Conserving Roadside Populations of Colorado's Globally Imperiled Plants,

a Pilot Project

Natural Heritage Program
Colorado

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: Roadside habitat, from top to bottom, for Grand Mesa penstemon, Bell's twinpod, and Gunnison milkvetch. © From top to bottom, Peggy Lyon, Susan Panjabi, and Bernadette Kuhn

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EXECUTIVE SUMMARY

Colorado supports habitat for approximately 120 globally imperiled plant species. 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. Further, there is a need for the development of species-specific Best Management Practices (BMPs) that will articulate and specify on-the-ground management considerations for highly imperiled species (for example, specific times to avoid spraying, mowing, etc.).

This pilot project addresses these needs by targeting ten globally imperiled plants that are known from roadside locations in Colorado, by delivering user-friendly location information and species-specific Best Management Practices (BMPs) to pertinent parties, and by engaging in outreach to actively reduce the potential threat from road maintenance.

We conducted research (interviews, etc.) regarding how other states work to effectively manage rare plants along roadsides. This information is summarized here, and the most effective and/or useful approaches, ideas and practices are incorporated into the data delivery and BMP development process developed for Colorado.

We developed recommended Best Management Practices (BMPs) for the ten targeted roadside rare plants including consideration of mowing, spraying, snow plowing, timing restrictions, etc. These were reviewed by experts familiar with the species, and, once finalized, they were sent to all partners that manage roadways where the plants are found.

We updated mapping of all roadside populations of the ten target plants in CNHP's BIOTICS database, and used distribution information to identify all partners, i.e., counties, municipalities, federal and state agencies.

We met with Jeff Peterson at the Colorado Department of Transportation (CDOT) to determine what data delivery format would best meet their operational needs while increasing awareness of rare plant locations.

We developed and delivered spatial data showing "Special Management Areas" (SMAs) along state and local road right of ways to CDOT and other partners with signed data license agreements with CNHP at CSU. Data license agreements are necessary because the locations of rare plants and other nearby significant natural resources are considered sensitive.

We were available to assist CDOT and other entities (e.g., local and county road departments) to actively implement Special Management Area (SMA) conservation and the rare plant BMPs. Our assistance was not requested during this pilot phase, and will likely be better fulfilled during a later phase. We also hope to conduct future trainings (as needed) about how to utilize and interpret maps, implement BMPs, and understand site-specific management needs.

We present implementation results including information about how the partners identified for this pilot project plan to use the recommended BMP and SMA information.

Finally, we present 'performance measures' to allow for the evaluation of roadside rare plant conservation success, and recommendations for future steps that can be taken to increase awareness and protection of the roadside populations of globally imperiled plants. Annual follow up communication with all partners, and annual qualitative monitoring of the roadside rare plant populations will help determine the level of success as well as needs for long term improvements.

ACKNOWLEDGEMENTS

We are grateful for the guidance provided by the Colorado Rare Plant Initiative, who articulated the need for increased attention to the management of roadside occurrences of globally imperiled plant species. Funding for this pilot project was provided by the Colorado Department of Transportation and the Colorado Natural Areas Program at Colorado Parks and Wildlife. We are especially thankful for the leadership and assistance provided by Jeff Peterson (CDOT), Brian Kurzel, Wendy McBride, Jonathan Huey, Raquel Wertsbaugh (CNAP), and Michael Menefee, Jill Handwerk, Bernadette Kuhn, Pam Smith, Dave Anderson, and Sarah Triplett (CNHP). Several state departments of transportation were generous with their time and knowledge including Oregon, California, Texas, North Carolina, Washington, Kentucky, Tennessee, and Georgia, as well as the Canadian province of Manitoba. Last but not least, we greatly appreciate the technical review of the Best Management Practices provided by Steve O'Kane, Tass Kelso, Jim Reveal, Delia Malone, Daniel Fosha, Alicia Langton, Steve Olson, Lori Brummer, Don Hazlett, Dina Clark, Jennifer Kesler, David Hirt, and Kurt Roy.

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INTRODUCTION

At least 22 globally imperiled plants found along roadside areas in Colorado are at risk of extinction (Table 1, Colorado Natural Heritage Program 2014). One of the biggest conservation issues for Colorado rare native plants is the lack of awareness of their existence and status. Increasing awareness of these species, especially during development and maintenance activities that may impact rare plants, will reduce the likelihood of future listings under the Endangered Species Act. Avoiding or minimizing impacts to these species during road maintenance activities may help to effectively conserve their habitat and is unlikely to confer substantial impacts on road maintenance goals and projects. The species-specific Best Management Practices (BMPs) which complement this document (Panjabi and Smith 2014a-j) are intended to help increase the awareness of these species for anyone involved in road maintenance activities.

The desired outcome of this report and the associated recommended BMPs is to significantly reduce the impacts of road maintenance activities to ten globally imperiled plants on federal, state, and/or private land, while still addressing roadside safety concerns. The BMPs are intended to be iterative, and to evolve as additional information becomes available about Colorado's botanical diversity, and as road maintenance technologies develop.

Federal, State, and local land management agencies have developed complementary policy and guidance regarding a number of issues discussed in these BMPs. For example, BLM's Record of Decision for the National Vegetation Treatments Final Programmatic EIS (PEIS) identifies standard operating procedures to be used with all applications of herbicides on public lands (BLM 2007a). The Biological Assessment developed for BLM's PEIS outlines conservation measures for species, or groups of species, that react similarly to proposed vegetation treatments. These conservation measures for plants are found on pages 4–129 to 4–134 of the Final Programmatic Biological Assessment for Vegetation Treatments on BLM Lands in 17 Western States (BLM 2007b).

If federally listed Threatened or Endangered plant species occur in a project area on federal lands, consultation with the U.S. Fish and Wildlife Service (USFWS) is necessary. If Candidate or Proposed species are found, the management of these species should also be discussed with the USFWS to avoid complications should these species become listed Threatened or Endangered during the life of the project.

The intent of this document and the associated recommended 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 they can coexist with maintenance activities. The implementation of these recommendations may assure that maintenance activities proceed without unintended harm to globally imperiled plants.

Table 1. Globally imperiled plant species known to occur along or near CDOT right of ways in Colorado. Species in **bold** are the target species for this project. For rank and status definitions please see the Colorado Natural Heritage Program website.

Scientific name	Common name	GRANK	SRANK	Rounded GRANK	USESA	FEDSENS
Astragalus anisus	**Gunnison milkvetch**	**G2G3**	**S2S3**	**G2**		**BLM**
Astragalus debequeas	**DeBeque milkvetch**	**G2**	**S2**	**G2**		**BLM**
Astragalus osterhoutii	Kremmling Osterhout milkvetch	G1	S1	G1	LE	
Camissonia eastwoodiae						
Erigeron kachinensis	Kachina daisy	G2	S1	G2		BLM
Eriogonum brandegeei	**Brandegee wild buckwheat**	**G1G2**	**S1S2**	**G1**		**BLM/USFS**
Eriogonum pelinophilum	Clay-loving wild buckwheat	G2	S2	G2	LE	
Frasera coloradensis	**Colorado green gentian**	**G2G3**	**S2S3**	**G2**		
Ipomopsis aggregata* ssp. *weberi	**Rabbit Ears gilia**	**G5T2**	**S2**	**G2**	**USFS**	
Lygodesmia doloresensis	Dolores River skeletonplant	G1G2	S1S2	G1		BLM
Nuttallia chrysantha	Golden blazing star	G2	S2	G2		BLM
Nuttallia densa	**Arkansas Canyon stickleaf**	**G2**	**S2**	**G2**		**BLM**
Oenothera coloradensis ssp. *coloradensis*	Colorado butterfly plant	G3T2	S1	T2	LT	
Oonopsis puebloensis	Pueblo goldenweed	G2	S2	G2		
Oxybaphus rotundifolius	Round-leaf four-o'clock	G2	S2	G2		
Penstemon mensarum	**Grand Mesa penstemon**	**G2**	**S2**	**G2**		
Phacelia formosula	North Park phacelia	G1	S1	G1	LE	
Physaria bellii	**Bell's twinpod**	**G2G3**	**S2S3**	**G2**		
Physaria calcicola	Rocky Mountain bladderpod	G3	S3	G3		
Physaria rollinsii	**Rollins' twinpod**	**G1**	**S1**	**G1**		
Physaria vicina	**Good neighbor bladderpod**	**G2**	**S2**	**G2**		
Spiranthes diluvialis	Ute ladies' tresses	G2G3	S2	G2	LT	

