

ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Ilex aquifolium* L.

Common name: English holly

Assessors:

Timm Nawrocki Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2798	Lindsey A. Flagstad Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2786
Matthew L. Carlson, Ph.D. Associate Professor Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2790	

Reviewers:

Ashley Grant Invasive Plant Program Instructor Cooperative Extension Service, University of Alaska Fairbanks 1675 C Street, Anchorage, Alaska 99501 (907) 786-6315	Bonnie M. Million. Alaska Exotic Plant Management Team Liaison Alaska Regional Office, National Park Service, U.S. Department of the Interior 240 West 5 th Avenue Anchorage, Alaska, 99501 (907) 644-3452
Gino Graziano Natural Resource Specialist Plant Materials Center, Division of Agriculture, Department of Natural Resources, State of Alaska 5310 S. Bodenburg Spur, Palmer, Alaska, 99645 (907) 745-4469	Jeff Conn, Ph. D. Research Agronomist Agricultural Research Service, U.S. Department of Agriculture 319 O'Neil Building, 905 Koyukuk St. – UAF Campus, Fairbanks, Alaska 99775 (907) 474-7652
Robert L. DeVelice, Ph. D. Vegetation Ecologist Chugach National Forest, Forest Service, U.S. Department of Agriculture 3301 C Street, Suite 300 Anchorage, Alaska 99503 (907) 743-9437	Whitney Rapp Katmai, Lake Clark, Alagnak, and Aniakchak Planning, Research Permitting, GIS/GPS, and Invasive Species National Park Service, U.S. Department of the Interior P.O. Box 7 King Salmon, Alaska, 99613 (907) 246-2145

Date: 10/19/2010

Date of previous ranking, if any: 4T

OUTCOME SCORE:

CLIMATIC COMPARISON

This species is present or may potentially establish in the following eco-geographic regions:

Pacific Maritime	<u>Yes</u>
Interior-Boreal	<u>No</u>
Arctic-Alpine	<u>No</u>

INVASIVENESS RANKING

	Total (total answered points possible ¹)	Total
Ecological impact	40 (<u>40</u>)	<u>24</u>
Biological characteristics and dispersal ability	25 (<u>25</u>)	<u>16</u>

Ecological amplitude and distribution	25 (25)	18
Feasibility of control	10 (10)	9
Outcome score	100 (100) ^b	67 ^a
Relative maximum score ²		67

¹ For questions answered “unknown” do not include point value for the question in parentheses for “total answered points possible.”

² Calculated as a/b × 100

A. CLIMATIC COMPARISON

1.1. Has this species ever been collected or documented in Alaska?

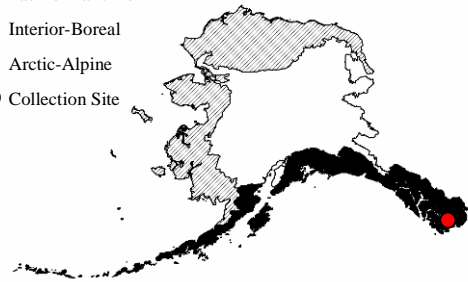
- Yes - continue to 1.2
 No - continue to 2.1

1.2. From which eco-geographic region has it been collected or documented (see inset map)?

Proceed to Section B. INVASIVENESS RANKING

- Pacific Maritime
 Interior-Boreal
 Arctic-Alpine

- Pacific Maritime
□ Interior-Boreal
▨ Arctic-Alpine
● Collection Site



Documentation: *Ilex aquifolium* has been documented near Ketchikan in the Pacific Maritime ecogeographic region of Alaska (AKEPIC 2010).

2.1. Is there a 40 percent or higher similarity (based on CLIMEX climate matching, see references) between climates where this species currently occurs and:

- a. Juneau (Pacific Maritime region)?
 Yes – record locations and percent similarity; proceed to Section B.
 No
- b. Fairbanks (Interior-Boreal region)?
 Yes – record locations and percent similarity; proceed to Section B.
 No
- c. Nome (Arctic-Alpine region)?
 Yes – record locations and percent similarity; proceed to Section B.
 No

If “No” is answered for all regions; reject species from consideration

Documentation: *Ilex aquifolium* has been collected from a site approximately 19 km south of Røros, Norway, at an elevation of 700 m (Vascular Plant Herbarium Oslo 2010). According to CLIMEX, Røros has a climatic similarity of 55% with Fairbanks and 76% with Nome (CLIMEX 1999). The native range of this species, however, has been suggested to be largely controlled by mean minimum February temperatures of just -0.3°C (Bañuelos et al. 2004). Thus, *Ilex aquifolium* is unlikely to establish in the Interior-Boreal or Arctic-Alpine ecogeographic regions.

