

Oregon Department of Agriculture
Noxious Weed Pest Risk Assessment for
Yellow Archangel
Lamium galeobdolon
Lamiaceae
February 2012

Findings of Review and Assessment: Yellow archangel (*Lamium galeobdolon*) was evaluated and determined to be a category “B” noxious weed as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination is based on a literature review and analysis using two ODA evaluation forms. Using the ODA Noxious Qualitative Weed Risk Assessment v.3.8, yellow archangel scored 47. Using the ODA Noxious Weed Rating System v.3.8, the species scored 15 indicating a “B” listing.

Introduction: Yellow archangel is a perennial in the mint family, with showy yellow flowers that makes it popular in gardens. Non-native to the United States, it has been observed becoming naturalized in Massachusetts, Pennsylvania, and Virginia by the USDA in 2009 (Lamont and Glenn, 2009). It has spread to other areas of the United States as well including Washington and Oregon, particularly in the urban-wildland interface. The aggressive nature of the plant and its ability to escape its original planting site have concerned local resource managers as its spread has increased over time.

Reproduction: Sexual reproduction is limited during cool damp summers. Plants flower much more vigorously during hot dry summers than cool damp summers. Seeds produced by yellow archangel are dispersed by ants, particularly *Formica rufa* and *Lasius niger*, which are attracted to oil in the seed. An individual plant produces approximately 800 seeds annually (Packham, 1983). Natural seed dispersal does not appear to be particularly effective for long distance dispersal, as evidenced by the plants disjunctive distribution in the British Isles and germination appears to vary greatly, depending on site characteristics (Packham, 1983). Human activities appear to be the best long-distance dispersal agent.

The long ground-hugging stolons can grow one meter outward per year giving it a competitive advantage in habitats with varying environmental conditions. This horizontal spread enable the plant to root in one place and carry out photosynthesis in another over short distances. It also can rapidly increase yellow archangel’s infestation size. Disturbances such as logging in yellow archangel infested forests stimulate plant growth, increasing the infestation size. The highest productivity and largest seed-set are found in lightly shaded woodlands and in hedgerows on moist nutrient rich soils (Packham, 1983). The species has been observed spreading over extensive areas in its native woodland floor, and grows in associated with various other native species in its native range (Packham, 1983).

Factors Effecting Establishment: Yellow archangel is mainly limited to temperate regions, with it lacking adaptations for high temperatures and low moisture content. Yellow archangel does not resist drought effectively, however in areas of low rainfall, the species will survive in woodlands (Packham, 1983). It grows particularly well in damp woods and shaded areas, but is limited from dry soils. Yellow archangel will survive heavy frost with no damage to leaves (Packham, 1983). It can grow in areas waterlogged during winter, but not continuously saturated throughout an entire year. Yellow archangel’s propensity for moist soils make it a well suited for riparian habitat, and it has been observed growing rapidly along lower “receiving” slopes and stream banks (Packham, 1983). It grows on a wide range of soil types developed from limestone, clays, sandstone, conglomerates and recent alluvium (Packham, 1983). It flourishes on stabilized scree and deep loamy soils rich in nutrients.

Probability of Detection: Yellow archangel is showy and stands out on the forest floor but does not climb trees and tall shrubs and may escaped attention unless walked upon. Infestations may escape detection for many years and become well established, reducing the opportunity for eradication. Generally the public is not aware of its invasiveness and may not report infestations.

Distribution in Oregon: Yellow archangel is known to occur in both Oregon and Washington. Within Oregon it has been mainly associated with the urban-wildland interface where dumping of yard waste and garden escapee populations are present. The known counties with populations include but are not limited to: Polk, Lane, Lincoln, Tillamook, Multnomah, Washington, Clackamas, and Columbia counties.

Environmental Impacts: A competitive advantage yellow archangel possesses is its ability to perform well in various habitats utilizing its long stolons to be able mitigate varying environmental factors such as light and moisture. It is assumed that escapee populations in the US often come from the dumping of plant materials from gardens that begin to propagate from rhizome fragments (Lamont and Glenn, 2009). Whether escaping from gardens, or areas where it was dumped as garden waste, the plant aggressively forms dense stands that shade out and dominate less tenacious native plants. It has been noted growing up to waters edge, but has not been seen moving into saturated soils where it could become a riparian invader. Movements into multiple ecological zones is possible as the plant is associated with dumping of waste on roadsides, this is especially worrisome as yellow archangel is known to be able to propagate in many soil types and shade levels. It is not known whether yellow archangel is a source of food for native wildlife.

Economic Impacts: The potential economic impact is difficult to estimate. Yellow archangel can invade the shady forest floor that constitutes a large percentage of habitats in western Oregon. Control of this species in forested parkland and private property is difficult and can be expensive. The majority of economic cost can be attributed to these control efforts. A movement of yellow archangel into managed forest plantations could increase reforestation costs as rhizomes are stimulated by land disturbance and smother conifer seedlings.

It is a moderately popular perennial evergreen ground cover in gardens and is often sold at home improvement stores. The value of sales to these stores is not known. The Oregon Association of Nurseries producers guide listed no growers of yellow archangel in Oregon.

Control: In the plant's native habitat in European forests, grazing effectively eliminated yellow archangel from the understory (Oniandia et al., 2004). Glyphosate, triclopyr and imazapyr have been shown to be the most effective herbicides to control yellow archangel (Miller, Ph. D.). Hand pulling has shown to be effective when the entire plants including root fragments are removed from the ground. Residual root fragments have the potential to propagate into mature plants (Jefferson County, WA, 2011).

