

English Holly

Ilex aquifolium
Aquifoliaceae

King County Weed of Concern
Control Recommended

Legal Status in King County: English holly is not on the Washington Noxious Weed List and there is no legal requirement to control it. The King County Noxious Weed Control Board recognizes that this plant is invasive and is collecting information and providing education on control. The Board encourages and recommends control and containment of existing populations and discourages new plantings.



English holly branch with leaves and berries. Photo by S. Shaw.

BACKGROUND INFORMATION

Impacts and History

- Native to Eurasia and Northern Africa. Can be found naturalized throughout Western Washington, Oregon, California, Hawaii, Virginia and New Jersey (USDA NRCS Maps 2019). Classified as an invasive plant species in California and Portland, OR (EDDMapS 2020, City of Portland 2016) and as a Weed of Concern in King County, Washington.
- Introduced to the Pacific Northwest in 1869 as an ornamental plant for hedges (Boersma et al. 2006, NW Holly Growers Association 2019). Currently commercially cultivated in Washington for floral decorations (Boersma et al. 2006, NW Holly Growers Association 2019).



English holly infestation. Photo by D. Sorensen.

- Fourth most abundant non-native species in Seattle parks after Himalayan blackberry, Scotch broom, and English ivy according to Green Seattle Partnership (Green Seattle Partnership 2014).
- Forms dense evergreen thickets that dominate forests. Suppresses and displaces native species by creating deep shade which reduces germination and growth. Competes with native vegetation for nutrients and resources such as water (Stokes et al 2014, Boyar 2014, H. Mustin, Personal Communication, December 18, 2019).
- Changes the compositions of forests; according to a study led by Dr. Stokes at St. Edward State Park. At the 33 sites where they compared vegetation cover under and adjacent to holly canopy, an average of 79 percent of the area under holly was devoid of native evergreen and woody vegetation (Stokes et al 2014).
- Changes soil composition by increasing sulfur, persistent organic matter, and decreases pH (Berger 2017).
- English holly leaves produce a flammable vapor when heated, which allows them to ignite easily and may pose a fire risk (Kew Science 2019).
- Berries are poisonous to people, pets and livestock but not to birds. Children are at the highest risk, ingesting results in gastroenteritis stress and drowsiness (Zabrina et al 2012, ASPCA 2020).

Identification

- Large, dense, slow-growing, evergreen tree or shrub, 15 to 50 feet tall and up to 15 feet wide or more.
- Can grow as either a single-trunk tree or a multi-stemmed thicket.
- Leaves usually have sharp, stout spines along edges although may be smooth on older stems.
- Leaves are thick, glossy, dark green and wavy, 1-3 inches long, alternate and simple.
- Flowers are small, whitish, inconspicuous, sweetly scented.
- Bunches of red, yellow or orange berries produced on female trees in winter (note: berries are toxic to people, pets and livestock)
- Resembles native plants low and tall Oregon grape (*Mahonia aquifolium* and *Mahonia nervosa*). Both Oregon grape species have paired leaflets, while English holly has alternate leaves.

(Hitchcock & Cronquist 2018, Boersma et al. 2006).



Above: English holly leaves, notice that they are attached to the stem alternately. Photo by S. Shaw.



Above: Oregon grape, notice the paired leaflets. Photo by NWplants.com

Habitat

- Grows in shade or sun, primarily in well-drained soil.
- English holly can tolerate a wide range of environments from full sun to deep shade and is often found in forest understories (Boersma et al 2006).
- Can be found in residential areas where it has been planted as an ornamental or has escaped cultivation (Church 2016).
- Also present in rural areas, actively managed forestry sites and clear cuts (Church 2016).
- Can invade into and spread in natural forests with intact native forest canopy and an established forest understory (Boyar 2014, H. Mustin, Personal Communication, December 18, 2019).
- Occurs in low to mid elevation mature forests, often associated with larger diameter trees (Boyar 2014, Watts 2013).

Reproduction and Spread

- Reproduces by seed and vegetatively by layering (Stokes et al 2014).
- Branches or stems pressed to the ground will form roots and new branches (Stokes et al 2014).
- Dioecious (separate female and male plants). Berries are generally ripe around October and remain on the plant through the winter (Zika 2010, Boersma 2006). Female plants begin producing berries at about 15 years old although some may produce fruit at a younger age (Boersma et al 2006).
- One tree may produce 120,000 seeds a season (Peterken & Lloyd 1967).
- Berry production increases with available sunlight, in deep shade it produces fewer berries (Church 2016).
- Relatively short-lived seed bank. Most germination occurs within a year. After three years seed banks are reduced by 80-90 percent (Sagrario & Francisco 2004, Boersma et al 2006). Germination tends to be highest along forest edges although seeds do not need light to germinate (Sagrario & Francisco, 2004).
- Birds feed on the berries then move to another location and regurgitate the seeds, spreading English holly into new areas (Boersma et al 2006, Zika 2010).
- According to a study by Peter Zika, 99 percent of the fruit is consumed in a single season, mainly by American robins (*Turdus migratorius*) (Zika 2010). Rodents are attracted to the seeds and will consume them, destroying the seed. However this effect is limited in urban areas, possibly due to predators (Zika 2010).
- Plants are long lived and can survive past 250 years (Peterken & Lloyd 1967, Boersma et al 2006).

