

Cover Crops for Home Gardens in Western Washington and Oregon



Introduction

Cover crops provide many benefits in gardens and agriculture, including protecting the soil from runoff and erosion, recycling and supplying nutrients, replacing soil organic matter, and suppressing weeds. Your choice of a cover crop will depend on which benefits are most important to you. This bulletin describes the benefits of cover crops, different types of cover crops and their suitability for different situations, and how to grow and manage cover crops in your garden.

What is a cover crop?

Cover crops are plants grown to cover the soil during idle periods. Gardeners usually plant cover crops in the fall for winter cover, but some gardeners also use cover crops as part of a summer rotation. When cover crops are returned to the soil, they supply plant nutrients and organic matter.

Choosing a Cover Crop

Table 1 lists benefits provided by cover crops. No one cover crop provides all of these benefits. Different cover crops offer different benefits and disadvantages. Deciding which cover crop or combination of cover crops to grow depends on which benefits are most important to you, and which cover crops best fit into your garden management.

Table 1. Benefits of cover crops

- Replacing soil organic matter
- Recycling nutrients
- Supplying nitrogen (only provided by legumes)
- Protecting soil from raindrop impact
- Reducing runoff and erosion
- Protecting water quality
- Suppressing weeds
- Reducing disease and nematodes (some evidence for this)

Specific cover crops and their traits

Common cover crops belong to one of three groups:

- Grains and grass
- Legumes
- Other broad-leaved plants

Cereal grains grow vigorously and can provide quick ground cover even when the weather is cool. They yield large amounts of biomass when planted and harvested at the proper times. Legumes are generally slower growing than cereal grains in cool weather, but grow rapidly when the weather is warm. They can fix nitrogen from the atmosphere, increasing the amount of soil nitrogen available for the next crop. Most other broad-leaved plants are more difficult to grow and manage than cereal grains and do not provide the nitrogen-fixing benefits of legumes. Buckwheat is a frost-sensitive broadleaf that is easy to grow in warm weather and is well suited as a summer cover crop.

Cover crops within each family are described below. Tables 2-4 list average planting dates, seeding rates, seed availability, and chance of winterkill for each crop. Planting dates, chance of winterkill, and management vary with climate. A longer season is available for planting and growing winter cover crops in the Willamette Valley of Oregon than in northwestern Washington.

Table 2. Cereal and other grass cover crops

Crop	Planting dates	Seeding rate lb/1000 SQ. ft.	Winterkill	Seed availability
Cereal rye	Late Aug.-Late Oct.	2-3	No	+ ²
Winter wheat	Late Sept.-Late Oct.	2-3	Seldom	+
Spring oats	Late Aug.-Early Sept. ¹	2-3	Susceptible	+
Spring barley	Late Aug.-Early Sept. ¹	2-3	Occasional	+
Winter triticale	Late Aug.-Late Oct.	2-3	Seldom	-
Annual ryegrass	Late Aug.-Mid Sept.	0.5-1	Seldom	+

¹These crops can be planted until mid-October in the Willamette Valley

²+ means seed is usually available at feed or garden stores

- means seed usually must be ordered

Table 3. Legume cover crops

Crop	Planting dates	Seeding rate lb/1000 sq. ft.	Winterkill	Seed availability
Hairy Vetch	Late Aug.-Early Sept. ¹	1.5-2	Seldom	+ ²
Common Vetch	Late Aug.-Early Sept. ¹	1.5-2	Seldom	+
Austrian winter peas	Early Sept.-Late Sept. ¹	2-3	Occasional	+
Crimson Clover	Late Aug.-Early Sept. ¹	0.5-1.5	Seldom	-
Fava bean	Early Oct.	2-3	Seldom	-

¹These crops can be planted until mid-October in the Willamette Valley

²+ means seed is usually available at feed or garden stores

- means seed usually must be ordered

Table 4. Other broadleaf cover crops

Crop	Planting dates	Seeding rate lb/1000 sq. ft.	Winterkill	Seed availability
Buckwheat	May-Early Aug.	1-2	Yes	+ ¹
Rape	Late Aug.	1/8-1/4	Seldom	+
Mustard	Late Aug.	1/8-1/4	Seldom	-
Turnip	Late July-Early Aug.	1/8-1/4	No	-

¹+ means seed is usually available at feed or garden stores
- means seed usually must be ordered

A. Grains and grass

Rye, wheat, oats, barley, and triticale are all cereal grains. Their growth habits suit them as a cover crop. Annual ryegrass is a turfgrass and can be more difficult to manage as a cover crop. Its uses are more limited.

