Recommended Best Management Practices for Colorado green gentian (*Frasera coloradensis*)

Practices Developed to
Reduce the Impacts of
Road Maintenance Activities
to Plants of Concern

CNHP's mission is to preserve the natural diversity of life by contributing the essential scientific foundation that leads to lasting conservation of Colorado's biological wealth.

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Front Cover: *Frasera coloradensis* plants and habitat, from top to bottom,

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Table of Contents

Introduction

Colorado green gentian (*Frasera coloradensis*) is a small plant in the Gentianaceae (Gentian Family) that is known only from the southeastern Colorado in Baca, Bent, Prowers, and Las Animas counties, and is considered to be imperiled at a global and state level (G2G3/S2S3; Colorado Natural Heritage Program 2014). One of the biggest conservation issues for this imperiled plant species is the lack of awareness of its existence and status. Avoiding or minimizing impacts to this species during road maintenance activities will effectively help to conserve its habitat and is unlikely to confer substantial impacts on road maintenance goals and projects. The Best Management Practices (BMPs) included in this document are intended to help increase the awareness of this species for anyone involved in road maintenance activities.

The desired outcome of these recommended BMPs is to significantly reduce the impacts of road maintenance activities to the Colorado green gentian on federal, state, and private land. The BMPs listed here are intended to be iterative, and to evolve over time as additional information about the Colorado green gentian becomes available, or as road maintenance technologies develop.

The intent of these BMPs is to inform people working along roadside areas regarding the importance of Colorado green gentian, one of Colorado's botanical treasures, and to outline some of the ways in which this species can coexist with road maintenance activities. The implementation of these recommendations will help to assure that maintenance activities proceed without unintended harm to the Colorado green gentian.

Best Management Practices for Colorado Green Gentian (*Frasera coloradensis*)

1. Gather mapped location information for Colorado green gentian along roadsides (within 50 meters/54 yards of all roads: CDOT, County, USFS, BLM, and municipalities) consulting with the Colorado Natural Heritage Program (CNHP) at Colorado State University, local herbaria, and other known sources of rare plant location data. In 2014 this step was conducted by the Colorado Natural Heritage Program as part of a pilot project to conserve roadside populations of globally imperiled plants (Panjabi and Smith 2014).

2. Work with the Colorado Natural Heritage Program to create Special Management Areas based on the distribution of Colorado green gentian within 50 meters/54 yards of roads and a recommended avoidance buffer of 200 meters/218 yards. The 200 meter/218 yard buffer reduces dust transport, weed invasion, herbicide damage, magnesium chloride damage, and other unintended impacts, such as alteration of hydrological setting. It also reduces impact to pollinators and their habitat. Special Management Areas (maps and data tables) are presented in Appendix One if a data sharing agreement has been signed with the Colorado Natural Heritage Program.

3. Prior to road maintenance work, the field supervisor (CDOT) or land manager (County, BLM, etc.) should provide maps to road crews showing all known Special Management Areas for the plants (as hard-copy and GIS files, and including the UTMs indicating the extent of the Special Management Areas along roads). The maps and other data should be "species blind"; they should *not* indicate what species are found within the Special Management Areas (Colorado green gentian as well as other rare taxa). The maps should be updated as new plant locations are found.

4. Within the Special Management Areas the roadsides should not be seeded, sprayed, or mowed to avoid disturbance to soils, plants, and habitat. This includes all brush control, fire control, and weed control. Dust abatement applications, if necessary, should be comprised of water only, with use of magnesium chloride to the minimum extent necessary.

5. If mowing is necessary, for example for safety reasons, avoid mowing from May 1-August 31. Mowing with a 12 inch/0.3 meter or higher cut could take place in the Special Management Areas before May 1 (or after August 31) as long as the mowers do not drive over/park on top of the plants.

6. If grading is necessary, following rain or other events that wash out roads, avoid burying the rare plants.

7. Snow and ice control measures present some concerns for the Special Management Areas, though public safety is a priority. When possible, plowing, deicer and sand applications, rock slide removal, snow fence maintenance and construction activities should consider the locations of the Special Management Areas. For example, sand applications could cover plants when the snow melts and should be avoided if possible.

