RECOMMENDED BEST MANAGEMENT PRACTICES FOR PLANTS OF CONCERN

Practices Developed to Reduce the Impacts of Oil and Gas Development Activities to Plants of Concern

Prepared by the Colorado Rare Plant Conservation Initiative

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April 2, 2009

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Introduction

Seventeen globally imperiled plants found in oil and gas development areas in Colorado are in danger of extinction (Table 1). Collectively, these species occupy less than 30,000 acres in Colorado (Figure 1 and Table 1). One of the biggest conservation issues for Colorado native plants is the lack of awareness of the existence and status of these rare plant species. Increasing this awareness, especially during development 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 oil and gas development activities may help to effectively conserve their habitat and is unlikely to confer substantial impacts on oil and gas development projects. The Best Management Practices (BMPs) included in this document are intended to help increase the awareness of these species for anyone involved in oil and gas development activities.

The desired outcome of these recommended BMPs is to significantly reduce the impacts of oil and gas development to the seventeen plants of concern on federal, state, and/or private land. These BMPs are not intended to replace other BMPs written for specific species or habitats. The BMPs listed here are intended to be iterative, and to evolve as additional information becomes available about Colorado's botanical diversity, and as resource extraction and resource conservation 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).

The intent of these BMPs is to inform people working in energy development areas regarding the importance of Colorado's botanical treasures, and to outline some of the ways in which they can coexist with oil and gas development.

The following recommended measures are organized to provide guidance during each phase of the oil and gas development process. The implementation of these recommendations may assure that development proceeds without unintended harm to globally imperiled plants.

Project Planning Phase

1. Gather mapped location information for plants of concern (Table 1) in potential project areas by consulting with the Colorado Natural Heritage Program at Colorado State University, the U.S. Fish and Wildlife Service, or other known sources of rare plant spatial data.

2. If plants of concern (Table 1) are known from the vicinity of potential project areas or suitable habitat is present (Figure 2), plan to conduct field surveys for the plants of concern (see also Pre-Ground Disturbance Fieldwork section of this document). Botanical surveys are generally considered valid for three years.

3. Prior to field surveys, the landowner or land manager should provide maps (as hard-copy and GIS files) to a botanical surveyor showing all known locations for the plants of concern, as well as the proposed areas of disturbance. Maps should include existing and proposed roads, pipelines, well pads, ponds, pits, parking lots, all other work areas, and any area liable to be subjected to ground disturbance. These maps should be updated as new sites are proposed.

4. 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, discuss the management of these species with the USFWS to avoid complications should these species become listed Threatened or Endangered during the life of the project.

5. If populations of plants listed in Table 1 are found during surveys, assure that they are placed on updated project maps.

6. No surface occupancy or ground disturbance is recommended in Areas of Critical Environmental Concern (ACECs) designated for rare plant values, or in known occupied habitat for plants listed in Table 1.

7. Where plants of concern (Table 1) occur in a project area, an avoidance buffer of 200 meters minimum is recommended. The 200 meter buffer reduces dust transport, weed invasion, unauthorized vehicular activities, and chemical and produced-water spills. It also reduces impact to pollinators and their habitat.

8. Where avoidance is not feasible and development is allowed within 200 meters of plant populations, impacts to the plants of concern can be reduced by placing temporary fencing or other barriers around the footprint of the project so that vehicles don’t go any further than needed and the sensitive habitat is avoided as much as possible. To avoid working in rare plant habitat and drawing attention to the plants, the edge of disturbance should be fenced, not the nearby plant population.

9. Communication of the importance of rare plant habitat protection with those working on the project is vital to the success of fencing or barriers.

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

11. Prepare a reclamation plan and weed management plan prior to ground-disturbing activities. Realize that seeding or planting native plants may need to be repeated until deemed successful (see also the Revegetation and Invasive Plants section of this document).

12. Begin the development of monitoring plans for the plants of concern, revegetation efforts and noxious weed management (see also the Post-Project Monitoring Phase section of this document).

