



COLORADO

Parks and Wildlife

Department of Natural Resources

Resource Stewardship Program
6060 Broadway
Denver, CO 80216

MEMORANDUM

TO: Contractor/Project Manager
FROM: Colorado Parks and Wildlife
SUBJECT: CPW Cherry Creek State Park
Revegetation/Reclamation Seed Mixes and Specifications

This document outlines Colorado Parks and Wildlife standards procedures for revegetating soil disturbance areas. This document includes three primary sections: 1) Best Management Practices and Guidelines for effectively seeding disturbed areas; 2) Specifications, Guidelines, and Protocols for contractors (Appendix A); and 3) seed mixes (Appendix B) tailored to each state park location based upon elevation, general hydrologic condition – riparian or upland – and high use areas.

Seed mixes and Guidelines are designed to provide a balance between meeting the goals of ecological diversity and wildlife habitat structure, while considering cost, commercial availability of seed/species, and revegetation success for ground disturbing projects.

Effective results for seeding projects stem from attention to five simple steps that, when implemented correctly, greatly increase the chances of plant establishment:

- 1) Selecting the right seed mix for the site in question (provided in this specification), and selecting a vendor and a product to ensure quality weed-free seed arrives on site;
- 2) Appropriate seedbed preparation, including (only as necessary) soil amendments (Appendix A);
- 3) Incorporating seed into the soil at the correct rate, time of year, and depth (Appendix A);
- 4) Protecting the seeded soil surface with the right material – ie: mulch or erosion blanket depending on the stressors of the site (wind, water, foot traffic, animals, etc.) (Appendix A); and
- 5) Monitoring and maintaining the seeded area in the first three years following seeding (Appendix A).

This document provides best management practices (BMP's) to achieve the steps outlined above. The BMP's and guidelines in this document were developed to help make your seeding projects a success and to help reduce inadvertent impacts to soil, wildlife, and water.

Success of all seeding projects is the responsibility of the vendor or project manager of each ground-disturbing project. For construction projects, it is **HIGHLY recommended to choose a separate vendor with seeding/restoration expertise for a separate revegetation contract from the construction project**. A warranty for seeding success will be provided for all seeding projects prior to initiation of ground-disturbing projects.

IMPORTANT: ALL SEEDING RATES PROVIDED ARE FOR BROADCAST SEEDING. If drill seeding is performed, reduce the seeding rates by ½.

For more information or questions about these specifications contact:

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BEST MANAGEMENT PRACTICES AND GUIDELINES

SEED SOURCING AND QUALITY ASSURANCE

Ensure high quality weed free seed is used on every project by following the guidelines and tips below:

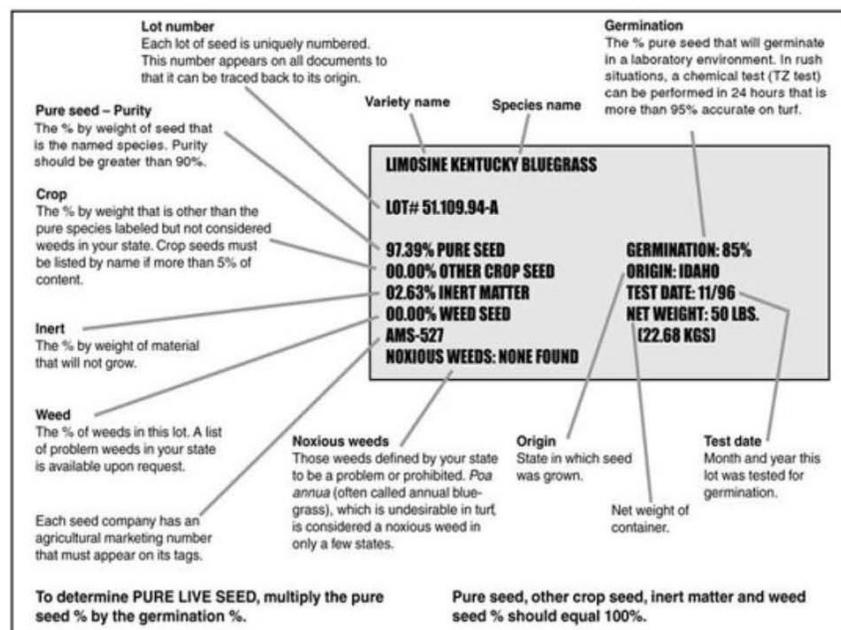
Pure Live Seed: The amount of viable seed (on a percentage basis) in a given bag varies greatly depending on how old the seed is (and hence the viability of the seed), seed dormancy, and the amount of non-seed content such as stems and awns, weed seeds, crop seeds, and other organic and inert material. When a bag of seed is analyzed for just the viable seed that is contained in the bag, that seed is referred to as Pure Live Seed. To understand how much viable seed you are receiving in a given pound, you must require the vendor to provide seed mixes on a *Pure Live Seed* (PLS) basis. There should be no exceptions.

Weed Notes: It is important to know that Colorado state law *does* allow for the presence of a certain number of weeds in seed mixes (to a limit). For this reason, the project manager should ask the seed vendor to provide the list of weeds present in each seed lot. No seed used on CPW properties should include any noxious or other non-native species prohibited under the Colorado Seed Act. In addition, the following species should not be present in a quantity greater than 0.002% of the seed provided by a vendor for use on any CPW property: smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), kochia (*Basia scoparia*), Canada thistle (*Cirsium arvense*). Park and Wildlife Managers may have additional *low tolerance* species that are of concern to their park. If any seed lot in your mix contains undesirable weed content, substitutions for the contaminated seed lot are acceptable according to the “Acceptable Alternatives” species list provided below each seed mix in **Appendix B**. If a certain species in the park seed mix are not available due to undesirable weed content, ask the vendor to replace the species of concern in the seed mix with a species with the same life history traits (see Appendix B for list of life history traits by species).

Seed Delivery & Labeling: Seed shall be delivered in original containers, unopened, bearing dealer's warranty analysis and certification labels. All seed shall be labeled as Certified by the Colorado Seed Growers Association. Seed tags will be checked by the project site manager for these labels at the time of delivery. Failure to follow these guidelines can place warranty responsibility on the seeding contractor.

