Yellow Archangel

Lamiastrum galeobdolon
Lamiaceae

Class B Noxious Weed
Control Recommended

Legal Status in King County: Yellow archangel is a Class B noxious weed (non-native species that can be designated for control based on local priorities) according to Washington State Noxious Weed Law, RCW 17.10. The State Weed Board has not designated this species for control in King County. The King County Weed Control Board recommends control of this species where feasible, but does not require it. State quarantine laws prohibit transporting, buying, selling, or distributing plants, plant parts or seeds of yellow archangel.

Yellow archangel leaves. Photo by Pietraszewski.

Yellow archangel infestation. Photo by D. Sorensen.

BACKGROUND INFORMATION

Impacts and History

- Native to Europe and Asia (WSNWCB 2005, Packham 1983). It was first reported to the King County Noxious Weed Control Board as escaping cultivation in 2000. Considered invasive in British Columbia, Pacific Northwest, Midwest and East Coast states. Naturalized in Australia and New Zealand (EDDsmaps 2019, WSNWCB 2005).
- Widely used in the ornamental trade for hanging baskets and groundcover (Miller 2014). Currently on the Washington State Department of Agriculture

(WSDA) Quarantine list: it is prohibited to transport, buy, sell or distribute plants, plant parts or seeds in Washington State (WSNWCB 2020).

- Escapes from residential plantings, quickly spreading and forming dense mats of groundcover. Can grow up and over other plants (WSNWCB 2005, Miller 2012).
- Outcompetes native plant species and forms dense monocultures (DesCamp 2010). Does not provide adequate food or cover for wildlife (WSNWCB 2005). Reduces flower diversity and access to food for pollinators (Invasive Species Council of BC. 2017).

Identification

- Fast-growing perennial groundcover, trailing or upright depending on conditions, grows year-round. In full sun conditions, it can stand upright (WSNWCB 2005, Missouri Botanical Garden 2020, Packham 1983).
- Leaves oval-shaped, coarsely toothed, hairy, typically variegated with silvery-gray markings, and arranged opposite on square stems (Hitchcock & Cronquist 2018). Stem and leaf undersides are sometimes purplish (Packham 1983).
- Flowers small, yellow and tubular; grow on short stalks that rise above the leaves. Flowers appear from April to June (Hitchcock & Cronquist 2018, WSNWCB 2005, Jacobson 2003).

Flowering yellow archangel. Photo by A.Velazquez.

- Leaves are aromatic when crushed and covered with fine hairs (WSNWCB 2005, Packham et al 1983, Missouri Botanical Garden 2020).
- Evergreen except in cases of colder climates, it may lose some leaves (BC Invasives 2017, Packham 1983).
- "Archangel" common name refers to the wing-like shape of the leaves (Missouri Botanical Garden 2020).

Habitat

- Can grow in a wide range of conditions including full-sun to full-shade, and dry to moist sites. Grows most vigorously in moist, shaded forest conditions (WSNWCB 2005, Packham 1983). Plants can quickly adapt in response to environmental changes and alter growth rate and leaf production (DesCamp 2010).
- Can withstand heavy frost and drought without losing leaves (Packham 1983).
- Most often found in forest habitats and in ravines, greenbelts, roadsides and parks (Hitchcock & Cronquist 2018).

- Occurs in residential landscape settings such as flower gardens, rockeries and ornamental borders (Missouri Botanical Garden 2020).

Reproduction and Spread

- Reproduces vegetatively from stem fragments, roots, and to a lesser degree by seed (BC Invasive 2017, WSNWCB 2005, Packham 1983).
- Develops roots along stems as it grows along the ground, allowing new plants to form when broken off. Plants produce stolons that can grow over three feet in a year (WSNWCB 2005, Packham 1983). This allows the plant to be rooted in one area and photosynthesize in another (Packham 1983, DesCamp 2010). Grows year-round (WSNWCB 2005).
- Can spread from small root fragments. Roots can reach 12 inches in length and grow 8 inches deep (Packham 1983).
- Each flower produces four nutlets and each nutlet has one seed (Invasive Species Council of BC 2017, DesCamp 2010). One plant can produce an average of 800 seeds (Packham 1983). Seeds can be transported up to 230 feet away by ants (Sernander 1906). However, few seeds reach maturity, and germination is generally low (Packham 1983, DesCamp 2010).
- Seed viability is not well researched but expected to be about three years in the seed bank (DesCamp 2010).
- Many escaped populations appear to originate from compost piles, hanging baskets, and yard waste dumped into natural areas (Miller 2012, WSNWCB 2005).
- Plants may live for decades under favorable conditions (Packham 1983).

Yellow archangel seedlings. Photo by Dierken.

Local Distribution

- Populations occur throughout King County. Can be found in urban and suburban areas as well as rural and undeveloped natural areas such as Mt. Baker-Snoqualmie National Forest (EDDSMapS 2019, WSNWCB 2005).

