



*Ilex aquifolium*

BEST MANAGEMENT PRACTICES FOR  
**English Holly**  
in the Metro Vancouver Region



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SERVICES AND SOLUTIONS FOR A LIVABLE REGION



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**In partnership with:** The Invasive Species Council of British Columbia  
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**Requested by:** Metro Vancouver’s Regional Planning Advisory Committee –  
Invasive Species Subcommittee

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August 2021



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CREDIT: F. STEELE

## Introduction

The impacts of invasive species on ecological, human, and economic health are of concern in the Metro Vancouver region. Successful control of invasive species requires concerted and targeted efforts by many players. This document - **“Best Management Practices for English Holly in the Metro Vancouver Region”** - is one of a series of species-specific guides developed for use by practitioners (e.g., local government staff, crews, project managers, contractors, consultants, developers, stewardship groups, and others who have a role in invasive species management) in the region. Together, these best practices provide a compendium of guidance that has been tested locally by many researchers and operational experts.

Native to Europe, northern Africa and Asia, English holly (*Ilex aquifolium*) is prized and grown for its bright red berries and spiny, dark green evergreen foliage. It has been widely used in gardens and is still farmed commercially for decorations, floral arrangements and as a landscape plant in the Pacific Northwest (Klinkenberg, 2017). Holly is grown on farms on Vancouver Island, the Sunshine Coast and the Fraser Valley (British Columbia Agriculture in the Classroom Foundation, 2014). Fresh cuttings from holly trees are widely sold in

British Columbia during the Christmas season. A large shrub or tree, English holly has become a serious invader because of its tolerance of a variety of soils and moisture conditions, and the ease with which its seeds are spread by birds. This species is considered a significant urban and forest pest.

Academic institutions, government, and non-government organizations continue to study this species in British Columbia. As researchers and practitioners learn more about the biology and control of English holly, it is anticipated that the recommended best management practices will change over time and this document will be updated. Please check [metrovancover.org](http://metrovancover.org) regularly to obtain the most recent version of these best management practices.

## REGULATORY STATUS

Although English holly is an invasive plant of concern in the Metro Vancouver region, it is not currently regulated anywhere in British Columbia.

## IMPACTS

English holly creates deep shade under its canopy. Native vegetation is greatly reduced under an English holly canopy; large holly thickets can often suppress all native vegetation over substantial areas (Stokes, Church, Cronkright, & Lopez, 2013). This characteristic enables it to dominate tall shrub layers of forest understories, shading out and suppressing germination of native trees and shrubs (Klinkenberg, 2017).

English holly is a notorious water and nutrient hog, which discourages other plants from growing in its vicinity. It has been shown to modify soil conditions, depositing significant amounts of organic matter and sulphur, making conditions more difficult for native plants to thrive (Berger, 2016).

These changes to soil conditions and rate of colonization are exponential over time, suggesting potential serious implications for the health of forests in the Pacific Northwest (Berger, 2016). Surveys conducted on the North Shore suggest that English holly is spreading rapidly beyond the urban interface into neighbouring forests. English holly is also reproducing successfully in undisturbed forests (Beard, 2018). In a matter of decades, if left unmanaged, English holly can quickly increase in numbers and area occupied (Stokes, Church, Cronkright, & Lopez, 2013). It is hypothesized that English holly is the region's shade tolerant invasive plant with the greatest potential to harm coastal forests (Beard, 2018).

While grown commercially, English holly has the potential to impact the forestry sector. It is invasive in actively managed forests and clear cuts in the Pacific Northwest, spreading across and persisting through forest successional stages (Church, 2016).

Although English holly berries are edible for birds, the British Columbia Drug and Poison Information Centre considers them toxic to humans, causing nausea, vomiting, abdominal pain and diarrhea if ingested (British Columbia

Drug and Poison Information Centre, 2010). Local animal protection agencies also consider English holly berries poisonous to pets (British Columbia Society for the Prevention of Cruelty to Animals, 2018).

English holly leaves produce flammable vapour when heated, causing them to ignite easily, and infestations may pose a fire risk (King County Noxious Weed Control Program, 2018). The prickly leaves can hinder human activity around English holly infestations.



Suckering from the base of a large English holly tree

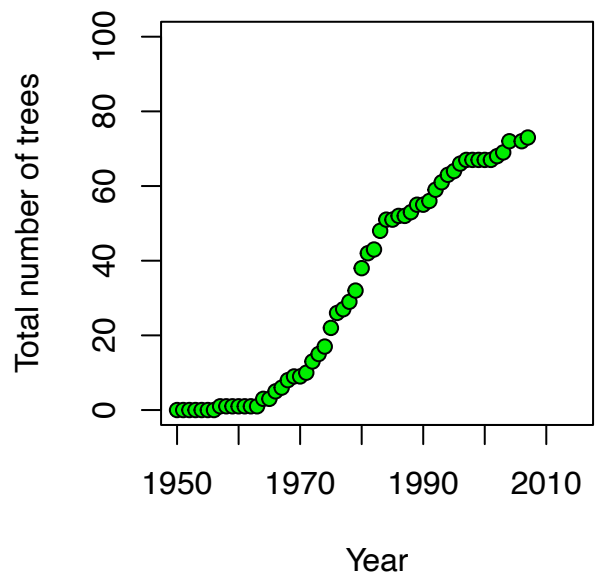
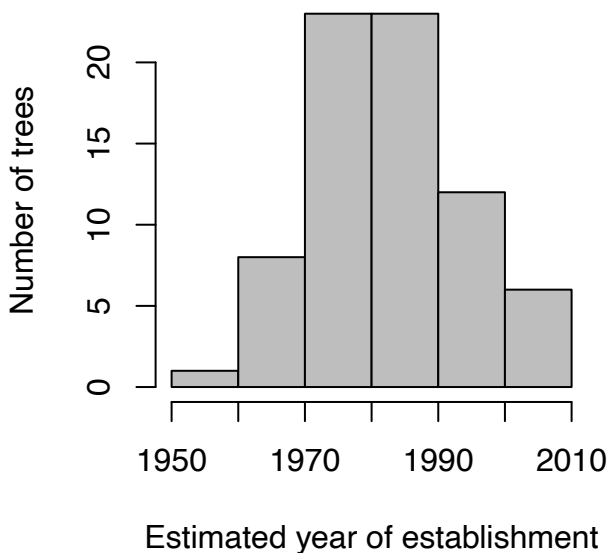
CREDIT: ISCMV

