



**RECOMMENDED BEST
MANAGEMENT
PRACTICES
For
Roan Cliffs Blazing Star
(*Nuttallia rhizomata*)**

**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.

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Front Cover: *Nuttallia rhizomata* plants and habitat, from top to bottom,
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INTRODUCTION

Roan Cliffs blazing star (*Nuttallia rhizomata*) is a low, sprawling, rhizomatous plant with bright yellow flowers with five petals. This species is known only from Garfield County in Colorado, and nowhere else in the world. It is considered to be imperiled at a global and state level (G2/S2; Colorado Natural Heritage Program 2017). 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 Roan Cliffs blazing star 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 Roan Cliffs blazing star 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 Roan Cliffs blazing star, 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 ROAN CLIFFS BLAZING STAR (*NUTTALLIA RHIZOMATA*)

1. Gather mapped location information for Roan Cliffs blazing star 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 Roan Cliffs blazing star 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 (Roan Cliffs blazing star 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 Sept 30. If mowing is necessary during June 1-September 30, mow with as high of a blade height as practicable, and do not drive over/park on top of the plants.
6. Discourage use of vehicle pull-off and turn-around areas where the plants are present. Signage, fencing, obstacles (boulders) are possible solutions.
7. If grading is necessary, following rain or other events that wash out roads, avoid burying the rare plants.
8. 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.
9. Locating signs away from Special Management Areas would benefit the Roan Cliffs blazing star. If guardrails need to be installed/repared, minimize impacts to the blazing star to the greatest extent possible.
10. Transplanting is not recommended under any circumstances.
11. Develop monitoring plans for the roadside locations of Roan Cliffs blazing star, 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 Roan Cliffs blazing star 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) Roan Cliffs blazing star sites.

NOXIOUS WEED MANAGEMENT IN HABITAT FOR ROAN CLIFFS BLAZING STAR (*NUTTALLIA RHIZOMATA*)

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 Roan Cliffs blazing star. 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 the Roan Cliffs blazing star 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 Roan Cliffs blazing star 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, 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 from June to August when the Roan Cliffs blazing star 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 Roan cliffs blazing star (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

Nuttallia rhizomata (Roan Cliffs Blazing Star)

Loasaceae (Blazing Star Family)



Close up of *Nuttallia rhizomata* by Susan Spackman Panjabi

Ranks and Status

Global rank: G2

State rank: S2

Federal protection status: BLM Sensitive

State protection status: None

Description and Phenology



Mentzelia rhizomata

Kathy Cranmer © 2014

Roans Cliffs blazing star *Nuttallia rhizomata* by Kathy Cranmer.

General description: Plants are low, sprawling, rhizomatous, long-lived herbaceous perennials forming discrete clumps 1-2.5 × 1-3.5 dm with numerous, twisted and often tangled, exceedingly fragile and easily detached caudex branches (0.5-)0.8-3 dm long arising at irregular points along a horizontally spreading, elongate, infrequently branched, woody, deeply seated underground, entirely smooth rhizome up to 1 m or more in length. Stems are widely spreading and becoming curved-ascending, flexuous, but often erect in early anthesis, slender, flexuous, freely branched, the epidermis white and papery, scabrous-puberulent with a mixture of pointed scabrid hairs and pagodiform, glochidiate hairs, the larger and longer hairs tapering to a slightly expanded base, the shaft of the scabrid hairs smooth or minutely rugose with the glochidiate ones finely retrorse, the pubescence becoming more dense and the hairs somewhat longer on the upper branches. Leaves are all cauline and well distributed along the stems, alternate, sessile, light green, narrowly

lanceolate, lanceolate, narrowly elliptic or obovate, entire or shallowly undulate-dentate with 2-4 rounded to obtuse lobes on each side, 1.5-4(-4.5) × (0.2-)0.3-1.2(-1.5) cm, scabrous-puberulent on both surfaces with longer and more dense hairs near the base, acute to obtuse apically, tapering basally, the margins often minutely ciliated with glochidiate hairs; inflorescences with 1-few flowers atop each side branch. Flowers are perfect, golden-yellow to yellow, the pedicel 1-3 mm long, subtended by two opposite, linear to narrowly lanceolate, foliaceous bracts, (8-)10-17(-20) × (0.8-)1-2.5 mm, these gradually deciduous in fruit; sepals 5, lanceolate, persistent, erect in bud, becoming strongly reflexed at anthesis but spreading in fruit, (4-)5-8(-11) mm long, scabrous abaxially with upwardly curved hairs, finely so with numerous, long, slender, appressed hairs adaxially; petals 5, glabrous, (9-)10-15 × 6-10 mm, broadly spatulate to broadly obovate and slightly clawed, obtuse to rounded apically; filaments yellow, numerous, glabrous, the two whorls of five petaloid filaments each typically cuspidate and frequently bearing an anther, slightly shorter and narrower than the petals, those of the first whorl rhombic and distinctly clawed, 7-9 × 5-6 mm, those of the second whorl oblanceolate to narrowly oblanceolate, 6-8 × (1.5-)3-4 mm, the remaining whorls of 35-60 or more filaments linear, (1.8-)2-4(-4.5) mm long; anthers pale yellow, (1-)1.2-1.7(-2) mm long, oblong; style early deciduous, erect, slender, 5.5-7 mm long, the stigma minutely 3-lobed. Fruit is a dried capsule, (5-)8-10(-13) × (5-)6-8(-10) mm, urceolate, scabrous-puberulent, rounded basally, opening as an ever-widening apical pore where the stigma was positioned; seeds 15-20 per capsule, oblong, flat, 2-3 × 1.6-2.2 mm, brownish-green, smooth and somewhat shiny, slightly winged, the surface cells with 8 to several papillae (Reveal 2002).

