

# City of Pocatello

## Re-vegetation Guide

### *Grasses, Forbs & Shrubs*



Sheep Fescue



© Gary A. Monroe

Gooseberryleaf Globemallow



Crested Wheatgrass



© J.S. Peterson

Common Snowberry



© Gary A. Monroe

Rocky Mountain Penstemon



© Robert Soreng

Bluebunch Wheatgrass



© W.L. Wagner

Indian Ricegrass



Common Sunflower



© Gary A. Monroe

Mockorange (Syringa)

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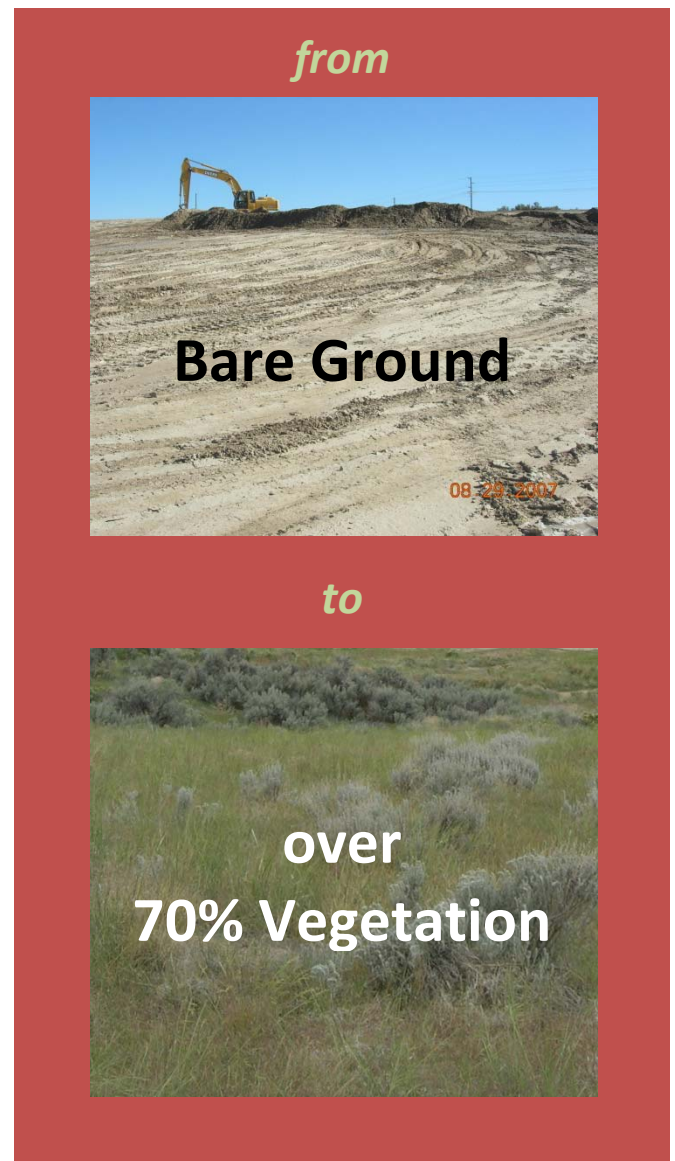
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## **Thank You**

This guide is the result a great partnership between the City of Pocatello and the US Department of Agriculture's Natural Resources Conservation Service (NRCS). A special thank you to the NRCS's Plant Materials Center staff and to the local retired restoration and forestry experts who contributed much time and expertise to this endeavor.

**This document outlines the steps required to successfully meet the final re-vegetation requirement of 70% ground cover within two (2) years.** Following these steps will help you overcome major obstacles (e.g. weeds, dry soils & climate, soil profile disturbance) to successful re-vegetation in southeast Idaho.

## **Pre Construction**

### **Soil Disturbance**

- Limit the area disturbed by construction activities to the extent possible in order to minimize the amount of area to be re-vegetated.

### **Soil Stockpiling**

- The upper 4 to 6 inches of topsoil of the construction area shall be removed and stockpiled in a separate area from other cut or fill material.
- The topsoil pile will be clearly signed with a weatherproof sign, so that it is only used for re-vegetation purposes.
- There will be a designated area for all stockpiles to limit soil movement throughout the construction process.
- Stockpiles will be stored as shallow and wide as possible to preserve the microbe life of the soil.
- No weeds shall be permitted to grow or set seed into the stored stockpile. Any weeds shall be removed (including roots and seed heads) and disposed of off-site.

## **Seed Selection and Quality:**

- Seed mixtures shall be selected based on soil type, site conditions and intended final use. See the sections that follow for suggested grasses, forbs and shrubs.
- Seed shall not be used later than one year after the test date that appears on the label.
- The bags of seed shall be clearly labeled indicating test date, weed percentage or % Pure Live Seed (PLS), viability or germination percentage, and inert material.
- Addition of shrubs to the seeding mix must be pre-approved by the city.
- Live seed shall be stored in temperature and moisture conditions appropriate to maintain seed vigor.

## **Time of Seeding:**

- Seeding will be accomplished in the spring after the frost leaves the ground and temperatures are consistent.
  - Grasses do best when seeded in the spring
  - If seeding is done after May 15<sup>th</sup> then provision shall be made for supplementary irrigation until the seedlings are several inches tall.
- Dormant seeding will be accomplished soon after the first frost in the fall, usually no earlier than October 15<sup>th</sup>. Seed shall not be applied on top of snow.
  - Most shrubs and forbs are best seeded in the fall because they may require winter cold to germinate.

## **Seed Bed Preparation Requirements prior to Seeding:**

- Re-spread topsoil to a minimum depth of 4 inches.
- Prepare a friable but firm and weed free seedbed that is not compacted by prior construction work. Appropriate firmness can be estimated when a person leaves about a ¼ inch deep footprint.
- Remove rocks, twigs, concrete, foreign material and clods over 2 inches that can't be broken down.
- Soil moisture content shall be at least 30% soil capacity. Do not seed into undesirable moisture conditions (e.g. "dust" or "mud").

## **Seeding Rates:**

Seeding rates are given for pure live seed (PLS). The reseeding guide rate for grasses and forbs lists the pounds you would need for a pure stand of that specific plant per acre. *To determine the amount of pure live seed in a bag, follow these guidelines:*

The formula for determining PLS is: **Germination x Purity = PLS**

### **Example 1:**

10 pounds (PLS) of Sodar streambank wheatgrass is required:

Purity .....99%

Germination .....90%

Inert .....1%

Weed .....None

Date of Test.....6-6-06 *It would be a good idea to get another*

.....*germination test (this one is more than 10 months old).*

10 pounds of this seed would contain 9.9 pounds pure seed (10 x 99%), but only 90% of these are viable.