Local Distribution

- Widespread throughout King County from urban areas to undisturbed natural areas, often occurring in forests and on forest edges (EDDmapS 2020, Consortium of PNW Herbaria 2020).
- Extensively spreads in otherwise undisturbed natural areas such as Mount Si, Tiger Mountain and other natural forests within King County (Boyar 2014, H. Mustin, Personal Communication, December 18, 2019).

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

- Survey natural areas for the presence of English holly (Stokes et al 2014).
- Winter is a great time to survey since many plants have died back, so it is easier to navigate through forests and to spot English holly's evergreen leaves (MacKenzie 2018).
- Report any sightings of this plant in natural areas to the land manager, especially in remote areas where it is likely to escape notice.
- If possible, remove English holly from landscaping to prevent spread by birds in to adjacent natural areas (Stokes et al 2014). If removal isn't feasible, cut low hanging branches to prevent vegetative spread by layering and reduce berry production (Stanley Park Ecology Society, 2012).
- Dispose of English holly decorations in garbage, do not leave in natural areas or compost (BC Invasives 2019, Oregonian 2014).
- After control treatments, monitor for re-growth or the appearance of new plants (Boersma et al 2006).

Manual Control

- Small plants and seedlings can be pulled out (wear heavy gloves) or dug out when the ground is moist for easier removal of roots. Make sure to remove all of the roots or any remaining parts will re-sprout. (MacKenzie 2018, H. Mustin, Personal Communication, December 18, 2019).
- Small to medium shrubs (about 1-1 ½ inch diameter) can be pulled out with a weed wrench or similar tool. Pull slowly to work the roots out of the soil. (H. Mustin, Personal Communication, December 18, 2019).
- Cutting holly stems is not effective. Trees cut at the base will re-grow into a dense shrub (H. Mustin, Personal Communication, December 18, 2019).
- Removal of large trees may not be feasible in most situations. Consult an arborist or tree removal specialist before attempting. Large trees generally have substantial roots that require major ground disturbance to remove (Church 2016).



English holly seedling with extensive root. Digging tools like the hori hori can help with removing the entire root. Photo by M. Winkler.

- Plant debris left on the ground will grow into new plants (Church 2016). If possible, create piles of pulled holly plants on downed trees or brush piles to avoid direct contact with the soil (H. Mustin, Personal Communication, December 18, 2019).
- Plants can be removed manually throughout the year. Although if plants are removed when berries are present it may lead to seed spread. If berries are left on the ground, make sure to monitor the area for four years for any seeds that have germinated (MacKenzie 2018, Sagrario & Francisco 2014).
- Soil disturbance encourages seeds to germinate (Whatcom County 2018).
- Since English holly readily re-sprouts, it is important to monitor treatments for effectiveness for at least four years (Sagrario & Francisco 2014).
- Girdling is not very effective, usually resulting in production of suckers. If the tree falls over it may be able to re-root. Girdled trees can be hazardous. (Metro Vancouver 2019)

Mechanical Control, Grazing and Burning

- Mowing and brush cutting are not effective, plants will regrow from below ground parts (MacKenzie 2018).
- Grazing is not recommended as plants will re-grow. Berries are poisonous to livestock (DiTomaso 2013).
- Burning is not recommended. English holly leaves are flammable, burning does not destroy the roots and plants will re-sprout (DiTomaso 2013, Kew Science 2019).

Chemical Control

- Foliar application is generally not recommended as herbicide has difficult time sticking to and penetrating the thick waxy leaves (Whatcom County WA 2018). This strategy may work on young dense stands but will need to be closely monitored for effectiveness (A. Bowron, Personal Communication, February 24, 2020).
- According to research by Earth Corps, injection (with a specialized injection tool such as EZ-Ject Lance, see details below) is the most effective chemical method for control. Cut-stump treatment is generally moderately effective (Salisbury 2013). Frilling may be effective if triclopyr is used.
- For easier access and to reduce regrowth from vegetative propagation, cut and pull lower branches around the base of the tree and remove any lateral growth coming from the base of the plant before treatment (Worcester 2018, H. Mustin, Personal Communication, December 18, 2019).
- Injection can be less time consuming to implement than other methods. There is reduced herbicide exposure to applicators and reduced off-target effects since

herbicide capsules are injected directly into the tree (Salisbury 2013). The method can also be done in the rain which allows more timing flexibility.