All levels of government, non-profit organizations and private property owners spend significant resources managing English holly in the Metro Vancouver region every year. In recent years, agencies represented on Metro Vancouver’s Regional Planning Advisory Committee – Invasive Species Subcommittee together have spent roughly \$85,000 on English holly control and volunteer stewardship annually. This figure does not include control costs for private landowners across the region or costs associated with education and awareness activities.

## REPRODUCTION AND SPREAD

In the region it is common to observe English holly growing as isolated single plants or trees, in small patchy populations, or in large populations ranging in age from seedlings to mature fruiting trees. It is found in urban areas where it may have been intentionally planted, and in rural habitats.

English holly spreads vegetatively and by seeds. These two methods of spread happen at different scales: contiguous spread is correlated with vegetative methods and long-distance spread is correlated with spread by seed (Stokes, Church, Cronkright, & Lopez, 2013). In a study of a large park in central Washington in which English holly had been established for 50 years, it was found that 78% of individuals originated from vegetative spread and the remaining 22% had spread by seed. English holly spreads by suckering (shoots arising from an existing root system) and layering (when branches or stems touch the ground and rooting occurs) (Evergreen, 2015). Researchers have observed linear expansion of English holly clumps resulting from the fall of a dead tree or limb onto a holly tree, thus pressing the holly tree lengthwise along the ground, leading to branches forming multiple standing trees (Stokes, Church, Cronkright, & Lopez, 2013). English holly also re-sprouts from cut stumps.



UBC geography students and staff calculations of tree ages in a selected stand of English holly in the Acadia Forest area of Pacific Spirit Regional Park

CREDIT: WILLIAMS, 2018



Birds eating English holly berries readily disperse the seeds in urban natural areas. In a 2010 Seattle, Washington study of English holly patches, seven species of birds were observed disseminating seeds by eating the berries (Zika, 2010). American robins were the primary consumers (accounting for 96% of observations) followed by European starlings (Zika, 2010).

Holly trees surveyed in a deciduous tree dominated stand in Pacific Spirit Regional Park were found to have established around 1980. The figure below shows how the exponential growth pattern exhibited from 1960 – 1980 tapered into a linearly growing population by 2018 (Williams, 2018). This area of the park has been observed to have many more berry producing trees than areas dominated by conifer stands. Williams (2018) found 26.2% of trees in alder dominated stands had berries while in a conifer dominated stand only 2% of the plants had visible berries (Worcester, 2018).

## HABITAT AND DISTRIBUTION

English holly is a hardy plant that has adapted to grow in moist forests at low elevations in shade or sun. It is tolerant to a wide range of soil, moisture, temperature and light conditions (Whatcom County Noxious Weed Control Board, 2018).

Its shade tolerance has allowed English holly to invade much of the south coast region of British Columbia, in the Fraser Valley and on Vancouver Island. Seedlings are commonly found in mixed deciduous and coniferous forests, along the edges of wetlands and especially near residential areas. In some parks and natural areas in the Metro Vancouver region, such as Pacific Spirit Regional Park, English holly is a high priority invasive plant targeted for management (Pierzchalski, 2018).

## CLIMATE ADAPTATION

Climate modellers predict that the Metro Vancouver region will experience warmer temperatures; a decrease in snowpack; longer dry spells in summer months; more precipitation in autumn, winter and spring; more intense extreme events; and an extended growing season. In the past, our region had an average of 252 days in the growing season. In lower elevations 45 days will be added to the growing season by the 2050s, and 56 days by the 2080s, resulting in nearly a year-round growing season of 357 days on average. In higher elevation ecosystems the growing season length will increase by 50% to 325 days by the 2080s (Metro Vancouver, 2016). These changes will stress many sensitive ecosystems, increasing their vulnerability to invasive species.

English holly may be able to adapt to our future climate in several ways:

- **Warmer temperatures:** In their study of anatomical change in English holly due to climate change, Rita et al (2015) discovered that this species has the potential to acclimate to increasing temperatures.
- **Longer summer drought periods:** In their study of anatomical change in English holly due to climate change, Rita et al (2015) discovered that this species has the potential to acclimate to water stress. During favorable water conditions, English holly shows a preferential allocation of resources to growing taller rather than growing wider, resulting in the trees accessing more advantageous light conditions in the upper tree canopy (Rita et al, 2015) compared to other species.

With these kinds of competitive advantages, English holly species is more adaptable than native species in a variety of ecosystems and suggest that it will be able to withstand, and possibly thrive, with changing climate conditions.

## Identification

**Lifecycle:** Perennial shrub 2–10 metres tall or sometimes a tree up to 16 metres. Plants may have a single trunk or multiple stems (Whatcom County Noxious Weed Control Board, 2018). English holly plants can live over 250 years and research indicates that individuals over 10 years old show a very low mortality rate and accelerating growth, indicating the species' high chance for success (Stokes, Church, Cronkright, & Lopez, 2013).

**Stem:** Erect, with spreading branches, minute hairy branchlets. Bark is green on young plants, and smooth, silver to grey on mature plants.

**Leaves:** Egg-shaped, 2.5–6 centimetres long, alternate, evergreen, leathery, glossy, wavy, and with stiff, sharp spines on the leaf margins. Mature leaves may have smooth leaf margins with few or no spines. Leaves are normally dark green. Variegated leaves are also seen in horticulture varieties.