Cereal rye is the most commonly grown cover crop in the Northwest. It is vigorous, very cold hardy, and can germinate and become established in cool weather.

When planted by early September, rye will capture some of the available nitrogen in the soil and recycle it for the next crop. Rye grows rapidly in the spring and can become difficult to turn under by the time gardeners are ready to work their gardens. Mowing may be necessary before turning under heavy growth of rye. Rye may suppress the growth of spring crops, but this is likely to happen only when heavy growth is turned under and not allowed to decompose before spring planting.

Winter wheat is most suitable for mid to late season plantings. Plantings before late September are susceptible to disease and premature death. Winter wheat covers the ground quickly in the fall, but does not grow as vigorously as rye does in the early spring, making it a good choice for late planted gardens. Wheat is more leafy than rye, so it may decompose faster when it is turned into the soil.

Spring oats are a good choice for an early cover crop, as they grow vigorously when the soil is warm. Oats should be planted by early September in the Puget Sound area to get good fall growth. Later planting is unlikely to produce good ground cover. Planting can be as late as October in the Willamette Valley. Oats tolerate wet and heavy soils better than other cover crops, but oats are susceptible to early winterkill. Winterkill is less of a problem in the Willamette Valley.

Spring barley is an early cover crop that is similar to oats in growth characteristics. It is also susceptible to disease and occasional winterkill. Barley produces a large amount of leaves, but most of its growth comes late in the spring. Winter barley is also available, but is only slightly more winter hardy than spring barley.

Triticale grows similarly to cereal rye but produces more vegetation. It is a leafier plant than rye and may decompose more easily when turned under. Triticale seed is often hard to find locally, but it is available through some seed catalogs. Expect to pay a higher price for triticale seed at this time.

Annual ryegrass is a turfgrass rather than a cereal grass. It has a vigorous root system that makes it hard to till under once it is established. It regrows readily after mowing. Annual ryegrass also can persist like a

perennial, making it a potential weed when used as a winter cover crop. Some gardeners use annual ryegrass as a companion crop for crimson clover.

B. Legumes

The most important benefit of legumes is their ability to fix nitrogen from the atmosphere into the plant. This is different from the grasses, which can only take up nitrogen already available in the soil. Legumes fix nitrogen in association with bacteria called Rhizobia, which form nodules on legume roots. Active nodules look pink when broken open. When the legumes are turned under and decompose, the fixed nitrogen is released for future crops.

Rhizobia are usually present in the soil, ready to inoculate legume plants and begin fixing nitrogen. Occasionally the proper Rhizobium is not present, and nitrogen fixation will not occur. In this case, root nodules will be white or green rather than pink on the inside. If you have not grown a particular legume in your garden before, you should buy the correct Rhizobium and mix it with the seed before planting. Be sure to buy a Rhizobium that is compatible with your legume. Buying Rhizobia is not always necessary, but it is an inexpensive way to ensure inoculation.

The main disadvantage of legumes is that they tend to grow slowly in cool weather and provide poorer ground cover than grasses. Most legumes are not well suited to wet soils, and perform poorly in soils deficient in phosphorus and potassium and soils with low pH.

Hairy vetch and **common vetch**. Hairy vetch is one of the more aggressive legumes and is a good companion crop for cereal grasses. It becomes established slowly and is poor ground cover when planted by itself. When the weather warms in the spring, hairy vetch will grow quickly. Its tendrils can wrap around tiller tines, making it more difficult to turn under with a rototiller.

Common vetch is similar to hairy vetch, but has fewer tendrils, making it easier to till into the soil. Both types of vetch can be persistent and have hard seed, possibly becoming weeds. Vetch should be turned under before flowering, reducing persistence problems.