REVIEW OF WHAT OTHER STATES ARE DOING

Several other states are working to avoid harm to rare plants along roadsides. All states we interviewed use detailed mapping data, from heritage programs and/or other sources, to create special management zones. In some cases the special management zones are posted/marked with signs, in others they are not. In general, the roadside conservation efforts target state and/or federally listed plant species. In some cases the conservation efforts may be limited to State Department of Transportation roads, in others they may include additional roads, such as county or federally managed roads. Trainings are considered an integral part of the roadside conservation efforts in some areas. Some states perform site checks and monitoring by botanists familiar with the rare plants. The following section provides details about specific state programs, with Oregon providing a program model that the authors of this report feel would be most applicable to long term goals for Colorado.

Oregon Department of Transportation (ODOT)

In Oregon, Special Management Areas (SMAs) are designed to protect state and federally listed T&E plant species occurring on ODOT land. The state list of species includes most globally imperiled plant species that are threatened by human activities. The SMA system helps ODOT apply appropriate levels of protection. The SMAs have special signs installed at the edges of the areas, and are coded so maintenance crews can see which activities are allowed and when. GIS maps are tied to the linear referencing system. For each Special Management Area, laminated Restricted Activity Zone Maps for maintenance use green and red color-coding scheme to indicate for each maintenance activity whether or not activity should be restricted along the left or right side of a given 0.01-mile segment of highway. Road crews receive special education regarding the signs. Regional biologists complete site checks of each SMA every year, with detailed monitoring every 3rd year. ODOT employs many of the best botanists in the State.

The library of geographic information system (GIS) data resulting from the project has given ODOT's regional staff a detailed inventory of biological resources, facilitating consideration of sensitive natural resources when planning and designing transportation system improvements. The maps have proven to be a reliable desktop scoping tool. The GIS system, data layers, and existing modeling routines facilitate easy updating as new information and aerial photography becomes available.

ODOT is now developing an internet-based application to enable wider desktop access to the information. Because the inventory data is digital and easily transferable between agencies, ODOT can also easily share this data and streamline communication processes with the National Marine Fisheries Service, the Oregon Department of Fish and Wildlife, the USFWS, and the U.S. Army Corps of Engineers.

Based on personal communication with Jimmy Kagan (Oregon Natural Heritage Program).

California Department of Transportation (CALTRANS)

In California, CALTRANS identifies Biological Management Areas (BMAs). Each Biological Management Area is signed and has its own management plan. The U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) share regulatory responsibility for the protection of special-status plant species. "Special-status" species are selected for protection because they are rare and/or subject to population and habitat declines. Special status is a general term for species that are afforded varying levels of regulatory protection. The highest level of protection is given to threatened and endangered species; these are species that are formally listed or proposed for listing as endangered or threatened under the Federal Endangered Species Act (FESA) and/or the California Endangered Species Act.

Based on personal communication with Maria Sosa, SER Project Lead, Division of Environmental Analysis; and documents posted through the Caltrans website.

North Carolina Department of Transportation (NCDOT)

In North Carolina the State Department of Transportation (NCDOT) has established Roadside Vegetation Management guidelines in Marked Areas. For example, no mowing between April 1 and November 15; restrict mowing to dry times; no herbicides or fertilizers; clean mowers before entering the site, leave clippings on site. They have identified more than 90 sites that support habitat for federal and state listed species.

NCDOT also has signed MOUs with North Carolina Department of Natural Resources and NC Department of Agriculture to protect populations of federally listed threatened and endangered species and to work cooperatively on a variety of plant conservation issues.

Personal communication Kent Kolbe, NCDOT.

Texas Department of Transportation (TXDOT)

TxDOT surveyed the Texas Biological Conservation Database to determine where listed or category plants coincided with highway ROWs; there were 150 in total. TxDOT relocated some occurrences and created management/monitoring areas for others. Signs were placed around certain rare plant populations, for example, "No Mow" or "Wildflower Research Area".

Washington State Department of Transportation (WSDOT)

Washington State's DOT extensively surveyed an area of highway in 1998, where they found three rare plant species. They then identified potential and actual threats to the rare plants, and then developed practices to minimize the threats that the DOT had the most control over:

- Minimize competition and shading from native trees & shrubs
- Minimize competition from non-native and/or state listed noxious plant species
- Use selective control & hand application when appropriate, ID road segments where spraying can be conducted and rare plants are absent, etc.
- Minimize impacts to rare plants during work on ditches
- Minimize threats to rare plants from soil erosion on unstable slopes

- Minimize threats from human intrusion, trampling, and unauthorized collection

WSDOT conducts annual training sessions to assure that rare native plants receive the attention required. Trainings include discussion of rare plant importance, their natural history and distribution, and the roles of DOT and other agencies in protection. They also include a field review to learn how to identify the rare plants, and their locations.

Kentucky

The Kentucky State Nature Preserves Commission has worked with the Kentucky DOT to protect right-of-ways by posting signs. The signs are specific to the time of year when certain activities should not take place (for example, no spraying between the signs), and also specific to the plants so that the habitat along the roads is not changed resulting in a decline/disappearance of the plants. In some cases, it is important for the DOT to mow to keep the habitat open; when the ground cover becomes too dense, the rare plants cannot survive.

Personal communication, Deborah White, Kentucky State Nature Preserves Commission.

Tennessee Valley Authority

GIS based sensitive site information is available from the Tennessee Valley Authority Heritage Program. Maintenance plans are developed, integrated into field crew work plans, and reviewed every five years. Sensitive areas are sometimes flagged off. Maintenance activities such as mowing, spraying, resurfacing, drainage ditches, etc., are considered. Counties have agreed to put up 'do not mow" and "do not spray" signs. Problems with this have included turn over in maintenance personnel who do not know to look for the signs, and the signs getting covered with overgrown vegetation (since they are not mowed!), or falling down. Competing vegetation can also become problematic. Also, the county road superintendents are usually elected and the information gets lost in the office, although the TVA has written agreements that are signed.

Personal communication, Andrea Shea Bishop, Recovery Biologist, TN Dept. of Environment and Conservation, Division of Natural Areas.

Todd Crabtree said TN also puts this message in other languages (Spanish).

Georgia

For a few rare plant locations in Georgia local stewards are dedicated to watching a site for the DOT highway ROW mowers. The DOT is supposed to only mow at certain times of the year, but sometimes that fails. The local stewards are in charge of contacting the Georgia Pest Control Association (GPCA) and intervening in the mowing if the plants are at risk. Signage is sometimes used, and can be helpful; the signs often include Spanish and English.

Personal communication, Lisa Kruse, Georgia Department of Natural Resources, Nongame Conservation Wildlife Biologist

RECOMMENDED APPROACH FOR COLORADO

At this time, the Colorado Department of Transportation (CDOT) is not interested in signing the roads; therefore, alternate approaches were taken. We wanted to include all partners that manage roads, e.g., USFS, BLM, counties, municipalities, not just CDOT. To this end, the following steps were taken:

1. Create plant species target list; include all species ranked G1-G2 by CNHP that have known roadside occurrences (Table 1). This list should be updated over time.
2. Update occurrence mapping for all target plant taxa.
3. Create roadside Special Management Areas based on occurrence records near roads.
4. Develop species-specific, recommended Best Management Practices (BMPs).
5. Distribute BMPs to all partners, *not including* sensitive/confidential location information.
6. Provide GIS based sensitive/confidential location information only to those partners that have a signed data license with CNHP.

