

WEED RISK ASSESSMENT FORM

Botanical name: *Digitalis purpurea* L.
 Common name: purple foxglove
 Assessors: Irina Lapina Matthew L. Carlson, Ph.D.
 Botanist, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501
 Assistant Professor, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501
 tel: (907) 257-2710; fax (907) 257-2789
 tel: (907) 257-2790; fax (907) 257-2789
 Reviewers: Michael Shephard Jeff Conn, Ph.D.
 Vegetation Ecologist Forest Health Protection State & Private Forestry
 Weed Scientist, USDA Agricultural Research Service
 3301 C Street, Suite 202, Anchorage, AK 99503 (907) 743-9454; fax 907 743-9479
 PO Box 757200 Fairbanks, Alaska 99775
 tel: (907) 474-7652; fax (907) 474-6184
Roseann Densmore, Ph.D. Julie Riley
 Research Ecologist, US Geological Survey, Alaska Biological Science Center, 1101 East Tudor Road Anchorage, AK 99503
 Horticulture Agent, UAF Cooperative Extension Service
 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143
 tel: (907) 786-3916, fax (907) 786-3636
 tel: (907) 786-6306
Jamie M. Snyder
 UAF Cooperative Extension Service
 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143
 tel: (907) 786-6310 alt.tel: (907) 743-9448

Outcome score:

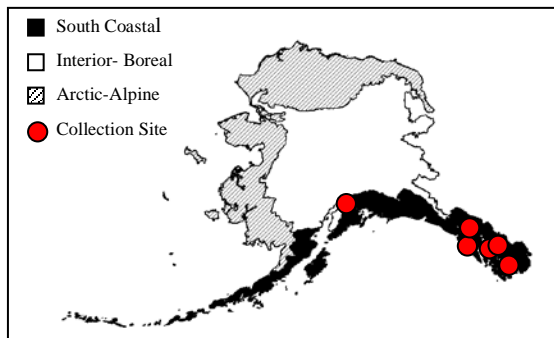
A. Climatic Comparison		
This species is present or may potentially establish in the following eco-geographic regions:		
1	South Coastal	Yes
2	Interior-Boreal	Yes
3	Arctic-Alpine	No

B.	Invasiveness Ranking	Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	16
2	Biological characteristic and dispersal ability	25 (25)	12
3	Ecological amplitude and distribution	25 (25)	19
4	Feasibility of control	10 (10)	6
	Outcome score	100 (100) ^b	51 ^a
	Relative maximum score†		0.51

* For questions answered "unknown" do not include point value for the question in parentheses for "Total Answered Points Possible."
 † Calculated as ^a/_b.

A. CLIMATIC COMPARISON:

1.1. Has this species ever been collected or documented in Alaska?	
Yes	Yes – continue to 1.2
	No – continue to 2.1
1.2. Which eco-geographic region has it been collected or documented (see inset map)? <i>Proceed to Section B. Invasiveness Ranking.</i>	
Yes	South Coastal
Yes	Interior-Boreal
	Arctic-Alpine



Documentation: *Digitalis purpurea* has been reported from Ketchikan, Petersburg, and Sitka (Hultén 1968, UAM 2004, AK Weed Database 2004). It is commonly grown in Juneau and Anchorage (J. Riley – pers. obs.).

Sources of information:

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 p.

Riley, J. Horticulture Agent, UAF Cooperative Extension Service, 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6306.

University of Alaska Museum. University of Alaska Fairbanks. 2004.

<http://hispidamuseum.uaf.edu:8080/home.cfm>

Weeds of Alaska Database. 2004. AKEPIC Mapping Project Inventory Field Data. Alaska Natural Heritage Program, University of Alaska – US Forest Service – National Park Service.

Available: <http://akweeds.uaa.alaska.edu/>

2.1. Is there a 40% or higher similarity (based on CLIMEX climate matching) between climates any where the species currently occurs and

a. Juneau (South Coastal Region)?

Yes – record locations and similarity; proceed to Section B.
Invasiveness Ranking

No

b. Fairbanks (Interior-Boreal)?

