoeas* L.	corn poppy	3, 4	cult; disturbed areas, waste areas, fallow fields; rare CA, PNW; native to Eurasia.
Papaveraceae	*Papaver somniferum* L.	opium poppy	3, 4	cult drug; disturbed areas, fallow fields; toxic, rarely persistent for more than 2 seasons; native to Eurasia.
Phytolaccaceae	*Phytolacca americana* L.	pokeweed, pokeberry, pigeonberry	3, 4, 22	medicinal & garden herb; disturbed areas, gardens, roadsides, waste areas; The Dalles, OR, CA; native to e US.
Plantaginaceae	*Plantago aristata* Michaux	<plantain>	3, 4	waste places; w Cas, CA; native to e US.
Plantaginaceae	*Plantago coronopus* L.	<plantain>	3, 4	coastal bluffs, salt marshes, trampled areas, chaparral, grassy flats; collected on coastal strand in Pacific Co, WA, CA; native to Eur.
Plantaginaceae	*Plantago indica* L.	<plantain>	3, 4	also called *P. psyllium*; oft used for bird seed & poultry feed; sandy waste places; occ w Cas; native to Old World.
Plantaginaceae	*Plantago lanceolata* L.	English plantain	1, 2, 3, 4, 18, 19, 22, 24	non-arid, gravelly soil at low elev: waste areas, lawns, roadsides, meadows, pastures, cult fields; comm PNW esp w Cas but not maritime; wdsp US; native to Eurasia.

Plantaginaceae	*Plantago major* L.	common plantain	2, 3, 4, 18, 19, 22, 24	*var. sachyphylla* native, uncomm; fertile, moist soils: disturbed areas, lawns, roadsides, waste areas, cult fields, valleys to mid montane; most comm plantain in PNW; wdsp US, PNW but not maritime in PNW; native to Eur.
Plantaginaceae	*Plantago pusilla* Nutt.	<plantain>	3, 4	sandy, non-saline soils; occ w Cas; native to e US.
Plantaginaceae	*Plantago virginica* L.	<plantain>	3	disturbed areas; native to c & e US.
Polygonaceae	*Polygonum arenastrum* Boreau	common knotweed, doorweed	2, 3, 4, 18, 19, 22, 24	also called *P. aviculare* which might be misapplied; variety of disturbed, open, dry or compacted areas: waste to cult areas; throughout PNW but rarely maritime; wdsp N.Am; native to Eur.
Polygonaceae	*Polygonum hydropiper* L.	marshpepper, smartweed, waterpepper	3, 4, 18, 22	moist to wet areas at low elev: low meadows, pastures, cult land, waste areas; wdsp N.Am; native to Eur.
Polygonaceae	*Polygonum lapathifolium* L.	Willow weed, curltop ladysthumb	3, 4, 18, 19, 24	wet areas: irrigated fields, gardens, bottomlands, shores, meadows, ditches, roadsides, swamps; low to mid elev; not comm PNW but moderately abundant in the CRG; N.Am; controversial: some consider it native while others consider it native to Eur.
Polygonaceae	*Polygonum persicaria* L.	lady's thumb	2, 3, 4, 18, 19, 22, 24	moist to wet urban areas: irrigated fields, waste areas, roadsides, ditches, shores; most wdsp & nuisance *Polygonium* sp, diff to eradicate; throughout N.Am except sw US; native to Eur.
Polygonaceae	*Polygonum ramosissimum* Michaux	<knotweed, smartweed>	3, 4	moist to dry soil, oft on disturbed waste areas; e WA & OR to CA, e through ID & MT to Can & the Atl; prob native to e N.Am.
Polygonaceae	*Rumex acetosa* L.	garden, kitchen, green, tall, or meadow sorrel	4	salad green; nc MT & prob elsewhere in the PNW; native to Eurasia.
Polygonaceae	*Rumex conglomeratus* Murray	clustered dock	3, 4, 18	moist places; scattered but locally comm w Cas, BC to CA; native to Eur.
Polygonaceae	*Rumex cuneifolius* Campd.	wedgeleaved dock	4	intro here & there, collected several times from Portland, OR.
Polygonaceae	*Rumex obtusifolius* L.	bitter or broad-leaved dock	3, 4, 11, 18, 19, 24	moist areas: pastures, meadows, fields, waste areas, roadsides, ditchbanks; comm w Cas, primarily in coastal counties; native to w Eur.
Polygonaceae	*Rumex pulcher* L.	fiddle dock	3, 4	moist to dry, disturbed areas, waste areas; in WV, OR in the PNW, comm in se & sw US; native to Medit.
Polygonaceae	*Rumex sanguineus* L.	red-veined dock	4	known in w OR & w WA; native to e US.
Portulacaceae	*Portulaca oleracea* L.	common puralane	2, 3, 4, 19, 22, 24	pot herb; moist, disturbed soils: cult areas, gardens, waste areas; hard to control; native to w Asia & Eur.
Primulaceae	*Anagallis arvensis* L.	poor-man's weatherglass,	3, 4, 18, 19	waste areas, lawns, fields, clearings, ocean beaches; toxic to livestock, humans; comm in much of US, but only occ in the PNW, w Cas from

		scarlet pimpernel		sw BC to CA.
Primulaceae	*Lysimachia nummularia* L.	moneywort, creeping Jenny	3, 4, 18	garden plant; moist meadows; w Cas, sw BC to WV, OR; much more comm in c & e US; native to Eur.
Ranunculaceae	*Nigella damascena* L.		4	occ esc from gardens.
Ranunculaceae	*Ranunculus acris* L.	meadow or tall buttercup	3, 4, 10, 18, 19, 22, 24	mainly moist areas at low elev: meadows, fields, pastures, waste areas, roadsides; poisonous to livestock but not a threat due to bad taste; throughout the PNW AK to CA, e to ID & MT; throughout N.Am; native to Eur.
Ranunculaceae	*Ranunculus arvensis* L.	field or corn buttercup, hungerweed.	2, 3, 4	waste areas, fields, ditch banks, & dry areas at low elev; sparingly distributed in the PNW, in e OR, e WA, & ID; native to Eur.
Ranunculaceae	*Ranunculus bulbosus* L.	bulbous buttercup	3, 4	meadows, roadside ditches; in WV, OR & near Bingen, WA; native to Eur.
Ranunculaceae	*Ranunculus ficaria* L.	lesser Celandine	4	also called *Ficaria ficaria*; sometimes cult; occ estab as in w WA; native to Eur.
Ranunculaceae	*Ranunculus muricatus* L.	spiny-fruit or roughseed buttercup.	3, 4, 10, 24	wet fields, ditches, vernal pools; toxic; mainly w Cas in the PNW, WA to CA; throughout US; native to Eur.
Ranunculaceae	*Ranunculus parviflorus* L.	little buttercup--?	3, 4, ?18	maybe ??? also called R. uncinatus var. parviflorus???; waste areas, wet fields; (?) comm w Cas & occ e Cas to RM; native to Eur.
Ranunculaceae	*Ranunculus repens* var. *pleniflorus* L./ Fernald	creeping buttercup	3, 4, 18, 19, 22, 24	cult orn; waste areas, ditches, wet fields; occ in OR, WA, & ID; throughout U.S.; native to Eur.
Ranunculaceae	*Ranunculus repens* L.	creeping buttercup	3, 4, 10, 18, 19, 22, 24	orn; moist, disturbed areas at low elev: fields, pastures, meadows, lawns, gardens, ditches, roadsides, clearings, temp pools; toxic; may become noxious esp in wet areas; toxic to livestock; most comm var; mostly w of the coast range, occ elsewhere; throughout n N.Am; native to Eur.
Ranunculaceae	*Ranunculus sardous* Crantz	hairy buttercup	3, 4	waste areas; in the PNW known only near Portland, OR; widely distributed in U.S.; native to Eur.
Ranunculaceae	*Ranunculus testiculatus* Crantz	hornseed buttercup	2, 3, 4, 10, 19, 24	waste areas, overgrazed pastures & rangeland, roadsides, cropland, sagebrush prairies, and other dry areas; toxic to livestock; livestock spreads seeds; e Cas OR & WA to NV, ID, & CO; native to Eurasia.
Resedaceae	*Reseda alba* L.	white mignonette	3, 4	cult orn, but in PNW mostly intro on ballast; ballast, waste ground, fields, roadsides; in PNW sparingly intro along coast; native to Medit.
Resedaceae	*Reseda lutea* L.	yellow mignonette	3, 4	cult orn; waste areas, creekbeds; native to Medit.

