

Washington Invasive Ranking System

Washington Natural Heritage Program

Ilex aquifolium (English Holly)

Assessed by

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Ecological Impact Rank: **High** (88)

Confidence: **High** (75)

Management Difficulty Rank: High (75)

Confidence: Moderate (60)

Biological Characteristics of Invasiveness: High (90)

Confidence: High (75)

Concern Related to Distribution and Abundance: High (93)

Confidence: High (80)



Photo Credit: David Giblin 2022, used under Creative Commons license (Burke Herbarium, University of Washington, 2024).

Ranking Notes

Ilex aquifolium was assessed by multiple individuals. Range of assessor ratings is provided in parentheses following the final assigned rating.

Ilex aquifolium escapes in the U.S. are domesticated cultivars, so information on species biology and ecology were taken from research done in the U.S., when possible. Studies from *I. aquifolium*'s native range frequently target wildtype plants that are less competitive than cultivars bred by horticulturalists, meaning comparisons between the two populations may not be relevant (Valladares et al., 2005).

Legal Listings

[Washington State Weed Board](#): Monitor list. However, many counties in Washington actively control this species.

[Washington Invasive Species Council](#): No

Section 1: Distribution and Abundance

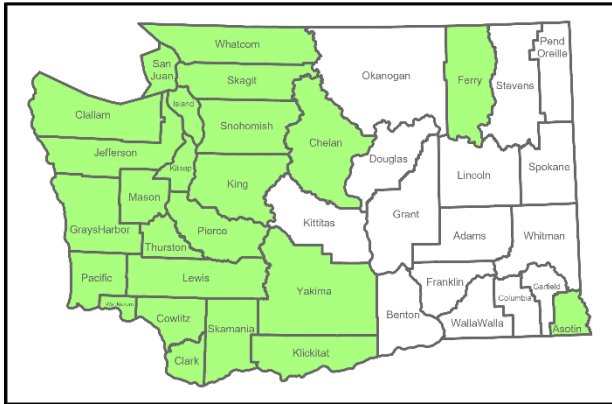


Figure 1. Distribution of counties where *Ilex aquifolium* has been documented in Washington State (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024).

Q1: Current Range Size in Washington

Rating: High

Confidence: High

Ilex aquifolium is reported from 24 out of 39 counties (62%) in Washington (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024).

Source: Professional expertise, Herbarium records and other observations

Q2: Current Trend in Total Range

Rating: High

Confidence: High

Ilex aquifolium populations are mostly limited to the west side of the Cascades in Washington, though this species has been reported twice from Ferry County and once from Asotin County in eastern Washington (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024). However, models predict that this species is capable of spreading to all counties in Washington (EDDMapS, 2024).

Source: Professional expertise, Herbarium records and other observations

Q3: Proportion of Potential Range Currently Unoccupied

Rating: Low

Confidence: High

Ilex aquifolium has been reported from 59% of the counties in Washington (CPNWH, 2024; EDDMapS, 2024; iNaturalist Community, 2024). However, this species' potential range encompasses the entire state (EDDMapS, 2024), suggesting it is still capable of significant expansion.

Source: Professional expertise, Herbarium records and other observations, Model predictions.

Q4: Local Range Expansion or Change in Abundance

Rating: High

Confidence: Moderate (range Moderate - High)

Research supports rapid local expansion of *I. aquifolium* populations in western Washington (Church, 2016). The earliest recorded escaped *I. aquifolium* observations are from the 1960s, the first herbarium collection was made in 1987, and by 2010, naturalized populations had been documented in all urban areas west of the Cascades (Zika, 2010).

A study at St. Edward's Park in Seattle found that *I. aquifolium* had an average density of 55 stems per hectare in 2012. Data found the population established in 1966, showed little mortality and exhibited exponential growth with no sign of slowing (Stokes et al., 2014). This also indicates that *I. aquifolium* is increasing locally at the same time as expanding its range in Washington.

iNaturalist observations also indicate that *Ilex aquifolium* may be rapidly infilling habitat in western Washington (iNaturalist Community, 2024), though such trends may be tied to an increasing user base.

Source: Published research, Professional expertise, iNaturalist observations, Thesis

Q5: Diversity of Ecosystems Invaded

Ecosystem types: Forest & Woodland, Grassland & Shrubland, Forested Wetland

Rating: Moderate

Confidence: Moderate

Ilex aquifolium invades mesic forests, woodlands, and riparian areas, as well as disturbed sites such as roadsides and edge habitats (Zika, 2010). This species' ability to invade undisturbed forests has the

potential to significantly alter forest understory and structure in Washington (Stokes et al., 2014). *Ilex aquifolium* may not be particularly cold or drought tolerant (Valladares et al., 2005; Pachura et al., 2021) and appears most successful in western Washington.