13. Minimize impacts to habitat for plants of concern through appropriate and creative project planning. Some examples of appropriate and creative project planning include:
    - Place well pads, roads, pipelines, structures, and associated infrastructure where they will cause the least impact to the plants of concern.
    - Maximize distance between well pads by use of directional drilling.
    - Construct the smallest well pads and access needed to safely develop the site.
    - Limit new access routes created by the project and prevent unauthorized use of temporary roads.
    - Build roads to the appropriate standard, no higher than necessary for use and safety, and utilize primitive or two-track roads rather than newly constructed roads where feasible.
    - Reduce right-of-way length and width, and minimize the depth of roadbed excavation to minimum requirements.
    - Place signs to limit off-road travel in sensitive areas.
    - Pipelines (and electrical powerlines when possible) should be placed within road corridors to minimize disturbance
    - Fire retardant chemicals should not be applied to plants of concern.
    - Alteration and disturbance of the hydrological setting for plants of concern are discouraged.
    - Indirect impacts from water management should be avoided (i.e., install berms or catchment ditches to prevent spilled materials from reaching occupied or suitable habitat through either surface or groundwater).
    - Overspray from evaporation ponds should be located such that it falls at least 200 meters from habitat for plants of concern.
    - Construction should take place down slope of plants of concern where feasible. Down slope ground disturbing activities should be conducted in such a way as to avoid as much as is reasonably possible undercutting and sloughing of the slopes where rare plant habitat occurs. If well pads and

roads must be sited upslope, buffers of 200 meters minimum between surface disturbances and plants of concern should be incorporated.

Pre-Ground Disturbance Fieldwork Phase

1. Field botanical surveys are recommended for all projects that overlap the range of the plants of concern (Figure 2) to determine if plants of concern (Table 1) or suitable habitat are present. If possible, all plants tracked by the Colorado Natural Heritage Program should also be documented in the surveys (Colorado Natural Heritage Program 2008).

2. Field botanical 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 at Colorado State University can provide references, field forms, etc.

3. Field botanical surveys should be conducted at a time when the plant species of concern can be detected and accurately identified. In some cases multi-year surveys are necessary. For example, in dry years some ephemeral annuals (such as *Phacelia submutica*) may not germinate and produce plants, but they are still present at the site in the seedbank.

4. Field botanical surveys should be completed across the project disturbance area and include a 200 meter buffer around the project area. In some cases the topographic setting or land ownership patterns may impede covering the full recommended survey area. Surveys should also include areas where direct or indirect effects may impact hydrology. Surveys should be floristic, providing a list of plant species encountered during the survey. Negative survey data should also be reported to the landowner or land manager.

5. If plant 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.

6. Field survey results should be reported to the Colorado Natural Heritage Program at Colorado State University, 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).

7. Document and map Colorado A and B list noxious weeds for later treatment (Colorado Noxious Weed Act 2003). The Colorado Noxious Weed List can be

found at: http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733.

8. Erect temporary fencing or other barriers and necessary signage to restrict ground disturbance to the previously determined project footprint.

Project Implementation Phase

1. Verify that adequate field surveys and all other planning phase activities have been completed. If new locations of plants listed in Table 1 were found during botanical surveys, ensure that they are shown on updated project maps.

2. Control erosion and polluted runoff in areas that would impact plants of concern.

3. Ensure that a botanical expert is on site when clearing of vegetation occurs in the vicinity of plant species of concern.

4. 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.

5. Restrict motorized travel to designated roads and trails. Routes should be designated and marked prior to implementation.

6. Prevent plumes of dust and particulate matter from impacting plants of concern. While new roads should not be built within 200 meters of the plants of concern, preexisting roads with an expected increase in traffic should be graveled in these areas. The operator is encouraged to apply water for dust abatement to such areas during the flowering period. If possible, dust abatement applications should be comprised of water only, with minimal use of magnesium chloride.

7. Minimize disturbance to soil and native vegetation as much as possible.

8. Wash vehicles and other equipment to reduce the spread of noxious weeds from other areas. Portable wash stations would be ideal in areas of heavy oilfield traffic and in areas where noxious weeds are an issue.

9. Stockpile topsoil for use in final reclamation. Topsoil should be stored separately from other fill materials.

Management of Revegetation and Invasive Plants

1. Rigorously 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 plants of concern.

2. Monitor project areas for new weed infestations. Noxious weeds in close proximity (within 400–800 meters) to the plants of concern should be the highest priority for control. Ensure that the rare plants are protected from undue damage resulting from weed control efforts.

3. Control noxious weeds using integrated techniques. Limit chemical control in areas with 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 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. Minimize the disturbed area of producing well locations through interim and final reclamation. Reclaim well pads following drilling to the smallest area possible.

