

# Revegetation: Seeding Essentials for Reclaiming Disturbed Lands



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Resources

# Where we are headed

- Designing a seed mix
- Seedbed preparation
- Using the best planting methods



# Revegetation

- Challenging
  - Low/variable precip., thin soils, steep slopes, cold and windy climate
- Choose adapted varieties native to site



# Designing a reclamation seed mix

- Reclamation Objective
  - Reestablishing diverse native plant community of grasses, forbs, and shrubs
  - Inventory pre-disturbance plant community for setting reclamation objectives and designing seed mix

# Designing a reclamation seed mix

- Assess pre-disturbance plant community
  - Determine elevation, annual precipitation, timing of precipitation, growing season length, existing veg., soil depth and texture, and land form characteristics
  - Inventory helps determine ecological site
    - ESD is an excellent tool to help in designing an appropriate seed mix for your site

# Ecological Site Description

- **Ecological site** = kind of land with:
  - specific physical characteristics (soil, topography, climate)
  - which differs from other kinds of land in its ability to produce
  - distinctive kinds and amounts of vegetation
- In other words, a kind of land with similar natural potential

Ecological sites vary in kind and amount of vegetation



An **ecological site description**, developed for Wyoming by the NRCS, is a reliable tool for planning site-specific seed mixes

- <http://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=Reference%20Sheet>

- <http://uwyo.edu/WRRC>
  - “Reclamation Information”





An **ecological site description**, can also be found using the **web soil survey**

- <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

- Click on the large **Green START** button



# Web Soil Survey

Web Soil Survey - Microsoft Internet Explorer

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Address: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> Go

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Area of Interest (AOI) Soil Map **Soil Data Explorer** Shopping Cart (Free)

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Intro to Soils Suitabilities and Limitations for Use Soil Properties and Qualities Ecological Site Assessment **Soil Reports**

Search

Soil Reports

Open All Close All

- AOI Inventory
- Building Site Development
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- Land Classifications
- Land Management
- Recreational Development
- Sanitary Facilities
- Soil Chemical Properties
- Soil Erosion
- Soil Physical Properties
- Soil Qualities and Features
- Vegetative Productivity
- Waste Management
- Water Features

Soil Map

Legend

Scale (not to scale)

Internet

# Rangeland Productivity and Plant Composition

Report — Rangeland Productivity and Plant Composition

Sheridan County Area, Wyoming						
Map unit symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Rangeland composition
		Favorable year	Normal year	Unfavorable year		
		<i>Lb/ac</i>	<i>Lb/ac</i>	<i>Lb/ac</i>		
						<i>Pct</i>
154—Haverdad very fine sandy loam, 0 to 3 percent slopes						
Haverdad	Lowland 10-14" Northern Plains Precipi	3,000	2,300	1,600	Green needlegrass	25
					Needle and thread	10
					Slender wheatgrass	10
					Western wheatgrass	10
Clarkelen	—	—	—	—	—	—
Draknab	—	—	—	—	—	—
Freq. flooded soils	—	—	—	—	—	—
Gravel bars	—	—	—	—	—	—
155—Haverdad loam, moist, 0 to 3 percent slopes						
Haverdad, moist	Lowland (15-19 Np)	3,000	2,500	2,000	Green needlegrass	25
					Western wheatgrass	25
					Slender wheatgrass	10
					Needle and thread	5
Clarkelen	—	—	—	—	—	—
Draknab	—	—	—	—	—	—



Manage and  
promote what we  
want or where we  
want to go

Long-term success in restoring a species to a given site is dependent upon obtaining **plant materials adapted** to the site



Photo by Calvin Strom

# Working to design an appropriate seed mix



A tractor pulling a seed drill in a field under a cloudy sky. The tractor is in the middle ground, moving from left to right, kicking up a cloud of dust. The field is a mix of brown soil and sparse, dry vegetation. The sky is filled with large, dark, grey clouds, with some lighter patches where the sun is breaking through.

