

## **SEEDING AND PLANTING GUIDANCE AND INFORMATION**

*Last Updated: 2/19/2018*

### **Guidance for Determining PLS and Bulk Seeding Rates**

Seeding rates in NRCS seeding recommendations / prescriptions are *always* to be computed and documented as pounds of “pure live seed” (PLS). Actual bulk (field) seeding rates will typically be higher, depending upon the quality (i.e., purity and germination) of the purchased seed. Commercial seed dealers should be able to calculate, formulate and mix the required bulk pounds needed, based on the PLS pounds provided in NRCS recommendations for each species in a mixture.

Calculate the PLS content of each bag of seed (or seed lot) using the formula:

$$\text{Percent PLS} = \text{Percent Germination} \times \text{Percent Purity.}$$

Calculate the Bulk Seeding Rate for each bag of seed as follows:

$$\begin{array}{l} \text{Bulk Seeding Rate} \\ \text{(lbs / acre)} \end{array} = \begin{array}{l} \text{Recommended} \\ \text{PLS Seeding Rate} \\ \text{(lbs / acre)} \end{array} / \text{Percent PLS}$$

#### **Example:**

The specified PLS seeding rate for California brome (*Bromus carinatus*) is 10.5 lbs PLS / acre and the seed tag shows:

**Purity:** 95 percent

**Germination:** 79.5 percent (do not include the percent hard seed)

PLS content of seed bag = 95% x 79.5% = 75.5% (or 0.755 converted to decimal format)

**Bulk Seeding Rate** is: 10.5 lbs. PLS per acre / 0.755 = 13.9 bulk lbs./acre

### **Calibrating Drills or Broadcast Seed Spreaders**

When any kind of seed drill or seed broadcaster (e.g., rotary spreader) is used, or even with manual hand-spreading, calibration is needed to insure that the specified seeding rate is being applied. This calibration is conducted using *bulk* seeding rates to be applied in the field, as determined from PLS calculations used to derive bulk pounds per acre needed.

#### **Drilled Seedings**

The required number of seeds per linear foot of drill row can be calculated using the following formula:

$$\text{Seeds / FT. of Row} = \frac{\text{(bulk seeding rate in lbs. per acre X number of seeds per lb.)}}{\text{Row Factor (RF)}}$$

Number of seeds per pound for all seeded species in the eVegGuide can be found in the individual specie’s Plant Record, accessed using PLANT EDITOR.

Row Factor (RF) – represents the total feet of rows per acre

87,120 for 6-inch row spacing (i.e., 2 rows per foot of width x 43,560 feet = 1 acre)  
79,860 for 7-inch row spacing  
72,600 for 8-inch row spacing  
65,340 for 9-inch row spacing  
58,080 for 10-inch row spacing  
50,820 for 11-inch row spacing  
43,560 for 12-inch row spacing (i.e., 1 row per foot of width x 43,560 feet = 1 acre)

For other row spacing (i.e., less than 6 inches, or greater than 12 inches), use the following row factor formulas:

Less than 6 inches – add 7,260 for each inch less than 6.

More than 12 inches – subtract 7,260 for each inch greater than 12.

**Example:**

California Brome (*Bromus carinatus*) is to be seeded as a monotypic (100%) seeding, using a grass drill that has 7-inch row spacing.

Bulk Seeding Rate = 13.9 lbs. per acre (to achieve 25 PLS seeds per square foot)

Number of Seeds per lb. = 103,680

$$\text{Species seeds per linear foot of drill row} = \frac{(13.9 \text{ lbs. per acre} \times 103,680 \text{ seeds per lb.})}{79,860}$$

$$= 1,441,152 / 79,860 = 18.05$$

**USE:** 18 seeds per linear foot

The same calculations will hold true for a multi-species mixture, using the total bulk pounds per acre for the mixture. Seed dealers will often provide total mixture purity and germination, as determined from their individual calculations derived from the individual component species.

If these cumulative values are not provided by the seed dealer, then the calibration values can be approximated from the individual component species as follows:

**A)** Use the largest single component species as the guide for calibration, IF the species is 50% or greater of the seed mixture.