Resedaceae	*Reseda luteola* L.	dyer's rocket	3, 4	ballast, garden orn, former source of yellow dye; waste areas, fields, roadsides; native to Old World.
Resedaceae	*Reseda odorata* L.	garden mignonette	3, 4	cult orn; disturbed areas; sometimes esc in PNW & CA, but prob never truly estab; native to the Medit.
Rosaceae	*Duchesnea indica* L.	mock- or Indian strawberry	3, 4	cult orn, ground cover; disturbed urban areas; w Cas from BC to OR, CA; native to India.
Rosaceae	*Potentilla norvegica* L.	Norwegian or rough cinquefoil	3, 4, 22	also called *P. monspeliensis*; moist disturbed areas: waste area, fields, meadows, pastures, thickets; throughout PNW; throughout N.Am except for the extreme south; native to Eurasia.
Rosaceae	*Sanguisorba minor* ssp. *muricata* Scop./ Briq.	garden burnet	3, 4	sometimes no ssp; oft used in seeding mixtures after fires & in pastures; open, esp disturbed areas; only w Cas in the PNW, occ in other parts of w N.Am; native to Eur.
Rubiaciae	*Asperula odorata* L.	sweet woodruff, waldmeister	4	woods; occ intro w Cas; native to Eur.
Rubiaceae	*Galium mollugo* L.	hedge or smooth bedstraw	3, 4, 22	disturbed areas on gravelly or sandy loam soils: meadows, pastures, lawns, roadsides, waste areas; occ w Cas, s OR to central CA; comm north Atlantic states; native to Eur.
Rubiaceae	*Galium parisiense* L.	wall bedstraw	3, 4	warm, dry, gen rocky soil; occ w Cas; native to Medit.
Rubiaceae	*Galium verum* L.	ladies' bedstraw, yellow bedstraw	3, 4	lawns; occ intro w Cas; native to Eurasia.
Rubiaceae	*Sherardia arvensis* L.	field madder	1, 3, 4, 18	fields, pastures, lawns, waste areas at low elev; scattered but locally frequent w Cas, s BC to CA; native to Medit.
Saururaceae	*Anemopsis californica* Hook.	yerba mansa	3, 4	cult medicinal or orn groundcover; marshy saline or alkaline areas, seeps or springs; intro & well estab at Hermistion, Umatilla Co, OR; native TX to CA.
Scrophulariaceae	*Antirrhinum majus* L.	comm. snapdragon, lion's-mouth.	3, 4	cult orn; open, disturbed areas; native to Medit.
Scrophulariaceae	*Antirrhinum orontium* L.	weasel's snout, calf's snout, lesser snapdragon	3, 4, 24	cult; open, disturbed areas; coastal regions of OR, WA & CA; native to the Medit.

Scrophulariaceae	*Chaenorrhinum minus* (L.) Lange	dwarf snapdragon	8	intro as seed contaminate in ship ballast to the e coast; newly disturbed ground esp in gravelly or sandy fill material: railroads, highway rights-of-way, roadsides, sometimes in winter wheat fields & gardens; reproduces by seed which can be carried long distances by the broken off parent plant hitching rides on passing vehicles & trains; it has spread at a rate of 10 miles per growing season in e N.Am; union Co, OR; Spokane & Whitman Cos, WA; Boundary, Nez Perce, & Idaho Cos, ID; Burnaby. Agassiz, Elko, Fernie, Wasa, & n end of Yellowhead Lake in BC; at least 30 states & 9 provinces in N.Am starting in NJ & working westward; native to s Eur.
Scrophulariaceae	*Cymbalaria muralis* Gaertner, Meyer, & Scherb.	Kenilworth ivy	3, 4	cult orn; rock walls, shady, disturbed areas; w Cas; native to Medit.
Scrophulariaceae	*Euphrasia officinalis* L.	hairy or Eastern eyebright	4, 18	also called *E. nemorosa*, *E. americana*, & *E. canadensis*; disturbed habitats at low elev: fields, roadsides, waste areas; occ w Cas, sw BC & WA; native to Eur.
Scrophulariaceae	*Kickxia elatine* (L.) Dumort	sharp-leafed fluellin	3, 4, 24	moist, sandy, disturbed, open areas, becoming a problem in cult land; w Cas in the PNW; native to Eur.
Scrophulariaceae	*Linaria canadensis* var. *c.* (L.) Dumont	blue or wild toadflax	3, 4, 18	var *texana* native; hort; moist, sandy, open areas; occ intro w Cas.
Scrophulariaceae	*Mazus japonicus* (Thunb.) Kuntze.	Japanese mazus	4	lawns, wet bottom-lands; w Cas; native to e Asia.
Scrophulariaceae	*Veronica arvensis* L.	corn speedwell	3, 4, 22	meadows, fields, rocky & sterile pastures, lawns, gardens, woodland, open waste areas; West Coast, e US; native to Eurasia.
Scrophulariaceae	*Veronica biloba* L.	bilobed speedwell	4, 24	also called *V. campylopoda*; arid & semi-arid areas: fields, foothills, waste areas, & disturbed areas; able to thrive in areas of limited precipitation; throughout the arid & semi-arid west; native to Asia.
Scrophulariaceae	*Veronica catenata* Pennell	chain speedwell	3, 4	wet meadows, slow streams; native to Eur.
Scrophulariaceae	*Veronica chamaedrys* L.	<speedwell, brooklime>	3, 4	lawns; occ intro, mainly w Cas; native to Eur.
Scrophulariaceae	*Veronica filiformis* Sm.	slender or creeping speedwell	3, 4, 17, 18	lawns; settled areas s PNW, w Cas; wdsp ne US; native to Eur or Asia.
Scrophulariaceae	*Veronica longifolia* L.	long-leafed speedwell	4	also called *V. maritima*, *V. spicata* sometimes misapplied; occ w Cas in the PNW; native to Eur.
Scrophulariaceae	*Veronica officinalis* L.	common speedwell, Paul's betony	4, 22	mostly on gravelly or stony acid soils: pastures, old fields, open woodland; w Cas in PNW, n & c e US; native to Eur.

