From Forage to Profit
How to Establish and Manage a Productive Pasture in Western Oregon

Establishing a pasture

Improved or "permanent" pastures provide a major portion of the feed cattle and sheep consume in western Oregon. These pastures are characterized by the use of grasses and legumes that are most productive rather than native to the area, by application of lime and fertilizer to maximize production, and by the use of intensive rather than extensive grazing management strategies.

Improved pastures provide low-cost feed of high quality, require little labor, aid in soil and water conservation, and help control weeds. They also can improve soil fertility.

Unfortunately, many of the attempts to establish new pastures are made in ways that provide little forage improvement and a very short stand life. While success may be affected by uncontrollable factors such as weather, this publication offers suggestions that will help tilt the balance in favor of obtaining a highly productive stand of plants that will provide nutritious feed for years to come.

Planning before you plow

Planning and preparation are important to successful pasture establishment. In your planning, consider soil type, soil fertility, plant species, cost and availability of machinery, lime, seed, fertilizer, fencing, water for irrigating pastures, and financing.

Soil type

Your soil type will affect what you should plant and the yield you can expect. You may obtain detailed soils maps and information from the Soil Conservation Service.

Soil fertility

Determine this with a soil test. You can obtain sampling instructions through your local Oregon State University Extension Service office. Knowledge of your soil's fertility is essential in determining the kind and amount of fertilizer to use and whether to add lime to the soil.

Many factors other than soil type will affect soil fertility; therefore, use the same fertilizer your neighbor did may not give you the same results. Don't guess—the consequences can be expensive.

Plant species

Tailor these to the soil type, on-farm conditions, and intended pasture use. Improved pastures normally consist of a grass- and legume mixture. Species frequently mixed to take advantage of different seasonal growth characteristics and tolerance to soil and management conditions.

The final sections of this publication describe several common pasture species. Use only certified seed to assure both seed purity and a high rate of germination.

Supplies

- Purchase seed, fertilizer, and fencing through co-ops, farm stores, and dealers. (See the yellow pages in your phone book under Seeds, Fertilizers, Feed & Seed Dealers, Fencing, etc.)
- You can purchase lime in small quantities at some farm stores. For bulk deliveries of lime (the usual method), contact a lime vendor. (They are listed in the yellow pages under Lime.)

You can purchase new and used farm machinery through implement dealers (Farm Equipment in the yellow pages). Used machinery is frequently advertised in local newspapers and farm newspapers classified advertisements.

Advertisements are also a good source for custom operators who will lease their equipment to till your fields. Be sure to check ahead on supplies as they often are unavailable at times of peak demand.

Water

- Plan water for irrigated pasture before planting. A simple quantity is essential. You must deliver it at the right time, in the right amount.

A water quality check by the Oregon State University Soils Laboratory or a commercial laboratory may be advisable if you think your irrigation water contains high concentrations of particular elements.

Place samples in spill-proof plastic containers and take or send them to the laboratory. Simply request a water quality evaluation on all samples.

By statute, all water in Oregon from all sources belongs to the public. Rights to use the water for irrigation may be obtained by application through the State Water Resource Department, Salem 97310. You do not need water rights for domestic wells, stock watering, or gardens and lawns under ½ acre.

If an irrigation system does not already exist for the area you plan to irrigate, look into the matter carefully. Such systems can represent a large investment, and advance planning may save you much work and money.

Obtain help in this area through irrigation equipment dealers and from Oregon State University Experiment Station Circular of Information 628, Consumptive Use...
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Financing
You may need it if many acres are involved. Include a realistic estimate of all costs and arrangements to pay for them in your plans. Using an inadequate amount of fertilizer or poor quality seed because of insufficient funds can lead to problems.

Timing
This is critical for establishing nonirrigated pastures—most often in the fall in western Oregon.

In the spring, usually it is too wet to work clay-type soils until late in the season after there is no longer enough water to keep young plants growing. There are some exceptions; on loose, well-drained soils, spring planting may be feasible.

Time planting to take advantage of water from gentle, early fall showers. Enough moisture needs to be present in the surface soil to germinate the seeds and provide moisture for shallow rooted seedlings until the next shower.

Planting success is usually obtained between early or mid September and early October. Plantings made after October 15, however, run a high risk of winter kill from early frosts.

Irrigated pastures present less of a timing problem than nonirrigated pastures because you can more easily control moisture conditions. Still, do not plant when young seedlings will be exposed to hot periods that dry the soil to a depth greater than the newly formed roots. Consider the possibility of frost (late spring as well as early fall), too.