Yes – record locations and similarity; proceed to Section B.
Invasiveness Ranking

No

c. Nome (Arctic-Alpine)?

Yes – record locations and similarity; proceed to Section B.
Invasiveness Ranking

No

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

Documentation: Using CLIMEX matching program, there is a high climatic match between Nome and areas where the species is documented such as Røros, Norway (76%). In Norway, *Digitalis purpurea* occurs along the coast as far north as 69° N (Lid and Lid 1994). However, it appears to reach its physiological limit around Anchorage as it not able to overwinter (J. Riley – pers. obs., R. Densmore – pers. obs.). It is therefore unlikely to establish in the arctic-alpine ecoregion.

Sources of information:

CLIMEX for Windows, Version 1.1a. 1999. CISRO Publishing, Australia.

Densmore, R. Ph.D. Research Ecologist, US Geological Survey, Alaska Biological Science Center, 1101 East Tudor Road Anchorage, AK 99503 tel: (907) 786-3916, fax (907) 786-3636.

Lid, J. and D. T. Lid. 1994. Flora of Norway. The Norske Samlaget, Oslo. Pp. 1014.

Riley, J. Horticulture Agent, UAF Cooperative Extension Service, 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6306.

B. INVASIVENESS RANKING

1. ECOLOGICAL IMPACT

1.1. Impact on Natural Ecosystem Processes

- | | | |
|----|---|----|
| A. | No perceivable impact on ecosystem processes | 0 |
| B. | Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) | 3 |
| C. | Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl) | 7 |
| D. | Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology; hydrology; or affects fire frequency, 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 |
| U. | Unknown | |

Score

3

Documentation:

Identify ecosystem processes impacted:

As a pioneer of disturbed sites purple foxglove likely hinders natural successional processes (M. L. Carlson – pers. obs.).

Rational:

Sources of information:

Carlson, M. L., Assistant Research Professor - Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska.
Tel: (907) 257-2790 Pers. obs.

1.2. Impact on Natural Community Structure

- | | | |
|----|--|----|
| A. | No perceived impact; establishes in an existing layer without influencing its structure | 0 |
| B. | Influences structure in one layer (e.g., changes the density of one layer) | 3 |
| C. | Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) | 7 |
| D. | Major alteration of structure (e.g., covers canopy, eradicating most or all layers below) | 10 |
| U. | Unknown | |

Score

3

Documentation:

Identify type of impact or alteration:

Purple foxglove often forms dense patches, increasing the density of the herbaceous and herbaceous/shrub layers (Harris 2000).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

1.3. Impact on Natural Community Composition

- | | | |
|----|---|----|
| A. | No perceived impact; causes no apparent change in native populations | 0 |
| B. | Influences community composition (e.g., reduces the number of individuals in one or more native species in the community) | 3 |
| C. | Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community) | 7 |
| D. | Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community) | 10 |
| U. | Unknown | |

Score

3

Documentation:

Identify type of impact or alteration:

Purple foxglove is capable of forming dense patches, displacing natural vegetation (Harris 2000).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

1.4. Impact on higher 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. | Minor alteration | 3 |
| C. | Moderate alteration (minor reduction in nesting/foraging sites, reduction in habitat connectivity, interference with native pollinators, injurious components such as spines, toxins) | 7 |
| D. | Severe alteration of higher trophic populations (extirpation or endangerment of an existing native species/population, or significant reduction in nesting or foraging sites) | 10 |

U. Unknown

Score

7

Documentation:

Identify type of impact or alteration:

Purple foxglove is toxic to human and animals (CUPPID 2004, Harris 2000, USDA 2002, Whitson et al. 2000). Rabbits and deer avoid the leaves of foxglove (Floridata 2002).

Rational:

Sources of information:

CUPPID - Cornell University: Poisonous Plants Informational Database.

<http://www.ansci.cornell.edu> [November 11, 2004].

Floridata. 2002. *Digitalis purpurea*. Available: http://floridata.com/ref/d/digi_pur.cfm [November 11, 2004].

