

Appendix H

Best Management Practices (BMPs)

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BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are innovative, dynamic, and economically feasible mitigation practices that are applied on a site-by-site basis to reduce, prevent, or avoid adverse environmental or social impacts of development activities (BLM 2004). A number of BLM BMPs for oil and gas development are incorporated into the general oil and gas development requirements in the Proposed Plan. These include minimizing the number of pads by utilizing multiple well designs and directional drilling, minimizing road footprints, utilizing centralized support facilities such as tank batteries, collocating utilities and pipelines in common corridors and aligning them along roadways, and implementing interim reclamation practices. The BMPs identified in this Appendix represent the kinds of activities which may be required; actual BMPs required during the permitting process to mitigate impacts may vary. BMPs and specific methodologies associated with them are expected to change over time to reflect the results of monitoring and ongoing adaptive management efforts. Additional practices may be required, practices may be withdrawn, or practices may be modified during activity, implementation, or project level planning; this may be done without future land use plan (RMP) decisions or amendments, but would likely be analyzed as part of the NEPA analysis associated with the permitting process. Monitoring and adaptive management practices will be used to refine and clarify needed practices consistent with the goals and objectives of this plan.

The following or similar BMPs will be applied to all long-term ground-disturbing activities, as appropriate to each site and activity. This list is not all inclusive, but is presented to aid the reader in understanding BMPs.

Physical Site Protection/Water Quality Controls

- Employ dust suppression to minimize impacts to air, water, vegetation, and wildlife.
- Install silt fences to protect riparian areas, wetlands, and open water.
- Use closed compressor buildings or mufflers to minimize noise.
- Install catalytic converters to minimize emissions.

Air Quality Protection

- Implement the Comprehensive Air Resource Protection Protocol (CARPP); as part of the CARPP, and in addition to the CARPP, the following may be applicable as needed:
 - Apply best available control technology to minimize air pollutant emissions in order to comply with applicable local, state and federal laws, statutes, regulations, standards and implementation plans.
 - Adaptively manage air quality through baseline assessment, continuous monitoring, re-evaluation, and adjustment as necessary.
 - Cooperate in an interagency process to conduct regional air quality modeling and develop a comprehensive strategy to protect regional air quality.
 - Utilize regional air modeling and project-specific modeling to develop air resource protection strategies.
 - Consider the following factors to identify pollutants of concerns and the appropriate level of air analysis, monitoring and reporting for a proposed activity: magnitude of potential air emissions; duration of proposed activity and phases; proximity to Class I areas, Sensitive Class II areas, population centers, or other sensitive receptors; proximity to non-attainment or maintenance area; meteorological and geographic conditions; existing air quality data; intensity of existing and projected regional development; and issues identified during scoping.

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- As an operator, conduct one year of pre-construction baseline air quality monitoring within or adjacent to a proposed development area during the year immediately preceding the proposed project submittal. This includes siting, installing, operating, and maintaining the required air quality monitors.
- As an operator, conduct air quality monitoring for the life of the development project.
- Publicly disclose air monitoring data.
- As an operator, conduct project-specific air quality modeling for the pollutant(s) of concern in the absence of sufficient data to ensure compliance with laws and regulations or to determine the effectiveness of mitigation options.
- Manage the timing, pace, place, density, and intensity of leasing and development to meet air quality goals.
- As an operator, provide an emissions inventory as part of an application for a permit to drill.
- As an operator, obtain an air permit from the Air Pollution Control Division for the site as a whole or cover individual equipment under one of Colorado's general permits for oil and gas operations.
- If a project may cause a significant adverse air quality impact or exceed an air quality standard, develop an emissions reduction plan.
- Respond to monitored exceedances of the National Ambient Air Quality Standards (NAAQS) by: reviewing the metadata for quality assurance and quality control (QA/QC) and meteorological data for exceptional atmospheric events; and, if validated, conducting a screening analysis to determine the likely cause, source, and origin. Consult with appropriate agencies, mitigate the exceedance(s) and enforce compliance with the NAAQS.
- Prepare and publish an annual air quality summary report.
- Post and enforce reduced speed limits to decrease fugitive dust from vehicular traffic on unpaved roads.
- Reduce unnecessary vehicle idling to reduce combustion emissions, ozone formation, visibility impacts, and fuel consumption.
- Surface or stabilize roads and disturbed areas where soils are susceptible to wind erosion.
- Restrict surface-disturbing activities to periods when wind speeds are less than 25 miles per hour.
- Keep soil moist while loading into trucks.
- Keep soil loads below the freeboard of trucks.
- Minimize drop heights when loaders dump soil into trucks.
- Tighten gate seals on trucks.
- Cover truck loads before traveling on public roads.
- Cover construction materials and stockpiled soils if sources of fugitive dust.
- Train workers to handle construction materials and debris to reduce fugitive emissions.
- Centralize or consolidate gas processing facilities, liquids gathering systems (condensate and produced water), and water and/or fracturing liquids delivery systems to reduce volatile organic compound (VOC) and greenhouse gas (GHG) emissions from individual dehydration/separator units and to reduce vehicle emissions.
- Utilize dust suppression techniques on unpaved surfaces to prevent fugitive dust from vehicular traffic, equipment operations, and wind. Dust suppression techniques may include watering, applying BLM-pre-approved chemical suppressants, and adding gravel, particularly during the construction and well development phases.
- Initially apply at least six inches of compacted gravel to upgraded roads.
- Reduce trucking and service traffic through car pools, innovative work schedules, and centralized collection facilities in order to minimize fugitive dust and tailpipe emissions.
- Improve engine technology (Tier 2 or better) for diesel drill rig engines, as well as all mobile and non-road diesel engines, to reduce nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO) and VOC emissions.

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- With regard to drill rig, hydraulic fracturing, and completion-related engines, comply with EPA Non-Road Tier II Emissions Standards in order to achieve compliance with short-term nitrogen dioxide (NO₂) air quality standards.
- Instead of diesel engines, utilize natural-gas-fueled engines to reduce NO_x emissions and reduce the formation of visibility-impairing compounds and ozone.
- Utilize ultra-low-sulfur diesel (e.g., in engines, compressors, construction equipment) to reduce emissions of PM and sulfates.
- Utilize closed-loop drilling systems to reduce VOC and methane emissions.
- Implement directional and horizontal drilling to reduce construction-related emissions and surface disturbance, thereby minimizing the road network, as well as dust and emissions from truck traffic and construction activities.
- Utilize “green completions” when feasible.
- Utilize “green workovers” to reduce VOC and methane emissions.
- Utilize enclosed tanks instead of open top tanks or pits to reduce VOC and GHG emissions.
- Confine fracturing fluids and condensates to lined pits or tanks.
- Utilize and maintain proper hatches, seals, and valves to minimize VOC emissions.
- Replace wet compressor seals with dry seals or use mechanical seals to reduce gas venting and decrease power requirements. Utilize a degassing recovery system for centrifugal compressors with wet seals.
- Utilize electricity or renewable power sources (e.g., solar panels) for wellhead compressors, pumps, and monitoring equipment to reduce truck trips, engine emissions, methane emissions from gas pneumatic pumps, and local fossil fuel combustion emissions.
- Utilize compressed air or nitrogen instead of natural gas for engine starting to reduce methane and VOCs emissions.
- Frequently replace rod packing to reduce emissions.
- Ideally, utilize flareless technology to reduce VOC and methane emissions; if not feasible, flaring the natural gas is preferable to venting.
- Improve capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units.
- Replace intermittent or continuously burning flare pilots with electrical sparking flare ignition devices.
- Reduce miscellaneous fugitive VOC emissions by: installing plunger lift systems with smart automated control systems to reduce methane emissions from well blowdowns; installing and maintaining low VOC-emitting seals, valves, and hatches on production equipment; initiating an equipment leak detection and repair program (e.g., including FLIR infrared cameras, grab samples, organic vapor detection devices, and/or visual inspection); installing or converting gas-operated pneumatic devices to electric, solar, or instrument (or compressed) air-driven devices/controllers; utilizing “low” or “no-bleed” gas-operated pneumatic devices/controllers; utilizing a closed-loop system or thermal combustion for gas-operated pneumatic pump emissions; installing or converting gas-operated pneumatic pumps to electric, solar, or instrument (or compressed) air-driven pumps; and installing vapor recovery units on truck loading/unloading operations at tanks.
- Optimize glycol circulation and install a flash tank separator to capture and recycle methane, thereby reducing VOCs and methane emissions.
- Install selective catalytic reduction systems to convert NO_x into nitrogen and water vapor.
- Improve capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion to reduce VOC, HAP, and GHG emissions.
- Utilize zero-emissions dehydrators or desiccants dehydrators to reduce VOC, HAP, and GHG emissions.
- Improve capture and control of produced water, crude oil, and condensate tank emissions to reduce VOC and GHG emissions.

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- Utilize inert gases and pigs to purge pipelines rather than vent natural gas to the atmosphere.
- Install a dedicated vapor recovery system to recover gas from pipeline pigging operations.
- Where underground cast iron or unprotected steel distribution pipelines cannot be replaced with plastic pipe (e.g., bridge crossings), utilize flexible plastic insert liners.
- Replace burst plates with secondary relief valves to reduce emissions of methane, VOCs and HAPs.
- Install excess flow valves to minimize emissions.
- Utilize pressurized storage/transport of condensate to avoid venting methane, VOCs, and hazardous air pollutants (HAPs) to the atmosphere.
- During condensate loading, flare or recover the low-pressure gas in the natural gas liquids storage tank to avoid methane emissions.
- Utilize telemetry and automation of wellhead equipment to remotely control and monitor production thereby reducing vehicle traffic and associated emissions.
- Adhere to manufacturers' equipment operation and maintenance requirements.
- Track and record the utilization of hazardous chemicals.
- Regularly inspect and maintain wells and facilities, including pressure safety valves, excess flow valves, compressor stations, flowlines, gas processing plants and booster stations.
- Prior to reclamation, either adequately treat potentially hazardous materials to remain onsite or dispose of them at an approved disposal area.
- Reclaim disturbed areas as soon as possible.

Noise Management

- Apply best available control technology to minimize noise in order to comply with applicable local and state laws, statutes, regulations, standards and implementation plans.
- Implement and enforce the Colorado Oil and Gas Conservation Commission's (COGCC's) day and nighttime noise level standards.
- Manage the timing, pace, place, density, and intensity of leasing and development to manage noise.
- Centralize or consolidate well pads, facilities, and systems to reduce the amount of disturbance and overall area impacted by elevated noise levels.
- Design and locate disturbance activities to minimize noise impacts to wildlife, livestock and the public.
- Design wells, drill pads, compressors, roads, and facilities with auditory buffers or screens (topography, vegetation, distance).
- Design road networks and manage road use (through car pools, innovative work schedules, and centralized collection facilities) to minimize traffic and reduce noise.
- Prohibit the utilization of horns, bells, or other-noise-making devices other than for safety measures.
- Post and enforce "no jake brake zones."
- Reduce unnecessary vehicle idling to reduce noise.
- Monitor noise levels of drilling, cementing, and completion activities.
- Between a noise source and a receptor, construct engineered sound barriers (tightly-spaced wooden fences, concrete fences, earthen berms, walls, sheds).
- Utilize electric-powered equipment rather than diesel-powered equipment to reduce noise.
- Utilize drilling rigs with noise dampening equipment.
- Utilize pneumatic pumps that produce little or no noise.
- Utilize "green completions" when feasible to reduce noise levels.
- Utilize telemetry and automation of wellhead equipment to remotely control and monitor production thereby reducing vehicle traffic and associated noise.
- Install suitable mufflers on all internal combustion engines and certain compressor components.

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- Decrease continuous noise levels by installing multi-cylinder pumps and hospital-grade mufflers, carefully selecting the placement of exhaust systems, enclosing engines, and installing additional muffler exhaust suppression.
- Install suitable mufflers or otherwise control exhaust noise from pump jacks and compressors in order to not exceed 49 dB at 30 feet from the source.
- Implement compressor and pump-jack noise abatement (hospital-grade mufflers, design retrofits on older equipment, equipment location, high-grade mufflers on exhausts, electric power rather than diesel, progressive cavity pumps or other quiet-running artificial lift equipment instead of conventional pump jacks, enclosures with insulation).
- Adhere to manufacturers' equipment operation and maintenance requirements to minimize noise.
- Install monitoring devices where compressors are built within ¼ mile of sensitive receptors.
- Apply buffers and abide by timing restrictions to reduce noise impacts on bald eagles, owls, raptors, sage grouse, and songbirds.
- Limit noise to less than 10 dB above ambient levels (typically 20 to 24 dB) from two hours before until two hours after sunrise at the perimeters of a sage grouse lek during the active lek season.
- Utilize noise shields when drilling during the lek, nesting, brood-rearing, and wintering seasons.

Soil Management

- Protect soils and native vegetation by minimizing their disturbance.
- Consider site-specific soil and vegetative characteristics and reclamation potential in a project design and layout. To reduce soil disturbance, consider mowing or brush beating of vegetation for parts of the well location or access road where excavation is not necessary.
- Consider topography and landforms when proposing surface disturbance. Deep vertical cuts, long or steep fill slopes and side cuts across steep slopes will be avoided. Cluster surface disturbance (rights-of-way will be shared, structures and facilities will be grouped, etc.).
- Avoid disturbance in areas with erodible soils, steep slopes, fragile soil (areas with erodible soils and slopes greater than 30 percent), saline soil, rugged terrain, sparse vegetation, previous mass wasting and unstable geologic conditions prone to mass wasting. If unavoidable, create and get approval of a specific development plan (covering erosion control, GIS modeling, and engineered survey and design) to minimize erosion and maintain productivity.
- Avoid disturbance in areas with cut slope challenges, surface or subsurface water issues, inadequate fill material, or reclamation limitations (e.g., little to no topsoil, saline soils).
- Design and construct each oil and gas pad in the shape of a tear-drop to maximize interim reclamation and minimize bare soils. Cluster infrastructure appropriately on the pad to facilitate the smallest disturbance footprint.
- Post and enforce reduced speed limits to decrease erosion on unpaved roads. Restrict surface-disturbing activities to periods when wind speeds are less than 25 miles per hour.
- Drive only on established routes.
- Stabilize slopes with retaining structures (loose rock, gabions, reinforced concrete, piles, crib walls, soil nails, mechanically stabilized soil walls with facings of geotextile/welded wire/timber/concrete blocks, etc.), buttresses, brush layering and drainage.
- Where applicable, cover entrances to construction locations with gravel to prevent sediment and weed seeds from being tracked in and out.
- Follow the "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (commonly referred to as "The Gold Book") when conducting surface-disturbing activities associated with the development of fluid minerals.
- Following the initial clearing of large trees and salvaging of certain vegetation, etc., include all growth medium present at a site in topsoil stripping, as indicated by color or texture. The stripping and storage depth may be specified during the onsite inspection. Salvage, segregate, and store all

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stripped topsoil/growth medium in a stable manner that extends biological viability and mitigates erosion. Replace topsoil and all growth medium prior to seedbed preparation.

