



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

Tucson
Plant Materials
Center
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Seed establishment techniques and seeding specifications

Arizona Technical Note No. TN-PM-18-1-AZ



Conservation Plantings

Successful establishment of plantings from seed requires proper seedbed preparation, proper seeding techniques, and quality seed. This guidance applies on rangelands, native or naturalized pasture, grazed forest or other suitable location and to the following Conservation Practices: Conservation Cover (327), Cover Crop (340), Critical Area Planting (342), Forage and Biomass Planting (512), and Range Planting (550).

Seed/Planting Stock

All seed and planting materials shall be labeled and meet state seed quality law standards. Use of certified seed is encouraged.

Legume species require inoculation with rhizobium bacteria for healthy stand establishment. If the legume seed is not sold pre-inoculated, be sure to use the proper inoculant for the plant species. Inoculant should be used prior to the expiration date on the package and applied following manufacturer recommendations.

Seed Quality

All seed purchases must be accompanied by seed tags with a current (less than one year old) analysis for purity and germination (see Figures 4 and 5). Lab test results, if available, may be used in place of a seed tag (see Figure 3). **Purity** specifies the percentage of the lot that is the desired seed, rather than other seed or inert matter. **Germination** indicates the percentage of seed that is live and capable of germinating. Sometimes germination is estimated with a tetrazolium test in the lab. In this case, the tag will say TZ rather than germination. Some species produce dormant (hard) seed, which means that the seed is alive, but germination may be delayed. The percentage of dormant seed is indicated on the tag as applicable. Pure live seed (PLS) is calculated by multiplying purity and germination (including dormancy). High PLS usually indicates high quality seed.

Additional Seed Quality Considerations

- If ordering a seed mix for grassland drills, request that seeds in different stages of cleaning or sizes be separated (i.e. fluffy, smooth small, and smooth large).
- Seed coatings are considered inert matter and are included in the inert percentage on the tag.

Seedbed/Planting Site Preparation

The successful seeding of a conservation planting depends on proper seedbed preparation. The goals of seedbed preparation are to optimize germination and emergence by 1) improving seed to mineral soil contact, 2) ensuring proper seeding depth, 3) controlling competing vegetation, and 4) maintaining ample soil moisture.

If the seedbed is too loose and fluffy, seeds will be placed too deep for proper germination, which may lead to stand establishment failure. An ideal seedbed is uniformly firm, has soil moisture near the surface, is free from competing vegetation, and is well-packed underneath with small surface clods or a light mulch of residue to prevent soil erosion. The correct firmness has

been achieved when an adult footprint is only slightly visible (no more than ½ inch) on the prepared seedbed prior to the seeding operation.

Use of chemicals (burn-down herbicides) as an alternative to mechanical seedbed preparation should be considered where tillage is not an option.

Sometimes an area may need to be shaped or graded to eliminate existing surface erosion patterns or to improve ease of seeding operations. Sites reshaped with heavy equipment may have a smooth hard surface and compacted soils, making it difficult to prepare a good seedbed. In such situations, disking, ripping or other treatment may be necessary. A secondary operation such as rolling or cultipacking may be required to firm the seedbed in preparation for planting.

For enhancement or interseeding projects, it is necessary to both prepare a proper seedbed and reduce competition from the established vegetation. Strip (localized) tillage to a depth of 4 inches or localized chemical control may be needed to reduce competition.

Weed Control- Requirements

Weeds compete with young seedlings for moisture and light. For best results, control weeds prior to planting. A weed-free seedbed is generally defined as not exceeding one (1) weed seedling per square foot at the time of planting. State-listed noxious weeds must be controlled either mechanically or chemically. Treat weeds before they produce seed.

Soil Amendments

Soil amendments will be added as necessary to ameliorate or eliminate physical or chemical conditions that inhibit plant establishment and growth. Amendments including fertilizer, compost or manure to add organic matter and improve soil structure and water holding capacity; agricultural limestone to increase the pH of acid soils; or elemental sulfur to lower the pH of calcareous soils shall be included in the site specification with amounts, timing, and method of application. Consider initial and follow up applications of fertilizer to ensure stand establishment. However, be aware that initial fertilizer applications can favor weed growth at the expense of stand establishment. Amendment application rates must be based on soil analysis, land grant university recommendations, or industry standards.

Seeding

Placement- Seeding Equipment

Choosing the appropriate planting method depends on the type and condition of the site, equipment availability, and the type of seed being planted. There are two commonly used methods for conservation seedings, drilling and broadcasting. Both methods require calibration in order to plant seed at the proper rate. Seeding rate recommendations are given in pounds of pure live seed (PLS) per acre. Because the actual bulk seed in the bag is planted, these PLS seeding rates must be converted to bulk pounds per acre in order to properly calibrate the planting equipment.