90% (Germination) x 9.9 pounds (Pure Seed) = 8.91 pounds PLS.

**To get 10 pounds PLS about 11 pounds of seed would be needed.**

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### **Example 2:**

Again, 10 pounds (PLS) of Sodar streambank wheatgrass is needed:

Purity .....60%

Germination .....75%

Inert .....40%

Weed .....1%

Date of test .....1-6-07

10 pounds x 60% = 6 pounds pure seed

75% x 6 pounds = 4.5 pounds PLS

**10 pounds contains 4.5 pounds PLS, 15.5 pounds would be needed to get 10 pounds PLS.**

**Purity:** *High quality seed should run from 80-99 pure seed.* The purity of seed listed tells what proportion of that seed is sound as opposed to chaff, stems, and other inert matter. Unprocessed seed may be only 50 percent sound seed and the other 50 percent chaff, hulls, and bits of stem and leaf which have not been separated from the seed.

**Germination:** *The seed should have a test date no more than nine (9) months old.* This test tells how much of the pure seed is alive (viable). Not every seed produced on a plant is live and able to grow. Storage and age further decrease the number of viable seeds which can produce a new plant. The germination test printed on the label tells what % of the pure seed was capable of growing on the date of the test. **Never buy outdated seed.**

## **Seeding Mixes**

Most plants should be combined in a mixture of plants and therefore you will have to adjust the pounds per acre that you will need per acre for a mixture based on the percentage desired for each species in the mixture.

1. Determine the percent (%) of each plant species you desire in the mixture
2. Calculate: (% desired in mix) x (required pounds/acre) = pounds mix per acre

### **Example 1:**

You are in the 12 – 14” precipitation zone and want a mix of grasses and forbs

First:

You desire 50% to be Beardless Wheatgrass and it requires 8.0 lbs. per acre

You desire 35% to be Meadow Brome and it requires 10.0 lbs. per acre

You desire 15% to be Small Burnet and it requires 20.0 lbs. per acre

Calculate:

Beardless Wheatgrass: (50%) x (8.0 lbs. per acre) = 4.0 lbs. mix/acre

Meadow Brome: (35%) x (10.0 lbs. per acre) = 3.5 lbs. mix/acre

Small Burnet: (15%) x (20.0 lbs. per acre) = 3.0 lbs. mix/acre

**Total mix bulk seed required for one acre = 10.5 lbs.**

**See Appendix 1 for grass, forb (flower) and tree descriptions.**

**See Appendix 2 for recommended seed mixes.**

**See Appendix 3 for seed and plant vendors**

## **Seeding Methods:**

All seeding methods will be subject to the standard of 70% required vegetated cover within the 2 year warranty period.

**Drill** This *is the preferred method*. The drill should be set to a depth of ¼ to ½ inch for the selected grass and forb species chosen. The seed should be drilled making passes at right angles (see Figure 1).

Consider using a weed free straw or hay mulch to enhance plant establishment and control erosion if selected species are not intended for quick germination (*see following pages for specific application techniques*).

**Broadcast** On slopes 2:1 and steeper, seed may be broadcast using a push-type or hand spreader. Broadcast seeding rates are usually double that of the drill rate. Once broadcast, lightly hand-rake the soil over the seed. To control erosion you may use an Excelsior erosion control blanket, jute matting staked into place, or a weed free straw or hay mulch (*see following pages for specific application techniques*).

**Hydroseeding** *Not recommended.* For areas to be hydroseeded, leave the soil surface in a slightly roughened condition. *Fertilizer shall be incorporated prior to seeding.*

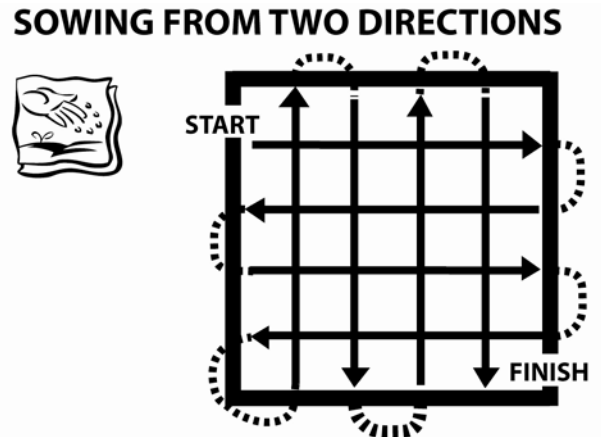
A minimum of 1000 gallons of water per acre shall be used. The hydraulic seeding equipment shall include a pump rated and operated at no less than 100 gallons per minute and at no less than 100 pounds per square inch pressure. The tank shall have a mechanical agitator powerful enough to keep all materials in a uniform suspension in the water. Calibration of the hydraulic equipment shall be accurate.

When seeding legumes, increase the recommended rate for inoculant by four times for hydroseeding. If legume inoculant is added to a fertilizer, seeding should be applied within 30 minutes of the fertilizer/inoculant mixture. Pre-inoculated seed is recommended.

Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Fibers should be kept to less than ¾ inch as fibers longer than about ¾-1 inch clog hydromulch equipment. Hydromulch must be of high quality, commercially manufactured and contain **NO** recycled components such as paper. Hammer milled paper is not acceptable hydro mulch.

A total of 1500 pounds of mulch/acre should be applied in two (2) steps.

1. Application of seed and approximately 100 pounds of hydromulch applied through the hydromulcher. Mulch will serve as an indicator of where application has been completed.
2. Application of the remainder of the mulch (1400 pounds) immediately applied over the freshly seeded area. This process serves to ensure contact of the seed with the soil.



**Figure 1.** Whether hand broadcasting or using a spreader, apply one-half of the seed from each direction and cover the area twice for even distribution.

See [Appendix 4](#) for local drill and hydroseeding contractors.

## **Mulch**

### **Mulching Purpose**

The purpose of mulching soils is to provide immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There is an enormous variety of mulches that can be used. Only the most common types are discussed in this section.

### **Conditions of Use**

As a temporary cover measure, mulch should be used:

- On disturbed areas that require cover measures for less than 30 days.
- As a cover for seed during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.
- Mulch may be applied at any time of the year and must be refreshed periodically.