Scrophulariaceae	*Veronica persica* Poiret	Persian speedwell	3, 4, 17, 24	prob cult orn; lawns, fields; problem in some wheat fields in w OR & WA; wdsp US; native to Asia Minor.
Scrophulariaceae	*Veronica serpyllifolia* var. *s.* L.	thyme-leafed speedwell	3, 4, 18	var. *humifusa* native; moist meadows, streambanks, clearings, oft on disturbed sites; low to sometimes high elev; occ w Cas; native to Eur.
Scrophulariaceae	*Veronica triphyllos* L.	<speedwell, brooklime>	3	gravelly flats; uncomm; native to Eur.
Solanaceae	*Atropa belladonna* L.	dwale, deadly nightshade, belladonna	4	cult for atropine; w Cas; native to Eur.
Solanaceae	*Datura stramonium* L.	jimson weed	3, 4, 22, 24	2 vars: *stramonium* & var. *tatula*; cult narcotic; sandy, rich soils in open, oft disturbed areas: cult fields, waste areas, vacant lots, dry rangeland; toxic; s & c US and up both coasts; controversial: conflicting reports as to plant's origin, poss native to Mexico.
Solanaceae	*Hydroscyamus niger* L.	black henbone, hog's bean	4	narcotic; roadsides, waste areas; toxic; casual throughout US; native to Eur.
Solanaceae	*Nicotiana acuminata* var. *multiflora* Hook./(Philippi)Reiche	<tobacco>	3, 4	sometimes no vars; cult narcotic; open, sandy or gravelly areas like stream banks; intro in CA, but rare in the PNW; native to S.Am.
Solanaceae	*Physalis pubescens* var. *grisea* L./Waterf.	<ground-cherry>	3, 4	oft cult; cult fields, waste areas; w Cas; native to c & e US.
Solanaceae	*Solanum carloinense* L.	Carolina horse-nettle	3, 4, 22, 24	sandy, disturbed areas: fields, roadsides, gardens, waste areas; noxious weed; w US, occ in PNW; native to c & e US, n Mex.
Solanaceae	*Solanum elaeagnifolium* Cav.	silverleaf night shade, white horse-nettle	3, 4, 24	dry, disturbed areas: rangeland, pastures, fields, waste areas; poisonous, noxious weed; occ in the PNW, comm in CA; native to c US & n Mex.
Solanaceae	*Solanum furcatum* Dunal	<nightshade>	3	open, oft disturbed places; native to S.Am.
Solanaceae	*Solanum nigrum* L.	black nightshade	2, 3, 4, 18, 22, 24	disturbed areas: cult fields, roadsides, waste areas; contaminates crops like peas, toxic; occ PNW as at Portland, OR; c & e N.Am; native to Eur.
Solanaceae	*Solanum sisymbriifolium* Lam.	<nightshade>	3, 4	disturbed areas, roadsides; occ PNW; native to S.Am.
Urticaceae	*Urtica urens* L.	dwarf or dog nettle	3, 4, 18	disturbed areas at low elev; gardens, orchards, waste areas; occ OR & WA; native to Eur.
Valerianaceae	*Valeriana officinalis* L.	garden heliotrope or valerian; all-heal	4	cult; occ PNW; native to Eur.
Valerianaceae	*Valerianella carinata* Loisel.	keeled corn-salad	3, 4	cult food; moist, open, oft disturbed areas; occ PNW; native to Eur.
Valerianaceae	*Valerianella locusta* (L.) Betcke	European corn salad	3, 4	cult food; moist, gen shaded; oft disturbed areas; occ PNW; native to

				Eur.
Verbenaceae	*Verbena bonariensis* L.		3	disturbed, oft wet areas: fields, roadsides; native to S.Am.
Violaceae	*Viola arvensis* Murray	wild pansy, cult pansy	3, 4	widely cult; lawns, gardens, waste areas; prob not persistent in the PNW, wdsp N.Am; native to Eur.
Violaceae	*Viola odorata* L.	English violet	3	cult orn; gen disturbed areas; uncommonly naturalized; native to Eurasia.
Iridaceae	*Crocosmia xcrocosmiiflora* (Lemoine) N.E. Br.		3	cult French cross between two s Afr spp, *C.pottsii* X *C. aurea*; gen in disturbed coastal, urban areas, as roadsides, oft from garden waste; comm in CA.
Liliaceae	*Allium nigrum* L.	black or Homer's garlic	4	occ esc in the PNW; mainly in WV, OR.
Liliaceae	*Allium triquetrum* L.	<onion, garlic>	3	cult orn; shady, more or less disturbed areas; locally comm in CA; native to w Medit.
Liliaceae	*Allium vineale* L.	crow or field garlic	3, 4, 22, 24	intro food flavoring by early settlers; poorly drained areas along rivers & streams, hillsides, fields, pastures, lawns, roadsides, disturbed areas; noxious weed that is drought & cold hardy and tolerant to wet soils with a preference to heavy soils, diff to eradicate; w Cas WA to n CA, WY, e US; native to Eur.
Liliaceae	*Asparagus officinalis* ssp. *o.* L.	asparagus	3, 4	sometimes no ssp; extensively cult vegetable; disturbed areas: fence rows, orchards, fields, roadsides, river banks; comm esc PNW; native to Eur.
Liliaceae	*Muscari botryoides* (L.) Miller	<grape hyacinth>	3	cult orn; disturbed urban areas; native to s Eur.
Orchidaceae	*Epipactis helleborine* (L.) Crantz	<helleborine>	3, 4	gen dry slopes, road-cuts; occ esc PNW, VI & in Lewis & Clark Co, MT; native to Eur.

Grasses & Grass-like Species

Family	Species	Common Name		Comments
Cyperaceae	*Scirpus setaceus* L.	bristle-leafed sedge	1, 3	wet areas: streambanks, pond margins; typical sp of exposed seaward slopes of the s OR coast; native to Eurasia, Afr, & Aus.
Poaceae	*Agropyron desertorum* (Fischer) Schultes	desert crested wheatgrass	3, 4	also called *A. pectiniforme*; intro for forage, erosion control; disturbed areas, roadsides; native to e Eur.
Poaceae	*Agropyron triticeum* Gaertn.	wheatgrass	4	sparingly intro drier regions of w N.Am: OR, WA, ID, MT; native to Eurasia.

