FORAGE PLANTS FOR THE NORTHERN FRONT RANGE

Larimer County Cooperative Extension

Colorado State University Cooperative Extension

KEY TO PLANTING/RESEEDING PASTURES

⊠ **Soil Samples:** Refer to SIA .500, *Soil Sampling: The Key To A Quality Fertilizer Recommendation.* Note: A sample should be taken once every 2-3 years

⊠ **Irrigated vs. Non-irrigated:** Irrigated land is land that should receive two acre-feet of water for every acre of crop land to be able to produce irrigated crops. Non-irrigated land is land that receives water naturally from rainfall and snow.

⊠ **Depth of Planting:** ½- to ¾-inch range

⊠ **Seed Rate:** Information provided in this bulletin. Also, if broadcasting, you will need 50-percent more seed than drilling.

⊠ **Planting Technique:** Broadcast vs. planter. Broadcast is when seed is scattered abroad over an area while a grass drill planter plants the seed at controlled rates and depth.

⊠ **Bunchgrass vs. Sod**: a bunchgrass is a species of grass that grows in distinct clumps spread only by seed while sod is a grass containing matted roots of grass spread by seed and root development.

⊠ **Time of Planting:** cool-season grasses may be planted in (a) early spring (around April) or (b) early fall (around August); while warm-season grasses should be planted in spring (around May)

⊠ **Plant Varieties:** A list of varieties (cultivars) are provided for most plants. A variety is a particular selection of a plant species (for example, 'Fairway' crested wheatgrass) that has distinct, improved features because of slightly different genetic make-up.

⊠ **Grazing Management:** Minimum stubble heights, as indicated for the forages in this report, are given both for pastures which are continuously and rotationally grazed. Plants can be grazed to lower heights but they will have slower regrowth. Early growing periods with good soil moisture provide the best conditions for managed, aggressive grazing. However, overgrazing at this time can be particularly damaging to plant health.

Healthy plants must have an opportunity to regrow. Adequate soil moisture and the amount of leafy material on plants after grazing are key factors in the speed of regrowth.

For proper plant regrowth before regrazing, allow two to four weeks to allow stand to increase. This amount of time can vary depending on soil moisture, amount of existing leafy material, soil fertility, air temperature, and sunlight. Continuously overgrazed plants will lose health (vigor) and eventually die. Delay first grazing in the spring until plants reach a five- or six-inch height. Avoid grazing grasses in heading and seed-set stages. During the dormant season when plants are not growing (November through February), plants can be grazed heavily. However, snow caught by tall stubble heights gives protection to plants and enhances soil moisture in the spring.

⊠ **Cool- vs. Warm-Season Grasses:** Different grass species have a preference for growing best when the weather is cool or hot. A cool-season grass is a grass that generally makes the major portion of its growth during early spring and early fall. Kentucky bluegrass is a cool-season grass example. A warm-season grass is one that makes most or all of its growth during late spring and summer and are usually dormant in the winter. Blue grama is an example. (Refer to SIA 6.108)

⊠ **Legumes:** Legumes are broadleaf plants which have the distinct ability to work with rhizobia bacteria in the soil to produce nitrogen useable by plants. Rhizobia invade root hairs of legume seedlings and form nodules (pinkish lumps) on the roots where the fertilizer nitrogen manufacturing takes place. Each legume requires a specific species and strain of rhizobia to form nodules. It is best to apply the correct inoculant to seed at planting time to assure successful nodulation and effective nitrogen fixation.

SERVICE-IN-ACTION SHEETS:

6.105, *Glossary of Range Management Terms*
6.104, *Designing a Grazing Mgt Plan for Co Ranches*
6.107, *Range Condition and Guide to Grazing Mgt.*
6.108, *Grass Growth and Response to Grazing*
6.101, *Seed Species for Colorado Rangelands*
6.103, *Planning for Drought on Colorado Rangeland*
6.102, *Exchanging Steers for Cow-Calf Pairs on Shortgrass Rangelands*
.103, *Planting Guide for Colorado Field Crops*
6.100, *Poisonous Plants on Colorado Rangelands*
6.106, *Animal & Plant Response to Stocking Intensity*

The following is an alphabetical listing of the most common plants which may be considered for planting and using as forage in the northern front range of Colorado. Grasses are presented first, legumes second. Descriptions are provided for each plant, as well as for their use as hay or pasture.

GRASSES

BLUEGRASS, KENTUCKY: A cool-season grass which originated from Europe and has naturalized in many drainages and higher moisture sites in Colorado. It is an aggressive sod-former and very palatable. Needs irrigation or subirrigation to maintain summer growth, or it will go dormant after daily maximum temperatures reach 90 degrees F. Regrows in fall. Stems are one to two feet tall, with leaves two to seven inches long. Seed one to five pounds per acre with legume.