### **Design and Installation Specifications**

- For mulch materials, application rates, and specifications, see below table. *Thicknesses may be increased for disturbed areas in or near sensitive areas or other areas highly susceptible to erosion.*
- Mulch used within the ordinary high-water mark of surface waters should be selected to minimize potential flotation of organic matter.
- Composted organic materials have higher specific gravities (densities) than straw, wood, or chipped material.

### **Maintenance Standards**

- The thickness of the cover must be maintained
- Any areas that experience erosion shall be re-mulched and/or protected with a net or blanket. If the erosion problem is drainage related, then the problem shall be fixed and the eroded area re-mulched.

## Mulch Types



*Properly crimped mulch stands out of the soil and creates a protected and moisture holding environment for seed germination.*

### Straw

**Quality:** Air-dried; free from undesirable seed and coarse material.

**Application Rates:** 2"-3" thick; 5 bales/1000 sf or 2-3 tons/acre.

**Application Notes:** Hand-application generally requires greater thickness than blown straw. The thickness of straw may be reduced by half when used in conjunction with seeding. Mulch should be crimped in using a serrated disc (or crimper) designed for that purpose. In windy areas straw must be held in place by crimping, using a tackifier, or covering with netting. Blown straw always has to be held in place with a tackifier as even light winds will blow it away.

**Pros:** Cost-effective protection when applied with adequate thickness.

**Cons:** Straw, however, has several deficiencies that should be considered when selecting mulch materials. It often introduces and/or encourages the propagation of weed species and it has no significant long-term benefits. Straw should be used only if mulches with long-term benefits are unavailable locally. It should also not be used within the ordinary high-water elevation of surface waters (due to flotation).

### Composted Mulch and Compost

**Quality:** No visible water or dust during handling. Must be purchased from supplier with Solid Waste Handling Permit (unless exempt).

**Application Rates:** Approximately 100 tons/acre (a 2" thick layer of compost weighing 800 lbs/cubic yard).

**Application Notes:** More effective control can be obtained by increasing thickness to 3". Composted mulch has a coarser size gradation than compost. It is more stable and practical to use in wet areas and during rainy weather conditions.

**Pros:** Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment.

### Hydromulch

**Quality:** No growth inhibiting factors.

**Application Rates:** Approx. 25-30 lbs/1000 sf or 1500-2000 lbs /acre.

**Application Notes:** Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Fibers should be kept to less than ¾ inch as fibers longer than about ¾-1 inch clog hydromulch equipment.

Hydromulch must be of high quality, commercially manufactured and contain **NO** recycled components such as paper. Hammer milled paper is not acceptable hydro mulch.

A total of 1500 pounds of mulch/acre should be applied in two (2) steps.

1. Application of seed and approximately 100 pounds of hydromulch applied through the hydromulcher. Mulch will serve as an indicator of where application has been completed.
2. Application of the remainder of the mulch (1400 pounds) immediately applied over the freshly seeded area. This process serves to ensure contact of the seed with the soil.



*Applying hydromulch and seed with a hydromulcher.*

### **Chipped Site Vegetation**

**Quality:** Average size shall be several inches. Gradations from fines to 6 inches in length for texture, variation, and interlocking properties. All weed plant parts to be removed from material before chipping. Mulch from trees such as Siberian Elm and Russian Olive should be avoided, since they are usually loaded with seeds.

**Application Rates:** 2" minimum thickness.

**Application Notes:** Generally, it should not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. *Juniper needles and bark are not acceptable for mulch on re-vegetated areas due to the presence of compounds which prevent or kill grass seedlings. This material is best used as mulch around trees and shrubs and is not on reseeded areas.*

**Pros:** This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates the problems associated with burning.

**Cons:** If seeding is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment.

### **Wood Based Mulch**

**Quality:** No visible water or dust during handling. *Must be purchased from a supplier with a Solid Waste Handling Permit or one exempt from solid waste regulations.*

**Application Rates:** 2" thick; approx. 100 tons per acre (approx. 800 lbs. per cubic yard).

**Application Notes:** This material is often called "hog or hogged fuel."

**Pros:** It is usable as a material for Stabilized Construction Entrances and as a mulch.

**Cons:** Special caution is advised regarding the source and composition of wood-based mulches. Its preparation typically does not provide any weed seed control, so evidence of residual vegetation in its composition or known inclusion of weed plants or seeds should be monitored and prevented (or minimized). Caution related to juniper needles and bark applies.

## **Erosion Control Fabrics**



*Laying down, and stapling erosion control jute matting.*

### **Jute Matting**

Matting strips shall be placed on the prepared surface (that has been seeded and fertilized if required) parallel to the flow of water. Each strip shall be laid flat without stretching. Matting strips shall be overlapped four inches along edges and ends. The matting shall be held in place by means of staples driven vertically into the soil.

**See Appendix 4 for a list of contractors who can apply erosion control fabrics.**

Staples shall be spaced not more than three feet apart in three rows for each strip, with one row along each edge and one row alternately spaced in the middle. All ends of the matting shall have the staples six inches apart across their width. Matting shall be spread evenly and smoothly and shall be in contact with the soil at all points (remove rocks where possible). The installed matting shall be pressed into the soil with a light lawn roller or similar methods.

### **Excelsior Erosion Control Blankets**

Prior to placing the blankets, the area shall be prepared, seeded and fertilized as specified. Blankets shall be laid evenly and smoothly. When the blanket is unrolled, the netting shall be on top and the fiber side should be in contact with the soil. In ditches the blankets should be unrolled in the direction of the flow of water and overlapped a minimum of two inches and a maximum of four inches with the upstream blanket on top. A common row of “U” pin staples shall be offset approximately eight inches from the center of the ditch.

When used on slopes, the blankets may be rolled horizontally or vertically to the slope. Blankets shall be overlapped a minimum of three inches and maximum of four inches. Check slots shall be dug and the blanket ends shall be buried a minimum of three inches to hold them in place for both slope and ditch application. “U” pin staples shall be driven vertically into the ground through each side of the blankets and shall be spaced six feet apart. “T” pins shall be driven vertically along the centerline of the blankets and placed at six foot intervals alternately with the “U” pins. All corners shall be stapled with “U” pins.

### **Erosion Control Netting**

The area to receive netting shall have first been prepared, seeded, fertilized and mulched according to the specifications. The mulch shall not be crimped in. The erosion control netting shall be rolled out in the direction of water flow on top of the straw. Adjoining pieces of netting shall be overlapped a minimum of two inches and a maximum of four inches with the upstream piece of netting on top. The netting shall be fastened with “U” staples and “T” pins which shall be driven vertically into the ground. The top end shall be stapled first, starting in the center of the netting and working to the outside edges. A common row of “U” staples shall be used on adjoining blankets of netting and shall be spaced approximately 1.5 feet apart. “U” staples shall also be driven at 1.5 feet intervals at the beginning and end of each run of netting and at five foot intervals along each edge of the netting. “T” pins shall be driven along the centerline of the netting at five foot intervals.