Source: Published research, Professional expertise

Section 2: Biological Characteristics

Q6: Aggressive Mode of Reproduction

Rating: Yes

Confidence: High

Ilex aquifolium is dioecious and reaches reproductive age at approximately 15 years. This species reproduces readily both vegetatively and from seed, grows rapidly, and sprouts readily from both living and cut stems. Vegetative reproduction occurs via suckers, layering, and roots. Thickets expand from a founder tree by means of root suckers and adventitious roots, and can also root from limbs or trunks where they touch the ground (Zika, 2010; Stokes et al., 2014; NWCB, 2022). While *Ilex aquifolium* can experience relatively rapid growth for a tree, invasions by tree species move slowly and can go unnoticed until populations are well-established and difficult to control (Church, 2016).

A study in western Washington found that consumption and regurgitation by American Robins (the most common seed dispersal mechanism for *I. aquifolium*) did not affect germination. The same study found that seed predation by rodents is rare in urban areas, but that rodents consume up to 39% of dispersed *I. aquifolium* seeds outside of urban areas. In forested areas, up to 76% of seeds were either damaged or non-viable. Differences in seed predation may explain why *I. aquifolium* is generally more abundant in urban and residential areas than in natural areas (Zika, 2010).

Source: Published research, Informal publication, Thesis

Q7: Innate Potential for Long-Distance Dispersal

Rating: Yes

Confidence: High

Ilex aquifolium is dispersed by many frugivorous birds, which may prefer holly berries to native fruits (NWCB, 2022). These birds aid dispersal to remote places (e.g., seldom visited islands in the San Juan Islands) (NWCB, 2022). American Robins are by far the most common consumer of *Ilex* fruits in western Washington (Zika, 2010). Robins account for 96% of *I. aquifolium* fruit consumption and observations suggest that they are excellent and prolific long-distance dispersal agents for *I. aquifolium* seeds (Zika, 2010).

Source: Published research, Informal publication, Professional expertise

Q8: Potential to be Spread by Human Activities

Rating: Yes

Confidence: High

Ilex aquifolium is a popular ornamental, planted both for appearance and for backyard habitat. This species also grows well in disturbed areas and edge habitats created by human activities (Zika, 2010). Timber harvest may also increase growth and abundance in *I. aquifolium* populations (Church, 2016).

Source: Published research, Thesis

Q9: Allelopathy

Rating: Yes

Confidence: Low

A literature search did not find information regarding allelopathy in *Ilex aquifolium*. However, other species of *Ilex*, such as *Ilex paraguariensis* (yerba mate) and *Ilex vomitoria* (yaupon), are known for their caffeine content, which can function as an allelopathic chemical in plants. Other *Ilex* species produce saponins, which may also be allelopathic (Coelho et al., 2010). *Ilex aquifolium* does not produce caffeine. However, it does produce a suite of other secondary compounds (Pachura et al., 2021), including known defensive chemicals (Valladares et al., 2005). At least some of these chemicals may be allelopathic.

Source: Published research, Professional expertise

Q10: Competitive for Limiting Abiotic Factors

Rating: Yes

Confidence: Moderate

Studies have found reduced native vegetation cover beneath *I. aquifolium* canopies, with the densest thickets completely excluding native plants (Stokes et al., 2014). *I. aquifolium* can grow deep roots (NWCB, 2022)—in its native range, it frequently grows in nitrogen deficient soil (Valladares et al., 2005). Studies from its native range also suggest that *Ilex aquifolium* is less competitive at cooler temperatures (Valladares et al., 2005).

Source: Published research, Informal publication, Professional expertise

Q11: Growth Form

Rating: Yes

Confidence: High

Ilex aquifolium is capable of developing dense monocultural stands that exclude all other species (Stokes et al., 2014). This species may form dense evergreen foliage all the way to the ground, and it suckers and layers readily. It creates a thick skirt of fallen leaves at its base, which allows the lower branches (now buried) to root. When knocked down by falling limbs and trees, it roots wherever it touches the ground, so individual plants can have many rooted stems.

Source: Published research, Professional expertise

Q12: Germination Requirements

Rating: Yes

Confidence: Moderate

Research from Spain, within *Ilex aquifolium*'s native range, found that this species germinated best at forest edges, but was also capable of germinating within forests and grasslands. No information was found indicating that this species requires open ground to germinate, but given its ability to invade undisturbed areas and its habit as a late successional species in its native range (Arrieta & Suárez, 2004), it seems likely

that this species does not require bare soil for germination.