Use for Hay: Below average because of low growing leaves.

Use for Pasture: Provides good grazing and tolerates trampling. Overgrazing or undergrazing bluegrass for short periods is not harmful. Keep between a height of 2 and 6 inches. Crude protein may be 20% in the spring, but 10% at maturity.

Planting Rate: 2-3 pounds pure live seed per acre

Variety: 'Troy'

BLUESTEM, BIG: A native warm-season grass which grows three to six feet in height. Leaves grow 4 to 20 inch long. Known as "turkey-foot" because of the arrangement of the three seed heads that occur at the top of stalks, it is slightly sod-forming with adaptability to moist soils. Plant on dryland sites, although it responds fairly well to irrigation.

Use for Hay: Makes good hay if cut before stemmy seed heads are formed.

Use for Pasture: Big bluestem is tough and unpalatable after maturity. Otherwise it is relished by all livestock classes to a fault; if not managed well, it quickly will be grazed out of pastures. Stop grazing when stubble is down to an eight- or ten-inch height if continuously grazed. Graze down to six inches if adequate regrowth time is allowed.

Planting Rate: 7 pounds pure live seed per acre

Varieties: 'Pawnee', and 'Champ' from Nebraska, and 'Kaw' from Kansas.

BLUESTEM, LITTLE: A native warm-season grass which grows 18 to 40 inches tall. Leaves are 3 to 10 inches long. It is a bunchgrass with good adaptability to most soils. Plant on dryland sites receiving 14 inches or more precipitation.

Use for Hay: Yields 0.75 to 2.0 tons per acre.

Use for Pasture: It has less palatability than big bluestem which allows for somewhat more relaxed grazing management. Do not graze below a four-inch height. Manage for six- to eight-inch stubble when continuously grazed. Not preferred after heads appear. Not preferred by sheep.

Planting Rate: 3-4 pounds pure live seed per acre

Varieties: 'Pastura': from a low rainfall area in New Mexico; seed heads less fuzzy, 'Cimarron': from southwest Kansas, 'Blaze': leafy, late-maturing, and 'Camper'

BLUESTEM, SAND: A native warm-season grass which grows three to eight feet tall. Leaves grow 8 to 12 inches long. It is adaptable primarily to sandy soils; it ties these soils down well with its sod-forming growth habit. Can look like a bunchgrass.

Use for Hay: It can be a high hay producer with other sandhill grasses.

Use for Pasture: Do not graze below a six- to eight-inch height; ten to twelve inches if continuously grazed. Sand bluestem surprisingly does not take heavy trampling well.

Planting Rate: 7-8 pounds pure live seed per acre

Varieties: 'Garden': from panhandle of Nebraska; vigorous, tall and leafy, 'Elida': from east central New Mexico, recommended for 14-inch or more precipitation areas, released in 1963, 'Woodward': from Oklahoma panhandle, released in 1955.

BROME, MEADOW: A cool-season grass which originated in Eurasia. It is a bunchgrass with short rhizomes. It grows from 24 to 48 inches tall and is very palatable. Adapted to irrigated sites with silt to clay soil. A relatively slow establisher, but seedlings are strong. Highly desired by livestock and wildlife.

A good competitor, but not as aggressive as smooth brome. Because of its large number of basal leaves, it recovers faster than smooth brome from haying or grazing.

Use for Hay: Compared to smooth brome, it has a better leaf to stem ratio, better fall regrowth, and a maturity seven to ten days earlier. Because of the latter, it is not as compatible with alfalfa for hay. Heads have longer awns than smooth brome. Most appear in the first cutting and the first two years after establishment. Winter hardiness is better than some other irrigated grasses, like orchardgrass. Allow six inches of fall regrowth before a killing frost.

Use for Pastures: Begin grazing meadow brome at an eight- to twelve-inch height, and leave a three- to four-inch stubble. Allow three to four weeks of regrowth. Graze down to a six- to eight- inch height if continuously grazed.

Planting Rate: 10-12 lbs. pure live seed per acre

Varieties: 'Regar': earlier heading than 'Manchar' smooth brome; has good regrowth after cutting.

BROME, SMOOTH: A cool-season grass that originated in Europe. It grows two to four feet tall with leaves six to sixteen inches long. It is an aggressive sod-former that can become sod-bound if not adequately fertilized with nitrogen. Till rigorously to revive sod-bound stands. Has good spring growth, but goes dormant in the summer. Regrows in fall with adequate moisture. Does poor to fair on dryland. Has no awns (beards) on seed heads, unlike other bromes. Leaves have a distinctive "W" wrinkling a short distance below tips.