- Segregate and store topsoil separate from subsurface materials. Segregate thin or rocky topsoil from other topsoil.
- Stockpile, shred, and salvage with topsoil the cleared vegetation smaller than four inches in diameter. Scatter cleared vegetation larger than four inches in diameter over disturbed areas. Excessive vegetation larger than four inches in diameter may be removed from public land or shredded in place to be salvaged with topsoil. A wood cutting permit may be purchased from the BLM to remove material.
- Avoid surface disturbance near drainages and saline soils; however, if surface disturbance in sensitive areas is unavoidable, the disturbance will be minimized to the greatest extent practicable.
- Strip and salvage topsoil to a minimum depth of six inches at disturbance sites. An exception to this practice will be in disturbance areas infested with noxious weeds or other undesirable plants species, where deep burial of the infested topsoil may be preferable.
- To ensure successful vegetative growth, salvage topsoil during construction and re-spread to the greatest degree practical on cut slopes, fill slopes, and borrow ditches prior to seeding. Consider applying weed-free mulch or other erosion control measures to increase surface roughness and decrease erosion. Only utilize mulch when its potential benefits exceed its inherent risk of introducing undesirable plant species.
- Conduct stripping in stages to avoid topsoil compaction, beginning with a leading edge and moving in one consistent direction for subsequent loads.
- Prohibit the placement of soil and other material within floodplains.
- Prohibit the stripping or segregating of topsoil when saturated or frozen below the stripping depth unless a Winter Construction Plan is submitted and approved by the BLM Authorized Officer, thereby authorizing a Notice to Proceed with construction activities in frozen soils.
- Stockpile topsoil where no vehicle traffic will cross topsoil mounds. Protect stockpiles from wind and water erosion through the use of suitable weed-free mulch, weed-free seeding with native species appropriate to the site's native plant community, and other measures as necessary. Only utilize mulch when its potential benefits exceed its inherent risk of introducing undesirable plant species.
- Ensure stockpiles have appropriate heights and slopes to prevent wind and water erosion.
- As topographically appropriate (not on steep slopes or on minimally sized pads), windrow topsoil around the perimeter of the surface disturbance area to create a berm (no higher than five feet) that extends the viability of the topsoil, as well as limits and redirects storm water runoff. Windrow, segregate, and store topsoil along disturbed surfaces or linear features for later spreading across the disturbed corridor during final reclamation. Promptly seed topsoil berms with native species appropriate to the site's native plant community to maintain soil microbial activity, reduce erosion, and minimize weed establishment.
- Compact fills to minimize subsidence or slope failure. If excess material is present after fill areas are at grade, stockpile the excess material at approved locations.
- Prohibit the placement of drill rigs, tanks, heater-treaters, and other production equipment on uncompacted fill material.
- Locate mud tanks, generators, mud storage, and fuel tanks in areas with a slight slope or utilize a suitable alternative, such as ditching, to provide surface drainage from the work area to the pit.
- Prohibit the utilization of snow or frozen soil in fill areas, dikes, or berms.
- With the exception of active work areas, stabilize (as approved by the BLM) disturbed soils that remain exposed, unprotected, or un-reclaimed for longer than one month. Soil stabilization may include seeding with native seed or application of a covering, such as mulch, matting or hydromulch. Utilize certified weed-free mulch, and apply it only to sites where its potential benefit outweighs its inherent risk of introducing undesirable plant species.

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- Utilize erosion reduction techniques, such as silt fencing, diversion terraces, rip-rap, matting, biodegradable mulch/hydromulch/netting/soil stabilizers, sediment traps, and water bars.
- Implement mitigation measures for sedimentation, erosion, slippage, settlement, and subsidence on moderate to steep slopes that are disturbed.
- Design roads with gradients of eight percent or less (except for pitch grades no longer than 300 feet) to minimize erosion. Obtain approval for roads with gradients greater than eight percent but not exceeding 16 percent.
- Build and maintain all routes to BLM Manual Section 9113 standards for road shape and drainage features, BLM Manual Section 9112 standards for bridges and major culverts, or BLM Manual Section 9115 standards for primitive roads. For drainage crossings, size culverts for the 25-year storm event or greater without development of a static head at the pipe inlet. Install culverts of at least 24 inches in diameter and in the bottom and middle of the natural channel. Site-specific conditions may warrant the BLM to require designs for larger events (e.g., 75-to-100-year storm events). (Due to the flashy nature of area drainages and anticipated culvert maintenance, design drainage crossings for the 100-year storm event per the U.S. Army Corps of Engineers [USACE].) On perennial and intermittent streams, design culverts to allow for passage of aquatic biota.
- In areas where all-weather access is necessary, construct and maintain routes per BLM Manual Section 9113 standards. Apply gravel or other appropriate surfacing material to reduce environmental resource damage and provide safe all-weather access on “soft” road sections, steep grades, erosive soils, and clay soils.
- Initially apply at least six inches of compacted gravel to upgraded roads.
- Utilize and consider upgrading existing roads when feasible to minimize disturbance. Consider following topographic contours when designing and constructing new roads to minimize soil erosion.
- Utilize specialized low-surface-impact equipment (wide- or balloon-tired vehicles, all-terrain vehicles) or helicopters for activities in off-road areas to protect fragile soils or other resource values.
- Confine or route drainage (with ditches, berms or waterbars above cut slopes) from disturbed areas in order to minimize erosion, particularly within 100 feet of a waterway. Route runoff, including that from roads, through a sediment-trapping mechanism (native vegetation, anchored weed-free bales, catchments, sediment fences) prior to discharging into a waterway.
- Extend culvert outlets at least one foot beyond the toe of any slope. Utilize culvert outlet erosion control techniques (e.g., properly sized rip-rap) to slow water velocity and prevent soil erosion.
- Regularly inspect and maintain roads (compaction, dust abatement, etc.) and road drainage features (ditches, drainage dips, ditch turnouts, culverts, inslopes, etc.).
- Halt construction activities when saturated soil conditions exist on access roads or on location, or when road rutting becomes deeper than six inches, until soil material dries out or is frozen sufficiently for construction to proceed without undue damage and erosion to soils, roads and locations.
- Prohibit the placement of fill on a frozen foundation.
- Utilize closed-loop drilling systems or line reserve pits with impermeable liners (synthetic, bentonite, clay) to prevent soil contamination.
- Locate and construct reserve pits in cut material and outside of natural watercourses, avoiding areas with shallow groundwater or with porous soils over fractured bedrock aquifers. Install a leak detection system or utilize self-contained mud systems with drilling fluids, mud, and cuttings disposed at approved disposal areas.
- Return shot-hole cuttings to the hole, or submit an alternative plan to the BLM for approval.
- After cessation of drilling and completion operations, remove and properly dispose of any visible or measurable oil in the reserve pit.

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- Design and construct secondary containment to hold 110% of the largest single tank capacity and to be impervious to oil, glycol, produced water or other toxic fluid for 72 hours. To prevent seepage of a spill, construct earthen berms with fine material and compact them.
- Design and construct secondary containment with a sturdy corrugated metal wall, heavy impervious poly liner, and gravel surface. Install small plastic hoppers at all loadout connections to catch drips and small leaks.
- On tanks with a capacity of ten barrels or greater, label or post signage with the name of the Operator; Operator's emergency contact telephone number; tank capacity; tank contents; and National Fire Protection Association (NFPA) label. For each container with a capacity of less than ten barrels, label its contents and ensure the appropriate NFPA label is also visible.
- Only utilize topsoil for reclamation, and not for fill or for pipe bedding/padding during backfilling.
- Prohibit the placement of topsoil when in a frozen or muddy condition, when the subgrade is excessively wet (i.e., equipment creates ruts greater than six inches), or when the condition may otherwise be detrimental to proper grading or proposed sodding or seeding.
- Utilize best available science and technology to protect natural resources from undue degradation during interim and final reclamation.
- Maintain healthy, biologically active topsoil through timely reclamation (temporary, interim, final), and by adequately segregating and stockpiling topsoil (designed to maximize surface area to minimize microbial impacts). Stockpiles remaining less than two years facilitate microbial survival and native seed viability.
- Reclaim disturbed areas as soon as possible. Promptly reapply topsoil, prepare a seedbed (to retain moisture and foster vegetative growth), apply weed-free native seed of species appropriate for the site's native plant community, and utilize weed-free mulch for erosion control and soil moisture retention at lower elevation sites. Utilize straw mulch only in areas where potential benefits outweigh the potential risks of introducing undesirable plant species.
- Regularly monitor and adaptively manage soil stabilization measures and revegetation.
- Test soil samples to determine reclamation potential.
- During reclamation, amend the topsoil as necessary to foster native vegetative growth, thereby providing soil stability.
- Store chemicals and hazardous materials in a manner that does not allow contact with soil or exposure to weather. Properly label all containers. Keep containers closed when not being utilized; provide secondary containment.
- Utilize bioremediation techniques (e.g., landspreading, in-situ biotreatment, landfarming, compostion) to treat contaminated soil. Optimize soil conditions (pH, nutrients, moisture, aeration) for microorganisms.
- With regard to contaminated soil, either treat or remove to an appropriate disposal site.

Water Resource Management

- Avoid the alteration of natural hydrologic function and condition in source areas for springs, seeps, wetlands, or other water bodies by relocating surface-disturbing activities.
- Avoid soil compaction or surface-disturbing activities in recharge areas that could impair the natural function of springs or seeps.
- Document the baseline characteristics of a stream channel or wetland/riparian area prior to disturbance.
- Direct overflow from water developments to a natural drainage in a manner that does not facilitate erosion or modify riparian habitats.
- Time construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g., buried pipelines, culverts) to avoid high-flow conditions. When construction disturbs a flowing stream, utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.

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- Due to the flashy nature of area drainages and anticipated culvert maintenance, design drainage crossings for the 100-year event per USACE.
- Bore/bury pipelines installed beneath stream crossings a minimum depth of four feet below the channel substrate to avoid exposure by channel scour and degradation. Following burial, return the channel grade and substrate composition to pre-construction conditions. Apply the minimum width for rights-of-way where pipelines cross streams or riparian areas.
- Prohibit the permanent impairment of floodplain function as a result of surface-disturbing activities.
- Maintain appropriate vegetative/riparian buffers (at least 325 to 500 feet) around water features to slow runoff, trap sediments and protect water quality.
- Manage and manipulate invasive stands of brush and weeds on forest, range, and pasture land by mechanical, chemical, or biological means or by prescribed burning to improve watershed function and condition.
- Limit consumptive water use from Federal point source water rights on public lands that are not sustainable and/or would jeopardize discharge to streams, springs, seeps, wetlands, or downstream senior water rights.
- Utilize/establish off-stream watering facilities when possible (e.g., stock tanks, stock ponds, nose pumps). Where feasible, place grazing stock tanks and other watering facilities at least 400 meters (¼ mile) from riparian zones.
- Exclude livestock and vehicles from spring sources and riparian areas where on-site evaluation and/or monitoring data indicate degrading conditions or potential to degrade spring or riparian function.
- Implement range improvements in conformance with BLM Manual H 1740-2 and subsequent updates.
- Provide livestock with feed, salt, molasses and other supplements on uplands at least 400 meters (¼ mile) from riparian and wetland areas and on gently sloping land to encourage cattle to graze the uplands and move out of riparian areas. Locate supplementation sites at least 800 meters (½ mile) apart. (Supplemental feeding of livestock on public land is not authorized by regulation, unless approved by the authorized officer.)
- Limit surface disturbance near drainage features and minimize surface disturbance on steep slopes, fragile soils, saline soils, and Mancos-shale-derived soils.
- Consider topography and landforms when proposing surface disturbance. Deep vertical cuts, long or steep fill slopes and side cuts across steep slopes will be avoided. Cluster surface disturbance (rights-of-way will be shared, structures and facilities will be grouped, etc.).
- Follow the “Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development” (commonly referred to as “The Gold Book”) when conducting surface-disturbing activities associated with the development of fluid minerals.
- Build and maintain all routes to BLM Manual Section 9113 standards for road shape and drainage features, BLM Manual Section 9112 standards for bridges and major culverts, or BLM Manual Section 9115 standards for primitive roads. For drainage crossings, size culverts for the 25-year storm event or greater without development of a static head at the pipe inlet. Install culverts of at least 24 inches in diameter and in the bottom and middle of the natural channel. Site-specific conditions may warrant the BLM to require designs for larger events (e.g., 75-to-100-year storm events). (Due to the flashy nature of area drainages and anticipated culvert maintenance, design drainage crossings for the 100-year storm event per the U.S. Army Corps of Engineers [USACE].) On perennial and intermittent streams, design culverts to allow for passage of aquatic biota.
- When designing protective/mitigative measures, consider the changes that may occur in the watershed hydrology and sedimentation over the design life of the measure. Moreover, design and construct roads that are self-maintaining and consider using road surfacing, such as gravel, when year-long access may be necessary.
- Initially apply at least six inches of compacted gravel to upgraded roads.