Seed impregnated erosion control fabric: This fabric shall be installed as per “excelsior erosion control blankets” or as recommended by the manufacturer. The “seed testing date” should be as required above under “Seed Mixes”.

## Preservation of Seeded Areas:

### Irrigation

- Consider the use of irrigation for one growing season to assist with the establishment of plantings. **Use of irrigation on native species plantings will significantly improve the likelihood of a successful planting.**
  - Keeping the seedbed moist during germination will prevent soil crusting and ensure greater seedling success.
  - Regular germination until the grass reaches the 4-5 leaf stage (2-4" high) will also improve the likelihood of a successful planting.



*This project was seeded in July, necessitating irrigation until mid-October.*

### Weeds

- **Weed growth must be addressed immediately.** To the extent practicable, weed plants should be removed and disposed of off-site (including roots and seed heads); otherwise the weeds will outcompete the desirable seeds for resources. ***Weeds are a major cause of failure of re-vegetation efforts.***

### Soil Compaction

- Limit vehicle traffic and other forms of compaction in areas that are seeded.

### Inspections

- Inspect weekly during the growing season until vegetation is densely established.
- Inspect within 24 hours after every precipitation event that produces 0.5 inch of rain or more during a 24-hour period to check for excessive runoff and erosion problems.
- Inspect all planted areas for failures and make necessary repairs, replacements, reseeding, and re-mulching within the planting season.

### Repair & Re-seeding

- Repair and reseed areas that have erosion damage as necessary.
- If a stand has less than 70% ground cover after two years, re-evaluate the choice of plant materials, methods and available light and moisture. Re-establish the stand with modifications based on the evaluation.

### City of Pocatello Re-Vegetation Guide for Grasses

Grass Common Name	Introduced or Native species	Minimum Precip (inches)	Soil	Seeding Rate per acre	Seedling Vigor	Habitat or Environment	Prevents Wind Erosion	Prevents Soil Erosion	Provides Wildlife Forage and Cover	Provides Livestock Forage	Provides Beautification	Provides Restoration	Exclusions or Areas of Concern
Bentgrass, Redtop	Introduced	28	wet	0.5 lbs.	Med.	Riparian/Wetland		X	X			X	
Bluegrass, Big	Native	9	cl-sl	2.0 lbs.	Low-Med.	Grass/Forb Mix		X	X	X		X	Two year growth before grazing
Bluegrass, Canada	Introduced	16	cl-sl	2.0 lbs.	Low-Med.	Semi-Wet Meadow	X	X	X	X	X	X	Can dominate mixtures
Bluegrass, Sandberg	Native	8	l-cl	2.0 lbs.	Low-Med.	Grass/Forb Mix		X	X	X		X	Two year growth before grazing
Brome, Meadow	Introduced	14	c-sl	10.0 lbs.	Med.-Rapid	Grass/Forb Mix		X	X	X	X		
Brome, Mountain	Native	16	c-sl	10.0 lbs.	Med.-Rapid	Foothill/ Mountain		X	X			X	Short-lived (cover crop)
Brome, Smooth	Native	18	cl-sl	8.0 lbs.	High	Grass/Forb Mix		X	X	X	X		Aggressive behavior
Dropseed, Sand	Native	7	fsl-s	1.0 lbs.	Low	Grass Mixes	X	X	X	X			
Fescue, Hard	Introduced	12	c-sl	4.0 lbs.	Low	Grass Mixes/shade	X	X			X	X	Don't plant with forbs
Fescue, Idaho	Native	16	cl-sl	4.0 lbs.	Very Low	Grass/Forb Mix		X	X	X		X	Don't mix with introduced grasses; Blue foliage
Fescue, Red	Introduced	18	c-sl	4.0 lbs.	Low	Riparian/Wetland/shade	X	X			X	X	Plant in a mix with forbs
Fescue, Sheep	Introduced	12	c-sl	4.0 lbs.	Low	Foothill/ Mountain	X	X			X	X	Some variety have blue foliage
Fescue, Tall		30	cl-sl	15 lbs	Medium	Grass Mixes		X			X		Use higher seeding rate to establish a dense turf
Foxtail, Creeping	Introduced	18	c-l	3.0 lbs.	Low	Riparian/Wetland		X	X	X	X	X	Use seed carrier; Can be invasive in wet areas.
Gamma, Blue	Native	8	cl-sl	3.0 lbs.	Low	Grass/Forb Mix; lawn		X	X	X	X		Shade intolerant;
Gamma, Sideoats		6	cl-s	4.0 lbs.	Medium	Grass mixes		X	X	X	X	X	
Green Needlegrass	Native	12	cl-H	7.0 lbs.	Low	Grass/Forb Mix		X	X	X		X	Seed dormancy
Hairgrass, Tufted	Native	18	c-sl	1.5 lbs.	Low	Semi-Wet Meadow		X	X			X	Acidic sites
Idaho Bentgrass	Native	10	s-l	0.5 lbs.	Low	Wetland	X	X	X			X	
Junegrass, Prairie	Native	14	sil-s	1.0 lbs.	Very Low	Grass/Forb Mix		X	X	X		X	Two year growth before grazing
Muttongrass	Native	10	s-l	2.0 lbs.	Very Low	Grass/Forb Mix		X	X	X		X	Low seed viability
Needle and Thread	Native	8	fsl-s	6.0 lbs.	Low	Grass/Forb Mix	X	X	X		X		Injurious to livestock (seed-awns)
Orchardgrass	Introduced	18	c-sl	4.0 lbs.	Medium	Grass/Forb Mix		X	X	X	X		
Ricegrass, Indian	Native	10	fsl-s	6.0 lbs.	Medium	Grass/Forb Mix	X	X	X	X	X		Don't mix with introduced grasses;Requires carrier
Sacaton	Native	8	cl-sl		Medium	Grass Mixes	X	X	X	X	X	X	
Sedge, Carex	Native	18	wet		Low	Riparian		X	X	X	X	X	Use in basins, wet areas
Squirreltail, Bottlebrush	Native	8	cl-sl	6.0 lbs.	Medium	Grass/Forb Mix	X	X	X			X	Injurious to livestock (seed-awns)
Timothy	Introduced	18	c-sl	3.0 lbs.	Medium	Riparian/Wetland		X	X	X	X		
Wheatgrass, Beardless	Native	12	c-sl	8.0 bs.	Medium	Grass/Forb Mix + Foothill/ mountain		X	X	X		X	Don't mix with introduced grasses
Wheatgrass, Bluebunch	Native	12	cl-sl	8.0 lbs.	Medium	Grass/Forb Mix+ Mountain		X	X	X		X	Don't mix with introduced grasses
Wheatgrass, Crested (cristatum ssp.)	Introduced	9	c-sl	5.0 lbs.	Rapid	Grass/Forb Mix	X	X	X	X	X	X	Don't mix with native grasses
Wheatgrass, Crested (desertorum ssp.)	Introduced	8	c-sl	5.0 lbs.	Rapid	Grass/Forb Mix	X	X	X	X	X	X	Don't mix with native grasses
Wheatgrass, Intermediate	Introduced	7	cl-sl	8.0 lbs.	Rapid	Grass/Forb Mix		X	X	X	X	X	
Wheatgrass, Siberian	Introduced	8	c-sl	6.0 lbs.	Rapid	Grass/Forb Mix	X	X	X	X	X	X	Don't mix with native grasses