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Whitson, T. D., L. C. Burrill, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, R. Parker. 2000. Weeds of the West. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities, Cooperative Extension Services. University of Wyoming. Laramie, Wyoming. 630 pp.

Total Possible

40

Total

16

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode of reproduction

- A. Not aggressive reproduction (few [0-10] seeds per plant and no vegetative reproduction) 0
- B. Somewhat aggressive (reproduces only by seeds (11-1,000/m²)) 1
- C. Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed, <1,000/m²) 2
- D. Highly aggressive reproduction (extensive vegetative spread and/or many seeded, >1,000/m²) 3
- U. Unknown

Score

1

Documentation:

Describe key reproductive characteristics (including seeds per plant):

Purple foxglove reproduces entirely by seed, but produces many hundreds of seeds/plant (Floridata 2002, Harris 2000).

Rational:

Sources of information:

Floridata. 2002. *Digitalis purpurea*. Available: http://floridata.com/ref/d/digi_pur.cfm [November 11, 2004].

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

2.2. Innate potential for long-distance dispersal (bird dispersal, sticks to animal hair, buoyant fruits, wind-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
- U. Unknown

Score 3

Documentation:

Identify dispersal mechanisms:

Seeds are dispersed by wind and water (Harris 2000). However, the seeds lack apparent adaptations for long distance dispersal.

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contamination, etc.)

- A. Does not occur 0
- B. Low (human dispersal is infrequent or inefficient) 1
- C. Moderate (human dispersal occurs) 2
- D. High (there are numerous opportunities for dispersal to new areas) 3
- U. Unknown

Score 3

Documentation:

Identify dispersal mechanisms:

Purple foxglove is cultivated as an ornamental plant and grown commercially as a source of a heart stimulant (Floridata 2002). It has been escaped cultivation (Hultén 1968, Welsh 1974).

Rational:

Sources of information:

Floridata. 2002. *Digitalis purpurea*. Available: http://floridata.com/ref/d/digi_pur.cfm [November 11, 2004].

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 pp.

Welsh, S. L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham University Press. 724 pp.

2.4. Allelopathic

- A. No 0
- B. Yes 2
- U. Unknown

Score 0

Documentation:

Describe effect on adjacent plants:

Purple foxglove is not known to be allelopathic (USDA 2002).

Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

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 nitrogen fixing ability 3

U. Unknown

Score **0**

Documentation:

Evidence of competitive ability:

Purple foxglove species does not compete with established native vegetation, especially under the canopy (Harris 2000).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

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

- A. No 0
- B. Forms dense thickets 1
- C. Has climbing or smothering growth habit, or otherwise taller than the surrounding vegetation 2
- U. Unknown

Score **1**

Documentation:

Describe grow form:

Foxglove can form dense and tall patches (Harris 2000).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

2.7. Germination requirements

- A. Requires open soil and disturbance to germinate 0
- B. Can germinate in vegetated areas but in a narrow range or in special conditions 2
- C. Can germinate in existing vegetation in a wide range of conditions 3
- U. Unknown

Score **0**

Documentation:

Describe germination requirements:

Roots of young plants are not able to penetrate turf or litter. Successful establishment requires disturbance of soil, vegetation, and litter (Harris 2000, Vazquez-Yanes et al. 1990).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

Vazquez-Yanes, C., A. Orozco-Segovia, E. Rincon, M.E. Sanchez-Coronado, P. Huante, J.R. Toledo, and V.L. Barradas. 1990. Light beneath the litter in a tropical forest: effect on seed germination. *Ecology* 71(5): 1952-1958.

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

- A. No 0
- B. Yes 3
- U. Unknown

Score **3**

Documentation:

Species:

Digitalis lanata Ehrh. is known as an invader of grasslands and woodlands in Wisconsin (WDNR 2004).
Sources of information:
Wisconsin Department of Natural Resources: abstract. Non-native plants. 2003.
<http://www.dnr.state.wi.us> [November 12, 2004].