Use for Hay: Excellent grass for pastures which are short on irrigation water. Cut in bloom stage for best quality. Usually only one cutting per year. When mixed with alfalfa, hay yields often are triple those of smooth brome alone.

Use for Pasture: Rates fair as a pasture grass since leaves are located high on the plants. Graze lightly early; then allow 28 days for regrowth. Cut newly established stands for hay the first year. Manage 4- to 6-inch stubble if continuosly grazed.

Planting Rate: 8 pounds pure live seed per acre

Varieties: 'Lincoln': strongly rhizomatous and aggressive; sod binds rapidly; more basal leaves; begins growth earlier in the spring; better establisher; better drought resistance; poorer recovery after cutting or grazing. Plant on dryland or for grazing, 'Manchar': weaker sod-forming; sod binds less rapidly; leaves mostly on stem; better recovery after cutting; shorter- and finer-stemmed; matures earlier; hardier. The better choice when mixed with alfalfa, 'Achenbach': an aggressive variety similar to Lincoln; seed can be hard to find.

BUFFALOGRASS: Dense, sodformer by stolons; 2" to 6" tall. Matforming. Leaves basal; sheaths may have some marginal hairs near collar; blades sparsely long and hairy. Prefers medium to heavy textured soils. Can withstand heavy grazing.

This species has separate male and female plants. The male plants send up seed heads. The female forms burs that are close to the ground.

Planting Rate: 4-8 pounds pure live seed per acre

Varieties: 'Sharps', 'Texoka'

FESCUE, TALL: A cool-season grass which originated in Europe. It prefers clay or clay loam soils. It has tough leaves which have only fair palatability. This means it must be managed carefully for optimum use and feed quality. Grow under irrigation or on subirrigated land. It can withstand poorly drained sites.

Many tall fescue stands are infested with an endophytic fungus that produces an alkaloid which is toxic to livestock. This toxin can cause fescue foot in cattle and summer fescue toxicosis in cattle, sheep and horses. The toxin causes weight gain, and problems with reproduction and milk production. High soil nitrogen levels seem to enhance the toxicity. Fescue lameness is more common in late fall and winter. Toxicosis increases when air temperatures are over 75° to 80° F.

The toxin is most concentrated in seed heads. To reduce toxicity problems, keep plants young and vegetative. Tall fescue is not recommended to use during hot weather and do not dilute tall fescue with other grasses or legumes. Endophytic-free seed is available for planting. But no guarantee exists that the established grass from this seed will not later become infected.

Use for Hay: Best hay quality is acquired by harvesting at the boot stage or very first sign of heading. Hay yields are limited since most leaves are basal. Hay quality good, palatability is fair to poor.

Use for Pasture: Because tall fescue loses quality and palatability rapidly after heading, keep it grazed down. It has a tough root system which withstands trampling. One of its advantages is that it can be productive season-long with adequate moisture. In mixed species pastures, a heavy stocking rate is needed to ensure tall fescue is grazed. Livestock will select other forages first, if allowed the chance.

Planting Rate: 8 pounds pure live seed per acre

Varieties: 'Fawn': has good yield capacity in spring and early summer. Better seedling vigor, but earlier maturity. 'Kentucky 31': less palatable than 'Fawn', 'Alta': oldest of developed varieties, Endophyte-free cultivars: 'Forager', 'Johnstone', 'Mzark' and 'Martin' are examples.

GRAMA, BLUE: A native warm-season grass which is prevalent in the shortgrass prairie. Seed stalks grow 8 to 24 inches high; curly leaves grow two to six inches long. It prefers silt to clay soils and is an aggressive sod-former. One of the best drought tolerant grasses.

Use for Hay: Not suitable for hay as a result of low leaf growth.

Use for Pasture: Withstands trampling and grazing well. Not very productive, but supplies excellent summer or winter pasture feed. Do not graze to less than two inches tall. Will go dormant in summer in drought years.

Planting Rate: 2-3 pounds pure live seed per acre

Varieties: 'Hachita': from New Mexico; superior forage production, 'Lovington': from New Mexico; good seedling vigor; better establishment under drought, and 'Alma'.

GRAMA, SIDEOATS: A native, warm-season bunch grass which grows one to three feet high. Leaves grow 2 to 8 inches long. Turns a brownish-red color in fall. Adapted to wide range of soils.

Use for Hay: Quantity is fair, quality is good.