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Wheatgrass, Slender	Native	10	c-sl	6.0 lbs.	Rapid	Foothill/Mountain	X	X	X			X	Short-lived (cover crop)
Wheatgrass, Snake River/Secar	Native	8	c-sl	8.0 lbs.	Medium	Grass/Forb Mix		X	X	X		X	Don't mix with introduced grasses
Wheatgrass, Streambank/Thickspike	Native	8	c-l	6.0 lbs.	Rapid	Grass Mixes	X	X	X			X	Don't mix with introduced grasses
Wheatgrass, Tall	Introduced	14	saline	10.0 lbs.	Very Rapid	Semi-Wet Meadow	X	X	X	X	X	X	Grows slowly, needs protection
Wheatgrass, Western	Native	12	cl-sl	8.0 lbs.	Medium	Grass Mixes		X		X		X	Grows slowly, needs protection
Wildrye, Altai	Introduced	14	saline	12.0 lbs.	Low	Grass/Forb Mix	X	X	X	X			Grows slowly, needs protection
Wildrye, Basin	Native	8	sil-sl	8.0 lbs.	Low	Grass Mixes	X	X	X	X		X	
Wildrye, Beardless	Native	14	saline	6.0 lbs.	Very Low	Grass Mixes		X	X			X	Saline sites only
Wildrye, Blue	Native	16	cl-sl	8.0 lbs.	Medium	Foothill/Mountain		X	X			X	
Wildrye, Canada	Native	15	l-s	8.0 lbs.	Rapid	Foothill/Mountain		X	X			X	Short-lived (cover crop)
Wildrye, Russian	Introduced	8	c-sl	6.0 lbs.	Low	Grass/Forb Mix	X	X	X	X	X		Don't mix with native grasses

\* You must adjust this seeding rate if you are going to use the plants in a MIX, the rate stated is for a 100% pure seed rate per acre. See the Seeding Guidelines for more information on how to calculate rates for a mixture.

**Note:** The above seeding rates are based on planting using a drill. For broadcast seedings, seeding rates should be increased by 2.0 times.

**Soil:** c = clay; cl = clay loam; fsl = fine sandy loam; l = loam; s = sand; saline = saline; sil = silty; sl = sandy loam; wet = saturated

## City of Pocatello Re-Vegetation Guide for Forbs

Forb Common Name	Introduced or Native species	Minimum Precip (inches)	Soil	Seeding Rate per acre	Seedling Vigor	Habitat or Environment	Prevents Wind Erosion	Prevents Soil Erosion	Provides Wildlife Forage and Cover	Provides Livestock Forage	Provides Beautification	Provides Restoration	Exclusions or Areas of Concern
Alfalfa**	Introduced	14	sil-sl	5.0 lbs.	Medium	Grass/Forb Mix	X		X	X			Can cause bloating in livestock
Aster, Blueleaf	Native	15	gravelly		Medium	Grass/Forb Mix	X	X	X		X	X	
Balsamroot, Arrowleaf	Native	10	sil-sl	20.0 lbs.	Very Low	Grass/Forb Mix	X	X	X	X	X	X	
Beepplant, Rocky Mountain	Native	10	cl-sl		High	Grass/Forb Mix	X	X	X		X	X	
Blanket Flower	Native	15	cl-sl		High	Grass/Shrub Mix	X	X	X		X	X	
Buckwheat, Wyeth	Native	10	cl-sl		Medium	Grass/Shrub Mix	X	X	X		X	X	
Burnet, Small	Introduced	14	c-sl	20.0 lbs.	Medium	Grass/Forb Mix		X	X	X	X	X	
Clover, Red**	Introduced	18	sil-sl	6.0 lbs.	Medium	Grass/Forb Mix	X	X	X	X			Can cause bloating in livestock
Clover, Strawberry**	Introduced	18	wet/saline	4.0 lbs.	Medium	Semi-wet meadow	X	X	X	X			Can cause bloating in livestock
Clover, White (Ladino)**	Introduced	18	wet/cl-sil	4.0 lbs.	Medium	Semi-wet meadow	X	X	X	X			Can cause bloating in livestock
Columbine (several species)	Native	14	cl-sl		Medium	Shrub/Forb Mix		X	X		X	X	
Coneflower, Prairie	Native	15	cl-sl		High	Grass/Forb Mix	X	X	X		X	X	
Daisy, Aspen	Native	15	cl-sl		Medium	Grass/Shrub Mix	X	X	X		X	X	
Evening Primrose (several sp)	Native	10	cl-sl		High	Grass/Forb Mix		X			X	X	
Flax, Blue	Introduced	10	sil-sl	4.0 lbs.	Low-Med.	Grass/Forb Mix	X	X	X		X	X	
Flax, Lewis	Native	10	sil-sl	4.0 lbs.	Low-Med.	Grass/Forb Mix	X	X	X		X	X	
Geranium, Stick	Native	18	cl-sl		Medium	Shrub/Tree Mix	X	X			X		
Globemallow - several species	Native	7	saline	2.0 lbs.	Low	Grass/Forb Mix	X	X	X	X	X	X	
Goldeneye, Showy	Native	12	gravelly		High	Grass/Shrub Mix	X	X	X		X	X	
Lupine (several species)	Native	10	cl-sl		High	Grass/Shrub Mix	X	X	X		X	X	
Mallow, River	Native	18	cl-sl		High	Shrub/Tree Mix	X	X	X		X	X	
Milkvetch, Cicer**	Introduced	15	c-l	7.0 lbs.	Low	Grass/Forb Mix		X	X	X		X	Requires a competitive grass
Penstemon (other species)	Native												
Penstemon, Eaton (firecracker)	Native	10	cl-sl	4.0 lbs.	Very Low	Grass/Forb Mix		X	X		X		
Penstemon, Palmer	Native	10	cl-sl	4.0 lbs.	Very Low	Grass/Forb Mix		X	X	X	X		
Penstemon, Rocky Mountain	Native	18	cl-sl	4.0 lbs.	Very Low	Grass/Forb Mix		X	X	X	X	X	
Prairie Smoke	Native	8	gravelly		Low	Grass/Shrub Mix	X	X	X		X	X	
Princes Plume	Native	8	gravelly		High	scrubland	X				X	X	avoid wet soils Don't plant next to shelterbelts
Sainfoin**	Introduced	14	sil-s	34.0 lbs.	Low-Med.	Grass/Forb Mix			X	X	X		
Sunflower - several species	Native	18	cl-sl	4.0 lbs.	Med.-Rapid	Grass/Forb Mix		X	X	X	X	X	
Sunflower, Buckwheat	Native	8	gravelly		Low	Grass/Forb Mix		X	X		X	X	
Trefoil, Birdsfoot**	Introduced	18	c-s	3.0 lbs.	Low	Grass/Forb Mix	X	X	X	X		X	May become weedy or invasive
Yarrow, Western do not use Common Yarrow	Native	8	cl-sl	0.5 lbs.	Low	Grass/Forb Mix	X	X	X		X	X	Disturbed sites may become weedy