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
- U. Unknown

Score

0

Documentation:

Describe type of habitat:

Purple foxglove can be found on roadsides, fields, forest edges, wet ditches, moist meadows, open woodland, and pastures (Harris 2000, Pojar and MacKinnon 1994).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

Pojar, J. and A. MacKinnon. 1994. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska. B.C. Ministry of Forests and Lone Pine Publishing. Redmond, Washington. 527 pp.

Total Possible

25

Total

11

3. DISTRIBUTION

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

- A. No 0
- B. Is occasionally an agricultural pest 2
- C. Has been grown deliberately, bred, or is known as a significant agricultural pest 4
- U. Unknown

Score

4

Documentation:

Identify reason for selection, or evidence of weedy history:

Foxglove is cultivated as an ornamental plant and is grown commercially for medical reasons. Many cultivars have been developed (Floridata 2002).

Rational:

Sources of information:

Floridata. 2002. *Digitalis purpurea*. Available: http://floridata.com/ref/d/digi_pur.cfm [November 11, 2004].

3.2. Known level of impact in natural areas

- A. Not known to cause impact in any other natural area 0
- B. Known to cause impacts in natural areas, but in dissimilar habitats and climate zones than exist in regions of Alaska 1
- C. Known to cause low impact in natural areas in similar habitats and climate zones to those present in Alaska 3
- D. Known to cause moderate impact in natural areas in similar habitat and climate zones 4
- E. Known to cause high impact in natural areas in similar habitat and climate zones 6
- U. Unknown

Score

3

Documentation:

Identify type of habitat and states or provinces where it occurs:

It readily colonizes disturbed areas, forming dense patches that displace natural vegetation in California (Harris 2000).

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

3.3. Role of anthropogenic and natural disturbance in establishment

- A. Requires anthropogenic disturbances to establish 0
- B. May occasionally establish in undisturbed areas but can readily establish in areas with natural disturbances 3
- C. Can establish independent of any known natural or anthropogenic disturbances 5
- U. Unknown

Score

3

Documentation:

Identify type of disturbance:

Young plants are not able to penetrate turf or litter. Soil disturbance greatly increases establishment of seedlings (Harris 2000, Vazquez-Yanes et al. 1990). In Oregon and Washington foxglove commonly establishes on natural slides and windfalls (M. L. Carlson pers. obs.)

Rational:

Sources of information:

Carlson, M. L., Assistant Research Professor - Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 Pers. obs.

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

Vazquez-Yanes, C., A. Orozco-Segovia, E. Rincon, M.E. Sanchez-Coronado, P. Huante, J.R. Toledo, and V.L. Barradas. 1990. Light beneath the litter in a tropical forest: effect on seed germination. *Ecology* 71(5): 1952-1958.

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
- U. Unknown

Score

5

Documentation:

Describe distribution:

Foxglove is native to western Europe, the Mediterranean, and northwest Africa. It has become naturalized in other parts of Europe (including arctic and subarctic Scandinavia), Asia, Africa, South America, New Zealand, Canada, and much of the United States (Hultén 1968, USDA 2002, Wilson 1992).

Rational:

Sources of information:

Hultén, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, CA. 1008 pp.

USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Wilson, J.B., G.L. Rapson, M.T. Sykes, A.J. Watkins, and P.A. Williams. 1992. Distributions and climatic correlations of some exotic species along roadsides in South Island, New Zealand. *Journal of Biogeography*. 19(2): 183-193.

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

- A. 0-5% of the states 0
- B. 6-20% of the states 2
- C. 21-50%, and/or state listed as a problem weed (e.g., “Noxious,” or “Invasive”) in 1 state or Canadian province 4
- D. Greater than 50%, and/or identified as “Noxious” in 2 or more states or Canadian provinces 5
- U. Unknown

Score

4

Documentation:

Identify states invaded:

Foxglove is widely naturalized in northwestern and northeastern states (USDA 2002).
Digitalis purpurea is on the Colorado Invasive Weed Species List (BLM Colorado 2004).

