



***Plant Risk Evaluator -- PRE™  
Evaluation Report***

***Digitalis lanata -- Minnesota***

***2017 Farm Bill PRE Project***

**PRE Score:** 12 -- Accept (low risk of invasiveness)

**Confidence:** 74 / 100

**Questions answered:** 18 of 20 -- Valid (80% or more questions answered)

**Privacy:** Public

**Status:** Completed

**Evaluation Date:** September 7, 2017

*This PDF was created on June 17, 2018*



## Plant Evaluated

*Digitalis lanata*



Image by User:Haplochromis



## Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Digitalis lanata*) in an effort to understand the invasive history, reproductive strategies, and the impact, if any, on the region's native plants and animals. This research reflects the data available at the time this evaluation was conducted.

## Summary

It is interesting that while the PRE score of 12 rates this plant as "acceptable", the species is prohibited in Minnesota. Prohibited means "All above and below ground parts of the plant must be destroyed. Additionally, no transportation, propagation, or sale of these plants is allowed." While information regarding the process of declaring a plant as prohibited in Minnesota was not available at the time of this screening, it is the assumption of the screener that the plant's poisonous nature was a large factor in declaring it prohibited. Plant toxicity is only a small part of the PRE evaluation, receiving just one point for a "yes" response. Additionally, the Minnesota Department of Agriculture indicates that this plant produces "large amounts of seed that can be spread by wind, water, vehicles, humans, wildlife, and by moving seed-containing soil", but does not quantify the amount of seed, its germination rate, or the distance that seeds can travel via wind, water, animals, or humans.

## General Information

**Status:** Completed

**Screener:** Mike Monterusso

**Evaluation Date:** September 7, 2017

## Plant Information

**Plant:** *Digitalis lanata*

## Regional Information

**Region Name:** Minnesota



## **Climate Matching Map**

To answer four of the PRE questions for a regional evaluation, a climate map with three climate data layers (Precipitation, UN EcoZones, and Plant Hardiness) is needed. These maps were built using a toolkit created in collaboration with GreenInfo Network, USDA, PlantRight, California-Invasive Plant Council, and The Information Center for the Environment at UC Davis.

Click [here](#) to see the generated climate matching map for this region. This climate match database is hosted by GreenInfo Network and publicly accessible.



## Evaluation Questions

These questions are based in an original article published at the University of California, Davis, and can be found on the PLOS One website, here: <https://doi.org/10.1371/journal.pone.0121053>

### Invasive History and Climate Matching (Questions 1 - 6)

#### 1. Has the species (or cultivar or variety, if applicable; applies to subsequent "species" questions) become naturalized where it is not native?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screeners* has a **Very High** confidence in this answer based on the available literature.

#### Answer / Justification:

*Digitalis lanata* has naturalized in several US states.

#### Reference(s):

- United States Department of Agriculture (2017). Plants Profile for *Digitalis lanata* (Grecian foxglove).
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#### 2. Is the species (or cultivar or variety) noted as being naturalized in the US or world in a similar climate?

- Answer: **Yes**, which contributes **2** points to the total PRE score.
- The *screeners* has a **Very High** confidence in this answer based on the available literature.

#### Answer / Justification:

It has naturalized in Minnesota and Wisconsin.

#### Reference(s):

- United States Department of Agriculture (2017). Plants Profile for *Digitalis lanata* (Grecian foxglove).



### 3. Is the species (or cultivar or variety) noted as being invasive in the U.S. or world?

- Answer: **Yes**, which contributes **2** points to the total PRE score.
- The *screeners* has a **Very High** confidence in this answer based on the available literature.

#### Answer / Justification:

It is prohibited in Wisconsin and Minnesota. MDA mapped infestation and listed as noxious weed on the Eradicate List in 2011; 193 acres treated in 2014 and 2015; is being removed from prairies at Belwin Conservancy in Afton, MN.

#### Reference(s):

- Wisconsin Department of Natural Resources (2015). Grecian foxglove - Wisconsin DNR.
  - Minnesota Department of Agriculture (2017). Grecian Foxglove.
  - Justen, E., & Anderson L. (2016). Grecian Foxglove Management Success: A Collaborative Effort.
- 

### 4. Is the species (or cultivar or variety) noted as being invasive in the US or world in a similar climate?

- Answer: **Yes**, which contributes **3** points to the total PRE score.
- The *screeners* has a **Very High** confidence in this answer based on the available literature.