Sample Seed Label

(credit: CO Dept of Agriculture)



Seed Vendors

The following is a partial list of vendors that have provided native seed to CPW in the past. This list is not comprehensive, nor does CPW endorse these vendors. Park managers should solicit competitive bids from seed vendors before selecting a preferred vendor:

Western Native Seed
P.O. Box 188
Coaldale, CO 81222
(719) 942-3935
westseed@chaffee.net

Granite Seed
490 E 76th Ave unit A
Denver, CO 80229
(720) 496-0600
www.graniteseed.com

Pawnee Buttes Seed
P.O. Box 100
Greeley, CO 80632
(970) 356-7002 or (800) 782-5947
info@pawneebutteseed.com

Arkansas Valley Seed
P.O. Box 16025
Denver CO 80216
303-320-7500
www.avseeds.com

Sharp Brother's Seed Company
101 E 4th Street Road
Greely, CO 80631
(970) 356-4710
Info@buffalowbrandseed.com

SEED MIXES

The seed mixes in **Appendix B** are for upland, riparian, and high use (campground/facilities) areas of the CPW Property on which the project is located. Depending on the goals of a given revegetation project (habitat creation, wetland mitigation, erosion control, etc.) and the specific site in mind (i.e., high traffic area, open meadow, etc.), seed mixes can vary. The seed mixes are for general restoration projects, and so include a variety of pioneer (early successional) plants, late successional plants (i.e., climax species), and a range of species in-between. These mixes also include a mix of grasses and pollinator species, as well as combination of cool season and warm season species. Because of the likelihood that not every species will be available at the time you order a seed mix, a list of acceptable alternative species is provided. Alternate species should be selected to replace a given species according to that species life history trait, such as Native Perennial Grass or Native Annual Forb. Refer to the "Life History Trait" list at the bottom of the seed mix for additional information.

SEEDBED PREPARATION AND SOIL AMENDMENTS

Three important factors in preparing a seedbed include proper decompaction, appropriate soil amendments, and adequate furrowing of the soil. Many disturbed sites have compacted soil, resulting in difficult conditions for seedling establishment. **Decompaction** of soil can be accomplished with a dozer pulling ripper blades (for heavily compacted soils), the bucket of an excavator (for moderate to heavily compacted soils), or by disc (in lightly compacted soils). Regardless of the method, the decompacted and **prepped seedbed** should be easy to drill seed. If decompacted soil produces too many very large clods, the soil may need to be disced or harrowed, or other means available to the contractor, to create a condition that can be treated with a seed drill. If broadcasting seed, the prepped seedbed should have a variety of ridges (0.5-1.5" high) or furrows that allow for seeds to fall into crevices before raking or drag harrowing soil over the seed.

Topsoil Salvaging and Placement

Salvage topsoil (if the pre-project site condition is not dominated by undesirable weeds) before disturbing a site, so that topsoil can be placed back over the disturbed site before seeding. If topsoil is imported to the site, it should be weed free, low in salts and nitrogen, and free of heavy metals and other contaminants. Acquiring quality topsoil is a problem in Colorado, and should be avoided whenever possible. When topsoil is used, spread topsoil to a depth of 6-10" in areas to be seeded, or as directed by the CPW project manager, Park/Wildlife Area Manager, or staff in the field. Amending existing soil substrate with organic fertilizers and/or compost (a variety of well-aged organic matter that is low in nitrogen) is often cheaper than importing topsoil and is a good way to reduce costs while improving soil conditions in seeded areas.

Soil Amendments

A common problem in applying soil amendments is adding too much nitrogen. Too much nitrogen in Colorado soils can often lead to a proliferation of weeds. Colorado plants are for the most part adapted to nitrogen poor soils. If in doubt, do not add any nitrogen soil amendments to a soil. A soil test can verify if any nitrogen or other soil amendments are needed. If you believe there is a reason to apply fertilizer, you may use Biosol, Richlawn (two widely accepted slow-release organic fertilizers) at a rate of 300-500 lbs/acre. They can be broadcast on the seeded soil surface, or incorporated into the top 1-3" of the soil surface.

Note, the specifications on the bags of these materials specify application rates that are too high for most Colorado native grass mixes, and can result in high weed growth in a seeded area. Compost (well-aged, low in salts, and low in nitrogen) can also be tilled into the top 6-8" of a seedbed, as appropriate for the site, to increase water and nutrient holding capacity of the soil and to reduce the bulk density of the soil. The method of incorporating compost into the soil is the responsibility of the vendor. Adding compost to a seedbed can be very expensive, so should be specified only when necessary to meet project goals. Well produced compost (reaching temperatures of 145^o F for 30 days) kills the great majority of weed seeds.

SEEDING QUALITY ASSURANCE MEASURES

Minimum procedures to follow for all seeding projects:

1. Seeding or mulching shall not occur during windy weather or when ground is frozen or otherwise not tillable.
2. Operate seed drill in two passes applying ½ the seed in each pass. When broadcasting seed, seed should be applied in two passes, ½ of the seed in each pass, with the direction of the second pass perpendicular to the first pass.
3. Hydroseeding is not allowed. Seed should not be applied in hydromulch.

All Equipment Shall be Cleaned Prior to Brining On Site: Any equipment brought onto a CPW property by a contractor should be cleaned prior to entering project sites. Contractors should give park staff a two-week notice of when equipment will arrive on site, so that staff can schedule a time to inspect the equipment prior to work commencing. All machinery, including wheels, tracks, chassis, hydraulics, cabs, and every surface should be free of mud, dirt, and any organic matter to ensure weeds are not inadvertently brought into the CPW property. Additionally, seeding equipment, including disks, drag harrows, and hoppers, will be cleaned in a similar manner. No remnant seed (from a previous project) should remain in the hoppers, seeding tubes, augers, or any other part of the seeding equipment.

Timing: The best timing for most projects is Fall, after mid September for most project sites, and later into the fall for lower elevation sites. The later the better. Early spring is another good time for seeding, and should be done as

early as possible (before April 1 is ideal for most low elevation sites, and mid may can be effective for sites above 7,000' elevation). Meeting seeding success standards is the responsibility of the vendor.

Methods (Broadcast vs drill): The method of seeding is often the choice of the vendor. Typically, small (i.e., less than 1 acre), irregularly shaped, and/or steep sites are best for broadcast seeding while larger flat acreages are best for drill seeding. Drill seeding also works better than broadcast seeding in sandier soils. Broadcast seeding can often be successful on sites of 5 acres or larger, but may be more expensive due to higher amount of seed needed and increased labor needs. Broadcast seeded sites have the added benefit of having a more natural appearance (not in regular crop rows), and can often incorporate a greater variety of seeds well into the soil compared to some methods of drill seeding. All seeding rates in **Appendix B** are based on seeds per square foot, assuming broadcast seeding is being used.

NOTE: ALL SEEDING RATES PROVIDED IN APPENDIX B ARE FOR BROADCAST SEEDING. If drill seeding is being use be sure to use half as much seed as what is called for in the broadcast seed mix.

