The South Dakota Method of Specifying Mixtures for Range Seeding

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Ranchers and government agencies have long been aware of a need for a better method of specifying and calculating mixtures for range seedings. Seeding-rate charts stated in pounds per acre are inadequate because they do not specify the full range of acceptable mixtures for specific environments while also considering purity and germination.

Increased federal cost-sharing for range seedings has accentuated the problem, particularly as it relates to specifying a range of suitable mixtures for different types of sites and equitable computation of cost-share for each. To be equitable, cost-sharing must take into account not only proper seeding rates for each of several species in a range mixture but also their various degrees of seed purity, likelihood of establishment, and ability to persist on the kind of land to be seeded. Range seedings, unlike tame pasture seedings, are intended to be permanent. Data on average quality of commercial seed are often useful for domesticated species but may be useless for computing seed needs of native species for a specific range seeding. Range seeding rates must generally be based on pure live seed in the lot purchased, as well as on other considerations.

A range seed mixture requiring specific amounts of pure live seed of certain native species may be impossible to formulate

Table 1. Adaptation of grasses to range soil groups in areas of less than 20-inch rainfall in percentage of species, South Dakota.

NATIVE SPECIES	Wet Land Sub-Irrigated	Saline Lowland	Overflow	Sands and Sandy	Silty and Clayey	Dense Clay and Shallow Clay	Panspots and Shallow
TALL GRASSES							
Cool Season							
Reed canarygrass	0-100[1]		0-100				
Warm Season							
Switchgrass	0-40	20-40	0-40	0-30			
Indiangrass	0-20		0-20	0-20			
Big bluestem	10-50		0-40	0-50			
Sand bluestem				0-30			
Prairie sandreed				0-50			
MID-GRASSES							
Cool Season							
Western wheatgrass	10-30	30-60	20-60	0-40[2]	0-60	0-60	0-60
Green needlegrass			20-60		0-50	0-50	0-40
Canada wildrye			0-30	0-25			
Slender wheatgrass	0-20	0-20	0-20		0-20	0-20	0-20
Nuttall alkaligrass		0-100					
Warm Season							
Little bluestem				0-75	0-40[5]		0-30
Sideoats grama					0-40[5]		0-30
Sand lovegrass				0-30[4]			
SHORT GRASSES							
Warm Season							
Blue grama				0-25[3]	0-25[6]		0-40
LEGUMES (Use optional)							
Alfalfa		0-20	0-20	0-20	0-20		0-20
Sweetclover		0-20	0-20	0-20	0-20	0-20	0-20

[1]Only adapted native grass on Wet Land for which commercial seed supply is available.
[2]Western wheatgrass only on sandy texture.
[3]Blue grama only on sandy texture.
[4]Sand lovegrass on sands only in Shannon, Bennett, Todd, and Tripp Counties.
[5]Little bluestem and sideoats grama on clayey.
[6]Blue grama only on silty.

Table 2. Form for calculating seed required for full seeding of a range mixture—South Dakota.

(1) Species	(2) Mixture Selection	(3) Pounds of Pure Live Seed, Full Planting (20 P.L.S. per sq. ft.)	(4) P.L.S. needed per acre	(5) Available Seed needed per acre
	(Percent)	(Pounds)	(Pounds)	(Pounds)
TALL GRASSES				
Reed canarygrass	To be	4	Found by	Divide the
Switchgrass		3		
Indiangrass	within	5	Column No.	figure from
Big bluestem		5		
Sand bluestem	the	4	2 x Column	Column 4
Prairie sandreed		3.5		
MID-GRASSES	limits		No. 3.	by (purity
Western wheatgrass		10-8*		
Green needlegrass	set in	10-6*		times germi-
Canada wildrye		7.5		
Slender wheatgrass	Table I	5.5		nation) of
Nuttall alkaligrass		1		
Little bluestem	or II	3.5		seed being
Sideoats grama		5		
Sand lovegrass		1		used.
SHORT GRASSES				
Blue grama		1		
INTRODUCED GRASSES				This will
Crested wheatgrass		5		give the
Intermediate wheatgrass		6		amount of
Pubescent wheatgrass		6		seed which
Tall wheatgrass		6		should be
Russian wildrye		5		planted per
Smooth brome		8		acre deter-
LEGUMES (optional)				mined on a
Alfalfa		4		PLS basis.
Sweetclover		4		
Total	100			

*Use high figure for spring planting and lowest figure when planting is made in the fall. Disregard germination. Divide the product found for Col. 4 by percentage of purity.

if local seed of one or more species in the mixture is not available that year. Also, equipment capable of properly planting a fuzzy or chaffy seed, specified in a mixture, may not be available locally. Any such obstacle can cause unfortunate delays in range seedings.

To overcome delays, plant technologists have developed a type of specification that reflects the full range of acceptable range seeding mixtures for specific kinds of land. Credit is especially due L. F. Bredemeier, John McDermand, Leslie R. Albee, and E. J. Dyksterhuis for work leading to the system presented here. Needed flexibility in formulation of mixtures for individual cases is provided by seeding specifications that show the full range of tolerable variation in choice of species; and among these, the tolerable range in amounts of each expressed as ranges in percentages of the mixture. Both different species and different percentage ranges can thus be prescribed for different kinds of land considering climate, soil, and the dominant species of the original or climax vegetation.