Crimson clover also starts growth slowly, and performs best if planted in late August or early September in the Puget Sound area. October planting dates are successful in the Willamette Valley. Crimson clover does not compete as well with the cereals, and is often grown alone or with annual ryegrass. It is easier to turn under and less likely to become a weed than the vetches.

Austrian winter pea can be grown alone or mixed with cereal rye, and can be planted successfully during September in the Puget Sound area. It is a poor competitor against winter weeds, and weed competition can choke out Austrian winter pea during mild winters. Gardeners who raise animals can graze them on the Austrian winter pea before turning the crop into the soil.

Fava bean is a good legume for October plantings because it grows faster during the fall and winter than the other legumes. If planted too early, excess fall growth will reduce crop hardiness, increasing the risk of winterkill. Fava beans can be grown alone or mixed with cereal grains. Seed may be difficult to find.

C. Other Broadleaves

Other broadleaves include rape, mustard, and turnips, and the summer cover, buckwheat. Rape, mustard, and turnips are all members of the Brassica family, while buckwheat is classified as a Polygonaceae.

Rape, Mustard, and Turnips. In most cases the disadvantages of these plants outweigh their benefits as cover crops. These plants do not fix nitrogen and they decline in quality rapidly after flowering. They are harder to grow than the cereals, especially when sown late. They have hard seeds, making them likely to become a weed. Further, they can become a serious contamination problem in areas where Brassica seed

(such as cabbage seed) is grown commercially, and should not be grown there. Brassica seed is grown in the Willamette Valley of Oregon and in parts of Skagit, Island, Snohomish, and Lewis counties in Washington.

Some research shows that rape may suppress weed germination and nematodes in the spring crop, and mustard may also suppress some weeds. Turnips can be grazed by animals. Despite these potential advantages, these crops are seldom a good choice for Northwest gardeners.

Buckwheat is the most widely grown summer cover crop and is well suited to the Northwest. It grows quickly in warm weather in a wide range of soils and is usually ready to turn under in 30 days. It is possible to grow several crops of buckwheat in a single summer. Buckwheat will smother weeds with its prolific growth. If allowed to grow too large, it becomes difficult to turn under. Buckwheat is sensitive to frost and should not be planted until the danger of frost has passed in the spring.

■ D. Cover Crop Mixtures

Cover crops are commonly grown as mixtures, which combine some of the advantages of each of the component species. Cover crop mixtures sometimes function synergistically, providing more benefits than the individual species grown alone.

Cover crop mixtures typically involve two species, but can include five or more species. One commonly grown mixture uses a cereal grain and a legume. Cereals, such as rye, wheat, and triticale, typically germinate and grow readily through the fall and into the winter. If planted early, these cover crops not only provide good soil cover, but also capture some soil nitrogen that might otherwise be lost to soil leaching during the winter rains. Legumes, such as vetch, crimson clover, and Austrian field peas, become established more slowly and do not provide good soil cover or soil nitrogen capturing ability. Legumes put on most of their growth in the spring, usually in April and May. Because of their unique relationship with nitrogen-fixing Rhizobia bacteria on the roots, legumes can fix substantial amounts of nitrogen.

By planting a mixture of a cereal and legume, the soil covering and nitrogen scavenging abilities of the cereal are combined with the nitrogen fixing ability of the legumes.

Many of the cereal cover crops have been shown to contain natural herbicides, or "allelopathic" chemicals, which can reduce growth of both weeds and vegetable crops. Research has shown that including a legume in the mixture reduces this allelopathic effect.

One commonly grown mixture is cereal rye and hairy vetch, typically planted in the garden at a seeding rate of 1.75 lbs/1000 sq ft of rye plus .75 lb/1000 sq ft of hairy vetch. The vetch will germinate in the fall, but grows very slowly until spring. Then it will use the more upright rye as a structure on which to grow. Other common cover crop mixtures include oats or barley plus crimson clover or Austrian field peas.

Cover Crop Management

Garden planning for cover crops

Cover crops are more likely to perform well if you include them in your garden plan rather than plant them as an afterthought. By planning ahead, you will be ready to plant and turn under the cover crops at the appropriate times.

