

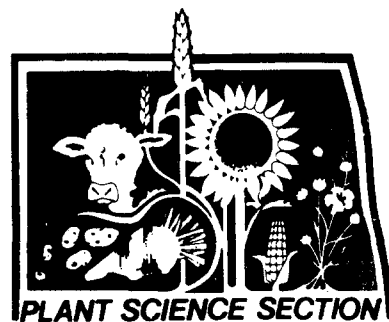


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FORAGE CROP . . . SEED MIXTURE FORMULATION

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Seed mixtures should be simple. A mixture should contain at least one grass and a legume. Generally there is little, if any, advantage in placing more than three or four grasses and legumes in a seed mixture.

The kind of forage crop grown must serve the intended use—hay, haylage, silage, pasture, soil protection and/or improvement or a combination of uses. A number of factors should be considered when selecting forage varieties for use in seed mixtures (Table 1). If soils are uniform and possess ideal conditions for growth, a single species may be the most desirable (depending on the intended use). Mixtures will likely

do best on soils of variable textures, variation in slope and unfavorable internal drainage and soil salinity levels. Mixtures of compatible grasses and legumes are desirable for grazing, especially if nitrogen fertilization is not practiced and where feeding programs require grass-legume forage.

**Table 1. Consideration in
Selecting Forages
for Seed Mixtures**

- WINTER HARDINESS
- PERSISTENCE
- POTENTIAL YIELD
- INSECT RESISTANCE
- DISEASE RESISTANCE
- NUTRITIVE VALUE
- SOIL ADAPTATION
- DROUGHT TOLERANCE
- GROWTH SEASON
- COMPATABILITY
- PALATABILITY

Grasses and legumes commonly used in North Dakota are quite variable in their tolerance to drought, flooding, and soil salinity (Table 2). In addition, forage

crops may differ in their adaptation to differing soil textural classes. Seeding rates vary depending upon the kind of soil and its potential to support thick stands following establishment, natural precipitation potential of an area, supplemental water available, seedbed preparation and planting practices, ease with which different forage crops establish, seed quality and the number of seeds per pound of seed sown.

Studies have shown that only 10 to 40 per cent of the seed planted produce healthy seedlings when using good cultural and planting practices. In general, seeding rates required are generally—

- Less on sandy soils or in low rainfall areas where the potential moisture will not normally support high plant populations.*
- Heavier on low fertility soils due to seedling losses during establishment and less crown development of established plants.*
- Heavier if the intended use is for hay or pasture to provide denser stands for grazing and finer stemmed forage for hay.*
- Heavier if only bunchgrasses are planted as they do not spread to thicken the stand as do sod-forming grasses.*
- Heavier if seedbed preparation and seeding methods are less than ideal for proper seed placement.*

Table 2. Characteristics of Commonly Used Cool-Season Hay and Pasture Grasses and Legumes.

| Species | Growth Form | | Tolerance To | | | Establishment | | | Soil Adaptation | | |
|----------------------------|-------------|-----|--------------|----------|-------|---------------|--------|-----------|-----------------|--------|------|
| | bunch | sod | drought | flooding | salts | easy | medium | difficult | coarse | medium | fine |
| Legumes: | | | | | | | | | | | |
| Alfalfa | - | - | G | P | F | X | | | X | X | X |
| Sweetclover | - | - | G | P | F | X | | | X | X | X |
| Introduced Grasses: | | | | | | | | | | | |
| Creeping foxtail | | X | P | G | P | | | X | | X | X |
| Crested wheatgrass | X | | G | P | F | X | | | X | X | X |
| Inter. wheatgrass | | X | F | F | F | X | | | | X | X |
| Orchardgrass | X | | F | F | P | | X | | | X | X |
| Pubes. wheatgrass | | X | F | F | F | X | | | X | X | X |
| Russian wildrye | X | | G | F | G | | X | | X | X | X |
| Smooth brome | | X | F | F | P | X | | | X | X | X |
| Tall wheatgrass | X | | F | G | G | X | | | | X | X |
| Native Grasses: | | | | | | | | | | | |
| Green needlegrass | X | | G | F | F | | X | | X | X | X |
| Reed canarygrass | | X | F | G | P | | X | | | X | X |
| Slender wheatgrass | X | | G | P | G | X | | | X | X | X |
| Western wheatgrass | | X | G | G | G | | X | | X | X | X |

^{1/}G = good; F = fair; P = poor

Grasses and legumes included in seed mixtures must perform well together. They should be competitive with each other in the final stand, mature at approximately the same time and be adapted to the area, to the soil and for the intended use.

Once the proper seed mixture has been selected, the pure live seed (PLS) seeding rate can be determined. This requires that the number of seeds planted per square foot/pound of seed sown per acre be known (Table 3).

Suggested guidelines for dryland and irrigated-forage crop seed mixture formulation are provided in Table 4. These guidelines list the approximate number of pure live seeds (PLS) required per square foot planted in the field to provide full stands of grasses and/or legumes. The percentage composition of each species should be based on the final stand composition desired, ease of establishment and the intended use.

