



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

***Gentiana cruciata -- Illinois***

***2017 Farm Bill PRE Project***

**PRE Score:** 8 -- Accept (low risk of invasiveness)

**Confidence:** 59 / 100

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

**Privacy:** Public

**Status:** Submitted

**Evaluation Date:** July 26, 2017

*This PDF was created on June 15, 2018*



## Plant Evaluated

*Gentiana cruciata*



Image by Hectonichus



## Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Gentiana cruciata*) 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.

## General Information

**Status:** Submitted

**Screener:** Emily Russell

**Evaluation Date:** July 26, 2017

## Plant Information

**Plant:** *Gentiana cruciata*

## Regional Information

**Region Name:** Illinois

## 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 **Low** confidence in this answer based on the available literature.

#### Answer / Justification:

A literature review revealed only one known instance of *Gentiana cruciata* naturalizing where it is not native: in Massachusetts, according to the USDA PLANTS database.

#### Reference(s):

- USDA NRCS (2017). USDA PLANTS Database: *Gentiana cruciata* (star gentian).
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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: **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:

*Gentiana cruciata* is reportedly naturalized in Massachusetts, but this is not a climate match for Illinois.

#### Reference(s):

- [Anonymous] .



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

- 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:

There are no reports of *Gentiana cruciata* as an invasive species.

#### Reference(s):

- [Anonymous] .
- 

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

- 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:

There are no reports of *Gentiana cruciata* as an invasive species.

#### Reference(s):

- [Anonymous] .
- 

### 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 **Medium** confidence in this answer based on the available literature.



**Answer / Justification:**

A review of the nineteen species of *Gentiana* listed in the Global Compendium of Weeds yielded few citations; most were naturalised, casual alien, cultivation escape, or weed. None appear to be posing a significant threat. No other reports of invasion by *Gentiana* could be found.

**Reference(s):**

- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
- 

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

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

**Answer / Justification:**

The distribution in Southwestern Europe (France, Spain, Italy) and Siberia do not match the climate of Illinois, but the heart of the distribution in Eastern Europe and the Caucasus do match.

**Reference(s):**

- GBIF Secretariat (2016). GBIF Backbone Taxonomy: *Gentiana cruciata* L..
  - USDA-Grin (2017). *Gentiana cruciata*. In: Taxonomy - GRIN-Global Web v 1.9.8.2.
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**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: **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:**

There are no reports of dominating plant communities.

**Reference(s):**

- [Anonymous] .
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**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 *screeners* has a **Low** confidence in this answer based on the available literature.

**Answer / Justification:**

There is no evidence of changing fire regimes.

**Reference(s):**

- [Anonymous] .
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**9. Is the plant a health risk to humans or animals/fish? Has the species been noted as impacting grazing systems?**

- 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:**

*Gentiana cruciata* has been used medicinally. There are no reports of impacts to grazing systems or animals.

**Reference(s):**

- Plants For A Future (PFAF) (2012). *Gentiana cruciata* PFAF Plant Database.



## 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 **Medium** confidence in this answer based on the available literature.

### Answer / Justification:

As a low-growing herbaceous perennial, it is unlikely *Gentiana cruciata* could produce impenetrable thickets.

### Reference(s):

- [Anonymous] .
- 

## Reproductive Strategies (Questions 11 - 17)

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

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

### Answer / Justification:

"In addition to producing seed *Gentiana cruciata* is a hemicryptophyte and reproduces vegetatively giving rise to clumps of stems made up of various numbers of fertile and sterile stems. Thus, gentian population can survive the loss of a large proportion of seeds if the site is suitable for vegetative growth."

### Reference(s):

- Arnyas, E., Bereczki J., Toth A., Pecsénye K., & Varga Z. (2006). Egg-laying preferences of the xerophilous ecotype of *Maculinea alcon* (Lepidoptera: Lycaenidae) in the Aggtelek National Park. *European Journal of Entomology*. 103, 587–595.
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**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 *screeener* has a **Low** confidence in this answer based on the available literature.

**Answer / Justification:**

There is no evidence that *Gentiana cruciata* reproduces by fragmentation.

**Reference(s):**

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

- 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:**

*Gentiana cruciata* reproduces primarily by seed.

**Reference(s):**

- Petanidou, T., Nijs JCM. den, & Oostermeijer J.. G. B. (1995). Pollination ecology and constraints on seed set of the rare perennial *Gentiana cruciata* L. in the Netherlands. *Plant Biology*. 44, 55–74.
  - Kéry, M., Matthies D., & Fischer M. (2001). The effect of plant population size on the interactions between the rare plant *Gentiana cruciata* and its specialized herbivore *Maculinea rebeli*. *Journal of Ecology*. 89, 418–427.
  - Malinauskaitė, R., & Kukauskienė G.. (2013). The investigations of cross gentian (*Gentiana cruciata* L.) seedage.. *Žemės ūkio Mokslai*. 20, 141–149.
-



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

- 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:

Petanidou found 50 flowers per stem, several stems per plant. Fruit set was 100% with 50-100 viable seeds per fruit for open-pollinated plants. From Kery: "G. cruciata genets had a median of 2 flower stems ... and median number of 15 flowers per stem, which corresponds to 30 fruits per genet...G. cruciata genets developed on average 87.1 seeds per fruit regardless of population size."