Use for Pasture: Palatable when green to all livestock. Does not take heavy grazing well. Leave stubble height of three to four inches; six to eight inches if continuously grazed. Fair winter forage.

Planting Rate: 3-4 pounds pure live seed per acre

Varieties: 'Pierre', 'Butte': from Nebraska; earlier maturing, 'Vaughn': from New Mexico; good seedling vigor; drought tolerant; low palatability, 'Niner': winter hardy, 'El Reno': from Oklahoma; good leafiness, 'Coronado': from New Mexico.

GRASS, ALKALAI: A bunchgrass suitable to salty sites. Grows 8 to 24 inches tall; leaves from one to four inches long.

Planting Rate: 2-3 pounds pure live seed per 1,000 square feet

Variety. 'Fults'

NEEDLEGRASS, GREEN: A native, cool-season bunchgrass which often is associated with blue grama on tight, dryland soils. It is nutritious and palatable. Although having awns (beards), they are not troublesome to livestock. Seed dormancy percentage can be high, with some germinating two to three years after planting. Seed stalks grow two to three feet high. Leaves are 3 to 12 inches long. A relatively early spring grower.

Use for Hay: Provides good quality hay.

Use for Pasture: Can maintain palatability through the summer when moisture is available. Manage for a stubble height of four inches; four to six inches if continuously grazed. More palatable to cattle and horses than to sheep and goats. Let developed awns fall before continuing grazing.

Planting Rate: 8-10 pounds pure live seed per acre

Varieties: 'Lodorm': less seed dormancy; released from Mandan, North Dakota, 'Green Stipagrass'

ORCHARDGRASS: An excellent cool-season grass which originated in Europe. Best known as an irrigated grass. Grows two to five feet tall; leaves from 4 to 16 inches long. Combines well with legumes since it is a bunchgrass. Needs good moisture to grow and survive winters. Seed 3 to 10 pounds per acre if with a legume. Wetness and flood tolerance are poor. Recovers rapidly from grazing.

Use for Hay: An excellent hay grass. Quality and palatability are high. Solo yields can be one to two tons per acre; two to four tons per acre with alfalfa. Cut hay when plants are fully headed to first bloom.

Use for Pasture: Very palatable to all livestock classes. Graze eight- to nine-inch tall plants down to four-inch stubble. Prevent development of seed stalks. Provides excellent regrowth in summer, unlike most other grasses. Does not tolerate close and continuous grazing, but is adapted to frequent grazing. Rotational grazing is needed to prevent grubbing out. Low trampling tolerance.

Planting Rate: 2-3 pounds pure live seed per acre

Varieties: 'Paiute': can have very poor stand longevity of about three years, Latar': leafy; recovers quickly after cutting; good winter hardiness, 'Paiute': better than Potomac; responds well to irrigation, 'Potomac': earlier maturing, lower producer; seed with clover, 'Dawn': newer variety; 3 to 4 days later maturity than Latar. Hardier than Potomac. Good yielder, 'Akaroa': mid-maturity.

SACATON, ALKALI: A warm-season, native bunchgrass which is adapted to salty sites. Can grow where the soil electrical conductivity is more than 12 mmhos/cm and less than about 25 mmhos/cm. It is long lived and grows two to three feet tall, It can form wide bunches. Prefers fine textured soils. Withstands high water tables (four to eight feet) or frequent flooding. Stands can be hard to establish. Very difficult to establish; broadcasting seed has worked best.

Use for Hay: Produces hay of fair quality if cut at early heading.

Use for Pasture: Grazed freely by cattle and horses. As it matures, plants become coarse, tough and unpalatable. Keep grazed down to maintain quality. Does not cure into good winter feed.

Planting Rate: 2-3 pounds pure live seed per acre

SALTGRASS, INLAND: A native, warm-season, vigorous sod-former. Grows 4 to 16 inches tall; leaves from 2 to 6 inches long. Leaf blades are stiff and sharp. It is adapted to the margins of salty sites and roadsides. Will experience a 50 percent decline in yield on salty soils with an electrical conductivity of 18 mmhos/cm.

Use for Hay: Can be harvested for hay on good sites. Quality is fair.

Use for Pasture: Has little forage value because of harsh and tough leaves. Is grazed in absence of better forage. Graze during early growth stages.

Planting Rate: 1-1½ pounds pure live seed per acre (purchase by mix, seed by itself is difficult to find)

SANDREED, PRAIRIE: A native, warm-season grass which does well only on sandy sites. A sod-

former, it grows two to 5.5 feet tall. Leaves are 4 to 20 inches long. Can take two to three years to become established.

