



**RECOMMENDED BEST
MANAGEMENT
PRACTICES
for Degener's Penstemon
(*Penstemon degeneri*)**

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

CNHP's mission: We advance conservation of Colorado's native species and ecosystems through science, planning, and education for the benefit of current and future generations.

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Front Cover: *Penstemon degeneri* plants and habitat, from top to bottom,
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INTRODUCTION

Degener's penstemon (*Penstemon degeneri*) is a perennial herb in the Plantaginaceae (Plantain Family) that is found only in Fremont, Custer and Chaffee counties, and is considered to be imperiled at a global and state level (G2/S2; Colorado Natural Heritage Program 2016). When flowering, it has beautiful blue-purple flower spikes. 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 reduce significantly the impacts of road maintenance activities to the Degener's penstemon on federal, state, and/or private land. The BMPs listed here are intended to be iterative, and to evolve over time as additional information about the Degener's penstemon 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 Degener's penstemon, 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 these globally imperiled plants. A summary checklist of BMPs is presented in **Appendix One**.

BEST MANAGEMENT PRACTICES FOR DEGENER'S PENSTEMON (*PENSTEMON DEGENERI*)

1. Gather mapped location information for Degener's penstemon along roadsides (20 meters/22 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 and 2016 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 Degener's penstemon within 20 meters/22 yards of roads. **Special Management Areas** (maps and data tables) are presented in **Appendix Two** 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 (Degener’s penstemon 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. (For appropriate management of noxious weeds, please refer to the Noxious Weed Management section below.) Dust abatement applications, if necessary, should be comprised of water only, with use of magnesium chloride limited to the minimum extent necessary.
5. If mowing is necessary, for example for safety reasons, avoid mowing from June 1 to August 31. If mowing is necessary during June 1-August 31, mow with as high of a blade height as practicable, and 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, gravel, 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 Degener’s penstemon. If guardrails need to be installed/repared, minimize impacts to the penstemon to the greatest extent possible.
9. Minimizing and/or discouraging the use of vehicle pull-off and turn-around areas where the rare plants are present would also be beneficial. Proper signage, fencing, obstacles (boulders) are all possible solutions.
10. Transplanting is not recommended under any circumstances.
11. Develop monitoring plans for the roadside locations of Degener’s penstemon, with the goals of detecting any decrease in the population size or condition, and/or needs for restoration efforts and/or noxious weed management.

12. Minimize impacts to Degener's penstemon habitat 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 of) Degener's penstemon sites.

NOXIOUS WEED MANAGEMENT IN HABITAT FOR DEGENER'S PENSTEMON (*PENSTEMON DEGENERI*)

1. Document, map, monitor and control all infestations of noxious weeds (Colorado Noxious Weed Act 2003) and other non-native invasive plant species in and adjacent to occupied habitat for Degener's penstemon. The Colorado Noxious Weed List can be found online at: <https://www.colorado.gov/pacific/agconservation/noxious-weed-species>
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.
5. For further information on managing weeds in the vicinity of rare plant populations please see the Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants (Mui and Panjabi 2016). Link provided here: [http://www.cnhp.colostate.edu/download/documents/2016/BMP Noxious Weeds on Sites with Rare Plants CMui SPanjabi May 2016.pdf](http://www.cnhp.colostate.edu/download/documents/2016/BMP%20Noxious%20Weeds%20on%20Sites%20with%20Rare%20Plants%20CMui%20SPanjabi%20May%202016.pdf).

OTHER NEEDS AND RECOMMENDED GUIDELINES

Further inventory, monitoring, research, and conservation planning is recommended for Degener's penstemon 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 Degener's penstemon 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 effective, and clarify the conservation status of the species. Research into pollination ecology (following English 2013), 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 Degener's penstemon 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 Degener's penstemon (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

Penstemon degeneri (Degener's Penstemon)

Plantaginaceae (Plantain Family)



Close ups of Degener's penstemon (*Penstemon degeneri*) in flower by Steve Olson.



Degener's penstemon (*Penstemon degeneri*) in fruit by Steve Olson.



Close up of Degener's penstemon (*Penstemon degeneri*) seed capsules by David Elin.