Noxious Weed Qualitative Risk Assessment 3.8
Oregon Department of Agriculture

Common Name: Yellow Archangel
Scientific Name: *Lamium galeobdolon*
Family: Lamiaceae

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

Total Score: 47 Risk Category: B

GEOGRAPHICAL INFORMATION

- 1) **6** **Invasive in Other Areas**
0 Low- not known to be invasive elsewhere.
2 Known to be invasive in climates dissimilar to Oregon's current climates.
6 Known to be invasive in geographically similar areas.
Comments: Reported from other temperate zone states in the north east.
- 2) **4** **Habitat Availability:** Are there susceptible habitats for this species and how common or widespread are they in Oregon?
1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).
Comments: Habitat covers much of western Oregon.
- 3) **0** **Proximity to Oregon:** What is the current distribution of the species?
0 *Present* – Occurs within Oregon.
1 *Distant* – Occurs only in distant US regions or foreign countries.
3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.
Comments: Occurs in western Oregon
- 4) **8** **Current Distribution:** What is the current distribution of escaped populations in Oregon?
0 *Not present* – Not known to occur in Oregon.
1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).
Comments: Regionally limited.

BIOLOGICAL INFORMATION

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

Comments: Prefers moist soils, well suited for riparian habitat, and it has been observed growing rapidly along lower “receiving” slopes and stream banks

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

Comments: Plant reproduces via seed and also extend outward from rooted areas by stolon growth.

- 7) **3** **Biological Factors:** Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)
- 0 *Negligible* – Host plant not present for parasitic species.
 - 1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).
 - 2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.
 - 4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: No herbivory observed, no biocontrols present

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

- 5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: None

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

Comments: Because it is used in landscaping, escape populations are associated with garden waste dumping in forests and other natural areas.

IMPACT INFORMATION

- 10) **4** **Economic Impact:** What impact does/can the species have on Oregon’s agriculture and economy?
- 0 *Negligible* – Causes few, if any, economic impacts.
 - 1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).
 - 5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).
 - 10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Similar impacts to that of English Ivy.

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

Comments: Causes reductions in species richness where infestations are large and dense.

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

Comments: No impact on health.

CONTROL INFORMATION

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

Comments: Because it is attractive but low growing and unassuming, the public may not notice the spread of the species early on.

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

Comments: Difficult to control, often requiring multiple treatments.

Category Scores:

18 Geographic score (Add scores 1-4)

12 Biological Score (Add lines 5-9)

8 Impact Score (Add lines 10-12)

9 Control Score (Add Lines 13-14)

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

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

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

V3.8 2/19/2016



Photo by Washington State Noxious Weed Control Board

Oregon Department of Agriculture
Noxious Weed Rating System

Common Name: Yellow archanger

Scientific Name: *Lamium galeobdolon*

Point Total: **15**

Rating: **B**

1) Detrimental Effects: Check all that apply, add number of checks

- 1. *Health*: causes poisoning or injury to humans or animals
- 2. *Competition*: strongly competitive with crops, forage, or native flora
- 3. *Host*: host of pathogens and/or pests of crops or forage
- 4. *Contamination*: causes economic loss as a contaminate in seeds and/or feeds
- 5. *Interference*: interferes with recreation, transportation, harvest, land value, or wildlife and livestock movement

2) Reproduction & Capacity for Spread: Check the number that best describes, enter that number

- 1. Few seeds, not wind blown, spreads slowly
- 2. Many seeds, slow spread
- 3. Many seeds, spreads quickly by vehicles or animals
- 4. Windblown seed, or spreading rhizomes, or water borne
- 5. Many wind-blown seeds, high seed longevity, spreading rhizomes, perennials

3) Difficulty to Control: Check the number that best describes, enter that number

- 1. Easily controlled with tillage or by competitive plants
- 2. Requires moderate control, tillage, competition or herbicides
- 3. Herbicides generally required, or intensive management practices
- 4. Intensive management generally gives marginal control
- 5. No management works well, spreading out of control

4) Distribution: Check the number that best describes, enter that number

- 1. Widely distributed throughout the state in susceptible habitat
- 2. Regionally abundant, 5 or more counties, more than 1/2 of a county
- 3. Abundant throughout 1- 4 counties, or 1/4 of a county, or several watersheds
- 4. Contained in only 1 watershed, or less than 5 square miles gross infestation
- 5. Isolated infestation less than 640 acres, more than 10 acres

5) Ecological Impact: Check the number that best describes, enter that number

- 1. Occurs in most disturbed habitats with little competition
- 2. Occurs in disturbed habitats with competition
- 3. Invades undisturbed habitats and crowds out native species
- 4. Invades restricted habitats (i.e. riparian) and crowds out native species

15

TOTAL POINTS

Note: Noxious weeds are non-native plants with scores of 11 points or higher. Any plants in 4.1, 4.2, and 4.3 should not be classified as “A” rated weeds. Ratings: 16+ = A, 15 – 11 = B
ODA Weed Rating System 2/22/16 V3.8

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Miller, Ph. D., Tim. "Yellow archangel control."

Reported by: Glenn Miller and Alex Park, ODA 2012

USDA hardiness zones <http://plants.usda.gov/hardiness.html>

