



**RECOMMENDED BEST
MANAGEMENT
PRACTICES
for
Golden Blazing Star
(*Nuttallia chrysantha*)**

**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 chrysantha* plants and habitat, from top to bottom,

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INTRODUCTION

Golden blazing is a tall plant, with thick stems, and attractive, 10-petaled bright yellow flowers. Golden blazing star is found primarily on the Smoky Hill member of the Niobrara shale, in the middle Arkansas Valley, in Fremont and Pueblo counties, Colorado, and nowhere else in the world. Golden blazing star 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 Golden 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 Golden 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 Golden 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 GOLDEN BLAZING STAR (*NUTTALLIA CHRYSANTHA*)

1. Gather mapped location information for Golden 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 Golden 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 (Golden 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 July 1 to September 15. If mowing is necessary during July 1 to September 15, 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 Golden 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 Golden 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 Golden 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) Golden blazing star sites.

NOXIOUS WEED MANAGEMENT IN HABITAT FOR GOLDEN BLAZING STAR (*NUTTALLIA CHRYSANTHA*)

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 Golden 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 Golden 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 Golden 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 during July to early September when the Golden 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 Golden 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 chrysantha (Golden Blazing Star)

Loasaceae (Blazingstar Family)



Close up of *Nuttallia chrysantha* by Stephanie Neid



Close up of *Nuttallia chrysantha* by Georgia Doyle

Ranks and Status

Global rank: G2

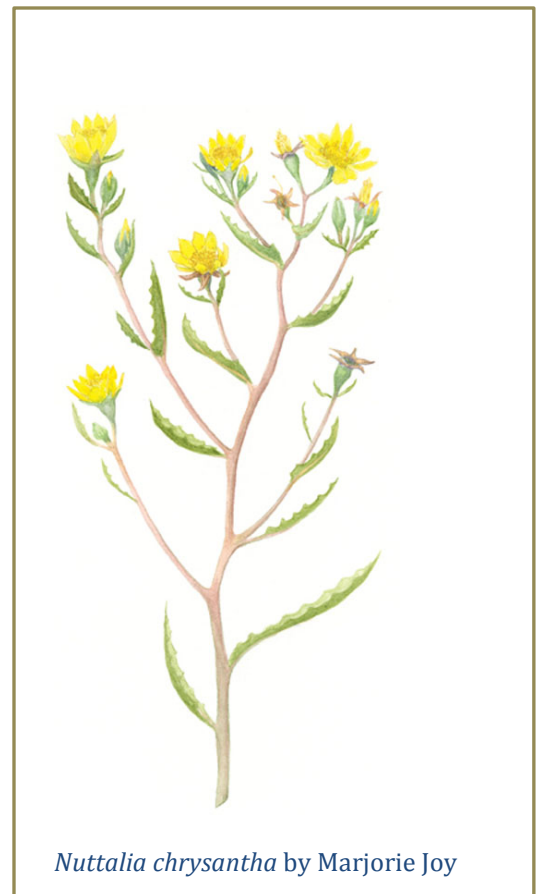
State rank: S2

Federal protection status: BLM Sensitive

State protection status: None

Description and Phenology

General description: *Nuttallia chrysantha* is a biennial or monocarpic perennial. In favorable years, it can complete its lifecycle in two years, but it can persist for several years as a rosette awaiting a favorable year. After it bolts and flowers, the plant dies. The plant has thick, erect, mostly unbranched stems, 2 to 6 dm tall. The leaves are 2 to 15 cm long, elongated (ovate-lanceolate to ovate), and sinuous-dentate (Spackman et al. 1997). The leaves, stems, and fruits have a dense covering of hairs. *Nuttallia*



Nuttallia chrysantha by Marjorie Joy

chrysantha produces numerous bright lemon yellow or golden yellow perfect flowers with 10 petals (Spackman et al. 1997).

Look Alikes: Weber and Wittmann (2001) distinguish *N. reverchonii* from *N. chrysantha* using seed characteristics. *Nuttallia reverchonii* has broadly winged seeds that have few papillae on the seed coat while the seeds of *N. chrysantha* have narrow wings and are distinctly papillose. However, these characters are subtle and variable, and make it difficult to identify plants in vegetative or flowering stages. In the rosette stage, *N. chrysantha*, *N. reverchonii*, *N. decapetala*, and *N. nuda* cannot be reliably distinguished (Anderson 2006). *Nuttallia nuda* is found with *N. chrysantha* at some locations. *Nuttallia nuda* has cream-colored flowers and blooms in June while *N. chrysantha* has golden yellow flowers and blooms from July to early September (Spackman et al. 1997).