\* You must adjust this seeding rate if you are going to use the plants in a MIX, the rate stated is for a 100% pure seed rate per acre. See the Seeding Guidelines for more information on how to calculate rates for a mixture.

**Note:** The above seeding rates are based on planting using a drill. For broadcast seedings, seeding rates should be increased by 2.0 times.

\*\* Legume - nitrogen fixer in the soil

Soil: c = clay; cl = clay loam; l = loam; s = sand; saline = saline; sil = silty; sl = sandy loam; wet = saturated

## City of Pocatello Re-Vegetation Guide for Shrubs

Shrub Common Name	Introduced or Native species	Minimum Precip (Inches)	Soil	Seeding Rate - Plant Density/Acre	Seedling Vigor	Habitat or Environment	Prevents Wind Erosion	Prevents Erosion	Soil	Provides Wildlife Forage and Cover	Provides Livestock Forage	Provides Beautification	Provides Restoration	Exclusions or Areas of Concern
Bitterbrush, Antelope	Native	10	cl-sl	1/4 lb/ac - 400 plants/ac	Low	Grass/Brush Mix	X	X		X		X	X	
Buffaloberry, Silver	Native	12	sc	750 plants/mile	Low	Windbreak-Shelte	X			X		X		Can be invasive with sucker roots
Chokecherry	Native	12	sil-s	700 plants/mile	Low	Windbreak-Shelte	X	X		X		X	X	Leaves may cause poisoning
Cinquefoil, Shrubby	Native	18	wet-all	400 - 500 plants/ac	Low	Foothill/Mountain	X	X		X		X	X	
Currant, Golden	Native	12	sil-sl	400 plants/ac	Low	Foothill/Mountain				X	X	X	X	Don't plant with pine trees
Currant, Wax	Native	12	sil-sl	400 plants/ac	Low	Foothill/Mountain				X	X	X	X	Don't plant with pine trees
Desert Fernbush	Native	12	gravelly		Medium	Rocky	X	X		X		X		
Dogwood, Redosier	Native	16	moist	900 plants/mile	Low	Riparian/Wetland	X			X		X	X	
Elderberry, Blue	Native	18	gravelly	1100 plants/mile	Low	Riparian/Wetland		X		X		X	X	Don't plant in windswept areas
Hawthorn, Black/River	Native	12	cl-sl	500 plants/mile	Low	Windbreak-Shelte	X	X		X		X	X	Lower elevations 2200 - 5400 ft.
Juniper, Rocky Mountain	Native	12	cl-sl	700 plants/mile	Medium	Windbreak-Shelte	X			X		X	X	Don't plant near apple orchards
Kinnikinnick	Native	18	cl-sl	1700 plants/ac	Low	Tree/Shrub	X	X		X		X	X	Plant in partial shade; difficult to grow in SE I
Kochia, Forage	Introduced	8	cl-sl	1/4 lb/ac - 400 plants/ac	Low	Grass/Brush Mix			X	X	X			May spread and become invasive
Mahogany, Mountain	Native	14	rocky	400 plants/ac	Low	Foothill/Mountain	X	X		X	X	X	X	Leaves may cause poisoning
Mockorange (Syringa)	Native	18	sl- grave	500 plants/ac	Low	Tree/Shrub			X	X		X	X	
Oregongrape	Native	15	sl- grave	1400 plants/ac	Low	Creeping Shrub	X	X		X		X	X	Don't plant in sunny windswept areas
Peashrub, Siberian	Introduced	10	fsl-sl	700 plants/mile	Medium	Windbreak-Shelte	X	X		X				
Rabbitbrush, Green and Rubber	Native	10	sil-s	400 plants/ac	Low	Grass/Brush Mix	X	X		X		X	X	Becomes invasive on disturbed sites
Sagebrush, Basin Big	Native	8	cl-sl	1/40 lb/ac - 400 plants/a	Low	Grass/Sagebrush	X	X		X			X	Becomes invasive if site is disturbed
Sagebrush, Mountain Big	Native	14	sil-sl	1/40 lb/ac - 400 plants/a	Low	Grass/Sagebrush	X	X		X			X	
Sagebrush, Wyoming Big	Native	8	cl-sl	1/40 lb/ac - 400 plants/a	Low	Grass/Sagebrush	X	X		X	X		X	
Saltbush, Fourwing	Native	8	l-s	1/4 lb/ac - 400 plants/ac	Low	Grass/Brush Mix		X		X	X		X	Use caution if planting near roadways
Serviceberry, Saskatoon	Native	14	sil-sl	800 plants/mile	Low	Foothill/Mountain	X	X		X		X	X	
Snowberry - several species	Native	14	sil-sl	400 plants/ac	Low	Foothill/Mountain	X	X		X	X	X	X	
Sumac, Skunkbush	Native	14	rocky	1000 plants/mile	Low	Windbreak-Shelte	X	X		X		X	X	Intolerant of extended flooding
Willow - several species	Native	20	wet	species dependent 300 - 1700 plants/mile	Rapid	Riparian/Wetland			X	X	X		X	
Winterfat	Native	7	limy	1/4 lb/ac - 400 plants/ac	Low	Grass/Brush Mix			X	X	X	X	X	
Woods Rose	Native	18	cl-sl		High	Tree/Shrub			X	X		X	X	

\* This rate is the recommended number of plants per mile if planting is commonly in a linear pattern. This is a MIX rate not the 100% pure seed rate, and is based on targeting a specific number of plants per acre for optimal wildlife habitat.