B. INVASIVENESS RANKING

1. Ecological Impact

1.1. Impact on Natural Ecosystem Processes

- a. No perceivable impact on ecosystem processes

0

- b. Has the potential to influence ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) 3
 - c. Has the potential to cause significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, degrades habitat important to waterfowl) 7
 - d. Has the potential to cause major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology, hydrology, or affects fire frequency thereby altering community composition; species fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) 10
 - e. Unknown U
- Score 3

Documentation: *Ilex aquifolium* requires significant moisture (King County 2008) and may reduce the amount of soil moisture available to surrounding native species. No other impacts on ecosystem processes have been documented.

1.2. Impact on Natural Community Structure

- a. No perceived impact; establishes in an existing layer without influencing its structure 0
 - b. Has the potential to influence structure in one layer (e.g., changes the density of one layer) 3
 - c. Has the potential to cause significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7
 - d. Likely to cause major alteration of structure (e.g., covers canopy, eliminating most or all lower layers) 10
 - e. Unknown U
- Score 7

Documentation: *Ilex aquifolium* can grow at high densities in forests of the Pacific Northwest (Polster 2004, King County 2008). It is known to form pure stands in its native range (Peterken and Lloyd 1967). This species usually grows between 2 and 5 m tall, although it can grow taller, and it often shades out native vegetation (King County 2010, Klinkenberg 2010). Thus, *Ilex aquifolium* has the potential to increase the density of tall shrub layers and decrease the density of underlying layers in Alaska.

1.3. Impact on Natural Community Composition

- a. No perceived impact; causes no apparent change in native populations 0
 - b. Has the potential to influence community composition (e.g., reduces the population size of one or more native species in the community) 3
 - c. Has the potential to significantly alter community composition (e.g., significantly reduces the population size of one or more native species in the community) 7
 - d. Likely to cause major alteration in community composition (e.g., results in the extirpation of one or more native species, thereby reducing local biodiversity and/or shifting the community composition towards exotic species) 10
 - e. Unknown U
- Score 7

Documentation: In the Pacific Northwest, *Ilex aquifolium* can grow in very dense stands that suppress the germination and growth of native trees and shrubs (King County 2008, Klinkenberg 2010).

1.4. Impact on associated trophic levels (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades)

- | | | |
|----|--|----|
| a. | Negligible perceived impact | 0 |
| b. | Has the potential to cause minor alteration (e.g., causes a minor reduction in nesting or foraging sites) | 3 |
| c. | Has the potential to cause moderate alteration (e.g., causes a moderate reduction in habitat connectivity, interferes with native pollinators, or introduces injurious components such as spines, toxins) | 7 |
| d. | Likely to cause severe alteration of associated trophic populations (e.g., extirpation or endangerment of an existing native species or population, or significant reduction in nesting or foraging sites) | 10 |
| e. | Unknown | U |

Score

7

Documentation: *Ilex aquifolium* has spiny leaves. The berries are consumed by birds, and many animals, including a variety of insect herbivores, feed on the leaves and twigs. During winter, mammals eat the bark. Roots have been associated with mycorrhizal fungi in Europe. *Ilex aquifolium* is a known host of eight species of plant parasites (Peterken and Lloyd 1967). Flowers are pollinated by bees (Roberts and Boller 1948, Peterken and Lloyd 1967, King County 2008); thus, their presence has the potential to alter native plant-pollinator interactions in Alaska.

Total Possible	<table border="1"><tr><td>40</td></tr></table>	40
40		
Total	<table border="1"><tr><td>24</td></tr></table>	24
24		

2. Biological Characteristics and Dispersal Ability

2.1. Mode of reproduction

- | | | |
|----|--|---|
| a. | Not aggressive (produces few seeds per plant [0-10/m ²] and not able to reproduce vegetatively). | 0 |
| b. | Somewhat aggressive (reproduces by seed only [11-1,000/m ²]) | 1 |
| c. | Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed [<1,000/m ²]) | 2 |
| d. | Highly aggressive (extensive vegetative spread and/or many seeded [>1,000/m ²]) | 3 |
| e. | Unknown | U |

Score

3

Documentation: Under favorable conditions, mature plants can produce up to 120,000 seeds per year. *Ilex aquifolium* is also capable of vegetative reproduction. Low-hanging branches can root if in contact with the soil or covered by leaf litter, leafy twigs broken off the parent plant can form roots if covered by moist litter, and new plants can sprout from the horizontal roots of parent plants (Peterken and Lloyd 1967).