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- Avoid cutting the toe of cut slopes when grading roads or pulling ditches.
- Grade road surfaces only as often as necessary to maintain a stable running surface and to retain the original surface drainage.
- Design and construct surface pipelines at drainage crossings at an adequate height above possible flood levels. Bore/bury pipeline crossings below the surface deep enough to remain undisturbed by scour and fill processes typically associated with peak flows. Complete a hydraulic analysis during the pipeline design phase to avoid repeated maintenance of such a crossing and eliminate costly repairs and potential environmental degradation associated with pipeline breaks at stream crossings. Utilize horizontal directional boring techniques below perennial water bodies and/or wetland complexes when environmental circumstances allow.
- X-ray pipeline welds within 100 feet of a perennial stream to prevent leakage into the stream. Where pipelines cross streams that support Federal or State-listed threatened or endangered species or BLM-listed sensitive species, utilize additional safeguards (such as double-walled pipe, and remotely-actuated block or check valves) on both sides of the stream.
- Prior to surface disturbance at a pad, access road, or facility, have an approved surface drainage plan with minimal clearing and grading, protection of waterways, phased activities to limit soil exposure, immediate stabilization of exposed soils, protection of steep slopes and cuts, installation of perimeter control to filter sediments, advanced sediment settling controls, contractor certification and training, site waste control, and inspection and maintenance of adaptive BMPs (e.g., run-on/run-off controls, such as surface pocking or re-vegetation, ditches or berms, and basins). Install pre-construction drainage BMPs as appropriate.
- Minimize crossing streams and wetlands/riparian areas with vehicles, heavy machinery and facilities.
- When activity in streams, wetlands, or riparian areas is unavoidable, first employ best available technology, such as eco-matting, to reduce impacts. Then restore modified or damaged areas as close as practicable to natural conditions to protect banks and wetlands, as well as to re-establish native riparian vegetation.
- Subject to BLM approval, professionally engineer (design, construct, and maintain) stream crossings affecting perennial streams or streams supporting riparian habitat.
- Avoid the placement of roads or facilities immediately adjacent and/or parallel to streams. If unavoidable, design and construct crossings perpendicular to streams in straight sections of stable reaches to handle (at a minimum) the 25-year flood and allow aquatic organism passage, and have the route immediately exit the riparian buffer zone.
- Maintain to the greatest extent practicable natural flow rates and chemical and physical properties of surface and groundwater during work within stream channels, floodplains, and/or riparian areas.
- Utilize low-water crossings where an access road crosses a small drainage or intermittent stream not requiring a culvert. Dip the road to the original streambed elevation of the drainage, and prevent blockage or restriction of the existing channel. Stockpile material moved from the banks of the crossing nearby for later use in reclamation. Gravel, riprap, or concrete bottoms may be required.
- Conduct activities in wetlands and watercourses during low-flow or no-flow conditions (e.g., prior to spring runoff or during late summer/early fall) and in a manner consistent with BMPs for biological resources. Note that high flows occur during late summer/ early fall as a result of high-intensity convective thunderstorm events.
- Armor low-water stream crossings, place properly sized culverts, and span streams as appropriate to protect riparian areas.
- Place energy dissipaters (e.g., rock piles and logs) where necessary at the downstream end of ditch relief culverts to reduce erosion and sedimentation.
- Regularly inspect and maintain drainage features. Keep road inlet and outlet ditches, catchments, and culverts free of obstructions, clean dips and cross-drains, repair ditches, and mark the location of culvert inlets, particularly before and during spring runoff. Minimize routine machine-cleaning of

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- ditches during wet weather. Leave disturbed areas in a condition that provides drainage with no additional maintenance.
- Remove and reclaim temporary stream crossings immediately after utilization. Install cross-ditches at the ends of routes or rights-of-way to mitigate erosion/sedimentation from disturbed areas.
 - Locate residue piles (e.g., sawdust, field chipping residue, disposal ponds) away from drainages where runoff may wash residue into water bodies or wetlands.
 - Within 200 feet of a water body, prohibit activities using chemical processes (except for vegetation management) or pollutants. This includes equipment maintenance and the use of staging equipment for refueling. Prohibit the placement of staging areas for refueling, maintenance equipment, materials, operating supplies, and well borings in wetland/riparian areas.
 - Confine or route drainage (with ditches, berms or waterbars above cut slopes) from disturbed areas in order to minimize erosion, particularly within 100 feet of a waterway. Route runoff, including that from roads, through a sediment-trapping mechanism (native vegetation, anchored weed-free bales, catchments, sediment fences) prior to discharging into a waterway.
 - Avoid water courses when locating pipelines and flowlines; utilize road corridors wherever possible to minimize surface disturbance and provide better leak detection and access for installation and repair activities.
 - Prohibit the pipeline construction from blocking, damming, or changing the natural course of a drainage.
 - Test pipelines and flowlines for leak before backfilling trenches. Compact pipeline trenches during backfilling. Regrade cut-and-fill slopes to conform to adjacent terrain, and reclaim them.
 - Avoid placing well pads near 100-year floodplains.
 - Reduce the potential of water resource contamination where the environmental risk of a drilling fluid spill is heightened. Areas of heightened environmental risk include a ¼-mile buffer around the following: mapped alluvial, colluvial, and glacial deposits; springs and perennial water sources; Source Water Protection Areas, and Municipal Watersheds. In these areas, conduct the following:
 - utilize closed-loop drilling systems;
 - utilize gas-blocker additives during the cementing process;
 - store flowback and stimulation fluids in tanks on the well pad with secondary containment;
 - install secondary containment beneath and around crude oil, condensate and produced water storage tanks;
 - collect baseline water quality data from downstream fresh water sources prior to drilling or the storage of potentially harmful substances (Parameters to be analyzed will be determined on a site-specific basis. A list of parameters will be submitted to and approved by the BLM prior to sampling.);
 - identify potentially impacted Public Water Systems within 15 miles downstream;
 - develop and submit to the BLM an emergency spill and response program, which requires approval prior to surface-disturbing activities.
 - Locate and construct reserve pits in cut material and outside of natural watercourses, avoiding areas with shallow groundwater or with porous soils over fractured bedrock aquifers. Install a leak detection system or utilize self-contained mud systems with drilling fluids, mud, and cuttings disposed at approved disposal areas.
 - When constructing dikes for pits or impoundments with fill embankment, excavate a keyway or core trench to a minimum depth of two to three feet below the original ground level. Then construct the core of with compacted, water-impervious material.
 - Locate mud tanks, generators, mud storage, and fuel tanks in areas with a slight slope or utilize a suitable alternative, such as ditching, to provide surface drainage from the work area to the pit.
 - Within portions of municipal watersheds and source water protection areas available for fluid minerals development, develop and implement a watershed protection plan that includes characterization and monitoring of baseline hydrologic/hydrogeologic conditions (such as, but not

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limited to, water quality, water quantity, groundwater flow patterns, connectivity between geologic formations, and communication between surface and ground water). Collaborate with all watershed stakeholders regarding the development and implementation of the watershed protection plan.

- When conducting oil and gas drilling operations within municipal watersheds, source water protection areas, or locally important fresh water aquifers, utilize methods and materials to prevent the degradation of underlying groundwater. This may include practices such as surface and intermediate casing through potential fresh water zones, gas blocker additives in cement, green fracturing fluids, and closed-loop drilling. Document the utilization of “green” fracturing fluids in the form of Material Safety Data Sheets (MSDSs) to be reviewed by the operator for compliance prior to use. Keep the MSDSs on-site at all times such chemicals are present.
- Utilize anti-backflow devices when drafting fresh water from streams, springs, reservoirs and wells.
- Prohibit the utilization of hazardous substances in drilling, testing, or completion operations, as well as in the reserve or cuttings pit. Confine fluids to pits or tanks. Pits that may contain liquids will be lined to protect groundwater. Liners will be maintained in good condition, with no tears or holes, until they are removed when the reserve pit is closed.
- Substitute less toxic, yet equally effective products, for conventional drilling products.
- Design and construct pits to eliminate drainage into them. Maintain fluid levels at least two feet below the lowest point of containment.
- Subject to BLM approval, dispose of produced water by subsurface injection, pits, surface discharge into channels or impoundments or other methods, including beneficial use, in accordance with the requirements of Onshore Order No. 7, Disposal of Produced Water, and other Federal and State regulations.
- At pits, water impoundments, and surface discharges that present a potential hazards to humans, livestock, wildlife and other resources, install appropriate mitigation, such as fencing, netting, caging, or covers.
- Prohibit shot-hole seismic testing near aquatic habitats.
- Dispose of spoil material from clearing, grubbing, and channel excavation in a manner that will not interfere with the function of the channel and in accordance with all local, state, and federal laws and regulations. Prohibit the casting of fill material over hilltops and into drainages.
- Locate stockpiles outside of active floodplains.
- Prohibit concentrated flows of surface water (natural drainage ways, graded swales, downspouts) on the face of cut or fill slopes.
- Provide subsurface drainage where necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet conditions.
- With regard to the discharge of surface and ground water to surface drainages, comply with the Federal Water Pollution Control Act (as amended through P.L. 107–303, November 27, 2002), obtain a pre-approval by the BLM, and meet the following criteria:
 - discharge operations will not negatively impact downstream beneficial uses;
 - discharge soil/water interactions will not facilitate the mobilization of water quality contaminants (e.g., salt, selenium [typically associated with Mancos-shale-derived soils], sediment, metals) above natural rates in surface and/or ground water;
 - discharge will be limited to well-defined major channels (away from major erosional features), to reduce the potential of discharged water dissolving and transporting salts from the stream channel and to reduce the concentration of salts in alluvium;
 - discharge will be limited to a volume no greater than the naturally occurring mean annual peak flow (which is roughly equivalent to a two-year, 24-hour storm peak) conveyed by the natural channel under anticipated conditions;
 - discharge points will be located in stable channels or reservoirs away from any downstream head-cuts or other major erosional features as determined by the BLM (The outfall design

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- may include discharge aprons and downstream stabilization of channel side slopes to prevent erosion and provide energy dissipation.);
- subject to BLM approval, establish and monitor water-quality thresholds for both surface and ground water during discharge operations and cease operations if thresholds are exceeded;
- monitor surface- and ground-water quantity and quality during discharge operations and for at least two years following the cessation of discharge operations (The monitoring locations will be subject to BLM approval.).
- Prohibit the utilization of subsurface explosives and vibrosis buggies within 0.25 miles of all spring sources and perennial streams.

Riparian and Wetland Habitats Management

- Minimize surface disturbance in areas prone to flooding and near wetland edges, lowland bottoms, drainages, open water, wetlands, riparian areas, and sensitive habitats.
- Establish staging, refueling, and storage areas outside of areas prone to flooding, wetland edges, lowland bottoms, drainages, open water, wetlands, riparian areas, and sensitive habitats.
- Mitigate activities that degrade wetlands or riparian areas.
- Avoid the alteration of natural hydrologic function and condition in source areas for springs, seeps, wetlands, or other water bodies by relocating surface-disturbing activities.
- Conduct activities in wetlands and watercourses during low-flow or no-flow conditions (e.g., prior to spring runoff or during late summer/early fall) and in a manner consistent with BMPs for biological resources. Note that high flows occur during late summer/ early fall as a result of high-intensity convective thunderstorm events. Particularly in cold-water systems, maintain a minimum flow.
- Avoid soil compaction or surface-disturbing activities in recharge areas that could impair the natural function of springs or seeps.
- Manage vegetation in riparian areas to provide wildlife habitat, adequate shade, sediment control, bank stability, and recruitment of wood into stream channels.
- Restrict disturbance of riparian habitat within ½ mile of owl and bald eagle habitat.
- Phase the size and timing of vegetation removal treatments within riparian areas to reduce soil and water temperatures, maintain bank and soil stability, and retain adequate wildlife habitat for cover and nesting.
- Phase the size and timing of vegetation removal treatments on uplands immediately adjacent to riparian areas, and buffer treatment boundaries away from riparian areas to reduce sedimentation and erosion in riparian zones. Allow for at least one year between vegetation removal treatments in uplands and in riparian/wetland areas.
- Utilize the techniques and methods for vegetation treatments identified in the Record of Decision for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States.
- Maintain appropriate vegetative/riparian buffers (at least 325 to 500 feet) around water features to slow runoff, trap sediments and protect water quality.
- Document the baseline characteristics of a stream channel or wetland/riparian area prior to disturbance.
- Prohibit disturbance in areas adjacent to streams containing Colorado River cutthroat trout.
- Avoid riparian areas and wetlands when designing and constructing roads and trails (off-highway vehicle, horse, bicycle, hiking). If unavoidable, the roads and trails will be designed and constructed in accordance with “Managing Degraded Off-Highway Vehicle Trails in Wet, Unstable, and Sensitive Environments”.
- Direct overflow from water developments to a natural drainage in a manner that does not facilitate erosion or modify riparian habitats.

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- Utilize low-stress methods of stockmanship (e.g., herding, movements between pastures) to encourage cattle grazing away from riparian areas. Turn cattle out away from riparian areas when entering new pastures or allotments. Also guide cattle to appropriate bedding areas.
- Utilize/establish off-stream watering facilities when possible (e.g., stock tanks, stock ponds, nose pumps). Where feasible, place grazing stock tanks and other watering facilities at least 400 meters (¼ mile) from riparian zones.
- Cull individually identified cattle from the herd that congregate or preferentially graze a riparian area for extended periods of time.
- Avoid late summer or early fall grazing in areas with declining willow populations. If grazing during these time periods must occur, allow for at least one full year between grazing rotations.
- Utilize riparian pastures as appropriate to manage grazing activities in riparian areas by varying the timing, duration, and frequency of riparian pasture grazing. Actively move cattle to and from riparian pastures or pastures containing riparian habitat. Do not allow cattle to drift between pastures.
- Exclude livestock and vehicles from spring sources and riparian areas where on-site evaluation and/or monitoring data indicate degrading conditions or potential to degrade spring or riparian function.
- Prohibit the placement of fences on the immediate edge of riparian areas. Place fences away from riparian/wetland areas to decrease impacts of trailing along fences.
- Provide livestock with feed, salt, molasses and other supplements on uplands at least 400 meters (¼ mile) from riparian and wetland areas and on gently sloping land to encourage cattle to graze the uplands and move out of riparian areas. Locate supplementation sites at least 800 meters (½ mile) apart. (Supplemental feeding of livestock on public land is not authorized by regulation, unless approved by the authorized officer.)
- Minimize crossing streams and wetlands/riparian areas with vehicles, heavy machinery and facilities.
- Install bridges and culverts in accordance with BLM Manual Section 9112.
- Due to the flashy nature of area drainages and anticipated culvert maintenance, design drainage crossings for the 100-year event per the USACE.
- Bore/bury pipeline crossings below the surface deep enough to remain undisturbed by scour and fill processes typically associated with peak flows. Apply the minimum width for rights-of-way where pipelines cross streams or riparian areas.
- When activity in streams, wetlands, or riparian areas is unavoidable, first employ best available technology, such as eco-matting, to reduce impacts. Then restore modified or damaged areas as close as practicable to natural conditions to protect banks and wetlands, as well as to re-establish native riparian vegetation.
- Subject to BLM approval, professionally engineer (design, construct, and maintain) stream crossings affecting perennial streams or streams supporting riparian habitat.
- Avoid the placement of roads or facilities immediately adjacent and/or parallel to streams. If unavoidable, design and construct crossings perpendicular to streams in straight sections of stable reaches to handle (at a minimum) the 25-year flood and allow aquatic organism passage, and have the route immediately exit the riparian buffer zone.
- Avoid stripping riparian canopy or stream bank vegetation. Crush or shear streamside woody vegetation rather than completely removing it.
- Segregate hydric topsoil from spoil.
- Maintain to the greatest extent practicable natural flow rates and chemical and physical properties of surface and groundwater during work within stream channels, floodplains, and/or riparian areas.
- Armor low-water stream crossings, place properly sized culverts, and span streams as appropriate to protect riparian areas.

