OGMCOAL DNR <ogmcoal@utah.gov>

Reclamation of Cottonwood Mine Drain Field Area and Cottonwood Fan Portal- Questions

Lisa Reinhart <lreinhart@utah.gov> Thu, Jan 22, 2015 at 9:15 AM
To: Dennis Oakley <Dennis.Oakley@pacificorp.com>, OGMCOAL DNR <ogmcoal@utah.gov>

Dennis,

Regarding the seed mixes you sent me and asked for approval. Why not use the same seed mix for both locations? I may have missed something in the plan but it looks to me like you should be using the seed mix on page 23 Part 4 for all final reclamation. Please let me know if I am incorrect with this. If another seed mix was previously approved, please reference that approval so I can locate it in the plan. The only concern I have with the seed mix that is already approved in the plan is the Big white rabbitbrush. Since it is approved it's not something I would push to change but in the future I would really question using this seed.

My specific comments with the mixes you provided are:

For the Cottonwood Fan Portal- I would consider removing the Big White Rabbitbrush and also rework the seeding rate. It seems pretty high and I am sure expensive. My question here is why is this seed mix is different than the one in the MRP. You said on the phone yesterday this mix was previously approved- can you point me to that approval?

For the Mine Drain Field area- Again, why is the seed mix not the same seed mix in the plan mentioned above. I have some concerns with the mix you provided me, specifically the crested wheatgrass. It states in the plan (page 21 part 4) field trials will be used to demonstrate whether the introduces species can establish a diverse, effective and permanent cover. If you have the results of these field trials I would like to review them. Crested wheatgrass is appropriate in some places for reclamation but I would argue not included with a native seed mix.

I have attached documents on crested wheatgrass and rabbitbrush to provide more details. The main point is that these species are extremely competitive with the other native seeds in the mix and they can easily rob them of moisture and nutrients. Although they may be very good at establishing cover on disturbed ground, that doesn't mean they equal good habitat for wildlife or livestock forage.

Per Page 26, Part 4, Reclamation plan. 7.a. The range condition of all reference areas will be re-assessed in 1989 and every 5 years thereafter. Please provide the most report for 2013-2014. I did not find it in the annual report.

One last comment is that of the seed mix rate. It seems high and I am sure expensive. I have attached a spreadsheet that includes all the species in your plan (with the exception of Intermediate wheatgrass because it was not available in the tool & does not include the trees). Note that at a broadcast seeding, total PLS is around 23 lbs.

I look forward to hearing back from you soon.

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3 attachments

mcarthur-chrysothamnusnauseosus2004.pdf
160K

CWG_agcr.pdf
150K

Range_Planting_Broadcast (Cottonwood).xlsm
209K

Plant Guide

CRESTED WHEATGRASS

Agropyron cristatum (L.) Gaertn.

Plant Symbol = AGCR

Contributed By: USDA, NRCS, Idaho State Office

Jeanne M. Janish
Cronquist et al. (1977)
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Alternate Names
fairway wheatgrass, fairway crested wheatgrass

Uses
Grazing/rangeland/hayland: Crested wheatgrass is a perennial, introduced grass commonly seeded in the arid sections of the western United States. Crested wheatgrass is commonly recommended for forage production. It is palatable to all classes of livestock and wildlife. It is a preferred feed for cattle, sheep, horses, and elk in spring and also in the fall, if additional growth occurs. It is considered a desirable feed for deer and antelope in spring and fall, if additional growth occurs. It is not considered a desirable feed for cattle, sheep, horses, deer, antelope, and elk in the summer. In spring, the protein levels can be as high as 18 percent and decrease to about 4 percent as it matures. Digestible carbohydrates remain high throughout the active growth period. It is commonly utilized for winter forage by cattle and horses, but protein supplements are required to ensure good animal health. It is noted for its ability to withstand very heavy grazing pressure (65-70 percent utilization), once stands are established. Crested wheatgrass is a good forage producer in the areas where best adapted. Crested wheatgrass is generally not recommended above 12-14 inches of precipitation, because better, alternative forage species are available. Crested wheatgrass stands generally produce from 1.5 to 2 times more than native grass stands, generally in the bluebunch wheatgrass (*Pseudoroegneria spicata*) ecosystems. The best forage types, in order, are Siberian, desert, and Fairway.