6. Close and rehabilitate roads quickly once they are no longer needed.

7. When timely natural regeneration of the native plant community is not likely to occur, carefully select and use native species that will not compete with or exclude botanical resources for revegetation efforts. Bare sites should be seeded with native plant species as soon as appropriate to prevent establishment of undesirable plant species. Although land management agencies may allow use of non-native species under some circumstances, we believe that **nonnative invasive plant species should not be used under any circumstances**.

8. Selection of appropriate species for revegetation is site-specific and seed recommendations are beyond the scope of this document. We recommend that experts be consulted to develop an appropriate seed list. The selection of appropriate species for revegetation directly influences the success or failure or revegetation efforts.

9. Ensure that seed used for revegetation as well as straw and hay bales used for erosion control are certified free of noxious weeds.

10. Monitor revegetation sites to ensure successful establishment of desired species.

11. Re-contour roads to blend into the landscape; ripping and seeding roads are usually not sufficient.

12. Protect cut-and-fill slopes against erosion with the use of water bars, lateral furrows, or other appropriate measures. Biodegradable straw matting, bales or wattles of weed-free straw or weed-free native grass hay, or well-anchored fabric silt fence should be used on cut-and-fill slopes and along drainages to protect against soil erosion.

Post-Project Monitoring Phase

1. 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).

2. Monitor impacts from oil and gas development on plants of concern. If impacts are noted, change management to address the cause of impacts.

3. Monitor the long-term success of revegetation efforts to ensure successful establishment of desired species and detect any noxious weed infestations. If revegetation is unsuccessful, continue efforts to establish native species in disturbed sites.

4. Develop and implement monitoring plans for noxious weeds, especially in revegetation areas. Plans should be designed to detect new infestations and document the extent and spread of existing weeds.

Acknowledgements

We appreciate the input of numerous individuals during the preparation of this document, especially Carol Dawson, Anna Lincoln, Carla DeYoung, Terry Bridgman, Jessica Farber, and Dave Anderson. We are also grateful for funding provided by the National Fish and Wildlife Foundation.

References

ALL Consulting. 2002. Handbook on Best Management Practices and Mitigation Strategies for Coal Bed Methane in the Montana Portion of the Powder River Basin.

BLM. 2004. Best Management Practice Information Sheets. (WO1_WO_BMPs_Technical_Information_Sheets)

BLM 2006. BLM Programmatic Consultation for Resource Management Plan Implementation: Proposed Project Design Criteria.

BLM 2007a. Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Statement and associated Record of Decision. (FES 07-21).

BLM 2007b. Final Biological Assessment for Vegetative Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States (FES 07-21).

BLM White River Field Office. Undated excerpt. Piceance Development Project.

California Native Plant Society. 1992. Policy on Appropriate Application of Ex Situ Conservation Techniques.

Colorado Bird Observatory. Undated. Best Management Practices for Shortgrass Prairie Birds: A Landowner's Guide.

Colorado Mule Deer Association and the Colorado Wildlife Federation. 2006. Wildlife Management Guidelines for Oil & Gas Development.

Colorado Natural Areas Program. 2008. Best Management Practices/ Conservation Measures for the Mount Callahan Natural Area and Mount Callahan Saddle Natural Area. Exhibit B of the Articles of Designation for Mount Callahan and Mount Callahan Saddle Natural Areas.

Colorado Natural Heritage Program. 2008. Biodiversity Tracking and Conservation System. Colorado State University, Fort Collins, Colorado.

Colorado Natural Heritage Program and The Nature Conservancy. August 2008. A Biodiversity Scorecard for Colorado. Colorado Natural Heritage Program, Colorado State University, Ft. Collins, Colorado, and The Nature Conservancy, Boulder, Colorado. Unpublished Report to The Nature Conservancy. 133 pp.

Colorado Noxious Weed Act. 2003. Title 35: Agriculture, Article 5.5: Colorado Noxious Weed Act, and 8 CRR 1203-19 Rules pertaining to the administration and enforcement of the Colorado Noxious Weed Act.

Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1997. Measuring & Monitoring Plant Populations. BLM Technical Reference 1730-1.

Federal Register: 2006. Notice of Proposed Plant Materials Policy, Forest Service Manual. Vol. 71, No. 102: 30375-30376.

Horizon Environmental Services. 2004. Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites HJN 040027 IM.

U. S. Department of the Interior and United States Department of Agriculture. 2007. The BLM GOLD BOOK: Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development. BLM/WO/ST-06/021+3071/REV 07. Bureau of Land Management. Denver, Colorado. 84 pp.

