



Recommended Best Management Practices for Gunnison milkvetch (*Astragalus anisus*)

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: *Astragalus anisus* plants and habitat, from top to bottom,

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Introduction

Gunnison milkvetch (*Astragalus anisus*) is a small plant in the Fabaceae (Pea Family) that is known only from the Gunnison Basin in Gunnison and Saguache counties, Colorado, 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 reduce significantly the impacts of road maintenance activities to the Gunnison milkvetch 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 Gunnison milkvetch 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 Gunnison milkvetch, 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.

Best Management Practices for Gunnison Milkvetch (*Astragalus anisus*)

1. Gather mapped location information for Gunnison milkvetch 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 Gunnison milkvetch 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 disturbance of hydrological setting. It also reduces impact to pollinators and their habitat. Special Management Areas (maps and data tables)
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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 (Gunnison milkvetch 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 6 in/15 cm 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 Gunnison milkvetch. If guardrails need to be installed/repared, minimize impacts to the milkvetch to the greatest extent possible.
 9. *Ex-situ* techniques such as transplanting are not recommended under any circumstances.
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10. Develop monitoring plans for the roadside locations of Gunnison milkvetch, 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 Gunnison milkvetch 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) Gunnison milkvetch sites.

Noxious Weed Management in Habitat for Gunnison Milkvetch (*Astragalus anisus*)

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 Gunnison milkvetch. 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.
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Other Needs and Recommended Guidelines

Further inventory, monitoring, research, and conservation planning is recommended for the Gunnison milkvetch 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 Gunnison milkvetch 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 Gunnison milkvetch 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 Gunnison milkvetch (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
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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

Astragalus anisus

(Gunnison milkvetch)

Fabaceae (Pea Family)



Close up of *Astragalus anisus* in flower by Lori Brummer.



Close up of Gunnison milkvetch (*Astragalus anisus*) in fruit by Barry Johnston.



Close up of Gunnison milkvetch (*Astragalus anisus*) pods by Barry Johnston.

Ranks and Status

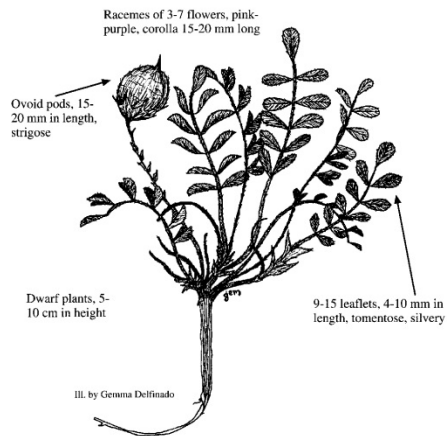
Global rank: G2G3

State rank: S2S3

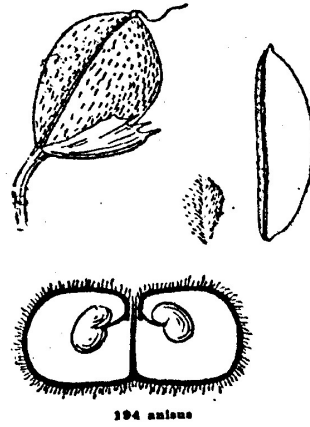
Federal protection status: BLM Sensitive

State protection status: None

Description and Phenology



Gunnison milkvetch (*Astragalus anisus*)
by Gemma Delfinado.



Gunnison milkvetch (*Astragalus anisus*)
by M. E. Jones.

General description: Gunnison milkvetch (*Astragalus anisus*) is a short, tufted perennial with basal leaves that arise from a very short stem above a woody taproot. The caudex, or stem base, often shows the thatched remains of old leaves. The leaves are pinnately compound, up to 7 cm/3 in long, with 11 to 15 leaflets. The entire plant appears silvery-gray due to the presence of numerous hairs of a characteristic dolabriform (ax or pick-shaped) shape. Flowers are borne on short racemes and are typically pink-purple in color. The pods (fruits) are short (1.3 to 1.8 cm/0.5-0.7 in in length) and almost round, though somewhat compressed from front to back, and of a fleshy texture with flat-lying hairs. Fruits are originally green in color, becoming brown with maturity. Each fruit contains 28 to 40 ovules. Seeds are smooth, black, and small (2.0 to 2.4 mm/0.08-0.09 in in length). The fruit is bilocular (has two chambers), often appears red or orange when inflated, and splits into two sections when dry (Decker and Anderson 2004).

Look Alikes: *Astragalus anisus* could be confused with *A. missouriensis* which also grows in the Gunnison Basin, but has a mottled pod. The two species can only be distinguished by their fruit.

Phenology: Flowers May-June (Spackman et al. 1997, Ackerfield 2012).

Habitat



Habitat of Gunnison milkvetch (*Astragalus anisus*) by Bernadette Kuhn

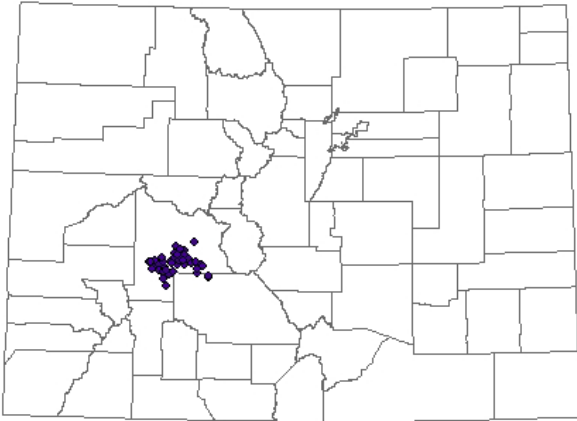
Habitat description: The Gunnison milkvetch is found within Sagebrush Shrubland (dominated by *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*, or *Artemisia cana*) and Sagebrush Shrub Steppe (dominated by *Artemisia nova* or *Artemisia arbuscula*) ecological system types; primarily within the Dry Sagebrush Shrubland type. This species is usually found in fairly open sites where sagebrush shrubs do not form a closed canopy, but sometimes shelters under low sagebrush plants. Sites are characterized by the absence of trees, moderate shrub cover, moderate understory cover, and extensive bare ground. Gunnison milkvetch is found on flats on the floor of the Gunnison Basin and on hillsides. Usually on sandy clay to gravelly soils overlying granitic bedrock; parent materials include rhyolite, tuff, gneiss, and schist. Slopes range 0 - 34% (average 17.3%) and aspects are usually west-facing. Other associated species include *Phlox hoodii*, *Bouteloua gracilis*, *Poa fendleriana*, and *Stipa pinetorum* (Decker and Anderson 2004).

Elevation Range: 7,523 - 9,741 feet; 2,293 - 2,969 meters

Distribution

Colorado endemic: Yes

Global range: The species entire global range is contained within the upper Gunnison Basin, in Gunnison and Saguache counties, Colorado.



Distribution map of Gunnison milkvetch (*Astragalus anisus*) in Colorado. This species is known from Colorado and nowhere else in the world.

Threats and Management Issues

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).

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