



Critical Area Planting (ACRE)

Code 342

Montana Conservation Practice Specification Sheet

DEFINITION

Establishing permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical, or biological conditions that prevent the establishment of vegetation with conventional practices.

PURPOSE

Stabilize the soil to reduce damage from sediment and runoff, improve wildlife habitat and visual resources.



CONDITIONS WHERE PRACTICE APPLIES

On highly erodible or critically eroding areas that cannot be stabilized by ordinary conservation treatment and management and if left untreated can cause severe erosion or sediment damage. Examples of applicable areas are dams, dikes, mine spoil, levees, cuts, fills, surface-mined areas, abandoned feedlots, areas burned by wildfires and denuded or gullied areas where vegetation may be difficult to establish by conventional planting methods. When establishing and maintaining vegetation on channel banks, berms, spoil and associated areas, refer to the Field Office Technical Guide, (FOTG), Section IV – Practice Standards and Specifications, Channel Bank Vegetation (Code 322).

CONSERVATION MANAGEMENT SYSTEM

Critical Area Planting is used concurrently with other practices as part of a conservation management system. It is used in conjunction with practices such as grassed waterways, diversions, stream banks, construction areas and other practices needed on a site-specific basis to address natural resource concerns and the producer's objectives.

OPERATION AND MAINTENANCE

Use of the critical area should be avoided during periods of establishment. Use thereafter should be minimal and based on physiological condition of vegetation and erodibility of the site. The site may require permanent protection from both domestic livestock and wildlife. Refer to FOTG, Section IV – Practice Standards and Specifications, Fence (Code 382).

All seedings will be protected from grazing by domestic animals and other disturbances until stand establishment. Seeded species may be considered established when they are well rooted - not easily pulled out of the ground by hand - and/or are producing reproductive stems. A minimum of one full growing season is recommended. Establishment weed control will be by clipping or labeled herbicides.

OPERATION AND MAINTENANCE -- CONTINUED

Plant densities of 10–40 plants per square foot for grasses and one to five plants per square foot for shrubs are desirable. However, judgment should be used when assessing stand adequacy on shallow, drought-prone sites, or sites where other limitations compromise stand establishment.

Maintenance needed for this practice includes:

1. Periodic inspection and evaluation of vegetation to determine maintenance needs.
2. Control of noxious weeds by appropriate recommended integrated pest management.
3. Replanting due to drought, fire, insects, or other events that prevented adequate stand establishment should be addressed within one to three years of planting. Recommendations may vary from complete re-establishment to over seeding or spot planting.
4. If FOTG, Section IV – Practice Standards and Specifications, Use Exclusion (Code 472) is not a planned component, than Prescribed Grazing (Code 528) and/or Forage Harvest Management (Code 511) will be applied to an established planting.
5. Repair of appurtenances and fences.
6. After establishment, the management of the area should comply with the FOTG, Section III– Resource Management System for the planned land use.

SEEDBED PREPARATION



Available soil should be identified, salvaged, and stored by layers prior to construction. Caution should be exercised so as not to uncover or re-distribute on-site toxic materials. Toxic materials (if applicable) should be buried appropriately prior to site preparation. Topsoil should not be stored longer than two years to maintain biological attributes. Sites that are unsuitable for vegetative establishment should be covered with a minimum of four inches of topsoil, or if not available, whatever topsoil is available. Topsoil should be spread evenly over the subsoil. If particle sizes are significantly different between subsoil and topsoil surface interfaces, mixing should occur to facilitate water infiltration, percolation, and root penetration.

Sites reshaped with heavy equipment may have a smooth, hard surface with compacted soil making it difficult to prepare a good seedbed. Disking, ripping, or other treatment may be necessary to prepare the site for seeding. During site preparation, all debris that could potentially interfere with the drill seeding operation should be removed.