Erosion control/reclamation: Crested wheatgrass is well adapted to stabilization of disturbed soils. It competes well with other aggressive introduced plants during the establishment period. Crested wheatgrass is not compatible in mixes with native species, because it is very competitive and will out-compete slower developing native species. Their drought tolerance, fibrous root systems, and good seedling vigor make these species ideal for reclamation in areas receiving 8 to 16 inches annual precipitation. In areas above 14 inches annual precipitation, 'Roadcrest' and 'Ephraim' may exhibit their rhizomatous traits and make excellent low maintenance lawns when broadcast seeded to establish thick lawns. These grasses can be used in urban areas where irrigation water is limited to provide ground cover, weed control and to stabilize ditch banks, dikes, pipelines, power lines, and roadsides.

Wildlife: Birds and small rodents eat crested wheatgrass seeds. Deer, antelope, and elk graze it, especially in spring and fall. Upland and songbirds utilize stands for nesting. Where it is planted as a monoculture, the resulting biodiversity is lower than that found in a diverse plant community.

Status
This is a species introduced from Asia. Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's

current status, such as, state noxious status and wetland indicator values.

Description

General: Grass Family (Poaceae). It is a long-lived, cool season, drought tolerant, introduced, and winter hardy grass with an extensive root system. Related species include the following: Desert wheatgrass (*Agropyron desertorum*) and Siberian wheatgrass (*Agropyron fragile*).

Spike 2 to 7 cm long. The spikelets more widely spreading with the glumes somewhat contoured, gradually tapering into awns 2 to 5 mm long. Fairway or crested wheatgrass has short-broad spikes that taper at the top, smaller seeds, grows shorter, and has finer leaves and stems than desert wheatgrass. Desert wheatgrass has longer spikes than fairway, but vary in spike shape from comb-like to oblong. Fairway and desert grow from 1 to 3 feet tall with seed spikes 1.5 to 3 inches long. Spikelets are flattened, closely overlapping, oriented at a slight angle on the rachis. The lemmas are linear-lanceolate narrowing to a short awn. Glumes are awl shaped and firm, and keeled. Culms are erect. Leaves are flat, smooth below, slightly scabrous (coarse) above and vary in width from 2 to 6 mm. Siberian is very similar to fairway and desert, but has finer leaves and stems, narrower and awnless glumes and lemmas, and the spikelets are more ascending, which gives the spike a narrow, oblong, sub-cylindrical shape. Siberian is more droughts tolerant and retains its greenness and palatability later into the summer than either desert or fairway.

Distribution

This species was introduced from Asia and is naturalized from the Pacific coast to New York. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Establishment

Crested wheatgrass should be seeded with a drill at a depth of 1/2 inch or less on medium to fine textured soils and 1 inch or less on coarse textured soils. Single species seeding rates recommended for crested wheatgrass and its close relatives are 5-7 pounds Pure Live Seed (PLS) per acre or 20 to 30 PLS per square foot. Single species seeding rates recommended for Siberian wheatgrass is 6-8 pounds PLS per acre or 24-30 PLS per square foot. If used as a component of a mix, with alfalfa (*Medicago* spp.), sainfoin (*Onobrychis viciifolia*), yellow sweetclover (*Melilotus officinalis*), cicer milkvetch (*Astragalus cicer*), or others adjust to percent of mix desired. For mined lands and other harsh critical areas, the seeding rate should be increased to 10-12 pounds PLS per acre or 40 to 50 PLS per square foot. Mulching and light irrigation on highly disturbed, droughty areas are beneficial for stand establishment.

The best seeding results are obtained from seeding in very early spring on heavy to medium textured soils and as dormant seeding in late fall on medium to light textured soils. Late summer (August - mid September) seedings are not recommended unless irrigation is available.

Crested and Siberian wheatgrasses establish quickly, with 'Hycrest' and 'Vavilov' noted for their seedling vigor. They should not be seeded with native species, unless seeding rates are very low (< 2 pounds per acre). They may compliment native stands that are already partially established. Under favorable conditions they are good weed barriers.