The following photos show English holly plant parts.



Typical spiny holly leaves

CREDIT: DAWN HANNA



Mature leaves (note less spines and smoother leaf margins)

CREDIT: ISCMV



Variegated leaves

CREDIT: JOHN RUTER, UNIVERSITY OF GEORGIA, BUGWOOD.ORG





Female flowers  
(with large green  
ovary in the middle)  
CREDIT: [USANPN](#)  
[PHENOPHASES, FLICKR](#)



Male flowers  
(with 4 long stamens)  
CREDIT: [BJORN S...,](#)  
[FLICKR](#)



Female plant in  
winter (with berries)  
CREDIT: ISCMV



Male plant in winter  
(without berries but  
remnants of male  
flowers)  
CREDIT: ISCMV



Bark of a mature  
holly tree (white  
spots are lichen)  
CREDIT: ISCMV

## SIMILAR SPECIES

### NATIVE

English holly is commonly mistaken for varieties of the genus *Mahonia* (Oregon grape). There are 2 native *Mahonia* species in the Metro Vancouver region, *M. nervosa* and *M. aquifolium* (Klinkenberg, 2017) – both have blue berries with alternate, evergreen, pinnate leaves with less prominent spines than English holly leaves.



*Mahonia nervosa*  
Dull Oregon grape  
CREDIT: RICHIE STEFFEN,  
GREAT PLANT PICKST



*Mahonia aquifolium*  
Tall Oregon grape  
CREDIT: UBC BOTANICAL  
GARDEN



*Ilex opaca*  
American holly  
CREDIT: [DENDROICA CERULEA, FLICKR](#)

### NON-NATIVE

There are hundreds of holly species worldwide. *Ilex opaca* (American Holly) is found in the region. The Invasive Species Council of British Columbia's '[Grow Me Instead](#)' Program brochure suggests the following *Ilex* varieties as non-invasive ornamental alternatives to *Ilex aquifolium*: *I. x meservae* (Meserve hollies) and *I. x aquipernyi* (San Jose holly).

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## Tracking

The Provincial government maintains the [Invasive Alien Plant Program \(IAPP\) application](#) (British Columbia Ministry of Forests, Lands and Natural Resource Operations and Rural Development, 2017), which houses information pertaining to invasive plant surveys, treatments, and monitoring. Many agencies, including local governments, have their own internal invasive species inventory and mapping protocols that are used by staff, contractors and, in some cases, the public. For example, the City of North Vancouver has its own system called AlienMap. Agencies in British Columbia that do not enter data into IAPP are encouraged to check it regularly because it contains public reports and data from other agencies and it is important to consider as much data as possible when making management decisions. The Map Display module of IAPP is publicly accessible.

When carrying out English holly inventory it is useful to record the following information as it will later inform treatment plans:

- Size and density of infestation;
- Location in relation to the 10 metre Pesticide Free Zone adjacent to water courses; and
- Location in relation to other water sources, such as wells.

## Reporting

Please report English holly occurrences to:

- The Provincial Report Invasive Species program (via smart phone app [www.gov.bc.ca/invasive-species](http://www.gov.bc.ca/invasive-species)).
- The Invasive Species Council of Metro Vancouver: 1-604-880-8358 or [www.iscmv.ca](http://www.iscmv.ca)
- The municipality where the English holly was found
- The landowner directly – If the landowner is unknown, the [Invasive Species Council of Metro Vancouver](#) can provide support to identify the appropriate authority

Reports submitted through these channels are reviewed by invasive species specialists who coordinate follow-up activities when necessary with the appropriate local authorities. However, some people may be hesitant to report infestations as their presence may affect property values.

# Prevention and Control Strategies

Effective invasive plant management may include a variety of control techniques ranging from prevention, chemical, manual, mechanical, biological and/or cultural methods. Each method is described below in order of effectiveness. Follow-up monitoring and treatment will be required for several years regardless of the treatment technique.

Efforts to control English holly are varied throughout the region. It is a popular plant for volunteers and stewardship groups to tackle. The Pacific Spirit Park Society has a dedicated group (formerly called the “Holly Haulers”, now the EcoTeam) who tackle this plant specifically throughout the year (Pierzchalski, 2018).

To avoid scratches or injury from the prickly leaves, wear eye protection, long pants, long sleeves, sturdy footwear and work gloves when working around English holly (Pacific Spirit Park Society, 2018). Children and pets should be kept away from English holly berries. If ingested, vomiting should not be induced. Call the British Columbia Poison Control Centre (24-Hour Line: 1-800-567-8911 or 604-682-5050), or for pets contact a local veterinary emergency clinic.

**STRATEGY COLOUR LEGEND**

**GREEN: RECOMMENDED**

**ORANGE: CAUTION**

**RED: NOT RECOMMENDED OR NOT AVAILABLE**

## PREVENTION: IMPERATIVE

**Prevention is the most economical and effective way to reduce the spread of English holly over the long term.**

When working in or adjacent to English holly, it is best to inspect and remove plants, plant parts, and seeds from personal gear, clothing, pets, vehicles, and equipment and ensure soil, gravel, and other fill materials are not contaminated with English holly before leaving an infested area. Plants, plant parts, and seeds should be tarped or bagged before transport to an appropriate disposal site (see Disposal section).

English holly is readily sold as a horticulture plant or hedge throughout British Columbia. For some people, the plant holds cultural value as the berries and foliage are prized for holiday wreaths and crafts. However, it is recommended to avoid selling, planting, propagating, trading and otherwise encouraging the desire and spread of this plant in the region. Non-fruiting varieties of English holly should also be avoided due to the plant’s capacity for vegetative spread. Instead, regional native or non-invasive plants should be used. The Invasive Species Council of British Columbia’s [‘Grow Me Instead’ Program](#) or [Metro Vancouver’s Grow Green website](#) provide recommendations for non-invasive, drought-tolerant plants, and garden design ideas. All materials (e.g., topsoil, gravel, mulch, compost) should be weed-free. Healthy green spaces are more resistant to invasion by invasive plants, so it is also important to maintain or establish healthy plant communities.



