

3.12 Summary of Current Status of Exotic Species in Oregon

Stevan J. Arnold

Chair, Department of Zoology, OSU

Jill Anthony

Department of Fisheries and Wildlife, OSU

Report Card

- Nearly a thousand exotic species have invaded Oregon since the time of European settlement. Of these 1,000 species, 150 probably warrant special attention.
- Exotic species can impede forest regeneration and render grasslands unsuitable to nearly all kinds of grazing animals.
- Many roadsides in Oregon have become jungles of exotic species. Clearcuts, other disturbed sites and urban forests have become gardens of exotics that have the potential to foster the establishment of serious exotic pests.
- The annual cost imposed by exotic species in the United States is estimated to be \$123 billion.
- The cost of controlling gypsy moths in Oregon and Washington from 1985 to 1995 was more than \$50 million.
- No state agency takes responsibility for coordinating the monitoring of all exotic species across the state.

Indicators

1. The number of exotic species and its trend through time.
2. The distribution of exotic species.
3. The distribution of exotic species with the potential for causing serious harm.

Introduction

Exotic species are non-native species that are capable of establishing and spreading in disturbed habitats or natural communities. Weeds are one category of exotic species, as are exotic microorganisms that act as pathogens. In contrast, many beneficial species owe their perpetuation to conscious human assistance and so are not considered invasive species.

Exotic species arrive in the state by several avenues. Some exotic species have been intentionally released and encouraged to proliferate. A number of species of game birds (such as chukar, white-tailed ptarmigan, and wild turkey) and sport fish (such as large-mouth bass) were introduced by the Oregon Department of Fish and Wildlife (formerly the Oregon Game Commission) (Evanich 1986). Such introductions are no longer state policy because of the threats they pose to native wildlife. Private individuals are also responsible for some exotic introductions (such as bullfrogs).

Many exotic species are maintained as pets or as ranching experiments. Occasionally such species escape from cultivation and establish breeding populations. Nutria (a large South American rodent), snapping turtles and carp are in this category.

Exotic species can enter by hitch-hiking on people, pets, aquaculture species, or nursery stock. Incidental invasion is thought to be a major route for wood-boring insects in untreated wood and marine organisms in ships' ballast (Carlton 1989). Port-Orford-cedar root disease entered Oregon on infected ornamental plants in the 1920s (Brookes 1996).

Some species disperse naturally into Oregon after establishing themselves in nearby states and provinces. Aggressive colonizing birds such as English sparrows and European starlings flew into Oregon on their own power.

Definition of ecosystem health with respect to exotic species

Ecosystem health means a minimum presence of exotic species. The tide of exotic invasions threatens both ecosystem services and the native character of our landscapes, and incurs huge economic costs. Complete elimination of exotics, although a laudable goal, is not biologically or economically feasible. Some exotics are too widespread and too firmly established to be eliminated. Nevertheless, it is important to realize that every exotic species carries risks.

Exotic game birds and fish are real threats to the native wildlife of Oregon, despite their popularity. Exotic birds have the potential to outcompete native species and to infect our native species with exotic diseases. Exotic fish species have the potential to replace native species. The potential for hatchery-raised fish to genetically swamp native stocks is now recognized as a serious problem (Gross 1998). The recreational value of exotic species and hatchery-reared stocks must be weighed against the threat that they pose to Oregon's ecosystems.

A healthy environment is relatively resistant to the establishment of exotic species. We are plagued with successive waves of established exotic species because of our environmental practices. Disturbed ecosystems encourage the establishment of exotics. Clearcutting provides habitats for weedy species such as Scotch broom. Fire suppression promotes crowded forests and outbreaks of exotic – as well as native – wood-boring insects and tree pathogens (Brookes 1996). Overgrazing promotes the establishment of cheatgrass and other noxious weeds (Mac et al. 1998). Once established these exotic annuals promote grass fires, which favor the growth of exotic annuals over native perennials, producing the so-called “cheatgrass-wildfire” cycle (Billings 1990, Young 1994, Whisenant 1990, Peters and Bunting 1994). Clearcutting, fire suppression and overgrazing represent departures from a naturally functioning landscape, departures that open the door to the establishment and spread of exotics.

Indicators of ecosystem health with respect to exotic species

One indicator of ecological health is the number of exotic species and its trend through time. The frame of reference for this indicator is the list of exotic species compiled by Arnold and Anthony (2000). This indicator recognizes that every exotic species poses some environmental risk.

The distribution of exotic species is another indicator of ecological health. This indicator recognizes that the negative impact of an exotic species increases as its geographic range expands. A limitation of this indicator is that geographic distribution of most exotic species is poorly documented.