**Note 1:** The above seeding rates are based on planting using a drill. For broadcast seedings, seeding rates should be increased by 2.0 times.

**Note 2:** Many shrub seeds require a carrier for seeding.

**Soil:** cl = clay loam; fsl = fine sandy loam; gravelly = 1/8 - 2" rock; l = loam; limy = high calcium content; moist = moist-well drained; rocky = 2" plus rock; s = sand; sc = sandy clay; sil = silty; sl = sandy loam; wet = saturated

## Recommended Seed Mixes for Re-vegetation

The following seed mixes have been selected for their ability to quickly achieve 70% vegetation cover. This will minimize:

- 1) the establishment of weed species, and
- 2) erosion.

<u>Species</u>	<u>Rate (PLS/Acre)</u>
<i>Hay/pasture area (to receive supplemental irrigation during the summer)</i>	
Smooth brome	6 lbs
Timothy	2 lbs
Western Wheatgrass	8 lbs

<i>Low Water Lawn areas (to receive some supplemental irrigation and may be mowed regularly)</i>	
Blue gramma	0.25 lbs/1000 sq ft
Red fescue	2.0 lbs/1000 sq ft
Tall fescue	6.0 lbs/1000 sq ft
Sideoats gramma	0.5 lbs/1000 sq ft

<i>Low Water Lawn areas (to receive some supplemental irrigation and may be mowed regularly)</i>	
'Covar' sheep fescue	4 lbs/1000 sq ft
Lewis' flax	a few ounces

<i>Non-irrigated areas (must receive irrigation until it reaches 2-4" height)</i>	
Western wheatgrass	6 lbs
Intermediate wheatgrass	8 lbs
Idaho fescue	6 lbs
Streambank wheatgrass	5 lbs

<i>Non-irrigated areas being established in more difficult conditions</i>	
Streambank wheatgrass	5 lbs
Western wheatgrass	5 lbs
Thickspike wheatgrass	4 lbs

<b>Sandy Soils Use one of the above mixes and supplement with:</b>	
Indian ricegrass	4 lbs

<b>Saline Sites Use one of the above mixes and supplement with:</b>	
Tall wheatgrass	5 lbs

City of Pocatello Re-vegetation Requirements

APPENDIX 3

<u>Species</u>	<u>Rate (PLS/Acre)</u>
<i>Native seed mix used at the Clark Street Interchange (east side) in Pocatello (to receive irrigation until it reaches 2-4" in height) NOTE: planting to occur in spring 2010.</i>	
'Anatone' bluebunch wheatgrass or Secar/ Snake river wheatgrass	4 lbs
'High plains' sandberg bluegrass	1 lb
'Magnar' basin wildrye	3.2 lbs
'Bannock' thickspike wheatgrass	2.4 lbs
'Pryor' slender wheatgrass	1.2 lbs

***Forbs (flowers) and other wildlife friendly seed mixes.***

It is recommended that forbs, shrubs and other wildlife friendly seeds be added AFTER successful revegetation has been achieved.

***DO NOT use invasive or noxious weed seeds in your mixture. Bannock County Weed Control can provide you with their latest list of noxious weeds: 234-4139***

## **Seed & Plant Sources**

The following is provided as a general guide to nurseries that can be used to find and purchase seeds & plants for the grasses, forbs and shrubs listed in this manual. This list is not exhaustive nor does it imply any recommendation for a listed nursery. Contact information was current at time of press.

### **Pocatello Area**

#### **Idaho Grimm Growers**

PO Box 276  
Blackfoot, ID 83221  
Phone: (208) 785-0830

#### **Conservation Seeding & Restoration, Inc**

506 Center Street W Kimberly, ID 83341  
Phone: 208-423-4835  
Email: [steven@csr-inc.com](mailto:steven@csr-inc.com)  
Web: [www.csr-inc.com](http://www.csr-inc.com)

#### **Granite Seed Company**

1697 West 2100 North; Lehi, Utah 84043  
Phone: 801-768-4422  
Email: [granite@graniteseed.com](mailto:granite@graniteseed.com)  
Web: [www.graniteseed.com/](http://www.graniteseed.com/)

#### **Lawyer Nursery Inc. (bareroot nursery stock)**

6625 Montana Highway 200 Plains, Montana 59859  
Phone: 800-551-9875  
Email: [seeds@lawyernursery.com](mailto:seeds@lawyernursery.com)  
Web: [www.lawyernursery.com/](http://www.lawyernursery.com/)

#### **Lone Peak Conservation Nursery (plants only)**

271 W Bitterbrush Lane Draper UT, 84020  
Phone: 801-571-0900  
Email: [lpcc@utah.gov](mailto:lpcc@utah.gov)  
Web: [www.Seedlings.utah.gov](http://www.Seedlings.utah.gov)

#### **Native Seed Network**

563 SW Jefferson Ave Corvallis, OR 97333  
Phone: 541-753-3099  
Web: [www.nativeseednetwork.org/](http://www.nativeseednetwork.org/)

#### **Pawnee Buttes Seed Inc.**

PO Box 100 605 25th Street Greeley, CO. 80632  
Phone: (800) 782-5947  
Email: [info@pawneebutteseed.com](mailto:info@pawneebutteseed.com)  
Web: [www.pawneebutteseed.com/](http://www.pawneebutteseed.com/)

#### **Sun Mountain Natives**

1406 East F Street Moscow, ID 83843  
Phone: 208-883-7611  
Web: [www.sunmountainnatives.com](http://www.sunmountainnatives.com)

#### **U. of Idaho Forest Nursery (plants only)**

PO Box 441137 Moscow, Idaho 83844  
Phone: (208) 885-3888  
Email: [seedlings@uidaho.edu](mailto:seedlings@uidaho.edu)  
Web: [seedlings.uidaho.com/NurseryShop/](http://seedlings.uidaho.com/NurseryShop/)