## MANUAL/MECHANICAL: RECOMMENDED

Control will be most effective if the entire plants (roots and all) are removed (MacKenzie, 2018) (Pacific Spirit Park Society, 2018). Any remaining underground parts will re-sprout. Multiple follow-up removals are required (MacKenzie, 2018). The following manual/mechanical methods can be used on their own, or in combination, to control English holly:

- **Pulling or digging**

- **Small plants (up to 3 centimetres in diameter)** removed by hand can be effective when the soil is moist (MacKenzie, 2018). Small seedlings should be pulled soon after they first appear. For sprouts that don't come out easily by hand, digging around the plant with a shovel or pick will help loosen the soil (Pocock, 2018).
- **Medium-sized plants (trunks up to 10 centimetres in diameter)** may be pulled, dug or excavated using a manually-operated tool (e.g. Weed Wrench®, Extractigator® and others) that removes entire plants via a base with powerful jaws and a handle that uses leverage to pry the roots from the ground. For plants with many branches and prickly leaves, consider first using hand saws, pruners or loppers to cut the branches, followed by cutting the trunk to a height of about 1 metre from the ground, allowing for easier root removal (Pacific Spirit Park Society, 2018). To extract the roots, choose a pickaxe, shovel, extracting tool described above, or similar tool to loosen the roots and remove the entire plant (Pierzchalski, 2018). For larger plants, rock the plant back and forth in different directions or knock it down to help pry it out of the ground (MacKenzie, 2018). The position of extracting tools may need to be adjusted to grasp newly exposed lower portions of the plant as you work (Pacific Spirit Park Society, 2018). It may be necessary to uncover the roots with your hands and use clippers or loppers to cut them as you go if they do not come out easily. All roots should be removed, even if they have been cut.

For safety reasons, some volunteer groups in the region do not remove plants that are greater than 5 centimetres in diameter; larger plants are left for staff with tree removal training or are treated with herbicide (Worcester, 2018). Mature plants and trees have deep and extensive roots so removing them is labour-intensive and expensive and may cause significant soil disturbance. Removal of large trees should only be undertaken by professional arborists.

It is desirable to remove as much of the plant as possible (Stanley Park Ecology Society, 2012), which may be difficult, as the roots are very long and often grow laterally (Pierzchalski, 2018) or can be intertwined around other plant roots or rocks (Pocock, 2018). Disturbance of the soil may encourage germination of seeds in the soil, so monitoring after pulling and digging is essential (Whatcom County Washington, 2018).

Follow up treatments are critical to successful manual treatment of holly (Worcester, 2018). A local study of holly treatment sites at 4 and 9 years following one-time manual removal, found the mean holly stem abundance was not significantly less than in control sites. In fact, at one site, holly stem abundance was greater than in the control (Haines, Cameron, & Hughes, 2016).

- **Girdling** or ring-barking is possible for large plants and trees. This technique should only be undertaken by professionals who have experience using this technique. The plant should be girdled as low to the ground as possible by cutting into the bark using a handsaw or chainsaw and removing a strip from around the entire circumference of the tree. There should be no branches below where the girdling occurs. The width of the girdle should be about the same as the diameter of the tree itself and the depth of the incision should be at least 1 centimetre (Worcester, 2018). Make a complete ring around the tree ensuring that the tree is unable to transport nutrients from the roots into the tree, and it will eventually die (MacKenzie, 2018).



Holly tree with lower branches removed

CREDIT: ISCMV

Holly wood is quite hard and girdling may be more difficult compared to other tree species (Worcester, 2018). This technique should not be used in areas where there is concern about the tree falling after it dies, unless there are plans to cut down or remove the tree at this point (MacKenzie, 2018). Dead holly trees left onsite can also increase the fire hazard and should be assessed by a professional.

- **Cutting** holly at the base will usually result in re-sprouting (MacKenzie, 2018). Monitoring and repeated follow-up cutting of any re-growth may suppress the plant over time (Whatcom County Noxious Weed Control Board, 2018), but this method will likely not kill the plants. It may result in multi-stemmed thickets so should be undertaken with

caution. Cutting can be done using pruners, loppers or hand saws.

Cutting is recommended when it can be done in combination with cut surface herbicide application, outlined below (Salisbury, 2013). It can also be used to control lower branches of large English holly trees to prevent layering (Stanley Park Ecology Society, 2012). Remove any branches on the lower part of the trees that are growing close to the ground (see photo).

For larger plants that cannot otherwise be removed or as a short-term management strategy, cutting can also be used to remove berries to prevent seed spread (Pocock, 2018).

- **Brush cutting or mowing** will not be successful with English holly as it does not target the roots and it will grow back (MacKenzie, 2018). Furthermore, these techniques are not possible on large woody shrubs or trees.
- **Prescribed burning** is not recommended for English holly. Although holly wood burns easily, only moderate success is seen with prescribed burning and treatments need to be repeated (DiTomaso & Kyser, 2013). English holly leaves produce flammable vapour when heated, causing them to ignite easily, posing a fire risk (King County Noxious Weed Control Program, 2018). Further, prescribed burning is not selective and may require a permit from the local fire department.

Removal of female plants should be prioritized first to prevent further production of berries, especially if not all plants can be managed in one season. Seeds can still be viable and can germinate after they have been cut, so be sure to follow disposal recommendations (below) when dealing with plants with berries (Evergreen, 2015).