#### Answer / Justification:

It is prohibited in Wisconsin and Minnesota.

#### Reference(s):

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
  - Wisconsin Department of Natural Resources (2015). Grecian foxglove - Wisconsin DNR.
-



**5. Are other species of the same genus (or closely related genera) invasive in a similar climate?**

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **High** confidence in this answer based on the available literature.

**Answer / Justification:**

*Digitalis purpurea* is invasive in some areas but not in an area with a climate similar to Minnesota.

**Reference(s):**

- [Anonymous] .
- 

**6. Is the species (or cultivar or variety) found predominately in a climate matching the region of concern?**

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **Very High** confidence in this answer based on the available literature.

**Answer / Justification:**

According to GBIF, most occurrences of *D. lanata* are in Europe, which has a climate that differs from Minnesota.

**Reference(s):**

- GBIF (2016). *Digitalis lanata* Ehrh..
-



## Impact on Native Plants and Animals (Questions 7 - 10)

### 7. Does this plant displace native plants and dominate (overtop or smother) the plant community in areas where it has established?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screeener* has a **Medium** confidence in this answer based on the available literature.

#### Answer / Justification:

"Grecian foxglove is native to central and southern Europe. It was brought to North America as an ornamental then escaped cultivation. In Minnesota, it is invasive and displaces desirable vegetation."

#### Reference(s):

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
- 

### 8. Is the plant noted as promoting fire and/or changing fire regimes?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeener* has a **High** confidence in this answer based on the available literature.

#### Answer / Justification:

No evidence found.

#### Reference(s):

- [Anonymous] .
-





## 9. Is the plant a health risk to humans or animals/fish? Has the species been noted as impacting grazing systems?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screeener* has a **Very High** confidence in this answer based on the available literature.

### Answer / Justification:

"Grecian foxglove is toxic to humans, livestock, and wildlife. Grecian foxglove cut and dried in hay could result in livestock poisoning...Cardiac glycosides from Grecian foxglove include digoxin and digitoxin and primarily affect cardiovascular, neurologic, and gastrointestinal systems. Ingesting plant parts or absorbing compounds through skin in direct contact with Grecian foxglove may adversely affect humans and other mammals and could be fatal. It is possible that smoke from burning plants may be toxic" (Minnesota Department of Ag)....."Digitalis lanata, like some other foxglove species, is highly toxic in all parts of the plant. Given the average percentage of digoxin and digitoxin in the plant to be less than .2%, nearly 2000 lbs would have to be consumed by a 200lbs adult to die, if the ld50 for mice (16mg/kg) is accurate to humans... Symptoms of digitalis poisoning include nausea, vomiting, severe headache, dilated pupils, problems with eyesight, and convulsions at the worst level of toxicity. The plant is also harmful to other animals" (Wikipedia).

### Reference(s):

- Wikipedia (2017). Digitalis lanata - Wikipedia.
  - Minnesota Department of Agriculture (2017). Grecian Foxglove.
- 

## 10. Does the plant produce impenetrable thickets, blocking or slowing movement of animals, livestock, or humans?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeener* has a **High** confidence in this answer based on the available literature.

### Answer / Justification:

No evidence found.

### Reference(s):

- [Anonymous] .



## Reproductive Strategies (Questions 11 - 17)

### 11. Does this species (or cultivar or variety) reproduce and spread vegetatively?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **High** confidence in this answer based on the available literature.

#### Answer / Justification:

"Seed production is prolific and is the only means of reproduction for this species."

#### Reference(s):

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
- 

### 12. If naturally detached fragments from this plant are capable of producing new plants, is this a common method of reproduction for the plant?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **High** confidence in this answer based on the available literature.

#### Answer / Justification:

"Seed production is prolific and is the only means of reproduction for this species."

#### Reference(s):

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
-



**13. Does the species (or cultivar or variety) commonly produce viable seed?**

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screeners* has a **Very High** confidence in this answer based on the available literature.

**Answer / Justification:**

"Seed production is prolific and is the only means of reproduction for this species."

**Reference(s):**

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
- 

**14. Does this plant produce copious viable seeds each year (> 1000)?**

**Answer / Justification:**

Seed production has been reported as "prolific" but no specific quantity of seed was referenced.