Stands may require weed control measures during establishment, but application of 2,4-D should not be made until plants have reached the four to six leaf stages. Mow when weeds are beginning to bloom to reduce weed seed development. Grasshoppers and other insects may also damage new stands and use of pesticides may be required.

Adaptation: Crested wheatgrass is adapted for non-irrigated seedings, where annual precipitation averages 8-16 inches or more (fairway should average 10 inches or more), and where the frost-free period is generally less than 140 days. Desert and hybrid cross are superior above 8 inches annual precipitation in spring recovery and grazing readiness. On droughty sites with 7-10 inches annual precipitation, Siberian wheatgrass may be the best choice. It is known to surpass desert and hybrid cross in rate of establishment, stand persistence, and total forage yield on the more arid sites. Siberian has been seeded in areas with as little as 5 inches of precipitation with some success.

Crested wheatgrass should generally be seeded below 7,000 feet elevation. Fairway does well up to 9,000 feet elevation. Crested wheatgrass does well on shallow to deep, moderately course to fine textured, moderately well to well drained soils. Under saline conditions, vigor and production are reduced. Fairway is not well adapted to silty soils. Siberian types are well adapted to light-sandy, droughty soils. All crested wheatgrasses are cold tolerant and can withstand moderate periodic flooding, not exceeding 7-10 days in the spring. They are very tolerant of fire. They will not tolerate long periods of

inundation-standing water, poorly drained soils, or excessive irrigation.

Management

Crested wheatgrass produces leaves in the spring about 10 days after bluegrass species and about two weeks earlier than native wheatgrasses. They make good spring growth, little summer growth and good fall growth if moisture is available.

Crested wheatgrass has good palatability for livestock and some wildlife. Livestock and wildlife will graze crested wheatgrass throughout the spring growing season until it becomes too coarse, and again in fall if re-growth occurs. Established stands can withstand very heavy grazing.

New stands of crested wheatgrass should not be grazed until they are firmly established and have started to produce seed heads. Six inches of new growth should be attained in spring before grazing is allowed in established stands. Three inches of stubble should remain at the end of the grazing season to maintain the long-term health of the plant. In addition, leaving three inches or more stubble will result in a 10 - 14 day earlier growth period or "green-up" in spring.

Crested wheatgrass is a low maintenance plant requiring little additional treatment or care. However, spring/fall deferment or grazing rotations are recommended to maintain plant health and to maximize forage production potential.

Crested wheatgrass is competitive with weedy species, but can be crowded out by some aggressive introduced weedy species and native woody species.

Crested wheatgrass can be used for hay production and will make nutritious feed, but is more suited to pasture use. Light infrequent applications of nitrogen (25 pounds/acre) and light irrigation will increase total biomass production and lengthen the growing period. Re-growth of crested wheatgrass is slow.

Environmental Concerns: Crested wheatgrass is long-lived and spreads primarily via seed. Spread of rhizomatous varieties is very slow in the case of the 'Roadcrest' and 'Ephraim'. They are not considered "weedy" or invasive species. Most seedings do not spread beyond original plantings. They will cross with each other, but do not cross with native species.

Crested wheatgrass resists cheatgrass competition better than most native species, because it germinates earlier and grows more rapidly at colder temperatures. This has an important competitive advantage, when dealing with winter annual species, such as cheatgrass.

Full, properly managed stands of crested wheatgrass generally exclude native grasses and forbs. When inter-seeded into native stands, crested wheatgrass commonly co-exists with native grasses, forbs and shrubs. Some native shrubs, such as big sagebrush and rabbitbrush, often invade crested wheatgrass stands, especially if native seed sources are nearby.

Due to commonly being planted in monocultures (single species) stands in the past, some feel crested wheatgrass is not ecologically appropriate. It is important to consider the paragraph above and to plant multiple species mixes to avoid this perception.