Poaceae	*Agrostis gigantea* Roth	redtop	3, 4, 18, 19	sometimes called *A. alba* (? var. *alba*); cult for lawns, forage; gen important elements in permanent pastures, meadows & lawns; disturbed areas, roadsides, relatively dry fields, ditches, waste areas; low elev to lower mnts; comm throughout PNW; temp, moist N.Am; prob native to Eur.
Poaceae	*Aira caryophyllea* L.	silver European hairgrass	1, 3, 4, 18	dry, sandy, gravelly or rocky sites, open or disturbed: bluffs, beaches, grassy meadows, talus slopes, & occ rock garden weed; low to occ mid high elev; comm w Cas, sw BC to CA, e US; native to Eur.
Poaceae	*Aira elegantissima* Schur	elegant European hairgrass	3, 4	also called *A. elegans*; dry, open, mostly disturbed or overgrazed areas, sandy to clay soils; sparingly intro w Cas, WA to CA; along the coast from TX to MD; native to s Eur.
Poaceae	*Aira praecox* L.	early or little hairgrass	1, 3, 4, 18	dry, sandy, gravelly or rocky sites near the ocean: bluffs, beaches, dunes, rock knolls, grassy meadows, prairies; low to occ mid high elev; coast s VI to CA, e US; native to s Eur.
Poaceae	*Alopecurus pratensis* L.	meadow foxtail	3, 4, 18	cult for forage; open, wet meadows & fields, roadsides, swampy areas; scattered but locally comm in the PNW, N.Am; native to Eurasia.
Poaceae	*Ammophila breviligulata* Fern.	American beachgrass	3, 20	sand dunes; coasts of OR & WA; native to coastal e US.
Poaceae	*Anthoxanthum aristatum* Boiss.	annual vernal grass	3, 4, 18	also called *A. puellii*; typically in dry, disturbed areas: fields, waste areas; VI to CA, both sides of Cas; native to Eur.
Poaceae	*Apera spica-venti* (L.) Beauv.	silky apera	3, 4	also called *Agrostis s.*; genus cult for revegetation; disturbed, open areas; near Portland, OR in the PNW; scattered e US; native to temp Eur.
Poaceae	*Avena barbata* Link	slender wild oat	3, 4, 6, 24	disturbed sites; occ in w OR, & Klicktat Co, WA; comm in sw US; native to s Eur.
Poaceae	*Avena fatua* L.	wild oat	1, 2, 3, 4, 6, 18, 19, 22, 24	sometimes cult for hay; disturbed areas: cult fields, waste areas, roadsides, pastures; comm PNW, throughout much of N.Am; native to Eur.
Poaceae	*Brachypodium distachyon* (L.) Beauv.	<false-brome>	3, 4	disturbed areas, dry slopes; known only near Portland, OR in the PNW, occ in N.Am esp near the coast; native to s Eur.
Poaceae	*Briza maxima* L.	<quaking grass>	3	cult orn; shaded areas; native to s Eur.
Poaceae	*Briza minor* L.	little quaking grass	1, 3, 4	**???shaded & open???;** prob cult orn; shaded or moist, open areas, grasslands; well estab in sw OR & CA, occ in nw OR & ID, near Nanaims, VI; dry areas of e N.Am; native to s & e Eur.
Poaceae	*Bromus arenarius* Libill.	Australian brome	3, 4	open, disturbed areas; poss estab in OR, only collected near Portland, OR; wdsp sw US; native to Aus.

Poaceae	*Bromus catharticus* Vahl	rescue grass	3, 24	cult winter forage; open, gen disturbed areas, fields; native to S.Am.
Poaceae	*Bromus commutatus* Schrad.	meadow or hairy brome, hairy cheat	1, 3, 4, 22	indistinct from *B. japonicus*; dry roadsides, waste areas, pastures, grasslands; mostly e Cas but also in WV grasslands & OR coast grass balds; widely distributed US; native to Eur.
Poaceae	*Bromus diandrus* Roth	ripgut grass	3, 4, 24	also called *B. rigidus*; open, gen disturbed areas: fields, roadsides, railroads, waste areas, rangeland where invasive; injurious to grazing animals; mostly w Cas BC to Mex, scattered populations e to ID & RMS; native to Eur.
Poaceae	*Bromus hordeaceus* L.	soft brome or cheat/chess	1, 3, 4, 18	also called *B. mollis* which may be misapplied; open, oft disturbed areas at low elev: fields, roadsides, clearings, rocky slopes, dry open forests, grasslands; comm throughout the PNW from AK to Baja, CA; prob the most comm & wdsp intro ann Brome on the NW coast; native to Eur.
Poaceae	*Bromus madritensis* ssp. *m.* L.	foxtail chess	3, 4	sometimes no ssp; open, gen disturbed areas; collected on ballast near Portland, OR in the PNW; occ in sw US; native to Eur.
Poaceae	*Bromus madritensis* ssp. *rubens* L./(L.) Husnot	foxtail chess	3, 4	also called *B. rubens*; open, gen disturbed areas; now comm esp on overgrazed land e Cas, occ collected w Cas, as at Portland, OR; native to Eur.
Poaceae	*Bromus secalinus* L.	ryebrome, chess, cheat	2, 3, 4, 22, 24	occ cult for hay; open, disturbed areas; grainfields, dry meadows, roadsides, waste areas; occ in the PNW & CA; wdsp US; native to Eur.
Poaceae	*Bromus trinii* Desv.	Chilean chess	3, 4	open, sandy or gravelly areas; well estab in sw US n to e OR, poss farther; prob native to w S.Am.
Poaceae	*Cenchrus incertus* M.Curtis	coast or field sandbur, burgrass	3, 22, 24	disturbed areas, mostly on sandy soils: fields, waste areas, roadsides, garden crops, lawns; noxious weed; native to s US, Mex, C. & S.Am
Poaceae	*Coleanthus subtilis* (Tratt.) Seidel.	moss-grass	4	sand bars & river islands; CR & near Portland, OR; native to Eur.
Poaceae	*Cortaderia jubata* (Lemoine) Stapf		3	disturbed areas, many habitats esp coastal; invasive; native to montane w S.Am.
Poaceae	*Cortaderia selloana* (Schultes) Asch. & Graebner	Pampas grass	3	cult orn; disturbed areas; native to e S.Am.
Poaceae	*Crypsis alopecuroides* (Piller & Mitterp.) Schrader	<pickle grass>	3	bottom-lands, reservoir & river margins; native to Eur.