Late April to late May, and early September to early October, are acceptable times for planting in a "normal" year. These times will vary, of course, in coastal areas and high valleys.
Getting ready to plant

Soil preparation will vary with soil type, condition, and makeup of the proposed seeding. Prepare the soil in a manner that will provide a firm seedbed with good contact between soil and seed. This will mean a more finely pulverized soil for smaller seeds. Footprints will be about a half-inch deep or less on a properly prepared, firm seedbed.

Breaking up old sod on a heavy, clay soil will require plowing, followed by disking—and possible harrowing. It may be possible to prepare the seedbed simply by disking and harrowing lighter soils (those with a greater proportion of sand), or soils that have had an annual crop that year. You and harrowing lighter soils (those with a greater proportion of sand), or soils that have had an annual crop that year. You also can use rotary cultivation, although it is expensive, to prepare a seedbed.

No-till (minimum) tillage procedures have been receiving a lot of publicity and increased acceptance. The application of these procedures to western Oregon pasture production is still under development. These methods forego plowing, control competing vegetation with herbicides, and involve the use of specialized machinery for planting.

The main advantages of minimum-tillage procedures are time and fuel saved and the erosion protection provided by leaving old sod or stubble on the soil surface. Disadvantages are the expense and scarcity of appropriate equipment and the unpredictability of success associated with the technology. Large amounts of old crop residue also may hinder the establishment of small-seeded legumes. For smaller farms, hiring a custom operator will be the only economically feasible way of using a tillage method.

Take care with any method of tilling to avoid overtiling. If the soil is too finely broken up, compaction can result, which causes restricted root growth and poor movement of air and water in the soil.

Preparing small areas of land will rarely justify the cost of owning tillage equipment. If this is your situation, you may want to hire a neighbor or have the work done by a custom operator.

In the case of heavy, old sod, it is usually best to produce some type of annual crop for one or more years before planting a new, permanent pasture. This will aid in the decomposition of the old root structure, allow preparation of a finer seedbed, and provide more opportunities for weed control.

If you carry out plans properly, you will complete seedbed preparation well in advance of seeding time. This will increase the likelihood of a successful crop. Use the following information as a general procedure for annual cropping in preparation for a permanent pasture.

Annual cropping

1. First spring. Use all of the existing feed to establish a seedbed. Turn the residue under and be sure to slow the topsoil in time. Do at least the first part of the disking at this time. Chemical fallow, although possibly more expensive, is an effective method of preparing land for permanent pasture.

2. First spring. Use all of the existing feed to establish a seedbed. Turn the residue under and be sure to slow the topsoil in time. Do at least the first part of the disking at this time. Chemical fallow, although possibly more expensive, is an effective method of preparing land for permanent pasture.

3. First fall. Prepare the annual crop seeded. This can be (and probably will be) much rougher than a permanent pasture seeding. Select plants for the annual crop that are suited to a rougher seedbed (larger seed and more vigorous seedlings)—oats, wheat, rye, annual ryegrass, turnips, rape, or kale work well. Seed the annual crop in the fall when that crop is normally seeded.

Annual crop seeding rates

<table>
<thead>
<tr>
<th>Crop</th>
<th>Lb/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual ryegrass</td>
<td>40</td>
</tr>
<tr>
<td>Small grains and</td>
<td>50-60</td>
</tr>
<tr>
<td>Austrian peas</td>
<td>50-60</td>
</tr>
<tr>
<td>Rape or kale</td>
<td>30-40</td>
</tr>
<tr>
<td>Small grains</td>
<td>10-12</td>
</tr>
<tr>
<td>Small grains and</td>
<td>55-75</td>
</tr>
<tr>
<td>Red clover</td>
<td>10-12</td>
</tr>
<tr>
<td>Turnips</td>
<td>3-5</td>
</tr>
</tbody>
</table>

4. Late winter/early spring. Make a heavy application of nitrogen (70 to 100 lb/acre). This will stimulate the growth of the winter annuals you have planted and provide strong competition for the summer annuals that are going to volunteer from seed in the ground. It will also speed the rotting of the old sod, and, of course, increase the amount of crop to harvest.

Complete further weed control with herbicides during the spring if weeds continue to be a problem.

5. Spring. Harvest crop by grazing, chopping for silage, or haying. Or you could turn it under as a green manure crop to improve soil structure and fertility.

6. Late spring/early summer. Repeat steps 1 and 2.

7. Second fall. Evaluate the quality of weed control and seedbed preparation that you have achieved. If conditions are satisfactory, seed the permanent pasture. If conditions are not satisfactory, repeat the annual crop as in steps 3 through 6.
Liming and fertilizing

Follow soil-test recommendations. If your soil analysis indicates the need for lime, apply it after plowing and work it into the upper 4 to 6 inches of soil as early as possible.

