Seeding Rates – Seeding rates can vary by species and environmental conditions. In general, clovers require higher soil pH, phosphorus and potassium levels than grasses. A soil test will indicate the amount of lime, phosphorus and potassium required for successful establishment and production of the clover. Application of nitrogen should be avoided, as it will stimulate the grass and make it more competitive to the young clover seedlings.

1) Soil test and add recommended soil amendments. In general, clovers require higher soil pH, phosphorus and potassium levels than grasses. A soil test will indicate the amount of lime, phosphorus and potassium required for successful establishment and production of the clover. Application of nitrogen should be avoided, as it will stimulate the grass and make it more competitive to the young clover seedlings.

2) Reduce grass competition. An important step to success is to reduce the vegetative mass that covers the soil. Removing the excess grass or other vegetation will make it easier to get the clover seed in contact with the soil. Heavy grazing is usually the simplest and easiest way to accomplish this step; however, mowing, herbicides and/or light tillage can also be used.

3) Select clover to use. Red clover produces more total dry matter than white clover and has upright growth that allows it to compete well with accumulated grass growth, and is therefore the best for hay. For both hay and grazing, a mixture of red and white clover works well. A mixture of red and white clover, or white clover alone, can work well for grazing. For a long-lived clover stand a ladino/intermediate white clover mixture works well though it will produce less total production.

Seeding Method – Clovers can be seeded using several seeding methods. All can be successful if requirements are met for germination. Both red clover and white clover seed should be placed approximately ¼ inch deep and with good seed-to-soil contact. This can be accomplished using various techniques.

Frost Seeding – A simple but effective method is to broadcast clover seed uniformly on the soil surface in late winter (February – early March) when there is still time for freezing-thawing to occur. As the soil freezes and thaws, the seeds are covered with soil. When frost seeding is used, it is critical that the pasture be grazed short so the clover seed can be directly on the soil surface. This method is not usually successful on sandy soils.

No-Till Drills – No-till drills can be used to place seed at the desired rate and depth. Close grazing or use of chemicals for controlling competition may be required so the drill can penetrate the soil and competition for the clover plants will be reduced.

Tillage – Although usually not as desirable as frost or drill seeding, use of light tillage to disturb 40-60 percent of the grass can help control the grass growth and expose some soil so clover has a better chance to germinate and grow. In tilled areas, seed can be broadcast and covered with a cultipacker.

Control Competition – Many factors can influence the ability of a young clover seedling to get established in a grass pasture. Competition from existing grass and weeds is usually the most important problem. Grass will compete for nutrients, water and especially light, and if not controlled will prevent the clover seedlings from getting established. The grass should be grazed short prior to seeding. The existing grasses should be grazed or mowed periodically until the young clover is 3½-4 inches tall. At this height, the animals will begin biting off the young clover and should be moved to another pasture. If the grass is grazed to the same height, the clover is usually capable of competing. Depending on growing conditions, the grass-clover mixture should be ready to graze or cut in 5-7 weeks. For best results, a rotational grazing system should be used.

Stand Maintenance – Once established, both red clover or white clover-grass pastures should be rotationally grazed for best yield, quality and clover persistence. A harvest for hay/baleage can be made when red clover is in the early bloom stage. Clipping following grazing may be required to control certain weeds and unwanted seedheads. Fertility should be monitored through soil testing, and soil pH, phosphorus and potassium should be maintained at desired levels. No nitrogen is needed on a clover-grass mixture that has a ground cover of twenty-five percent or more clover. Clover stands should always be monitored for diseases and insects.
Perennial grasses dominate most pastures throughout the USA. Dominant species in the North and East include: orchardgrass, tall fescue, Kentucky bluegrass, perennial ryegrass and smooth bromegrass. Bermudagrass, bahiagrass and dallisgrass are dominant in much of the Southeast, and numerous “range grasses” are present in the west. These grasses play a critical role in providing ground cover and enhancing soil conservation, furnishing food and habitat for wildlife and a feed supply for domestic animals.