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- Within 200 feet of a water body, prohibit activities using chemical processes (except for vegetation management) or pollutants. This includes equipment maintenance and the use of staging equipment for refueling. Prohibit the placement of staging areas for refueling, maintenance equipment, materials, operating supplies, and well borings in wetland/riparian areas.
- On stream banks (lotic areas), maintain a minimum six-inch stubble height for the key specie(s) of the riparian area by the end of October or the winter grazing rotation. If the riparian system stability is dependent upon key riparian grasses and forbs, maintain an adequate stubble height to dissipate energy from spring runoff.
- In wet meadows (lentic areas), maintain a minimum four-inch stubble height for the key specie(s) of the riparian area by the end of October.
- Avoid placing well pads near 100-year floodplains.
- Prohibit shot-hole seismic testing near aquatic habitats.
- Locate residue piles (e.g., sawdust, field chipping residue, disposal ponds) away from drainages where runoff may wash residue into water bodies or wetlands.
- Relocate existing roads away from riparian areas as feasible during the requested permitting or authorization of routes. Reclaim abandoned portions of relocated roads back to natural conditions. Recontour routes to natural slopes as feasible, rip compacted soils (except for in close proximity to desirable trees), and seed disturbed areas.
- Regularly monitor seeps and springs near disturbance areas.
- Regularly monitor erosion, degradation and riparian health.

Reclamation

The objectives of temporary or interim reclamation are to restore vegetative cover and a portion of the landform sufficient to maintain healthy, biologically active topsoil; control erosion; and minimize loss of habitat, forage, and visual resources.

The long-term objective of final reclamation is to return the land to a condition approximating that which existed prior to disturbance. This includes restoration of the landform and natural vegetative community, hydrologic systems, visual resources, and wildlife habitats. To ensure that the long-term objective will be reached through human and natural processes, standards will be enforced to meet objectives for site stability, visual quality, hydrological function, and vegetative productivity.

- Maintain healthy, biologically active topsoil through timely reclamation (temporary, interim, final), and by adequately segregating and stockpiling topsoil (designed to maximize surface area to minimize microbial impacts). Stockpiles remaining less than two years facilitate microbial survival and native seed viability.
- As topographically appropriate (not on steep slopes or on minimally sized pads), windrow topsoil around the perimeter of the surface disturbance area to create a berm (no higher than five feet) that extends the viability of the topsoil, as well as limits and redirects storm water runoff. Topsoil will also be windrowed, segregated, and stored along disturbed surfaces or linear features for later spreading across the disturbed corridor during final reclamation. Topsoil berms will be promptly seeded with native species to maintain soil microbial activity, reduce erosion, and minimize weed establishment.
- Implement dust abatement measures during reclamation.
- Reclaim disturbed areas as soon as possible. Promptly reapply topsoil, prepare a seedbed (to retain moisture and foster vegetative growth), apply native weed-free seed of species appropriate for the site's native plant community, and utilize weed-free mulch for erosion control and soil moisture retention at lower elevation sites. Utilize straw mulch only in areas where potential benefits outweigh the potential risks of introducing undesirable plant species.

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- Identify, delineate, and segregate all salvaged topsoil and subsoil based on a site-specific soil evaluation, including depth, chemical and physical characteristics. Identify stockpiles with appropriate signage.
- Seed soils to be stored more than one growing season with native weed-free seed of species appropriate for the site's native plant community.
- Protect salvaged soil from erosion, degradation and contamination.
- Prior to reclamation, either adequately treat potentially hazardous materials to remain onsite or dispose of them at an approved disposal area.
- Only utilize topsoil for reclamation, and not for fill or for pipe bedding/padding during backfilling.
- Recontour cut-and-fill slopes to the approximate original contour or consistent with the adjacent topography to maintain the approximate drainage pattern, profile, and dimension of nearby stable naturally functioning drainages.
- Thin and feather existing vegetation in areas where dense vegetation has been removed, and salvage/redistribute cleared trees, debris, and rock over recontoured cut-and-fill slopes or along linear features to: help mitigate the contrast of recontoured slopes; emulate the color, texture, and form of the natural landscape; and foster microclimates that encourage vegetative growth. Material should be placed so that it appears to be naturally deposited.
- Reduce compaction (e.g., ripping) prior to redistributing topsoil.
- Prohibit the placement of topsoil when in a frozen or muddy condition, when the subgrade is excessively wet (i.e., equipment creates ruts greater than six inches), or when the condition may otherwise be detrimental to proper grading or proposed sodding or seeding.
- Test soil samples to determine reclamation potential.
- During reclamation, amend the topsoil as necessary to foster vegetative growth, thereby providing soil stability.
- Redistribute soil materials in a manner that resembles the predisturbance soil profile.
- Prepare a seedbed to provide suitable surface and subsurface physical, chemical and biological properties to support the long-term establishment and viability of the desired plant community.
- Apply BLM-approved native weed-free seed of species appropriate for the site's native plant community.
- Protect the seed and seedling establishment by managing weeds, restricting livestock and wildlife activities through grazing management or fencing/cattleguards/gates, and restricting human activities.
- Minimize erosion and sedimentation on or adjacent to the reclaimed area by: minimizing surface disturbance; minimizing the duration of bare soils; surface roughening for moisture retention; applying mulch; revegetating; constructing/installing water bars/dips, mats/blankets, check dams, sediment basins, silt fences, etc.; and/or phasing reclamation.
- Regularly monitor reclamation success utilizing standard quantitative vegetation sampling protocols, with an adequate sample size to accurately assess plant cover by species across the site.
- Remove temporary BMPs once site stabilization and reclamation efforts have been deemed successful by the BLM.
- 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.
- Develop vegetation objectives that include desired plant composition, canopy and ground cover prior to conducting vegetation treatments or revegetation efforts.
- Utilize the techniques and methods for vegetation treatments identified in the Record of Decision for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (BLM 2007).
- Close and rehabilitate roads quickly when they are no longer needed.
- Build roads to the appropriate standard, no higher than necessary for use and safety, and utilize primitive or two-track roads rather than constructing new roads where feasible.

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- Pipelines (and electrical power lines when possible) shall be placed within road corridors to minimize disturbance.
- Minimize disturbance to soil and native vegetation as much as possible.
- Stockpile topsoil for use in final reclamation. Topsoil shall be stored separately from other fill materials.
- When timely natural regeneration of the native plant community is not likely to occur, carefully select species that will not compete with or exclude native botanical resources for revegetation efforts. Bare sites shall be seeded as soon as appropriate to prevent establishment of undesirable plant species.
- Utilize appropriate sagebrush species/subspecies and important understory plants relative to site potential in seedings.
- Ensure that seed used for revegetation as well as straw and hay bales used for erosion control are certified free of noxious weeds.
- Monitor the long-term success of revegetation efforts (according to the Reclamation Plan or Vegetation Objectives of the vegetation treatment plan) to ensure successful establishment of desired species and detect any noxious weed infestations. If revegetation is unsuccessful, continue efforts to establish desired species in disturbed sites.
- In Salt Desert Shrub communities with biological soil crusts, require reclamation that includes, but is not limited to: broadcasting bacterial inoculants, planting native grass, forbs, and shrub seedlings, and installing exclosure fences.
- Road and pipeline reclamation, including seedbed prep and seeding of temporarily disturbed areas will be completed within 30 days following completion of construction.
- In areas that have low reclamation potential or are especially challenging to restore, reclamation plans will be required prior to APD approval. The plan shall contain the following components: detailed reclamation plans, which include contours and indicate irregular rather than smooth contours as appropriate for visual and ecological benefit; timeline for drilling completion, interim reclamation earthwork, and seeding; soil test results and/or a soil profile description; amendments to be used; soil treatment techniques such as roughening, pocking, and terracing; erosion control techniques such as hydromulch, blankets/matting, and wattles; and visual mitigations if in a sensitive VRM area.
- Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring, unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an unreclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.
- All topsoil shall be stripped following removal of vegetation during construction of well pads, pipelines, roads, or other surface facilities. In areas of thin soil, a minimum of the upper 6 inches of surficial material shall be stripped. The BLM may specify a stripping depth during the onsite visit or based on subsequent information regarding soil thickness and suitability.
- If requested by the project lead NRS for a specific pad or group of pads, the operator shall contact the NRS by telephone or email approximately 72 hours before reclamation and reseeding begin. This will allow the NRS to schedule a pre-reclamation field visit if needed to ensure that all parties are in agreement and provide time for adjustments to the plan before work is initiated.
- For cut-and-fill slopes, initial seedbed preparation shall consist of backfilling and recontouring to achieve the configuration specified in the reclamation plan. For compacted areas, initial seedbed

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preparation shall include ripping to a minimum depth of 18 inches, with a maximum furrow spacing of 2 feet. Where practicable, ripping shall be conducted in two passes at perpendicular directions. Following final contouring, the backfilled or ripped surfaces shall be covered evenly with topsoil.

- Final seedbed preparation shall consist of scarifying (raking or harrowing) the spread topsoil prior to seeding. If more than one season has elapsed between final seedbed preparation and seeding, and if the area is to be broadcast-seeded or hydroseeded, this step shall be repeated no more than 1 day prior to seeding to break up any crust that has formed.
- Interim reclamation includes recontouring and revegetating the entire portion of the disturbed area except that part of the well pad needed for production activities.
- It will be completed within six months following completion of the last well planned for the pad or after a year has passed with no new wells drilled on the pad. All areas unnecessary to production activities will be revegetated, including the area within the remaining rig anchors. In special cases, an exception to this will be requested.
- Before interim reclamation is scheduled, the operator will meet with BLM to inspect the disturbed area, review the existing reclamation plan, and agree upon any revisions to it.
- All parts of the area unnecessary for long-term operations will be reshaped to blend with natural topography, covered evenly with topsoil and a seedbed prepared.
- For cut-and-fill slopes, initial reclamation will typically consist of moving fill material back into cuts, back-filling and reshaping to achieve the configuration specified in the reclamation plan. Compacted areas will be well ripped in two passes at perpendicular directions. In fragile or loose soils, compaction techniques such as tread-walking may be necessary to prevent high erosion hazard. Topographic contours will be reshaped to blend with natural topography. These may include berms and swales to manage water drainage, support revegetation, mitigate visual impacts and maximize natural appearances.
- Seedbed Preparation. Good seedbed preparation is key to soil stabilization, moisture infiltration, and improving the chances for revegetation success.
- Following contouring, backfilled or ripped surfaces will be covered evenly with topsoil.
- Within 24 hours of broadcast seeding, the spread topsoil will be roughened by a method such as pitting, raking or harrowing before seeding, to break up any crust that has formed and ensure good seed-to-soil contact.
- To control erosion and enhance vegetative establishment on slopes steeper than 3:1, or to create a more natural looking landscape in areas of visual sensitivity, or if directed by the BLM, the operator shall implement measures following seedbed preparation (when broadcast-seeding or hydroseeding is to be used) to create small depressions to enhance capture of moisture and establishment of seeded species. Depressions shall be no deeper than 1 to 2 inches and shall not result in piles or mounds of displaced soil. Excavated depressions shall not be used unless approved by the BLM for the purpose of erosion control on slopes. Where excavated depressions are approved by the BLM, the excavated soil shall be placed only on the downslope side of the depression.
- Requests to use soil amendments, including fertilizer and soil conditioners, will be submitted to the BLM for approval. Submittal will include basic information on the amendment and the purpose of its use.
- If directed by the BLM, the operator shall conduct soil testing prior to reseeding to identify if and what type of soil amendments may be required to enhance revegetation success. At a minimum, the soil tests shall include texture, pH, organic matter, sodium adsorption ratio (SAR), cation exchange capacity (CEC), alkalinity/salinity, and basic nutrients (nitrogen, phosphorus, potassium [NPK]). Depending on the outcome of the soil testing, the BLM may require the operator to submit a plan for soil amendment. Any requests to use soil amendments not directed by the BLM shall be submitted to the CRVFO for approval.

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- Seed Mixes. Seed mixes will typically consist of native, early-succession species, or species with the ability to establish quickly in disturbed soil areas. Non-native species shall not be used, except under rare circumstances and with prior written approval from the BLM.
- Seed mix composition will be calculated based on the number of Pure Live Seed per pound rather than percentage by weight. Seeding rate in pounds per acre will be based on the total number of Pure Live Seeds per square foot.
- Weed free seed will be used. It will contain no prohibited or restricted noxious weed seeds and no more than 0.5 percent by weight of any other weed seeds. Seed may contain up to 2.0 percent of “other crop” seed by weight, including the seed of other agronomic crops and native plants; however, a lower percentage of other crop seed is recommended. To maintain quality, purity, germination, and yield, only tested, certified seed for the current year, with a minimum germination rate of 80 percent and a minimum purity of 90 percent will be used unless otherwise approved by BLM in advance of purchase. Seed shall be viability-tested in accordance with State law(s) and within nine months before purchase.
- Seed mixes for temporary use must contain only native species, except under rare circumstance and with prior written approval from the BLM.
- For private surfaces, the operator shall use a BLM-approved native seed mix unless specified otherwise by the private landowner.
- Seed tags or other official documentation of the seed mix will be supplied to the BLM for approval at least 14 days before the date of proposed seeding. Seed that does not meet the above criteria will not be applied to public lands. A Sundry Notice describing the completed work, the weed-free certification, and the seed tag(s) will be submitted BLM within 30 days after seeding.
- Seeding Procedures:
- Seeding will be conducted no more than 24 hours following completion of final seedbed preparation (see Seedbed Prep).
- Where practical, seed will be planted by drill-seeding to a depth of 0.25 to 0.5 inch along the contour of the site. Drill seeding will be followed by culti-paction to enhance seed-to-soil contact and prevent losses of both. Where drill-seeding is impracticable, seed may be installed by broadcast-seeding at twice the drill-seeding rate, followed by raking or harrowing to provide 0.25 to 0.5 inch of soil cover. An exception to these seeding requirements shall be made for seeding of sagebrush. Sagebrush seeding shall occur prior to winter snowfall, or on top of snow. Sagebrush may be sown either by broadcast seeding, or, if not on snowpack, by placing the seed in the fluffy seed box of a seed drill, with the drop tube left open to allow seed to fall out on the ground surface.
- Hydro-seeding and hydro-mulching may be used in temporary seeding or in areas where drill-seeding or broadcast-seeding/ raking are impracticable. Hydro-seeding and hydro-mulching must be conducted in two separate applications to ensure adequate seed-to-soil contact.
- If interim revegetation is unsuccessful, reseeding will be repeated annually until satisfactory vegetative cover has been achieved. Requirements for reseeding of temporary areas will be considered on a case-by-case basis. Seeding will be considered successful when the site is protected from erosion and revegetated with a vigorous, self-sustaining, and diverse cover of native (or otherwise approved) plant species. BLM shall not require reseeding during periods that have proven less than optimal.
- Mulch shall be applied within 24 hours following completion of seeding in project areas within pinyon-juniper, sagebrush shrubland, and/or salt desert shrub habitat types. Mulch may consist of either hydromulch or of certified weed-free straw or certified weed-free native grass hay crimped into the soil. Mulch shall not be used within mountain shrub or spruce-fir forest habitat types, unless requested or approved by the BLM.
- Hydro-mulching may be used in areas of interim reclamation where crimping is impractical, in areas of interim reclamation that were hydroseeded, and in areas of temporary seeding regardless of seeding method.