Ranks and Status

Global rank: G2

State rank: S2

Federal protection status: USFS Sensitive, BLM Sensitive

State protection status: None

Description and Phenology

Artwork in progress by Sharon Garrett. Please also see Spackman et al. 1997.

General description: *Penstemon degeneri* is a perennial herb from 25 to 40 cm tall with five or more, slender, leafy, short-pubescent stems and a somewhat woody caudex. The basal leaves are lanceolate, entire, and up to 6 cm long and 16 mm wide (Spackman et al. 1997). The cauline leaves are more linear, more pubescent, and more sessile. The unleafy, sparingly glandular inflorescence is 3 to 10 cm high, with 2 to 10 tubular flowers at the ends of the stems. The dark blue to violet corolla of the flower is gradually inflated, 14 to 19 mm long and 4 to 5 mm wide at the mouth. The corollas are slightly two-ridged on the floor and have straight, reddish guidelines and sparse yellow hairs in the corolla throat. The staminode is also bearded with sparse golden hairs for about half its length. The anther sacs are 2.0 mm across the connective and are longer than wide. The papery calyx is persistent and the dehiscent capsules are 7 to 9 mm long, with small, dark brown, irregularly angled seeds (Beatty et al. 2004).

Look Alikes: *Penstemon degeneri* is similar to *P. radicosus* in appearance, though *P. radicosus* is limited to Jackson County in northcentral, Colorado, and *P. degeneri* is found in southcentral Colorado. *Penstemon griffinii* is the only relative in the alliance in Colorado. It is characterized by having a deeply 2-ridged corolla and a dense covering of long, golden hairs on the floor and opening of the corolla. *Penstemon degeneri* has a less strongly ridged corolla and an opening with a few hairs and a glabrous floor. *Penstemon griffinii* has a basal rosette through the flowering period, and smaller, linear stem leaves (2-3 cm long, 2 mm wide), while *Penstemon degeneri* lacks a basal rosette at flowering time, and has longer and wider stem leaves (up to 6 cm long and 16 mm wide (Spackman et al. 1997). The staminode of *P. degeneri* is pubescent for roughly half its length with golden hairs while the staminode of *P. griffinii* is pubescent for most of its length (Ackerfield 2015).

Phenology: Flowering occurs June through mid-July, and fruits set late July (Spackman et al. 1997).

Habitat



Habitat of Degener's penstemon (*Penstemon degeneri*) by David Elin.

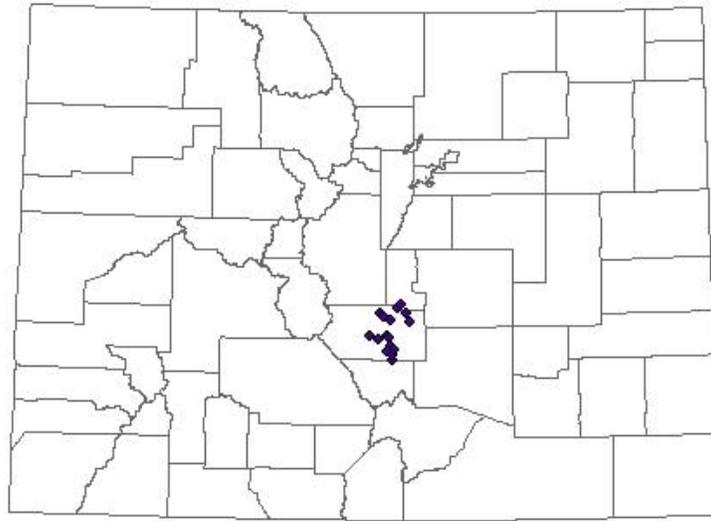
Habitat description: Degener's penstemon is found in open pinyon-juniper woodlands and montane grasslands, in rocky soils with igneous bedrock. The plants grow mainly near the rim of canyons, and also in cracks of large rock slabs, in full sun or shade. Associated species include *Quercus gambelii*, *Sitanion longifolium*, *Verbena bacteata*, *Lesquerella montana*, *Grindelia squarrosa*, *Heterotheca horrida*, *Artemisia frigida*, *Carex stenophylla*, *Eriogonum jamesii*, *Opuntia phaeacantha*, *Atriplex canescens*, *Pinus edulis*, and *Juniperus monosperma* (Peterson and Harmon 1981).