Use for Hay: Hay quality is good. Cut at the heading stage.

Use for Pasture: Provides good grazing but is susceptible to trampling, despite its rhizomatous nature. Manage for a stubble height of 6 to 8".

Planting Rate: 3-4 pounds pure live seed per acre

Variety: 'Goshen'

SWITCHGRASS: A moderate sod-forming, native grass. It is a warm-season grass which is adapted to a wide range of soil types. Performs best on sites receiving 16 inches or more of annual precipitation, or more than 14 inches on sandy soils. Seed stalks grow 2 to 5 feet tall; leaves one to two feet long. Plant cures to a colorful reddish-brown by winter.

Use for Hay: Switchgrass makes good hay on sites with adequate moisture.

Use for Pasture: Palatable to all livestock but as stems mature in late summer, nutrient content and palatability decline rapidly. Graze to a stubble height of six inches; twelve to fourteen inches if continuously grazed.

Planting Rate: 5-8 pounds pure live seed per acre

Varieties: 'Blackwell': oldest variety, good seedling vigor, leafy, good producer. Originated in Oklahoma, 'Grenville': leafy, fine-stemmed, medium maturity, 'Nebraska 28': finer stemmed, matures earlier, adapted to diverse soils.

WHEATGRASS, CRESTED: Cool-season grass which originated in Russia. All but one variety are bunchgrasses. All are drought tolerant. Plants are 8 to 30 inches tall; leaves are 2 to 8 inches long.

These grasses provide forage two to three weeks earlier than most other grasses, but become dormant with hot temperatures in early June.

Use for Hay: Can provide good quality hay if cut soon after heading. Rarely harvested for hay, however. Fine stems cure quickly and well.

Use for Pasture: Very tolerant of grazing. Poor forage in June through August, unless good moisture is received. Stocking rate can be 1 ac/AUM in the spring, depending on stand productivity and management. Plants will be grazed out if grazed heavily through spring on an annual basis. Can graze 70% of growth if good soil moisture exists to provide for regrowth. Leave two-inch stubble. Graze during the establishment year after frost to remove growth that inhibits spring grazing.

Planting Rate: 10-20 lbs. pure live seed per acre

Varieties: 'Ephraim':released in 1992; short-rhizomatous but poorly productive. It is a good, mid-height, low maintenance ground cover. Stabilizes disturbed areas, 'Hycrest': released in 1984; a cross between 'Nordan' and 'Fairway'. Yields 15 to 20 percent more forage than its parents. It has more and finer leaves, and is quicker establishing than 'Nordan'. More stemmy than other crested wheatgrasses. Emerges from deeper planting depth better than 'Nordan' Twelve-inch rows have held out cheatgrass. Adapted to 8 inches or more of annual moisture, 'Nordan' (or standard): more productive and remains greener under drought than 'Fairway'. Tends to have more open stands. Withstands close grazing and trampling. Needs 10 inches or more of annual precipitation. May need nitrogen fertilization to revitalize stands. Good on clay, 'Fairway': thickens in stands better than 'Nordan'; leafier and finer-stemmed. Establishes slower and grows shorter. Flowering heads taper towards tip. Cures earlier than 'Nordan'. Needs 10 inches, or more of annual moisture, 'Siberian': awnless (beardless) and finer stemmed than 'Nordan'; Retains greeness and palatability later into the summer than other crested wheatgrasses. However, it yields less and has poorer seedling vigor. Needs 13 inches of precipitation or more.

WHEATGRASS, INTERMEDIATE: A cool-season grass which originated in Eurasia. It is a bunchgrass that can be a week sod-former. It will grow 2.5 to 3.5 feet high; leaves are 4 to 16 inches long. Stands can decline after six years. Greater drought resistance and regrowth than smooth brome. Needs 15 or more inches of annual moisture to outperform pubescent wheatgrass. Good as a salt tolerant grass.

Use for Hay: Produces fair to good yields of hay. Quality is good if cut before flowering. Good grass for acreages short of irrigation water. Mixes well with alfalfa.

Use for Pasture: Provides good mid-spring to late summer forage. Leave three- to four-inch stubble; six to eight inches if continuously grazed. Does not freeze back as easily as smooth brome in the fall and some regrowth can be grazed at this time.

Planting Rate: 8 pounds pure live seed per acre

Varieties: 'Amur': selected for seedling vigor and for resistance to drought. Does not have the productive capacity of 'Oahe'. New Mexico release, 'Manska': 15% more digestible than Oahe; similar or better drought resistance, 'Oahe': vigorous and leafy; very good yield capability, 'Greenar': released from Washington. Selected for forage production and compatibility with alfalfa.