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- Mulch will not be applied in areas where erosion potential necessitates use of a biodegradable erosion-control blanket (straw matting).
- Cut and fill slopes will be protected against erosion by contour grading, microbasins or other measures approved by the BLM. Well anchored BMPs such as biodegradable matting, weed-free bales or wattles may also be used on cut-and-fill slopes and along drainages to protect against soil movement.
- The reclaimed pad will be protected from disturbance by a fence to exclude livestock grazing for the first two growing seasons or until seeded species are firmly established, whichever comes later. Seeded species will be considered firmly established when perennial grass and forb species are at least 80% cover of that of the surrounding or reference area.
- Monitoring. Because weed and reclamation management activities are components of a long-term process, monitoring and reporting are integral to and long-term commitment to land health.
- The operator shall conduct annual monitoring surveys of all sites categorized as “operator reclamation in progress” and shall submit an annual monitoring report of these sites, including a description of the monitoring methods used, to the BLM by December 31 of each year. The monitoring program shall use the four Reclamation Categories defined in Appendix I of the 1998 DSEIS to assess progress toward reclamation objectives. The annual report shall document whether attainment of reclamation objectives appears likely. If one or more objectives appear unlikely to be achieved, the report shall identify appropriate corrective actions. Upon review and approval of the report by the BLM, the operator shall be responsible for implementing the corrective actions or other measures specified by the BLM
- Monitoring shall be performed using a standard quantitative vegetation sampling protocol, with a sampling pattern and sufficient to represent the vegetative diversity across the site. Sampling shall include percent canopy cover by plant species, as well as percent bare ground.
- All sites considered as “operator reclamation in progress” will be routinely monitored for reclamation success. Reports will be submitted to the BLM by December 1 of each year. Annual reports will include whether accomplishment of objectives appears likely and of not, what corrective actions are proposed.
- All sites will be routinely monitored for the presence of noxious weeds or other undesirable plant species as set forth in the joint BLM/US Forest Service Noxious and Invasive Weed Management Plan for Oil and Gas Operators. Pesticide Use Proposals will be approved by the BLM before application of herbicides. Annual weed monitoring reports shall be submitted to the BLM by December 1. They will include weed species found (listed by common names), total acres infested with weeds, total acres treated, treatment methods, and total pounds of active ingredient of pesticides applied. All Noxious Weed Inventory and Pesticide Application records for that year will be included with the report. Weed reports shall include BLM Pesticide Application Records (PARs) for all weed treatments, as well as GPS data with data fields for all weed treatments sufficient to meet the requirements of the BLM NISIMS database.
- To the extent practical, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. Cleared trees and rocks may be salvaged for redistribution over reshaped cut-and-fill slopes or along linear features.
- Above-ground facilities will be painted a non-reflective natural color selected to minimize contrast with adjacent vegetation or rock outcrops. Colors may be specified by the BLM on a project-by-project basis.
- Adaptive management techniques may be applied before or after construction to mitigate straight-line visual contrast effects of pad margins, cut and fill slopes, pipeline alignments or other cleared vegetation. This could include additional tree removal along contrasting edges, to create irregularly shaped openings or more natural-looking mosaic patterns, or treating surfaces to mitigate visual contrasts in color or surface texture.

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- Trees and vegetation will be left along the edge of surface disturbance whenever feasible to provide screening.
- To help mitigate the contrast of recontoured slopes, reclamation will include measures to feather cleared lines of vegetation and to save and redistribute cleared trees, debris, and rock over recontoured cut and fill slopes.
- To reduce the view of project facilities from visibility corridors and private residences, facilities will not be placed in visually exposed locations (such as ridgelines and hilltops).
- Project facilities will be clustered and placed away from cut slopes and fill slopes to allow the maximum recontouring of cut and fill slopes.
- All long-term above ground structures will be painted in a non-reflective finish to blend with the environment. Colors will be selected (from the BLM “Standard Environmental Colors”) in the field at the proposed project location, considering viewer’s likely observation points and the time of year with the greatest number of viewers. Selected colors will be one to shades darker than those naturally occurring in the background landscape.
- Projects should be located to take advantage of existing vertical features, such as landforms or existing stands of vegetation to provide visually screening.
- Projects should not be located in visually exposed locations, such as ridgelines and hilltops.
- Projects should be located in areas that will minimize the amount of cut-and-fill needed to meet natural grade.
- Linear disturbances (roads and pipelines) should follow the natural contours of the landscape as much as possible.
- Project design should take into consideration any existing vegetation surrounding the project that can be used for visual screening. Care should be taken to preserve the integrity of the vegetation and the vegetation should remain standing and undamaged when the cut-and-fill slopes are recontoured.
- Thinning and feathering of existing vegetation may also be used in areas where clearing within dense vegetation is required. Thinning and feathering will reduce the hard line between new construction and existing vegetation and will emulate the forms of natural clearings.
- Project facilities should be placed to maximize recontouring of the cut-and-fill slopes and interim reclamation. Facilities should be oriented in the direction that is least visually obtrusive and should be clustered to reduce the overall impact and the area that will need to be visually mitigated. Facilities should be located away from the cut-and-fill slopes and, if possible, near a road to maximize the total surface area that can be reclaimed.
- Cut-and-fill slopes should be recontoured to the approximate original contour or consistent with the adjacent topography so that the reclaimed landscape features blend into the natural surroundings.
- Berms may be utilized to provide visual screening, but should be used only when it makes sense when viewing the surrounding natural environment and should blend with the adjacent topography.
- Cleared vegetation and rocks salvaged during construction should be salvaged and redistributed over reshaped cut-and-fill slopes or along linear features to emulate the color and texture closer to that of the natural landscape and to help create microclimates to encourage vegetation growth. The material should be placed so that it appears to be naturally deposited.

Site Stabilization, Reclamation and Monitoring

- During interim reclamation contour land forming will be used to create a visual barrier to the permanent structures location on the site.
- Re-topsoil and revegetate access road cut & fill slopes, backslopes and road shoulders, and borrow ditches. Also, revegetating the travel surface of surfaced roads and turnarounds, where practical. With low traffic roads, this will result in a hardpan, two-track road that is stable and requires less maintenance.

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- Reclamation plans would contain specifics such as elevation, pre-disturbance plant community species and habitat type, soil type, soil testing, topsoil management, seed mix and/or container stock species, mulch, site preparation, soil amendments including fertilizer, mycorrhizal and/or bacterial inoculum, organic material and/or carbon amendments, etc.
- Require that all mulch used in reclamation activities be certified weed free.

Special Status Species – General

- The CRVFO will consult agency species management plans and other conservation plans as appropriate to guide management and devise mitigation measures when needed. Examples of these plans include, but are not limited, to the Colorado Wildlife Action Plan, Colorado Sagebrush: A Conservation Assessment and Strategy, National, range-wide, statewide and local working group conservation plans for Gunnison and greater sage grouse, Sharing the land with pinyon-juniper birds, Birds in a sagebrush sea: managing sagebrush habitats for bird communities, North American Landbird Conservation Plan, North American Waterbird conservation Plan, National and Colorado Partners in flight Bird Conservation Plans, Colorado Gunnison's and White-tailed Prairie Dog Conservation Strategy and Recovery plans for federally listed species, and Colorado Rare Plant Conservation Initiative's Recommended Best Management Practices for Plants of Concern.
- Lessees will be notified when a lease parcel contains potential habitat for threatened, endangered, proposed, candidate or BLM sensitive plants, fish and wildlife.
- Limit flaring operations when well pads are within 100 m of occupied special status species habitat.
- Surveys for raptor nests, sensitive plant and animal species and cultural resources will be conducted prior to construction activities following BLM survey standards. Survey results will be submitted to the BLM for analysis and recommendations before project approval.

Special Status Species – Plants

- Prior to approving any ground-disturbing activities, suitable habitat for special status plants will be identified based on existing plant location records, soil or geological mapping, USFWS Section 7 range maps, aerial photos, and/or site inventories. In areas identified as suitable habitat, surveys for special status species will be performed prior to conducting any ground disturbance. Surveys will take place when the plants can be positively identified, usually during the appropriate flowering periods. Surveys will be performed by qualified field botanists/biologists who will provide documentation of their qualifications, experience and knowledge of the species prior to starting work. Surveys will be performed in compliance with the latest CRVFO survey protocols.
- For surface-disturbing activities with the potential to affect special status species, surveys in core habitat for T&E species will generally extend at least 200 meters (656 feet) beyond the edge of disturbance and at least 100 meters (328 feet) beyond the edge of disturbance outside of core habitat. For linear features such as roads and pipelines, surveys will extend at least 100 meters (328 feet) beyond the edge of the proposed ground disturbance along each side of the right of way. If special status plants are found within the survey area, the contractor will endeavor to determine the complete areal extent of the occurrence and the approximate number of individuals within the occurrence.
- For Colorado hookless cactus and other federally listed, proposed or candidate plant species, surface-disturbing activities will be avoided within 200 meters of current or historically occupied plant habitat wherever possible and where geography and other resource concerns allow. (Historically occupied habitat is habitat where plants were known to occur within the past 15-20 years and a viable seedbank may remain). Fragmentation of existing populations and identified areas of suitable habitat will be avoided wherever possible.
- For BLM sensitive species surface-disturbing activities will be avoided within 100 meters of occupied plant habitat wherever possible and where geography and other resource concerns allow.

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Fragmentation of existing populations and identified areas of suitable habitat will be avoided wherever possible.

- Where surface-disturbing activities are allowed within 100 meters of occupied habitat for special status plant species, unauthorized disturbance of plant habitat will be avoided by on-site guidance from a biologist, and by fencing the perimeter of the disturbed area, or such other method as agreed to by the Fish and Wildlife Service. In such instances, a monitoring plan approved by the Service will be implemented for the duration of the project to assess impacts to the plant population or seed bank. If detrimental effects are detected through monitoring, corrective action will be taken through adaptive management.
- Surface disturbance closer than 20 meters to a listed plant will be considered an adverse effect. Mitigating measures within this narrow buffer are very important and helpful to individual plants, but it is unlikely that all adverse effects can be fully mitigated within this distance. Some adverse effects due to dust, dust suppression, loss of pollinator habitat, and toxic spills will likely remain. There are two possible exceptions to this rule of thumb: 1) The new disturbance is no closer to a listed plant than preexisting disturbance and no new or increased impacts to the listed plant are expected; or 2) the listed plant is screened from the proposed disturbance (e.g., tall, thick vegetation or a berm acts as a screen or effective barrier to fugitive dust and other potential impacts).
- Transplantation of potentially affected plants will not be used as a rationale to defend a “not likely to adversely affect” or a “no effect” determination for listed plant species.
- Protect pollinator species for endangered or threatened species by incorporating the standard operating procedures found in the Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (BLM 2007).
- Prepare a reclamation plan and weed management plan prior to ground-disturbing activities. Reclamation seeding within special status plant habitat should consist of native species only. If possible, seeds will be from locally collected genotypes. Realize that seeding or planting native plants may need to be repeated until deemed successful by the Authorized Officer.
- Rigorously monitor and control all infestations of noxious weeds and other non-native invasive plant species in and adjacent to occupied habitat for special status plants.
- Control noxious weeds using integrated techniques. Limit chemical control in areas with special plant species to avoid damage to non-target species. Mechanical or chemical control in and near special status plant habitat shall only be implemented by personnel familiar with the rare plants.
- Broadcast spraying of herbicides, either by ground or aerial methods, shall comply with the Conservation Measures from the Biological Assessment for the Vegetation EIS. The conservation measures are specific to the herbicide to be used, the desired mode of application, and the conditions of the site. Manual spot treatment of undesirable vegetation can occur within the listed buffer zones if it is determined by local biologists that this method of herbicide application would not pose risks to listed or proposed plant species in the vicinity. Additional precautions during spot treatment of vegetation within these buffers shall be employed to avoid pesticide drift in those cases.
- Prevent plumes of dust and particulate matter from impacting special status plants. While new roads should not be built within 200 meters of special status plants, preexisting roads with an expected increase in traffic should be graveled (or paved) in these areas. The operator is encouraged to apply water for dust abatement to such areas during the flowering period. Magnesium chloride or other additives should not be used in special status plant habitat.
- The use of deicers and dust suppressants, other than water, within 100 meters of roadside occurrences of special status plant species will require prior approval from the BLM.
- Prohibit collection of rare plants or plant parts, except as permitted by the BLM Authorized Officer for scientific research.