Colorado Target Plants for Pilot Project

We selected the target plants from a list of G1-G3 plants that are known to occur along CO roads (Table 1), and chose only G1-G2 taxa for this pilot project.

We did not include federally listed Threatened and Endangered species because CDOT is already managing those locations, and this project is intended to protect plants that are not currently protected.

Mapping Occurrences of all Target Plants for Pilot Project

We updated the mapping of all roadside populations of the ten target plants in CNHP's BIOTICS database prior to the development of the Special Management Areas (SMAs). This was done to ensure the SMAs reflected the most accurate locations of the target plants. We also used the distribution information to identify all partners, i.e., counties, municipalities, state, and federal agencies.

New location data from various sources were acquired for the target plants. Herbarium specimens, published and gray literature were also reviewed for incorporation into the CNHP BIOTICS database. Location data were compiled into Element Occurrence Records (EOR's) using CNHP methodology. Element occurrence specifications were reviewed and implemented as needed while adding new spatial data (new mapped areas). Element Global Rank (EGR) or Element Subnational Rank (ESR) reports for these species were updated, as needed, to reflect current information on number of occurrences, range, occupied area, population size and threats.

A total of 13 element occurrence records were created or updated in BIOTICS adding 7 new mapped locations. This work is detailed below, by species. These data are included in roadside

SMAs as appropriate, and also will assist with population monitoring, management of existing and potential threats to these species, and increase accuracy and precision of habitat models.

Target Plant Species for which new information was incorporated:

Gunnison milkvetch *(Astragalus anisus;* G2G3/S2S3) – one updated EOR with two mapped areas.

Colorado green gentian *(Frasera coloradensis*; G2G3/S2S3) – one new EOR and thirteen updated EORs adding a total of 186 mapped areas.

Rabbit ears gilia *(Ipomopsis aggregatta* ssp*. weberi;* G5T2/S2) – one updated EOR.

Rollins' twinpod *(Physaria rollinsii*; G1/S1) – four new EORs including four mapped areas.

Bell's twinpod *(Physaria bellii*; G2G3/S2S3) –two updated EORs.

Grand Mesa penstemon *(Penstemon mensarum;* G2/S2) – two new and two updated EORs, deleted two incorrectly identified, county record EORs. The global and state ranks were updated for this Colorado endemic (from G3/S3 to G2/S2) based on new distribution information.

Please note that a signed data license is needed to receive sensitive data from the Colorado Natural Heritage Program.

Creating Special Management Areas Based on Mapped Locations of Target Plants

Roadside Special Management Areas (Figures 1 and 2) contain roadside locations of the globally imperiled plants listed in bold in Table 1. The occurrences are buffered by 50 meters. More specifically,

The following steps were taken, please note that this analysis requires access to CNHP data:

1. Download the 2013 TIGER "All Roads" line feature class for each county from:
    a. http://www.census.gov/geo/maps-data/data/tiger-line.html
2. If the distribution includes multiple counties – perform a Merge to get all county's roads in one feature class.
3. Possible values for the RTTYP code include the following.
4. Selected EORs for targeted plant species from the CNHP 2013 Hyerlink database, export to a new feature class called "Targeted_EORS".
5. Remove minute and general records, keep only seconds.
6. Buffer the road layer to 50 meters (both sides), Flat ends, no dissolve field.
7. Select by location EORs that intersect with the buffered roads, and create new feature class called something like "Target EORs near roads."
8. Intersect the EORs_NR (near roads) with the buffered road layer.

9. Perform a dissolve on the intersect layer, using EO_ID as the dissolve field, add a field called I_Sq_Meter (Intersect Sq Meters) type = double, and calculate geometry to get the area of the EOR within the buffer.
10. Do a tabular join, join the dissolve layer created in step 9 to the intersect layer created in Step 8, using EO_ID as your join field.
11. Add a field to hold the percentage of the EOR within buffer, called PC_Buff (stands for percentage within buffer) and use the field calculator to divide I_Sq_Meter by Sq_Meter to get your percentage.

INTERPRET AND CREATE ROADSIDE SPECIAL MANAGEMENT AREAS:

12. Now you have a large table with EORs and road information.
13. Prioritize based on EO rank and/or percent of EOR within buffer. For this pilot project we only included occurrences with EO ranks A, B, or C.
14. Review EORs on available aerial imagery (google maps, etc.), looking for EORs that appear to have been extirpated (habitat is not present).
15. Create your filtered list of EORs (shortlist).
16. With this filtered group of EORS, create the **Special Management Areas**:
    a. Create SMA start and end points, feature class, drop points, intersect points with the EOR/intersect layer, calculate X,Y coordinates.

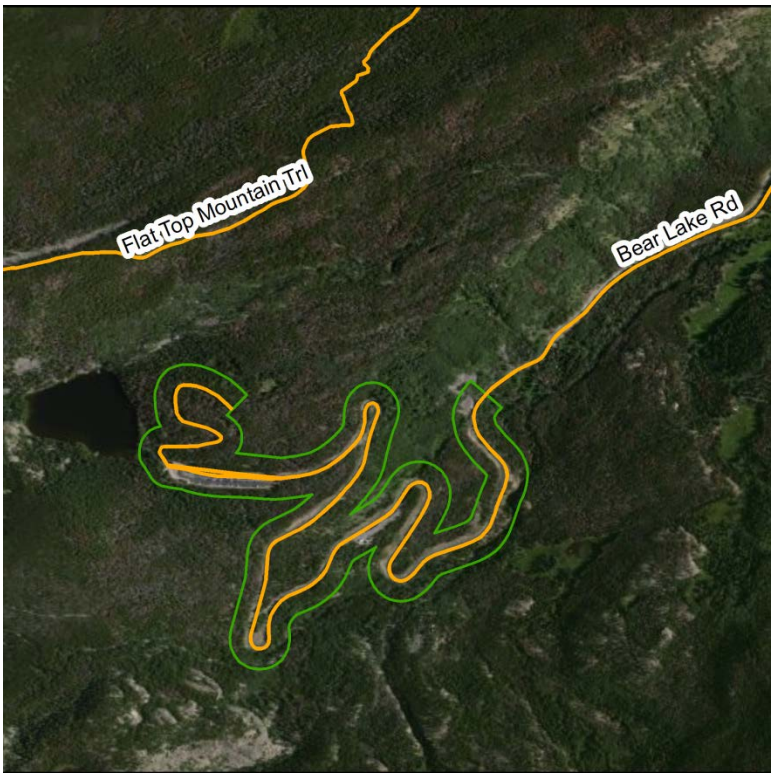

Figure 1. Example Special Management Area (SMA) map.