## REMOVAL TIMING

English holly can be removed throughout the year. However, as berries can persist for many months, undertaking manual control methods prior to berry maturation or including a plan for removing and disposing of the berries during treatment

is ideal. Often holly is managed by crews during the winter months as other high priority plants are targeted during the spring and summer and holly management is possible in the winter (Hendel, 2018). One advantage of conducting management in the winter is that English holly is easy to spot and access since deciduous plants will have lost their leaves (MacKenzie, 2018).

During the hottest part of the summer, English holly plants may be dry and brittle, and branches and roots may be more likely to break during treatment; similarly, during extreme cold and frost, plants may be frozen and easily snap (Pocock, 2018).

As with all environmental activities, caution must be taken to avoid disturbing wildlife throughout the year, especially nesting birds. While birds are not commonly known to nest in English holly, some will eat English holly berries (Pierzchalski, 2018) and use holly for perching and cover (Voth, 2018).

### APPLYING MANUAL/MECHANICAL CONTROL METHODS IN RIPARIAN AREAS

English holly often grows in large contiguous patches right up to the edge of water courses. Consider the impact of control techniques and the resulting bare soil on the adjacent aquatic environment. Schedule removal works during a period of least risk to fish species, outside of the [fish window](#). Adhere to Provincial and Federal riparian regulations. It is recommended to consult with a qualified environmental professional when working around water bodies.

### CHEMICAL: CAUTION

When alternative methods to prevent or control invasive plants are unsuccessful, professionals often turn to herbicides. Chemical control may be required to control large English holly infestations that are not feasible to only control manually/mechanically, but this method should be used with caution for the following reasons (Crosby, 2018):

1. Weather conditions greatly influence treatment efficacy;
2. English holly may grow in riparian areas where pesticide use is restricted; and
3. Native vegetation is often integrated with English holly infestations. Mortality of non-target plants is possible.

With the exception of substances listed on Schedule 2 of the [Integrated Pest Management Regulation](#), the use of herbicides is highly regulated in British Columbia. Site characteristics must be considered with herbicide prescribed, based on site goals and objectives and in accordance with legal requirements. [This summary of the Integrated Pest Management Act](#) provides an overview of the Provincial legislation.

### PESTICIDE LICENCE AND CERTIFICATION

A valid pesticide licence is required to:

- offer a service to apply most pesticides;
- apply most pesticides on public land including local government lands<sup>1</sup>; and
- apply pesticides to landscaped areas on private land, including outside office buildings and other facilities.

<sup>1</sup> on up to 50 hectares/year by a single organization. Organizations looking to treat over 50 hectares of land per year are also required to submit a Pest Management Plan and obtain a Pesticide Use Notice confirmation.



Pesticide applicator certificates can be obtained under the category 'Industrial Vegetation Management' to manage weeds on industrial land, roads, power lines, railways, and pipeline rights-of-way for control of noxious weeds on private or public land. Assistant applicator training is also available and the [online course and exam](#) are free.

It is best practice for personnel supervising or monitoring pesticide contracts to also maintain a pesticide applicator licence so they are familiar with certification requirements.

For more information on how to obtain a licence and the requirements when working under the Provincial [Integrated Pest Management Act and Regulation](#), please review the Noxious Weed & Vegetation Management section on this webpage: [gov.bc.ca/PestManagement](http://gov.bc.ca/PestManagement).

Pesticides (e.g., herbicides, insecticides, fungicides) are regulated by the Federal and Provincial government, and municipal governments often have pesticide bylaws.

- Health Canada evaluates and approves chemical pest control products as per the [Pest Control Products Act](#).
- The [Integrated Pest Management Act](#) sets out the requirements for the use and sale of pesticides in British Columbia. This Act is administered by the Ministry of Environment and Climate Change Strategy.
- Several municipalities have adopted bylaws that prohibit the use of certain pesticides.

Everyone who uses pesticides must be familiar with all relevant laws.

ONLY companies or practitioners with a valid Pesticide Licence and staff who are certified applicators (or trained assistant applicators working under a certified applicator) may apply herbicide on invasive plants located on public lands in British Columbia. Applicators must be either the land manager/owner or have permission from the land manager/owner prior to herbicide application.

On private property the owner may obtain a Residential Applicators Certificate (for Domestic class products only) or use a qualified company. Residents do not require a Residential Applicator Certificate for certain uses of domestic class glyphosate including treatment of plants that are poisonous for people to touch, invasive plants and noxious weeds listed in legislation, and weeds growing through cracks in hard surfaces such as asphalt or concrete. Refer to the 'Pesticides & Pest Management' and 'Home Pesticide Use' webpages listed in the Additional Resources Section for more information.

Questions? Contact the Integrated Pest Management Program: Telephone: (250) 387-9537  
Email: [bc.ipm@gov.bc.ca](mailto:bc.ipm@gov.bc.ca)

## HERBICIDE LABELS

Individual herbicide labels must always be reviewed thoroughly prior to use to ensure precautions, application rates, and all use directions, specific site and application directions are strictly followed. Under the Federal *Pest Control Products Act* and the Provincial Integrated Pest Management Regulation, **persons are legally required to use pesticides (including herbicides) only for the use described on the label and in accordance with the instructions on that label.** Failure to follow label directions

could cause damage to the environment, poor control results, or danger to health. Contravention of laws and regulations may lead to cancellation or suspension of a licence or certification, requirement to obtain a qualified monitor to assess work, additional reporting requirements, a stop work order, or prohibition from acquiring authorization in the future. A conviction of an offence under legislation may also carry a fine or imprisonment.

Herbicide labels include information on both the front and back. The front typically includes trade or product name, formulation, class, purpose, registration number, and precautionary symbols. Instructions on how to use the pesticide and what to do in order to protect the health and safety of both the applicator and public are provided on the back (British Columbia Ministry of Environment and Climate

Change Strategy, 2011).