Elevation Range: 5,991 - 9,449 feet (1,826 - 2,880 meters)

Distribution

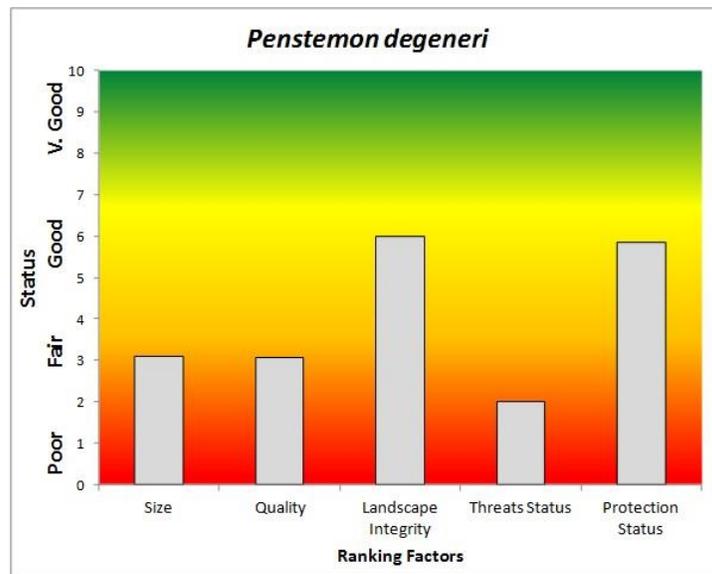
Colorado endemic: Yes

Global range: A Colorado endemic, this species is known from Fremont, Custer, and Chaffee counties. Estimated range is 2,445 square kilometers (944 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences (calculated by the Colorado Natural Heritage Program in 2008).



Distribution map of Degener's penstemon (*Penstemon degeneri*) in Colorado.

Threats and Management Issues



Summary results of an analysis of the status of *Penstemon degeneri* based on several ranking factors. This species was concluded to be "moderately conserved". From Rondeau et al. 2011.

The primary threat at this time is considered to be road building (and maintenance) (Decker and Anderson 2004, Rondeau et al. 2011). Other threats are from off-road vehicle use, non-motorized recreation, non-native species invasion, grazing, residential development, fire suppression, resource extraction, and global climate change. A lack of systematic tracking of population trends

and conditions and a lack of knowledge about the species' basic life cycle also contribute to the possibility that one or more of these factors will threaten its long-term persistence (Decker and Anderson 2004).

REFERENCES

- Ackerfield, J. 2015. Flora of Colorado, Colorado State University Herbarium, Botanical Research Institute of Texas Press, Fort Worth, Texas. 818 pp.
- Beatty, B.L., W.F. Jennings, and R.C. Rawlinson (2004, February 23). *Penstemon degeneri* Crosswhite (Degener's beardtongue): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: <http://www.fs.fed.us/r2/projects/scp/assessments/penstemondegeneri.pdf>.
- Colorado Native Plant Society. 1989. Rare plants of Colorado. Rocky Mountain Nature Association, Colorado Native Plant Society, Estes Park, Colorado. 73 pp.
- Colorado Natural Heritage Program. 2017. Biodiversity Tracking and Conservation System. Colorado State University, Fort Collins, CO.
- Colorado Noxious Weed Act. 2003. Title 35: Agriculture, Article 5.5: Colorado Noxious Weed Act, and 8 CRR 1203-19 Rules pertaining to the administration and enforcement of the Colorado Noxious Weed Act.
- Crosswhite, F.S. 1965. Revision of *Penstemon* section *Penstemon* (Scrophulariaceae) II. A western alliance in series Graciles. American Midland Naturalist 74:429
- Decker, K. and Elliott, B. A., S. Spackman Panjabi, B. Kurzel, B. Neely, R. Rondeau, M. Ewing. 2009. Recommended Best Management Practices for Plants of Concern. Practices developed to reduce the impacts of oil and gas development activities to plants of concern. Unpublished report prepared by the Rare Plant Conservation Initiative for the National Fish and Wildlife Foundation.
- Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1997. Measuring & Monitoring Plant Populations. BLM Technical Reference 1730-1.
- English, C. 2013. Effective pollination in a rare Colorado endemic: *Penstemon degeneri*. *Aquilegia*, Newsletter of the Colorado Native Plant Society. Volume 37, Number 1, Pages 15-18.
- Kartesz, J.T. 1994. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. 2nd edition. 2 vols. Timber Press, Portland, OR.
- Mui, C. H. and S. S. Panjabi. 2016. Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants. Unpublished report prepared by the Colorado Department of