8. Locating signs away from Special Management Areas would benefit the Colorado green gentian. If guardrails need to be installed/repaired, minimize impacts to the gentian to the greatest extent possible.

9. *Ex-situ* techniques such as transplanting are not recommended under any circumstances.

10. Develop monitoring plans for the roadside locations of Colorado green gentian, with goals to detect any decrease in the population size or condition, and/or needs for restoration efforts and/or noxious weed management.

11. Minimize impacts to habitat for Colorado green gentian through appropriate and creative project planning. Some examples of appropriate and creative project planning include:

- Wash vehicles and other equipment to reduce the spread of noxious weeds from other areas.
- Assure that straw and hay bales used for erosion control are certified free of noxious weeds.
- Contact the Colorado Natural Heritage Program at Colorado State University when planning ground breaking activities at or near (within 200 meters/218 yards) Colorado green gentian sites.

Noxious Weed Management in Habitat for Colorado Green Gentian (*Frasera coloradensis*)

1. Document, map, monitor and control all infestations of noxious weeds (Colorado Noxious Weed Act 2003) and other non-native invasive plant species in the Special Management Area for Colorado green gentian. The Colorado Noxious Weed List can be found online at: http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733

2. Monitor Special Management Areas for new weed infestations. Noxious weeds in close proximity (within 400–800 meters/437-875 yards) to the plants of concern should be the highest priority for control. Ensure that the rare plants are protected from any damage resulting from weed control efforts.

3. Control noxious weeds using integrated techniques. Limit chemical control in areas within 200 meters/218 yards of rare plant species to avoid damage to non-target species. Mechanical or chemical control in and near rare plant habitat should only be implemented by personnel familiar with the rare plants.

4. Herbicide application should be kept at least 200 meters/218 yards from known plant populations, except in instances where weed populations threaten habitat integrity or plant populations. Great care should be used to avoid pesticide drift in those cases.

Other Needs and Recommended Guidelines

Further inventory, monitoring, research, and conservation planning is recommended for the Colorado green gentian to assist with future development and implementation of these Best

Management Practices (BMPs), as well as our basic understanding of this rare species. As we work to manage for the long-term viability of the Colorado green gentian it will be important to conduct botanical surveys (inventories) and map new locations to improve our understanding about how roadside locations contribute to full species distribution. Inventory work may also help to identify sites that could be suitable for conservation efforts. Monitoring roadside locations is important to determine if the BMPs are working, and clarify the conservation status of the species. Research into pollination ecology, recommended setbacks, and phenology is also suggested. As these research efforts are undertaken, the following recommendations can help assure high quality results that will be most useful in conservation planning activities.

1. Botanical field surveys should be conducted by qualified individual(s) with botanical expertise, according to commonly accepted survey protocols, and using suitable GPS equipment. The Colorado Natural Heritage Program (CNHP) at Colorado State University can provide references, field forms, etc. Surveys should be repeated at least once every 10 years. Prioritize surveys on preferred geologic substrates within species range.

2. Botanical field surveys should be conducted during June and July when the Colorado green gentian can be detected and accurately identified. In some cases multi-year surveys may be necessary, e.g., if drought conditions occur during the survey window.

3. If Colorado green gentian (or other species of concern) are found within the survey area, the botanist should endeavor to determine the complete extent of the occurrence and the approximate number of individuals within the occurrence. Ideally occurrences should be delineated by GPS and the results imported to GIS for inclusion on updated project maps.

4. Field survey results should be reported to CNHP, and to appropriate land managers. A photograph or voucher specimen (if sufficient individuals are present) should be taken. Vouchers should be deposited in one of Colorado's major herbaria (e.g., University of Colorado, Colorado State University, Denver Botanic Gardens). Negative results of surveys should also be reported to CNHP.

5. Perform frequent and timely inspections of development sites and plants of concern occurrences to ensure that BMPs are being followed, and to identify areas of potential conflict. Inspections of plant occurrences should be performed by a botanist or other qualified personnel.