CONTROL INFORMATION

Integrated Pest Management

- The preferred approach for weed control is Integrated Pest Management (IPM). IPM involves selecting from a range of possible control methods to match the

management requirements of each specific site. The goal is to maximize effective control and to minimize negative environmental, economic and social impacts.
- Use a multifaceted and adaptive approach. Select control methods which reflect the available time, funding, and labor of the participants, the land use goals, and the values of the community and landowners. Management will require dedication over a number of years, and should allow for flexibility in method as appropriate.

Planning Considerations

- Survey area for weeds, set priorities and select best control method(s) for the site conditions and regulatory compliance issues. See the King County Noxious Weed Regulatory Guidelines for more information.
- Control practices in critical areas should be selected to minimize soil disturbance or efforts should be taken to mitigate or reduce impacts of disturbance. Any disturbed areas need to be stabilized for erosion and sediment control.
- Erosion and sediment control (ESC) means any temporary or permanent measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave the site or enter into wetlands or aquatic areas. Refer to the King County Surface Water Design Manual, Appendix D for ESC Standards.
- Minimizing soil disturbance also reduces germination of weed seeds.
- Generally work first in least infested areas, moving towards more heavily infested areas. This allows for natural re-vegetation to occur, which helps sustain the control work over time. Also, controlling small, satellite populations has a bigger impact on reducing the spread to new areas.
- Properly dispose of all parts of the plant (see Disposal Methods section below).
- Whenever possible, control should be done before plants are flowering to prevent seed production.

Early Detection and Prevention

- Do not dispose of yard waste, compost or unwanted plants in natural areas or parks. Report any sightings of this plant in natural areas to the land manager, especially in remote areas where it is likely to escape notice.
- The sale of yellow archangel is prohibited in Washington. If you already have this plant, contain it by moving it into planter pots or regularly trim it back, disposing of plant parts in municipal yard waste or garbage bins.
- Yellow archangel has limited ability to disperse to new areas by itself, contain and prevent this plant from spreading into natural areas (Invasive Species Council of BC 2017, Miller 2014).
- Clean boots, tools, and other gear when working in infested areas.

Manual Control

- Manual control is labor intensive and will require follow up treatments (Metro Vancouver 2019, DesCamp 2010).
- Careful hand-pulling works best in loose and moist soils. It is important to remove all plant parts especially roots and stems. Re-growth can occur from any missed stem and root fragments. Follow up several times a year to remove any surviving plants and any seedlings that may emerge from seeds already in the soil. Plants recover more slowly in the winter due to lowered energy reserves (Invasive Species Council of BC 2017, Brocklebank et al. 1989).
- Take care when doing manual control over large forested areas because excessive trampling can compact soils and may make it difficult for native vegetation to re-establish (R. Brunskill, Personal Communication, April 17, 2020). Application of mulch or working during the dry season may help reduce compaction.
- Sheet mulching with cardboard covered by wood chips, or tarps/geotextiles can work but requires careful vigilance to ensure success. High tolerance for shade means that plants can grow under weed blocking fabric and tarps for a long time. This method works best when plant growth is already stressed such as during hot dry summers or in late fall/winter (Metro Vancouver 2019, Invasive Species Council of BC 2017). Gaps in the sheet mulching around desirable plants can harbor yellow archangel plants and become sources of re-infestation (DesCamp 2010). Mulching without cardboard or other material is not effective. Plants can grow through deep leaf litter (DesCamp 2010).
- Note that sheet mulching is non-selective and will inhibit the growth of native plants as well as the yellow archangel so the area may need to be replanted after.
- Steps for sheet-mulching yellow archangel:
    - Remove any plant matter from above ground through pulling or chemical control.
    - Cover area and make sure to extend covering a few feet past the edge of the infestation. Light should not be able to penetrate through the covering material. Make sure that there are no gaps between sheets of cardboard or fabric.
    - Leave covering in place for several years, make sure to check area regularly to verify that the covering hasn't been disturbed by animals or by other means.
    - Remove a small area first to spot check for surviving roots.
    - After covering is removed, monitor the area and quickly remove any re-growth or seedlings. Re-growth is most likely to occur in spring or summer. Exact seed viability is not known but expected to be around three years (WSNWCB 2007, Shaw 2019, Invasive Species Council of BC 2017, Metro Vancouver 2019, DesCamp 2010).

Mechanical Control

- Mowing is not effective as plants quickly recover from being cut and will spread from cut fragments (Metro Vancouver 2019, DesCamp 2010).
- Weed torching is not effective as it does not kill roots or plant parts below the surface (Metro Vancouver 2019).

Chemical Control

- For best results, use a foliar application of a combination of herbicides and surfactant (spreader-sticker) if not already in product (PNW Handbook 2019).
- The first application will likely control 70-80 percent of the plants. If surviving plants are not followed up with, populations will rebound. Monitor for re-growth, additional treatments will be necessary (WSNWCB 2007, Invasive Species Council of BC 2017, Miller 2014, James et al. 2015).
- Leaves are very hairy and must be dry for herbicide application. Allow herbicide contact on plants for six hours for proper absorption (PNW Handbook 2019).
- Spring and fall are the best times to spray since plants are growing quickly and are not stressed (PNW Handbook 2019, Metro Vancouver 2019). Avoid treatments during hot weather, drought or wet weather (Metro Vancouver 2019).
- Any desirable plants growing among the yellow archangel could be injured or killed so take care to not overspray (Metro Vancouver 2019).
- Sometimes plants may not show any symptoms from the herbicide until the next spring when the evergreen leaves drop (Packham 1983).