Phenology: The seeds of *Nuttallia chrysantha* germinate in the early spring, or in late summer during a wet monsoon year. *Nuttallia chrysantha* is in flower through most of the late summer months, during which it bears numerous flowers in a tall inflorescence (Anderson 2006). Plants are in bloom from July to early September, and they are in fruit from late August into September (Spackman et al. 1997). Flowers open at 5-6 p.m, and close just after dark. Seeds are dispersed in the fall and winter. Dead stalks with dehisced fruits remain erect through the fall and into winter (Anderson 2006).

Habitat



Habitat of Golden blazing star (*Nuttallia chrysantha*) by Susan Spackman Panjabi

Habitat description: *Nuttallia chrysantha* is typically found on barren slopes and road cuts of limestone, shale, or alkaline clay. The habitat of *N. chrysantha* consists of moderately disturbed, wasting slopes such as those above the Arkansas River. Slopes are usually moderately steep in the shale barrens; no particular aspect is favored. *Nuttallia chrysantha* occupies slopes and road cuts, where it grows prolifically and is often the only plant species growing in large numbers. *Nuttallia chrysantha* is found on a variety of geologic formations, mainly marine deposits from the upper

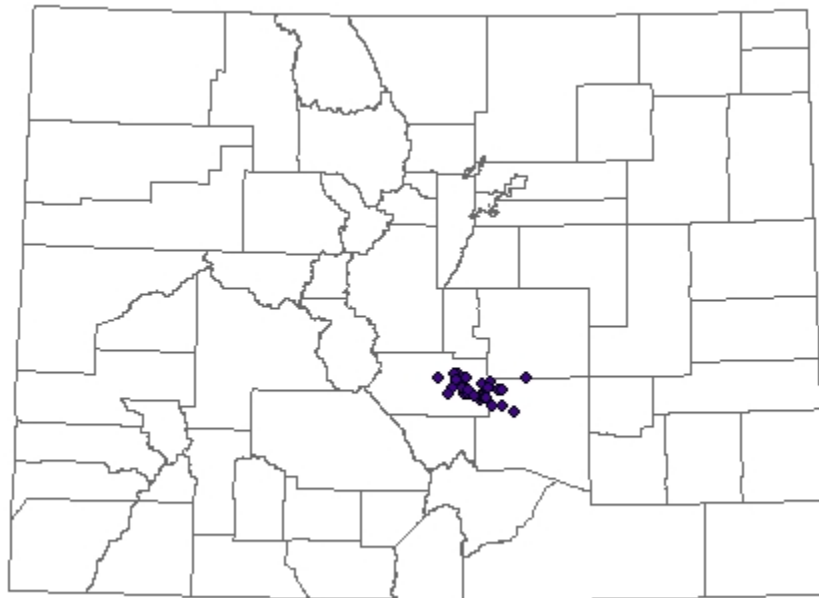
(late) Cretaceous period. *Nuttallia chrysantha* is found primarily on the Smoky Hill member of the Niobrara shale, which is widespread throughout the middle Arkansas Valley, especially in the vicinity of Florence. The Smoky Hill member includes seven subunits that vary greatly in texture and color (may be olive black, yellow-brown, olive gray, pale yellow, or yellow gray). Coarse-scale vegetation types in which *N. chrysantha* is found include pinyon juniper-woodland and juniper woodland communities. While a few occurrences have actually been documented in pinyon-juniper woodland vegetation, the most commonly associated species are *Frankenia jamesii* and *Atriplex canescens* (Anderson 2006). *Nuttallia chrysantha* is also often associated with other rare plants such as *Parthenium tetraeuris* and *Oxybaphus rotundifolia*.

Elevation Range: 4,751 - 6,854 feet (1,448 - 2,089 meters)

Distribution

Colorado endemic: Yes

Global range: Colorado endemic (Fremont and Pueblo counties). Estimated range is 1,373 square kilometers (530 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences (calculated by the Colorado Natural Heritage Program in 2008).