U.S. Fish and Wildlife Service. 1999. Biological Opinion for the Proposed Inland Production Company Road, Water Pipeline and Natural Gas Pipeline and Potential Well Development within Inland's Humpback and Greater Boundary Oilfield Units.

U.S. Fish and Wildlife Service. 2007. FWS/BLM Recommendations for Avoiding Adverse Effects on Threatened, Endangered, Proposed, and Candidate plants; updated draft 9-21-2007.

U.S. Fish and Wildlife Service. 2007 Ute ladies'-tresses (*Spiranthes diluvialis*) Conservation Measures.

U.S. Fish and Wildlife Service. 2008. Grahams Beardtongue Conservation Measures.

U.S. Fish and Wildlife Service. 2008. Uinta Basin hookless cactus Conservation Measures.

U.S. Fish and Wildlife Service. 2008. White River beardtongue (*Penstemon scariosus* var. *albifluvis*) Conservation Measures.

U.S. Forest Service. FSM 2070: Native Plant Materials.

Table 1. Seventeen plants of concern that are the primary focus of these BMPs. These species are either considered globally imperiled or are federally listed by the USFWS. All of these taxa are threatened with extinction because of oil and gas development activities in Colorado (Colorado Natural Heritage Program and The Nature Conservancy 2008, Colorado Natural Heritage Program 2008).

Scientific name	**Imperilment rank** (CNHP 2008)	**Federal Status**	**Endemic to Colorado**	**Occupied acres in Colorado**	**Habitat**
Astragalus humillimus	G1/S1	LE	No	1,433	Cliff and canyon
Astragalus debequaeus	G2/S2	BLM	Yes	106	Pinyon-juniper
Astragalus osterhoutii	G1/S1	LE	Yes	793	Shrubland
Cryptantha gypsophila	G1G2/S1S2	BLM (proposed)	Yes	525	Pinyon-juniper
Eriogonum clavellatum	G2/S1	none	No	4	Shrubland
Eriogonum pelinophilum	G2/S2	LE	Yes	1,178	Shrubland
Lesquerella congesta	G1/S1	LT	Yes	740	Barrens
Lesquerella parviflora	G2/S2	BLM	Yes	3,272	Barrens
Mentzelia rhizomata	G2/S2	BLM	Yes	4,547	Barrens
Penstemon debilis	G1/S1	C	Yes	60	Barrens
Penstemon fremontii var. *glabrescens*	G3T2/S2	none	Yes	3,416	Shrubland
Penstemon grahamii	G2/S1	BLM	No	639	Barrens
Penstemon scariosus var. *albifluvis*	G4T1/S1	C	Yes	124	Barrens
Phacelia submutica	G2T2/S2	C, FS	Yes	586	Barrens
Physaria obcordata	G1G2/S1S2	LT	Yes	473	Barrens
Sclerocactus glaucus	G3/S3	LT	Yes	10,203	Barrens
Thalictrum heliophilum	G2/S2	none	Yes	457	Barrens
Total Acres				**28,556**	

* Federal Status codes: BLM: Bureau of Land Management Sensitive, FS: Forest Service Sensitive, LE: listed Endangered, LT: listed Threatened, C: Candidate.