Depending on geographical location, many species of clovers can be added to grass pastures. A common practice throughout the South is to overseed/interseed annual clovers such as crimson clover and/or arrowleaf clover into bermudagrass or bahiagrass in the fall. Doing this can increase forage yield in late winter and spring, thus extending the grazing season. Even once the summer grass begins growing again in spring, annual legumes can be added to grass pastures. A common practice throughout the South is to overseed/interseed annual clovers such as crimson clover and/or arrowleaf clover into bermudagrass or bahiagrass in the fall. Doing this can increase forage yield in late winter and spring, thus extending the grazing season.

This publication will focus on putting perennial clovers (red and/or white) into cool season perennial grasses such as tall fescue, orchardgrass, Kentucky bluegrass, perennial ryegrass and smooth bromegrass. Research and farmer experience have shown many potential advantages for this practice:

- Lowered Nitrogen Fertilizer Needs
- Improved Forage Quality
- Better Distribution of Growth
- Higher Forage Yield
- Reduced Risk
- Benefits in Crop Rotations
- Reduced Animal Toxicities
- Greater Environmental Acceptability
- More Interesting and Attractive Pastures
- Increased Profit

See the Oregon Clover Commission publication “Ten Great Reasons for Growing Closers” for greater detail. We want to emphasize four of these agronomically and economically important points: higher forage yield, improved forage quality, more summer production and biological nitrogen fixation.

### WHITE CLOVER VS. RED CLOVER

White clover, a true perennial, is the most widely-grown clover in the United States. Where adapted, individual plants often live for several years. Ladino varieties of white clover are usually the most productive the first year or two after having been planted, but generally do not reseed well. Intermediate white clover types are better reseeders and generally more persistent and stress tolerant, although usually initially less productive than Ladino types. White clover is tolerant of grazing, which makes it a good choice for many pastures, but it is not well-suited for hay situations. Though widely adapted, it is best suited to soils that have good moisture-holding ability.

Red clover has excellent seedling vigor and larger seed than white clover, which facilitates drilling it into existing grass pastures. In many areas, red clover plants can live for 2 to 3 years (and occasionally longer), but in the lower South it often acts as an annual. In areas where it is well adapted, it is the best-yielding clover species on an annual basis. It is often grazed, but is also well suited for use as hay, haylage and balage situations. However, it is not tolerant of continuous, close defoliation. Therefore, rotational stocking is best. Red clover requires good soil moisture, but is not as tolerant of wet conditions as white clover. For more details on these important clovers see the publications ‘Clover Selection Guide,’ ‘Red Clover,’ and ‘White Clover,’ available from the Oregon Clover Commission.

### BENEFITS OF ADDING CLOVERS

#### Higher Yields

- The yield of forage per acre can often be increased. For example, a study conducted at the University of Kentucky compared renovating a tall fescue pasture using red clover to fertilizing the grass with various levels of nitrogen. In this study, red clover growing with tall fescue produced higher yields than tall fescue fertilized with up to 180 lb N/ac.

- Improved Forage Quality – Adding clovers to grass fields improves forage quality over grass alone. This added quality includes increases in intake, digestibility and nutrient content. The result is improved animal performance. Many research studies have shown that clovers improve animal growth rates, reproductive efficiency and milk production.

- Nitrogen Fixation – Clovers and many other legumes get the nitrogen they need as a result of interacting with a specific type of bacteria associated with their roots. These bacteria (various species in the genus *Rhizobium*) live in “knots” (nodules) on the clover roots. This cooperation between the bacteria and legumes is referred to as “symbiosis.” Specific strains of *Rhizobium* bacteria are required to result in effective nitrogen fixation by a given legume. To ensure these bacteria are present, the proper type of bacteria are placed on the seed by the company prior to sale (pre-inoculated) or by the producer at seeding. Pre-inoculated seed carried over from spring to summer will likely need to be re-inoculated.

- Nitrogen “fixed” by the bacteria is available for use by the clovers, and eventually much of it becomes available to grasses growing with them or after them. Different clovers “fix” different amounts of nitrogen. Red clover usually fixes the most (75 to 200 lbs/A/yr), followed by white clover (75 to 150 lbs/A/yr) and then annual clovers (50 to 150 lbs/A/yr). The value of the nitrogen fixed by clovers varies depending on the cost of nitrogen fertilizer at the time.

More Summer Growth – Most growth of cool-season grasses occurs during the spring and fall. However, red clover makes more growth during the summer months than cool-season grasses. Growing grasses and red clover together improves the seasonal distribution of forage including more growth during summer.