Rational:

Sources of information:

Bureau of Land Management. 2004. Weed Management of Colorado. BLM National list of invasive weed species of concern. Colorado State Office. Available: <http://www.co.blm.gov/index.htm> [November 11, 2004].
 USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Total Possible

25

Total

19

4. FEASIBILITY OF CONTROL

4.1. Seed banks

- A. Seeds remain viable in the soil for less than 3 years 0
- B. Seeds remain viable in the soil for between 3 and 5 years 2
- C. Seeds remain viable in the soil for 5 years and more 3
- U. Unknown

Score

2

Documentation:

Identify longevity of seed bank:

Seeds remain viable in the soil at least five years (Harris 2000).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California’s wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

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
- U. Unknown

Score

0

Documentation:

Describe vegetative response:

Purple foxglove has no ability to resprout (USDA 2002).

Rational:

Sources of information:

USDA (United States Department of Agriculture), NRCS (Natural Resource

Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

4.3. Level of effort required

- A. Management is not required (e.g., species does not persist without repeated anthropogenic disturbance) 0
- B. Management is relatively easy and inexpensive; requires a minor investment in human and financial resources 2
- C. Management requires a major short-term investment of human and financial resources, or a moderate long-term investment 3
- D. Management requires a major, long-term investment of human and financial resources 4
- U. Unknown

Score

3

Documentation:

Identify types of control methods and time-term required:

Hand pulling is an effective control of foxglove. Herbicides are effective in large infestations. Control efforts generally require at least five years. Sites must be monitored for five to ten years after treatment due to the long-lived seed bank. Biological control has not been pursued because of plant's value in horticulture (Harris 2000).

Rational:

Sources of information:

Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.

Total Possible

10

Total

5

Total for 4 sections Possible

100

Total for 4 sections

51

References:

- Carlson, M.L., Assistant Research Professor - Botany, Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska. Tel: (907) 257-2790 Pers. obs.
- CLIMEX for Windows, Version 1.1a. 1999. CISRO Publishing, Australia.
- CUPPID - Cornell University: Poisonous Plants Informational Database. <http://www.ansci.cornell.edu> [November 11, 2004].
- Densmore, R. Research Ecologist, US Geological Survey, Alaska Biological Science Center, 1101 East Tudor Road Anchorage, AK 99503 tel: (907) 786-3916, fax (907) 786-3636 – Pers. obs.
- Riley, J. Horticulture Agent, UAF Cooperative Extension Service, 2221 E. Northern Lights Blvd. #118 Anchorage, AK 99508-4143 tel: (907) 786-6306 – Pers. obs.
- Floridata. 2002. *Digitalis purpurea*. Available: http://floridata.com/ref/d/digi_pur.cfm [November 11, 2004].
- Harris, S.A. 2000. *Digitalis purpurea* L. In: Invasive plants of California's wildlands. Edited by Bossard, C.C., J.M. Randall, and M.C. Hoshovsky. University of California Press. p. 158-161.
- Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, CA. 1008 pp.

- Lid, J. and D.T. Lid. 1994. Flora of Norway. The Norske Samlaget, Oslo. Pp. 1014.
- Pojar, J., and A. MacKinnon. 1994. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska. B.C. Ministry of Forests and Lone Pine Publishing. Redmond, Washington. 527 pp.
- University of Alaska Museum. University of Alaska Fairbanks. 2003.
<http://hispidamuseum.uaf.edu:8080/home.cfm>
- USDA (United States Department of Agriculture), NRCS (Natural Resource Conservation Service). 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
- Vazquez-Yanes, C., A. Orozco-Segovia, E. Rincon, M.E. Sanchez-Coronado, P. Huante, J.R. Toledo, and V.L. Barradas. 1990. Light beneath the litter in a tropical forest: effect on seed germination. *Ecology* 71(5): 1952-1958.
- Weeds of Alaska Database. 2004. AKEPIC Mapping Project Inventory Field Data. Alaska Natural Heritage Program, University of Alaska – US Forest Service – National Park Service. Available: <http://akweeds.uaa.alaska.edu/>
- Welsh, S.L. 1974. Anderson's flora of Alaska and adjacent parts of Canada. Brigham University Press. 724 pp.
- Wisconsin Department of Natural Resources: abstract. Non-native plants. 2003.
<http://www.dnr.state.wi.us>