Table 2. For each Special Management Area (SMA) we also report the following information (if known):

Special Management Area (SMA) Number	SMA #
Road Name	e.g., Co Rd #, road names
Route Type	e.g., County, State, Federal
CDOT Region	Region #
Road Manager	e.g., City, County, CDOT, etc.
Land Owner	e.g., BLM, USFS, State of Colorado, private, etc.
% of rare plant occurrence in SMA	e.g., 71.12 % or 21.27%, etc.
County	County name

Map of Roadside Special Management Areas

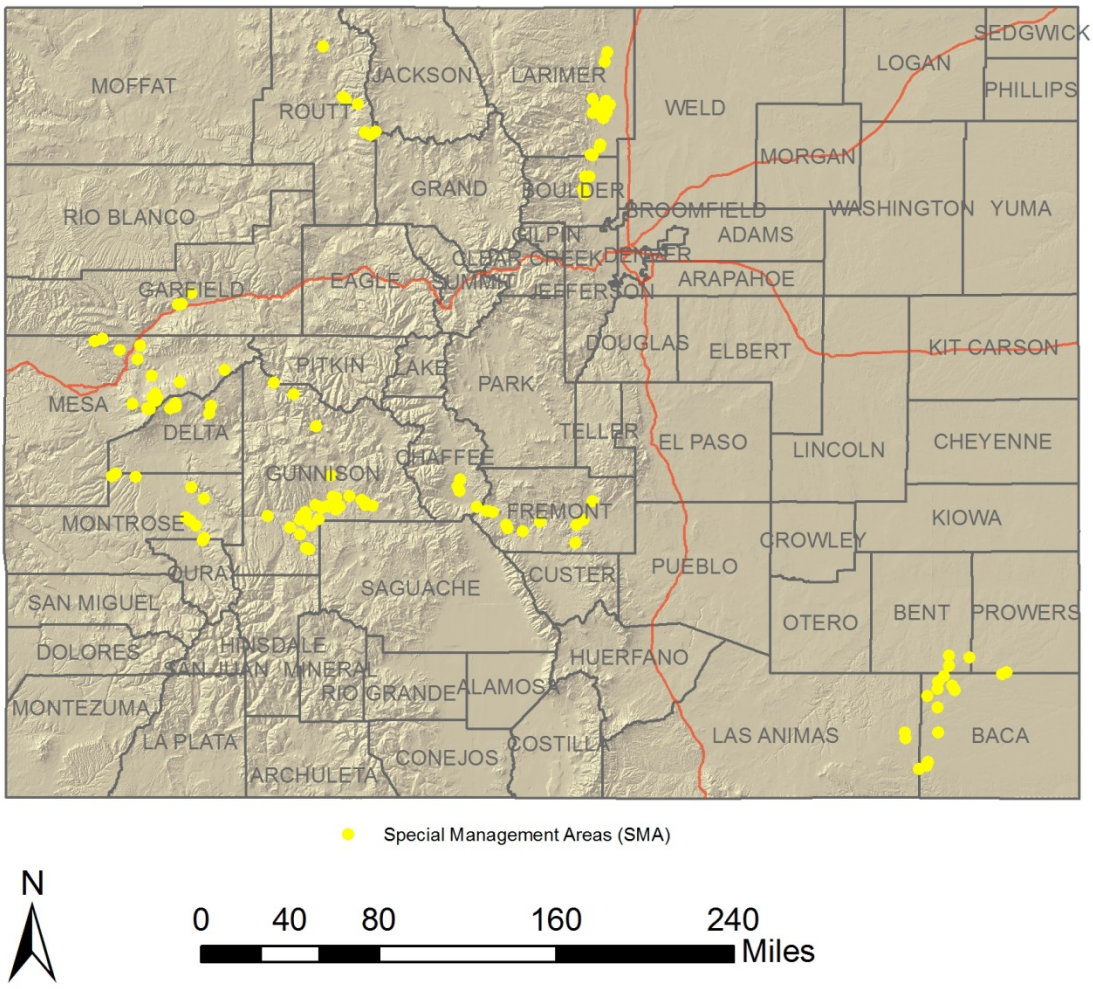

Figure 2. Map of roadside Special Management Areas developed for plants of concern targeted for this pilot project. The details of the SMAs are provided with the species-specific BMPs (Panjabi and Smith 2014a-j) to partners who have signed data license agreements with CNHP.

Recommended Best Management Practices and Special Management Areas for Roadside Occurrences of Plants of Concern

1. Gather mapped location information for species of concern 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 this pilot project.

2. Work with the Colorado Natural Heritage Program to create **Special Management Areas** based on the distribution of the species of concern 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) are presented in an appendix of the species-specific BMPs (Panjabi and Smith 2014a-j) 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. 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 during the flowering and fruiting season of the plant of concern (see Table 3). Mowing with a cut that is higher than the height of the plants of concern (Table 3) could take place in the Special Management Areas before or after the flowering and fruiting season 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 plants of concern. If guardrails need to be installed/repaired, minimize impacts to the rare plants to the greatest extent possible.

9. *Ex-situ* techniques such as transplanting are not recommended under any circumstances.

10. Develop monitoring plans for the roadside locations of plants of concern, 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 plants of concern 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) rare plant sites.

Species-specific BMPs are provided in a separate report for each of the target species (Panjabi and Smith 2014). The following table shows the species specific guidelines pertaining to the BMP's above.

Table 3. Plant height and flowering and fruiting period of the plants targeted for this pilot project. This information is needed to apply the Recommended Best Management Practices.

Scientific name	Common name	Plant height	Flowering/fruiting period
Astragalus anisus	Gunnison milkvetch	7 cm (3 inches)	May-June
Astragalus debequeas	DeBeque milkvetch	20 cm (8 inches)	April-May/May-July
Eriogonum brandegeei	Brandegee wild buckwheat	10-25 cm (4-10 inches)	June-August/August-September
Frasera coloradensis	Colorado green gentian	10-20 cm (4-8 inches)	June-July/July
Ipomopsis aggregata ssp. *weberi*	Rabbit Ears gilia	15-60 cm (6-24 inches)	July
Nuttallia densa	Arkansas Canyon stickleaf	30 cm (12 inches)	July-August/September
Penstemon mensarum	Grand Mesa penstemon	40-100 cm (16-40 inches)	Late June-July/early August
Physaria bellii	Bell's twinpod	5-13 cm (2-5 inches)	April-June/July-August
Physaria rollinsii	Rollins' twinpod	5-10 cm (2-4 inches)	May-June
Physaria vicina	Good neighbor bladderpod	10-25 cm (4-10 inches)	April-May

IMPLEMENTATION

A total of 32 partners were identified as being important to the implementation of the BMPs for the 10 target plants (**Appendix One**). Partners *without* signed data licenses with CNHP received the recommend BMPs only. Partners *with* signed data licenses received the BMPs that included the specific locations of the SMAs, presented as maps in the BMP report; and also received the SMA GIS layer and associated fields, such as the UTMs marking the extent of the SMA along a specific roadway. In some cases, partners without data licenses received rough location information about SMAs in their jurisdiction (**Appendix One**). For example, for the two SMAs identified in Prowers County, we sent the Prowers County Road and Bridge Department the Township, Range, and Sections that intersected the SMAs so that they would have some idea of the area we were concerned about, fulfilling one of the main purposes of the project, to increase awareness that the plants are found in these areas.

Determining the specific road manager for each SMA was often difficult. This information was not readily available from accessible data sources. This was especially true on Colorado Parks and Wildlife (CPW) State Wildlife Area properties where land ownership and management patterns are particularly complex (pers. comm. Wertsbaugh 2014).

Jeff Peterson, Colorado Department of Transportation (CDOT), will work with the CDOT Maintenance Supervisor and also with the Federal Highways Administration, to implement the BMPs and promote awareness of the SMAs. Ultimately, Jeff will work with the CDOT Maintenance Patrols to assure effective implementation within the specific SMAs managed by the State and the Federal Highways Administration. CDOT will also use the BMPs and SMAs to help guide road construction activities.

Raquel Wertsbaugh, Colorado Natural Areas Program Coordinator, distributed the BMP and SMA information to Colorado Parks and Wildlife (CPW) staff that manages and/or contributes to the management of the CPW owned or managed properties that were within or overlapped with the SMAs. CPW staff will use the information to guide not only roadside maintenance activities but other relevant management activities in order to help protect the rare plant species identified.

Mindy Gottsegen, Conservation Services Manager, State Land Board, indicated that they will check the SMA locations automatically with all projects and will make every effort to implement the BMPs if possible. They are also working on other BMP documents and the BMPs developed for this project can help inform that work. They will also work with counties to communicate the importance of the plants.

