



**RECOMMENDED BEST  
MANAGEMENT  
PRACTICES  
For Colorado's Globally  
Imperiled Plants**

**Practices 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.*

**Colorado Natural Heritage Program**

Warner College of Natural Resources  
Colorado State University  
1475 Campus Delivery  
Fort Collins, CO 80523  
(970) 491-7331

Report Prepared for:  
the Colorado Natural Areas Program

Recommended Citation:

Panjabi, S.S. and G. Smith, 2017. Recommended best management practices for Colorado's Globally Imperiled Plants: practices to reduce the impacts of road maintenance activities to plants of concern. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.

Front Cover: from top to bottom,  
© Al Schneider, David Elin, Susan Panjabi

# **RECOMMENDED BEST MANAGEMENT PRACTICES for Colorado's Globally Imperiled Plants**

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

Susan Panjabi and Gabrielle Smith

Colorado Natural Heritage Program  
Warner College of Natural Resources

Colorado State University  
Fort Collins, Colorado 80523



June 2017

# ACKNOWLEDGEMENTS

Funding for this important project was provided by the Colorado Natural Areas Program (CNAP).

We appreciate the input of numerous individuals during the preparation of this document, especially Raquel Wertsbaugh, Jessica Smith, Jeff Peterson, Brian Elliott, Carol English, Sara Brinton, Janis Huggins, Delia Malone, Peggy Lyon, Jill Handwerk, Bernadette Kuhn, Georgia Doyle, and Ann M. Grant. Special thanks to Cora Marrama for making the Special Management Area maps.

# TABLE OF CONTENTS

Acknowledgements .....	i
Introduction.....	1
Best Management Practices for Colorado’s Globally Imperiled Plants:.....	1
Noxious Weed Management in Habitat for Colorado’s Globally Imperiled Plants:.....	3
Other Needs and Recommended Guidelines.....	4
References .....	5
Appendix -Special Management Areas .....	8

# INTRODUCTION

Colorado supports habitat for approximately 120 globally imperiled plant species (Colorado Natural Heritage Program, Colorado State University 2017). These plants are in need of conservation attention to prevent unnecessary extirpations and extinctions. Numerous populations of these globally imperiled plants are known from roadside locations in Colorado. The Colorado Department of Transportation (CDOT), the Colorado Natural Areas Program at Colorado Parks and Wildlife (CPW), and the Colorado Natural Heritage Program (CNHP) are working together to ensure that information about the roadside plant populations is made available to the people and organizations managing and working along the roadways. Location information is critical to communicate so that road crews, weed managers, and others can avoid preventable harm to the plants.

One of the biggest conservation issues for these imperiled plant species is the lack of awareness of their existence and status. Avoiding or minimizing impacts to these species during road maintenance activities will effectively help to conserve important rare plant 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 these species locations 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 Colorado's globally imperiled plants 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 rare plants 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's botanical treasures, and to outline some of the ways in which these 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 COLORADO'S GLOBALLY IMPERILED PLANTS:

1. Gather mapped location information for globally imperiled plants along roadsides (within 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 globally imperiled plants within 20 meters/22 yards of roads. **Special Management Areas (maps and data tables) are presented in Appendix Two at the end of this report, and are also provided as GIS files. Additional species-specific information can be provided 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 UTM coordinates 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. 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 during the “No Mow Dates” included in the table with each SMA map. 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.
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 globally imperiled plants. If guardrails need to be installed/repaired, minimize impacts to the rare plants 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 the globally imperiled plants, 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 globally imperiled plant 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) globally imperiled plant sites.

## **NOXIOUS WEED MANAGEMENT IN HABITAT FOR COLORADO'S GLOBALLY IMPERILED PLANTS:**

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 globally imperiled plants. 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 Colorado's globally imperiled plants to assist with future development and implementation of these Best Management Practices (BMPs), as well as our basic understanding of these rare species. As we work to manage for the long-term viability of the globally imperiled plants 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 distributions. 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, 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 ranges.
2. Botanical field surveys should be conducted when the globally imperiled species are in bloom, and/or in fruit as the plants 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 globally imperiled plants (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.

## REFERENCES

- Ackerfield, J. 2015. *Flora of Colorado*, Colorado State University Herbarium, Botanical Research Institute of Texas Press, Fort Worth, Texas. 818 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.
- 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.
- Flora of North America Editorial Committee, ed. (FNA). 1993+. *Flora of North America North of Mexico*. Oxford Univ. Press, New York, Oxford.

- 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.
- Lavender, A.E., M.M. Fink, S.E. Linn, D.M. Theobald. 2011. Colorado Ownership, Management, and Protection v9 Database. Colorado Natural Heritage Program and Geospatial Centroid, Colorado State University, Fort Collins, CO.
- 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](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., B. Neely and P. Lyon. 2011. Preliminary Conservation Action Plan for Rare Plants in the Plateau Creek and Miramonte Reservoir West Priority Action Areas. Prepared by The Nature Conservancy and the Colorado Natural Heritage Program. Unpublished report prepared for the National Fish and Wildlife Foundation. 28 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.
- 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.
- Schneider, A. 2013. Wildflowers, Ferns, and Trees of the Four Corners Regions of Colorado, New Mexico, Arizona, and Utah. Accessed on-line at <http://www.swcoloradowildflowers.com>.
- 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. 2017. 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 Mow Dates”. If mowing is necessary during the “No Mow Dates”, mow with as high of a blade height as practicable.
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.