**Reference(s):**

- [Anonymous] .
- 

**15. Is there significant germination (>25%) of seeds the next growing season, with no requirement of an infrequent environmental condition for seeds to germinate (i.e. fire) or long dormancy period?**

**Reference(s):**

- [Anonymous] .
-



**16. Does this plant produce viable seed within the first three years (for an herbaceous species) to five years (for a woody species) after germination?**

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screeners* has a **Very High** confidence in this answer based on the available literature.

**Answer / Justification:**

"Grecian foxglove is a perennial plant that forms a rosette its first year, then bolts and sends up a single flowering stem its second and subsequent years."

**Reference(s):**

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
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**17. Does this plant continuously produce seed for >3 months each year or does seed production occur more than once a year?**

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **Medium** confidence in this answer based on the available literature.

**Answer / Justification:**

"Flowering occurs in the summer."

**Reference(s):**

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
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## Dispersal (Questions 18 - 20)

### 18. Are the plant's propagules frequently dispersed long distance (>100 m) by mammals or birds or via domestic animals?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **Low** confidence in this answer based on the available literature.

#### Answer / Justification:

It has been reported to be distributed by a variety of means but no mention of frequency or distance was given: "Established stands produce large amounts of seed that can be spread by wind, water, vehicles, humans, wildlife, and by moving seed-containing soil."

#### Reference(s):

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
- 

### 19. Are the plant's propagules frequently dispersed long distance (>100 m) by wind or water?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **Low** confidence in this answer based on the available literature.

#### Answer / Justification:

It has been reported to be distributed by a variety of means but no mention of frequency or distance was given: "Established stands produce large amounts of seed that can be spread by wind, water, vehicles, humans, wildlife, and by moving seed-containing soil."

#### Reference(s):

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
-



**20. Are the plant's propagules frequently dispersed via contaminated seed (agriculture or wildflower packets), equipment, vehicles, boats or clothing/shoes?**

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screeners* has a **Low** confidence in this answer based on the available literature.

**Answer / Justification:**

It has been reported to be distributed by a variety of means but no mention of frequency or distance was given: "Established stands produce large amounts of seed that can be spread by wind, water, vehicles, humans, wildlife, and by moving seed-containing soil."

**Reference(s):**

- Minnesota Department of Agriculture (2017). Grecian Foxglove.
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**Total PRE Score**

**PRE Score:** 12 -- Accept (low risk of invasiveness)

**Confidence:** 74 / 100

**Questions answered:** 18 of 20 -- Valid (80% or more questions answered)

**PRE Score Legend**

The PRE Score is calculated by adding the point totals for each (answered) question.

< 13 : accept (low risk of invasiveness)

13 - 15 : evaluate further

> 15 : reject (high risk of invasiveness)

**Questions Answered Legend**

It is important to answer at least 16 questions to consider a PRE Score as "valid".

>= 16 : valid (80% or more questions answered)

<= 15 : invalid (not enough questions answered)



## **Organization Ownership and Content Privacy**

**Organization:** 2017 Farm Bill PRE Project

**Content Privacy:** Public



## Evaluation Reviewers

The PRE approach is to base decisions on science and make decisions by consensus of diverse horticultural stakeholders. The literature review and process of answering PRE's questions are based on science; the decisions of which plants to prioritize are based on consensus. To ensure this process is in place and that PRE is collaborative, volunteer stakeholders are recruited from each region to review evaluations. The following experts in their profession (plant science, conservation, or horticultural trade) have participated as volunteer PRE reviewers for this evaluation:

- Chel Anderson December 27, 2017
- Angelique Dahlberg December 11, 2017
- Tom Buechel November 9, 2017

This evaluation has a total of 3 reviewer(s).





## Evaluation Issues

The following section lists all public issues for this evaluation. Issues provide a way for stakeholder reviewers to communicate any concerns or suggestions they might have with the plant or evaluation. Please email [PlantRight@suscon.org](mailto:PlantRight@suscon.org) if additional action is required to resolve open issues.

### Issue ID # 6134

**Date Created:** December 11, 2017 - 8:30am

**Date Updated:** December 22, 2017 - 9:33am

**Submitted by:** Angelique Dahlberg

**Status:** Fixed

**Type:** Comment

**Severity:** Minor

**Scope:** Q09. Is the plant a health risk to humans or animals/fish? Has the species been noted as impacting grazing systems?

