



# Cover Crops for Home Gardens East of the Cascades

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This fact sheet, the second in a three-part series on cover crops for home gardeners, focuses on choosing cover crops for gardens east of the Cascades. The first fact sheet in this series, *Cover Crops for Home Gardens West of the Cascades*, focused on choosing appropriate cover crops for gardens in Washington and Oregon west of the Cascades, and the third fact sheet, *Methods for Successful Cover Crop Management in Your Home Garden*, will cover management of cover crops in gardens, including planning, planting, managing nutrients, and terminating plants.

## What Is a Cover Crop?

Cover crops are plants grown to both cover and improve the soil. They may be used as a living or dead mulch on the soil surface, or they can be tilled into the soil as a “green manure.” Gardeners usually plant cover crops in the fall for winter cover, but some gardeners also use cover crops as part of a summer rotation. Cover crops can be any type of plant but are generally grasses (including cereal grains), legumes, or grass/legume mixtures. Some non-legume broadleaf plants can also be used.

## Why Grow a Cover Crop?

Cover crops serve the gardener in many ways, typically by protecting and improving the soil, suppressing weeds, and attracting beneficial insects (Table 1). However, no single cover crop will provide all these benefits since different types of cover crops and management approaches offer different types of benefits. Many gardeners plant a mixture of cover crops to increase the number of benefits to their garden, but cover crops do require some management. Seed must be purchased and planted at the right time, cover crops may need some irrigation during establishment, and the right tools and techniques are needed to terminate cover crops.

## How to Choose a Cover Crop?

You should choose cover crops based on which benefits are most important to you and which cover crops best fit into your garden plan. The information that follows will help you choose the right cover crops.

Table 1. Benefits of cover crops.

- Replace soil organic matter
- Recycle nutrients
- Supply nitrogen (legumes only)
- Protect soil from rain and wind erosion
- Reduce runoff and water erosion
- Reduce leaching of nutrients
- Suppress weeds
- Break up compacted soil
- Attract beneficial insects by providing pollen and nectar
- Reduce disease and nematodes

## Cold-hardy cover crops

Gardeners usually plant these species in the fall as winter cover crops, but they can be grown in the summer as well. When choosing species, decide which crop functions are most important to you. Legumes are the clear choice if you want to add nitrogen to your soil, and grasses are a good choice if you want plants that compete with weeds, establish quickly (reducing erosion), or capture available nitrogen left over at the end of the growing season. Grasses are often used in combination with legumes to reap the benefits of both these types of cover crops.

### Cereal grains and other grasses

Grasses can include perennials, but most grass cover crops are annuals, such as annual ryegrass and cereal grains like rye, wheat, barley, and oats. These cover crops grow vigorously and can provide quick groundcover even when the

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weather is cool. Their extensive root systems grow deep, capturing soil nitrogen that might otherwise be lost to leaching. They also yield large amounts of aboveground plant material when planted and terminated at the proper times. It is important to note that cereals may reduce the availability of nitrogen to subsequent crops if they are planted alone, especially if they mature to the point of flowering or seed set before termination. However, they are very effective at reducing weed survival through competition because they establish themselves very quickly.

- **Cereal rye** (*Secale cereale*) is one of the most commonly grown cover crops in the Northwest (Figure 1). Rye is vigorous, cold hardy across the Inland Northwest, and can germinate and become established in cool fall 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, so it can become difficult to turn under by the time gardeners are ready to work their gardens. Thus, mowing or weed whacking may be necessary before incorporating a heavy cover crop of cereal rye.



Figure 1. Cereal rye in early spring.

- **Winter wheat** (*Triticum aestivum*) is most suitable for mid- to late-season plantings. Wheat covers the ground quickly in the fall but does not grow as vigorously as rye in the early spring, making it a good choice for late-planted gardens. Wheat is more herbaceous than rye, so it may decompose faster when it is turned back into the soil.
- **Winter Triticale** (*X Triticosecale*) is a cross between wheat and cereal rye. It is vigorous, nearly as cold hardy as rye and is leafy like wheat. Seed is not as commonly found as wheat and rye and may need to be ordered from specialty suppliers.
- **Oats** (*Avena sativa*) are a good choice for an early cover crop because they grow vigorously when the soil is warm (Figure 2). Oats also tolerate wet and heavy soils better than many other cover crops. Spring oats (i.e., the varieties Cayuse and Monida) should be planted by early September. They may experience winterkill, depending on location and weather, but with enough fall growth, killed spring oats can still provide soil-protecting mulch that is then easy to reincorporate in the spring. Winter oats (i.e., the varieties Amity and Walken) are more



Figure 2. Oats in early spring.

winter hardy compared to spring oats and can be planted in early spring. They are unlikely to experience winterkill.