Seed Depth

The seeding contractor should know the depth of seeding based on soil type and the species in the mix. Proper seed depth varies from 1/8" deep to "1/4" deep. In sandier soils, deeper burial of seed (up to 1/2" deep) is preferred for most grass seed. In general, the smaller the seed (such as many small wildflower/forb seeds, and very small sedge or rush seeds) the shallower it should be buried. Grass seed is often buried 1/4" deep. If the mix has a high degree of small seeded species, seeding contractors must sow those seeds separately (broadcast on the soil surface prior to roller compacting, or no deeper than 1/8 – 1/16"), or in a separate hopper in order to ensure that seed is not buried too deep.

Covering Seed

Whether seed is drilled or broadcast, it should be covered using a drag harrow, packer wheels, rakes, chains, or other effective means. Seeded sites should be rolled or tamped sufficiently to firm the soil over the seed. Exact means of covering seed will vary depending on the method of seeding, site constraints, and equipment available to the contractor. Small seeded areas can be walked upon to tamp the soil.

SOIL SURFACE PROTECTION

Covering a seeded area with mulch or erosion control blanket (ECB, also known as erosion matting) accomplishes several important objectives in a seeded area: 1) protects the soil surface from wind or water erosion, 2) helps retain soil moisture in the soil, 3) reduces risk of herbivory by birds and other animals, and 4) reduces soil surface temperatures – all improving the performance of seeding projects. Like seed, any mulch or other erosion control products brought onto Colorado Parks and Wildlife property should be free of weeds. While many different products are available for your project, below are some fundamental guidelines for some of the more common products.

Seeded areas should be covered by mulch or other soil surface protection treatments within 72 hours of seeding during dry periods. Seeded areas should be covered by soil surface protection treatments not more than 24 hours after seeding if rains are possible within the first 1-2 days after seeding.

Agricultural Straw (for upland areas < 30% steep)

Agricultural straw (typically from wheat, barley, or oats) shall be Colorado certified weed free with bindings consisting of blue and orange Colorado weed free twine, specially produced galvanized shiny wire, or the bale will have a certified program tag indicating the weed free certification number. Ag straw should be applied **uniformly** at a rate of two tons (4,000 lbs)/acre, and crimped into the ground to prevent removal by wind.

Agricultural Hay (even if it is certified weed free) is not permitted on Park and Wildlife properties due to presence of troublesome exotic plants that are not currently prohibited by state law but are a problem in many of our parks.

Mulching and crimping procedures and equipment shall conform to Colorado Department of Highway Standard Specifications, Section 213, subsection 213-03, *paragraph a*, 1999 Edition.

Wood StrawTM and Wood Grind

Wood straw mulch, at 70% cover, is a 100% weed free product that performs well in high wind areas. Large ground wood fibers (not small wood chips) can be used in place of wood straw. Ground wood fibers (AKA first grind) should meet this specification in order to minimize removal by wind and overland flow: no more than 10% of fibers being greater than 10" long, 80% of fiber lengths ranging between 2-8" long, and no more than 10% of the material consisting of lengths less than 2".



Erosion Control Blanket (for waterways and upland slopes > 30 degrees steep)

Erosion control blanket (also called erosion matting) is especially effective in areas prone to wind, or prone to scour by water along streambanks or windy shorelines, or on steep slopes. ECB is a short-term treatment until seedlings become fully established. In all seeded areas where scour by water (river banks and overbank areas, and shorelines with high wave action) is expected, or on slopes steeper than 30 degrees (58%), ECB should be used.

In order to install erosion matting correctly, and to build expertise in "field fitting" erosion matting during a project, it is important to first understand the forces acting on the treated area. Erosion matting is highly susceptible to blowing off the site from wind or curling up from flowing water if it is not anchored completely to the soil surface. In order to address the forces acting on erosion matting, the following tasks should be followed closely.

Tasks

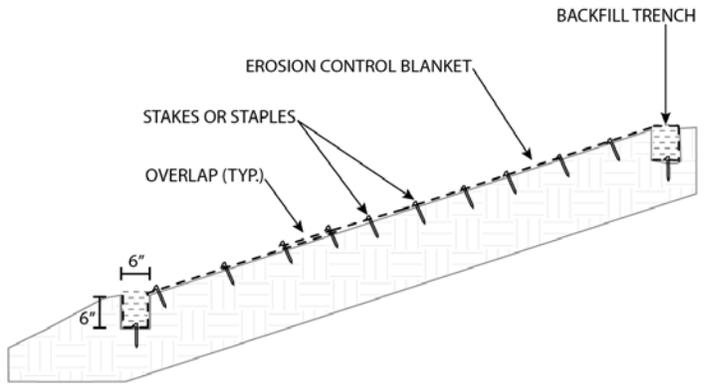
The following tasks are listed in typical order, assuming the area to be treated has already been measured. Depending on the actual restoration site in question, the order of tasks may vary.

- **Note forces:** Identify the direction of overland flow, prevailing winds, and other forces. In Colorado, prevailing winds are typically from the west and the north, but the varied topography on some projects can result in prevailing winds coming from a variety of directions. For fall-line areas, the direction of overland flow is obvious. In areas where the disturbed area is diagonal to the fall-line, consider that overland flow may be coming from two directions.
- **Remove rocks:** Remove all rocks and sticks greater than the size of your fist from the area where erosion matting will be applied.
- **Seedbed preparation and seed:** According to specifications above.
- **Dig trenches:** The edges of the matting at risk from wind and overland flow must be trenched. Dig a trench 6" deep and 6" wide on each side that will receive overland flow and direct winds. Lay the matting in the trench such that the end of the matting covers the entire bottom and both sides of the trench. Install landscape staples or wooden stakes every 18" through the matting and

cover the matting/trench with soil. Compact the soil covering the trench with McCleods or other tamping tools.

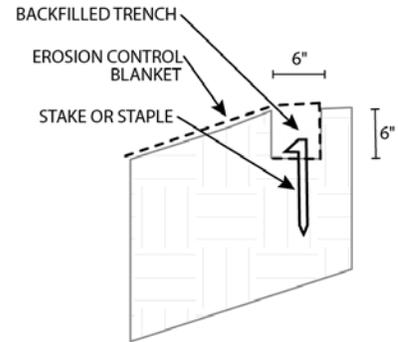
- **Cover:** Lay erosion matting over seeded areas so that matting is **even** and **flat** over the surface. Avoid wrinkles and folds, as these can catch wind and allow water to flow beneath the matting, undermining the site.
- **Stake:** Secure matting in place by placing wooden stakes (Ecostakes or dimensional lumber with a diagonal cut at bottom) in a zig-zag pattern at approximately 1.8 staples/stakes per square yard. On steeper slopes (i.e., > 60%) stakes should be installed at a higher density. Manufacturers' specifications often provide stapling density recommendations and other specifications based on slopes and soils.