### Issue Description

Other websites with information on toxicity:

1. MDA: <http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/foxglove.asp>  
x
2. The FDA has some suggested articles: <https://www.accessdata.fda.gov/scripts/plantox/textResults.cfm?q=Digitalis+lanata>

### Issue Resolution (Screener's Response to Issue)

Issue resolved by PRE Data Manager -- added information from MDA and linked source. It looked like most of the sources from FDA were outdated, and the question can be answered with high confidence without other sources.

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### Issue ID # 6133



**Date Created:** December 11, 2017 - 8:23am

**Date Updated:** December 22, 2017 - 9:40am

**Submitted by:** Angelique Dahlberg

**Status:** Fixed

**Type:** Comment

**Severity:** Minor

**Scope:** Q03. Is the species (or cultivar or variety) noted as being invasive in the U.S. or world?

### Issue Description

Grecian foxglove is being removed from prairies at Belwin Conservancy in Afton, MN. Information about the infestation and management is on Belwin's website, and a copy of a presentation by Belwin and the Minnesota Department of Agriculture is online at: [https://bugwoodcloud.org/mura/mipn/assets/File/U\\_MISC-2016/Tuesday/1/Justen\\_Anderson\\_GrecianFoxgloveMgmtSuccess.pdf](https://bugwoodcloud.org/mura/mipn/assets/File/U_MISC-2016/Tuesday/1/Justen_Anderson_GrecianFoxgloveMgmtSuccess.pdf)

### Issue Resolution (Screener's Response to Issue)

Issue resolved by PRE Data Manager -- text from issue and presentation added to Q3. Added presentation to PRE bibliography and linked to question.

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### Issue ID # 5920

**Date Created:** November 21, 2017 - 1:50pm

**Date Updated:** November 28, 2017 - 12:54pm

**Submitted by:** Laura Van Riper

**Status:** Fixed

**Type:** Suggestion

**Severity:** Minor

**Scope:** Q14. Does this plant produce copious viable seeds each year (>1000)?

### Issue Description

I think this question should be left unanswered. I don't see any references that list an estimate of number of seeds per plant. With no data, the question should be left unanswered. The plant has many flowers that produce multiple seeds per flower. Without any specific numbers, we don't know that the number of seeds per plant is less than 1000.



### Issue Resolution (Screener's Response to Issue)

I understand the logic and generally agree, so I did remove the answer. However, care needs to be given to answer these types of questions consistently. Specifically, when to answer "no" versus when to simply not answer the question. This would be the case for any question with a quantifiable answer (years, quantity, distance, etc)... if a specific quantity isn't identified, should the question be answered "no" or left unanswered.

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### Issue ID # 5919

**Date Created:** November 21, 2017 - 1:18pm

**Date Updated:** November 28, 2017 - 1:00pm

**Submitted by:** Laura Van Riper

**Status:** Fixed

**Type:** Suggestion

**Severity:** Minor

**Scope:** General Information

### Issue Description

There is this quote in the "Evaluation Summary":

Minnesota Department of Natural Resources indicates that this plant produces "large amounts of seed that can be spread by wind, water, vehicles, humans, wildlife, and by moving seed-containing soil",

When I look at the MN DNR Grecian Foxglove webpage, I do not see the above quote.  
<http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/grecianfoxglove.html>

It looks like the quote is actually from the Minnesota Department of Agriculture. Please correct the statement.



<http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/foxglove.aspx>

**Issue Resolution (Screener's Response to Issue)**

Noted and corrected.

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## **About PRE and this Plant Evaluation Report**

The PlantRight Plant Risk Evaluator -- PRE is an online database and platform enabling those involved in non-native, terrestrial plant production to know before they grow if a plant poses a regional invasive risk. This tool offers many benefits, and we encourage you to visit the PRE website (<https://pre.ice.ucdavis.edu>) for more information.

If you are a nursery trade association, or involved in the research, development or distribution of horticultural plants we invite you to join the PRE community. If you are a plant scientist, affiliated with a horticultural college or botanic garden, and would like to learn more about becoming a PRE Screener, please drop us an email, [PlantRight@suscon.org](mailto:PlantRight@suscon.org), requesting a PRE Account.

PRE beta funding is provided by Sustainable Conservation (<http://www.suscon.org/>) and a USDA Farm Bill grant.