Selecting your seed mix depends  
on objectives, characteristics of  
disturbed area and seed preference  
and availability

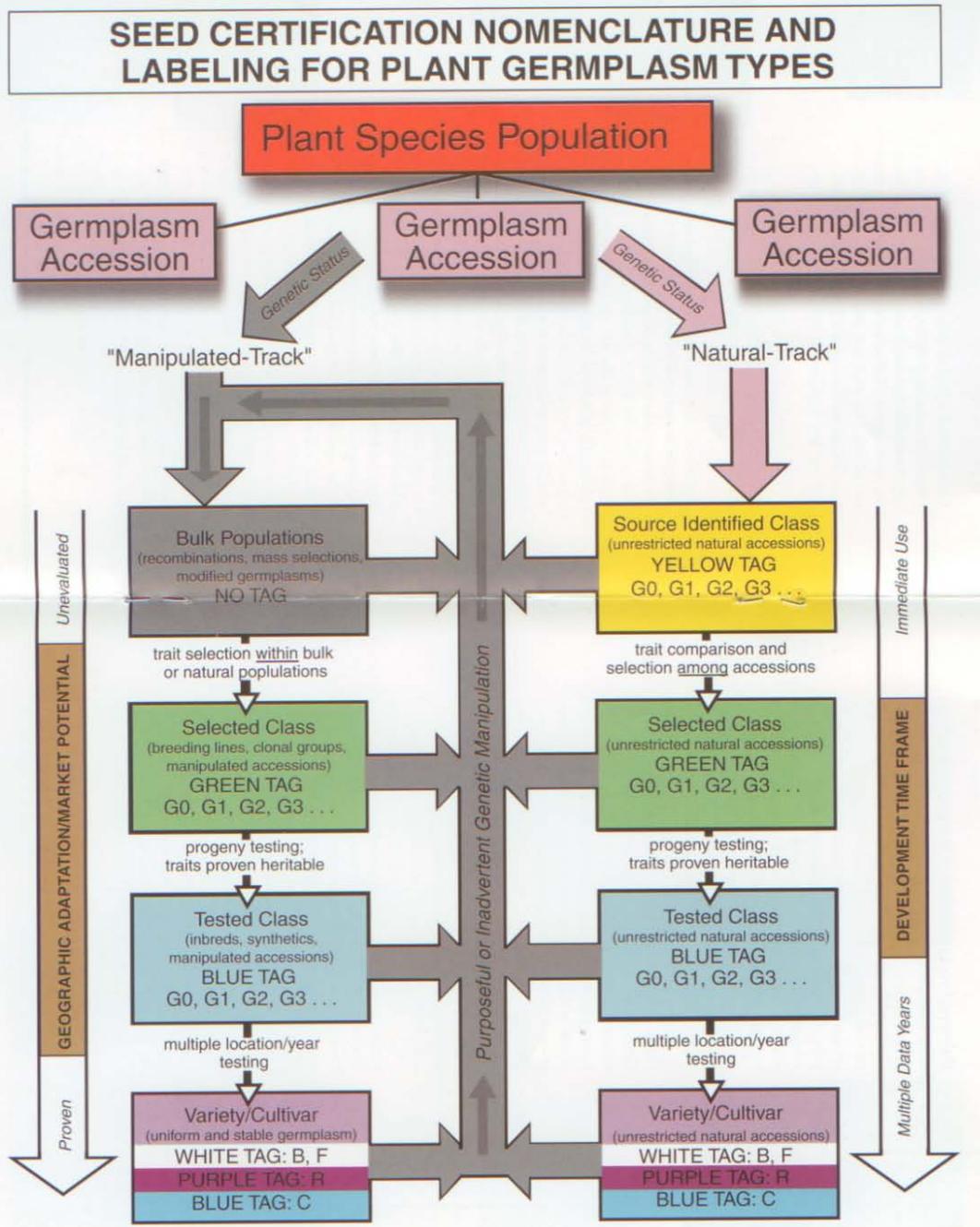
Photo by Calvin Strom

To assure genetic integrity of seeds there are standards that must be adhered to in order to sell the product as certified seed.

- Not all seeds for sale are certified
- Bags of certified seeds are marked with colored tags
- **Certified tags should have data on genetic identity of seeds, purity and germination**
- Noncertified seeds' label includes purity and germination data alone
- Genetics to match ecological site!
- Excellent idea to purchase *Certified* or *Source Identified* (unless from reputable seller)



FIGURE 1. Germplasm development flow chart.



Two approaches to germplasm development: manipulated track & natural track

# Unevaluated germplasm identified to species and location of the wild growing parents (exclusive to the natural track)

SOURCE IDENTIFIED SEED		
	Species Name	<i>Sporobolus heterolepis</i>
	Common Name	Prairie Dropseed
	Germplasm ID, Gen.	G3/5
	G3 State, County, Elev.	WI, Dane, 800 ft.
	G0 State, Region, Elev.	WI, Southwest, 790 ft.
	G0 Indigenous?	Yes
	Natural-Track?	Yes
	Lot:	2999-SPOHET-3-SE; 03346
MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES		

# Variety/cultivar release if eligibility requirements are satisfied

CERTIFIED CLASS SEED	
<i>Agency logo here</i>	KIND: Mountain Big Sagebrush
	VARIETY: Hobble Creek, "Natural-track"
	CERT. #: WC-1852
	LOT #: ArTrVaHC-02001
MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES	