Poaceae	*Cynodon dactylon* (L.) Pers.	bermuda grass	3, 4, 22, 24	cult for lawns & forage; disturbed open areas: pastures, lawns, railroad tracks, dockyards, most cult areas; toxic, hay fever allergenic; in & around Portland, OR in the PNW; wdsp s 2/3 of the US; moving into the colder regions along the coasts; native to Afr.
Poaceae	*Cynosurus cristatus* L.	crested dogtail	3, 4, 18	occ cult for forage; disturbed areas: fields, clearings; occ w Cas WA to CA, ID; intro many places in N.Am; native to Eur.
Poaceae	*Cynosurus echinatus* L.	hedgehog dogtail	1, 3, 4, 18	open, sometimes disturbed sites, usually at low elev but can occur in grass balds in the OR coast range: clearings, roadsides, meadows, dry forest edges (oak, douglas fir, madrone); well estab w Cas, sw BC to WV, OR; many parts of the US.
Poaceae	*Desmazeria rigida* (L.) Tutin		3, 4	also called *Scleropoa r.*; open, oft sandy areas; only in OR in the PNW: Baker Co, near Portland, Salem; wdsp US; native to s & w Eur.
Poaceae	*Digitaria ischaemum* (Schreber) Muhlenb.	smooth crabgrass	3, 4, 18, 19, 22, 24	disturbed areas, gen where moist: fields, lawns, roadsides, waste areas; noxious weed; wdsp N.Am; native to Eur.
Poaceae	*Digitaria sanguinalis* (L.) Scop.	hairy or large crabgrass	2, 3, 4, 18, 19, 22, 24	disturbed areas near settlements at low elev: cult fields, lawns, gardens, roadsides, railroad tracks, waste areas; wdsp N.Am; native to Eur.
Poaceae	*Echinochloa colonum* (L.) Link	junglerice, watergrass, small barnyard-grass	3, 4, 24	also called *E. colonum*; wet areas, cult fields, waste areas; known in PNW only near Portland, OR where not persistent; throughout sw US; native to Eurasia.
Poaceae	*Echinochloa crus-galli* (L.) P. Beauv.	Japanese millet, large barnyard-grass, watergrass.	2, 3, 4, 6, 18, 19, 22, 24	previous cult for forage & bird seed; comm at low elev near settlements in moist, disturbed areas: cult areas, fields, ditches, clearings, barnyards, roadsides, waste areas; wdsp US, tropics; native to Eur poss Asia & Afr.
Poaceae	*Eleusine indica* (L.) Gaertner	goose grass	3, 4, 22, 24	disturbed areas: roadsides, lawns, fields, open ground, gardens, waste areas; w Cas, WA to OR, CA, wdsp US, tropics; native to the Old World.
Poaceae	*Elymus canadensis* L.	Canadian wildrye	3, 4	comm, streambanks & sandy, dry to moist meadows & mnt canyons, disturbed areas; e Cas BC to n CA, e throughout N.Am; native to c & e US.
Poaceae	*Eragrostis cilianensis* (All.) Janchen	stinkgrass	3, 4, 24	waste, disturbed, or cult areas, & along streambanks, pond, or lake margins; c WA to Mex, WI & Argentina; throughout US; native to Old World.
Poaceae	*Eragrostis mexicana* var. *virescens* (Hornem.)Link/(J.S...	Orcutt's lovegrass	3, 4	also called *E. orcuttiana*; disturbed soils, fields, pastures, sandy river banks, ditch banks, stream & pond margins, waste areas; occ in PNW: near Portland, OR, Yakima Valley, WA, Canyon Co, ID; comm sw US;

				native in CA.
Poaceae	*Festuca bromolides* L.	barren or six-weeks fescue	1, 4, 18	also called *F. dertonensis* & *Vulpia b.*; ocean beaches & salt marshes, to sagebrush deserts; low to mid elev; s BC to s CA & AZ, occ farther; intro from Eur.
Poaceae	*Festuca ovina* var. *capillata* (Lam.) Alef.	sheep fescue	1, 4, 18	two native vars, sometimes not broken into vars; lawn grass; dry outcrops & rocky slopes, forest edges; OR, w WA, e US.
Poaceae	*Festuca ovina* var. *ovina* L.	sheep fescue	1, 4, 18	two native vars, sometimes not broken into vars; occ lawn grass; not seen in the PNW; native to Eurasia.
Poaceae	*Festuca trachyphylla* (Hackel) Kraj.	hard or sheep fescue	3	used for erosion control esp on ski slopes; open areas, slopes; native to Eur.
Poaceae	*Gastridium ventricosum* (Gouan) Schinz & Thell.	nit grass	1, 3, 4	open, gen dry, disturbed areas; WV grasslands; native to Eur.
Poaceae	*Heleochloa alopecuroides* (Pill. & Mitterp.) Host.	<heleochloa>	4	intro on ballast; sand dunes & arid banks of the CR; OR & WA; native to Eur.
Poaceae	*Hordeum marinum* ssp. *gussoneanum* Hudson/(Parl.)Thell.	Mediterranean barley	3, 4	also called *H. geniculatum*; dry to moist, waste areas & disturbed areas; sharp spikelets injure animals; comm s BC, both sides of Cas, to s CA; less comm e to ID, UT, AZ; Native to Eur.
Poaceae	*Hordeum murinum* ssp. *glaucum* L./(Steudel) Tzvelev	seagreen barley	3, 4	also called *H. g.*; moist, gen disturbed areas; uncomm PNW c WA & OR to ID; comm rest of w US; native to Eur.
Poaceae	*Hordeum murinum* ssp. *leporinum* L./ (Link) Arcang.	charming or wild or hare barley	2, 3, 4, 24	also called *H. l.*; moist, gen disturbed areas: fields, roadsides, waste areas; awns injure animals; comm throughout PNW except in mnts, comm in most of w States; native to Eur.
Poaceae	*Hordeum murinum* ssp. *m.* L.	mouse or wall barley, foxtail	3, 4	also called *H. m.*; moist, gen disturbed areas; fairly comm s BC & w WA, CA; native to Eur.
Poaceae	*Koeleria phleoides* (Villars) Pers.		3, 4	open, disturbed areas; in the PNW rare near Portland, OR where apparently not persistent, CA; native to the Medit.
Poaceae	*Lagurus ovatus* L.	<hare's tail>	3	cult orn; disturbed areas; native to s Eur.
Poaceae	*Leptochloa fascicularis* (Lam.) Gray.	bearded or loose-field sprangletop, clustered salt-grass	4, 24	wet areas at edges of fields, irrigation & drainage canals, irrigated crops, coastal in brackish water; occ OR, WA, & ID, mostly along SR & CR; more comm in the sw; native along the Atl.
Poaceae	*Lolium temulentum* L.	darnel, annual ryegrass	3, 4	contaminates flour & bird seed; open, disturbed areas, mainly in waste areas; toxic; wdsp N.Am; native to Medit.