Lime dissolves slowly; it requires several weeks to reduce soil acidity (this also makes one lime application good for several years). Since lime vendors are usually quite busy at seeding time in the fall, it is easier for them to serve you promptly if you place your order early (June or July for a fall seeding).

Fertilizers are most often broadcast on the soil and lightly worked into the upper 2 to 3 inches. You can provide more immediate response and efficient use of phosphorus by using a drill that lays down a band of fertilizer beside or under the row of seed. You can include a small amount of nitrogen in the band, but the seed should not be in contact with the fertilizer. Never band fertilizers that contain boron.

Planting the permanent pasture

Seeding

You can seed most effectively with a grass and legume seeder that has fertilizer and rolling attachments intended for pasture seedings. This equipment will place the seed uniformly at the correct depth (1/4 to 3/4 inch deep), distribute the fertilizer near the seed, and firm the soil around the seed. It is worth the expense of using such equipment to get the job done right.

Some grain drills have grass and legume attachments that are useful in pasture planting. If a drill doesn’t have rollers on it, follow the seeding with some type of roller to firm the seedbed.

Broadcasting the seed on the soil surface is the least effective method. If you use this method, follow seeding with a light harrowing or rolling; use a drag (board, light chain, or even tree branches) to help cover the seed. Be cautious, especially with a harrow, about dragging the seed too deeply into the soil.

As the quality of the seeding method decreases, it is best to increase the amount of seed you plant. A 50-percent increase is suggested when you broadcast the seed.

An important step in seeding is to inoculate clover (or other legume) seed with a fresh culture of the bacteria specific to that legume. To assure survival of the bacteria, inoculate seed within 24 hours of seeding.

The bacteria will form nodules on the clover roots and convert nitrogen from the air into a form usable by the clover and grass. This will make a big difference in your fertilizer bill during the following years.

More detailed information is available in Extension Circular 1055, Inoculating Alfalfa and Clover Seed, from your local OSU Extension Service office (or from the Bulletin Mailing Service, OSU, Corvallis 97331; enclose 25¢ plus 25¢ postage).

Pasture management

Initial management

Start grazing as late summer or early fall seeded pasture until the following spring. Likewise, postpone spring grazing until the ground is dry enough to support the animals without breaking through the new sod. In addition, plants should have enough growth to keep the animals from pulling them up when grazing.

Frequently, the first year’s spring growth will be taken off as hay and no grazing attempted until fall. When you are planning your pasture, provide for adequate feed from other sources until the new seeding is ready for grazing.

Don’t be disappointed if you see numerous weeds during the first spring. Some weeds will sprout with the new seeding and will be crowded out as the pasture seeding becomes better established. The use of certified seed will aid in minimizing weed problems. Rotating annual crops through the field, as previously described, will help prevent weeds. Control weeds also by clipping the pasture when the weeds are about 6 inches high, but be sure the soil is dry and the equipment doesn’t damage the new plants.

Grazing management

Once your pasture is well established, how long it lasts will be affected by how you manage grazing. Overgrazing can cause a pasture to decline in production and revert quickly to weedy species. Underuse can allow aggressive native species to force desirable forage species out of the pasture.

If you understand the characteristics of the various plants in your pasture, you will be able to manage it for maximum pasture productivity. A discussion of the underlying principles of plant management in pastures can be found in Extension Circular 1077, Pasture Management In Western Oregon, available through the OSU Extension Service in Corvallis or county Extension offices (25¢ plus 25¢ postage).
One of the greatest challenges to the manager of a grazing land in western Oregon is the seasonal distribution of forage production (figure 1). Stocking rates that are high enough to use all of the spring production will require either heavy feed purchases for the balance of the year or sale of some livestock. Stocking rates tailored to seasons of lower production, on the other hand, will result in excess feed during late spring.

Try to match animal requirements and seasonal forage supplies. Ewes with lambs born in January-February, especially those with a high proportion of twins, are well matched to the forage production pattern (figure 2). Alternatives include spring grazing of yearling cattle and storage of excess feed as hay or silage.

A common factor in the management of all perennial forage species is that plants will benefit from a resting period after grazing. During this period, they can replenish food reserves in the roots as well as grow more forage to be eaten. Without this resting/rebuilding phase, the life of some perennials can be quite short.