Seed Production

Seed production of crested wheatgrasses has been very successful under cultivated conditions. Row spacing of 24 to 30 inches when irrigated and 36 inches or greater under dryland conditions are recommended. Early spring or late fall seedings are recommended under dryland conditions. Early spring seedings are recommended under irrigated conditions. When irrigated, spring seedings consistently yield more seed during the first year of seed production. To obtain maximum seed production, fall plantings are not recommended.

Control weeds during stand establishment and long term management of stand by clipping, hand rouging or light rates of herbicide (2,4-D or Bromoxynil according to label) after the five-leaf stage. Fertilizer is generally not recommended during establishment. If soil nitrogen and phosphorus are low, an application of 10-15 pounds per acre nitrogen and 20-30 pounds per acre phosphorus may be applied prior to planting. Fertilize for full seed production following the establishment year in early fall or use a split application in early fall and again in early spring. Very early spring application of nitrogen may be beneficial on sandy soils to promote vegetative growth. When irrigated, apply adequate moisture for germination, establishment, and to bring soils to field capacity. Following stand establishment, fertilize and irrigate soon after seed harvest in fall to stimulate seed head primordia development. Do not stress plants during re-growth and tillering in the fall, late boot stage, and during pollination. Avoid irrigating during flowering.

Seed fields are productive for four to five years. Average production of 200 to 300 pounds per acre can be expected under dryland conditions in 14 inch

plus rainfall areas. Average production of 500 to 600 pounds per acre can be expected under irrigated conditions. The seed heads do not readily shatter, but some shatter can be expected. Harvesting is best completed by direct combining when the top of the seed head begins to shatter or wind-rowing at hard dough stage and combining with pickup attachment in about 5 to 7 days. Seed is generally harvested in mid July to mid August.

Cultivars, Improved and Selected Materials (and area of origin)

Foundation and registered seed is available through the appropriate state Crop Improvement Association or commercial sources to grow certified seed.

Agropyron cristatum is not as drought tolerant as desert or Siberian wheatgrasses. They are adapted to the northwest, intermountain, and Great Plains regions with at least 10 inches of annual precipitation. They do well on shallow to deep, moderately coarse to fine textured, moderately well to well drained and weakly acidic to moderately alkaline (saline and sodic) soils. Under alkaline conditions, vigor and production are reduced. The Fairway type was first recognized in 1950 as being different than other crested types. Fairway is shorter, denser, finer stemmed, and less productive than desert wheatgrass at lower elevations and may exceed desert wheatgrass production at higher elevations. Cultivars include the following: ‘Douglas’, 'Ephraim', 'Parkway', ‘Roadcrest’, and 'Ruff'.

'Douglas' was developed by ARS in Logan, Utah and released in 1994 in cooperation with the Utah Agricultural Experiment Station and NRCS. The breeding populations were derived from accessions originating in the former USSR, Iran, and Turkey. One accession was characterized with very broad leaves and was used as the female parent in all crosses. Douglas has larger seed than other crested wheatgrasses and has excellent seedling vigor. It produces less forage than other cultivars, but is leafier and remains green longer into the growing season suggesting improved forage preference and improved fire resistance. Douglas requires 13-14 inches or more annual precipitation. It is not recommended for turf applications, but may work very well in roadside applications. Certified seed is available. ARS in Logan, Utah maintains breeder and foundation seed.

The Forest Service Shrub Laboratory in Provo, Utah and Utah Division of Wildlife Resources developed ‘Ephraim’ from an accession originating in Turkey. It was released in 1983 by the developing agencies in cooperation with NRCS and Agricultural Experiment Stations in Arizona, Idaho, and Utah. It is weakly rhizomatous, with rhizomes being expressed at higher precipitation zones above 14 inches. It is well adapted to disturbed areas, roadsides, and mine spoils. It has been used successfully as a low maintenance turf. It is not well adapted to silty soils. It is a good seed producer. Certified seed is available. Aberdeen PMC maintains breeder and foundation seed.

'Parkway' was developed by the Canada Department of Agriculture, Research Station, and Saskatoon, Saskatchewan and released in 1969. It is recommended for hay and pasture. It is a good seed producer and has good lodging resistance. It is not recommended for turf applications. Certified seed is available. Agriculture and Agri-Food Canada, Research Station, Swift Current, Saskatoon, Saskatchewan, maintains breeder and foundation seed.