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- When not needed for other resource uses, close and reclaim roads that are directly or indirectly impacting special status plant species to minimize disturbance, habitat fragmentation, and loss of pollinator habitat.
- Surface disturbances (including wildfire and prescribed fires) within lower-elevation salt desert shrub and pinyon-juniper woodland habitat should review the need for cheatgrass control and/or restoration seeding. Seeding should emphasize locally-adapted native species (or locally collected ecotypes, when available) that will not outcompete the special status plants.
- Protection of T & E plant occurrences from use of non-native seed with a 1 km restriction buffer around TES plant occurrences where native seed is required
- Limit flaring operations when well pads are within 100m of occupied special status plant habitat.
- Surface disturbances (including wildfire and prescribed fires) within potential habitat for listed or proposed plant species (i.e. salt desert shrub and Wyoming big sagebrush habitat west of Rifle) should review the need for cheatgrass control and/or seeding. Seeding should emphasize locally-adapted native species (or locally collected ecotypes, when available) that will not outcompete the special status plants.
- Prior to approving any ground-disturbing activities, suitable habitat for special status plants will be identified based on existing plant location records, soil or geological mapping, aerial photos, and/or site inventories. In areas identified as suitable habitat, surveys for special status species will be performed prior to conducting any ground disturbance. Surveys will take place when the plants can be positively identified, usually during the appropriate flowering periods. Surveys will be performed by qualified field botanists/biologists who will provide documentation of their qualifications, experience and knowledge of the species prior to starting work.
- For Colorado hookless cactus and other federally listed, proposed or candidate plant species, surface-disturbing activities will be avoided within 200 meters of occupied plant habitat¹ wherever possible and where geography and other resource concerns allow. Fragmentation of existing populations and identified areas of suitable habitat will be avoided wherever possible.
- Where development is allowed within 100 meters of occupied habitat for listed, proposed, candidate or BLM sensitive species, unauthorized disturbance of plant habitat will be avoided by on-site guidance from a biologist, and by fencing the perimeter of the disturbed area, or such other method as agreed to by the Fish and Wildlife Service. In such instances, a monitoring plan approved by the Service will be implemented for the duration of the project to assess impacts to the plant population or seed bank. If detrimental effects are detected through monitoring, corrective action will be taken through adaptive management.
- Surface disturbance closer than 20 meters to a listed plant will be considered an adverse effect. Mitigating measures within this narrow buffer are very important and helpful to individual plants, but we do not expect that all adverse effects can be fully mitigated within this distance. Some adverse effects due to dust, dust suppression, loss of pollinator habitat, and toxic spills will likely remain. There are two possible exceptions to this rule of thumb: 1) The new disturbance is no closer to a listed plant than preexisting disturbance and no new or increased impacts to the listed plant are expected; or 2) the listed plant is screened from the proposed disturbance (e.g., tall, thick vegetation or a berm acts as a screen or effective barrier to fugitive dust and other potential impacts).
- Transplantation of potentially affected plants will not be used as a rationale to defend a “not likely to adversely affect” or a “no effect” determination for listed plant species.
- Protect pollinator species for endangered or threatened species by incorporating the standard operating procedures found in the Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (BLM 2007).
- When not needed for other resource uses, close and reclaim roads that are directly or indirectly impacting special status plant species to minimize disturbance, habitat fragmentation, and loss of pollinator habitat.

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- All weed management actions will comply with the Conservation Measures from the Biological Assessment for the Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (June 2007).
- Within mapped occupied and suitable habitat for Colorado hookless cactus, DeBeque phacelia or Parachute penstemon, wildland fire management actions will be conducted in the following manner:
 - Minimize surface disturbance by using retardant, water, engines/wet lines, etc in known habitat rather than dozers or hand crews.
 - Unless firefighter safety is jeopardized, construct fire line outside the perimeter of known cactus populations.
 - Avoid cross-country use of motorized vehicles and mechanical equipment within known populations of federally listed or proposed plants.

Visual Resource Management

- Limit surface disturbance to the minimum area necessary
- Use natural features such as trees, rock formations, or terrain, to conceal disturbed areas. Constructed berms that blend with the terrain may be useful for concealment.
- Minimize contrast of the structure or activity with the surrounding terrain by using the visual resource management principles of form, line, color, and texture.
- Paint structures a color that blends with the surrounding vegetation.
- Remove unnecessary equipment, structures, and debris from the site that are not necessary for daily operation.
- All new surface-disturbing projects or activities, regardless of size or potential impact, will incorporate visual design considerations during project design as a reasonable attempt to meet the Visual Resource Management (VRM) class objectives for the area and minimize the visual impacts of the proposal. Visual design considerations will be incorporated by:
 - a. Using the VRM contrast rating process (required for proposed projects in highly sensitive areas, high impact projects, or for other projects where it appears to be the most effective design or assessment tool), or by
 - b. Providing a brief narrative visual assessment for all other projects that require an environmental assessment or environmental impact statement.
 - c. Measures to mitigate potential visual impacts could include the use of natural materials, screening, painting, project design, location, or restoration (See Appendix H; BLM Handbook H-8431-1, Visual Resource Contrast Rating; or online at <http://www.blm.gov/nstc/VRM/8431.html>, for information about the contrast rating process).
- All new roads will be designed and constructed to a safe and appropriate standard, “no higher than necessary” to accommodate intended vehicular use. Roads will follow the contour of the land where practical. Existing oil and gas roads that are in eroded condition or contribute to other resource concerns will be brought to BLM standards within a reasonable period of time.
- Impacts to dark night skies will be prevented or reduced through the application of specific mitigation measures identified in activity level planning and NEPA level review. These measures may include directing all light downward, using shielded lights, using only the minimum illumination necessary, using lamp types such as sodium lamps (less prone to atmospheric scattering), using circuit timers, and using motion sensors.
- Any facilities authorized will use the best technology available to minimize light emissions
- Any new permits/authorizations, including renewals, will be stipulated to use the best technology available to minimize light emissions as compatible with public health and safety.
- Restrict visual intrusion in VRM Class I and II areas and within 0.25-mile of historic trails.
- Screening facilities from view and avoiding placement of production facilities on steep slopes, hilltops, and ridgelines.

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- Paint all facilities a color that best allows the facility to blend with the background (Operator-committed BMP).
- Gravel of road color shall be similar to adjacent dominant soil colors.
- Reduce impacts on visual resource management class II and class III areas.
- Bury distribution powerlines and flow lines in or adjacent to access roads.
- Repeat form, line, color, and texture elements to blend facilities with the surrounding landscape
- All aboveground facilities including power boxes, building doors, roofs, and any visible equipment will be painted a color selected from the latest national color charts that best allows the facility to blend into the background.
- Perform final reclamation recontouring of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography.
- To the extent opportunities are practicable, extreme visual contrast created by past management practices or human activities will be minimized. Examples include right-of-way amendments, mineral material sites, abandoned mines, and areas impacted by unauthorized off-road driving.
- Reclaim unused well pads within one year.
- Final reclamation of all oil and gas disturbance will involve re-contouring of all disturbed areas, including access roads, to the original contour or a contour that blends with the surrounding topography and revegetating all disturbed areas
- The use of submersible pumps will be strongly encouraged, especially in VRM Class I, II or III areas or any area visible by the visiting public.
- The use of partial or completely below-grade wellheads will be strongly encouraged in high visibility areas as well as VRM Class I, II or III areas.
- The placement of production facilities on hilltops and ridgelines will be prohibited where they are highly visible.

Livestock Management

- Implement management tools such as fencing, stock ponds, and salt licks to manage livestock distribution as needed, and discourage grazing in unwanted areas such as riparian vegetation and sensitive wildlife habitat.
- Adjust livestock grazing in heavily used areas to allow native vegetation a period of recovery.
- Restoring temporarily disturbed areas, using native species, planting woody species, or use a biodegradable erosion-control fabric to enhance germination and seedling establishment
- Drill-seed at a rate of Pure Live Seeds per square foot as needed to establish healthy vegetation (rate may be double for broadcast-seeding or hydroseeding) and be preceded by adequate site preparation, including decompaction of soil and control of annual or biennial weeds
- Fence revegetated areas to exclude livestock for at least two full growing seasons
- Use culverts or hardened crossings for use of roads that cross streams
- Use erosion control devices around culverts as needed to reduce erosion and gulley formation.
- Construct fences and gates to ensure that livestock do not enter areas being protected for another resource that would be diminished by grazing or trampling
- Construct alternative water sources to disperse livestock use and reduce dependence on natural streams and riparian corridors

Noxious and Invasive Weed Management

- Rehabilitation disturbed sites as quickly as possible following interim or final rehabilitation guidelines as appropriate.
- Allow on supplementary livestock feed and revegetation mulches that are certified weed free.
- Clean vehicles regularly using water or air spray to reduce the chance of transporting weed seed from affected areas to non-affected areas.

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- All weed management actions will comply with the Conservation Measures from the Biological Assessment for the Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (June 2007).

Pre-Project Planning

- Environmental analyses for projects, vegetation treatments, and maintenance programs should assess weed risks, analyze high-risk sites for potential weed establishment and spread, and identify prevention practices.
- Determine site-specific restoration and monitoring needs and objectives at the onset of project planning.
- Inventory all proposed projects for weeds prior to ground-disturbing activities. If weeds are found, they should be treated (if the timing is appropriate) or removed (if seeds are present) to limit weed seed production and dispersal.
- Wash vehicles and other equipment to reduce the spread of noxious weeds from weed-contaminated areas to non-contaminated areas. Portable wash stations would be ideal in areas of heavy oilfield traffic and in areas where noxious weeds are an issue.
- Locate and use weed-free project staging areas. Avoid or minimize travel through weed infested areas, or restrict travel to periods when spread of disseminules is least likely.
- Identify sites where equipment can be cleaned. Remove mud, dirt, and plant parts from project equipment before moving it into a project area. Seeds and plant parts should be collected and incinerated when possible.
- If certified weed-free gravel pits become available in the county, the use of certified weed-free gravel will be required wherever gravel is applied to public lands (e.g., roads).
- Maintain stockpiled, non-infested material in a weed-free condition. Topsoil stockpiles should be promptly revegetated with native species to maintain soil microbial health and reduce the potential for weeds.
- Use native seed mixes appropriate to the ecological site and those species that are demonstrated to be best at inhibiting weed establishment, except when other resource values dictate a less-competitive mix.
- A certified seed laboratory shall test each seed lot according to the Association of Official Seed Analysts standards (which include an all-state noxious weed list) and provide documentation of the seed inspection test. The seed shall contain no prohibited or restricted noxious weed seeds and shall contain no more than 0.5 percent by weight of other weed seeds. Seed may contain up to 2.0 percent of "other crop" seed by weight, including the seed of other agronomic crops and native plants; however, a lower percentage of other crop seed is recommended.

Project Implementation

- Minimize soil disturbance. To the extent practicable, native vegetation should be retained in and around project activity areas, and soil disturbance kept to a minimum.
- If a disturbed area must be left bare for a considerable length of time, cover the area with weed barrier until revegetation is possible.
- Clean all equipment before leaving the project site when operating in weed infested areas.
- Inspect, remove, and properly dispose of weed seed and plant parts found on clothing and equipment. Proper disposal means bagging and incinerating seeds and plant parts or washing equipment in an approved containment area.
- Require pressure-washing or an equivalent seed removal process on all vehicles and equipment prior to entry of all ground-disturbing project areas, and upon exit of project areas infested with noxious weeds.
- Revegetate disturbed soil where appropriate to optimize plant establishment for that specific site. Define revegetation objectives for each site. Revegetation may include topsoil replacement, planting,

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seeding, fertilization, and certified weed-free mulching as necessary. Native materials should be used except under rare circumstances and with prior written approval from the BLM.

- Monitor sites where seed, hay, straw, or mulch has been applied. Eradicate weeds before they form seed. In contracted projects, contract specifications could require that the contractor control weeds for a specified length of time.
- Inspect and document all ground-disturbing activities in noxious weed infested areas for at least three growing seasons following completion of the project. For ongoing projects, continue to monitor until reasonably certain that no weeds are present. Plan for follow-up treatments based on inspection results.

Roads and Utilities - Pre-Project Planning

- Communicate with contractors, local weed districts or weed management areas about projects and best management practices for prevention.
- Remove mud, dirt, and plant parts from project equipment before moving it into a project area. Seeds and plant parts shall be collected and incinerated when practical, or washed off in an approved containment area.
- Avoid acquiring water for road dust abatement where access to water is through weed-infested sites.
- Treat weeds on travel rights-of-ways before seed formation so construction equipment doesn't spread weed seed.
- Schedule and coordinate blading or pulling of noxious weed-infested roadsides or ditches in consultation with the local weed specialist. When it is necessary to blade weed-infested roadsides or ditches, schedule the activity when disseminules are least likely to be viable.

Roads and Utilities - Project Implementation

- Retain shade to suppress weeds by minimizing the removal of trees and other roadside vegetation during construction, reconstruction, and maintenance; particularly on south aspects.
- Do not blade or pull roadsides and ditches infested with noxious weeds unless doing so is required for public safety or protection of the roadway. If the ditch must be pulled, ensure weeds remain onsite. Blade from least infested to most infested areas.

Roads and Utilities - Post-Project

- Clean all equipment (power or high-pressure cleaning) of all mud, dirt, and plant parts before leaving the project site if operating in areas infested with weeds. Seeds and plant parts shall be collected and incinerated when possible.
- When seeding has been specified for construction and maintenance activities, seed all disturbed soil (except travel route) soon after work is completed.
- Use a certified weed-free seed mix suitable for local environmental conditions that includes fast, early growing native species to provide quick revegetation. Consider applying weed-free mulch with seeding in salt desert shrub, sagebrush, and pinyon-juniper woodland habitat types.
- Periodically inspect roads and rights-of-way for noxious weeds. Train staff to recognize weeds and report locations to the local weed specialist. Follow-up with treatment when needed.
- When reclaiming roads, treat weeds before roads are made impassable. Inspect and follow up based on initial inspection and documentation.
- To avoid weed infestations, create and maintain healthy plant communities whenever possible, including utility rights-of-ways, roadsides, scenic overlooks, trailheads, and campgrounds.

Recreational Activities

- Inspect and clean mechanized trail vehicles of weeds and weed seeds.
- Wash boots and socks before hiking into a new area. Inspect and clean packs, equipment, and bike tires.

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- Avoid picking unidentified "wildflowers" and discarding them along trails or roadways.
- Maintain trailheads, campgrounds, visitor centers, boat launches, picnic areas, roads leading to trailheads, and other areas of concentrated public use in a weed-free condition. Consider high-use recreation areas as high priority sites for weed eradication.
- Sign trailheads and access points to educate visitors on noxious and invasive weeds and the consequences of their activities.
- In areas susceptible to weed invasion, limit vehicles to designated, maintained travel routes. Inspect and document travel corridors for weeds and treat as necessary.
- Encourage use of pelletized feed for backcountry horsemen and hunters. Pelletized feed is unlikely to contain weed seed.

Outfitting / Recreation Pack and Saddle Stock Use

- Allow only certified weed-free hay/feed on BLM lands.
- Inspect, brush, and clean animals (especially hooves and legs) before entering public land. Inspect and clean tack and equipment.
- Regularly inspect trailheads and other staging areas for backcountry travel. Bedding in trailers and hay fed to pack and saddle animals may contain weed seed or propagules.
- Tie or contain stock in ways that minimize soil disturbance and prevent loss of desirable native species.
- Authorized trail sites for tying pack animals should be monitored several times per growing season to quickly identify and eradicate new weeds. Trampling and permanent damage to desired plants are likely. Tie-ups shall be located away from water and in shaded areas where the low light helps suppress weed growth.
- Educate outfitters to look for and report new weed infestations.