The distribution of exotic species with the potential for causing serious harm is probably the most important indicator of health. This indicator recognizes that the potential for serious impact is greater for some species than for others. The frame of reference for species in this category is the Red List (see: the SOER Appendices, at the Oregon Progress Board website: www.econ.state.or.us/opb). Although this list is a current inventory of the 66 most problematic exotic species in the state, in most cases we do not have an accurate assessment of geographic distribution or the potential for harm.

Current status and trends

Nearly a thousand exotic species have invaded Oregon since the time of European settlement (Arnold & Anthony 2000). If we take the onset for invasions as about 1850, then the average rate of new species entering Oregon is about 7 species a year. The rate has undoubtedly been much higher in the last 50 years, because of an increase in rate of human population growth and commerce. The total number of exotic species is also probably much larger than 1,000. A surprisingly high proportion of exotic species has been revealed when specialists have closely examined collections of particular groups. Thus, about 17% of the 423 species of aphids known in Oregon are exotic species (Jensen et al. in press). The implication is that hundreds – if not thousands – of exotic insect species have already invaded Oregon but have not been detected by monitoring agencies.

Exotic species pose a major threat to the natural functioning of our ecosystems (Dukes and Mooney 2000). As the inventory of exotic species expands, we run the risk that our ecosystems will not deliver important services such as erosion prevention, water and air purification and climate amelioration. Exotic species can impede forest regeneration and render grasslands unsuitable to nearly all kinds of grazing animals. One exotic species, crested wheatgrass, decreases soil quality, increases greenhouse gases, and causes population explosions of native, herbivorous insects (Lattin et al. 1995, Christian and Wilson 1999).

Exotic species threaten the native character of our landscapes. Because exotic species are often aggressive competitors, they can depress populations of native species and sometimes replace them. Many roadsides in Oregon have become jungles of exotic species. Clearcuts, other disturbed sites and urban forests have become gardens of exotics that have the potential to foster the establishment of serious exotic pests. The potential of exotic species to alter the landscape is startling. Klamath weed, an invasive weed that is toxic to livestock, reached western North America in the late 1800s and by the early 1950s had infested more than 370,000 acres in Oregon (Noxious Weed Control Task Force 1952, Cox 1999). Cur-

rently, almost 3 million acres in Oregon are dominated by exotic species such as cheatgrass (Defenders of Wildlife 1998).

The problems caused by noxious exotic plants in Oregon are particularly well understood due to evaluation by the Noxious Weed Control Program of the Oregon Department of Agriculture. These problems include: fire hazard (gorse), poisoning of livestock (tansy ragwort), interfering with re-establishment of conifers on harvested lands (Scotch broom), making rangelands unsuitable for grazing livestock (various thistles), crowding out native vegetation in wetlands (purple loosestrife), and clogging waterways (hydrilla).

Exotic species pose a serious economic threat. The annual cost imposed by exotic species in the United States is estimated to be \$123 billion (Pimentel et al. 2000). The total annual cost of exotic species in Oregon has not been estimated but probably runs in the billions of dollars. The annual cost of livestock and pasture losses due to just one noxious weed (tansy ragwort) was estimated to be \$5 million in Oregon before a successful program of biological control was put in place (Radtke 1993). Exotic diseases are an important problem for forest trees. Two exotic diseases (Port-Orford-cedar root disease and white pine blister rust) have had a major impact on forests in Oregon (Brookes 1996).

Threats

Exotic species invade unhealthy ecosystems. As a general rule, exotic species exploit opportunities that are created by human activity (Hobbs 1989). Clearcutting in the Cascades has created vast brushfields dominated by European plant invaders such as Scotch broom and gorse. Overgrazing in eastern Oregon has fostered large tracts of exotic grasslands dominated by cheatgrass and thistles (Mac et al. 1998). Thus, one future threat is additional spread of exotic species due to a lack of effective policies of control.

There is a premium on early detection and eradication. The cost of controlling gypsy moths (a species capable of defoliating trees over large areas) in Oregon and Washington from 1985 to 1995 was more than \$50 million (Brookes 1996). This is the cost to control a species in the pre-establishment stage, before it can sustain populations from year to year. As establishment and dispersal proceeds, the costs of control rapidly escalate. A cost-effective strategy may be to emphasize monitoring and focus control where it can succeed, which is generally in the pre-establishment stage. Thus, another set of risks is incurred by a lack of preventative monitoring and proactive management.

Exotic species can exist for many generations at low population densities before explosively increasing in geographic range. The reasons for this lag before explosive spread are not completely understood (Ewel et al. 1999). This period before

exponential spread is, however, the window during which control and eradication are possible. Nevertheless, a policy of control may be hard to implement in the early stages of invasion, because the threat is masked by low population numbers and narrow distribution. Thus, timing is crucial in deciding whether eradication is feasible. Bomford and O'Brien (1995) have suggested six criteria for deciding if eradication is technically possible and preferable to merely controlling vertebrate pests: (1) rate of removal can exceed rate of increase at all population densities, (2) immigration can be prevented, (3) all reproductive animals are subject to eradication, (4) animals can be detected at low-densities, (5) discounted benefit-cost analysis favors eradication over control, (6) the socio-political environment is suitable for eradication.