Prevent underuse by keeping the stocking rate high enough that the animals graze the forage uniformly rather than in patches. During periods of peak forage production, it probably will be necessary to bring in additional stock or set some areas aside for hay production. Underuse becomes apparent when the stock leave patches of pasture undergrazed.

A clear implication of these practices is that you will need several fields involved in pasture production. In practice, this may be one field divided by simple, inexpensive cross fences into several smaller pasture units (4 to 8 or more are desirable). The ability to manage the pasture as several small units rather than as one large unit is highly desirable.

If you cannot maintain separate pastures, you can make management easier by using only one species of grass and one of clover in the seed mix. There will be less of a problem with selective grazing patterns if there are fewer species to select from.

This is a particular concern when orchardgrass and tall fescue are seeded together. Inadequate grazing pressure will result in the orchardgrass being overgrazed while the fescue is undergrazed.

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You can also use grazing management as a tool to shift the ratio of grass to clover in a pasture. Ordinarily, it is desirable to maintain half clover and half grass in the plant population. Excessive clover consumption can cause bloat problems in ruminants and foundering in horses and ponies.

Excessive grass in the pasture will result in higher nitrogen fertilizer requirements and pastures that provide less of some required nutrients (magnesium in particular) in comparison to a good mixture of clover and grass.

When you want more clover in the pasture, allow livestock to graze it down to a height of 2 to 3 inches before you move them to another pasture. You can encourage more grass in the pasture by removing the stock when the feed has been grazed to a height of no less than 4 to 6 inches.

Once or more each year, it is recommended that you use a pasture harrow or other suitable device (such as a shallow-set, spike-tooth harrow or a group of heavy tires lashed behind a heavy plow) on the pasture. Dragging such a device will help spread the fertility in manure piles, level gopher and mole hills, and help break up any remaining dead grass. A late summer or early fall operation of this type also can be useful in stimulating germination of subterranean clover.

Setting limits for late spring and winter grazing is a difficult aspect of pasture management. Winter grazing will certainly be a temptation when hay is high priced and there isn’t enough in the barn. Weigh the potential damage to a permanent pasture by improper grazing or overgrazing, however, against dollar savings from feeding cut hay purchased.

You can graze reasonably well drained soils in the winter at times when the ground is not so soft that the sod will be broken. Poorly drained soils will probably be too soft throughout most of the winter, even though there is feeding moisture that could otherwise be used.

Sheep cause less damage to pastures than cattle, but too many sheep can still be detrimental.

You also need to consider plant requirements. Light to moderate winter grazing won’t hurt vigorous plants. Heavy grazing, however, will deplete energy reserves in the roots and crowns of the plants; this, in turn, will limit early spring growth. In severe cases, desirable perennials can be weakened to the point that they disappear from the pasture.

Reducing winter grazing damage

Three options to reduce this problem are:

• Buy additional feed. This may be expensive, but it could well be less expensive than reducing the productive capacity of a good pasture.

• Sell some of your livestock. By selling stock, you can achieve balance between available feed and stock to be fed. Feeding just a few head to bulk generate enough cash to buy additional feed for those that remain. Prime candidates for sale would be young males that have not been used for breeding, those that have produced inferior quality of offspring, those that have a history of subpar performance, and those that are aged or in questionable health.

• Feed animals at slightly less than maintenance until reproductive needs dictate otherwise. The feed that has been stored in fat can make up the difference. A high ration of supplements is available only if the animals are somewhat overweight at the start of the winter and is a management technique for the experienced producer. Those trying it for the first time should be mindful of the adage, “You can’t starve a profit out of a cow.”

Fertility management

You should be sure that your pasture has adequate nutrients if it is to be highly productive. The continual breakdown of soil particles, decay of dead plant material, and recycling of nutrients through the urine and manure of animals can supply a major portion of plant nutrients.

The addition of manure and fertilizers from outside the pasture make up the external sources of nutrients. Both are important. You need to understand both if you are to be in balance at an optimum level with the least possible cost.

The use of clovers in the pasture will provide a “free” source of nitrogen through biological nitrogen fixation. As the nitrogen-fixing nodules on the clover roots die and decay, the nitrogen becomes available to the grasses and stimulates their growth. This is one major reason for including clovers or other legumes in a seed mix.

When considering the recycling of nutrients through manure and urine from livestock, you should recognize that these nutrients are often transferred from one spot to another in a pasture system. Bedding areas and other congregation areas typically have very high nutrient levels. Those nutrients have been brought from other areas in the form of urine and manure. This reinforces the desirability of management by cross-fencing.