WHEATGRASS, PUBESCENT: A cool-season bunchgrass that is closely related to intermediate wheatgrass, but longer lived. Seed heads are short-hairy, or pubescent. Better than intermediate on drier, low-fertility sites. Salt tolerance is similar to that of intermediate wheatgrass.

Use for Hay: Responds to irrigation but not as well as its cousin, intermediate wheatgrass. Seed with a legume for increased quality.

Use for Pasture: Nutritional grass grazed by all livestock classes. Can graze two weeks earlier than native grasses and can continue well into summer.

Planting Rate: 10-12 lbs. pure live seed per acre

Varieties: 'Luna': the commonly used variety of choice, 'Common' usually has too much pubescence, which cuts palatability.

WHEATGRASS, TALL: A tall, cool-season bunchgrass which originated in Eurasia. It is slow to establish and is late-maturing. Stems grow 2 to 5 feet tall. Adapted to saline sites and those where temporary up to five weeks spring flooding occurs. Withstands 25 percent more salts in soils than pubescent wheatgrass. Will experience a 50% decline in yield on soils with an electrical conductivity of 18 to 19 mmhos/cm.

Use for Hay: Makes fair hay quality because of coarse leaves, however, quantity is large. Cut before or at early heading when it can be higher in digestible protein and total digestible nutrients than other wheatgrasses.

Use for Pasture: Provides an extraordinarily long grazing period. Keep grazed down to maintain best palatability, but not below a 6" stubble height. Old coarse growth can prevent grazing of current growth.

Planting Rate: 8-10 pounds pure live seed per acre

Varieties: 'Jose': New Mexico release; earlier maturing; improved palatability, 'Largo': Utah release, 'Alkar': Washington release; late maturing, 'Argentina', 'Platte': Cheyenne, Wyoming release.

WHEATGRASS, THICKSPIKE: A mid-height, cool-season, native sod-former which is adapted to sandy and silty sites. Closely related to western wheatgrass, but forage production is lower. It has good seedling vigor and emergence. Graze from spring to early fall. Withstands trampling. Tends to become wiry with maturity.

Planting Rate: 6-8 pounds pure live seed per acre

Varieties: 'Critana': excellent seedling vigor.

WHEATGRASS, WESTERN: A cool-season, native sod-former which grows one to two feet tall. Leaves grow 4 to 12 inches long. It is adapted to dryland silty to clayey sites where it is often found with blue grama. Withstands flooding and silting in lowland sites. It requires two years of growth before hardy top growth seen. Combines well with bunchgrasses by filling in bare spaces.

Use for Hay: A common hay grass in drainages in the eastern plains. Hay quality is good. Cut in the very early bloom stage for best quality.

Use for Pasture: Can be grazed from early spring to fall. Or let cure and graze in winter. Despite stiff leaves, it rarely becomes coarse enough to prevent sheep from grazing. Manage for two- to three-inch stubble; four to six inches if grazed continuously.

Planting Rate: 10 pounds pure live seed per acre

Varieties: 'Arriba': originated from Arriba, Colorado, 'Barton': Kansas release.

WILDRYE, RUSSIAN: A cool-season dryland bunchgrass which originated in northern Asia. Grows one to three feet high with many basal leaves 6 to 18 inches long. Has high digestibility and exceptionally long season of use. Very drought tolerant but difficult to establish on lighter soils. Adapted to 8 inches or more of annual moisture, once established. Begins growth two weeks later than crested, but has better fall regrowth and summer availability, if soil moisture is available. Russian wildrye will survive on salty soils up to an electrical conductivity of 18 mmhos/cm.

Performs better when seeded in 16- to 21-inch row spacing. Interseeded legumes work well, but such a mixed pasture must be managed well due to the high palatability of the legume/grass.

Use for Hay: Poor because of basal leaves that are largely unharvestable.

Use for Pasture: An excellent dryland pasture grass which is palatable to all livestock. Tolerates close grazing better than most grasses. Regrows quickly. A good strategy is to graze it lightly in the spring, saving growth for late summer and fall when other grasses are not available. Manage for a 4-inch stubble height; 6- to 8-inches if grazed continuously.

Planting Rate: 8-10 pounds pure live seed per acre

Varieties: 'Bozoisky-Select': a 1985 release; significantly more vigorous establisher than 'Vinall'. Will establish from deeper seeding depth than 'Vinall' and 'Swift', 'Mankota': a 1992 release out of North Dakota; greater yield than 'Vinall'; seed emerges from 2.5-inch depth, 'Vinall': 1960 release from Dakotas, 'Swift', 'Sawki'

LEGUMES

ALFALFA: Alfalfa is the well known "Queen of Forages". It is adapted to a wide range of soils which must be well drained. Tolerates some soil alkalinity. Dryland and irrigated varieties exist, as well as varieties for grazing (with creeping growth forms) or haying.