Wildlife Habitat Projects

- Incorporate weed prevention into all wildlife habitat improvement project designs.

Watershed Management

- Frequently and systematically inspect and document riparian areas and wetlands for noxious weed establishment and spread. Eradicate new infestations immediately since effective tools for riparian-area weed management are limited.
- Promote dense growth of desirable vegetation in riparian areas (where appropriate) to minimize the availability of germination sites for weed seeds or propagules transported from upstream or upslope areas.
- Address the risk of invasion by noxious weeds and other invasive species in watershed restoration projects and water quality management plans.

Grazing Management

- Consider prevention practices and cooperative management of weeds in grazing allotments. Prevention practices may include:
 - Altering season of use
 - Minimizing ground disturbance
 - Exclusion
 - Preventing weed seed transportation
 - Maintaining healthy vegetation
 - Revegetation
 - Inspection
 - Education
 - Reporting

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- When authorized, provide certified weed-free supplemental feed in a designated area so new weed infestations can be detected and treated immediately. Pelletized feed is unlikely to contain viable weed seed. (Supplemental feeding of livestock on public land is not authorized by regulation, unless approved by the authorized officer.)
- If livestock may contribute to seed spread in a weed-infested area, schedule livestock use prior to seed-set or after seed has fallen.
- If livestock were transported from a weed-infested area, annually inspect and treat entry units for new weed infestations.
- Consider closing infested pastures to livestock grazing when grazing will either continue to exacerbate the condition or contribute to weed seed spread. Designate those pastures as unsuitable range until weed infestations are controlled.
- Manage the timing, intensity (utilization), duration, and frequency of livestock activities to maintain the competitive ability of desirable plants and retain litter cover. The objective is to prevent grazers from selectively removing desirable plant species and leaving undesirable species.
- Exclude livestock grazing on newly seeded areas with fencing to ensure that desired vegetation is well established, usually after 2-3 growing seasons.
- Reduce ground disturbance, including damage to biological soil crusts. Consider changes in the timing, intensity, duration, or frequency of livestock use; location and changes in salt grounds; restoration or protection of watering sites; and restoration of yarding/loafing areas, corrals, and other areas of concentrated livestock use.
- Inspect areas of concentrated livestock use for weed invasion, especially watering locations and other sensitive areas that may be particularly susceptible to invasion. Inventory and manage new infestations.

Fire Management Plans

- Prescribed fire plans should include pre-burn invasive weed inventory and risk assessment components as well as post-burn mitigation components.
- Integrate prescribed fire and other weed management techniques to achieve best results. This may involve post-burn herbicide treatment or other practices that require careful timing.
- Include weed prevention and follow-up monitoring in all prescribed fire activities. Include in burn plans the possibility for post-burn weed treatment.
- For prescribed burns, inventory the project area and evaluate potential weed spread with regard to the fire prescription. Areas with moderate to high weed cover should be managed for at least 2 years prior to the prescribed burn to reduce the number of weed seeds in the soil. Continue weed management after the burn.
- Ensure that a weed specialist is included on a Fire Incident Management Team when wildfire or prescribed operations occur in or near a weed-infested area. Include a discussion of weed prevention operational practices in all fire briefings.
- Use operational practices to reduce weed spread (e.g., avoid weed infestations when locating fire lines).
- Identify and periodically inspect potential helispots, staging areas, incident command posts, and base camps and maintain a weed-free condition. Encourage network airports and helibases to do the same.
- Develop a burned-area integrated weed management plan, including a monitoring component to detect and eradicate new weeds early.

Fire-Fighting

- Ensure that all equipment (including borrowed or rental equipment) is free of weed seed and propagules before entering incident location.
- When possible, use fire suppression tactics that reduce disturbances to soil and vegetation, especially when creating fire lines.

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- Use wet or scratch-lines where possible instead of fire breaks made with heavy equipment.
- Given the choice of strategies, avoid ignition and burning in areas at high risk for weed establishment or spread.
- Hose off vehicles on site if they have traveled through infested areas.
- Inspect clothing for weed seeds if foot travel occurred in infested areas.
- When possible, establish incident bases, fire operations staging areas, and aircraft landing zones in areas that have been inspected and are verified to be free of invasive weeds.
- Cover weed infested cargo areas and net-loading areas with tarps if weeds exist and can't be removed or avoided.
- Flag off high-risk weed infestations in areas of concentrated activity and show weeds on facility maps.
- If fire operations involve travel or work in weed infested areas, a power wash station should be staged at or near the incident base and helibase. Wash all vehicles and equipment upon arrival from and departure to each incident. This includes fuel trucks and aircraft service vehicles.
- Identify the need for possible fire rehab to prevent or mitigate weed invasion during fire incident and apply for funding during the incident.

Post-Fire Rehabilitation

- Have a weed specialist review burned area rehabilitation reports to ensure proper and effective weed prevention and management is addressed.
- Thoroughly clean the undercarriage and tires of vehicles and heavy equipment before entering a burned area.
- Treat weeds in burned areas. Weeds can recover as quickly as 2 weeks following a fire.
- Schedule inventories 1 month and 1 year post-fire to identify and treat infestations. Eradicate or contain newly emerging infestations.
- Determine soon after a fire whether revegetation is necessary to speed recovery of a native plant community, or whether desirable plants in the burned area will recover naturally. Consider the severity of the burn and the proportion of weeds to desirable plants on the land before it burned. In general, more severe burns and higher pre-burn weed populations increase the necessity of revegetation. Use a certified weed-free seed mix.
- Inspect and document weed infestations on fire access roads, equipment cleaning sites, and staging areas. Control infestations to prevent spread within burned areas.
- Seed and straw mulch to be used for burn rehabilitation (e.g., for wattles, straw bales, dams) shall be certified weed-free.
- Prevent seeded species from being grazed during the first two growing seasons (>18 months) following seeding, or until site-specific analysis and/or monitoring data indicates that vegetation cover, species composition and litter accumulation are adequate to support and protect watershed values, meet vegetation objectives and sustain grazing use.

Recreation

- Special Recreation Permits will contain noxious weed management stipulations (e.g., pre-event inventories to avoid infested areas, event management to avoid or isolate activities that could cause weed introduction or spread, monitoring and treatment of infestations exacerbated by the activity, and other appropriate noxious weed management stipulations).
- Promote the seven standard principles of Leave No Trace outdoor ethics through print and electronic media, and through personal communications with recreationists participating in non-motorized recreation activities on BLM-managed public lands. (www.lnt.org)

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- Promote the principles of Tread Lightly outdoor ethics through print and electronic media, and through personal communications with recreationists participating in recreation activities on BLM-managed public lands. (www.treadlightly.org)
- Apply Recreation Management Guidelines to Meet Public Land Health Standards on BLM Lands in Colorado. Website: http://www.blm.gov/co/st/en/BLM_Information/newsroom/2000/recguidefnr/guide_final.html.
- Apply Guidelines for a Quality Built Environment. Website: http://www.blm.gov/style/medialib/blm/wo/Planning_and_Renewable_Resources/recreation_images/national_programs/VRM.Par.62809.File.dat/GQBE_WEB.pdf.
- Route design, construction and maintenance will follow: BLM guidelines, guidelines established in the Gold Book (BLM 2007) and technical recommendations of partner groups (e.g. International Mountain Bicycling Association (IMBA), Volunteers for Outdoor Colorado - Crew Leader Manual, Backcountry Horsemen, National Off-Highway Vehicle Conservation Council (NOHVCC)).

Lands and Realty

- Power lines shall be constructed in accordance to standards outlined in "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996" (Avian Power Line Interaction Committee 2006). Right-of-way applicants shall assume the burden and expense of proving that proposed pole designs not shown in the above publication are "raptor safe." Such proof shall be provided by a raptor expert approved by the BLM Authorized Officer.
- Rights-of-way and other lands and realty authorizations, including power lines, pipelines, transmission corridors, energy development sites and related development, and gravel pits, will contain noxious and invasive plant management terms or stipulations for all ground-disturbing actions. These will include conducting a pre-disturbance noxious weed inventory, designing to avoid or minimize vegetation removal and weed introduction or spread, managing weeds during the life of the right-of-way or authorization to prevent or minimize weed introduction or spread, abandoning the right-of-way or authorization to establish competitive vegetation on bare ground areas, and monitoring revegetation success and weed prevention and control for a reasonable number of years.
- Rights-of-way will be constructed to avoid physical damage to range improvements and rangeland study areas.
- No signs or advertising devices shall be placed on the premises or on adjacent public lands, except those posted by or at the direction of the BLM Authorized Officer.
- The Holder shall promptly remove and dispose of all waste caused by its activities. The term "waste" as used herein means all discarded matter including, but not limited to, human waste, trash, garbage, refuse, petroleum products, ashes, and equipment. No burning of trash, trees, brush, or any other material shall be allowed.
- The Proponent shall notify all existing right-of-way holders in the project area prior to beginning any surface-disturbance or construction activities. The Holder shall obtain an agreement with any existing right-of-way holders or other parties with authorized facilities that cross or are adjacent to those of the holder to assure that no damage to an existing right-of-way or authorized facility will occur. The agreement(s) shall be obtained prior to any use of the right-of-way or existing facility.
- The Holder shall participate in the formation of a Road User's Association for the road if new rights-of-way are granted for use of the existing road. All new users will be required to join the association.
- The Holder will provide a performance bond for the authorized facility, acceptable to the BLM Authorized Officer, in the amount of \$(_) that must be maintained in effect until restoration of the right-of-way has been accepted by the BLM Authorized Officer. The bond shall be furnished by the holder within 30 days of signing the grant () and shall be applied to all additional authorizations associated with the project as necessary.

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- Incorporate conditions of approval and mitigation measures from the Final Programmatic EIS on Wind Energy Development on BLM-administered Lands in the Western US, as applicable (BLM 2005).
- Incorporate conditions of approval and mitigation measures from the Solar Energy PEIS, as applicable (pending completion of Solar PEIS).
- All construction activities shall be confined to the minimum area necessary. The exterior boundaries of the construction area shall be clearly flagged prior to any surface-disturbing activities.
- Existing roads will be used wherever possible. Additional roads shall be kept to the minimum. Route locations must be approved by the BLM prior to construction.
- When blasting is necessary, the following precautions will be used:
 - In areas of human use, blasting blankets will be used.
 - Landowners or tenants in close proximity to the blasting will be notified in advance of the blasting so that livestock and other property can be removed adequately protected.
 - Access to the blasting area will be restricted by construction personnel stationed at each end of the area to be blasted.
 - Blasting within 0.25-mile of federally-owned or controlled springs and flowing water wells must be approved in writing by the area manager.
 - No blasting will be permitted within 0.25-mile of historic trails, natural areas, identified archaeological sites, and recreation areas.
 - Powder magazines will be located out of sight or at least 0.5-mile from roads. Loaded shot holes will not be left unattended. Approval from the area manager will be obtained for the magazine locations.
- Roads will be constructed and maintained to BLM road standards (BLM Manual 9113 [BLM 2012]). All vehicle travel will be within the approved driving surface.

Best Management Practices for Pipeline Projects

- A preconstruction field conference shall be requested by the grantee at least five working days prior to any construction activities unless otherwise agreed upon by the BLM Authorized Officer.
- Once the pipeline is constructed, the grantee/operator shall restore the existing roadway to meet or exceed conditions prior to construction. The preconstruction width of the driving surface shall also be restored and erosion control structure installed subject to approval of the BLM Authorized Officer. The grantee/operator shall be responsible for road maintenance from the beginning to completion of operations. This may include, but not be limited to, blading the roadway, cleaning ditches and drainage facilities, dust abatement, or other requirements as directed by the BLM Authorized Officer.
- Construction width shall include the existing road. The pipeline shall be located two to three feet from the edge of the ditch along the existing road. The existing road shall be on the working side of the trench.
- The grantee shall accomplish the crossing of the pipeline owned by (company name) in accordance with an agreement between the grantee/operator.
- Pipeline location warning signs shall be installed within five days of construction completion. Each sign shall be permanently marked with the right-of-way serial number.

Geophysical Exploration

- The operator will furnish a map with the Notice of Intent showing approximate line to be used. A map will also be filed with the Notice of Completion showing the completed line. The map will be of a minimum scale of 0.5-inch equals 1.0 mile.
- Rehabilitation of disturbed areas is to be done concurrent with the geophysical operations.

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- Blasting or vibrating within 0.25-mile of federally-owned or controlled springs and flowing water wells or cultural resource sites must be approved in writing by the area manager.
- Plugging of drill holes will conform to the Colorado Reclamation Standards Abandoned Drill Holes Act. Drill hole cuttings will be returned to the hole. LR
- No blading or other dirt work will be allowed without written permission from the area manager.
- Standard Terms and Conditions described in BLM Handbook H-3150-1: Onshore Oil and Gas Geophysical Exploration Surface Management Requirements (BLM 1994 Rev. 2007).
- Coordinate with the Colorado Parks and Wildlife early in the sale process on proposals to sell public land encumbered by a small capacity wildlife water development.

Wildlife, Aquatic

- Consider the following options regarding erosion control to limit sedimentation into
 - perennial, ephemeral, and intermittent drainages:
 - Placement of straw waddles
 - Construction of silt fencing
 - Placement of geo-textile matting/fabrics
 - Timely and appropriate reseeding methods and species
 - Hydro-mulching
 - Topsoil stockpiling
 - Recontouring slopes at a minimum of 2:1 to facilitate revegetation
 - Hay bales
 - Sediment retention dams
 - Water dips
- Avoid direct discharge of pipeline hydrostatic test water to any reservoir, lake, wetland, or natural perennial or seasonally flowing stream or river.
- When constructing stream crossings or other in-channel structures, divert water around the construction site to minimize sedimentation.
- Avoid low water crossings of live streams, but if done, armor crossings with appropriate sized native substrate to limit sedimentation and maintain water depths for fish passage.
- For perennial stream crossings use professional engineering to design and consider using bridges or appropriately sized culverts of at least bank-full flow width.
- When possible, design road crossings of streams and riparian corridors at right angles and preferably along straight, stable stream reaches to minimize the area and amount of disturbance. However, when needed, place culverts in alignment with natural stream sinuosity.
- Address aquatic organism passage and appropriate life-stage requirements of target species when designing new or modifying existing road/stream crossings.
- Identify and protect access to ephemeral/temporary pools and ponds to provide breeding, aestivating, and hibernating habitat for amphibians.
- To avoid spread of aquatic nuisance species and disease vectors clean and disinfect all equipment and gear used in water by one of the following methods:
 - by spraying with 409, bleach, or a similar germicide solution and let equipment thoroughly dry.
 - wash/spray equipment and gear with hot tap water > 140 degrees Fahrenheit for 10 minutes and then drain onto the ground, not down a drain or into another water body.
- Improve stream conditions associated with past, ongoing, and future planning, construction, and maintenance actions in the I-70 mountain corridor as per Stream and Wetland Ecological Enhancement Program (SWEEP) MOU.
- Identify limiting habitat factors based on site characteristics and habitat capabilities using channel type and geology classifications (e.g., Rosgen). Upon identification of limiting factors,

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prioritize and fix those that can be fixed using proven river, stream, lake, and riparian methodologies (e.g., in-channel habitat structures to create pools, riparian plantings, tamarisk removal), or by changing management of other program activities (e.g., changing livestock grazing season of use) to achieve desired future condition.