An occasional shifting of salt licks, watering equipment, portable creep feeders, and outdoor feeding areas also can be a useful management tool in this type of nutrient transfer. Removing shade trees in pasture areas also will assist in more uniform nutrient recycling by eliminating a potential congregation area.

Base the addition of external sources of fertility on a recent soil test. A new test is recommended every 2 to 3 years and often is desirable on an annual basis. When you cannot easily control the transfer of nutrients by livestock, the soil sampling procedure should reflect the differences expected in different areas. This may mean taking two separate samples from one field.

In the absence of adequate knowledge about soil fertility levels in various parts of the pasture, a “best guess” approach would be to spread manure, bedding from
barns, and poultry litter in those areas where animals have not been congregating.

When using manures, remember that if in the first year about one-half of the nitrogen will be quickly available; the balance will be released over the next year or so. The decay of plant materials will take place over 1 to 3 years.

When using commercial or chemical fertilizers, consider the availability of the nutrient to the plants and the potential for nutrient losses through leaching.

Nitrogen, potash, and sulfate forms of sulfur fertilizers provide nutrients that are available to plants as soon as moisture carries them into the soil. Phosphate and elemental sulfur fertilizers need some time to become available to pasture plants. When excessive water is available (as in the winter), water may carry some nutrients away as it goes through the soil.

Most forms of nitrogen are quickly lost in this way, and sulfate sulfur also will leach out in appreciable amounts. Phosphate and potash are less mobile in the soil and are not readily leached in spite of excess moisture.

Elemental sulfur will stay in place but will be continually oxidizing to the sulfur form, some of which is lost each year. With these principles in mind, the following suggestions are made for fertilizer application:

**Nitrogen**

In the fall, apply only amounts that will be used during the following growing period. Use a spring (late January through early March) application of additional nitrogen to stimulate early-spring grass production. (Take care not to have equipment on the fields when soil moisture is too high, as severe rutting and/or compaction can result.)

With a vigorous stand of grass, nitrogen fertilization may be unnecessary. When clover is an important part of the pasture, nitrogen (N) applications should not exceed 40 lb/acre in any one application. Greater amounts of N will significantly reduce the biological nitrogen fixation and result in more grass and less clover in the pasture.

**Phosphate**

Fall application is recommended, so that it will be available to support growth in the spring when nutrient demands are highest. Late winter or early spring applications are also acceptable, but fall weather will be much more convenient.

**Potash**

Since this nutrient is both stable in the soil and readily available, you can spread it in either the fall or spring. As with phosphate fertilization, fall will probably prove to be a more popular choice.

**Sulfur**

If you plan to use the sulfate form, apply it in early spring to reduce leaching loss. Heavy applications in the fall, however, may leach through the winter and support good spring growth.

When using elemental sulfur, it is a "slow release" characteristic that will make leaching less of a problem.

By using elemental sulfur of a burning particle size, it is possible to get a 2 or 3 years' supply at one time (fertilizer can be spread in a sustained release during this long period). Sulfur application is appropriate, but other times of the year are acceptable if you allow enough lead time for breakdown by oxidation.

**Altering the ratio**

You may also use fertilizers as a management tool to alter the ratio of grass to clover. The management, however, will most effective if you use them together with the grazing management suggestions made earlier.

Grasses and clovers both need all of the nutrients discussed above. They differ, though, in the amounts needed. This gives you the opportunity to weight management in favor of one or the other.

Grasses require large quantities of nitrogen; clovers (if properly inoculated) will not need any fertilizer source of nitrogen. Clovers, however, need substantially more phosphate and sulfate then grasses.

To alter the grass/clover ratio, increase nitrogen and decrease phosphate and sulfate when your goal is to increase grass production. To favor the clover, omit nitrogen fertilization and apply more phosphate and sulfate.

**Hay production from pastures**

For a variety of reasons, the feed produced by pastures is not always harvested by grazing. Usually, when a portion of the pasture is not grazed, it is simply put up by hay in the late spring or early summer and used as winter feed later in the year. Occasionally, some excess feed will be stored as silage, or it may be cut and sold as green chop.

By using one of these alternatives, some producers will apply nitrogen heavily (60 to 80 lb/acre) early in the spring to maximize grass growth. This practice should yield a heavier hay crop, but it may be at the expense of damage to the clover fraction of the pasture. This is the result of competition for light from the heavy grass growth and from the adverse effect of too much nitrogen on the process of nitrogen fixation that occurs in the nodules on the clover roots.

When New Zealand white clover is the legume in a grass-clover mix, it is recommended that you vary the areas you set aside for haying from year to year. If you allow the same area to come up to hay each year, the clover will gradually decline as a percentage of the total plant population.