‘Roadcrest’ was developed by ARS in Logan, Utah and released in 1998. It is a long-lived perennial, and is significantly more rhizomatous than Ephraim, the only other somewhat rhizomatous crested wheatgrass cultivar. Roadcrest is recommended for use along roadsides or similar low-maintenance turf application areas in 10 inch and higher rainfall areas. Certified seed is available. ARS in Logan, Utah maintains breeder and foundation seed.

'Ruff' was developed by ARS, Lincoln, Nebraska and released in 1974 by ARS and the Nebraska Agricultural Extension Service. It is recommended for a short season, spring forage crop. It can be used as a low maintenance turf on roadsides, parks, and playgrounds in low rainfall areas of the central Great Plains. Common seed is available, but certified seed is not available.

Agropyron desertorum is more drought tolerant than crested or fairway wheatgrass. It is not as drought tolerant as the Siberian type. Desert wheatgrass is adapted to the Northwest, Intermountain and Great Plains regions with at least 8 inches (‘Douglas’ requires 13-14 inches) of annual precipitation below 6500 feet elevation. It does well on shallow to deep, moderately coarse to fine textured, moderately well to well drained and weakly acidic to moderately alkaline soils. Under saline conditions, vigor and production are reduced. It is considered slightly more saline tolerant and more productive than fairway wheatgrass.

The following cultivars are desert wheatgrasses: 'Nordan' and 'Summit'.

ARS at the Northern Great Plains Research Laboratory, Mandan, North Dakota, developed 'Nordan'. ARS and ND Agricultural Experiment Station released Nordan in 1953. It is uniform, erect, with heavy seeds that are awnless. The seed heads are dense and compressed. It has good seedling vigor and seed quality and long-term forage yields are equal to the newer varieties. It is very palatable in spring and fall, but less so in summer. Certified seed is available. ARS at the Great Plains Research Laboratory maintains breeder and foundation seed.

'Summit' was introduced from Western Siberian Experiment Station, Omsk, and former USSR. Canada Department of Agriculture released it in 1953. It is considered very similar to 'Nordan'. Certified seed is available. The Canada Department of Agriculture, Saskatoon, Saskatchewan, maintains breeder and foundation seed.

Agropyron cristatum × *Agropyron desertorum* is a hybrid cross, which results in a plant with excellent seedling vigor. The following cultivars are hybrid crosses and considered similar to desert wheatgrass: 'Hycrest' and 'CD-II'.

ARS in Logan, Utah released 'CD-II' in 1996. CD-II is a selection of 'Hycrest' and was released to ensure the genetic purity of the cross. It has increased growth characteristics under cold temperatures. Characteristics and performance are the same as Hycrest. Certified seed is available. ARS Logan, Utah maintains breeder and foundation seed.

ARS in Logan, Utah developed 'Hycrest' by crossing Fairway and desert wheatgrasses. ARS, NRCS, and Utah Agricultural Experiment Station released it in 1984. It is easier to establish than either of its parents and is more productive during the establishment period than either parent. Long-term productivity exceeds Fairway and it is equal to the desert wheatgrass. The leaves and stems are coarser and it has more stems than Fairway. Good stands have been established in the 8 inch or greater precipitation zones. It is best adapted to 5,000 to 9,000 feet elevation zones, but good stands are common to 2,500 feet. It does well on shallow to deep, coarse to fine textured, moderately well to well drained soils. Under slightly saline conditions, vigor and production are reduced. It is not adapted to excessively saline areas. Certified seed is available. ARS, Logan, Utah, maintains breeder and foundation seed.

Agropyron fragile is similar to desert wheatgrass, but is considered more drought tolerant than fairway, desert, and hybrid cross types. 'P27' and 'Vavilov' are Siberian wheatgrass.