6. Monitoring is more likely to succeed if properly planned. Collection of baseline data, prior to any impact, is vital. Although land management agencies may have specific monitoring guidelines, an excellent reference for developing and implementing a monitoring plan is Elzinga et al. (1997).

7. Monitor impacts on plants of concern from road maintenance or other activities in the area. If impacts are noted, change management to address the cause of impacts.

8. Develop and implement monitoring plans for noxious weeds. Plans should be designed to detect new infestations and document the extent and spread of existing weeds.

Species profile

Frasera coloradensis
(Colorado green gentian)
Gentianaceae (gentian family)


Close up of *Frasera coloradensis* by Jill Handwerk


Close up of *Frasera coloradensis* by Jill Handwerk

Ranks and Status

Global rank: G2G3
State rank: S2S3
Federal protection status: None
State protection status: None

Description and Phenology

Frasera coloradensis by Patricia Whalen

General description: A small (10-20 cm/4-8 inch) and variously branched perennial. Leaves are thick, long and narrow, with white margins, glabrous or minutely pubescent. Plants appear as rosettes before flowers are produced. Flowering structures are typically much branched panicles, with greenish-white flowers. Calyx is deeply 4-parted, with petals 8-10 mm/0.3-0.4 inches long. A small greenish gland occurs near the base of each petal, and small purplish dots appear on the upper surface of the petals (Naumann 1991, Spackman et al. 1997).

Look Alikes: It is quite distinctive and is unlikely to be confused with other taxa. (Naumann 1991) However, leaves look superficially like the young leaves of *Yucca glauca*, but on close inspection, Yucca leaves are thicker and more fibrous, with fibers peeling off at the margins.

Phenology: Flowers in mid-June to mid-July. Produces fruits in July after flowering.

Habitat


Habitat of *Frasera coloradensis* by Jill Handwerk


Habitat of *Frasera coloradensis* by Jill Handwerk


Habitat of *Frasera coloradensis* by Steve Olson

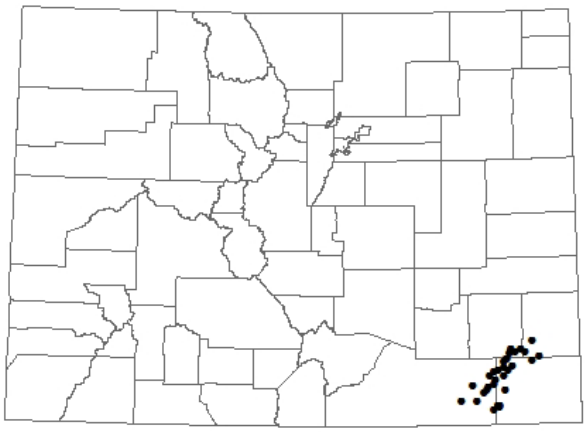
Low sandy/sandstone breaks in grasslands, northerly aspects in between rocks or just below them; shallow slopes. Associated with surface outcrops or shallow-to-bedrock occurrences of Cretaceous rock formations, including Greenhorn limestone, Graneros shale and Dakota

sandstone. Plant community generally shortgrass prairie, mixed prairie breaks, or open pinyon-juniper woodlands. Substrate is the best indicator for locations of this species (Naumann 1991, Spackman et al. 1997).

Elevation Range: 4,071 - 5,800 feet; 1,241 - 1,768 meters

Distribution

Colorado endemic: Yes
Global range: Colorado endemic; documented habitat less than 300 acres; potential undocumented habitat is estimated at about 1,000 acres (Naumann 1991). Total range is about 25 miles x 75 miles (estimated by the Colorado Natural Heritage Program in 2008). This species is known from four counties: Baca, Bent, Prowers, and Las Animas.



Distribution map of *Frasera coloradensis* in Colorado

Threats and Management Issues

Primarily threatened by wind energy development (pers. Comm. Hazlett 2014). Moderately threatened by agricultural and road management practices such as herbicide application; grazing may suppress reproduction, but probably doesn't frequently kill established plants except in cases of overgrazing; primary threat is inadvertant loss or alteration of naturally limited habitat (Naumann 1991).

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