Poaceae	*Molinia caerulea* (L.) Moench.	purple moorgrass	4	marshes near Newport, Lincoln Co, OR; occ ne N.Am; native to Eurasia.
Poaceae	*Panicum dichotomiflorum* Michaus	western witchgrass	3, 4, 22, 24	moist ground & along streams, cropland, waste areas; Malheur & Jackson Cos, OR & Indian Valley, Adam Co, ID in the PNW, CA; native to c & e N.Am.
Poaceae	*Parapholis incurva* (L.) C.E. Hubb.	sickle grass	3, 4	disturbed, well drained soils for salt marshes, gen above highest tide level; rare in PNW but at Gold Beach, OR, & poss Portland, OR, e.e. along coast; native to Eur.
Poaceae	*Paspalum dilatatum* Poiret	Dallis grass	3, 22, 24	pasture grass; moist lowland: meadows, prairies, pastures, ditches, roadsides, occ on ballast; w Cas s WA to s OR; s US; native to S.Am.
Poaceae	*Phalaris aquatica* L.	Harding grass	3, 4	cult, wet areas, ditches, fields, waste areas; OR, CA, & occ elsewhere in US; native to Medit & Eur.
Poaceae	*Phalaris brachystachys* Link	shortspike canarygrass	3, 4	wet disturbed areas, ballast; collected once or twice on ballast near Portland, OR; CA; native to Eur.
Poaceae	*Phalaris canariensis* L.	canary grass	3, 4	used in bird seed; disturbed areas; throughout the PNW but uncomm; CA; native to Medit, Eur.
Poaceae	*Phalaris minor* Retz.	littleseed or small canarygrass	3, 4, 24	disturbed areas; collected once or twice on ballast near Portland, OR; winter crops in CA & AZ; native to Medit.
Poaceae	*Phalaris paradoxa* L.	paradox canarygrass	3, 4	disturbed areas, waste areas; occ in OR & WA, s to CA & AZ; native to Medit, Eur.
Poaceae	*Poa annua* L.	annual bluegrass	2, 3, 4, 18, 24	contaminate of lawn grass seed; comm in disturbed, open areas at low elev: lawns, gardens, fields, crops, roadsides, waste areas, open woods; gen throughout the PNW, but most comm w Cas; wdsp west US; native to Eur.
Poaceae	*Poa bulbosa* L.	bulbous bluegrass	2, 3, 4, 14, 18, 19, 24	early 1900's produced commercially in s OR, by 1919 it had spread over much of s OR; disturbed, rather dry, gravelly areas at low elev: waste areas, deteriorated rangeland, roadsides, pastures, grain fields, grasslands; comm throughout the PNW except montane habitats, but mostly e Cas; wdsp N.Am; native to Eur.
Poaceae	*Poa nemoralis* L.	wood bluegrass	3, 4	disturbed moist areas in meadows, forest & along stream banks; coastal to mid-montane; rare OR, WA, more comm CA, BC, & ne N.Am; native to Eur.
Poaceae	*Poa palustris* L.	fowl bluegrass	3, 4, 18	disturbed areas at low to mid elev: wetlands, meadows, streamside sloughs & levees, wet ditches & clearings, moist forest, sagebrush scrub; wdsp AK & Can to n CA, NM, MO & VA; native to Eur.

Poaceae	*Poa pratensis* ssp. *angustifolia* L./(L.) Arcang.	Kentucky bluegrass	3, 18, 19	lawn & pasture grass; low to mid elev near settlements: meadows, pastures, clearings, roadsides, thickets & open forests, cult areas, waste areas; prob native to Eurasia.
Poaceae	*Poa trivialis* L.	rough bluegrass	3,4	disturbed, moist areas at low elev; native to Eur.
Poaceae	*Polypogon monspeliensis* (L.) Desf.	rabbitfoot polypogon, annual beard grass	3, 4, 18, 24	dry to moist waste areas, vernal pools esp with brackish water, along streams, ditches, pastures, lawns, roadsides; BC to Baja CA, e to all RMS; wdsp US; native to Eur.
Poaceae	*Sclerochloa dura* (L.) Beauv.	hardgrass	3, 4, 24	disturbed, waste areas; serious lawn & turf weed in many parts of the US; e OR, e WA, & sw ID in the PNW; native to Eur.
Poaceae	*Scolochloa festucacea* (Willd.) Link.	fescue scolochloa	4	gen in standing water: marshes, lake & stream edges; se OR & Flathead Co, MT in the PNW; wdsp n N.Am; native to Eurasia.
Poaceae	*Setaria pumila* (Poiret) Roemer & Schultes	yellow bristlegrass or foxtail	2, 3, 4, 18, 22	also called *S. lutescens* & *S. glauca*; gen moist areas: cult areas, fields, roadsides, waste areas; occ PNW on both sides of the Cas; wdsp N.Am; native to Eur.
Poaceae	*Setaria viridis* (L.) P. Beauv.	green bristlegrass or foxtail	2, 3, 4, 18, 19, 22, 24	crop seed contaminant; comm at low elev near settlements: waste areas, cult fields, roadsides; one of the most serious & wdsp grass weeds of cult & waste areas in the US; comm N.Am; native to temperate Eurasia.
Poaceae	*Sieglingia decumbens* (L.) Bernh.	heathgrass	4	somewhat marshy flats near Newport, OR, open woods near Long Beach, WA; rare in most of N.Am; native to Eur, poss native to e Can.
Poaceae	*Ventenata dubia* (Leers) Durieu.	Ventenata	2, 3, 4, 24	disturbed areas, rangeland, grain crops; near Spokane & Yakima & along n side of CR in Klickitat Co in WA & spreading, also in Kootenai Co, ID; native to Eur.

Aquatic

Family	Species	Common Name		Comments
Asteraceae	*Bidens beckii* Torr.	water marigold	4	Ponds & slow streams; OR, WA & s BC; Native to e Am.
Callitrichaceae	*Callitriche stagnalis* Scop.	<water-starwort>	3, 4	water edges: streams, pond or ditches; scattered but spreading in the NW: OR, WA, BC; more comm e US.
Haloragaceae	*Myriophyllum aquaticum* (Vell. Conc.) Verdc.	parrot's feather	3, 4	also called *M. brasiliense*; cult; ponds, ditches, streams, lakes; WV, OR & ID in the PNW; widely intro; native to S.Am.
Haloragaceae	*Myriophyllum elatinoides* Gaud.	waterwort water-milfoil	4	n of Bend, OR along the Deschutes River; native to S.Am & Aus.

Lentibulariaceae	*Utricularia gibba* L.	<bladderwort>	3, 4	occ cult; standing or slow moving, shallow water or mud; may be invasive; comm e & s of the PNW, but now found in Benton Co, OR; prob not native to CA (? PNW?)
Nymphaeaceae	*Nymphaea odorata* Aiton	fragrant or white waterlily	3, 4, 18, 22, 23	cult orn; low elev quiet water, sheltered ponds & lake edges, dead waters, bogs; noxious weed in waterways; comm PNW on both sides of Cas; native to e N.Am.
Scrophulariaceae	*Veronica anagallis-aquatica* L.	water speedwell	3, 4	wet meadows, streambanks, slow streams; wdsp N. & S.Am; native to Eur.
Alismataceae	*Alisma lanceolatum* With.	<water plantain>	3, 4	ponds, ditches, slow streams; Eugene, OR in the PNW; rare in N.Am except in CA; native to Eurasia & n Afr.
Araceae	*Acorus calamus* L.	sweet flag	3, 4	occ cult for oil, medical use; moist ground, ponds, marshes; uncomm, CA, flathead Lake, MT; native to Eurasia & poss native to e N.Am.
Araceae	*Peltandra virginica* (L.) Schott & Endl.	green arrow arum, trckahoe	3	ponds, reservoirs; uncomm CA; native to e N.Am.
Hydrocharitaceae	*Vallisneria americana* Michx.	eelgrass, American wild celery	4, 6	ponds, lakes & quiet streams; intro in Dry Falls Coulee, Grant Co & in several lakes w Cas in WA & prob in OR; native Quebec to TX & FL.
Cyperaceae	*Scirpus tuberosus* Desf.	seacoast bulrush	3, 4	poss also called *S. maritimus* var *paludosus*; cult water fowl food; wet areas esp where alkaline or saline: marshes, ditches, wet meadows, margins of ponds; throughout PNW esp along seacoasts, wdsp N.Hemisphere but irregularly distributed; native to Eur.
Potamogetonaceae	*Potamogeton crispus* L.	crispate-leaved or curly-leaf pondweed	3, 4, 6, 22	waterfowl food; shallow water, ponds, reservoirs, streams; w & ne OR, w & e WA & adj ID in the PNW; c & s CA along the coast, & ne N.Am.