'P27' was developed by the Aberdeen and Pullman Plant Materials Centers from collections originating from Kazakhstan and was released in 1953 by NRCS, Aberdeen and Pullman PMCs, and Idaho Agricultural Experiment Station. Its seeds are awnless, have finer leaves, retain greenness, and retain palatability later into the summer than other crested or desert wheatgrass. It yields less and has poorer seedling vigor than these two related wheatgrasses. It is best adapted to 8 inches and above annual precipitation and is noted for tolerating longer drought periods once established better than other wheatgrasses. It is well adapted to light-sandy, droughty soils. Certified seed is available. Aberdeen PMC maintains breeder and foundation seed.

ARS in Logan, Utah developed 'Vavilov' from collections originating from the former USSR, Turkey, and P-27. ARS and the Utah Agricultural Experiment Station released it in 1994. Seedling vigor is similar to Hycrest and is consistently better than P-27. It is more droughts tolerant and better adapted to sandy soils than other crested wheatgrasses. It is best adapted to 8 inches and above annual precipitation up to 7,000 feet elevation and is noted for tolerating longer drought periods once established than other crested wheatgrasses. It is expected that Vavilov will eventually replace P-27 on the commercial seed market. Certified seed is available. ARS Logan, Utah maintains breeder and foundation seed.

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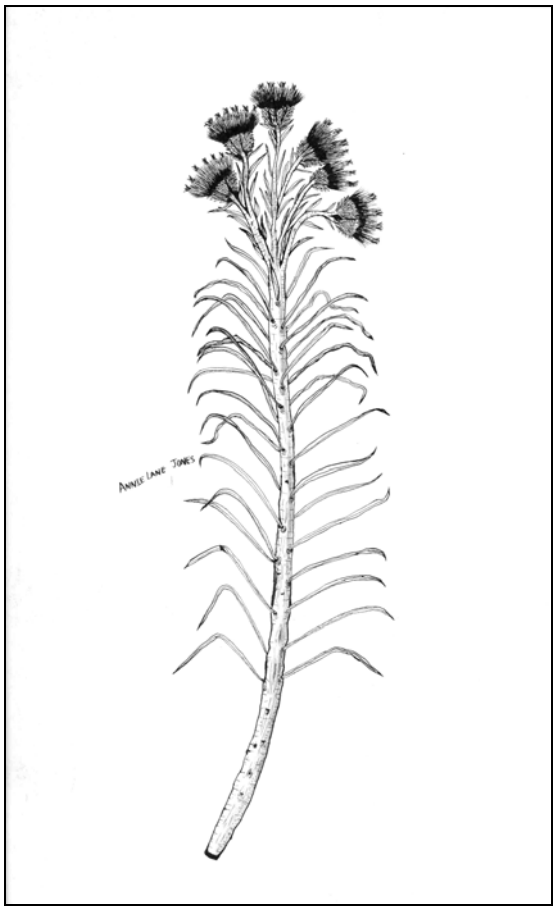
***Chrysothamnus nauseosus* (Pallas ex Pursh) Britton** rubber rabbitbrush
ASTERACEAE

Synonyms: *Bigelovia nauseosa* Gray
Chrysocoma nauseosa Pallas ex Pursh
Ericameria nauseosa (Pallas ex Pursh) Nesom & Baird



General Description.—Rubber rabbitbrush also know as common rabbitbrush is a shrub typically 0.3 to 2.0 m in height. Some types, however, are smaller while others exceed heights of 3.0 m. Usually several erect stems arise from the base and branch to create a rounded form. Branches are covered with a felt-like tomentum, permeated by a resinous gum, which can vary in color from green, yellow-green, gray-green, to white. Leaf shape can vary from filiform to broadly linear, and leaf length can range from 18 to 63 mm. Like branches, leaves are typically covered with tomentum. The flower heads are generally arranged into a cymose infloresence. Involucral bracts in each head may vary from glabrous to highly tomentose and number between 20 and 25.

Chrysothamnus nauseosus is uniformly diploid, x = 9, 2n = 18 (Anderson 1966).