##### Reference(s):

- Petanidou, T., Nijss JCM. den, & Oostermeijer J. G. B. (1995). Pollination ecology and constraints on seed set of the rare perennial *Gentiana cruciata* L. in the Netherlands. *Plant Biology*. 44, 55–74.
- Kéry, M., Matthies D., & Fischer M. (2001). The effect of plant population size on the interactions between the rare plant *Gentiana cruciata* and its specialized herbivore *Maculinea rebeli*. *Journal of Ecology*. 89, 418–427.

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#### 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?

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

##### Answer / Justification:

"It is recommended to sow seeds in autumn (in September) to reach better seed germination and earlier bloom. The germination was 47%, the plants began to bloom in the second year, in June." "Seed - best sown as soon as it is ripe in a light position in a cold frame. It can also be sown in late winter or early spring but the seed germinates best if given a period of cold stratification and quickly loses viability when stored, with older seed germinating slowly and erratically."



**Reference(s):**

- Malinauskaitė, R., & Kukauskienė G.. (2013). The investigations of cross gentian (*Gentiana cruciata* L.) seedage.. *Žemės ūkio Mokslai*. 20, 141–149.
  - Plants For A Future (PFAF) (2012). *Gentiana cruciata* PFAF Plant Database.
- 

**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 *screeener* has a **Medium** confidence in this answer based on the available literature.

**Answer / Justification:**

Estimates range from 2 to 7 years for the time from seed to bloom.

**Reference(s):**

- Malinauskaitė, R., & Kukauskienė G.. (2013). The investigations of cross gentian (*Gentiana cruciata* L.) seedage.. *Žemės ūkio Mokslai*. 20, 141–149.
  - Plants For A Future (PFAF) (2012). *Gentiana cruciata* PFAF Plant Database.
- 

**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 *screeener* has a **Medium** confidence in this answer based on the available literature.



**Answer / Justification:**

"The Chicago Botanic Garden evaluated plants of *Gentiana cruciata* from seed collected in the Republic of Georgia. The trial occurred between June 2012 and October 2015. No flowers were produced the first summer (2012) after planting in the trial garden. Copious flowers were produced in each of the subsequent years (2013-2015). Flowering dates in Glencoe, IL were typically early July to early August, for roughly one month. Actual flowering dates were 7/1-8/1/2013, 6/30-8/1/2014, and 7/13-8/10/2015. No seedlings were observed in the trial beds." (Richard Hawke, Chicago Botanic Garden, see issues).

**Reference(s):**

- [Anonymous] .
- 

## 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 *screeener* has a **Low** confidence in this answer based on the available literature.

**Answer / Justification:**

There is no evidence of dispersal by mammals or birds.

**Reference(s):**

- [Anonymous] .
- 

### 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 *screeener* has a **Low** confidence in this answer based on the available literature.



**Answer / Justification:**

Dispersal is either by gravity or wind, but no estimates of distance were available.

**Reference(s):**

- [Anonymous] .
- 

**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 *screeener* has a **Low** confidence in this answer based on the available literature.

**Answer / Justification:**

There is no evidence of accidental dispersal by people.

**Reference(s):**

- [Anonymous] .
- 

**Total PRE Score**

**PRE Score:** 8 -- Accept (low risk of invasiveness)

**Confidence:** 59 / 100

**Questions answered:** 20 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:

- Richard Hawke September 18, 2017

This evaluation has a total of 1 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 # 4827

**Date Created:** September 18, 2017 - 12:05pm

**Date Updated:** December 10, 2017 - 12:37pm

**Submitted by:** Richard Hawke

**Status:** Fixed

**Type:** Suggestion

**Severity:** Minor

**Scope:** Q17. Does this plant continuously produce seed for >3 months each year or does seed production occur more than once a year?

### Issue Description

The Chicago Botanic Garden evaluated plants of *Gentiana cruciata* from seed collected in the Republic of Georgia. The trial occurred between June 2012 and October 2015. No flowers were produced the first summer (2012) after planting in the trial garden. Copious flowers were produced in each of the subsequent years (2013-2015). Flowering dates in Glencoe, IL were typically early July to early August, for roughly one month. Actual flowering dates were 7/1-8/1/2013, 6/30-8/1/2014, and 7/13-8/10/2015. No seedlings were observed in the trial beds.

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

The answer was changed to No with medium confidence, and this data was added to the answer. Thank you!

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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.