Purchase and evaluate seed choices  
based on PLS (pure live seed)

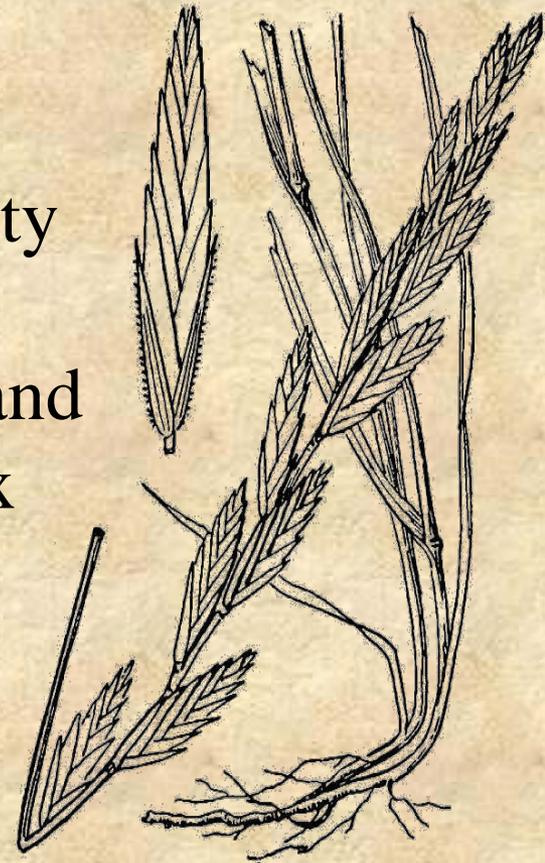


Photo by Rachel Mealor

PLS is the product of the purity (percentage of the lot by weight that consists of the crop seed) and percentage germination as performed by an official germination test

Example:

A 50-pound bag of seed with 90% purity and 90% germination has a PLS percentage of 81 ( $0.9 \times 0.9 = 0.81$ ), and amounts to 40.5 pounds of PLS ( $50 \times 0.81 = 40.5$ )



# Proper seeding rates

- Dependent on type and size of seeds, seeding techniques, soil type, and moisture
- Total of 8-16 lbs./ac for seeding native grass and forb mixture (Monsen and Stevens 2004)
  - Higher for difficult low productive sites and when broadcast seeding
- 20 pure-live-seeds/ft<sup>2</sup> for most species and doubling rate for broadcast and difficult sites (NRCS recommendations)



# Seedbed Preparation

A yellow metal frame, likely part of a seedbed preparation machine, is lying on a dirt field. The frame consists of two parallel horizontal bars connected by a vertical bar at one end. A stack of approximately ten black tires is lying horizontally across the two parallel bars. The background shows a flat, open landscape with dry grass and a cloudy sky.

Proper seedbed preparation results when seedbed is free of competition from established weeds, allows for infiltration of moisture (yet does not puddle), and is firm below seeding depth (Monsen and Stevens 2004)

# Proper Seedbed Preparation

- No clods more than 2 inches in diameter where a 170 lb. person leaves footprints no deeper than ½ inch (NRCS recommendation)
- Utilize correct tillage implements
- Works best at soil moisture content of about 10-15% (when a weak ball can be formed from soil 2-3 in. below surface)



# Ideal Seedbed

- Firm below seeding depth
- Free of large clods and smooth
- No clodding or puddling
- Free from live resident plant competition
- Free of seed from competitive species



Lastly: using the best planting methods

Photo by Calvin Strom

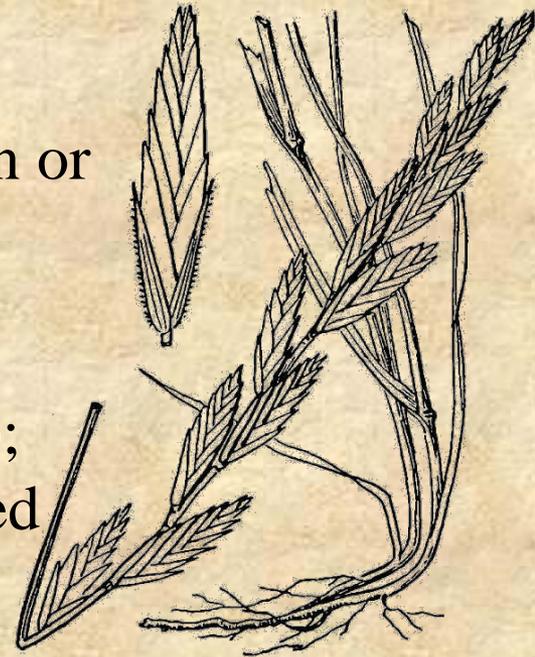
# Best Planting Methods

- Time planting to optimize moisture
  - Dormant seeding, October 15 and April 15 most effective (soil temp. less than 40 degrees at 2 in. depth)
  - Spring, summer or early fall can be successful, but a much bigger risk than dormant seeding