Taxonomy.—The International Plant Names Index (IPNI) recognizes 30 subspecies of *C. nauseosus* (IPNI. 2002). Some sytematists promote the transfer of rubber rabbitbrush to the genus *Ericameria* (Anderson 1995). Subspecies may vary by morphology, color, and secondary metabolic compounds. Each subspecies is likely the result of reproductive isolation inbreeding, although subspecific sympatry has been observed. Some of the more common subspecies include ssp. *albicaulis*, *hololeucus*, *consimilis*, *graveolens*, and *salicifolius* (McArthur and others 1979). White stem rubber rabbitbrush (*C. n.* ssp. *albicaulis* and *hololeucus*) vary from other subspecies by their dense white to grayish tomentum, the size and arrangement of involucral bracts (five distinct vertical ranks, 8 to 10 mm in length), and the corolla lobe length (1 to 2 mm in ssp. *albicaulis*, 0.5 to 1 mm in ssp. *hololeucus*). These two subspecies are segregated by elevation. Threadleaf rubber rabbitbrush (*C. n. consimilis*) is a tall form, up to 3.0 m, with green to yellow-green tomentum and thread-like leaves. Ecologically, spp. *consimilis* is more likely to be found in alkaline valley bottoms. Green rubber rabbitbrush (*C. n.* ssp. *graveolens*) has yellow-green to green stems and is less pubescent than other subspecies. Mountain rubber rabbitbrush (*C. n.* ssp. *salicifolius*) has larger leaves (4 to 8 cm long and 3 to 10 mm wide), less uniform involucaral bracts, and is one of the more palatable subspecies to livestock and big game.

Range.—Rubber rabbitbrush is common throughout the Intermountain West extending from British Colombia to Saskatchewan and south to western Texas, Sonora, Baja California, and eastern California (Anderson 1986). It inhabits plains, valley bottoms, and foothills and is often associated with sagebrush, pinyon-juniper, and ponderosa pine communities.

Ecology.—Rubber rabbitbrush establishes readily on disturbed areas and can often become the dominant vegetation on lands that have been disturbed by fire, insects, vehicles, or heavy grazing. The species spans a broad elevation gradient, extending from 150 to 2,700 m. with annual precipitation generally in the 250 to 350 mm range. This shrub grows well in sandy, gravelly, or clay-alkaline soils, depending on the subspecies or ecotype. Some subspecies have broader ecological amplitudes than others, allowing them to establish in a variety of habitats (McArthur and others 1979). Although it grows vigorously, it does not exclude or inhibit herbaceous species. On the contrary, production of herbaceous cover was greater where rubber rabbitbrush was present than when it was not present (Frischknecht 1963).

Reproduction.—Rubber rabbitbrush blooms from August to October. Seeds mature beginning in mid-October until late fall. In most conditions, rubber rabbitbrush is a heavy seed producer. Seed germination in rubber rabbitbrush is quite high, and seed viability remains relatively high (65 percent) for up to 3 year's storage under ordinary warehouse storage conditions (Stevens and others 1981). When exposed to cool night (4.7 ˚C) and warm day temperatures, seed germinates in about 2 days (Weber and others 1985). Under standardized single cool temperature conditions, however, seeds from lower elevations and latitudes germinate more quickly (2 weeks as compared to 4) than those from higher elevations and latitudes (McArthur and others 1987, Meyer and others 1989). Seed (achene) size in rubber rabbitbrush appears to be correlated to habitat; subspecies adapted to sandy sites have larger achenes (Meyer 1997). There are about 1,530 cleaned seeds per gram (McArthur and others 1979).

Growth and Management.—Once established, wind-disseminated achenes allow rubber rabbitbrush to spread easily and quickly (Meyer 1997, Young and others 1984). It is fast growing, reaching maturity in 2 to 4 years but relatively short-lived shrub, usually 5 to 20 years (personal observation). It can be aerially seeded. Rubber rabbitbrush can be troublesome on rangelands when it invades and occupies areas at high densities. It is a difficult to control because it is resistant to herbicides and has the ability to resprout from the crown (Cook and others 1965).