Erosion Blanket Installation Typical

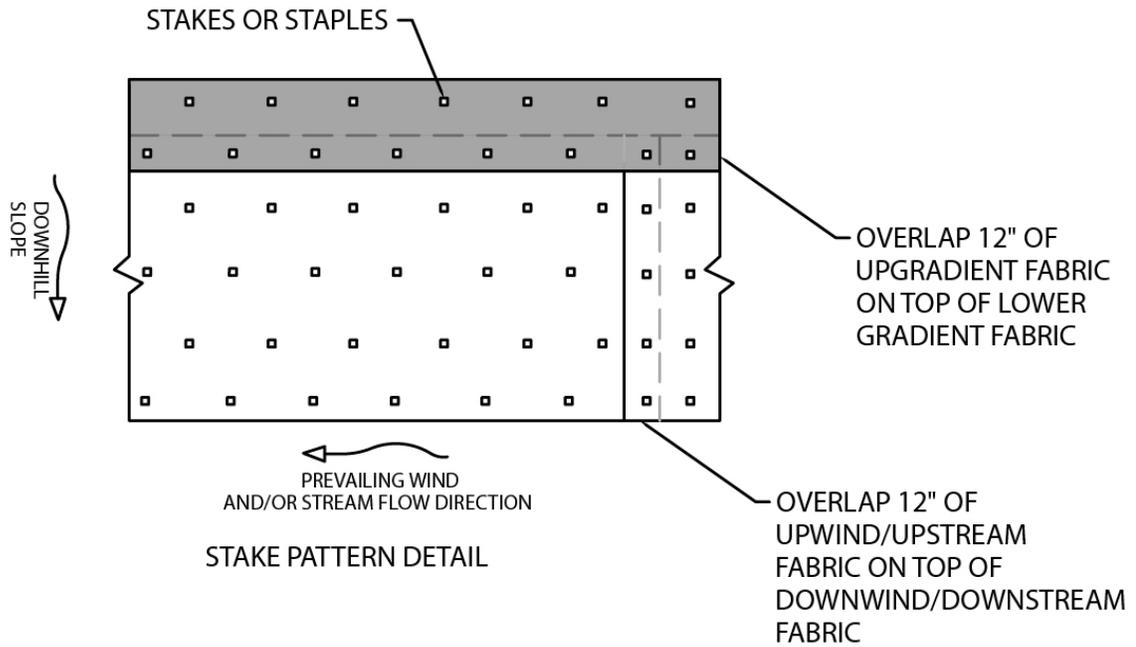


○ EROSION CONTROL MATTING
CROSS SECTION NOT TO SCALE

100%



○ EROSION CONTROL MATTING - TRENCH DETAIL
CROSS SECTION NOT TO SCALE



○ EROSION CONTROL MATTING - STAKE LAYOUT DETAIL
PLAN VIEW NOT TO SCALE

100% biodegradable materials are to be used for all projects

Biodegradable Matting and Wattles Reduces Incidental Death to Animals

Many erosion control mats and straw wattles contain photodegradable or even more durable plastic. Experience shows that photodegradable matting often breaks into small sections (i.e., 5" in diameter) and blows away from the site before it completely photodegrades. More durable plastic mesh may take decades or longer before disappearing completely from the site where it is applied. In the meantime, dozens of practitioners and land management agency staff have noted repeated trapping of mice, birds, snakes, and other small animals in the plastic mesh, often causing death of the trapped animal (**Figure 1**). 100% biodegradable materials are known to greatly reduce injurious effects to animals. Furthermore, these biodegradable products will decompose naturally, adding valuable organic matter to the restoration site over time.

Mind Your Materials!

Erosion control blankets, straw wattles, and other manufactured materials can be made of 100% plastic mesh, a combination of photodegradable plastic mesh and biodegradable fibers, or 100% biodegradable fibers. Photodegradable mesh and other synthetic materials are known to have deleterious effects on birds, snakes, rodents, aquatic organisms, and other wildlife (Figure 1). Because natural meshes such as jute, coir (i.e., coconut), and hemp can provide substantial protection against stressors, are 100% biodegradable, and have significantly less impact on wildlife, they are highly recommended for use in restoration and streambank bioengineering projects.

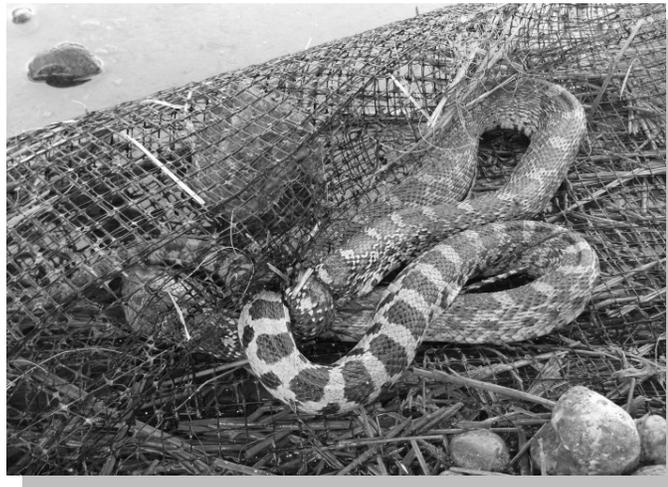


Figure 1. Dead bullsnake in plastic mesh. (Photo courtesy of AloTerra Restoration Services)

MONITORING AND MAINTENANCE

The success of seeding projects is the responsibility of the vendor who performs the seeding work. Performance standards are outlined on the next page of this document. It is highly recommended that regular evaluations be conducted on the seeded site during the growing season to determine the necessity of maintenance needs. Maintenance during the first growing season will greatly increase project success, while active maintenance through the three-year establishment phase will allow for the greatest opportunity for performance standards to be met. Whenever possible, it is highly recommended to irrigate the seeded project area, though depending on the availability and cost of water at the project site irrigation can be more expensive than the initial seeding effort.

SOLICITING QUALIFIED SEEDING CONTRACTORS

It is **highly recommended** that a separate revegetation vendor be contracted to perform seeding and soil amendment tasks, as general contractors are often not trained or experienced in the multitude of details involved in proper seeding, and their priorities tend to be on the construction end of a project. Likewise, construction projects that go over budget can leave CPW properties with serious noxious weed, visual, and habitat management issues. As a result, revegetation often does not receive the attention it deserves in order to be successful. When a separate qualified contractor is involved for just the seeding work, their primary goal is to make that seeding work successful. A second option is to require the general contractor to have a qualified revegetation contractor on their team at the time they submit their qualifications for a given job. The qualified revegetation contractor should list the qualified personnel that will be performing the seeding work, as well as three recommendations and three project examples where similar work was performed successfully.