A strategy for haying with less chance of rain-damaged hay involves a combination of grazing and hay production from pastures. To do this, it is necessary to have some well-drained soil in pasture that is sodded heavily enough that livestock won't damage the pasture.

Graze the field early in the season and remove the livestock by mid-April. This will allow regrowth to take place, but it will be delayed. It will also delay haying operations until later in the season.
Some decrease will probably be seen in the hay yield, especially if grazing is continued into late April or if moisture becomes a limiting factor late in the spring. Compare this reduction, however, with livestock weight gains obtained, the reduced chance of rain-damaged hay, and higher quality hay resulting from cutting hay at an early stage of maturity.

**Special subterranean clover notes**

Subterranean (sub) clover is unique among permanent pasture plants in that it is a winter annual, rather than a perennial. Subclover germinates from seed with the early fall rains, grows some through the fall and winter, provides a tremendous amount of feed in the springtime, and dies in the early summer after developing large numbers of seeds. Seeds remain dormant through the summer drought period, and the cycle begins again in the fall.

It is this cycle coupled with prolific seed production that makes subterranean clover so useful in nonirrigated pastures under the dry summer, mild winter, moist spring climate of western Oregon.

A weak point in the cycle, however, is seedling survival. If there is an overburden of dead plant material in the pasture at the time of seed germination, the new subterranean clover plants won't get enough sunlight to survive.

It becomes essential, therefore, to remove all of the plant material from the pasture during the summer. Overgrazing at this time or pasture in the summer once seed has been formed is impossible. While grazing is the most desirable method of removing the dead plant material, close clipping or burning (where legally and practically possible) also is acceptable.

Another noteworthy characteristic of subclover is that it is a shallow-rooted plant. Consequently, when soil sampling, it is a good idea to take only the upper 2 inches of soil. Deeper sampling in established fields will reflect soil fertility in areas that are not explored by subclover roots. This will result in fertilizer recommendations that exceed the real needs of the pasture and will increase fertilizer costs without increasing the benefits.

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**Plant species commonly used in pasture plantings**

### Grasses

#### Annual ryegrass

A fast-growing, competitive winter annual grass used extensively as a cover crop, for erosion control and for short term forage production. Quite tolerant of wet soils. Very useful as an interim crop between permanent pasture seedings. Tetraploid annual ryegrasses have good early spring production, are quite palatable, and tolerate a wide variety of soil conditions.

#### Meadow foxtail

A less desirable grass, adapted to wet soils that are subject to frequent and/or prolonged flooding. Produces less forage than other grasses. Tolerant of frost and prolonged snow cover in high altitude areas. Meadow foxtail is very undesirable in seed producing areas as its seed is extremely difficult to separate from some of the important seed crops. Because of this, it is not recommended in the main floor of the Willamette Valley or in other seed-producing areas.

#### Orchardgrass

A highly productive grass suitable for hay or pasture on well-drained soils under irrigated or nonirrigated conditions. Very palatable when young, but like all grasses, it tends to become coarse and less palatable if allowed to be overmature. Not recommended in combination with tall fescue, unless rotational grazing with high stocking rates can be practiced.

Selective grazing of mixed stands may result in poor use of the fescue and overgrazing of the orchardgrass if heavy stocking rates aren’t maintained. Best used in situations where high quality management can be exercised. Dormant in cold season.
Perennial ryegrass

A good cool-season grass used in pasture and hay production. Quite tolerant of wet soils. Recovers well after spring grazing but tends to become dormant in the summer. Can be used in irrigated or nonirrigated fields and with a wide variety of soil conditions. Germinates and becomes established rapidly. Longevity of newly developed tetraploid ryegrass varieties varies. Be sure that the ryegrass you choose for permanent pastures is a long-lived perennial.

Reed canarygrass

Used in swampy areas that are under water for long periods. Uniform grazing and haying will be difficult, but reed canarygrass can be very productive if grazed under careful management. Can become a noxious weed in drainage and irrigation ditches. Gets quite coarse if allowed to overmature.

Small grains

Wheat or oats. Can be used to produce grain, grazing, silage, or hay. Used as an interim crop between permanent pasture seedings if soil is well drained. High levels of fertility are required to obtain maximum growth. Plants tend to be very heavy-stemmed; forage quality will be poor if harvested late.