A suitable seedbed must be prepared to facilitate germination and provide weed control. Prepare a firm, clean, weed-free seedbed prior to seeding using mechanical tillage equipment. A seedbed is considered firm when the boot heel imprint of an average person leaves a maximum impression in the soil of no more than one-half inch. On sites where equipment cannot be operated, the seedbed will be prepared by hand, excavator, dozer, etc., to leave the surface with divots, or mini-basins for seed catchment. Broadcast seeding should be on freshly roughened soil surfaces. The horizontal indentations left by tracked equipment may provide a suitable broadcast or drill planting surface on steep slopes.

Reseeding after wildfires should be limited to severely burned sites with high-fire intensity. A description of Fire Burn Intensity Classification is at the following site: <http://www.mt.nrcs.usda.gov/technical/fires/severity.html>. In general, these are steep-timbered north and east slopes that contained a dense forest canopy and natural vegetative recovery is about five to ten years post fire. Wildfires will prepare a favorable seedbed for seeding. Wildfires remove the ground vegetation and the duff layer leaving an exposed mineral soil bed. Soil erosion potential is significantly increased following a wildfire. Reseeding burned sites is designed to decrease the likelihood of erosion and sediment movement down slope, to reduce noxious weed invasion or spread, and fulfill management objectives.

FERTILIZATION

Many critical area soils are low in most plant nutrients and will require a soil analysis to base fertilizer recommendations. Fertilizer will be applied according to recommendations determined from a soil test. Refer to FOTG, Section IV – Practice Standards and Specifications, Nutrient Management (Code 590). Caution should be used when recommending nitrogen application during establishment years, as the additional nitrogen may benefit more aggressive weed species. If the soil test shows a Nitrogen (N) deficiency – a minimal amount of N – less than 20 pounds actual, can be applied as a starter fertilizer. Phosphorus is particularly beneficial to legume stand establishment and maintenance.

When soils are coarse, sandy, gravelly or granitic, or when water quality will be adversely affected, reduce fertilizer rates.

Follow up applications of fertilizer will be applied when needed and will be based on a soil test completed within the previous five years.

SPECIES SELECTION

Plant species and their cultivars must be adapted to the site and the intended use. Selection of species shall be based on:

- Climatic conditions such as annual rainfall, seasonal rainfall patterns, length of growing season, temperature extremes, USDA Plant Hardiness Zones, Ecological Sites, or Major Land Resource Area (MLRA).
- Soil condition and site position attributes such as soil texture, pH, available water-holding capacity, slope, aspect, soil depth, or restrictive layers, inherent fertility, salinity and alkalinity, drainage class, flooding and ponding, and severe levels of toxic elements that may be present (i.e., selenium, aluminum, etc.).
- Plant resistance to disease and insects common to the site.
- Plant compatibility with other species/cultivars in rate of establishment, maturity, palatability, and growth habit when seeded together.

A combination of sod forming and rhizomatous species are beneficial with a majority of any one mixture being rhizomatous. Use certified seed and recommended cultivars whenever possible. Specific species selection will be in accordance with vegetative FOTG, Section IV – Practice Standards and Specifications, Pasture and Hay Planting (Code 512), Range Planting (Code 550), or Forest Trails and Landings (Code 655).

When reseeding after wildfires, select quick establishing and easy germinating species that will provide quick cover to control erosion and plant competition for noxious weeds. Often this is not the climax plant community. Those species will occupy the site over time as the pioneer species fade. A list of species to consider for reseeding after wildfires can be found at: <http://www.mt.nrcs.usda.gov/technical/fires/reveg.html>. Select a one to three species mix. When selecting species for a mix, do not mix native with introduced species, with the exception of Slender Wheatgrass can be mixed with introduced species.

Specification MT342-4

Seed will comply with the current Montana State Seed Law and Regulations. See FOTG, Section I – Laws. All seed and planting materials shall be labeled and meet State seed quality law standards.