References
1-Franklin and Dyrness 1988
2-Gaines and Swan 1972
3-Hickman 1996
4-Hitchcock and Cronquist 1973
5-Jensen et al. 1995
6-McKnight 1993
7-Petrides 1993
8-PNWEP 1991 Nov a
9- PNWEP 1991 Nov b
10- PNWEP 1992 Jan b
11- PNWEP 1992 Jan c
12- PNWEP 1992 June k
13-PNWEP 1993 Mar f
14- PNWEP 1994 July b
15- PNWEP 1994 July c
16- PNWEP 1995 Feb a
17- PNWEP 1995 Feb b
18-Pojar and MacKinnon 1994
19-Taylor 1990
20-TNC 1991 Feb
21-UICA 1990 Mar
22-USDA 1971
23-Weinmann et al. 1984
24-Whitson 1996

Appendix C

Invasive Plants in Neighboring States as of 1997

Disclaimer: Parts of the comments in this list are taken directly from the references. To make the section easier to read, quotation marks were omitted.

Trees

Family	Species	Common Name	References	Comments
Moraceae	*Morus alba*	white mulberry	8, 9, 10, 3, 1, 5, 4, 6, 32, 12	widely cult for fruit, orn, windbreak; disturbed moist areas: stream & river banks, near farms, along fence rows, waste areas, forest edges, shrub communities; seeds spread by birds & bears; SRC of se WA & adj ID; CA; wdsp N.Am; native to e Asia.
Rosaceae	*Prunus mahaleb*	mahaleb cherry	8, 9, 4	cult stock plant; near settlements: roadsides, fence rows, abandoned home sites; occ in e WA & w ID, se Can, ne US; native to Eur, w Asia.
Ulmaceae	*Ulmus pumila*	Siberian elm	8, 9, 13, 16, 4	cult orn & windbreak; waste areas, roadsides, washes; poss around abandoned homes; reproduces by seed & root sprouts; hardiest elm; CA to c US; Midwestern states & provinces; native to Asia.

Shrubs

Family	Species	Common Name		Comments
Buddlejaceae	*Buddleja davidii*	butterfly-bush	8, 9	cult orn; disturbed, gen urban & oft more or less damp areas: roadsides, railroad tracks; w WA, CA; native to China.
Fabaceae	*Alhagi pseudalhagi*	camelthorn	8, 9, 36	also called *A. camelorum, A. maurorum*; desert forage; arid agricult areas, moist or dry areas, spreading rapidly along streams & canals; reproduces by seed & deep roots & rhizomes; WA, as along Crab Creek in c WA; uncomm CA & sporadic to w TX; native to Asia.

Vines/Brambles

Family	Species	Common Name		Comments
Apocynaceae	*Vinca minor*	lesser periwinkle	14	cult orn; borders of woods, roadsides, abandoned areas; throughout e N.Am, prob in w N.Am

Herbs & Flowers

Family	Species	Common Name		Comments
Apiaceae	*Anthriscus sylvestris*	chervil	9, 22	poss intro in British wildflower seed mixes; uncult areas: moist pasture, forest, roadsides; not toxic but prob unpalatable; Spokane & Whitman Cos, WA; wdsp

				ne N.Am; native to Eur.
Apiaceae	*Heracleum mantegazzianum*	giant hogweed, giant cow-parsnip, giant bearclaw	13, 31, 27, 11	garden & arboretum orn; prefers rich damp soil, esp in riparian & open disturbed urban areas: roadsides, ditches, rights-of-way, vacant lots, streams, rivers; photo-toxic, can cause permanent scaring; promotes erosion, diff to control; Federal Noxious Weed, however it's still available from a few nurseries & seed companies; spreads by seeds, gardeners, & people using the dry flower head in floral decorations; in OR only one cult plant has been reported, in Portland in 1962; reported in 9 WA Cos; Ontario, Vt, ME, MD, NY; native to the Caucasus mnts in Asia.
Asteraceae	*Ambrosia tomentosa*	skeletonleaf bursage	36, 26	uncult & cult areas, irrig & dry: waste & abandoned areas, meadows, prairies, pastures, dry rangeland; diff to eradicate, spreads by clingy burs & extensive creeping roots which can form new colonies when broken; reduces crop yields, unpalatable to livestock, allergen; Franklin Co, WA; 5 se ID Cos; native to the sc Great Plains & sw RMS.
Asteraceae	*Carduus acanthoides*	plumeless thistle, acanthus thistle	8, 9, 36, 28	seed contaminate; uncult disturbed or infertile areas: pastures, rangeland, meadows, ne WA bluegrass meadows, roadsides, waste areas, stream valleys, fields, parks; reduces forage production, spines make it unpalatable & reduces access to surrounding plants, reduces recreational activities; reproduces & spreads by seed; heavy continuous grazing, burning & trampling assists in its spread; biocontrol agent available; a major problem in Stevens Co, WA; found in ID, e WA, n CA, CO, WY; ne US w to SD & NE, s to VA & OH; also in Nova Scotia, Quebec, Ontario & BC; native to Eurasia, prob the Medit region e to Siberia & the Caucasus.
Asteraceae	*Carthamus baeticus*	smooth distaff thistle	8	disturbed areas; no info for OR; CA; native to Medit
Asteraceae	*Carthamus leucocaulos*	whitestem distaff thistle	8	also called *C. leucocaulis*; grasslands; no info for OR; CA; native to Medit
Asteraceae	*Centaurea calcitrapa*	red starthistle	8, 17, 29, 2	medicinal herb, seed contaminant; disturbed areas, esp in sandy or gravelly soil: rangeland, pasture, roadsides, parks, natural areas; unpalatable, outcompetes native & forage spp, creates dense infestations that hinder recreation & makes areas inaccessible; reproduces by seed which spreads in hay, seed, equipment & livestock; a population near Jacksonville, OR has been eradicated; Asotin & Island Cos in WA, CA, WY, UT; native to the Medit region of s Eur, n Afr.