# Best Planting Methods

- Planting equipment
  - Seed drill
    - Fairly flat, smooth seedbed, relatively large seeds
    - On contour and perpendicular to prevailing winds
  - Broadcast seeders
    - Steep slopes or rough terrain, fluffy, uneven or trashy seed and very small-seeded species
  - Hydromulch and hydroseeders
    - Disperse with water or additives (fertilizer); areas with problematic access; not suggested except where other alternatives impossible

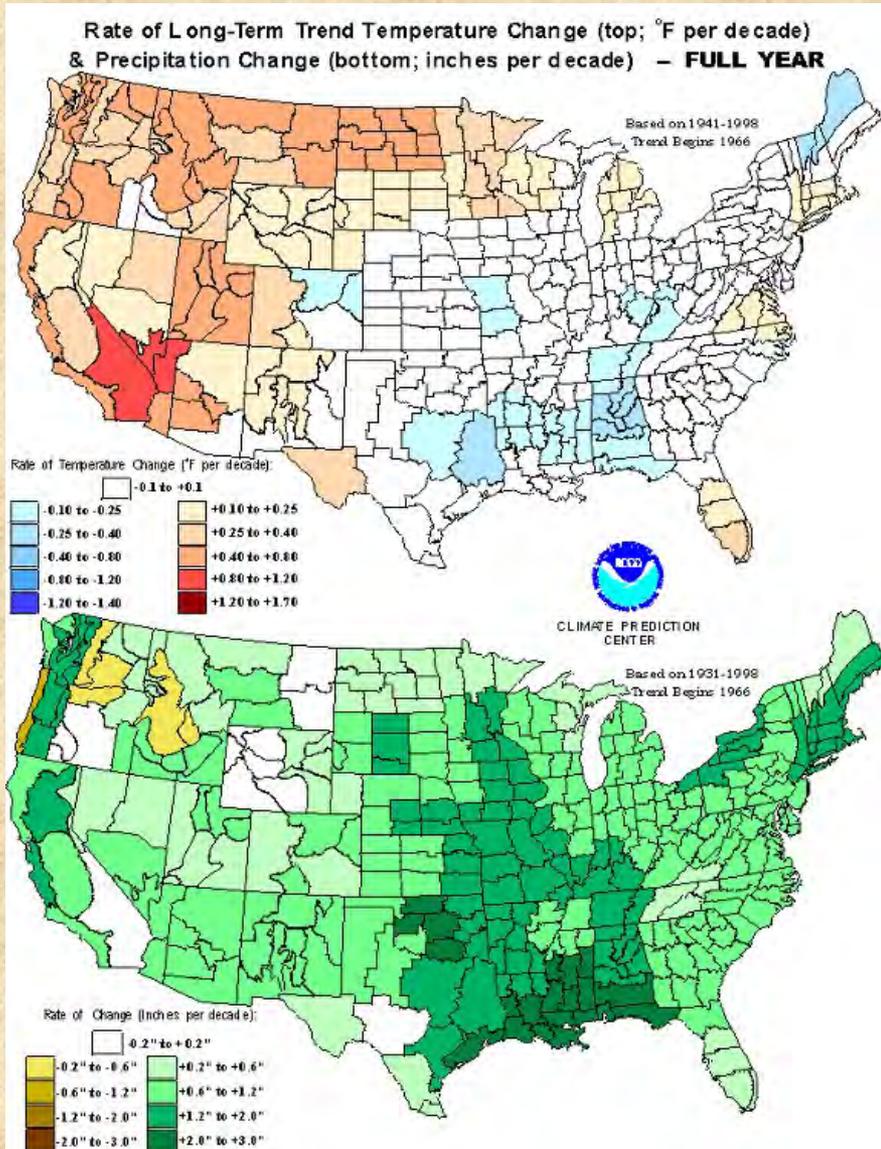


Match equipment with **seed size**,  
calibrate to **proper depth** of seeding  
and **seeding rate** for each plant species.