SEEDING RATES AND MIXTURES

Seeding rates, species, and variety selection will be chosen to allow for optimum vegetative establishment for the intended use. Planting dates, methods, cultivars, and seeding rates for non-irrigated land are shown in vegetative practice specifications. **The planting rates for Critical Area Planting will be double the rates listed in the appropriate practice specification (double the drill rates if the site can be drilled or double the broadcast rates if the site can be only be broadcast or hydro-seeded). Except for reseeding after wildfires, then the rate will be 1.25 to 1.5 times (50 to 60 seeds per square foot) the broadcast rates listed in the appropriate specification.** Refer to FOTG and methods, Section IV – Practice Standards and Specifications, Range Planting (Code 550), Pasture and Hay Planting (Code 512), or Forest Trails and Landings (Code 655). Conservation planners should reference material such as currently available *Forage Suitability Groups, Ecological Site Descriptions, Dryland Pasture in Montana and Wyoming*, Montana State University EB19, September 2000, or the Montana Interagency Plant Materials Handbook, EB69, June 1990, for species attributes and selection.

Where legumes are a stand component, the legume should be inoculated with the proper species of Rhizobia bacteria. Refer to vegetative practice specifications, FOTG, Section IV – Practice Standards and Specifications, Range Planting (Code 550), Pasture and Hay Planting (Code 512), or Forest Trails and Landings (Code 655).

Based on germination and purity information found on the seed tag, adjust seeding rates at the field site to insure the required amount of Pure Live Seed (PLS) is applied. Refer to [Montana Plant Materials Technical Note No. 38](#), Reading Seed Packaging Labels and Calculating Seed Mixtures, dated October 2002.

SEEDING METHODS

In many cases the potential for water erosion may occur before the stand is completely established. Planting on the contour across the slope may help reduce the effects of water erosion. Broadcast seeding should be on freshly disturbed and roughened soil surfaces.

Planting may be completed using a variety of techniques and equipment depending on the specific site. If a drill is to be used, best results are obtained with a double disk opener, packer wheels and deep bands, and seed agitator. Drills must be calibrated to the correct seeding rate and set for the correct planting depth. Refer to [Montana Technical Note 30](#), Drill Calibration, 1985. When broadcast seeding, a freshly roughened surface will accommodate seed catchment. The seed will be covered by use of hand raking or by dragging harrows, chains, or other suitable equipment over the surface or mulched to cover the seed where practical. **If seeding is to be completed by broadcast methods or hydro-seeding, seeding rates must be doubled from critical area rate.** If planting will be harrowed and packed after broadcasting, standard seeding rates may be used.

Small grass seeds should be planted no deeper than 1/4-inch. Large grass seeds will be planted no deeper than 1/2-inch.

Rice hulls or other diluents may be used to facilitate fluffy or multiple seed size emulsion, flow, and distribution.

All drill-seeded species will be planted at 14-inch rows or less except for Russian wildrye, which should be planted at 18-inch spacing. Where erosion hazards are possible, two seeding operations should be completed with the first operation perpendicular, serpentine to the second, or in alternate rows with forbs or shrubs. Where slopes are greater than five percent, planting should be completed on the contour.

The horizontal indentations left by tracked equipment may provide a suitable broadcast planting site on steep slopes.

A helicopter or fixed wing aircraft is the most efficient and economical method when reseeding large areas after wildfires. Calibrate your swath width based on the species mix selected. Typically, the swath width from a bucket seeder on a helicopter is 40 to 60 feet and about 40 to 50 feet for fixed wing.

TIME OF SEEDING

The objective to establishment of critical area plantings is to provide protective cover as soon as possible to minimize any wind or water erosion. In general, spring seeding should be completed by May 15. Seeding after May 15 may occur when there is at least two feet of moist soil and moisture is within two inches of the soil surface. Dormant fall seeding can be made after October 15 or when soil temperatures two inches below the soil surface remains at 40° F. or less for ten or more days. Aerial seeding following wildfires must be done prior to March 1 following the year of disturbance. If irrigation is planned after seeding, planting may be at any time of the growing season.