- Identify in-channel features (e.g., culverts, water diversion structures) that block aquatic organism movement and/or impair stream connectivity and replace, modify, or remove these impediments as they are identified and as opportunities allow. Consider and address aquatic organism passage and appropriate life-stage requirements when designing new or modifying existing stream crossings. Where in-channel barriers are needed to protect native fish species from competitive species and/or disease vectors, consider placement in coordination with CPW Aquatic Biologists and BLM staff.
- Minimize the spread of aquatic nuisance species including but not limited to zebra mussels, New Zealand mud snails, quagga mussels, and rusty crayfish, as well as disease vectors including whirling disease, and chytrid fungus when working in water and do the following:
 - Before leaving a particular water or entering a new water body, inspect and clean equipment and gear used in the water, including heavy equipment, watercraft (boats, canoes, kayaks, rafts, etc.), trailers, oars, nets, waders, wading boots, sandals, and life jackets. Remove vegetation, mud, grit, algae, etc. and drain water from boats and other gear.

Fire Management:

- In wildland fire situations work with the Fire Resource Advisor(s) during suppression efforts in the CRVFO to address water use and spread of aquatic nuisance species and disease vectors:
 - If possible, avoid the use of these water sources for use in fire suppression actions (i.e., helicopter bucket dips, water pumps, etc.). If these waters are used for fire suppression, screen water pump intakes with ¼ inch mesh to avoid entrainment of fish.
 - Clean and disinfect all fire suppression equipment including water hoses, water pumps, pumpkins, blivets, helicopter buckets, etc. between suppression incidents to avoid the transfer of aquatic nuisance species and disease vectors into the Colorado River and ponds, reservoirs, and lakes within 0.5 miles of the river.
 - Do not release unused water from water tenders, fire engines, or aircraft into the Colorado River or ponds, reservoirs, or lakes within 0.5 miles of the river. Discharge unused water on upland habitats away from these water sources to avoid possible spread of aquatic nuisance species and disease vectors.
- Avoid dropping fire retardant or foam within 300 feet of water bodies and avoid locating staging, fire retardant chemicals, refueling sites, or other chemicals within 300 feet of these waters.
- When fighting fires within 300 feet of occupied stream/lake drainages containing conservation populations of cutthroat trout, use water located from within the drainage for all suppression efforts..
- When obtaining water from the Colorado River the following actions should be taken:
 - The best method to avoid entrainment of fish is to pump from off-channel locations (e.g., ponds, lakes, and diversion ditches), not directly connected to the mainstem streams or rivers even during high spring flows.
 - If the pump head must be located in the river channel where larval fish are known to occur, the following measures apply:
 - do not situate the pump in a low-flow or no-flow area as these habitats tend to concentrate larval or young-of-year fishes. Instead place the pump into fast moving/riffle habitat;

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- limit the amount of pumping, to the greatest extent possible, during that period of the year when larval fish may be present (June 1 to August 15); and avoid pumping, to the greatest extent possible, during the pre-dawn hours (two hours prior to sunrise) as larval fish drift studies indicate that this is a period of greatest daily activity.
- Screen all pump intakes with ¼” or finer mesh material.
- Report any fish impinged on any intake screens to the Fish and Wildlife Service (970.243.2778) or the Colorado Parks & Wildlife Department:
Northwest Region
711 Independent Ave., Grand Junction, CO 81505
Phone: (970.255.6100)
- Require spill Prevention Plans for all pipeline companies and fluid mineral companies and their sub-contractors who haul or transport hazardous substances.
- Require Spill Contingency Plans for all pipeline companies and fluid mineral companies and their sub-contractors who haul or transport hazardous substances.
- When developing or improving water sources, consider development designs such as water wells and guzzlers, rather than surface impoundments, to minimize impacts to surface water hydrology resulting from attenuation of flood peaks and evaporative loss.
- Pro-actively manage special status species aquatic habitats. Identify limiting habitat factors based on site characteristics and habitat capabilities using channel type and geology classifications. Upon identification of limiting factors, prioritize and fix those that can be fixed using proven river, stream, lake, and riparian methodologies (e.g., in-channel habitat structures to create pools, riparian plantings) or by changing management of other program activities (e.g., changing livestock grazing season use) to achieve desired future condition.

Transportation

- Oil and gas development roads will be crowned, ditched, surfaced, drained with culverts and/or water dips, and constructed to BLM Gold Book standards [USDI and USDA 2007] as outlined in BLM Manuals 9113, Roads Design Handbook [BLM 2011a] and 9113-2, Roads National Inventory and Condition Assessment Guidance and Instructions Handbook [BLM 2011b].
 - All vehicle travel will be within the approved driving surface.
 - All construction activities will be confined to the minimum area necessary.
 - The exterior boundaries of the construction area will be clearly staked or flagged prior to any surface-disturbing activities.
 - If requested by the BLM representative, the operator will schedule a pre-construction meeting, including key operator and contractor personnel, to ensure that construction plans and/or any unresolved issues are fully addressed prior to initiation of surface-disturbing activities.
 - Initial gravel application shall be a minimum of 6 inches.
 - The operator shall provide timely year-round road maintenance and cleanup on the access roads.
 - A regular schedule for maintenance shall include, but not be limited to, blading, ditch and culvert cleaning, road surface replacement, and dust abatement.
 - When rutting within the traveled way becomes greater than 6 inches, blading and/or gravelling shall be conducted as approved by the BLM.
- Other BLM resource roads that do not serve oil and gas development or do not serve as primary (collector) roads within the transportation system will be designed, constructed, and maintained as outlined in BLM Manual 9115-1, Primitive Road Handbook [BLM 2012a] and 9115-2, Primitive

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Roads National Inventory and Condition Assessment Guidance and Instructions Handbook [BLM 2012b].

- All vehicle travel will be within the approved driving surface.
 - All construction activities will be confined to the minimum area necessary.
 - The exterior boundaries of the construction area will be clearly staked or flagged prior to any surface-disturbing activities.
 - If requested by the BLM representative, the operator or proponent will schedule a pre-construction meeting, including key representative(s) and contractor personnel, to ensure that construction plans and/or any unresolved issues are fully addressed prior to initiation of surface-disturbing activities.
- In order to ensure public access and safety, CRVFO shall continue an active road maintenance program including, but not limited to, road redesign or realignment, blading, brush or tree removal for sight distance and safety concerns, scarification, graveling, water barring, low water crossings, spur ditching, seeding and installation or cleaning of culverts and cattleguards. Such road maintenance work will adhere to standards and guidance outlined in appropriate BLM Road Handbooks

Wildlife

Planning

- Design plans of development to consolidate activity during wildlife sensitive times into geographic areas approved by the regulatory agencies in order to minimize impact.
- Where possible, develop existing or previously disturbed surface locations to reduce impacts on undisturbed areas and minimize impact to wildlife habitat.
- Design power lines to minimize raptor attraction.
- Install perch guards on utility lines to reduce risk of raptor electrocution and discourage raptor perching on utility poles by the use of anti-perching devices, or bury new utility lines.
- Minimize noise by using appropriate noise reduction devices.
- Require all refuse containers employ a bear-proof design and be emptied on a regular basis.
- Initiate an education program that reduces bear conflicts
- Adjust tower changes, material deliveries, and all other recurring transportation activity to and from the well pad to occur between 9:00 am and 4:00 pm and between 9:00 pm and 4:00 am, excluding emergencies.
- Use carpooling for activities like crew rotations and shift changes.
- Monitor and enforce speed limits using multiple techniques.
- Implement dust control BMPs in a timely manner.
- Reinforce wildlife training of employees and contractors at worksite tailgate meetings, monthly safety meetings, and the Environmental Health and Safety (EHS) hazard identification program, and through the use of signs.
 - Prohibit pets on all locations.
 - Prohibit possession of firearms by all employees and contractors on all locations.

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Drilling

- Implement drilling technology improvements, such as directional and horizontal drilling, to maximize resource recovery and minimize environmental impacts.
- Use natural gas drilling rigs to reduce emissions.
- Use dual-fuel natural gas/diesel engines, reducing diesel delivery to the well site by as much as 70%.
- Implement closed-loop drilling systems on all active rigs with only a small cuttings mixing area on each location.
- Conduct pre-rig move meetings with all parties to discuss access and concerns to reduce impacts to environment and landowners, to ensure a safe and efficient rig move.
- Net all oil and gas reserve and permanent pits to exclude birds; enclose pits within an 8-foot-high fence to exclude ungulates; enclose pits within a 2-foot solid barrier buried 6 inches into the soil to exclude small mammals and reptiles, and lined to prevent infiltration to groundwater.

Completions

- Restrict venting of natural gas to the atmosphere during new well completions.
- Require secondary spill containment for pump trucks on all active completions operations (e.g., portable containment, not earthen berms).
- Use permanent buried or temporary surface water delivery lines to reduce truck traffic.
- Optimize completion operations to minimize impact. Techniques include:
 - Use simultaneous drilling and completion operations (SIMOPS) to minimize the operating time on the well pad.
 - Remote completion operations using nearby existing well pads minimizes overall surface disturbance.
- Recycle all water used in completion activities to meet water needs for completion of subsequent wells on location; this will reduce fresh water consumption and reduce truck traffic.

Production

- Reduce visits to well sites through remote monitoring (i.e., SCADA) and the use of multi-function contractors.
- Use solar panels as an alternative energy source for on location production equipment, to limit trips to the location for production maintenance.
- Monitor wildlife as needed to document impacts of planned development on population dynamics or behavior; and develop and implement mitigation based on the results of monitoring.
- All stacks, vents, or openings must have screens to prevent wildlife entry.

Well Pad Construction and Reclamation

- Use advanced reclamation techniques to reclaim pads and pipeline construction within 6 months or less after completion activities are finished to establish desirable vegetation more effectively. Advanced reclamation techniques include:
 - Hydraulic erosion-control mulch on topsoil and wind-row perimeter control

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- Landform grading and hydraulic erosion-control mulch on steeper slopes
- Use of crimped straw mulch on shallower slopes
- Use integrated vegetation management techniques to simultaneously control weeds while developing successful reclamation.
- Construct well pads prior to onset of winter to minimize additional displacement of wildlife utilizing the area
- Use the Colorado Parks and Wildlife recommendations for wildlife friendly fence whenever fencing is required.
- If appropriate, employ habitat enhancement in suitable areas to offset habitat loss or fragmentation caused by the planned development.
- Prepare third party Biological Assessment Reports (BAR) completed for all new disturbances to customize the reclamation plan and to optimize the topsoil segregation, seed mix, and soil amendments to improve reclamation success.

Pipelines

- Expand the water distribution system to efficiently move water in pipelines, reducing truck traffic for drilling and completion activities.
- Install gathering lines adjacent to roads wherever possible. Use multiple gathering lines placed in a single trench to minimize disturbance and construction costs.
- Install trench plugs (sloped to allow wildlife or livestock to exit the trench should they enter) at known wildlife or livestock trails to allow safe crossing on long spans of open trench.
- Install pipeline crossings at right angles to the drainages, wetlands, and perennial waterbodies.
- Install equipment bridges for pipeline construction made from either clean rock and flume pipes or timber equipment mats with flume pipes.
- Use horizontal directional boring techniques under perennial waterbodies and/or wetland complexes.
- Enforce all In-stream construction activity to 24-hour periods for waterbodies less than 10 feet wide and to 48 hours for waterbodies greater than 10 feet wide at locations where horizontal boring is not possible.
- Maintain a minimum of 5 feet of soil cover between the pipeline and the lowest point of any drainage or water body channel.
- Restrict refueling equipment within 100 feet of a drainage, stream, or wetland during pipeline construction and employ secondary containment (e.g., portable containments).

Roads

- Use existing roads instead of new construction segments wherever feasible.
- Create topsoil windrows on all new facility construction for perimeter control to divert to terminal discharge points.
- Strategically apply fugitive dust control measures to reduce coating of vegetation and deposition in water sources, including enforcing speed limits on BLM and private roads.

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- Install toe berms of adequate size on all fill slopes facing and or adjacent to potential water to contain any erosion from the fill slope.
- Implement stormwater perimeter control(s) on all new facility construction adequate to contain a 100-year storm event.
- Use hydraulic erosion control mulch or armoring on all exterior slopes adjacent to waterways.
- Seed all access roads and facilities other than well pads seeded in a timely manner after construction has been completed and seeding of all topsoil on pad construction.

Cultural Resources

- The operator/holder/applicant is responsible for informing all persons who are associated with the project that they will be subject to prosecution for knowingly disturbing archaeological sites or for collecting artifacts.
- If any archaeological materials are discovered as a result of operations under this authorization, activity in the vicinity of the discovery will cease, and the BLM WRFO Archaeologist will be notified immediately. Work may not resume at that location until approved by the AO. The operator/holder/applicant will make every effort to protect the site from further impacts including looting, erosion, or other human or natural damage until BLM determines a treatment approach, and the treatment is completed. Unless previously determined in treatment plans or agreements, BLM will evaluate the cultural resources and, in consultation with the State Historic Preservation Office (SHPO), select the appropriate mitigation option within 48 hours of the discovery. The operator/holder/applicant, under guidance of the BLM, will implement the mitigation in a timely manner. The process will be fully documented in reports, site forms, maps, drawings, and photographs. The BLM will forward documentation to the SHPO for review and concurrence.
- Pursuant to 43 CFR 10.4(g), the operator/holder/permittee/applicant must notify the AO, by telephone and written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43 CFR 10.4(c) and (d), and the operator/holder/permittee/applicant must stop activities in the vicinity of the discovery and protect it for 30 days or until notified to proceed by the AO.