#### **Western Native Seed**

PO Box 188 Coaldale, CO 81222  
Phone: 719-942-3935  
Email: [info@westernnativeseed.com](mailto:info@westernnativeseed.com)  
Web: [www.westernnativeseed.com](http://www.westernnativeseed.com)

#### **Wind River Seed**

3075 Lane 51 ½ Manderson, WY 82432  
Phone: (800)967-1798  
Web: [www.windriverseed.com](http://www.windriverseed.com)

### **Additional sources for vendors selling seeds and native plants that grow well in our region:**

#### **Plant Native Website**

[http://www.plantnative.org/nd\\_idtoks.htm](http://www.plantnative.org/nd_idtoks.htm)

#### **USDA Natural Resources Plant and Seed Vendors**

[ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn33\\_vendors\\_1008.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn33_vendors_1008.pdf)

#### **Dr. Love's Native Plants and Where to Find Them**

<http://www.extension.uidaho.edu/idahogardens/Seasonal/Dr%20Loves%20Native%20Plant%20List.pdf>

Also provides names and descriptions for a variety of recommended native plants for use in landscaping within the interior Northwest.

## Re-vegetation Contractors

The following is provided as a general guide to local contractors that can assist with re-vegetation efforts. This list is not exhaustive nor does it imply any recommendation for a listed contractor. Contact information is current at time of press.

<u>Contractor</u>	<u>Drill Seeding</u>	<u>Hydroseeding/ Hydromulching</u>	<u>Erosion Control Fabric Application</u>	<u>Straw/ Compost/ Mulch Application</u>	<u>Tackifier Application</u>	<u>Irrigation</u>
<b>Amerigo</b> 735 S. 1 <sup>st</sup> Ave Pocatello, ID 83201 Phone: (208) 234-2181	YES	YES	YES	YES	YES	YES
<b>Anderson Hydroseeding</b> 10000 W. Thaine Rd Pocatello, ID 83201 Phone: (208) 221-1745	YES	YES	YES	YES	YES	
<b>Mountain Shadow Landscaping</b> 14458 W Siphon Rd Pocatello, ID 83202 (208) 234-9393		YES	YES	YES	YES	YES

## Re-vegetation Supply Sources

The following is provided as a general guide to local suppliers that can assist with re-vegetation efforts. This list is not exhaustive nor does it imply any recommendation for a listed supplier. Contact information is current at time of press.

<u>Supplier</u>	<u>Erosion Control Fabric</u>	<u>Straw</u>	<u>Compost</u>	<u>Irrigation Pipe</u>
<b>Amerigo</b> 735 S. 1 <sup>st</sup> Ave Pocatello, ID 83201 Phone: (208) 234-2181	YES	YES	YES	YES
<b>Robertson's Supply</b> 695 W Maple St Pocatello, ID 83201 (208) 234-4600				YES
<b>United Pipe &amp; Supply</b> 3484 Highway 30 West Pocatello, ID 83201 Phone (208)232-6600		YES	possibly	YES
<b>Western Supply</b> 2055 Garrett Way # 5 Pocatello, ID 83201 (208) 637-0727				YES

## **Additional Technical Information**

**Plant Materials and Re-vegetation Techniques.** *All the Internet links in this document were current at publication time. Since then some sites may not be maintained.*

### **Reading Seed Packaging Labels – Calculating Seed Mixtures**

Idaho Plant Materials Technical Note No. 4 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/seed\\_label.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/seed_label.pdf)

### **Mixing Seed with Rice Hulls**

Idaho Plant Materials Technical Note No. 7 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/mixseed\\_ricehulls.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/mixseed_ricehulls.pdf)

### **Calibrating a Seed Drill for Conservation Plantings**

Idaho Plant Materials Technical Note No. 19 <ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/calibration07.pdf>

### **Pasture and Range Seedings**

Idaho Plant Materials Technical Note No. 10 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn10\\_pasture.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn10_pasture.pdf)

### **Grass, Grass-Like, Forb, Legume, and Woody Species for the Intermountain West**

Idaho Plant Materials Technical Note No. 24 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn24\\_seedspecies.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn24_seedspecies.pdf)

### **Conservation Shrubs and Trees for the Intermountain West**

Idaho Plant Materials Technical Note No. 50 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn50\\_shrubs.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/tn50_shrubs.pdf)

### **Planting Guide for Bareroot Trees and Shrubs**

Montana NRCS Planting Guide [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/planting\\_guide\\_bareroot\\_3.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/planting_guide_bareroot_3.pdf)

### **Tree and Shrub Planting, Care and Management**

Idaho Plant Materials Technical Note No. 43 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/treecare\\_1007.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/treecare_1007.pdf)

**NRCS Plants Database** <http://plants.usda.gov>

**Table 2** Idaho Plant Materials Technical Note No. 43 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/treeshrub\\_table2.xls](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/treeshrub_table2.xls)

**Table 3** Idaho Plant Materials Technical Note No. 43 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/treeshrub\\_table3.xls](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/treeshrub_table3.xls)

### **Planting Guide for Container, Balled and Bur-lapped Stock**

Montana NRCS Planting Guide [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/planting\\_guide\\_balledbur\\_lap.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/planting_guide_balledbur_lap.pdf)

### **Pruning Trees and Shrubs**

<http://www.ext.nodak.edu/extpubs/plantsci/trees/h1036w.htm>

### **Weed Control in Tree Plantings**

<http://www.ext.nodak.edu/extpubs/plantsci/weeds/w1097-1.htm>

### **Weed Barrier Fabric Maintenance for Conservation Tree Plantings**

[ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/weed\\_barrier.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/weed_barrier.pdf)

### **Trees Against the Wind**

PNW Extension Publication [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/trees\\_wind05.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/trees_wind05.pdf)

**Windbreak Establishment** University of Nebraska Extension EC 91-1764-B.

<http://www.unl.edu/nac/brochures/ec1764/ec1764.pdf>

**Windbreak Management** University of Nebraska Cooperative Extension EC 96-1768-X.

<http://www.unl.edu/nac/brochures/ec1768/ec1768.pdf>

**Windbreak Renovation** University of Nebraska Cooperative Extension EC.98-1777-X

<http://www.unl.edu/nac/brochures/ec1777/ec1777.pdf>

### **Water Needs of Windbreaks for Trickle Irrigation System Design.**

Idaho Forestry Technical Note No. 14 [ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/trickle\\_irrigation.pdf](ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/trickle_irrigation.pdf)

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