MULCHING

Mulches are recommended on slopes steeper than two to one or which have a critical erosion concern. These slopes should be prepared, prior to mulching, to a roughened state by hand, excavator, dozer, etc., to leave a loosened surface with divots and mini-basins for broadcast seed catchment.

Straw is the preferred mulch, when needed, but needs to be uniformly applied no deeper than two inches and effectively anchored with equipment such as rollers and crimpers. Tackifiers, woven netting, and other covers can be used to anchor mulch when slopes are too steep to use equipment on the site.

Wheat straw deteriorates less rapidly and results in less volunteer growth compared to barley straw. Use clean straw to minimize spread of noxious weeds.

Apply ten pounds of actual nitrogen per ton of straw to balance the Carbon: Nitrogen ratio and avoid a Nitrogen deficiency during organic mineralization.

Woven, fabric, and artificial mulches can also be used.

A split hydro-mulch, hydro-planting procedure is recommended on suitable sites. Seed and fertilizer should be applied first to optimize seed to soil contact, and then the mulch is hydro-mulched over the site.

When plantings are to be irrigated, use non-erosive methods to maintain adequate moisture in at least the upper six inches of soil during the first four weeks and then in the upper 12 inches until the end of the growing season. Native seedlings may be susceptible to excessive irrigation during establishment.

For further technical information, refer to the FOTG, Section IV – Practice Standards and Specifications, Mulching (Code 484) Practice Standard.

Specification MT342-6

COVER CROPS

Nurse crops will not be used.

Where quick protection is required to reduce wind or water erosion a cover crop may be seeded one season prior to the desired vegetation at the following rates.

CROP	SEEDING Lbs/ac	SEEDS per Ft ²
Spring Wheat	20	6.7
Barley	15	4.5
Oats	20	6.5

Temporary cover crops can be used for up to two years where cover is needed. If construction is delayed on a site that has been disturbed, or will be redistributed in the near future, temporary cover crops can be used to protect the site against erosion or stabilize the site for eventual permanent vegetation establishment. In the latter situation, the cover crop must be clipped or chemically terminated prior to seed set control volunteer competition to new seedlings. Refer to the FOTG, Section IV – Practice Standards and Specifications, Cover Crop (Code 340) Practice Standard.

WOODY PLANTING

When considering bioengineering techniques for protecting critical area, refer to National Engineering Handbook, Part 650, Chapter 18, Soil Bioengineering for Upland Slope Protection and Erosion Reduction.

When establishing and maintaining vegetation on channel banks, berms, spoil, and associated areas, follow FOTG, Section IV – Practice Standards and Specifications, Channel Bank Vegetation (Code 322) Practice Standard and the [Montana Plant Materials Technical Note No. 36](#), Users Guide to Description, Propagation and Establishment of Native Shrubs and Trees for Riparian Areas in the Intermountain West, dated February 2001. Acceptable periods for obtaining woody cuttings from host plants and when woody cuttings will be planted is listed on the web site <http://nativeplants.for.uidaho.edu>.

Where woody plantings will be installed, the critical area will first be stabilized with herbaceous cover – as stated above – and broadleaf weeds controlled with labeled herbicides. Planting of woody species will be in accordance with the FOTG, Section IV – Practice Standards and Specifications, Tree/Shrub Establishment (Code 612). In most cases, trees and shrubs will be planted randomly rather than in a pattern following herbaceous plant establishment. This will allow the use of selective herbicides for broadleaf weed control during grass establishment. A map indicating planted areas should be developed to document the location of the plants for avoidance during routine maintenance operations.

SODDING

When using sod, the surface will be smoothed so air pockets will not form beneath the sod. Sod strips will be tamped tightly together in place. Sod will be staked down as needed to protect from movement on steep slopes. Cut sod will be kept moist. The maximum period between cutting and laying will not exceed 96 hours.