Example: The desired planting rate is 10 PLS pounds per acre. The PLS rate (purity x germination) from the seed tag is 88%, or 0.88.

$$10 \text{ PLS lb/ac} \div 0.88 = 11.36 \text{ bulk lb/ac}$$

This conversion can be done easily using the spreadsheet section shown in Figure 2 and information from the seed tags.

Drill seeding: Two types of seed drills are commonly used by the agricultural producer: grain and grassland drills. A grain drill has a single seed box and is typically used for planting wheat, oats and other small grains. Grassland seed drills are equipped with multiple seed boxes for planting different seed types (e.g. fluffy/chaffy seed, small seed). As the drill moves across the seed bed, seed from a hopper is metered out through tubes into a soil opening device (i.e. disc openers, chisels) that plant the seed at a set depth. Most seed drills have an adjustable planting depth to accommodate differences in seed sizes. **The typical planting depth of most conservation species ranges from ¼ inch to 1 inch in depth.** The soil opening and planting operation is normally followed by a set of packer wheels that press and firm the soil over the seed.

Drill calibration can be accomplished by collecting seed from openers after traveling a given distance or turning the drive wheel on the drill and collecting seed from openers. Some grassland drill companies give a standard calibration formula that allows conversion of the weight of seed collected to a lb/ac rate.

Broadcast seeding: Broadcasting is a planting method that scatters seed across an area, either by mechanical means or by hand. Mechanical broadcast seeders typically are cyclone spreaders driven by a tractor power-take-off, an electric motor, or by hand operation. They use centrifugal force to distribute seed across the site. When planting light fluffy seeds or extremely small seeds a carrier (such as pelletized lime, rice hulls, fertilizer, cracked corn, cottonseed, hulls, or damp sand) adds weight and helps distribute the seed evenly. Following a broadcast seeding, some type of light tillage or cultipacking should be used to help incorporate the seed and improve seed to soil contact.

Broadcasting equipment may not distribute seed evenly due to ground conditions or changes in speed, so calibrating a broadcast spreader is not as precise as calibrating a drill. To calibrate a broadcast seeder, determine your bulk seeding rate per acre and convert that to an anticipated number of seeds per square foot. Place several small tarps at multiple locations across the path of the seeder. Operate the seeder across the tarps and check each tarp for the average seed count per square foot. Increase or decrease the rate of seed flow by using the adjustable gate on the spreader.

Additional Seed Placement Considerations

Drill seeders should be operated at low speeds (under two miles per hour) for the best performance and uniform seed delivery. When operated at higher speeds, there will likely be

many "skips", disk penetration will be much more erratic, and furrow openers will throw soil into adjoining furrows

Seeding Dates and Timing

Plant seed mixes when soil moisture and temperature are optimum for germination. For seed mixes with greater percentages of either "cool" and "warm" season species consider the following:

- Cool season species germinate best when soil temperatures are cooler and day lengths are shorter.
- Warm season species germinate best with warmer soil temperature and longer day length.
- If planting during the dormant season to encourage winter stratification of forb seeds, allow for a minimum of 45 days with soil temperatures at 45 degrees Fahrenheit or below
- Strive to plant seed prior to a predicted precipitation event.

Establishment

Seeded species may be considered established when they are well-rooted (not easily pulled out of ground by hand) and/or are producing reproductive stems. Domestic grazing animals will be excluded from the newly seeded areas from the date of planting until the end of the second growing season. Temporary fencing may be required. Grazing may be permitted during the dormant period between the growing seasons, if plants are well rooted.

Noxious and competitive invasive weeds should be controlled by mowing, clipping or herbicides. Grass seedlings should be allowed to attain at least 4-5 leaf stage before herbicides are applied. Be sure to read and follow label directions.

When plantings are irrigated for establishment, maintain adequate moisture at least in the upper six (6) inches of soil during the first four (4) weeks and then in the upper 12 inches until the end of the growing season.

Operation and Maintenance

1. Periodic inspection and evaluation of vegetation to determine establishment and maintenance needs.
2. Management of vegetation growth, as applicable, by mowing, approved chemicals or other means to establish the desired cover.
3. Replanting due to drought, insects or other events which prevented adequate stand establishment should be addressed within 1-3 years of planting. Recommendations may vary from complete re-establishment to overseeding or spot replanting. Thin stands may only need additional grazing deferment during the growing season.
4. Repair of fences.
5. Pest (weeds, grasshoppers, rabbits, rodents, etc.) control will be undertaken when pests are determined to be detrimental to establishing new seedlings. Any control specified shall be in accordance with Pest Management (595).