**B)** If no single species constitutes 50% or more of the mixture, then use the following conversion:

Weighted seeds per pound =

$$\left( \begin{array}{l} \text{Species 1 bulk lbs. per acre} \times \text{Species 1 seeds per pound} + \\ \text{Species 2 bulk lbs. per acre} \times \text{Species 2 seeds per pound} + \\ \text{Species 3 bulk lbs. per acre} \times \text{Species 3 seeds per pound} + \\ \text{Species 4 bulk lbs. per acre} \times \text{Species 4 seeds per pound} + \\ \text{Species 5 bulk lbs. per acre} \times \text{Species 5 seeds per pound} + \\ \dots\dots\dots \\ \text{Species 'X' bulk lbs. per acre} \times \text{Species 'X' seeds per pound} \end{array} \right) / \text{Mixture total bulk pounds}$$

$$\text{Mixture seeds per linear foot of drill row} = \frac{(\text{Mixture bulk lbs. per acre} \times \text{Weighted seeds per lb.})}{\text{Row factor (RF)}}$$

## Broadcast Seedings

For any broadcast type of seeding, calibration is determined using cumulative seed weight over a prescribed unit area, rather than by counting number of seeds per linear foot of drill row. Other calibration factors must therefore be determined, as follows:

- Typical swath width of seed spread from broadcast seeder, rotary spreader, or by hand
- Length of calibration test swath (typically 12 – 20 feet)

Swath width (feet) x swath length (feet) = Area of test calibration (square feet)

Area of test calibration (square feet) / 43,560 = proportion of an acre for the calibration test area (acre)

Spread and secure a plastic or canvas tarp over the test calibration area. Operate the broadcast seeder, rotary spreader, or hand-spreading at normal operating speed over the desired length of test calibration area (minimum 12 feet). Collect and weigh the seed (in grams, ounces, or pounds, depending upon seed quantity) that was broadcast on the tarp.

$$\left. \begin{array}{l} \text{(Seed weight in grams / 453.6)} \\ \text{(Seed weight in ounces / 16)} \\ \text{Seed weight in pounds} \end{array} \right\} / \text{calibration test area (acre)} = \text{Bulk seeding rate per acre.}$$

### Example:

California Brome (*Bromus carinatus*) is to be seeded as a monotypic (100%) seeding, using a broadcast seeder or rotary spreader that has 6-foot swath width of seed spread at normal operating speed.

Bulk Seeding Rate = 13.9 lbs. per acre (to achieve 25 PLS seeds per square foot)

Calibration Test Area = 6 feet wide by 20 feet long = 120 square feet = 0.003 acre

**Species seed weight needed for the calibration test area** = 13.9 lbs. per acre x 0.003 acre

= 0.04 pounds

= 0.7 ounces

= 18.9 grams

Adjust apparatus or walking speed, and/or adjust broadcast rate per unit time from the apparatus, until this amount of bulk seed is collected from the calibration test area. The same calculations will hold true for a multi-species mixture, using modifications of the procedures noted above for drilled row seedings.

## Seeding Goals for Satisfactory Plantings

Seeding rates in the eVegGuide are calculated based on desired seed population per unit area (i.e., plant density) goals for either single (monotypic) species seeding or multi-species mixtures. The standard, base rate for drilled seedings is 25 pure live seeds per square foot for single species or cumulatively for a mixture. Broadcast seedings are calculated based on a 2X factor times the drilled seeding rate.

Some seeding rates differ from the standard, base rate of 25 PLS seeds per square foot. This is particularly true for many legume and cereal grain species that are commonly used in Cover Crop (Conservation Practice 340) applications. Seeding rates for these species typically conform to the agronomic industry standard, as based on current literature recommendations from NRCS Plant Material Centers, NRCS State Office and Area Office Specialists, University of California, SARE, and/or other pertinent sources. Certain legumes may also be used in rangeland and pasture (Conservation Practice 550 and 512) applications, but legume use in these latter situations may revert to the base rate of 25 seeds per square foot.