APPENDIX A

SPECIFICATIONS, CRITERIA & PROTOCOLS

This Appendix provides seeding specifications, protocols, evaluation criteria, and other information that should be included in Requests for Bids and other vendor selection processes to ensure vendors fully understand the specifications Colorado State Parks has for seeding projects. Every project is unique, requiring Park Managers to select the most appropriate sections from the information below to use in contractor solicitations and/or contracting language.

PERFORMANCE STANDARDS AND COMPLIANCE

GENERAL GUIDELINES

- A. The undercarriage and tires of all trucks and equipment must be power washed offsite before entering the project area to reduce the spread of noxious weeds from other projects. Machine operations should avoid driving through weed areas in route to restoration sites.
- B. All work related to re-seeding of disturbed areas shall comply with Sections 212 and 213 of CDOT, Construction Requirements, except as modified herein.
- C. Examine site to verify conditions are acceptable for proper installation of seed. Standing water, high soil moisture conditions, or snow is not acceptable.

SEEDING GUIDELINES

The following are general guidelines applicable to all seeding projects. Site specific projects may require additional guidelines, which will be applied at the discretion of the park manager:

- A. Seeding or mulching shall not occur during windy weather or when ground is frozen or otherwise not tillable.
- B. Order of Operations: The following order of operations is required for all seeding projects: 1) decompact soils, 2) seedbed preparation, 3) apply soil amendments, 4) apply and cover seed, and 5) apply soil surface protection treatments. If compost is being incorporated into the soil, it should be incorporated during decompaction or seedbed preparation steps.
- C. Operate drill in two passes applying ½ the seed in each pass. When broadcasting seed, seed should be applied in two passes, ½ of the seed in each pass, with the direction of the second pass perpendicular to the first pass.
- D. Hydroseeding is not allowed. Seed should not be applied in hydromulch.**
- E. Clean All Equipment: Any equipment brought onto your park by a vendor should be inspected before entering. Contractors should give park staff a two-week notice of when equipment will arrive on site, so that staff can schedule a time to inspect the equipment. All machinery, including wheels, tracks, chassis, hydraulics, cabs, and every surface should be free of mud, dirt, and any organic matter to ensure weeds are not being brought into the park inadvertently. Additionally, seeding equipment, including disks, drag harrows, and hoppers, should be cleaned in a similar manner. No remnant seed (from a previous project) should remain in the hoppers, seeding tubes, augers, or any other part of the seeding equipment.

- F. **Timing:** The best timing for most projects is Fall, after mid September for most project sites, and later into the fall for lower elevation sites. The later the better. Early spring is another good time for seeding, and should be done as early as possible (before April 1 is ideal for most low elevation sites, and mid may can be effective for sites above 7,000' elevation). Late spring to early summer seeding (May-July) can be effective for sites that experience a good monsoon season and have a high percentage of warm season grasses in the mix.
- G. **Methods (Broadcast vs drill):** The method of seeding is often the choice of the vendor. Typically, small (i.e., less than 1 acre), irregularly shaped, and/or steep sites are best for broadcast seeding while larger flat acreages are best for drill seeding. Drill seeding also works better than broadcast seeding in sandier soils. Broadcast seeding can often be successful on sites of 5 acres or larger, but may be more expensive. Broadcast seeded sites have the added benefit of having a more natural appearance (not in regular crop rows), and can often incorporate a greater variety of seeds well into the soil compared to some methods of drill seeding. All seeding rates in Appendix B are based on seeds per square foot, assuming broadcast seeding is being used.

DRILL SEEDING NOTE: If drill seeding is being use be sure to use half as much seed as what is called for in the broadcast seed mix.

- H. **Seed Depth:** The seeding contractor should know the depth of seeding based on soil type and the species in the mix. Proper seed depth varies from 1/8" deep to "1/4" deep. In sandier soils, deeper burial of seed (up to 1/2" deep) is preferred for most grass seed. In general, the smaller the seed (such as many small wildflower/forb seeds, and very small sedge or rush seeds) the shallower it should be buried. Grass seed is often buried 1/4" deep. If the mix has a high degree of small seeded species, seeding contractors must sow those seeds separately (broadcast on the soil surface prior to roller compacting, or no deeper than 1/8 – 1/16"), or in a separate hopper in order to ensure that seed is not buried too deep.
- I. **Covering Seed:** Whether seed is drilled or broadcast, it should be covered using a drag harrow, packer wheels, rakes, chains, or other effective means. Seeded sites should be rolled or tamped sufficiently to firm the soil over the seed. Exact means of covering seed will vary depending on the method of seeding, site constraints, and equipment available to the contractor.

SOIL SURFACE PROTECTION GUIDELINES

Covering a seeded area with mulch or erosion control blanket (ECB, also known as erosion matting) accomplishes several important objectives in a seeded area: 1) protects the soil surface from wind or water erosion, 2) helps retain soil moisture in the soil, 3) reduces risk of herbivory by birds and other animals, and 4) reduces soil surface temperatures. Like seed, any mulch or other erosion control products brought onto Colorado State Park property should be free of weeds. While many different products are available for your project, below are some fundamental guidelines for some of the more common products.

- A. Seeded areas should be covered by mulch or other soil surface protection treatments within 72 hours of seeding during dry periods. Seeded areas should be covered by soil surface protection treatments not more than 24 hours after seeding if rains are likely within the first 1-2 days after seeding.
- B. **Agricultural Hay (even if it is certified weed free) is not permitted on CPW properties** due to presence of troublesome exotic plants that are not currently prohibited by state law but are a problem in many of our parks. Agricultural straw (typically from wheat, barley, or oats) shall be Colorado certified weed free with bindings consisting of blue and orange Colorado weed free twine, specially produced galvanized shiny wire, or the bale will have a certified program tag indicating the weed free certification number. Ag straw should be applied uniformly at a rate of two tons (4,000 lbs)/acre, and crimped into the ground to prevent removal by wind.

- C. Mulching and crimping procedures and equipment shall conform to Colorado Department of Highway Standard Specifications, Section 213, subsection 213-03, *paragraph a*, 1999 Edition.
- D. All erosion control blankets shall be 100% biodegradable. Photodegradable mesh and other plastic or other synthetic products are not permitted due to damage to wildlife.