Source: Published research, Professional expertise

Q13: Invasiveness of Other Plants in Genus

Rating: Yes

Confidence: High

As of 2010, *Ilex opaca* and *Ilex crenata* have very occasionally been documented as escapes in Washington (one individual of *I. opaca* in King County and two individuals of *I. crenata* in Snohomish County) (Zika, 2010). Neither of these species are regarded as invasive in Washington, but *Ilex crenata* is considered invasive on the east coast of the U.S. (EDDMapS, 2024). Another introduced species, *Ilex cornuta*, is invasive in the southeastern U.S. (EDDMapS, 2024). *Ilex vomitoria* can also be invasive in parts of the U.S. outside of its native range (Schnelle, 2019).

Source: Published research, Professional expertise, Informal publications, reported observations

Q14: Shade Tolerance

Rating: High

Confidence: High

In Washington, this species has established in the understory throughout westside forests, in both disturbed and undisturbed areas, and can also be found in clearcuts, oak woodlands, or other areas with full or partial sun.

In its native habitat, *Ilex aquifolium* is a late-successional species (Arrieta & Suárez, 2004). Research from Spain suggests that in cool and wet climates, *I. aquifolium* can survive in sunny areas, but in hot, dry climates, *I. aquifolium* is constrained to shaded areas. Seedlings have greatest survival in 12% sunlight and minimal survival in both full shade and full sun. In areas with deep shade, *I. aquifolium* reproduces vegetatively and not via seed (Valladares et al., 2005).

Source: Published research, Professional expertise

Q15: Disturbance Tolerance

Rating: Yes

Confidence: Moderate

Ilex aquifolium is described as a late-successional species in its native range (Arrieta & Suárez, 2004). However, in Washington this species is also found in disturbed areas (NWCB, 2022) and is common in urban and residential areas, along roadways and in other anthropogenically disturbed sites (Zika, 2010). *Ilex aquifolium* resprouts readily after cutting, and layers from branches and trunks if plants are knocked down.

Source: Published Research, Informal Publication, Professional Expertise

Q16: Propagule Persistence

Rating: <5 years

Confidence: Moderate

A study from Spain, within the native range of *Ilex aquifolium*, found that the seedbank was 80%–90% depleted after three years. This species has seeds with woody outer shells and underdeveloped embryos, requiring a year of dormancy before seeds can germinate. Seeds break dormancy in grasslands and edges sooner than in woodlands. Estimated seed bank persistence is three to five years (Arrieta & Suárez, 2004).

Source: Published Research

Q17: Palatability

Rating: Yes, plant is unpalatable

Confidence: High

Herbivory results in increased spine development in *Ilex aquifolium* leaves and the bark produces defensive chemicals (e.g., methanol) that deter herbivory (NWCB, 2022). This species also produces a suite of other secondary compounds, several of which are herbivory defensive mechanisms (Valladares et al., 2005).

Cows and horses will browse *I. aquifolium* in the winter in this species' native range (Arrieta & Suárez,

2004). However, this does not suggest that *I. aquifolium* is preferred over other species.

Source: Published Research, Informal Publication, Professional Expertise

Section 3: Ecological Impact

Q18: Impact on Ecosystem Abiotic Processes

Abiotic Processes: Fire, Nutrient dynamics, Light availability, Chemistry

Rating: High (range Moderate - High)

Confidence: High

Ilex aquifolium can reduce light availability to understory communities by establishing a new sub-canopy tree or shrub layer in both logged and unlogged forests (Stokes et al., 2014). *Ilex* thickets may increase fire risk in invaded forests because it is highly flammable and potentially creates a new sub-canopy layer (Stokes et al., 2014; NWCB, 2022). On the other hand, when ignitions occur, stand-replacing fires are already the historical norm in the western Washington ecosystems where *Ilex aquifolium* is most prevalent.

Ilex aquifolium also affects nutrient cycles and soil chemistry, increasing sulfur content and lowering soil pH (NWCB, 2022). It grows in thickets that can shade out other understory species (Stokes et al., 2014). In western Washington, this species is also drought-tolerant relative to many native species. Because *I. aquifolium* is difficult to manage, changes to ecosystem processes may effectively be irreversible.

Source: Published research, Informal publication, Professional expertise

Q19: Impact on Ecosystem Structure

Rating: Moderate

Confidence: Moderate (range Moderate - High)

Ilex aquifolium is capable of creating a new sub-canopy layer in invaded forests and woodlands in Washington (Stokes et al., 2014). This species is most competitive in shaded conditions (Valladares et al., 2005), making conversion of grasslands to shrublands



or woodlands unlikely. However, in cool, wet climates, *I. aquifolium* can survive in full sun (Valladares et al., 2005), suggesting that this species may also be able to invade grasslands in western Washington, at least occasionally.