Rick Johnson with Larimer County Road and Bridge Department will work with others in the Department, e.g., Jim Frick who is charge of non-paved roads in the County, to implement the BMPs when possible. Jim mentioned that dust suppressions is required and cannot be avoided.

Justin Musser, Montrose County Weed Manger, felt that he could use the data in the thoughtful development and justification of invasive species prevention strategies, integrated management plans, and priority management area planning.

Tony Adamic, Fremont County DOT Director will, implement the BMPs when possible, and will also work with the County Weed Coordinator to make sure they are aware of locations.

BLM Field Managers indicated that the information would be useful to resource management planning activities. Some offices are in this process now, others are not. They will make sure others on their staff, e.g., sensitive species coordinators, GIS coordinators, are aware of the data and will stay in touch regarding any questions. In most cases the BLM is already aware of the sensitive plant locations, and is taking action to protect them. BLM Uncompahgre also emphasized the importance of working with the counties who manage many of the roads where the rare plants are found.

Anna Lincoln with the BLM in Grand Junction contacted us regarding a few DeBeque milkvetch plants that would be lost during an upcoming road construction project. Working together, we determined that the plants could be lost because the occurrence was large enough (small percentage of the occurrence was roadside), and most importantly, the road construction was

addressing a safety issue. Anna will contact the Denver Botanic Gardens, and others who may be able to include the plants in an educational garden, or similar project.

These BMPs are recommended for implementation when possible, while recognizing that public safety is always a top priority.

RECOMMENDATIONS AND PERFORMANCE MEASURES

Recommendations for Future Work

Develop BMPs and associated SMAs for the remaining species in Table 1. Check the CNHP BIOTICS database every year to determine if any additional roadside locations have been reported for all G1-G2 plants, potentially adding to the list of species in Table 1, and potentially adding new SMAs to the BMPs developed for this project.

Conduct site visits to SMAs determine if there have been impacts from road maintenance. Visit with road mangers and others (e.g., weed managers, land managers, sensitive species biologists) regarding the effectiveness of the BMPs. Reach out to other natural resource managers such as pertinent Weed Management Area managers (e.g. the Upper Arkansas Weed Management Cooperative), the Colorado Weed Network, and the Colorado Weed Management Association to inform them about the recommended roadside BMPs.

Follow up with all partners who did not sign a data license, unless they expressed that they did not want to be contacted again (Appendix Four). Send maps and/or conduct trainings as necessary to increase successes.

Reach out and collaborate with all roadside managers. Meet with the road managers individually and also hold regional partner meetings to include all the various road managers that manage roadside habitat for one or more plants. For example, meetings could be held in Trinidad for Colorado green gentian, Boulder or Fort Collins for Bell's twinpod, Steamboat Springs for Rabbit ears gilia, Canon City for Brandegee wild buckwheat and Arkansas Canyon stickleaf, Gunnison or Grand Junction for DeBeque milkvetch, Grand Mesa penstemon, Gunnison milkvetch and Rollins twinpod, and in Montrose for the Good neighbor bladderpod.

The BMPs developed for this pilot project are designed for road maintenance, but also applicable to road construction. The scope of the BMPs could be broadened to include road construction activities, and also more explicitly include weed management.

Add language to the original contact emails (please see **Appendix Two** for example emails) to include information about who the other road managers are that are also receiving the recommended roadside BMPs. For example, when contacting Larimer County about roadside locations of Bell's twinpod, let them know that Boulder County, the City of Fort Collins, and the State Land Board also manage roadside locations for this species, and will also be contacted as part of the project.

When contacting a road manager that does not have a data license with CNHP, give them some information about other agencies/counties/etc. that we do have data licenses with, so they might feel more comfortable with the process, and also know who to contact outside of CNHP regarding their questions about the licenses. (Please see **Appendix Three** for an example data license.)

The Oregon DOT offers a model that may be worth following, but was beyond the scope of this pilot project. For example, in Oregon, for each Special Management Area, laminated Restricted Activity Zone Maps are produced for maintenance crews. The maps use a green and red color-coding scheme to indicate for each maintenance activity whether or not an activity should be restricted along the left or right side of a given 0.01-mile segment of highway. Road crews receive special education regarding the signs. Regional biologists complete site checks of each SMA every year, with detailed monitoring every 3rd year.

Performance Measures

The performance measures presented here are a set of metrics by which the effectiveness of the recommended Best Management Practices (BMPs) and Special Management Areas (SMAs) can be assessed.

Performance measures can be obtained through a survey to all partners, which could include: 1) does the land manager have a signed data licenses with CNHP? (y/n); 2) is the land manager using the BMPs or SMA data (provided only to those partners with a data license) to avoid negative impacts to the rare plants? (y/n); 3) is the land manager communicating with CNHP and others, e.g., weed districts, sensitive species biologists, to help assure appropriate management of the rare plant habitat? (y/n).

To obtain further measures of success:

1) Conduct semiannual site visits to the SMAs, and use the NatureServe occurrence ranking factors: size, condition, and landscape context, to assess qualitative changes to the roadside locations. If negative impacts are noted, work with road managers to adjust management actions to best address the cause of the impacts. Inspections of plant occurrences should be performed by a botanist or other qualified personnel.

2) Conduct semiannual interviews with all partners to determine if BMPs are being followed, if SMAs are effective, and to identify areas of potential conflict. Summarize input from maintenance personnel and others working on the ground.

3) Monitor impacts on plants of concern from road maintenance or other activities in the area.

4) Address how to make the BMPs sustainable. Continue to pursue signed data licenses agreements with all partners.

Other Needs and Recommended Guidelines

Further inventory, monitoring, research, and conservation planning is recommended for the plants of concern to assist with future development and implementation of these Best Management Practices (BMPs), as well as our basic understanding of the 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 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 phenologically appropriate times of year when the plants of concern 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 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.

One of the most important aspects of this project is to increase awareness of the globally imperiled plant species found along roadways in Colorado. The Colorado Natural Heritage Program is also available to provide long-term monitoring, species distribution modeling, conservation planning, data management services, and to help define restoration goals.

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APPENDIX ONE

List of partners (Counties, Cities, State, and Federal) identified for this pilot project

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
Baca	11	Baca County	Connie McGinnis- Road and Bridge & Land Use Administrator, email: cmcginnis@bacacountyco.gov	Colorado Green Gentian	yes	no	Three emails sent, no response
Bent	2	Bent County Road and Bridge	West end Foreman: Robert Darnell, 719-456-1678; East end Foreman: Curtis Sniff, 719-829-4770; 725 Carson, Las Animas, CO 81054; bentadmin@bentcounty.net	Colorado Green Gentian	no	no	Only two SMAs fall in the County, and the County is not listed as road manager anywhere. Provide Township, Range and Section data.

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
Boulder	4	Boulder County Road Maintenance Division	Road Supervisor, Ted Plank, tplank@bouldercounty.org, 303-441-3962	Bell's twinpod	yes	yes	Provided County with BMPs including sensitive, location specific data. Sent all information to Road Supervisor and copied Boulder County Parks and Open Space (BCPOS). BCPOS staff provided helpful suggestions for the BMPs before they were finalized.
Chaffee	4	Chaffee County Road and Bridge	Mark Stacy, Superintendent, 719.539.4591, mstacy@chaffeecounty.org, Bob Properwick, Crew Leader Buena Vista 719.207.1502	Brandege wild buckwheat	yes	no	Township, range and section data provided for four SMAs in County.
Delta	6	Delta County Road and Bridge	Darlene Watson, Secretary, 970-874-2116; M-F 7:30-1 and 2-4:30; 3 districts, each with a Foreman, ask for email addresses; Larry record lrecord@deltacounty.com	DeBeque milkvetch and Grand Mesa penstemon	yes	no	Sent two emails and left phone message.