All legume seed should be inoculated with proper (typically species-specific) bacteria inoculant before planting. Pellet-inoculated (coated) seed can be purchased or inoculation can be done in the field. Use only fresh, age-dated inoculant specifically labeled for the legume species to be seeded. Contact your Area or State Office Agronomist / Specialist for assistance, and refer to the footnote links in the eVegGuide for species-specific inoculant recommendations, inoculation techniques, and related general information.

Vegetation listed for irrigated sites is suitable for all 4ETa Zones.

Seeding rates were reduced 40-50 percent for plants that tiller or are rhizomatous. For a vining legume like 'Lana' woolypod vetch (*Vicia villosa*), rates were reduced by 50 percent.

**Comment [KL1]:** No longer true in the eVegGuide. This would affect a large number of grass species in particular.

Satisfactory plantings for erosion control are based on the goal of having at least 60 percent ground cover by January 15 - which is considered the end of the first third of the critical rainfall erosion period (November 15 to May 15) for most of California.

**Comment [KL2]:** Is this still a valid goal???

For:

- |  |   |
|--|---|
| <u>Channel Vegetation</u>                | <u>Cross Wind Trap Strips</u>           |
| <u>Conservation Cover</u>                | <u>Emergency Seeding after Wildfire</u> |
| <u>Contour Buffer Strips</u>             | <u>Filter Strip</u>                     |
| <u>Cover/Green Manure Crop</u>           | <u>Grassed Waterway</u>                 |
| <u>Cover Crop ( for erosion control)</u> | <u>Hedgerow Planting</u>                |
| <u>Critical Area Planting</u>            | <u>Roadside-Weed Suppression</u>        |

Satisfactory Planting = 12 growing plants / square foot (SF) during the first season.

Planting Goals are based on the following rationale:

- Drilled -- 34-37 PLS/SF > 75% emergence = 25 plants > 50% survival = 12 plants
- Broadcast -- 50-55 PLS/SF > 50% emergence = 25 plants > 50% survival = 12 plants

For: Cover Crop (permanent - up to 9 percent slopes)

Satisfactory Planting = 6 growing plants/SF first season.

Planting Goals based on:

- DR 17 - 20 PLS/SF > 75% emergence = 13 plants > 50% survival = 6 plants
- BR 25 - 28 PLS/SF > 50% emergence = 13 plants > 50% survival = 6 plants

For: Heavy Use Area Protection - Turf

Satisfactory Planting = 60 growing plants/SF first season.

Planting Goals based on:

- DR 150-200 PLS/SF > 75% emergence = 120 plants > 50% survival = 60 plants
- BR 250-300 PLS/SF > 50% emergence = 125 plants > 50% survival = 62 plants

For: Range Planting (perennial grasses) Pasture and Hay Planting (perennial grasses)

Satisfactory Planting = 1-2 growing plants/SF end of first growing season.

Satisfactory Planting= 2-3 Plants/SF end of third growing season.

Planting Goals based on:

DR 20 - 25 PLS/SF > 30% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

BR 30 - 35 PLS/SF > 20% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

For: Wildlife Plantings Wildlife Nesting Cover

Satisfactory Planting = 2 - 3 Plants/SF

Example is Barley @ 40#/Acre (1/2 normal planting rate)

DR 20 - 25 PLS/SF > 30% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

BR 30 - 35 PLS/SF > 20% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

For: Natural Area Restoration

Satisfactory Planting = 2 - 3 Plants/SF

DR 20 - 25 PLS/SF > 30% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

BR 30 - 35 PLS/SF > 20% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

For: Riparian Areas

Satisfactory Planting = 2 - 3 Plants/SF

Use herbaceous plants in association with an overstory of shrubs and trees.

DR 20 - 25 PLS/SF > 30% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

BR 30 - 35 PLS/SF > 20% emergence = 6 - 8 plants > 40% survival = 2 - 3 plants

**Comment [KL3]:** How do people want these goals for minimum anticipated / desired plant density to be handled?? Revised to the base rate of 25 PLS per square foot, where applicable?? Cover crop species revised to their current seeding rates?? Drop this whole discussion (is it covered in a tech note elsewhere)??