Labels are also available from the Pest Management Regulatory Agency's [online pesticide label search](#) or [mobile application](#) as a separate document. These label documents may include booklets or material safety data sheets (MSDS) that provide additional information about a pesticide product. Restrictions on site conditions, soil types, and proximity to water may be listed. If the herbicide label is more restrictive than Provincial legislation, the label must be followed.

### HERBICIDE OPTIONS

The following herbicides can be used on English holly; although not specifically listed on these herbicide labels English holly may be treated under the general application provision for woody plants.

ACTIVE INGREDIENT (EXAMPLE BRAND NAMES)+	APPLICATION	PERSISTENCE	GROWTH STAGE	TYPE++
Triclopyr (e.g. Garlon™)	basal bark, cut surface, foliar	residual	actively growing (just before cut)	selective, no effect on grasses
Imazapyr (e.g. Arsenal™)	cut surface, foliar	residual	actively growing (just before cut)	non-selective
Glyphosate (many products)*	stem injection, cut surface, foliar	non-residual	actively growing	non-selective

+ The mention of a specific product or brand name of pesticide in this document is not, and should not be construed as, an endorsement or recommendation for the use of that product.

++ Herbicides that control all vegetation are non-selective, while those that control certain types of vegetation (e.g. only grasses or only broadleaf plants) are termed selective.

\* Glyphosate is considered the least effective herbicide for use with English holly no matter what method is used (Salisbury, 2013). Glyphosate can impact trees with roots within or adjacent to the treatment area.

## APPLICATION METHODS

Since manual/mechanical control is recommended for English holly plants less than 10 centimetres in diameter, chemical control is usually considered only for larger plants. Cut surface or stump application and stem injection methods have recently been tested in the Metro Vancouver region on English holly trees with varying success rates (Hendel, 2018). Larger scale American programs to chemically control English holly have shown good success using herbicide (Salisbury, 2013).

The preferred application methods to minimize non-target damage are outlined below.

- **Cut surface/stump application** (also known as ‘cut and paint’ or ‘cut stump’) involves cutting the stem as close to the ground as possible and applying herbicide directly to the entire cut surface, immediately after cutting (Whatcom County Washington, 2018). Compared to basal bark application and stem injection, this method usually results in more stump sprouts appearing after treatment (Salisbury, 2013).

This method can be used on any size plant that is too big to be removed by pulling. Use recommendations in the manual control section above for tips on cutting techniques.

Application can be done by a brush or by spray. This treatment can occur anytime during the year except should be avoided in the spring during periods of heavy sap flow or when low temperatures inhibit application of the herbicide due to freezing (Dow AgroSciences, 2018).

## APPLYING PESTICIDE IN RIPARIAN AREAS

Provincial legislation prohibits the use of herbicides within 10 metres of natural water courses and 30 metres of domestic or agricultural water sources on public lands. On private lands herbicide labels need to be followed (which means for glyphosate products treatment can happen up to the water’s edge) and other restrictions may apply (e.g. industrial sites, forestry sites, golf courses, etc.). On public lands, glyphosate is the only active ingredient that can be applied within the 10 metre Pesticide-Free Zone (PFZ)<sup>2</sup> in British Columbia in accordance with the *Integrated Pest Management Act* and Regulation and all public land Pesticide Management Plans (PMPs). A plant must be either a listed Noxious Weed (under the [Weed Control Act](#)) or appear in the *Forest and Range Practices Act Invasive Plants Regulation* to be treated within the 10 metre PFZ. **English holly is not listed and therefore glyphosate and other herbicides can only be applied on English holly up to 10 metres away from the high water mark (HWM)<sup>3</sup>.** The 30 metre no-treatment zone around a water supply intake or well used for domestic or agricultural purposes may be reduced if the licensee or PMP holder is “reasonably satisfied” that a smaller no-treatment zone is sufficient to ensure that pesticide from the use will not enter the intake or well.

2 The Pesticide-Free Zone (PFZ) is an area of land that must not be treated with pesticide and must be protected from pesticide moving into it, under the *Integrated Pest Management Act and Regulation*.

3 The High Water Mark (HWM) is defined as the visible high water mark of any lake, stream, wetland or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river stream, or other body of water a character distinct from that of the banks, both in vegetation and in the nature of the soil itself. Typical features may include, a natural line or “mark” impressed on the bank or shore, indicated by erosion, shelving, changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive physical characteristics. The area below the high water mark includes the active floodplain (British Columbia Ministry of Environment and Climate Change Strategy, 2011).



When managing English holly with herbicide in riparian areas:

- Observe and mark all PFZs while on site.
- The HWM should be determined by careful evaluation by the applicator.
- Distances in PFZs should be measured as horizontal distance.
- Herbicides restricted in a PFZ must not enter these zones by leaching (lateral mobility) through soil or by drift of spray mist or droplets.
- Treatments should be conducted when water levels are low (e.g. summer months) to reduce risk.
- Note that efficacy may be dependent on site conditions, including moisture in the soil.

Monitoring and follow-up treatments are critical as painted stumps will often exhibit re-growth after only one treatment. At the same site, some trees may respond after only one treatment while others may require follow up treatments (Worcester, 2018). Regrowth can occur from the cut stump or laterally from the remaining part of the trunk, sometimes at bizarre angles (Pierzchalski, 2018). The release of the seed bank under cut stumps can also be an ongoing issue (Worcester, 2018). Total control may not be apparent for years after treatment.

- **Stem injection** may be used to insert herbicide capsules around the base of the trunk with an injection lance (such as [EZ-ject®](#)). These hand-held tools are designed to inject herbicide-filled capsules into the base of a tree, stump, or bush with one simple spring-loaded movement. All branches below the application point must be removed (Caldicott, 2019). This technique reduces exposure risk to the applicator and reduces non-target herbicide effects compared to foliar application. The EZ-ject™ treatments is best for larger English holly plants that cannot be removed manually (Voth, 2018).