Areas covered with sod will be irrigated until sod has become well established. Certain species may require permanent irrigation to maintain adequate cover. Dryland sites that receive less than 18 inches of precipitation will not be sodded unless irrigated. Dryland sites that receive greater than 18 inches of precipitation will be sodded early spring to May 1. Irrigated sites can be sodded from early spring to September.

The following species are adapted for sod purposes:

INTRODUCED SPECIES	NATIVE SPECIES
Creeping Foxtail	Western Wheatgrass
Reed Canarygrass	Prairie Sandreed
Intermediate Wheatgrass	Slender Wheatgrass
Pubescent Wheatgrass	Streambank Wheatgrass
Kentucky Bluegrass	Thickspike Wheatgrass
Smooth Bromegrass	

STABILIZE CRITICALLY ERODING AREAS

Treatment of adjoining or upstream sites may be required prior to establishment of vegetation on critically eroding areas. Areas not suitable as a medium for plant growth should be covered with a minimum of four inches of topsoil or whatever is available and reasonable for the site. When stabilizing areas prone to sheet and rill erosion or wind erosion, the amount of established vegetative cover needed to reduce erosion within the soil loss tolerance (T) or other appropriate planned soil loss objective, shall be determined using WEQ or RUSLE2. Calculations shall account for the effects of other practices in the conservation management system.

Areas such as gullies, mined lands, or headcuts should first be stabilized utilizing other conservation practices. Water control practices will be installed as needed to control surface runoff and break up existing erosion patterns. Where there is concern for water quality reference FOTG, Section IV – Practice Standards and Specifications, Contour Buffer Strips (Code 332) or Riparian Forest Buffers (Code 391). Refer to [Montana Plant Materials Technical Note No. 36](#), Users Guide to Description, Propagation and Establishment of Native Shrubs and Trees for Riparian Areas in the Intermountain West, dated February 2001, and [Montana Plant Materials Technical Note No. 37](#), Users Guide to Description, Propagation and Establishment of Wetland Plant Species and Grasses for Riparian Areas in the Intermountain West, dated February 2001, for establishment and rates.

Areas will be shaped or graded where practical to eliminate existing surface erosion patterns, improve the ease of seeding operations, and provide a freshly disturbed surface to increase seed catchment.

OTHER CONSIDERATIONS

Consider the effects on erosion and the movement of sediment and soluble sediment-attached substances carried by runoff.

Consider the short-term and construction-related effects on downstream watercourses.

Consider the filtering effect of vegetation on movement of sediment and dissolved sediment-attached substance.

These sites are generally severely eroded or disturbed, have little topsoil, and have low fertility and few, if any, resident seeds. High seeding rates and a starter fertilizer are needed to insure adequate vegetative cover.

When seeding grasses, consider applying nitrogen fertilizer. Consider forms containing sulfur.

When seeding legumes, consider applying phosphorus fertilizer.

Consider the effective range of straw blowing equipment and hydro-seeders when use is planned.

Consider using hydro planting and mulching on steep, inaccessible sites not suitable for straw mulch planting. Do not use when high winds or animal or foot traffic are expected to interfere.

When selecting species for planting, habitat needs of target wildlife species should be considered.

PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for each treatment area and include planting area preparation; species to be planted; methods and rates of planting; planting depth; time of planting; fertilizer requirements; irrigation requirements; and management or establishment requirements.

REFERENCES

Montana Interagency Plant Materials Handbook. Montana State University Extension Service, EB69, April 1993.

Selecting Species for Revegetation. Montana Agricultural Experiment Station, Montana State University, Bozeman, Montana. Special Report 3, May 1984.

Plant Materials for use on Surface-Mined Lands in Arid and Semiarid Regions. USDA-SCS. SCS-TP-157. January 1982.

Handbook of Western Reclamation Techniques. University of Wyoming, Office of Research. 1996.

Native Plant Handbook. USDA-Forest Service Northern Region, Missoula, Montana. 1995.