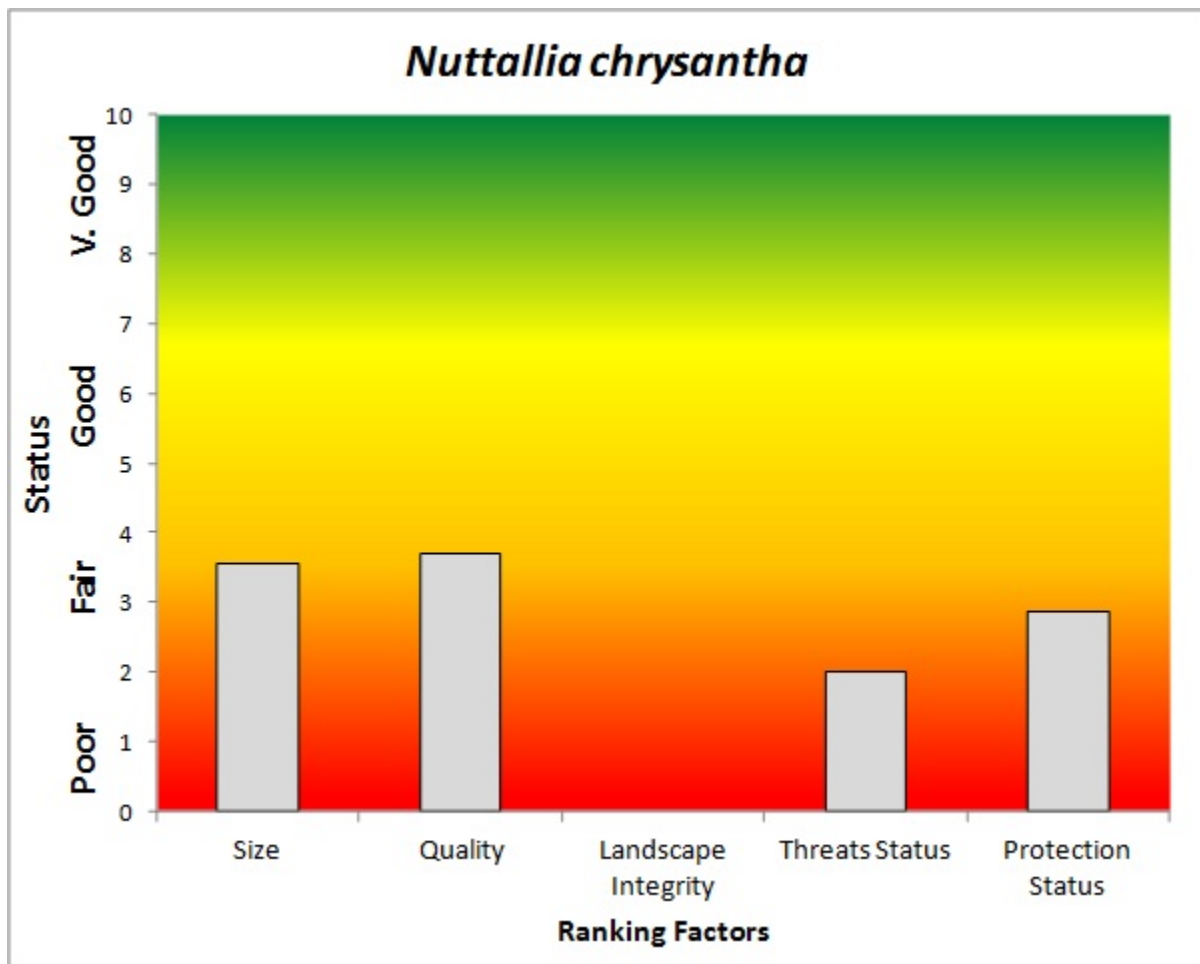


Distribution of Golden blazing star (*Nuttallia chrysantha*) in Colorado.

Threats and Management Issues

Residential development is considered to be the primary threat to the species at this time. Other threats include commercial development, mining, recreation, right-of-way management, exotic species invasion, grazing, effects of small population size, climate change, and pollution. Fremont County is among the fastest growing counties in the United States, and low-density development is proceeding rapidly throughout the Arkansas Valley. Many of the known occurrences are located in highway right-of-ways where they are at risk from weed invasion and management (Anderson 2006).

Summary results appear below of an analysis of the status of Golden blazing star (*Nuttallia chrysantha*) based on several ranking factors. This species was concluded to be “under conserved”. From Rondeau et al. 2011.



Conservation Status of Golden blazing star (*Nuttallia chrysantha*)

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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.