Table 3. Number of Seeds Per Pound and Per Square Foot/Pound of Seed Planted for Commonly Used Cool-Season Grasses and Legumes.

| Species | No. Seeds Per lb. | No. Seeds/Sq. Ft. Per lb. seed Planted |
|----------------------------|-------------------|----------------------------------------|
| Legumes: | | |
| Alfalfa | 220,000 | 5.0 |
| Sweetclover | 260,000 | 6.0 |
| Introduced grasses: | | |
| Creeping foxtail | 750,000 | 17.2 |
| Crested wheatgrass | 175,000 | 4.0 |
| Inter. wheatgrass | 88,000 | 2.0 |
| Orchardgrass | 650,000 | 14.9 |
| Pubes. wheatgrass | 91,000 | 2.1 |
| Russian wildrye | 175,000 | 4.0 |
| Smooth brome | 135,000 | 3.1 |
| Tall wheatgrass | 79,000 | 1.8 |
| Native grasses: | | |
| Green needlegrass | 180,000 | 4.1 |
| Reed canarygrass | 530,000 | 12.2 |
| Slender wheatgrass | 160,000 | 3.7 |
| Western wheatgrass | 110,000 | 2.5 |

Table 4. Seeding Rate Guidelines

| Forage Crop | Approx. Number PLS/sq. ft.^{*/} |
|-------------------------------|----------------------------------------------------|
| Dryland: | |
| Grass and/or Alfalfa Mixtures | 25-30 |
| Alfalfa | |
| Companion Crop | 25-30 |
| Direct Seeded + Herb. | 35-40 |
| Irrigation: | |
| Grass and/or Alfalfa Mixtures | 70 |
| Alfalfa | |
| Companion Crop | 40 |
| Direct Seeded + Herb. | 50 |

^{*/} Use lower number of seeds in Western areas.

Example 1:

A grass-legume mixture is being planted for hay. The final stand composition desired is 50% alfalfa and 50% crested wheatgrass. Using the guideline of 30 seeds/square foot planted in the field, how many pounds of pure live seed of each species is required.

Procedure:

1. List grasses and legumes to be planted in column 1.
2. List % composition desired in column 2.
3. Complete column 4 by multiplying column 2 x column 3 for each species.
4. List number of seeds/square foot/pound of seed planted for each species from Table 3 in column 5.
5. Complete column 6 by dividing column 4 by column 5. This is your PLS seeding rate/acre for each species.
6. Total column 6. This is your total PLS seeding rate/acre.

| Species | % Composition Desired | Total Seeds Per Sq. Ft. | Number Seeds Per Sq. Ft. | | Lbs. PLS Per Acre |
|--------------------|----------------------------------|----------------------------------------|-------------------------------------|----------------|------------------------------|
| | | | Total | Per lb. | |
| (1) | (2) | (3) | (4) | (5) | (6) |
| | | Table 4 | Col. 2 x 3 | Table 3 | Col. 4 ÷ 5 |
| Alfalfa | 50 | 30 | 15 | 5 | 3 |
| Crested wheatgrass | 50 | | 15 | 4 | 3.75 |
| | | | | | |
| Totals | 100 | 30 | 30 | XXX | 6.75 |

Example 2:

A grass-legume mixture is being planted for grazing. Final stand composition desired is 25% alfalfa, 20% slender wheatgrass and 55% smooth brome grass. Using the procedure in example 1 above, how many pounds PLS should be planted per acre for each species?

| Species | % Composition Desired | Total Seeds Per Sq. Ft. | Number Seeds Per Sq. Ft. | | Lbs. PLS Per Acre |
|----------------|----------------------------------|----------------------------------------|-------------------------------------|----------------|------------------------------|
| | | | Total | Per lb. | |
| (1) | (2) | (3) | (4) | (5) | (6) |
| | | Table 4 | Col. 2 x 3 | Table 3 | Col. 4 ÷ 5 |
| | | 30 | | | |
| | | | | | |
| | | | | | |
| Totals | 100 | 30 | 30 | XXX | 8.4 |

WORKSHEET

Mixture 1.

| Species (1) | % Composition Desired (2) | Total Seeds Per Sq. Ft. (3) | Number Seeds Per Sq. Ft. | | Lbs. PLS Per Acre (6) |
|----------------|---------------------------------|--------------------------------------|-----------------------------|----------------|-----------------------------|
| | | | Total (4) | Per lb. (5) | |
| | | Table 4 | Col. 2 × 3 | Table 3 | Col. 4 ÷ 5 |
| | | | | | |
| | | | | | |
| | | | | | |
| Totals | 100 | | | XXX | |

Mixture 2.

| Species (1) | % Composition Desired (2) | Total Seeds Per Sq. Ft. (3) | Number Seeds Per Sq. Ft. | | Lbs. PLS Per Acre (6) |
|----------------|---------------------------------|--------------------------------------|-----------------------------|----------------|-----------------------------|
| | | | Total (4) | Per lb. (5) | |
| | | Table 4 | Col. 2 × 3 | Table 3 | Col. 4 ÷ 5 |
| | | | | | |
| | | | | | |
| | | | | | |
| Totals | 100 | | | XXX | |

Mixture 3.

| Species (1) | % Composition Desired (2) | Total Seeds Per Sq. Ft. (3) | Number Seeds Per Sq. Ft. | | Lbs. PLS Per Acre (6) |
|----------------|---------------------------------|--------------------------------------|-----------------------------|----------------|-----------------------------|
| | | | Total (4) | Per lb. (5) | |
| | | Table 4 | Col. 2 × 3 | Table 3 | Col. 4 ÷ 5 |
| | | | | | |
| | | | | | |
| | | | | | |
| Totals | 100 | | | XXX | |