Asteraceae	*Centaurea iberica*	Iberian starthistle or knapweed	8, 36, 17, 29	can spread in hay, grass seed, equipment, livestock; disturbed areas: range, pasture, roadsides, streambeds & courses, wet areas; reduces forage production, unpalatable, restricts accessibility & native vegetation in natural areas & parks; reproduces by an abundance of seeds which disperse over long distances; in the 1950's it grew near Medford, OR but hasn't persisted; collected near Ellensburg, WA in 1929 but hasn't been reported since; currently found only in CA esp in Lake, Napa, Mariposa & Amador Cos; native to se Eur or Asia Minor.
Asteraceae	*Centaurea macrocephala*	bighead knapweed, lemon fluff, globe centaury	24, 29	cult orn, esc from abandoned gardens; prefers loam & silt loam soils receiving <= 20" annual precipitation: meadows, powerline clearings, unirrig Kentucky bluegrass sod; reproduces by seed which is spread by wind, passing animals, vehicles, seed catalogs & in dried flower arrangements; gardeners also divide the roots & sell it in nurseries; can be grazed; Pend Oreille, Whitman & Okanogan Cos, WA; Quesnel, BC; native to the mnt grasslands of Caucasia & the subalpine meadows of Turkey.
Asteraceae	*Centaurea trichocephala*	featherhead knapweed	29	was found in WA but has now been eradicated.
Asteraceae	*Helianthus ciliaris*	Texas blueweed	8, 36, 21	seed contaminate; disturbed areas, oft in saline or alkaline soils: along streams & canals, low drainage areas, dry lakes, roadsides, irrig fields, vineyards; reproduces by seed, creeping roots, & root fragments; reduces crop yields, can form dense patches, unpalatable to livestock; Yakima Co, WA; Twin Falls Co , ID; CA, KS; native to sc & sw US (OK, TX, NM, AZ) , n Mex.
Asteraceae	*Hieracium pratense*	meadow hawkweed	9, 36, 30	poss also called *H. caespitosum*; several hawkweeds hybridize & are hard to differentiate; prefer soils that are well drained, coarse-textured & moderately low in organic matter in open areas: permanent pastures & hayfields, mnt meadows, clearings in forest zones, open woodlands, roadsides, lawns, gardens, & abandoned farmland at elev of 2,100 to 5,400 ft; forms dense patches that eliminate forage & native spp; prob wont become a problem in the dry intermnt west rangeland; reproduces by seeds (which are spread by wind, fur, feathers, clothing, & vehicles), stolons & rhizomes; not yet a problem in OR; rapidly spreading in the ne Cos of WA (Okanogan, Ferry, Stevens, Pend Orielle, & Spokane), recently found in w WA (Skagit, Snohomish, & Whatcom Cos); n ID has large infestations in Flathead, Linclon, & Sanders Cos; spreading in several nw MT Cos; e N.Am; native to c & n Eur.
Brassicaceae	*Rorippa austriaca*	Austrian fieldcress	8, 25	adapts best to wet soils: along rivers, irrig canals, wet meadows, cult areas, waste areas, pastures, disturbed areas, roadsides, mud flats; reproduces by seed & creeping roots, but mainly spreads by root fragments; outcompetes native & desirable spp; some forage value; Whitman & Franklin Cos along the Palouse River, & near Topperish in Yakima Co in WA; Modoc Co, CA; Elko Co, NV; NY, NJ, NM, WI, SD, & Saskatchewan; native to Russia, e Eur.

Caryophyllaceae	*Lepyrodiclis holosteoides*	lepyrodiclis	18	source of origin intro unknown; annually cult cropland & adj disturbed waste areas; reduces crop yields; reproduces by seed which are sometimes abundant; seeds can spread on equipment to other fields; in N.Am it's only in se Whitman Co, WA & adj Nez Perce Co, ID; native to c Asia, Asia minor, Russia, Iraq, Iran, Armenia.
Nyctaginaceae	*Mirabilis nyctaginea*	four o'clock	8, 9, 23	Also called *Oxybaphus n.*; disturbed areas: alfalfa field, pasture, rangeland, pear & apple orchards, roadsides; reproduces & spreads by seed which are carried by vehicles & equipment, also contaminates crop seed & livestock feed; Okanagan Co near Loomis, Okanogan & Tonasket in WA; Bonner, Nez Perce, & Fremont Cos in ID; CA; native to c US, n Mex.
Zygophyllaceae	*Peganum harmala*	African rue	7, 9, 36, 19	intro as a cult drought tolerant plant; roadsides, waste areas, dry rangeland; toxic, unpalatable, allelopathic, outcompetes native spp; reproduces by seeds, roots, & root fragments; seeds spread in hay, seed, cattle feces, chicken scratch, equipment, & vehicles; population near Prineville, OR has not persisted; Grant Co, WA; CA, NV, NM, AZ, TX; native to n Afr & Asiatic deserts.
Zygophyllaceae	*Zygophyllum fabago*	Syrian beancaper	7, 8, 9, 20	poss contaminant in alfalfa seed, orn or garden plant; disturbed areas, in sandy to silt-loam soils: abandoned gardens, fields, pastures, waste areas; unpalatable to livestock, forms large colonies; spreads by seed, lateral roots, & root fragments; current WA populations occur in Adams, Grant, & Okanogan Cos; near Aberdeen in Bingham Co, ID; Alamosa & Delta Cos, CO; eradicated from CA; native to Medit, c Asia.

<u>Grasses & Grass-like Species</u>

Family	Species	Common Name		Comments
Cyperaceae	*Cyperus rotundus*	nutgrass	8, 34, 36	imported; moist, sandy soils: turf, orn areas, cult fields, ditchbanks, disturbed areas; troublesome weed; s & c CA coast e to sw AZ; s Atl & Gulf Coast states, w to TX & Mex; occ to New England; native to Eurasia.
Poaceae	*Aegilops ovata*	ovate goatgrass	8, 9	disturbed fields, roadsides; CA, w US; native to Medit Eur
Poaceae	*Aegilops triuncialis*	barbed goatgrass	8, 9	disturbed areas, cult fields, roadsides; CA, w US; native to Medit Eur, w Asia.
Poaceae	*Elytrigia elongata*	tall wheatgrass	8	also called *Agropyron e.*; disturbed areas, slopes; no info for OR; CA to the Great Basin; ID; native to Medit Eur.
Poaceae	*Pennisetum setaceum*	fountain grass	8	waste areas, urban roadsides; no info for OR; CA; native to Afr.
Poaceae	*Spartina densiflora*	denseflower cordgrass	8	coastal salt marshes; no info for OR; CA; native to s S.Am.

Aquatics

Family	Species	Common Name		Comments
Hydrocharitaceae	*Hydrilla verticillata*	hydrilla	8, 13, 15	aquarium plant; water ranging from a few cm deep to 15m: lakes, reservoirs, ponds, rivers, streams, canals, ditches; aggressive, forms a dense canopy at the water surface, outcompetes native spp, destroys fish habitat, degrades water quality, increases flooding, interferes with recreation; Federal Noxious Weed; spreads by fragments & axillary buds which travel on boats, motors, trailers, bait pails, fishing tackle, & poss water fowl; WA; 17 Cos in CA to s US, C.Am; native to Eurasia.

References

1- Bailey 1958
2- Bianchini and Corbetta 1975
3- Brayshaw 1996
4- Elais 1980
5- Farrar 1995
6- Fernald 1989
7- Gaines and Swan 1972
8- Hickman 1996
9- Hitchcock and Cronquist 1973
10- Johnson 1993
11- KCDNR
12- Mabberley 1989
13- McKnight 1993
14- Niering and Olmstead 1979
15-ODA b
16- Petrides 1993
17-PNWEP 1990 Mar
18- PNWEP 1990 Apr a
19- PNWEP 1991 June a
20- PNWEP 1991 June d
21- PNWEP 1991 June e
22- PNWEP 1991 June g
23- PNWEP 1991 June h
24- PNWEP 1991 Dec a
25- PNWEP 1992 June a
26- PNWEP 1992 June j
27- PNWEP 1992 Dec a
28- PNWEP 1992 Dec b
29- PNWEP 1993 Jan
30- PNWEP 1997 Sept
31- Pojar and MacKinnon 1994
32- St John 1969
33- Thompson 1991
34- USDA 1971
35- Weinmann et al. 1984
36- Whitson 1996