The number of capsules injected into the trunk depends on the herbicide product and the DBH (diameter at breast height). EZ-ject™ recommends one capsule every 5 centimetres around the circumference at the base of the tree above the root collar but below the lowest live branch (or remove the branch) (EZject™, 2018). If capsules are injected at only one side of the tree, the herbicide will not be transferred adequately and the damage will not be sufficient for full death as the tree will likely heal over the decay (Caldicott, 2019). English holly wood is quite hard and sometimes capsules fall out during application in which case they need to be re-injected (Hendel, 2018). It is essential to follow the protocols for injection otherwise the treatments will not be successful as holly has an amazing capacity to recover if given the chance (Worcester, 2018).

Injections can be successful in either fall or spring. This method may require several weeks or months to show signs of plant death or death of surrounding sprouts (Law, Chookolingo, Soria, & Nathania, 2017).

Stem injection of English holly trees with glyphosate in Pacific Spirit Regional Park was tested in 2017. All of the trees needed to be monitored and took longer than anticipated to show signs of death (Worcester, 2018). Those trees that were treated in fall using the manufacturer's instructions showed signs of death the following summer. Treatments proved difficult and pre-injection prep (i.e. trimming lower branches to gain good access to apply the herbicide around the base in a complete circle) is recommended to ensure success using this method (Worcester, 2018).

- **Basal bark application** involves spraying the base of woody plants or stems and any exposed roots. All sprouts or stems within a 30 centimetre radius of the main stem should be cut or treated at the same time (Salisbury, 2013). Triclopyr is the only herbicide that can be applied with this method.
- **Foliar application** is not recommended on English holly due to the thick, waxy leaves that reduce herbicide absorption and lower efficacy (Whatcom County Washington, 2018). The addition of a surfactant may improve absorption.

Note that after herbicide treatment plants may grow small stem enations or buds that may represent potential new sprouts (Salisbury, 2013). This is much more likely to occur with use of glyphosate, no matter what technique is used, especially after spring treatments (Salisbury, 2013).

## CULTURAL: NOT RECOMMENDED

DiTomaso et al. (2013) observed poor control rates (below 50%) with grazing of English holly. Although goats and other livestock may browse English holly foliage, the berries are poisonous to them as they are to humans (Ohio State University, 2018). Miller, Tarasoff & Salmon (2021) also researched the potential for targeted grazing as a control method, but English holly was deemed an unsuitable candidate due to its toxicity.

## BIOLOGICAL: NOT AVAILABLE

No biological control agents are currently available for distribution in British Columbia. However, there are a few insects and pathogens that pose challenges to holly farmers in British Columbia (British Columbia Agriculture in the Classroom Foundation, 2014). Since holly is prized for its foliage and berries, farmers desire unblemished holly plants. Two species of leafminer ('Holly leafminer' – *Phytomyza ilicis* and 'native holly leafminer' – *Phytomyza illicola*) found in British Columbia since the early 1900s exclusively feed on English and American hollies. Larvae consume the inner tissue of leaves leaving damage appearing as yellow, brown, or reddish mines on the leaves (Hollingsworth, 2018).

Due to the ornamental value of holly, the leafminers themselves are considered the pests, and are targeted for control (Hollingsworth, 2018). There is no data on whether the leafminers would be suitable biocontrol agents in regions where English holly is an undesired species. Similarly, *Phytophthora ilicis*, a leaf and twig blight, has been observed infecting English holly in Canada, causing leaf and berry damage (Pscheidt & Ocamb, 2018). It is also unclear whether this disease is a candidate for future biocontrol of English holly as its current status is an ornamental plant pest.

The British Columbia Institute of Technology carried out a trial at Burnaby Lake Regional Park using Chontrol peat paste, a biological herbicide for the inhibition of re-sprouting and re-growth from cut stumps; the treatment was ineffective (Caldicott, 2019).

## CONTROL SUMMARY

The following table provides a summary and comparison of control methods for English holly.

CONTROL STRATEGY	TECHNIQUES	APPLICABLE SITE TYPE	PROS	CONS
Manual	<b>Pulling or digging</b>	Small to medium sized plants, small infestations	Selective, small plants can be managed by volunteers, inexpensive	Creates disturbance, labour intensive, must remove entire plant, must deal with biomass
Mechanical	<b>Girdling</b>	Large plants, trees	Selective, relatively quick method for killing large plants with no other treatment options, non-chemical	Done by professionals, risk of tree falling once dead
	<b>Cutting</b>	Medium to large plants, trees	Selective, non-chemical, inexpensive, can be used in combination with chemical control	Will not kill the plants, stump sprouts will occur
Chemical	<b>Cut surface/stump application, stem injection, basal bark application, foliar application</b>	Large plants, trees	Treatment method for plants that cannot be managed other ways, less labour intensive, treat large areas, less disturbance of surrounding environment	Some techniques not recommended, unintended environmental/health impacts, high public concern, requires trained staff, speciality equipment and herbicide products
Mechanical	<b>Brush cutting, mowing, burning</b>		Non-chemical	May require trained staff and specialty equipment, burning may be restricted in some municipalities and/or require permits
Cultural	<b>Grazing</b>	Sites accessible to grazing herds	Non-chemical	Requires specially trained herds and special permits, non-selective, complex logistical considerations, unintended environmental impacts
Biological	<b>No biological control agents are currently available for distribution in British Columbia</b>			

### STRATEGY COLOUR LEGEND

**GREEN: RECOMMENDED**

**ORANGE: CAUTION**

**RED: NOT RECOMMENDED OR NOT AVAILABLE**

# Disposal

## ON SITE DISPOSAL

Due to the risk of suckering and rooting, it is best practice to remove as much of the holly roots and stems off site as possible. If sections of cut holly are left for even a year or two, they can continue to grow (Dreves, 2018).

Holly biomass without berries can be chipped with a machine and blown back onto the site (MacKenzie, 2018). Holly berries should not be composted at home or at municipal works yards as the temperature may not be high enough to kill the seeds.