Official Seed Analysis Report

USDA -NRCS

USAPlants ID	Date Received	Date Completed	Lab Number
000GJN	8/15/2017	8/25/2017	B20171098

Description:
Seedsman:
 USDA -NRCS
 3241 N ROMERO RD.
 TUCSON AZ 85705

Treated With: None Given
Lot Number: SFD-11-7:5-6-2

Sampled Date:
Test Date:

Seed: Variety	Origin
Alkalai Sacaton : Sporobolus airoides: Vegas - 9092744	None Given

Interstate Noxious Weed Test Grams Used: 1.004

Interstate Noxious Weeds Found	State	Nbr/LB
None Found		

Purity Test Grams Used: 0.5050

Seed Kind : Variety	Pure Seed %
Alkalai Sacaton : Sporobolus airoides: Vegas - 9092744	99.80

Purity Test

Crop Seed %	Inert Matter %	Weed Seed %	Coating %
0.00	0.20	0.00	0.00

Purity Test Grams Used: 0.5050

Weed Seeds
None Found

Purity Test Grams Used: 0.5050

Crop Seeds
None Found

Germination Test

Seed Kind : Variety	Seeds	Germ %	Abnormal %	Dead %	Dormant %	Hard %
Alkalai Sacaton : Sporobolus airoides: Vegas - 9092744	400	89	4	7	0	0

Notes

Inert material consists of broken seed, chaff and plant material.

Noxious weed seed exam done for all USA states except AK and HI.

Figure 3: A seed analysis report for Vegas alkali sacaton. Purity and germination percentages are highlighted along with the date of analysis.

Quantity	Description
1	1 acre Blain 7 mix
8	CSLG080 - Common Vetch Lot#: MS7022.t test: Feb 20, 2017 Origin: AUST Pure: 99.8 Germ: 94 Weed: 0 Other: 0 Inert: 0.13
3	CSLG150 - Yellow Clover: Yellow Sweet Clover Lot#: 17238CTD.b test: Jun 1, 2017 Origin: OR Pure: 65.2 Germ: 90 Weed: 0.2 Other: 0.2 Inert: 34.4
23	CSGR042 - Spring Barley: Lavina Lot#: TMNE-G-OC test: Aug 14, 2017 Origin: NE Pure: 99.81 Germ: 98 Weed: 0 Other: 0.1 Inert: 0.09
2	NOC010 - Micro Noc - Multi Spectrum
34	Mixing - Mixing of seed/app. of inoculants (if any)
34	Bagging - Bagging into 50# bags

Figure 4: Seed tag from a multi-species mix.

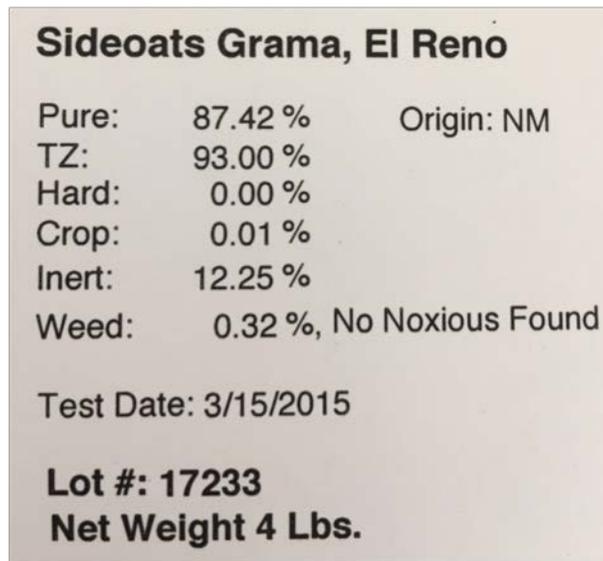


Figure 5: Seed tag showing purity and germination (TZ = by tetrazolium test).

A detailed seed tag is essential to determining if the correct amount of seed was applied over the seeding acreage. According to the Federal Seed Act, a label must list the percentage of species by weight in a mix and the percentage germination of any species. However, it is not required to list the percentage purity of each component. In these situations, it is necessary to calculate the percentage purity or request a letter of certification from the vendor in order to calculate PLS. Contact your local Field Office or Plant Materials Center for further information or help with any calculation questions.

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