Use for Hay: Cut at the 1/10th bloom stage to foster stand longevities of ten years or more. Weeds must be controlled to also foster stand life. Three cuttings can be expected on irrigated land, one on dryland. Allow 30 days of regrowth after the last cutting before the first killing frost from 26°F temperature. Alfalfa weevil can be a seriously destructive insect pest on growth in May.

Use for Pasture: Alfalfa is highly desired by all livestock. Do not graze closer than four to six inches to the ground. It will not persist with moderate to heavy grazing unless rest periods occur. In cattle and horses, alfalfa can cause bloat which results from gases trapped in the main stomach. If left untreated it will cause death. To decrease bloat hazard, use the product "Bloat-Guard", delay grazing until after the bloom stage, or first turn full-fed animals into fields at mid-day. Or keep alfalfa to less than 50 percent of a grass/alfalfa stand and monitor animal grazing. After a killing frost and leaves are fully wilted, standing alfalfa can be grazed safely.

Varieties: 'Vernal', 'Ladak', 'Ranger', 'Spredor 2', 'Spredor 3', 'Rhozoma', and 'Rambler'.

CLOVER, WHITE: This legume spreads via stolons. It is rather shallow-rooted and needs moisture to persist. Prefers well-drained soils. Leaves usually have V-shaped white marks in the middle. Not tolerant of saline or alkaline soils (a pH of 5 to 6 is best). Tolerates summer heat. Inoculate seed with appropriate rhizobia for best growth.

Ladino: The "giant" form of white clover, grows two to four times taller than the intermediate type. Good for hay which is low in stems and high in protein and digestibility. Not tolerant of low grazing. Leave 3-inch stubble with grass (two-inches with rapidly regrowing orchardgrass). Allow regrowth to eight inches. Seed at one pound per acre with grass to keep bloat hazard low. Will winter kill somewhat in dry soils. Requires high soil phosphorus. 'Pilgrim' and 'Merit' varieties are winter hardy.

Intermediate: Also know as common or White Dutch. Height can vary between tall or small. Tends to persist only 2 to 3 years. 'Grassland Huia' is an intermediate variety.

Small Type: Also known as low-growing or wild type. Commonly found in lawns. Well-suited to pastures; poor for hay. Persists well under heavy and continuous grazing and regrows rapidly. Grows fairly early in spring. Summer growth can be fair. Bloat hazard is similar to that with alfalfa. Will be shaded out by tall grasses. Not a heavy producer. 'Kent Wild' is a variety.

MILKVETCH, CICER: Cicer milkvetch is a native of Europe. It is a very long-lived perennial with vigorous, creeping rhizomes. This legume is very tolerant of soil alkalinity (to pH of 9.8) and is moderately tolerant to acidity and salinity. Disease and insect problems are uncommon. Stems are upright when young, but bend over with increasing height. Stem length can reach four to ten feet.

Flowers are pale yellow to white. Adapted to well-drained soil textures and subirrigated conditions with water at a 3- to 6-foot depth. Has some drought tolerance. Adapted to dryland areas receiving 16" or more precipitation. Responds very well to irrigation. Good winter hardiness.

A limitation is that seedlings are weak and require two to three years to establish. Seed in alternate rows with a cool-season grass to decrease competition from grasses. Can be so aggressive as to comprise 80 percent of a pasture after a few years. Seed must be scarified adequately to insure germination and must be inoculated with proper bacteria before seeding.

Use for Hay: Cicer milkvetch is well-suited for hay. When seeded in alternate rows with grass, winrows after cutting dry better. Crimping also helps dry-down. At harvest cicer's moisture content is four to eight percent greater than alfalfa and sainfoin. Leaf losses during baling are low and plants have a 40 percent higher leaf:stem ratio than alfalfa. These factors give cicer comparable nutritive value to alfalfa. However, cicer hay is not as desired by livestock when compared to other legumes.

Use for Pasture: Cicer is very tolerant of grazing and does not cause bloat in grazing animals. However, cicer is not eaten readily by livestock. Heavy grazing pressure is needed to ensure grazing use. It is reported to have caused some photosensitization problems in sheep. Cicer recovers well from grazing as new growth is stimulated in buds of rhizomes. Graze carefully towards end of the establishment year, and during the second year. Graze to a height similar to alfalfa.