Source: Published research, Professional expertise

Q20: Impact on Ecosystem Composition

Rating: High

Confidence: High

In Washington, native plant cover may be reduced or absent beneath dense *Ilex aquifolium* canopies (Stokes et al., 2014) and this species can all but eliminate native tree and shrub recruitment. In oak woodlands, *I. aquifolium* can occur with a suite of other invasives, including *Cytisus scoparius* and *Rubus bifrons*.

Source: Published Research, Professional Experience

Q21: Impact on Particular Native Species

Rating: Low

Confidence: Moderate

Ilex aquifolium can be a host for the invasive plant pathogen sudden oak death (*Phytophthora ramorum*) (NWCB, 2022; USDA APHIS, 2024). No data was available on how this changed disease burden in oaks. However, at least one study found this disease to be common in the Pack Research Forest in western Washington (Church, 2016).

Source: Informal publication, Professional expertise, Thesis

Q22: Observed Ability to Invade Undisturbed Ecosystems

Rating: High

Confidence: High

Ilex aquifolium is described as a late successional species in its native range (Arrieta & Suárez, 2004) and has been documented as naturalized in old-growth forests west of the Cascades (Zika, 2010).

Source: Published research, Professional experience

Q23: Observed Ability to Invade Naturally Disturbed Ecosystems

Rating: Yes

Confidence: High

Ilex aquifolium can invade oak woodlands, which rely on disturbance to maintain their structure and composition. This species is also known from edges habitats and other disturbed areas.

Source: Professional experience

Section 4: Management Difficulty

Q24: General Management Difficulty

Rating: High

Confidence: High

Ilex aquifolium is expensive and time-consuming to manage. Mechanical removal (pulling and cutting) can be effective, if monitoring continues after removal. Removal is most effective when combined with chemical treatments to prevent or reduce suckering from cut stumps. The leaves are resistant to foliar herbicide due to their thick, waxy cuticles. Injecting trees with herbicide is the most effective—and expensive—option (NWCB, 2022).

Ilex aquifolium's ability to root from its lower branches or anywhere a limb or trunk touches the ground means that basal herbicide injections are difficult. Each plant can have many rooted stems, and each one must be treated individually; herbicide transfer between stems appears minimal.

Source: Informal publication, Professional expertise

Q25: Minimum Time Commitment

Rating: High

Confidence: Moderate

Control of *Ilex aquifolium* requires multiple years of effort. This species sprouts readily from its roots when cut and its seeds are dispersed over long distances by birds (NWCB, 2022), making re-invasion possible even without nearby source populations.

Source: Informal Publication, Professional Expertise

Q26: Impacts of Management on Native Species

Rating: Low

Confidence: Low (range Low - Moderate)

Effective treatments for *Ilex aquifolium* generally target this species directly, either by hand removal or by direct application of pesticides to the tree (NWCB, 2022). While this treatment method could potentially also affect surrounding plants, generally few native plants are present under *I. aquifolium* canopies and negative effects of treatment on co-occurring native species has not yet been observed. Collateral damage to native species is probably minor and likely outweighed by the benefits of removing an invasive competitor.

Source: Informal publication, Professional expertise

Q27: Inaccessibility of Invaded Areas

Rating: Moderate

Confidence: Moderate

Ilex aquifolium is most abundant in urban and residential areas (Stokes et al., 2014). However, seed dispersal by birds and other animals allows for this species to reach and establish in quite remote and inaccessible areas, as well (Zika, 2010).

Source: Published Research, Professional Expertise

Q28: Sociopolitical Implications of Management

Rating: Moderate/Low (range Insignificant - Moderate/Low)

Confidence: High (range Moderate - High)

Growers in the Pacific Northwest supply up to 90% of the holly vegetation used as holiday greenery in the U.S. (NWCB, 2022). This species is also popular as an ornamental, in part because its berries also attract many birds to people's yards (Zika, 2010). These could potentially result in objections to treatments for this species in Washington State. However, given the potential for *I. aquifolium* to have negative impacts on growing merchantable timber for harvest and to increase fire danger (Church, 2016; NWCB, 2022),

and treating this species may not be sociopolitically difficult.

While objections to *I. aquifolium* control are uncommon, the sources of new populations are unlikely to be removed from the state.

Source: Published research, Informal publication, Professional expertise, Thesis

Additional Comments

None

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