COMPLIANCE TO PARK RULES AND PERFORMANCE STANDARDS

- A. Keep equipment, vehicles and foot traffic off all landscaped area. All damaged materials shall be replaced and restored to original condition.
- B. The Project Administrator/Park Manager may suspend or limit operations if excess damage is occurring due to mud, extreme fire danger, etc., or due to the operator's failure to meet contract specifications.
- C. Fuel, or other chemical spills will be reported to State Park Manager immediately. Soil contaminated by loss of fuel, oil, or herbicides shall either be removed and placed in covered drums or other acceptable containers for proper disposal by Contractor or left in place and mixed with an encapsulating product such as RamSorb I, depending on the amount of contamination and the judgment of State Parks staff.
- D. All vehicles and motorized equipment must utilize effective manufacturer-certified spark arresters and muffler systems.
- E. Any wildfire started or observed by the contractor within the Park will be immediately reported in the following order of priority:
 - 1. The Park Manager.
 - 2. In the event the above park personnel can be reached, the fire will be reported to 911. Or to Interagency Dispatch via VHF.
 - 3. Lastly, Vendor will report any fire to the appropriate CPW Regional Office, depending on the park location: Please insert the appropriate number depending on the region in which the park lies:
 - Northeast Region: (303) 291-7227
 - Southeast Region: (719) 227-5200
 - Southwest Region: (970) 252-0855
 - Northwest Region: (970) 255-6100
- F. In order to quickly request assistance in the event of a fire or medical emergency, each crew working on the site will be required to have immediate access to a cell phone.
- G. Gas powered equipment will be refueled in the middle of the road. Refueling areas will have a minimum dimension of five by five feet, and will be cleared of all combustible material to mineral soil. No motorized equipment will be started within 15 feet of any refueling area.
- H. Motorized equipment will be allowed to cool for a minimum of ten minutes before being refueled.
- I. **Smoking will only be allowed in vehicles.** Each vehicle must have a properly serviced Class A, 10 pound fire extinguisher. All vehicles and motorized equipment must utilize effective manufacturer-certified spark arresters and muffler systems.
- J. All access roads will be kept passable at all times. Access roads and trails will be cleared by the Contractor at the end of each day.

- K. Neither trash nor litter will be left by the Contractor anywhere on the Park, access route, or vicinity. Daily hauling of any trash generated by Contractor is Contractor's responsibility.
- L. It is the responsibility of Vendor to follow all rules and regulations established for the State Park in which they are working.
- M. The work site should be left in a safe manner at the end of every work day, and Vendor will take all reasonable precautions to prevent injury to the public. The following precautions are required:
 - 1. All equipment will be safely stored at the end of every work day or when unattended. Ignition keys will be removed from machinery. All vehicles, chippers, or other towed vehicles will be safely parked on level ground with the wheels blocked and locked at the end of each work day or when unattended.
 - 2. Motorized equipment, gasoline and oil will be locked inside a vehicle or secured in a locked metal box at the end of each work day or when unattended.
 - 3. Contractor will exercise due caution at all times. When working within 100 feet of any road, Contractor shall post signs at least 100 feet in advance of the work area on each direction of travel. Such signs shall have a minimum dimension of two feet by two feet.

WARRANTY (RESEEDING AND REPAIR)

- A. As determined by the State Park Manager/staff, the Contractor shall restore and re-seed eroded areas and areas lacking a satisfactory stand of grasses at the end of 12 months following seeding. A satisfactory stand is defined as a minimal coverage of 6 healthy seeded plants per square foot, with bare patches (not including weeds) less than 20 square feet in size. Re-seeding and repair shall occur during the next earliest seeding season following notice from park staff that seeded areas require reseeding and repair, and shall follow guidelines and specifications described herein.
- B. Re-seeding and repair, if required, shall be at contractor's expense.

ACCEPTANCE OF SUBSTANTIAL COMPLETION

- A. Substantial Completion
Upon completion of all seeding operations the Contractor shall notify the State Park Manager/staff. If all work is acceptable, the State Park Manager/staff shall record that date and issue a Substantial Completion memorandum stating that the Contractor has completed these follow up seeding operations. The seed establishment period shall begin upon issue of Substantial Completion by the State Park Manager/staff.
- B. Establishment and Final Acceptance
 - 1. Seeding Areas: The Contractor shall maintain seeded areas, including all areas disturbed by contractor equipment during the seeding operation (i.e., staging areas, access routes, etc.) until date of Final Acceptance. During the establishment period, the Contractor is responsible for keeping the seeding areas free of weeds and debris. Weed control will be accomplished by mowing the site at any point where weed species start to set flowers and before the seed heads develop, or when weeds reach 6" in height in dryland seeding areas. Areas seeded and so maintained shall be protected against damage by construction activity and pedestrian traffic by the use of barriers and appropriate warning signs.
 - 2. Seed Germination Inspection: When germination is complete and seedlings are visible, the Contractor shall notify the State Park Manager/staff and request a "Germination Inspection" for

final acceptance of the seeded areas. Any areas deemed by the State Park Manager/staff at this time to be thin, weak or dead shall be reseeded at this time.

3. Areas shall be reseeded and managed for weeds until they meet the following criteria:
 - a. Seeded areas contain no more than ten percent (10%) absolute weed cover;
 - b. No bare patches (i.e., no germination of sown species) greater than 20 square feet exist; and
 - c. Seeded areas contain, on average, more than 6 desirable seedlings per square foot.
4. Contractor shall continue to maintain areas until they successfully pass inspection.

SITE CLEAN UP

Contractor shall make a reasonable effort to clean up project on a daily basis to maintain a neat and orderly site as directed by the State Park Manager/staff. The Contractor shall leave the site in an orderly condition free of all debris and in accordance with safety standards outlined above. All areas outside the Contract limits, which have been disturbed, shall be restored to their original condition in accordance with procedures as described herein. Cleanup shall also include the washing of all paths, roads and pads adjacent to site. The Owner reserves the right to withhold any payments for services until final cleanup has been completed.

APPENDIX B

SEED MIXES

The following pages include seed mixes for arid upland habitats, riparian habitats (i.e., streamside habitats, not including active streambanks), and upland areas in high traffic areas such as campgrounds and maintenance yards and other park facilities.

Where parks span a great range of elevation, seed mixes are provided in 1,000-foot elevations bands. Consideration has been given to geography, soils (soil texture, pH, salinity, etc.), coarse precipitation patterns, and potential natural communities of each park. However, these seed mixes are provided for general conditions within each park. When small (i.e., less than 5 acres) disturbances overlap with very specific soil conditions such as saline soils or low pH soils, a more specific seed mix may be developed for that specific site.