Look Alikes: *Nuttalia rhizomata* is a long-lived perennial (rather than a biennial) and is unique among all members of the genus in having a rhizome (Reveal 2002).

Phenology: The plants flower June through August and set fruit from mid August until late September. Flowers are fully open only in the afternoon. Seeds are rapidly dispersed soon after reaching maturity (Reveal 2002). Plants have also been observed to flower in September during an unusually wet year (Colorado Natural Heritage Program 2013).

Habitat



Habitat of Roan Cliffs blazing star (*Nuttalia chrysantha*) by Jill Handwerk

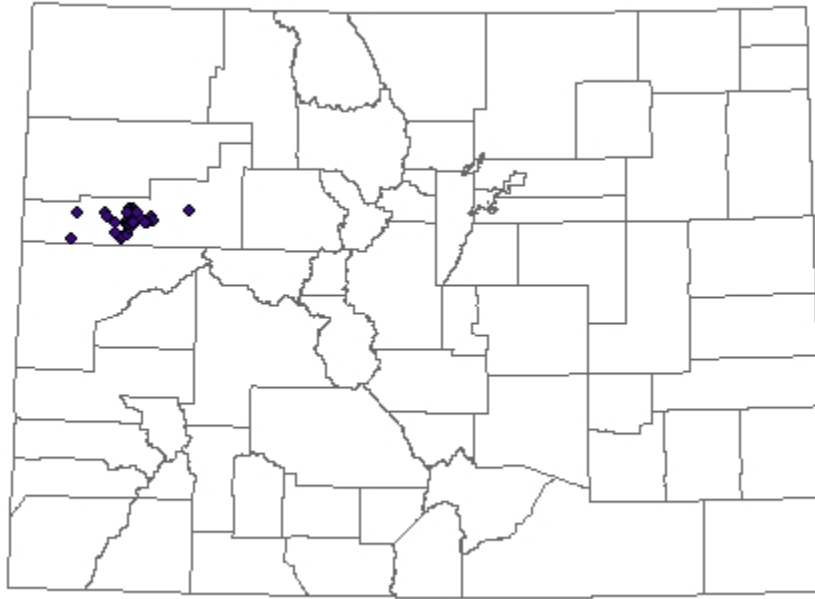
Habitat description: Known only from steep, shaley talus slopes derived from the Parachute Creek Member of the Green River Formation (Holmgren and Holmgren 2002, Reveal 2002). The plants are commonly associated with Gambel oak, western chokecherry, mountain mahogany and Utah juniper (Reveal 2002).

Elevation Range: 9,186 feet (1,598 - 2,800 meters)

Distribution

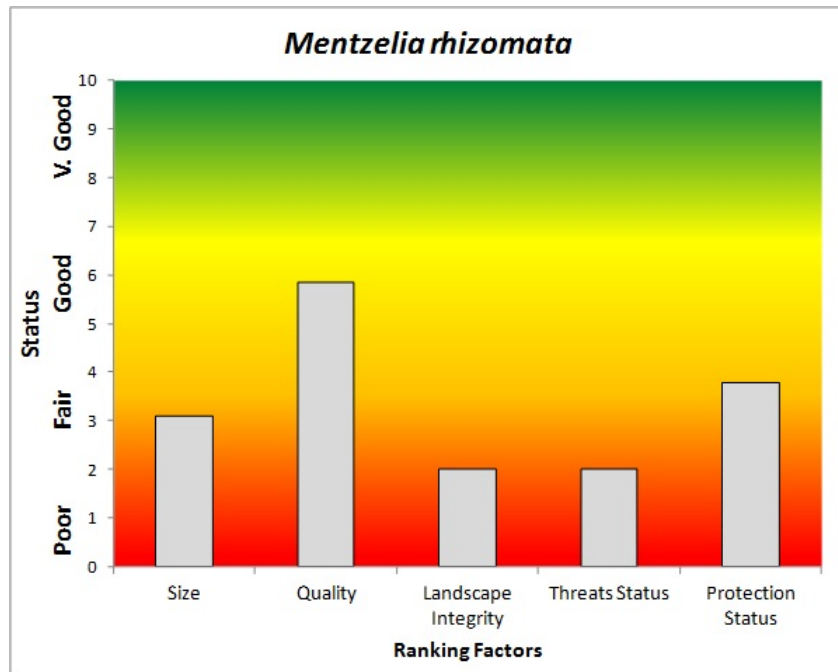
Colorado endemic: Yes

Global range: Endemic to Colorado; known from the Roan Plateau in Garfield County. Estimated range is 1,365 square kilometers (527 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences (estimated by the Colorado Natural Heritage Program in 2008).



Distribution map of Roan Cliffs blazing star (*Nuttallia rhizomata*) in Colorado

Threats and Management Issues



Summary results of an analysis of the status of *Nuttallia rhizomata* based on several ranking factors. This species was concluded to be “weakly conserved”. From Rondeau et al. 2011.

Oil and gas development and mining oil shale are possible threats for most of the known occurrences. Many of the occurrences are on private land owned by oil companies, and the

remaining are on BLM lands which are also leased for mining activities. Other potential threats include road construction and maintenance activities.

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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, 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.