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
Fremont	10	Fremont County Department of Transportation	Tony Adamic, DOT Director, annette.ortega@fremontco.com, 719-275-2047, M-Th 'til 4:30	Brandege e wild buckwhe at, Arkansas Canyon stickleaf	yes	yes	Provided BMP and sensitive SMA data. Fremont County DOT Director will also work with the Fremont County Weed Coordinator to make sure they are aware of locations too.
Fremont	1	City of Canon City		Arkansas Canyon stickleaf	no	no	One SMA in City. Information sent to Fremont County
Garfield	3	Garfield County Road and Bridge Department	Deb Fiscus, Director, dfiscus@garfield-county.com; santhony@garfield-county.com	DeBeque milkvetch	yes	yes	Provided BMP and sensitive SMA data.
Gunnison	28	Gunnison County Public Works	Marlene Crosby, Director, 970-641-0044, publicworks@gunnisoncounty.org	Gunnison milkvetch , Grand Mesa penstemo n, Rollins' twinpod	yes	no	Exchanged several emails and phone calls. The County appreciated receiving the BMPs (without the sensitive location data) but was not interested in engaging in a data sharing agreement.
Gunnison	1	City of Gunnison Streets and Alleys Department	970-641-8321; Greg Summer, Streets and Alleys Supervisor, gregs@cityofgunnison-co.gov	Gunnison milkvetch	yes	no	Sent two emails and left two phone messages.

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
Larimer	16	Larimer County Road and Bridge Department	Jim Frick, gravel roads, 498-5663, Frickj@larimer.org; Rick Johnson, paved roads, 498-5671, Johnsorb@larimer.org	Bell's twinpod	yes	yes	Provided BMP and sensitive SMA data.
Larimer	4	City of Fort Collins Street Maintenance Program	221-6615, Darren Moritz, dmoritz@fcgov.com	Bell's twinpod	yes	no	Darren will work on getting agreement signed. Plan to get together and look at maps. Very supportive. Good working relationship with CSU, etc.
Las Animas	1	Las Animas County Road and Bridge Department	Phil Dorenkamp, Director, phil.dorenkamp@lasanimascounty.org. divided into 5 districts, main office is in Trinidad-719-846-2931, no emial listed. Map of districts on website	Colorado Green Gentian	yes	no	Not interested in signing agreement and participating. Concerned that they would be asked to modify what they do in the future.
Mesa	15	Mesa County Road and Bridge Department	970-244-1807. Rudy Bevan, rudy.bevan@mesacounty.us, office open until 3:30	DeBeque milkvetch and Grand Mesa penstemon	yes	no	Several emails and phone conversations ; Road and Bridge Department is interested but we did not secure a signed data license.

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
Montrose	8	Montrose County Road and Bridge Department	Joseph Budagher, Superintendent, 970-249-5424, jbudagher@montrosecounty.net; County Weed Department- Justin Musser, Weed Manager, jmusser@montrosecoutny.net	Good neighbor bladderpod	yes	yes	Road and Bridge Department was not interested in working with us. County Weed Department secured a data license and we sent the BMPs with confidential SMA data.
Ouray	1	Ouray County Road and Bridge	970.626.5391; M-th-8-4:30, ex. 22, Chris Miller, Road and Bridge Superintendent, ex. 11-GIS Jeff	Good neighbor bladderpod	no	no	Only one SMA within County: County is Not listed as the road manager. Provide township, range and section data when email address is obtained.
Prowers	2	Prowers County Road and Bridge Department	Mark Dorenkamp, Road and Bridge Supervisor, mark.dorenkamp@prowerscounty.net, 109 East Sherman St., Lamar, CO 81052, 719-336-5536 or 719-537-6631	Colorado green gentian	yes	yes	sent information about the township, range, and sections that interest the SMAs

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
Routt	7	Routt County Road and Bridge	Janet Hruby, Road and Bridge Director, 970-870-5308, jhruby@co.routt.co.us; Mike Mordi, Road and Bridge Assistant Director, 970-870-5337, mmordi@co.routt.co.us, admin asst. also listed	Rabbit Ears gilia	yes	no	Not interested in signing agreement and participating.
		Colorado Department of Transportation	Jeff Peterson, CDOT Wildlife Specialist	all	yes	yes	Provided BMP and sensitive SMA data.
		Colorado Parks and Wildlife	Raquel Wertsbaugh, Colorado Natural Areas Program Coordinator	all	yes	yes	Provided BMP and sensitive SMA data.
		State Land Board	Right of Way Program Manager, David Rodenberg, david.rodenberg@state.co.us, 303-866-3454 x3328; Mindy Gottsegen, Conservation Services Manager, mindy.gottsegen@state.co.us, x3318	Gunnison milkvetch, Brandegee wild buckwheat, Arkansas Canyon stickleaf, Colorado green gentian, Bell's twinpod	yes	yes	Provided BMP and sensitive SMA data. Mindy will make this an automatic thing they consider. Will also work with counties to communicate importance, etc.
		BLM Little Snake Field Office	Wendy Reynolds, Field Manager, wreynolds@blm.gov, 970-826-5089; Tim Wilson, Acting Field Manager, 970-826-5089	Rabbitt ears gilia	yes	yes	SMAs not on BLM lands, but nearby. They are aware of this USFS Sensitive species.

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
		BLM Royal Gorge Field Office	Keith Berger, Field Manager, kberger@blm.gov, 719-269-8515; Melissa Garcia, Assitant field Mangfer (2 more listed), mgarcia@blm.gov, 269-8724; GIS Specialist, Taylor Holden, tholden@blm.gov, 303-239-3742	Bell's twinpod, Brandegee wild buckwheat, Colorado green gentian, Arkansas Canyon stickleaf	yes	yes	Provided BMP and sensitive SMA data. The BLM Royal Gorge office will plan to use the information for their Resource Management Planning activities. Keith will also make sure others on his staff (Melissa, Taylor, and sensitive species coordinator) are aware of these data and will let us know if there are questions.
		BLM Colorado River Valley Field Office	Steve Bennett, Field Manager, sbennett@blm.gov, 970-876-9002, and Carla DeYoung ecologist carla_deyoung@blm.gov, 970-876-9076	DeBeque milkvetch	yes	yes	Provided BMP and sensitive SMA data. Carla served as a peer reviewer on the BMPs for DeBeque milkvetch.
		BLM Grand Junction Field Office	Anna Lincoln, anna_lincoln@blm.gov, 970-244-3019	DeBeque milkvetch, Grand Mesa penstemon	yes	yes	Provided BMP and sensitive SMA data.

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
		BLM Gunnison Field Office	Brian St. George, Field Manager, bstgeorge@blm.gov, cc Gay Austin, Natural Resource specialist; 970-642-4940	Gunnison milkvetch, Good-neighbor bladderpod, Rollins' twinpod	yes	yes	Provided BMP and sensitive SMA data.
		BLM Uncompahgre Field Office	Barbara Sharrow, Field Manager, bsharrow@blm.gov, 970-240-5315 Amanda Clements, Ecologist, aclement@blm.gov, 970-240-5302, Ken Holsinger, Botanist, kholsing@blm.gov, 970-240-5389	Gunnison milkvetch, DeBeque milkvetch, Grand Mesa penstemon	yes	yes-date needed	Provided BMP and sensitive SMA data. Ken thought the BMPs are really good and that the BLM is already doing most everything in the BMPs and that all of our SMAs are not managed by the BLM in that area but are managed by the county or city or state. Ken feels county is esp. important to work with on these BMPs.