NOTE: If drill seeding is being use be sure to use half as much seed as what is called for in the broadcast seed mix.

When desired species are not commercially available, substitutions can be made. Each species in the seed mix is defined by a “life history code”. If a certain species in the seed mix is not available, or contains undesirable weed content, choose a species with the same life history code from the acceptable alternatives list with.

Definitions

Cultivar: A cultivated variety of a native plant, with intentional selection for agronomically desirable traits such as drought tolerance, rust resistance, even stand production, high germination rates, etc.

Ecotype: A genetically distinct plant population adapted to specific environmental conditions (elevation, geography, soils, precipitation, etc.). Ecotypic plant material is not selected for desirable traits.

Life History Codes: NAF: Native Annual Forb. NBF: Native Biennial Forb. NPF: Native Perennial Forb. NAG-L: Native Annual Grass-Like (grasses, sedges, or rushes). NPG-L: Native Perennial Grass-Like (grasses, sedges, or rushes). NS (or NPS): Native Shrub. NSubS: Native Sub-shrub.

NT: Native Tree.

PLS: Pure Live Seed. The amount of viable seed in a seed mix, which remains after one accounts for the chaff, unviable seed, inert material, crop seeds, weed seeds, and other material that is not part of the pure live seed listed in the desired seed mix.

VNS: Variety Not Stated. The designation “VNS” is typically used when a local ecotype is being sold, and may also be termed “yellow label” or Source Identified Seed, though there are subtle differences between these designations according to the Colorado Seed Growers Association.

Cherry Creek Upland Mix

Seeds Per sq. ft. (broadcast): 100

Vendor To Complete

Scientific Name (USDA)	Common Name (USDA)	Cultivar or Ecotype	Life History	% Mix	Pounds PLS Needed (1 acre)	Weed Content (name, % found)
<i>Achillea lanulosa var occidentalis</i>	common yarrow	Eagle or Yakima	NPF	2	0.020	
<i>Achnatherum hymenoides</i>	Indian ricegrass	White River	NPG-L	7	1.967	
<i>Aristida purpurea</i>	purple threeawn	CO Ecotype or Cultivar	NPG-L	7	1.173	
<i>Artemisia frigida</i>	prairie sagewort	CO Ecotype or Cultivar	NPF	2	0.019	
<i>Astragalus bisulcatus</i>	twogrooved milkvetch	CO Ecotype (or VNS)	NPF	1	0.109	
<i>Atriplex canescens</i>	fourwing saltbush	CO Ecotype (or VNS)	NPS	2	1.815	
<i>Bouteloua gracilis</i>	blue grama	Lovington or Hachita	NPG-L	10	0.589	
<i>Cleome serrulata</i>	Rocky Mountain beeplant	CO Ecotype (or VNS)	NAF	2	1.340	
<i>Dalea candida</i>	white prairie clover	CO Ecotype or Cultivar	NPF	4	0.627	
<i>Elymus elymoides</i>	squirreltail	Pueblo or Wapiti	NPG-L	6	1.413	
<i>Elymus trachycaulus</i>	slender wheatgrass	Pryor	NPG-L	10	3.004	
<i>Gaillardia aristata</i>	blanketflower	CO Ecotype (or VNS)	NPF	2	0.467	
<i>Gutierrezia sarothrae</i>	broom snakeweed	CO Ecotype (or VNS)	NSubS	2	0.387	
<i>Helianthus annuus</i>	common sunflower	CO Ecotype (or VNS)	NAF	2	1.245	
<i>Hesperostipa comata</i>	needle and thread	Paloma	NPG-L	6	2.273	
<i>Pascopyrum smithii</i>	western wheatgrass	Rosana	NPG-L	10	3.692	
<i>Penstemon secundiflorus</i>	sidebells penstemon	CO Ecotype (or VNS)	NPF	2	0.174	
<i>Poa fendleriana</i>	muttongrass	Ruin Cyn	NPG-L	8	0.392	
<i>Ratibida columnifera</i>	upright prairie coneflower	CO Ecotype (or VNS)	NPF	5	0.218	
<i>Sporobolus cryptandrus</i>	sand dropseed	CO Ecotype or Cultivar	NPG-L	10	0.078	
Total:				100	21.00	

ACCEPTABLE ALTERNATES

<i>Coreopsis tinctoria</i>	plains coreopsis	CO Ecotype (or VNS)	NBF
<i>Liatris punctata</i>	dotted blazing star	CO Ecotype or Cultivar	NPF
<i>Adenolium lewisii</i>	Lewis flax	CO Ecotype Only	NPF
<i>Penstemon angustifolius</i>	broadbeard beardtongue	CO Ecotype or San Juan Germ.	NPF
<i>Dalea purpurea</i>	purple prairie clover	Kaneb or Stephanie	NPF
<i>Abronia fragrans</i>	snowball sand verbena	CO Ecotype (or VNS)	NPF
<i>Lupinus plattensis</i>	Nebraska lupine	CO Ecotype (or VNS)	NPF
<i>Astragalus crassicaarpus</i>	groundplum milkvetch	CO Ecotype (or VNS)	NPF
<i>Astragalus drummondii</i>	Drummond's milkvetch	CO Ecotype (or VNS)	NPF
<i>Penstemon virgatus</i>	Front Range beardtongue	CO Ecotype or Bluebuckle	NPF
<i>Vicia americana ssp. americana</i>	American vetch	CO Ecotype (or VNS)	NPF
<i>Lupinus argenteus</i>	silvery lupine	CO Ecotype (or VNS)	NPF
<i>Thermopsis divaricarpa</i>	goldenbanner	CO Ecotype (or VNS)	NPF
<i>Artemisia dracunculul</i>	tarragon	CO Ecotype (or VNS)	NPF
<i>Bouteloua curtipendula</i>	sideoats grama	Niner	NPG-L
<i>Nassella viridula</i>	green needlegrass	Lodorm	NPG-L
<i>Sporobolus heterolepis</i>	prairie dropseed	CO Ecotype or Cultivar	NPG-L
<i>Muhlenbergia montana</i>	mountain muhly	CO Ecotype or Cultivar	NPG-L
<i>Koeleria macrantha</i>	prairie Junegrass	Sims Mesa	NPG-L
<i>Atriplex confertifolia</i>	shadscale saltbush	CO Ecotype (or VNS)	NPS
<i>Chrysothamnus viscidiflorus</i>	yellow rabbitbrush	CO Ecotype (or VNS)	NPS