2.2. Innate potential for long-distance dispersal (wind-, water- or animal-dispersal)

- | | | |
|----|--|---|
| a. | Does not occur (no long-distance dispersal mechanisms) | 0 |
|----|--|---|

- b. Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations) 2
 - c. Numerous opportunities for long-distance dispersal (species has adaptations such as pappus, hooked fruit coats, etc.) 3
 - d. Unknown U
- Score 3

Documentation: Seeds are primarily dispersed by birds after being ingested. Small mammals, such as foxes, occasionally ingest and disperse seeds (Peterken and Lloyd 1967, Herrera and García 2010). Vegetative reproduction contributes to the density of plants within a population, but does not aid the dispersal of populations (Peterken and Lloyd 1967).

2.3. *Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sale of species, use as forage or for revegetation, dispersal along highways, transport on boats, common contaminant of landscape materials, etc.).*

- a. Does not occur 0
 - b. Low (human dispersal is infrequent or inefficient) 1
 - c. Moderate (human dispersal occurs regularly) 2
 - d. High (there are numerous opportunities for dispersal to new areas) 3
 - e. Unknown U
- Score 2

Documentation: *Ilex aquifolium* is commonly cultivated as an ornamental and is grown commercially in the Pacific Northwest (Roberts and Boller 1948, DiTomaso and Healy 2007, Klinkenberg 2010). All recorded infestations in Alaska are associated with fill importation (AKEPIC 2010).

2.4. *Allelopathic*

- a. No 0
 - b. Yes 2
 - c. Unknown U
- Score 0

Documentation: No evidence has been documented to suggest that *Ilex aquifolium* is allelopathic.

2.5. *Competitive ability*

- a. Poor competitor for limiting factors 0
 - b. Moderately competitive for limiting factors 1
 - c. Highly competitive for limiting factors and/or able to fix nitrogen 3
 - d. Unknown U
- Score 2

Documentation: *Ilex aquifolium* has high water requirements and outcompetes native species for soil moisture in the Pacific Northwest (King County 2008).

2.6. *Forms dense thickets, has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation.*

- a. Does not grow densely or above surrounding vegetation 0

- b. Forms dense thickets 1
 - c. Has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation 2
 - d. Unknown U
- Score 2

Documentation: *Ilex aquifolium* grows densely in the Pacific Northwest. It grows taller than forb, graminoid, and shrub layers, and it can shade out native vegetation (King County 2008, Klinkenberg 2010).

2.7. Germination requirements

- a. Requires sparsely vegetated soil and disturbance to germinate 0
 - b. Can germinate in vegetated areas, but in a narrow range of or in special conditions 2
 - c. Can germinate in existing vegetation in a wide range of conditions 3
 - d. Unknown U
- Score 3

Documentation: Seeds can germinate in undisturbed coastal forests, woodlands, and riparian areas (Polster 2004, DiTomaso and Healy 2007, King County 2010). They also germinate in gardens, cultivated land, and disturbed areas (Roberts and Boller 1948, DiTomaso and Healy 2007, AKEPIC 2010, Klinkenberg 2010).

2.8. Other species in the genus invasive in Alaska or elsewhere

- a. No 0
 - b. Yes 3
 - c. Unknown U
- Score 0

Documentation: No *Ilex* species are listed as noxious weeds in the U.S. or Canada (Invaders 2010, USDA 2010). No other *Ilex* species are known or suspected to occur as non-native species in Alaska (AKEPIC 2010). *Ilex cornuta* and *Ilex crenata* are naturalized in Georgia but are not considered problem species in natural areas (GAEPPC 2006).

2.9. Aquatic, wetland, or riparian species

- a. Not invasive in wetland communities 0
 - b. Invasive in riparian communities 1
 - c. Invasive in wetland communities 3
 - d. Unknown U
- Score 1

Documentation: *Ilex aquifolium* grows in riparian areas (DiTomaso and Healy 2007).

Total Possible	25
Total	16

3. Ecological Amplitude and Distribution

3.1. Is the species highly domesticated or a weed of agriculture?

- | | | | |
|----|---|--|---|
| a. | Is not associated with agriculture | 0 | |
| b. | Is occasionally an agricultural pest | 2 | |
| c. | Has been grown deliberately, bred, or is known as a significant agricultural pest | 4 | |
| d. | Unknown | U | |
| | | Score <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">4</td></tr></table> | 4 |
| 4 | | | |

Documentation: *Ilex aquifolium* is commonly cultivated, and many different varieties have been developed (Peterken and Lloyd 1967). This species is grown commercially in the Pacific Northwest for sale as Christmas decorations (Roberts and Boller 1948, DiTomaso and Healy 2007, Klinkenberg 2010).