Agriculture and the Colorado Natural Heritage Program at Colorado State University.
Available online at

http://www.cnhp.colostate.edu/download/documents/2016/BMP_Noxious_Weeds_on_Sites_with_Rare_Plants_CMui_SPanjabi_May_2016.pdf

Neely, B., S. Panjabi, E. Lane, P. Lewis, C. Dawson, A. Kratz, B. Kurzel, T. Hogan, J. Handwerk, S. Krishnan, J. Neale, and N. Ripley. 2009. Colorado Rare Plant Conservation Strategy, Developed by the Colorado Rare Plant conservation Initiative. The Nature Conservancy, Boulder, Colorado, 117 pp.

Panjabi, S.S. and G. Smith. 2014. Conserving Roadside Populations of Colorado's Globally Imperiled Plants 2013-2014 Pilot Project. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.

Peterson, J.S. and W. Harmon. 1981. Status report on *Penstemon degeneri*. Unpublished report prepared for the Colorado Natural Areas Program, Denver, CO.

Rondeau, R., K. Decker, J. Handwerk, J. Siemers, L. Grunau, and C. Pague. 2011. The state of Colorado's biodiversity 2011. Prepared for The Nature Conservancy. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.

Rydberg, P.A. 1906. Flora of Colorado. Agricultural Experiment Station of the Colorado Agricultural College, Fort Collins.

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado rare plant field guide. Prepared for Bureau of Land Management, U.S. Forest Service and U.S. Fish and Wildlife Service by Colorado Natural Heritage Program.

The Colorado Native Plant Society. 1997. Rare Plants of Colorado, second edition. Falcon Press Publishing Co., Inc. Helena, Montana. 105pp.

USDA, NRCS. 2016. The PLANTS Database. National Plant Data Team, Greensboro, NC 27401-4901 USA.

Weber, W. A. and R. C. Wittmann. 2012. Colorado Flora, Eastern Slope, A Field Guide to the Vascular Plants, Fourth Edition. Boulder, Colorado. 555 pp.

Weber, W. A. and R. C. Wittmann. 2012. Colorado Flora, Western Slope, A Field Guide to the Vascular Plants, Fourth Edition. Boulder, Colorado. 532 pp.

APPENDIX ONE-SMA BMP CHECKLIST

This checklist is intended as a reminder for the Best Management Practices (BMPs) presented in the full report above that are recommended for the Special Management Areas (SMAs) presented in Appendix Two. Please see the full report for further details about the recommended BMPs listed here.

1. Avoid seeding, spraying, and mowing.
2. If mowing is necessary, avoid mowing during the “No Mowing Dates”. If mowing is necessary during the “No Mow Dates”, mow with as high of a blade height as practicable, and do not drive over/park on top of the plants.
3. If weed control is necessary, use integrated techniques that are implemented by personnel familiar with the rare plants.
4. Avoid burying plants.
5. Plowing, deicer and sand applications, rock slide removal, snow fence maintenance and construction activities should consider the locations of the SMAs.
6. Locate signs and guardrails away from SMAs to the greatest extent possible.
7. Minimize the use of vehicle pull-off and turn-around areas in SMAs.
8. Do not transplant rare plants.
9. Monitor rare plant occurrences within SMAs.
10. Monitor SMAs for new weed infestations.
11. Wash vehicles and other equipment to reduce the spread of noxious weeds from other areas.
12. Assure that straw and hay bales used for erosion control are certified free of noxious weeds.
13. Contact the Colorado Natural Heritage Program at Colorado State University when planning ground breaking activities in SMAs.

APPENDIX TWO-SPECIAL MANAGEMENT AREAS

Maps and location specific information provided to project partners only.