Cherry Creek Riparian Mix

Seeds Per sq. ft. (broadcast): 80

Vendor To Complete

Scientific Name (USDA)	Common Name (USDA)	Cultivar or Ecotype	Life History	% Mix	Pounds PLS Needed (1 acre)	Weed Content (name, % found)
<i>Andropogon gerardii</i>	big bluestem	Bonilla	NPG-L	7	1.626	
<i>Andropogon hallii</i>	sand bluestem	Garden	NPG-L	1	0.348	
<i>Apocynum cannabinum</i>	Indianhemp	CO Ecotype (or VNS)	NPF	1	0.070	
<i>Asclepias speciosa</i>	showy milkweed	CO Ecotype or Cultivar	NPF	2	0.968	
<i>Bromus ciliatus</i>	fringed brome	CO Ecotype or Cultivar	NPG-L	8	1.181	
<i>Calamovilfa longifolia</i>	prairie sandreed	Pronghorn	NPG-L	5	0.636	
<i>Carex praegracilis</i>	clustered field sedge	CO Ecotype or Cultivar	NPG-L	8	0.419	
<i>Elymus canadensis</i>	Canada wildrye	Mandan	NPG	10	3.057	
<i>Elymus lanceolatus ssp. lanceolatus</i>	thickspike wheatgrass	Critana	NPG-L	10	2.581	
<i>Helianthus maximiliani</i>	Maximilian sunflower	CO Ecotype (or VNS)	NPF	3	0.532	
<i>Juncus arcticus ssp. littoralis</i>	mountain rush	CO Ecotype or Cultivar	NPG-L	10	0.033	
<i>Muhlenbergia asperifolia</i>	scratchgrass	CO Ecotype (or VNS)	NPG-L	6	0.139	
<i>Panicum virgatum</i>	switchgrass	Forestburg	NPG-L	12	1.818	
<i>Poa palustris</i>	fowl bluegrass	CO Ecotype (or VNS)	NPG-L	8	0.147	
<i>Puccinellia nuttalliana</i>	Nuttall's alkaligrass	Anatone	NPG-L	7	0.116	
<i>Solidago canadensis</i>	Canada goldenrod	CO Ecotype (or VNS)	NPF	3	0.023	
<i>Sporobolus airoides</i>	alkali sacaton	Saldado	NPG-L	7	0.152	
<i>Sporobolus cryptandrus</i>	sand dropseed	CO Ecotype or Cultivar	NPG-L	8	0.050	

Total: 116 13.90

ACCEPTABLE ALTERNATES

<i>Vicia americana ssp. americana</i>	American vetch	CO Ecotype (or VNS)	NPF
<i>Solidago missouriensis</i>	Missouri goldenrod	CO Ecotype (or VNS)	NPF
<i>Carex pellita</i>	woolly sedge	CO Ecotype or Cultivar	NPG-L

Cherry Creek Campground & Facilities Maintenance Mix

Seeds Per sq. ft. (broadcast): 100

Vendor To Complete

Scientific Name (USDA)	Common Name (USDA)	Cultivar or Ecotype	Life History	% Mix	Pounds PLS Needed (1 acre)	Weed Content (name, % found)
<i>Dalea candida</i>	white prairie clover	CO Ecotype or Cultivar	NPF	4	0.627	
<i>Sporobolus cryptandrus</i>	sand dropseed	CO Ecotype or Cultivar	NPG-L	8	0.062	
<i>Ratibida columnifera</i>	upright prairie coneflower	CO Ecotype (or VNS)	NPF	5	0.218	
<i>Gutierrezia sarothrae</i>	broom snakeweed	CO Ecotype (or VNS)	NSubS	2	0.387	
<i>Pascopyrum smithii</i>	western wheatgrass	Rosana	NPG-L	14	5.168	
<i>Gaillardia aristata</i>	blanketflower	CO Ecotype (or VNS)	NPF	2	0.467	
<i>Achnatherum hymenoides</i>	Indian ricegrass	White River	NPG-L	7	1.967	
<i>Hesperostipa comata</i>	needle and thread	Paloma	NPG-L	6	2.273	
<i>Bouteloua gracilis</i>	blue grama	Lovington or Hachita	NPG-L	14	0.824	
<i>Penstemon secundiflorus</i>	sidebells penstemon	CO Ecotype (or VNS)	NPF	2	0.174	
<i>Elymus elymoides</i>	squirreltail	Pueblo or Wapiti	NPG-L	8	1.884	
<i>Artemisia frigida</i>	prairie sagewort	CO Ecotype or Cultivar	NPF	2	0.019	
<i>Elymus trachycaulus</i>	slender wheatgrass	Pryor	NPG-L	14	4.206	
<i>Achillea lanulosa var occidentalis</i>	common yarrow	Eagle or Yakima	NPF	2	0.020	
<i>Poa fendleriana</i>	muttongrass	Ruin Cyn	NPG-L	10	0.489	

Total: 100 18.79

ACCEPTABLE ALTERNATES

<i>Thelesperma filifolium</i>	stiff greenthread	CO Ecotype (or VNS)	NAF
<i>Coreopsis tinctoria</i>	plains coreopsis	CO Ecotype (or VNS)	NBF
<i>Liatris punctata</i>	dotted blazing star	CO Ecotype or Cultivar	NPF
<i>Adenolium lewisii</i>	Lewis flax	Co Ecotype Only	NPF
<i>Penstemon angustifolius</i>	broadbeard beardtongue	CO Ecotype or San Juan Germ.	NPF
<i>Dalea purpurea</i>	purple prairie clover	Kaneb or Stephanie	NPF
<i>Astragalus crassicaarpus</i>	groundplum milkvetch	CO Ecotype (or VNS)	NPF
<i>Penstemon virgatus</i>	Front Range beardtongue	CO Ecotype or Bluebuckle	NPF
<i>Vicia americana ssp. americana</i>	American vetch	CO Ecotype (or VNS)	NPF
<i>Thermopsis divaricarpa</i>	goldenbanner	CO Ecotype (or VNS)	NPF
<i>Artemisia dracunculus</i>	wild tarragon	CO Ecotype (or VNS)	NPF
<i>Bouteloua curtipendula</i>	sideoats grama	Niner	NPG-L
<i>Nassella viridula</i>	green needlegrass	Lodorm	NPG-L
<i>Sporobolus heterolepis</i>	prairie dropseed	CO Ecotype or Cultivar	NPG-L
<i>Muhlenbergia montana</i>	mountain muhly	CO Ecotype or Cultivar	NPG-L
<i>Koeleria macrantha</i>	prairie Junegrass	Sims Mesa	NPG-L
<i>Atriplex confertifolia</i>	shadscale saltbush	CO Ecotype (or VNS)	NPS
<i>Chrysothamnus viscidiflorus</i>	yellow rabbitbrush	CO Ecotype (or VNS)	NPS