County	Number of SMAs in County/ Area	Partner Organization	Contact information	Relevant BMPs	BMPs sent (and draft data license if needed; yes/no)	Signed Data Sharing Agreement (yes/no)	Follow up call/ email and notes
		US Highway Administration	Jeff Peterson, CDOT, will work with Federal Highways to assure effective implementation	Rabbit Ears gilia, Bell's twinpod, Brandege wild buckwheat, Arkansas Canyon stickleaf, Gunnison milkvetch		no	
Delta, Gunnison, Mesa	16	USFS-GMUG	Gay Austin, Natural Resource Specialist	Gunnison milkvetch, Grand Mesa penstemon	yes	yes	Provided BMP and sensitive SMA data.
Baca, Las Animas	3	USFS-Pike	Steve Olson, Forest Botanist	Colorado Green Gentian	yes	yes	Provided BMP and sensitive SMA data. Steve also served as peer review on the BMPs for Colorado green gentian.
Gunnison	1	USFS-White River	John Proctor, Botanist, jproctor@fs.fed.us	Grand Mesa penstemon	no	yes	need to follow up regarding the one SMA on the Forest
Routt	6	USFS-Routt	Marti Aitken, Botanist, maitken@fs.fed.us	Rabbit ears gilia	yes	yes	Provided BMP and sensitive SMA data.

APPENDIX TWO

Draft email to partner *without* data sharing agreement

Subject: Rare Plant Species Recommended Best Management Practices for roadside habitats

Tag: Confidential

Dear Partner (e.g., County, BLM, etc.)

We are working on a pilot project with the Colorado Department of Transportation and the Colorado Natural Areas Program to develop Best Management Practices to reduce the impacts of road maintenance activities on globally rare and imperiled plant species.

As part of this project we are providing you (e.g., County, BLM, etc.) with the attached Recommended Best Management Practices for species x (insert common name), a globally imperiled plant species known only from x and y counties, and nowhere else in the world.

We would also like to provide you with sensitive/confidential information about the specific locations of the Special Management Areas, described in the Best Management Practices, designed to protect roadside occurrences of this globally imperiled plant species. We can send the data in tabular and electronic formats once the attached data sharing agreement is signed.

Draft email to partner *with* data sharing agreement

Subject: Rare Plant Species Recommended Best Management Practices for roadside habitats

Tag: Confidential

Dear BLM,

We are working on a pilot project with the Colorado Department of Transportation and the Colorado Natural Areas Program to develop Best Management Practices to reduce the impacts of road maintenance activities on globally rare plant species.

As part of this project we are providing you (e.g., County, BLM, etc.) with the attached Recommended Best Management Practices for the species x (insert common name), a BLM sensitive and globally imperiled plant species known only from x and y counties, and nowhere else in the world.

These Best Management Practices include sensitive/confidential information about Special Management Areas designed to protect roadside occurrences of this globally imperiled plant species. Our data sharing agreement signed on DATE applies to these data. Upon request, we can also provide these data electronically, to be used by BLM personnel, again, following the conditions of our data sharing agreement.

APPENDIX THREE

EXAMPLE DATA LICENSE AND USE AGREEMENT
BETWEEN

Colorado State University – Colorado Natural Heritage Program

AND

Example County, Colorado

The Board of Governors of the Colorado State University System, acting by and through Colorado State University for the use and benefit of the Colorado Natural Heritage Program (CNHP) agrees to provide Data to Example County (LICENSEE) subject to the terms and conditions set forth herein.

CNHP agrees to provide confidential Special Management Areas location data for selected sensitive plant species within Example County. This license will also cover any additional data requests for a period of five years.

1. DEFINITIONS:

Internal Use. Use of Data for analysis, summarization, display, or other use of the data by a party to this Agreement that does not result in the production of a product for External Use.

External Use. Use of Data in any publication, report, press release, or other hard-copy, machine-readable material, or electronic product provided to the general public or to any corporation, organization, or other entity or person not a party to this Agreement.

BIOTICS. The proprietary Biodiversity and Tracking Conservation System in which CNHP Data, including Element Occurrences and Potential Conservation Areas, are maintained. Data maintained in the CNHP's BIOTICS database are an integral part of ongoing research at Colorado State University and reflect the observations of many scientists, institutions and our current state of knowledge. CNHP BIOTICS is the aggregation of all data developed and maintained using natural heritage methodology by CNHP and cooperating organizations. These data are acquired from various sources, with vary levels of accuracy, and are continually being updated and revised. CNHP BIOTICS includes species and vegetation data, including various types of information from range-wide status to specific locations.

Data. Any information provided under the Data License and Use Agreement regardless of format (i.e., electronic, paper, or verbal).

Element. A global or state rare species, subspecies, or unique natural community tracked by the CNHP.

Element Occurrence (EO). An Element Occurrence represents a location in which an element is, or was, present. An EO has continued (or historic) presence and/or regular recurrence at a given location and has practical conservation value.

Precision. Precision refers to the accuracy of the mapped location of an EO. General (G) precision is assigned to EO records whose locational uncertainty exceeds approximately 1

mile. Minutes (M) precision is assigned to EOs mappable within approximately 1 mile in any direction. Seconds (S) precision is assigned to EOs mappable to within approximately 3 arc seconds of latitude and longitude.

Sensitive EO. EOs may be marked sensitive either due to collection value, susceptibility to disturbance, federal status, or other factors (record displays a "Y" in the CNHPSENS field) or due to land status, i.e., private landowner request (record displays a "Y" in the DATASENS field).

Generalized EO. Please refer to the "CNHP Methodology for Generalizing Element Occurrence Data" document in the Supporting Documents directory for a detailed explanation.

Level 1 Data. Dataset of Natural Heritage Data which contains information on both non-sensitive and sensitive species, communities provided for **INTERNAL USE ONLY**. **These data are not to be redistributed**. Level 1 Data are not generalized. Level 1 dataset includes the following items and file formats:

a. EO Spatial Data (Arcview SHP) – Non-sensitive and sensitive EOs. Data contain full details maintained in BIOTICS and are provided as precisely as known or "as-is" from BIOTICS (data are not "fuzzed" or generalized).

b. EO Transcription (PDF) – For each EOs provided in the spatial data, reports which contain full details maintained in BIOTICS.

c. PCA Spatial Data (Arcview SHP) – All PCAs (non-sensitive and sensitive).

d. PCA Transcription (PDF) – PCA Reports for all PCAs provided in the spatial data. PCA reports contain full details maintained in BIOTICS.

e. NCA Spatial Data (ArcView SHP) – All NCAs.

f. NCA Transcription (PDF) – NCA Reports for all NCAs provided in the spatial data.

g. Observation Data (ArcView SHP) – All Observations Database records.

h. Metadata (MET) – FGDC-compliant metadata for EOs, PCAs, NCAs, and Observations.

Level 2 Data. Dataset of Natural Heritage Data which contains both non-sensitive and sensitive species, communities provided for **INTERNAL USE ONLY**. **These data are not to be redistributed.** Level 2 Data are generalized data provided private lands. Level 2 Data are generalized as follows. Level 2 dataset includes the following items and file formats:

a. Special Management Areas – Roadside zones based on the distribution of selected sensitive species 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 (including maps and data tables) are presented in Appendix One if a data sharing agreement has been signed with the Colorado Natural Heritage Program. These data are considered sensitive and should only be for internal use.

b. EO Spatial Data (Arcview SHP) – General EO records are provided "as-is." Minutes and seconds EO records are generalized to 1 sq. mile for non-sensitive EOs and to 4 sq. miles for sensitive EOs.

c. EO Transcription (PDF) – Data contain full details maintained in BIOTICS except, Lat/Long, Directions, Management Comments, and Protection Comments. Resolution of location information for EOs differs based on EO sensitivity: location of non-sensitive EOs reported to PLSS section level (1 sq. mile); location of sensitive EOs reported to PLSS range level (36 sq. miles).