- **Precautions:**
  - Herbicides should only be applied at the rates and for the site conditions and/or land usage specified on the label of the product being used. **Follow all label directions**.
  - Use extra caution where people, animals, bees, native plants or open water are present. Be careful to avoid drift and off-target exposure.
  - For herbicide use in critical areas and their buffers, certain restrictions apply depending on the site and jurisdiction. In unincorporated King County, refer to the King County Noxious Weed Regulatory Guidelines for a summary of current restrictions and regulatory compliance issues. Elsewhere, check with the local jurisdiction.
  - For your personal safety, at a minimum wear waterproof gloves, long sleeves, long pants, closed toe shoes, socks, hat and appropriate eye protection. Follow label directions for any additional personal protection equipment needed.

Specific Herbicide Information

- According to studies by Tim Miller and the PNW Weed Management Handbook, the best results come from combining glyphosate with triclopyr or imazapyr or aminopyralid. Make sure to add a surfactant if not included in the herbicide product being used. Use the recommended label rate (Miller 2014, PNW Handbook 2019, James et al. 2015).
- Glyphosate by itself may be effective but will need multiple treatments a year. Make sure the label rate is not exceeded (S. Shaw, Personal Communication, April 17, 2020).
- Glyphosate and imazapyr are non-selective and will damage both broadleaf and grass vegetation they are sprayed on. Triclopyr will harm broadleaf vegetation but won't harm most grasses (Metro Vancouver 2019). All three herbicides will harm trees and shrubs they contact, and imazapyr and triclopyr have some activity through roots and bark as well. Careful application is key to avoiding unintended impacts (NPIC 2020).
- Vinegar and clove oil are not effective for control. These products defoliate but plants quickly rebound even after repeated treatments (Invasive Species Council of BC 2017, Miller 2012).

The mention of a specific product brand name in this document is not, and should not be construed as an endorsement or as a recommendation for the use of that product. Chemical control options may differ for private, commercial and government agency users. **For questions about herbicide use, contact the King County Noxious Weed Control Program.**

Biological Control

- No biological control agents have been researched for yellow archangel.

SUMMARY OF BEST MANAGEMENT PRACTICES

Small Infestations in Native and/or Desirable Vegetation

- Carefully dig out plants making sure to remove as much of the root as possible. Do not leave any plant parts in the soil. Carefully monitor for regrowth several times per year and follow up as needed.
- Spot treat with herbicide (See Chemical Control above). Mark or shield all desired vegetation prior to spraying to prevent accidental injury.
- If the site conditions allow for it (relatively level ground, no desirable groundcover, no winter flooding), another option is to sheet mulch (See Manual Control above).

Large Infestations/Monocultures

- Sheet mulch may work for medium sized infestations. Large infestations may need to be completed in stages if this control method is chosen (See Manual Control above).
- Chemical control is a good strategy for large infestations with little or no native vegetation. Repeated treatments will be necessary (See Chemical Control above). Follow up treatments could include manual removal after the majority of the infestation has been knocked back (Metro Vancouver 2019).
- Survey edges of the infestation for plants spreading out of the infestation area or plants dispersed by seed.

Control in Riparian Areas

- Additional permits may be required for control of infestations in riparian areas. See the Noxious Weed Control Regulatory Guidelines for more information or contact your local jurisdiction.
- In some cases, the cleared area will need to be replanted with native or non-invasive vegetation and stabilized against erosion. See the King County Surface Water Design Manual, Appendix D for Erosion and Sediment Control Standards.
- Focus on manual removal for small infestations if possible.
- For larger areas where herbicide use is warranted, spray using low pressure and large droplet size to reduce drift. If herbicide could potentially drift into the water or a wetland area, use only approved aquatic herbicides and surfactants after obtaining necessary permits.

Control Along Road Rights-of-Way

- Dig up small infestations if possible.
- Spray infested areas with a systemic herbicide (see Chemical Section above for recommendations), taking care not to spray beneficial vegetation.
- In grassy areas, use a selective broadleaf herbicide such as triclopyr or aminopyralid; if controlled with a non-selective herbicide, such as glyphosate, re-seed after control is completed.

Disposal Methods

- Never dump plant material in a natural area because weeds can spread from yard waste piles.
- Do not compost, except in municipal yard waste bins. If yard waste bins are not available, dispose of plants in the garbage or at the transfer station (WSNWCB 2007, BC Invasive Species Council of BC 2017).

- When off-site removal of plant material is not feasible, plants may be left on site in piles to decompose provided that they do not make contact with the ground and are monitored closely for re-growth or spread (Metro Vancouver 2019).
- Burning is not recommended as temperatures may not be high enough to destroy seeds (Invasive Species Council of BC 2017).

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