What data are available and how complete are they?

Plants and insects with the most serious potential to cause economic harm are subject to rigorous monitoring. The Oregon Department of Agriculture (ODA) imposes quarantines on serious insect pests and noxious weeds that have a high risk of becoming established in the state. Such species are subject to detailed surveys and monitoring. In addition, ODA monitors the status of about 100 species of weeds that are in the pre-establishment stage or in early stages of establishment. Other exotic species receive far less attention and so data on arrival and spread are limited.

What more do we need to understand?

About 15% of the more than 6,000 exotic species in the United States cause serious economic or ecological harm (U.S. Congress, Office of Technology Assessment, 1993). Thus, 150 species of the nearly 1,000 exotic species in Oregon probably warrant special attention. How can these species of special concern be identified? We urgently need tools to solve the problem of identifying problem exotics and predicting their potential for establishment and spread. Currently, the single best predictor of serious impact is probably the species' track record elsewhere. Thus, a key to predicting future risks is good communication with agencies outside of Oregon.

Interactions among invading species is a little studied but potentially important threat. At some sites in Oregon a succession of invading plant species has been observed (J. Kagan, pers. comm.), suggesting that late arrivals may sometimes outcompete exotic species that are already established. Chukars – an introduced Asian partridge – thrive on rangelands that have been invaded by cheatgrass (Cox 1999). In the Willamette Valley, introduced bullfrogs use the burrows of an introduced South American rodent (nutria) as overwintering refuges (S. Hempel, pers. comm.). Associations and

interactions such as these suggest that early invaders help pave the way for later invasions.

A host of state and federal agencies play some role in monitoring and controlling exotic species in the State of Oregon: Oregon Department of Agriculture (ODA), Oregon Department of Wildlife (ODFW), Oregon State Police (OSP), United States Department of Agriculture (USDA), Soil Conservation Service (SCS), and the United States Fisheries and Wildlife Service (USFWS). No state agency takes responsibility for coordinating these efforts or for tracking all exotic species across the state. Criteria employed by different state agencies are not uniform. This lack of a coordinated program to monitor and control exotics may be the greatest risk of all.

Problematic exotic species by ecoregion

Coast Range: Examples of exotic plants that are especially problematic in the Coast Range are cheatgrass, diffuse knapweed, spotted knapweed, and Canada thistle. Major infestations of *Cardulus* thistles and milk thistle occur in Douglas, Coos and Curry counties. Port-Orford cedar root disease is a serious pathogen for Port-Orford cedar.

Klamath Mountains: Examples of exotic plants that are especially problematic in the Klamath Mountains are yellow starthistle, diffuse knapweed, leafy spurge, spotted knapweed, and Mediterranean sage. Sizeable infestations of musk thistle occur in Klamath and Lake counties. Port-Orford cedar root disease is a serious pathogen for Port-Orford cedar.

Cascades: Examples of exotic plants that are especially problematic in the West Cascades are cheatgrass, yellow starthistle, diffuse knapweed, leafy spurge, Dalmatian toadflax, and purple loosestrife. White pine blister rust is a problem in coniferous forests.

East Cascades Slopes and Foothills: Examples of exotic plants that are especially problematic in the East Cascades are cheatgrass, yellow starthistle, diffuse knapweed, leafy spurge, Dalmatian toadflax, and purple loosestrife. Extensive infestations of Scotch thistle occur in Malheur county. White pine blister rust is a problem in coniferous forests.

Snake River Basin: Examples of exotic plants that are especially problematic in the Basin and Range are cheatgrass, diffuse knapweed, leafy spurge, Scotch thistle, whitetop, Russian knapweed, spotted knapweed, purple loosestrife, rush skeletonweed, Mediterranean sage, and crested wheatgrass.

Blue Mountains: Examples of exotic plants that are especially problematic in the Blue Mountains are cheatgrass, yellow starthistle, leafy spurge, spotted knapweed, diffuse knapweed, and medusahead.

Columbia Plateau: Examples of exotic plants that are especially problematic in the Columbia Basin are cheatgrass, diffuse knapweed, leafy spurge, Dalmatian toadflax, and purple loosestrife.

Willamette Valley: Grand fir has been eliminated at low elevations by an exotic insect that was introduced in the 1930s (Brookes 1996). Examples of exotic plants that are especially problematic in the Willamette Valley are cheatgrass, diffuse knapweed, spotted knapweed, Canada thistle, and tansy ragwort. The most problematic exotic vertebrate animal species are nutria and bullfrogs.

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