Dead plants and debris left onsite can increase the fire potential and should be assessed for risk.

## OFF SITE DISPOSAL

When disposing off site, transport plant parts on tarps or in thick plastic bags to an appropriate disposal or compost facility. In the Metro Vancouver region, the several facilities accept English holly plants and/or infested soil. Please consult [this disposal facility list](#) for current details.

**PLEASE CONTACT ALL FACILITIES BEFOREHAND TO CONFIRM THEY CAN PROPERLY HANDLE THE MATERIAL.**

## CLEANING AND DISINFECTION<sup>4</sup>

Before leaving a site, all visible plant parts and soil from vehicles, equipment, and gear should be removed and rinsed if possible. When back at a works yard or wash station, vehicles should be cleaned and disinfected using the following steps:

- Wash with 180 °F water at 6 gpm, 2000 psi\*, with a contact time of  $\geq 10$  seconds on all surfaces to remove dirt and organic matter such as vegetation parts or seeds. Pay special attention to undercarriages, chassis, wheel-wells, radiators, grills, tracks, buckets, chip-boxes, blades, and flail-mowing chains.
- Use compressed air to remove vegetation from grills and radiators.
- Sweep/vacuum interior of vehicles paying special attention to floor mats, pedals, and seats.
- Steam clean poor access areas (e.g., inside trailer tubes) – 200 psi @ 300°F.
- Fully rinse detergent residue from equipment prior to leaving facility.

\* Appropriate self-serve and mobile hot power-wash companies in the Metro Vancouver region include: Omega Power Washing, Eco Klean Truck Wash, RG Truck Wash, Ravens Mobile Pressure Washing, Hydrotech Powerwashing, Platinum Pressure Washing Inc, and Alblaster Pressure Washing. Wash stations should be monitored regularly for English holly growth.

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<sup>4</sup> Adapted from Metro Vancouver 2017 Water Services Equipment Cleaning Procedures and Inspection Protocols.



# Follow-up Monitoring

Whatever control method is used, follow-up monitoring and maintenance treatments are components of an integrated management plan or approach.

For **manually treated** sites, follow-up monitoring should take place for at least 4 years following initial treatment. English holly has a relatively short-lived seed bank. Research

suggests that germination typically happens after one-year; seed banks are reduced by 80–90% of the initial seeds after three years (Sagrario & Francisco, 2014).

**Chemical treatments** should be repeated as directed on the herbicide label to control any subsequent growth.

# Restoration

Restoration is recommended to create competition, control English holly regrowth and replace lost habitat. Planting should not take place until control of new seedlings has been conducted.

Mulch can be used to avoid leaving bare soil and reduce colonization from other invasive plant species. The International Society of Arboriculture and relevant municipal Parks or arboriculture departments offer guidelines for mulch application. Specific mulch depths can be used to control invasive weeds and encourage plant growth (International Society of Arboriculture, August).

Examples of common competitive native species prescribed for sites within the Metro Vancouver region are summarized in the table below based on site moisture. Replacement species should be chosen based on the ecology of the site by a qualified environmental professional. Local biologists, environmental professionals, agronomists, agrologists, native and domestic forage specialists, seed companies and plant nurseries are all good sources for localized recommendations for regional native species and regionally adapted domestic species, based on site usage. Native grass seed mixes are also available. There are several science-based resources available to guide restoration efforts, such as the South Coast Conservation Program’s [Diversity by Design](#) restoration planning toolkit.

WET SITES	MOIST SITES	DRY SITES
<b>SHRUBS</b>		
Salmonberry	Salmonberry	Thimbleberry
Hardhack	Willow	Nootka rose
Willow	Red osier dogwood	Red flowering currant
Red osier dogwood	Red elderberry	Snowberry
Pacific ninebark	Vine maple	Tall Oregon grape
	Indian plum	Oceanspray
<b>TREES</b>		
Western red cedar	Western red cedar	Douglas-fir
Red alder	Red alder	Red alder



CREDIT: ISCMV

Plants listed in the “Similar Species” section above would also be suitable restoration species for English holly management sites.

Revegetation of the site to a domestic or cultured non-native plant species composition may be considered in some circumstances. Often domestic species establish faster and grow more prolifically, which aids in resisting English holly re-invasion.

English holly sites are often found in areas with existing, or potential, wildlife populations (e.g. deer, beaver, muskrat, vole, etc.) that can damage restoration plantings. Therefore, any revegetation plan must consider impacts from wildlife and utilize appropriate mitigation measures to protect the restoration and existing native plantings (tree wrapping, exclusion caging/fencing, vole guards, etc.).

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## Additional Resources

For more information please refer to the following resources.

- BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Invasive Alien Plant Program (IAPP). [www.gov.bc.ca/invasive-species](http://www.gov.bc.ca/invasive-species)
- E-Flora BC, an Electronic Atlas of the Plants of British Columbia. [www.eflora.bc.ca/](http://www.eflora.bc.ca/)
- Grow Green Guide. [www.growgreenguide.ca](http://www.growgreenguide.ca)
- Grow Me Instead. <http://bcinvasives.ca/resources/programs/plant-wise/>
- Pesticides and Pest Management. Province of British Columbia <https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management>
- Washington State English Holly. Washington State Noxious Weed Control Board. <https://www.nwcb.wa.gov/weeds/english-holly>

## Acknowledgments

The project team would like to thank the following individuals and groups for their contributions related to the development and review of this document:

Amy Hendel, Diamond Head Consulting Ltd.

Angela Crampton, City of Port Moody

Caitlin Pierzchalski, Pacific Spirit Park Society

Kari Pocock, District of West Vancouver

Keith MacKenzie, Diamond Head Consulting Ltd.

Krista Voth, City of Vancouver

Lisa Dreves, Langley Environmental Partners Society

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