Benefits.—Rubber rabbitbrush can be an important structural and ecological component in stable and disturbed plant communities. Its ability to stabilize soil and reduce wind and water erosion preserves habitat for other shrubs, forbs, and grasses. This shrub is an excellent plant for erosion control because it has deep roots, produces heavy litter, and is able to establish on severe sites (Aldon and Pase 1981, McArthur and others 1995, USDA 1937). Rubber rabbitbrush is browsed by deer, pronghorn, and by domestic animals, but palatability varies greatly between subspecies and ecotypes. The white to grayish subspecies (*albicaulis*, *hololoeucus*, and *salicifolius*) are more palatable than the green subspecies (*gravelens* and *consimilis*) (Goodrich and others 1999 Hanks and others 1975). Unlike some forage shrubs, however, rubber rabbitbrush is quite resilient to browsing. In addition to food, *C. nauseosus* also provides cover for small mammals, birds, and newly born pronghorn (Yoakum 1986). In addition to its ecological importance, people have also recognized the chemical properties of *C. nauseosus.* Rubber rabbitbrush has been investigated as a possible source of rubber and other chemicals (Hall and Goodspeed 1919; Hegerhorst and others 1987). Some accessions, for example, produce up to 6 percent stem rubber and 20 percent resin. Finally, some forms have ornamental shrub potential (McArthur and others 1979, Weber and others 1985).

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RANGE PLANTING
SPECIFICATION SHEET (550)

Name: UDOGM **Date:** January 28, 2015 **Precip:** 12-16

Location: Cottonwood/Wilber Mine **Soil(s):** **Acres:** 2

Tract: **Field:** **Slope:** 3-15% **Elevation:** 7300

Planned by: M. Dean Stacy **Erosion Potential:** High

MLRA E47B **Ecological Site:** Probably Upland stony loam (P/J)

Purpose(s): To begin restoration of the plant community
To reduce erosion by wind and/or water

Livestock:

Wildlife:

DWR Consultation: No **If Yes, Who with & When:**

Seedbed Preparation:

Planting Information

Date: Dormant Seeding

Depth: 0-1/8 inch

Spacing:

Method: Broadcast

Equipment: Hand Seeder

Species	Variety	PLS Rate (lbs/ac)	Bulk Rate (lbs/ac)	Total PLS Seed (lbs)
Wheatgrass, western	Recovery	1.32	2.07	3
Wheatgrass, thickspike	Bannock	1.20	1.57	2
Wheatgrass, bluebunch	Viva	1.56	2.04	3
Needle and thread	Sharptail	1.17	1.95	2
Ricegrass, Indian	Rimrock	1.56	2.05	3
Flax, Lewis	Maple Grove	0.30	0.35	1
Globemallow, scarlet	common	0.15	0.21	0
Sagebrush, Wyoming big	common	0.04	0.04	0
Saltbush, Fourwing	Wytana	0.15	0.15	0
Serviceberry, Utah	common	0.00	0.00	0
Burnet, small	Delar	1.95	2.28	4
Aster, blueleaf	common	0.23	0.23	0
Sweetvetch, Utah	Timp	1.80	2.37	4
***Total Rate to be Seeded:**		**11.42**	**15.31**	**23**

Management During Plant Establishment

Defer grazing for at least two growing seasons or until stand is established.

Operation and Maintenance of Seeding After Establishment

Grazing should be in accordance with Prescribed Grazing (528) specifications. Weeds, insects, and/or diseases should be controlled through mowing, burning, flash grazing, or pesticides as needed to maintain a healthy stand. Where stands are damaged by drought, insects, or other uncontrollable events, the stand should be replanted, overseeded, or spot planted. Thin stands may only need grazing deferment during the growing season rather than replanting.

Client's Acknowledgement Statement

The Client acknowledges that:

a. They have received a copy of the specification and understand the contents and requirements.

b. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Cooperator: _____ Data _____

Planner: _____ Data _____

Conservation Measures – Actions that must be implemented by the landowner/manager during practice implementation

Certification

I have completed a review of the information provided by the client (or checked in the field) and certify this practice has been applied.

Document or refer to attachment for each item below

Seedbed preparation techniques (weed control, equipment used, number of passes and method used)	
Seeding date, depth, rate (PLS) and method	
Plant species or mixture used (copy of the seed tag(s)) within +/- 10% of the specification	
Seedbed and growing conditions at planting (soil moisture, soil firmness, weather etc.)	
Map indicating acres treated	
Acres Certified	
Planner Signature	
Date	