3.2. *Known level of ecological impact in natural areas*

- | | | | |
|----|---|--|---|
| a. | Not known to impact other natural areas | 0 | |
| b. | Known to impact other natural areas, but in habitats and climate zones dissimilar to those in Alaska | 1 | |
| c. | Known to cause low impact in natural areas in habitats and climate zones similar to those in Alaska | 3 | |
| d. | Known to cause moderate impact in natural areas in habitat and climate zones similar to those in Alaska | 4 | |
| e. | Known to cause high impact in natural areas in habitat and climate zones similar to those in Alaska | 6 | |
| f. | Unknown | U | |
| | | Score <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">4</td></tr></table> | 4 |
| 4 | | | |

Documentation: *Ilex aquifolium* invades undisturbed forests in the Pacific Northwest, where it suppresses the germination and growth of native trees and shrubs and shades out other native plant species (Polster 2004, King County 2010, Klinkenberg 2010). It has escaped cultivation and become invasive in moist, coastal forests in California (DiTomaso and Healy 2007). *Ilex aquifolium* is considered one of the ten most invasive garden plants for sale in Tasmania. It invades bushland areas and threatens native species in several regions of Australia (Groves et al. 2005).

3.3. *Role of anthropogenic and natural disturbance in establishment*

- | | | | |
|----|---|--|---|
| a. | Requires anthropogenic disturbance to establish | 0 | |
| b. | May occasionally establish in undisturbed areas, readily establishes in naturally disturbed areas | 3 | |
| c. | Can establish independently of natural or anthropogenic disturbances | 5 | |
| e. | Unknown | U | |
| | | Score <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">3</td></tr></table> | 3 |
| 3 | | | |

Documentation: In the Pacific Northwest, *Ilex aquifolium* can establish in undisturbed forests (Polster 2004, King County 2010). All recorded infestations in Alaska, however, are associated with anthropogenic disturbances (AKEPIC 2010).

3.4. *Current global distribution*

- | | | |
|----|--|---|
| a. | Occurs in one or two continents or regions (e.g., Mediterranean region) | 0 |
| b. | Extends over three or more continents | 3 |
| c. | Extends over three or more continents, including successful introductions in arctic or subarctic regions | 5 |

e. Unknown

U
Score

Documentation: *Ilex aquifolium* is native to Europe and mountainous areas in North Africa and Asia Minor. It has been introduced to North America and Australia (Peterken and Lloyd 1967, Thorpe and Wilson 1998, USDA 2010, Klinkenberg 2010). This species is known from high elevations in subarctic Norway (Vascular Plant Herbarium Oslo 2010), but has not been documented from arctic regions.

3.5. *Extent of the species' U.S. range and/or occurrence of formal state or provincial listing*

- a. Occurs in 0-5 percent of the states 0
- b. Occurs in 6-20 percent of the states 2
- c. Occurs in 21-50 percent of the states and/or listed as a problem weed (e.g., "Noxious," or "Invasive") in one state or Canadian province 4
- d. Occurs in more than 50 percent of the states and/or listed as a problem weed in two or more states or Canadian provinces 5
- e. Unknown U

Score

Documentation: *Ilex aquifolium* has been documented in Alaska, California, Hawaii, Oregon, and Washington (USDA 2010).

Total Possible
Total

4. Feasibility of Control

4.1. *Seed banks*

- a. Seeds remain viable in the soil for less than three years 0
- b. Seeds remain viable in the soil for three to five years 2
- c. Seeds remain viable in the soil for five years or longer 3
- e. Unknown U

Score

Documentation: Seeds remain viable for at least three years (DiTomaso and Healy 2007). In Spain, seed banks are transient because of seed predation by rodents (Herrera and García 2010).

4.2. *Vegetative regeneration*

- a. No resprouting following removal of aboveground growth 0
- b. Resprouting from ground-level meristems 1
- c. Resprouting from extensive underground system 2
- d. Any plant part is a viable propagule 3
- e. Unknown U

Score

Documentation: *Ilex aquifolium* can resprout from its rootstock following removal of the aboveground portion. Leafy twigs broken off the parent plant can form roots if they are covered by moist litter (Peterken and Lloyd 1967).

4.3. Level of effort required

- a. Management is not required (e.g., species does not persist in the absence of repeated anthropogenic disturbance) 0
- b. Management is relatively easy and inexpensive; requires a minor investment of human and financial resources 2
- c. Management requires a major short-term or moderate long-term investment of human and financial resources 3
- d. Management requires a major, long-term investment of human and financial resources 4
- e. Unknown U

Score

4

Documentation: *Ilex aquifolium* can be difficult to eradicate once established. Plants can be hand-pulled or dug when they are small. Mechanical and chemical control methods are more effective when combined to successfully eradicate large plants. Stems can be cut near the base, and a glyphosate herbicide applied to the cut area (King County 2008).

Total Possible

10

Total

9

Total for four sections possible

100

Total for four sections

67

References:

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