In South Dakota two climatic belts were differentiated. One with less than 20 inches of annual precipitation, and one with 20 or more inches. A table of seeding rates was prepared for each, showing different mixtures for seven range soil-groups recognized in each belt. Data for the area with less than 20 inches of precipitation are presented as an example in Table 1.

The seven soil groups represent some grouping of kinds of range sites commonly mapped in inventories of range resources, but a much greater grouping of soils as commonly mapped on lands to be cultivated. Nonetheless, this differentiation of substrata is believed adequate to insure selection of a seed mixture that can develop a self-perpetuating cover.

The first step in using the South Dakota method is to choose the appropriate table based on climate. Next, the mixture must be selected from the proper range-site column. Next, a mixture is selected containing one or more species from the groups of Tall, Mid, and Short grasses shown as included in climax for the kind of site. The percent of each species selected must be within the limits shown in the table for the kind of land and prevailing climate. The mixture must total 100 percent from appropriate life-forms for the site. The upper percentage limit, listed in the table for each species, insures the inclusion of several species in the mixture in most cases. The percentages of each species selected are then used as indicated in Table 2.

Table 2 is used to calculate needed amounts of pure live seed of each species considering purity of each kind of seed. The table summarizes quantities of seed needed per acre. An example of use of Table 1 and 2, follows. Assume the field to be reseeded in South Dakota has "silty to clayey" soil, and less than 20 inches average annual

Table 3. Example of use of Tables 1 & 2

Part I: Quality of seed available in a specific case (Using choice among species to compose a mixture presented in Table I)

Species	(a) Purity	(b) Germination	(c) Pure Live Seed Index
	(Percent)	(Percent)	(Column axb)
Western wheatgrass	90	60	.54
Green needlegrass	95	60	.57
Slender wheatgrass	90	80	.72
Sideoats grama	50	80	.40

Part II: Computation of seed needs in pounds (Using data from (c) above according to procedure of Table II)

(1) Species	(2) Mixture Selection	(3) Pounds of P.L.S. Required/A for Single Species Planting	(4) Pounds P.L.S. Needed per A.	(5) Pounds of Available Seed Needed per A.
	(Percent)	(20 P.L.S./sq. ft.)	(Col. 2x3)	(Col. 4 ÷ c above)
Western wheatgrass	40	8	3.2	*(5.9)* or 6
Green needlegrass	30	6	1.8	*(3.1)* or 3
Slender wheatgrass	10	5.5	.55	*(0.8)* or 1
Sideoats grama	20	5	1.0	*(2.5)* or 2
Total	100%			

precipitation. One acceptable mixture for this site (Table 1) would be 40 percent western wheatgrass, 30 percent green needlegrass, 10 percent slender wheatgrass, and 20 percent sideoats grama. Assume further that purity and germination of seed available for this specific seeding were as indicated in Table 3. Table 3 is an example of use of Tables 1 and 2 in computing seed needs from the foregoing assumptions.

Past experience and study of many successful plantings have indicated that approximately 20 pure live seeds per square foot are needed to obtain satisfactory stands in South Dakota. Since 1954, provisions have also been made for 20 pure live seeds per square foot in alternative mixtures for each of several kinds of range sites in Nebraska. However, adjustments have been made where warranted. For example, in an actual case, big bluestem and sand bluestem pure live seed requirements were decreased one pound each because of tall stature of these species, their rhizomatous habit, and the limitations in the seed supply at the time. Also, two figures are usually given for western wheatgrass and green needlegrass in order to allow for great differences in seed dormancy between spring and fall planting.

It is recognized that the system presented, being new, may undergo changes and refinements. Field technicians generally now regard the system as a great improvement over earlier methods of calculating mixtures for permanent range seedings. Its principal merits are that it has stimulated the use of species suitable for specific kinds of sites and has reduced the inequities of cost-sharing based on pounds of seed of unspecified quality and unspecified suitability for range seedings.

In summary, the method provides for (a) the correct quantity of seed regardless of mixture selected and quality of seed used, (b) inclusion of climax dominants adapted to the range site in each range seeding, (c) flexibility in selection of species for mixtures to allow for variable availability of seeds and suitability of available planting equipment, and (d) equitable federal cost-sharing based on pure live seeds, in mixtures adequate to restore excellent range condition for the type of site.

NEW BULLETIN RELEASED

"Grasses, legumes, and cultural methods for improving pasture production and aiding conservation on saline-alkali land" is the title of a new bulletin released by the California Department of Natural Resources, Division of Soil Conservation. The authors are H. W. Miller, O. K. Hoglund, and A. L. Hafenrichter, Soil Conservation Service, U. S. Department of Agriculture.

Soil treatment, cultural methods, and species of grasses and legumes for converting low-producing native cover to improved pasture on fine-textured saline-alkali soils are described. The best methods and species raised the grazing capacity from 25 to 400 animal-unit days per acre. The pasture mixture produced 8.8 tons of air-dry roots per acre in the surface 8 inches of soil in 3 years. This materially improved soil structure. The results have application to a large area of similar soils in the Western States. Cost and return data showed that the method of soil treatment, the species used in the mixture, and the subsequent operation of the pasture were profitable. When such land is improved it can be used to relieve grazing pressure on adjacent range lands.