Tall fescue

A highly productive grass that grows well under a wide variety of moisture, soil, and temperature conditions. Provides good hay or pasture under irrigated or nonirrigated conditions. Less palatable than other commonly used forage grasses. Not highly desired by sheep. Strong sod-forming characteristics and the ability to grow with minimal moisture tend to provide for an extended grazing period.
Legumes

Alsike clover
A short-lived perennial clover used in much the same manner as red clover. Suitable for soils that are too wet, cold, or acid for red clover.

Austrian winter peas
An annual legume often sown with small grains when an interim crop is being used between permanent pasture plantings. Good drainage is needed. Austrian peas are somewhat more winter-hardy than other field pea varieties but may still suffer substantial winter kill in the prolonged freezing weather occasionally seen in the Willamette Valley.

Big trefoil
A good legume for soils that are wet all year round or subject to prolonged flooding or ponding in the winter. Can be used for pasture or hay. More tolerant than birdsfoot trefoil because of its rhizomes. Nonbloating legume like birdsfoot. Not winter-hardy in cold areas. Requires a special inoculum (not the same as birdsfoot inoculum).

Birdsfoot trefoil
A long-lived, deep-rooted legume suitable for hay or pasture in areas with drainage problems or low soil pH. Very winter-hardy and tolerant of dry summer conditions of western Oregon. Useful on irrigated or dry land. Nonbloating legume quite suitable for sheep or cattle but not a good horse pasture, because of the presence of tannins. Not tolerant of early spring grazing or continuous grazing. It establishes slowly and with some difficulty, but is vigorous once established. Requires a special inoculum.

Red clover
A fast-starting, highly productive, but short-lived perennial clover. Useful in short term pastures (1 to 4 years) or for increased legume production in permanent pastures that use a slower-starting clover, such as New Zealand white clover. Requires well-drained soil and will perform best under irrigation. Without irrigation, soils
Subterranean clover (Subclover)

A winter annual legume that germinates in the fall, grows rapidly in the spring, and dies after reseeding itself early in the summer. Ideal for foothill and nonirrigated pastures and hay fields. Not adapted to poorly drained soils or irrigated pastures. It is necessary to remove the forage by grazing, mechanical harvesting, or burning each summer to maintain subclover in the stand. Properly managed, subclover will reseed itself for many years.

Vetch

Hairy vetch and common vetch are viny, annual legume forages that make excellent pasture or hay and are used extensively as a green manure crop. When used as a pasture crop, vetches are often mixed with small grains or annual ryegrass. Common vetch is less winter-hardy than hairy vetch, but both can be grown in western Oregon.

White clover

A long-lived, perennial clover well adapted to wet soils and irrigated land. Moderate to high fertility and adequate moisture are needed for good production. Won't do well in very acid soils. New Zealand white clover is a type that is more resistant to slug damage and less inclined to cause bloat than some other white clovers. Continued grazing will likely cause a loss of white clover in the stand as grazing from tall grasses provides excessive competition. Continued close grazing also favor the clover to the exclusion of pasture grasses. Establishment is somewhat slower than other clovers.

Caution: Red clover produces hormone-like compounds (estrogens) that can interfere with livestock breeding. Don't use red clover in pastures where you plan to graze stock (especially sheep) during the breeding season.

that don't dry rapidly in the late spring (that is, deeper soils) are preferred.

Fact Sheets

More detailed information on the grasses and legumes mentioned here is available in a series of fact sheets dealing with forage species. They are listed below and are available from the Oregon State University Extension Service, Corvallis, or through your nearest OSU Extension Service office. (Oregonians may order up to 6 fact sheets at no charge. If you need more than 6, there will be a modest charge on mail orders.)

Legumes

FS 253 Growing Alfalfa for Forage
FS 254 Growing Alsike Clover for Forage
FS 255 Growing Red Clover for Forage
FS 256 Growing White Clover for Forage
FS 257 Growing Subterranean Clover for Forage
FS 258 Growing Big Trefoil for Forage
FS 259 Growing Birdsfoot Trefoil for Forage
FS 283 Growing Sainfoin for Forage
FS 284 Growing Sweetclover for Forage
FS 285 Growing Strawberry Clover for Forage
FS 288 Growing Field Peas for Forage
FS 292 Growing Vetch for Forage

Grasses

FS 260 Growing Kentucky Bluegrass for Forage
FS 261 Growing Orchardgrass for Forage
FS 262 Growing Perennial Ryegrass for Forage
FS 263 Growing Tall Fescue for Forage
FS 264 Growing Meadow Foxtail for Forage
FS 265 Growing Reed Canarygrass for Forage
FS 266 Growing Timothy for Forage
FS 289 Growing Smooth Bromegrass for Forage
FS 290 Growing Sorghum/Sudangrass for Forage
FS 291 Growing Annual Ryegrass for Forage

Miscellaneous forages

FS 287 Growing Rape and Kale for Forage
FS 296 Growing Turnips for Forage

For most current information:
http://extension.oregonstate.edu/catalog
Pasture mixture suggestions

In the description below, find the location and situation that most nearly fits your fields. The numbers at the right refer to one or more seed mixtures that would be appropriate for these conditions.