Varieties: 'Windsor', 'Monarch', 'Lutana'

SAINFOIN: Sainfoin originated in Europe and Asia. It is a deep-rooted legume with pink flowers. Sainfoin is well-adapted to all soil textures, and to high pH (up to pH 8) sites. Not suitable to saline or acidic soils (less than pH of 6). It is heat, drought and cold resistant. Sainfoin is not adapted to areas which are wet, frequently irrigated, or with high water tables. It grows to heights of three feet or more. Stems are hollow and coarse, but quite nutritious. Relatively easy to establish but effective nitrogen-fixing bacteria (rhizobia) have not been found. As a result nitrogen fertilization may be required. Has a tendency to bolt quickly (send up a tall stalk with few leaves) along the front range.

Use for Hay: Sainfoin is well-suited to hay harvesting as it grows upright and is cut easily. Since regrowth is poor, cut at about the half- to full-bloom stage.

Use for Pasture: Sainfoin has excellent use in pastures and is grazed in preference to alfalfa. It does not cause bloat. Grazing in the bud or early bloom stage and keeping the grazing height above eight inches (or 30 percent of the plant left as stubble) will extend stand life. Sainfoin grows ahead of alfalfa in the spring (in March) to provide early, high-protein grazing.

Varieties: 'Eski' and 'Remont'

SWEET CLOVER: Sweet clover belongs to a different plant family than the true clovers. It was introduced into North America as early as 1739. It is used for pasture, hay, disturbed lands, and as a green manure crop. It is salt-resistant and has an aggressive tap root which breaks up hard soils. Sweet clover is a biennial. From ten to 36 inches of growth occurs the season of seed, three to five feet the second year when seeds are produced and the plants die. It reseeds itself well if not crowded out by perennial grasses.

White flowered sweet clover is taller, coarser-stemmed and with coarser leaves than the yellow-flowered type. Yellow sweet clover has greater drought tolerance and seedling vigor, and flowers earlier. Sweet clovers are adapted best to well-drained, heavier soils. Grows best on neutral or alkaline soils, and is one of the best legumes to grow on highly alkaline soils. Seed only scarified seed that is inoculated with the proper nitrogen-fixing bacteria.

A high coumarin content makes sweet clover less palatable to livestock than many other legumes. Some varieties have low coumarin levels. Plants decline in quality as they reach maturity and become woody and stemmy.

Use for Hay: Since it is a biennial, sweet clover must be planted the year before they are to be cut for hay. Fair quality hay is acquired if plants are cut in the bud stage (13 percent crude protein). Leave at least 12-inch stubble if regrowth is desired.

Most sweet clover hay is safe to feed, but improperly cured or moldy hay should be fed only after being tested for dicoumaril content. Dicoumaril can develop from coumarin under poor curing conditions. Dicoumarin causes 'sweet clover disease' in livestock in which blood loses its clotting ability and death results from internal bleeding or other complications. This danger can be lessened by feeding sweet clover for two weeks, followed by two weeks of other forage.

Use for Pasture: Sweet clover provides excellent, early spring grazing. Good yields are provided well into June and July. Maintain a stubble height of twelve inches to allow for rapid regrowth and good quality. Heavier grazing can occur in late autumn. First season growth can be grazed after it is about 10 to 12 inches tall. High animal stocking rates are needed to keep plants grazed down and encourage new growth. Turn livestock in early, when plants are six to eight inches tall.

Variety: 'Madrid'

TREFOIL, BIRDSFOOT: This legume is native to Europe and parts of Asia. It is a long-lived perennial with a deep taproot and many laterals. It is leafy with fine stems which are prostrate to erect and one to two feet in length. Flowers are bright yellow with orange to red-tinged areas. It performs much better than alfalfa on poorly-drained, clay soils. It does well on low-fertility and alkaline soils with a pH less than 8. It reseeds itself well, even if closely grazed. However, it takes two years to become established and should be used lightly during this time. Seedlings should be protected from weedy growth. Minimum annual water requirement is 12 to 13 inches, once established. It is winter hardy.

Use for Hay: Erect types are suited to hay harvesting. It generally yields about two-thirds as much as alfalfa. Stems contain a high amount of water and are more difficult to dry than alfalfa. Quality is comparable to alfalfa.

Use for Pasture: Does not cause bloat in livestock. Withstands grazing better than most other legumes. Palatability is high which means good pasture management is required. Production is well distributed throughout grazing season. Allow four to six weeks between grazings to obtain a regrowth of six to ten inches.

Varieties: 'Empire', 'Viking', 'Maitland', 'Fergus', and 'Tretane'