Level 3 Data. Dataset of Natural Heritage Data which contains both non-sensitive and sensitive species, communities provided for **EXTERNAL USE** and mapping display. No transcription reports are provided with Level 3 Data. Level 3 dataset includes the following items and file formats:

a. EO Spatial Data (ArcView SHP) – For Records with general mapping precision are provided "as-is." Records with seconds and minutes mapping precision are generalized based on sensitivity. Non-sensitive EOs are generalized to 1 sq. mile blocks and sensitive EOs are generalized to 9 sq. mile blocks.

b. EO Summary Report (PDF) - for all EOs provided in spatial data.

c. PCA Spatial Data (Arcview SHP) – Non-sensitive PCAs only.

d. Network of Conservation Areas (NCA) Spatial Data (ArcView SHP) – All NCAs.

2. TERM: The term of the Data license granted herein and the period of performance of this Agreement is from the effective date of signature by both parties through five (5) calendar years from date of signing unless this Agreement is sooner terminated or extended by mutual written agreement of the Parties. Upon termination of this Agreement, all rights granted LICENSEE herein shall immediately expire and LICENSEE shall: (i) cease use of the Data and certify that all copies of these Data have been destroyed or return all copies of these Data to CNHP; or (ii) complete arrangements with CNHP to receive a comprehensive update to these Data. The arrangements shall include an updated license that will conform to the CNHP Data distribution policies in effect at the time of signing.

3. LICENSE FEE; FINANCE ADMINISTRATION AND PAYMENT: This dataset is being provided as a project deliverable for the Licensee at no further cost to the Licensee. Any future data requests that may require payment will be billed in accordance with established contracts and invoiced through CSU.

4. CONFIDENTIALITY AND NON-DISCLOSURE REQUIREMENTS: LICENSEE acknowledges that Level 1 Data provided by CNHP (described above), are considered **sensitive and confidential** for management and conservation reasons. Therefore, LICENSEE agrees to strictly adhere to the following requirements with respect to Data being provided by CNHP:

a. Level 1 Data are being provided for **internal use only**. LICENSEE will undertake appropriate measures to ensure that these Data will be accessible only to the LICENSEE and to no other entity, nor will these Data be made available for public viewing without prior approval by CNHP.

b. Level 3 Data are being provided for purposes of **external CNHP data display**, i.e., any printed or electronic items (e.g., maps, tables, charts, graphs, etc.) containing CNHP Data that the licensees wish to publish for public viewing.

c. All CNHP Data are copyrighted and ownership of the Data remains with CNHP. The licensees are being granted use of the Data for the purposes described herein. No interest whatsoever is conveyed to the LICENSEE in right, title, and interest of the Data, the information, and all copyrights (and renewals thereof) secured herein. All publication, dissemination and other rights in the Data are reserved to CSU/CNHP in all languages, formats, and throughout the world for the sole and exclusive use of any other disposition by CNHP or their assignees or grantees at any time and from time to time without any obligation or liability to any Data user.

d. The Data will be used for the requested purposes described above and for no other purpose.

e. The Data may not be transcribed, reproduced in any manner, nor redistributed to any third party, unless authorized in writing by CNHP. Requests for the Data from any other entity will be referred to CNHP.

f. Requests involving biological interpretation or use of the Data beyond the stated purposes will be referred to CNHP.

g. LICENSEE will provide acknowledgement for CNHP Data where appropriate. The correct citation for CNHP Data is as follows:

> Colorado Natural Heritage Program. 2014. Biodiversity Tracking and Conservation System. Colorado State University, Ft. Collins, CO. Data exported July 2014.

h. In the event that the LICENSEE receives a demand for disclosure pursuant to applicable law (including, but not limited to, the Freedom of Information Act (Public Law 89-554, 80 Stat. 383; Amended 1996, 2002, 2007), the Colorado Public Records Act (C.R.S. secs. 24-72-201, et seq.), as now or hereafter amended), or any lawful order, subpoena, or other process requiring disclosure of the Data, the LICENSEE shall immediately notify CNHP in writing in order to afford CNHP a reasonable opportunity to initiate legal action to enjoin, restrict, or otherwise oppose the disclosure in a court of competent jurisdiction. Such action shall be at the expense of CNHP, but the LICENSEE shall reasonably cooperate with CNHP in seeking protection of the Data.

5. NOTICE REGARDING INFRINGEMENT: LICENSEE shall promptly notify CNHP of any third party that it reasonably believes to be infringing any right of CNHP, and Licensee shall use reasonable efforts to provide to CNHP any information LICENSEE has in support of such belief.

6. DISCLAIMER OF WARRANTIES: LICENSEE acknowledges that CNHP Data require a certain degree of biological expertise for proper analysis, interpretation, and application. Care should be taken in interpreting these Data. These Data are dependent on the research and observations of many scientists and institutions, and reflect our current state of knowledge. Data are acquired from various sources, with varying levels of accuracy, and are continually updated and revised. They are provided for planning purposes only. Many areas have never been surveyed, however, and the absence of Data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not

present. These Data should not be regarded as a substitute for on-site surveys required for environmental assessments. Absence of evidence is NOT evidence of absence. Absence of any Data does not mean that other resources of special concern do not occur, but rather CNHP files do not currently contain information to document this presence. If ground-disturbing activities are proposed on a site, CNHP should be contacted for a site-specific review of the project area.

LICENSEE acknowledges that the Data and other Confidential Information provided to LICENSEE by CNHP are provided on an **as-is basis, as-available** basis without warranties of any kind, expressed or implied, **INCLUDING (BUT NOT LIMITED TO) WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT**. Although CNHP maintains high standards of Data quality control, CNHP, Colorado State University, and the State of Colorado further expressly disclaim any warranty that the Data are error-free or current as of the date supplied. For more information, see the Colorado Natural Heritage Program website at: www.cnhp.colostate.edu.

LICENSEE acknowledges that CNHP and licensee shall have no liability or responsibility to the Data users, or any other person or entity with respect to liability, loss, or damage caused or alleged to be caused directly or indirectly by the Data, including but not limited to any interruption of service, loss of business, anticipatory profits or indirect, special, or consequential damages resulting from the use or operation of the Data. LICENSEE hereby agrees, to the extent authorized by law, to hold CNHP, Colorado State University, and the State of Colorado harmless from any claim, demand, cause of action, loss, damage or expense arising from or related to LICENSEE's use of or reliance on the Data, regardless of the cause or nature thereof, except in the event that such cause is attributable to the negligence or misconduct of CNHP.

7. CHOICE OF LAW: This Agreement shall be interpreted, construed, and governed by the laws of the State of Colorado, and such laws of the United States as may be applicable.

8. MODIFICATION AND AMENDMENT OF AGREEMENT: Modifications to this Agreement may be proposed by either party at any time during the period of performance and shall become effective upon written approval by both parties.

9. PERIOD OF PERFORMANCE: The term of the Data license granted herein and the period of performance of this Agreement is from the effective date of signature by both parties through two (2) calendar years from date of signing unless this Agreement is sooner terminated or extended by mutual written agreement of the Parties. Upon termination of this Agreement, all rights granted LICENSEE herein shall immediately expire and LICENSEE shall:

A. cease use of the Data and certify that all copies of these Data have been destroyed or return all copies of these Data to CNHP; or
B. complete arrangements with CNHP to receive a comprehensive update to these Data. The arrangements shall include an updated license that will conform to the CNHP Data distribution policies in effect at the time of signing.

REPRESENTATIVES; NOTICE

For purposes of this Agreement, the persons named below are designated the representatives of the parties. All notice required to be given by registered or certified mail, return receipt requested, to the representative named below. The parties may designate in writing a new or substitute representative:

CNHP:

County:

Michael D. Menefee

Environmental Review Coordinator

Colorado Natural Heritage Program

Colorado State University

1474 Campus Delivery

Fort Collins, CO 80523-1474

P: (970) 491-7331

Michael.Menefee@ColoState.edu

In Witness Whereof, CNHP and the licensees have executed this data license and use agreement as of the last date signed below:

By: _____

Date

County

By: _____

Michael Menefee Date

Environmental Review Coordinator

CNHP