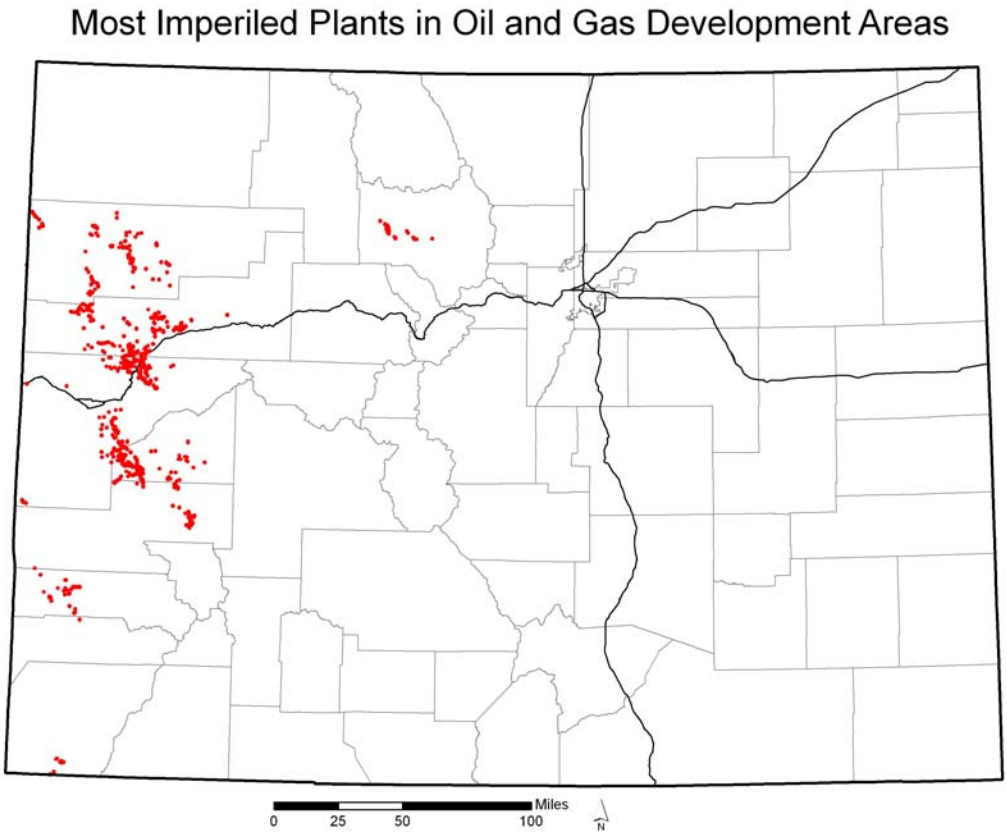

Figure 1. Occupied habitat for the seventeen plants of concern. Total occupied acreage is less than 30,000 acres (Colorado Natural Heritage Program 2008).

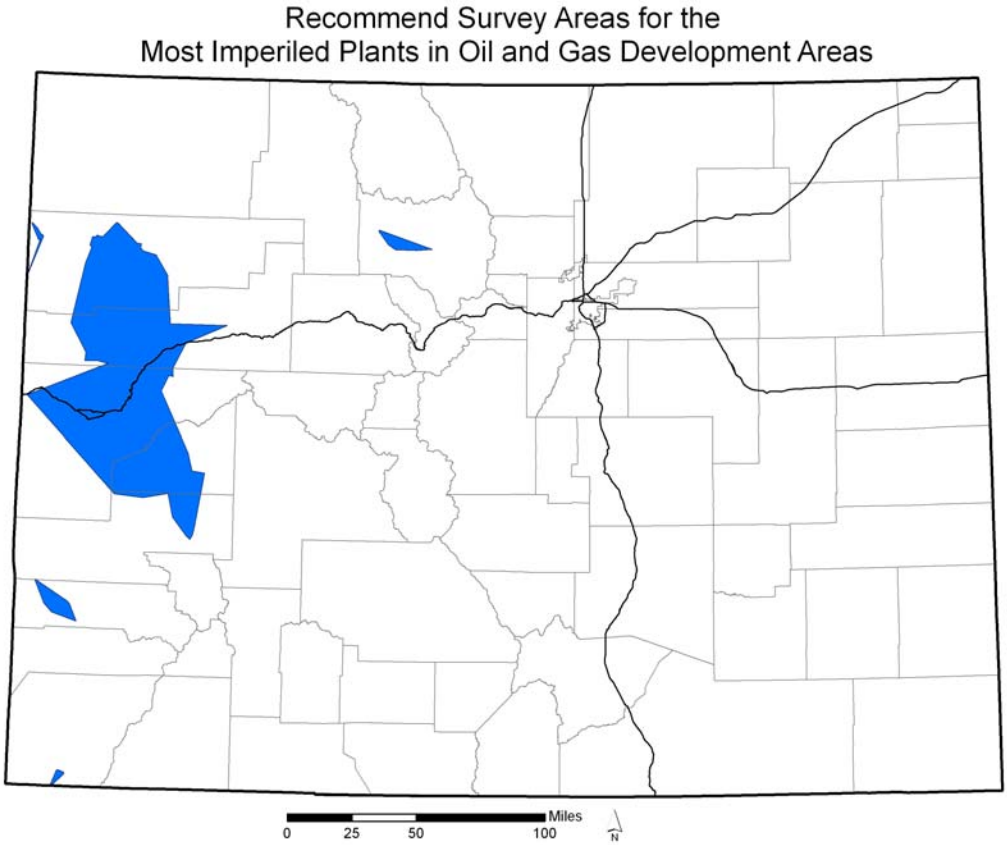

Figure 2. Areas recommended for survey for the seventeen plants of concern. These areas include the full range of the seventeen plants of concern in Colorado (Colorado Natural Heritage Program 2008).