**Willamette Valley and surrounding areas**

**Situation**

**Seed mixes**

- **Hill land**
  - Shallow soil, quick to dry in early summer ........................................ 1
  - Deeper soils, slower to dry in summer ........................................ 2, 3, or 4

- **Bottom land**
  - **Nonirrigated**
    - Good drainage; little, if any, standing water in rainy season .............. 2, 3, or 4
    - Fair drainage; standing water in rainy season .................................. 5, 7, 8, 9
    - Poor drainage; prolonged standing water in rainy season ................. 9
    - Mixed good and poor drainage ....................................................... 4
  - **Irrigated**
    - Good drainage; little, if any, standing water in rainy season .............. 6, 7, 8, 9
    - Fair drainage; standing water in rainy season ............................... 7, 8, 9

**Coastal areas**

**Situation**

**Seed mixes**

- **Hill land**
  - Well drained ....................................................... 1, 2, 3
  - Moist sites .......................................................... 5, 6, 7

- **Bottom land**
  - Well drained .......................................................... 5, 6, 7
  - Poorly drained ...................................................... 7, 8, 9
  - Swampy ................................................................. 10

**Permanent pasture seed mixes**

<table>
<thead>
<tr>
<th>Mixture</th>
<th>Lb/acre</th>
<th>Mixture</th>
<th>Lb/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Perennial ryegrass</td>
<td>12-15</td>
<td>6. Orchardgrass</td>
<td>8-10</td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>3-5</td>
<td>N.Z. white clover</td>
<td>2-3</td>
</tr>
<tr>
<td>2. Orchardgrass</td>
<td>8-10</td>
<td>7. Fawn tall fescue</td>
<td>8-10</td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>3-5</td>
<td>Perennial ryegrass</td>
<td>3-5</td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>2-3</td>
<td>N.Z. white clover</td>
<td>2-3</td>
</tr>
<tr>
<td>3. Fawn tall fescue</td>
<td>8-10</td>
<td>8. Birdsfoot trefoil</td>
<td>12-15</td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>3-5</td>
<td>Bigfoot trefoil</td>
<td>5-6</td>
</tr>
<tr>
<td>4. Fawn tall fescue</td>
<td>8-10</td>
<td>9. Meadow foxtail</td>
<td>6-8</td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>3-5</td>
<td>10. Meadow foxtail</td>
<td>6-8</td>
</tr>
<tr>
<td>Subterranean clover</td>
<td>4-7</td>
<td>11. Reed canarygrass</td>
<td>8-10</td>
</tr>
<tr>
<td>N.Z. white clover</td>
<td>2-3</td>
<td>Big trefoil</td>
<td>2-3</td>
</tr>
<tr>
<td>5. Perennial ryegrass</td>
<td>12-15</td>
<td>N.Z. white clover</td>
<td>2-3</td>
</tr>
</tbody>
</table>

- Seed rate assumes the use of a drill. Increase rate by 50 percent if you broadcast the seed.
- Inoculate all legumes (clovers, peas, trefoils above) with a fresh culture of the proper strain of bacteria within 24 hours before seeding.
- Ryegrass (perennial or annual) seeded in excess of 5 lb/acre (20% of the mixture) may result in undesirable competition for other grasses such as orchardgrass and tall fescue.
- To increase early legume production in these mixtures, it may be desirable to add 6 to 8 lb/acre of red clover or 4 to 6 lb/acre of alsike clover to the seed mix. Read the plant descriptions for these clovers on pages 8 to 11 before making your decision. Don't use red clover in fields that will be used for grazing sheep during the breeding season.

The Oregon State University Extension Service provides education and information based on timely research to help Oregonians solve problems and develop skills related to youth, family, community, farm, forest, energy, and marine resources.

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This publication was prepared by Paul E. Day, Lane County Extension agent; David B. Hannaway, Extension forage specialist; William S. McGuire, professor of agronomy; and Thomas E. Bedell, Extension range resources specialist; Oregon State University. It is intended as a basic guide for the production of improved pasture in western Oregon. The practices and plants suggested are appropriate for most situations; if you have a question about a pasture, call your county Extension agent.

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