How to plant

Cover crops need a good seedbed just like garden crops. After harvesting your garden crops, turn the soil and rake it smooth. Small seeded crops need the smoothest seedbed. Most of the common cover crops (cereals, vetches, Austrian winter pea, fava bean, and buckwheat) have medium to large seeds.

You can plant seeds either by broadcasting across the area or using a garden planter that places seeds in rows. Most gardeners will find broadcasting more convenient. You can broadcast by hand from a perforated can or from an inexpensive hand-held crank seeder. If you broadcast, use the high end of the range of seeding rates shown for each crop in Tables 2-4.

Cover the seeds by raking at least 1/4" deep, or rototill no more than 2" deep. This provides good soil-seed contact and protection from drying, which increases germination. You won't be able to work all the seeds below the surface, so do not be concerned that some seeds remain on the surface.

You do not need to fertilize cover crops in established gardens. Enough nutrients will remain available in the garden to meet their needs. Summer and early fall plantings usually need irrigation to germinate and become established.

When to plant



Tables 2-4 show a range of planting dates for each crop. Plan your garden to include cover crops and choose cover crops that fit your timing. Earlier planting recovers more nutrients, covers the soil more quickly, and produces more organic matter. By capturing more nutrients and covering the soil, early planting also improves water quality protection by reducing nutrient leaching, erosion, and runoff. For example, Washington State University research in Mt. Vernon, Washington, shows cereal rye planted September 1 will accumulate almost 4 times as much nitrogen as rye planted September 30. Late planting is better than no planting as long as planting is done within the recommended time range. If you plant beyond the recommended range, the cover crop may not become established.

You can plant cover crops by section in your garden, planting the earliest cover crops as soon as harvest is complete in the earliest parts of your garden. Many gardeners are still harvesting some parts of their garden into November or December. Since this is too late for planting cover crops, these parts of the garden are better mulched with straw or compost. If enough space is available, gardeners can plant cover crops between rows of late crops.

When to turn under



Turn the cover crop under before flowering (boot stage or earlier for grasses). Plants become woody and decompose more slowly if they grow to the flower or seed stage. If you can't turn the crop under in time, first chop or mow it, and turn it under as soon as possible. You can remove and compost the clippings, returning them to the garden as compost.

Ideally, turn the cover crop under about 3 weeks before planting. This gives time for some decomposition to occur, and for the soil to warm. You can turn your cover crop under in sections based on when you plant different parts of the garden. Avoid turning the cover crop when the soil is too wet for field work because this can harm the soil's structure.

How to turn under



If the top growth is too heavy to turn under easily, cut and remove most of the top growth first. Use a rototiller, shovel, or garden fork to turn the cover crop under to a depth of 3-6 inches. You can get into the garden earlier in the season using the hand tools than using a rototiller. Before planting the garden, prepare the seed bed as usual.

Summer cover crops



Summer cover crops are grown to help improve future garden space, to provide cover for garden space that isn't planted this year, or as part of a planned garden rotation. Buckwheat is the main summer cover crop although legumes also can be grown.

Summer cover crops combined with winter cover crops are especially valuable in improving future garden space. Preparation for the cover crop helps break up soil compaction, and the crop helps suppress weeds. Cover crops can be used together with compost to improve the tilth of a new garden. The cycle of summer and winter crops further reduces weed problems in new garden space.



By Craig Cogger, Extension Soil Scientist; Dyvon Havens, Cooperative Extension, Skagit County; Steve Fransen, Extension Forage Agronomist, all of Washington State University; John Luna, Extension Specialist, Integrated Farming Systems OSU; Wilbur Anderson, Horticulturist, and Shiou Kuo, Soil Scientist, both of Washington State University.

Issued by Washington State University Cooperative Extension and the U.S. Department of Agriculture in furtherance of the Acts of May 8 and June 30, 1914. Cooperative Extension programs and policies are consistent with federal and state laws and regulations on nondiscrimination regarding race, color, gender, national origin, religion, age, disability, and sexual orientation. Evidence of noncompliance may be reported through your local Cooperative Extension office. Trade names have been used to simplify information; no endorsement is intended. Published March 1997. Subject code 372. A