- Summary of EZ-Ject instructions (see product label for complete information):
 - For trees greater than 2.5 inches of trunk diameter, measured at the base of the plant, inject one shell every 2-4 inches of trunk circumference, evenly spaced around the trunk at the base of the tree, below all major branches. For stems less than 2.5 inches diameter, inject one shell per stem below all major branches. Stems smaller than $\frac{3}{4}$ inch diameter are too small to be injected. Note: Injury may occur to non-target or woody plants if they extend from the same root system, or their root systems are grafted to those of the treated tree.
 - Since the lance is gravity fed, position it angled downward at 30 to 45 degrees from horizontal. To inject a shell, position the lance nose piece onto the tree trunk so that the gripper teeth penetrate the bark and prevent the lance from sliding down. Then firmly push the lance on the tree. The pushing action will compress the lance and inject an herbicide shell into the tree. Ensure the shell has penetrated into the tree cambium. Generally, at least 1/2 of the shell should be embedded into the tree.
 - At the end of each use, remove unused casings from the EZ-Ject lance. Replace unused casings in original container and re-seal. Always store the product with the open end of the capsule facing UP. Refer to herbicide label and instruction guide for additional information. (EZ-Ject 2010, EZ-Ject No Date).
- Frilling requires more preparation and time to complete than the injection method. Make deep cuts with a hatchet, machete or chain saw at 45 degree angles around base of tree. Immediately apply herbicide into the cuts. Frilling can result in dead main stems and dense re-growth (K. Frappier, Personal Communication, February, 21, 2020). (Salisbury 2013).
- Cut-stump method will often require follow up treatment because of re-sprouting from the roots or crown. Cut trees or shrubs close to the ground and immediately apply herbicide. Fall cut stump treatment may have fewer re-sprouts than spring treatment. See specific herbicide information below. Plants should be monitored to verify that the treatment was successful (Worcester 2018, Salisbury 2013).

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 chemical resistant 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

- Injection with the EZ-Ject Lance with imazapyr in fall or spring is highly effective. Injection with glyphosate is not recommended due to poor control (Salisbury 2013, PNW Weed Handbook 2019). Follow manufacturer's instructions on safety precautions, timing, technique and number of capsules per inch of stem diameter. Avoid use in high temperatures because the capsules may leak when overheated.
- Frilling with triclopyr in fall or spring is highly effective (Salisbury 2013, PNW Weed Handbook 2019). **Make sure the herbicide formulation used is labelled for frilling treatment.** Follow directions on product label for herbicide concentration and safety precautions. Glyphosate is not effective with this method and may result in dense re-growth.
- Cut-Stump method with glyphosate, imazapyr and triclopyr can be used in fall or spring, although spring treatment with glyphosate results in a high number of re-sprouts (Whatcom County 2018, Salisbury 2013, PNW Weed Handbook 2019). **Make sure the herbicide formulation used is labeled for Cut-Stump treatment.** Follow directions on label for herbicide concentration and safety precautions.
- Glyphosate is the least effective herbicide for any of these methods but is best when used in the fall (Salisbury 2013, PNW Weed Handbook 2019).

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 controls agents have been researched as English holly is used in the ornamental and commercial trade.

SUMMARY OF BEST MANAGEMENT PRACTICES

Small Infestations in Native and/or Desirable Vegetation

- Hand pull or dig up small shrubs, make sure to remove the entire root. A weed wrench can be helpful to remove medium sized shrubs. Follow disposal methods provided below.
- For larger trees and shrubs, use an EZ-Ject Lance or similar tool to minimize off-target movement of herbicide (see Chemical Control section about for more information).
- Focus on control of large female trees first to prevent further spread of seed.
- Monitor treatments for effectiveness for at least four years and control any missed or new plants.

Large Infestations/Monocultures

- Start by targeting plants on the edges of the infestation and large female trees to prevent spread to other areas, then work on interior plants.
- Use injection with EZ-Ject lance or similar tool to treat trees. This is generally quicker to implement and requires fewer people to apply than other methods.
- For plants that are too small for the EZ-Ject lance, remove them with a weed wrench or similar tool, or mark them for control in later years.
- Monitor effectiveness of treatments for at least four years and control any missed or new plants.

Control in Riparian Areas

- Additional permits may be required for control of infestations in riparian areas. See the [Noxious Weed 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.
- 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

- Hand pull or dig up small shrubs, make sure to remove the entire root. A weed wrench can be helpful to remove medium sized shrubs. Follow disposal methods provided below.

- For dense stands of young plants, foliar treatment with a systemic brush control product may be used, but the site should be monitored for results since the effectiveness of this method is uncertain.
- For larger trees and shrubs, use an EZ-Ject Lance or similar tool to minimize off-target movement of herbicide. If there is a safety risk posed by leaving the dead trees in place, trees can be cut down and treated with the cut stump method (see Chemical Control section above for more information).

Disposal Methods

- English holly stems will form roots if they contact the ground. Pile holly stems on downed logs, brush piles or other elevated surfaces so stems will dry out.
- If creating piles on-site is not an option, dispose of holly stems in yard waste bins or take to a transfer station. Home compost and industrial compost may not have sufficient temperatures required to kill the seeds so composting trees with berries is not recommended.
- Because English holly leaves produce a flammable vapor when heated, large piles of holly may pose a fire risk. Avoid leaving large holly piles near structures and monitor any piles left in wooded areas.

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