- Most grasses and some forbs – relatively large seeds (higher seeding rates, relatively few seeds per pound, and deeper depths)
- Many shrubs and forbs – small seeds
- Higher rate is recommended for broadcast seeding



There are many aspects to seeding success, some of which we have no control



So much  
information,  
so little time

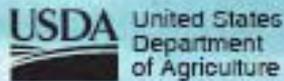
Table 6—Seeding requirements for some Intermountain shrubs. Shown are pounds of pure live seed required per acre, for four seeding rates, at each of four different row spacings.

Species	Purity/ germination	No. PLS per lb <sup>a</sup>	Number seeds per linear foot								
			Five				Ten				
			Row spacings ft								
			5	10	15	20	5	10	15	20	
Amount of seed sown, PLS lbs per acre <sup>b</sup>											
		<i>Percent</i>									
Bitterbrush, antelope	95/90	15,370	2.83	1.42	1.0	0.71	5.67	2.84	1.98	1.42	
Ceanothus, Martin	98/75	82,900	0.53	0.26	0.18	0.13	1.05	0.53	0.37	0.26	
Ceanothus, redstem	98/85	131,860	0.33	0.17	0.12	0.09	0.66	0.33	0.23	0.17	
Chokecherry, black	98/80	4,150	10.50	5.25	3.67	2.63	11.00	5.50	7.35	2.75	
Cliffrose, Stansbury	95/85	64,615	0.67	0.34	0.24	0.17	1.34	0.67	0.47	0.34	
Currant, golden	95/65	356,180	0.12	0.06	0.04	0.03	0.24	0.12	0.09	0.06	
Elderberry, blue	95/50	216,770	0.21	0.11	0.07	0.06	0.42	0.21	0.14	0.11	
Ephedra, green	95/85	24,955	1.75	0.88	0.61	0.44	3.50	1.75	1.22	0.88	
Eriogonum, Wyeth	95/75	141,310	0.31	0.16	0.11	0.08	0.62	0.31	0.22	0.16	
Mountain mahogany, curleaf	90/80	51,865	0.84	0.42	0.29	0.21	1.68	0.84	0.59	0.42	
Mountain mahogany, true	90/80	59,030	0.74	0.37	0.26	0.19	1.48	0.74	0.52	0.37	
Rabbitbrush, whitestem rubber	15/75	693,220	0.06	0.03	0.02	0.01	0.12	0.06	0.04	0.03	
Rose, Woods	95/70	45,300	0.96	0.48	0.34	0.24	1.92	0.96	0.67	0.48	
Sagebrush, big basin	12/80	2,575,940	0.02	0.01	0.006	0.005	0.04	0.02	0.01	0.01	
Sagebrush, black	12/80	907,200	0.05	0.03	0.02	0.01	0.10	0.05	0.03	0.02	
Saltbush, fourwing	95/50	55,365	0.79	0.40	0.28	0.20	1.58	0.79	0.55	0.39	
Serviceberry, Saskatoon	95/85	45,395	0.96	0.48	0.34	0.24	1.92	0.96	0.67	0.48	
Shadscale	95/35	64,920	0.67	0.34	0.24	0.17	1.34	0.67	0.47	0.34	
Snowberry, mountain	95/80	54,065	0.81	0.41	0.28	0.21	1.62	0.81	0.56	0.41	
Sumac, smooth	94/40	62,430	0.70	0.35	0.24	0.18	1.40	0.70	0.49	0.35	
Winterfat	50/85	112,270	0.39	0.20	0.14	0.10	0.78	0.39	0.27	0.20	

Species	Purity/ germination	No. PLS per lb <sup>a</sup>	Number seeds per linear foot							
			Fifteen				Twenty			
			Row spacings ft							
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Chokecherry, black	98/80	4,150	31.49	15.75	11.00	7.87	41.98	20.99	14.69	10.49
Cliffrose, Stansbury	95/85	64,615	2.02	1.0	0.71	0.50	2.68	1.34	0.94	0.67
Currant, golden	95/65	356,180	0.37	0.18	0.12	0.09	0.50	0.25	0.17	0.12
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<sup>a</sup>Number of PLS/lb is determined on the number of pure live seeds per pound.

<sup>b</sup>Amount of seed sown is computed in pounds of pure live seed.



Forest Service

Rocky Mountain  
Research Station

General Technical  
Report RMRS-GTR-136-vol. 1

September 2004



# Restoring Western Ranges and Wildlands

Volume I  
Chapters 1–17, Index



# References

<http://uwadmnweb.uwyo.edu/WRRC/>

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Reclaimed sagebrush on coal mined land (Olson photo) [Next photo >](#)

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-  Train students to facilitate land reclamation and restoration projects based on applied and theoretical ecological principals
-  Research best management practices in reclamation of disturbed

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