- **Barley** (*Hordeum vulgare*) (Figure 3) is similar to oats in growth characteristics. It produces a large amount of leafy material, but most of its growth comes in April and May; although, spring varieties are susceptible to occasional winterkill. Barley uses less water in later growth stages compared to other cereals, which reduces the need for irrigation if it is grown as a summer cover crop.
- **Annual ryegrass** (*Lolium multiflorum*) is a turf-grass rather than a cereal grass (Figure 4). It has a



Figure 3. Closeup of Barley in early spring.



Figure 4. Fall-planted annual ryegrass in early spring.

vigorous root system that is effective at reducing soil erosion, and it is reasonably tolerant of short-term flooding. However, once it is established, annual ryegrass can be harder to till under compared to cereals. Annual ryegrass regrows readily after mowing and can subsequently persist like a perennial, making it more difficult to kill than other winter cover crops. You may need to till or dig it up more than once, and remove the surviving plants by hand.

## Legumes

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

*Rhizobia* are present in the soil and are ready to inoculate legume plants and begin fixing nitrogen immediately. Occasionally, the proper *Rhizobium* is not present, so nitrogen fixation will not occur. In these cases, the inside of the root nodules will be white or green rather than pink. If you have not grown a particular legume in your garden before, you should buy the *Rhizobium* species that is compatible with your legume, and mix it with seed before planting. Buying *Rhizobia* is not always necessary, but it is an inexpensive way to ensure the formation of active nodules. Additionally, many seed companies offer pre-inoculated or coated cover crop seed that comes with the correct *Rhizobia*.

Legumes generally grow more slowly than cereal grains in cool weather, but they grow rapidly when the weather is warm. Because they establish slowly in cool weather, they may not provide good winter cover when grown alone, unless they are established early enough in the fall. Most legumes are not well suited to wet soils and perform poorly in soils deficient in phosphorus and potassium, as well as soils with low pH.

- **Hairy vetch** (*Vicia villosa*) is one of the more aggressive legumes. When the weather warms in the spring, hairy vetch will grow quickly. Its tendrils help the plant climb up the stems of other plants, making it a particularly good companion crop for cereals. However, the tendrils can also wrap around tiller tines, making it more difficult to turn the crop under with a rototiller. Hairy vetch should be terminated before it sets seed to prevent it from becoming a weed.
- **Common vetch** (*Vicia sativa*) (Figure 5) is similar to hairy vetch but is less winter hardy. It also has fewer tendrils than hairy vetch, which makes it easier to till back into the soil.
- **Crimson clover** (*Trifolium incarnatum*) (Figure 6) is easier to turn under, and it is less likely to become a weed compared to vetches. It is a good option for areas where early crops will be planted the following year, but it does not compete well with weeds. It also does not compete as well with cereals and is often grown alone or with annual ryegrass. It grows best when planted in the first half of September.
- **Austrian winter pea** (*Pisum sativum*) is a cover crop that can be grown alone or mixed with cereal rye. It competes poorly with winter weeds, which can choke it out during mild winters. Gardeners who raise animals can graze them on the Austrian winter pea before turning the crop back into the soil. Some winter pea varieties have the added benefit of producing delicious pea shoots early in the spring.
- **Fava or bell bean** (*Vicia faba*) is a good legume for October plantings because it grows faster during cool weather compared to other legumes. It is not as winter hardy as many other legumes, but planting later decreases the risk of winterkill. Fava beans can be grown alone or mixed with rye or wheat. When grown as a summer cover crop, fava beans compete well with weeds. Small-seeded fava beans (also called bell beans) are most commonly used for cover crops, rather than the large-seeded varieties grown primarily as a food crop.
- **Red clover** (*Trifolium pretense*) is a short-lived perennial cover crop, but it is sometimes used in annual gardens when there is a longer window for cover cropping. For example, red clover is a good



Figure 5. Common vetch in early spring in the stage of early vegetative growth.



Figure 6. Crimson clover in bloom.



**Figure 7. White sweetclover in bloom.**

crop to plant in August or early September for termination the following spring. Red clover also tolerates some shade and foot traffic, so it can do well when relay-seeded into a late-season vegetable crop, such as late sweet corn, peppers, or tomatoes. It can also be planted in the spring as a summer cover. Red clover establishes more slowly than many annual legumes.

- **Yellow and white sweetclover** (*Melilotus officinalis* and *M. alba*) (Figure 7) are drought tolerant and cold hardy biennial legumes that can be planted in the spring as a summer annual cover crop, or allowed to overwinter as a combination summer and winter cover crop. If allowed to flower (in the second year), these legumes will attract honeybees to your garden. As the names imply, yellow sweetclover will have bright yellow flowers while white sweetclover will have white flowers. White sweetclover is normally taller with coarser stems than yellow sweetclover. Biomass for tilling into the soil will be less in the first year compared to the second but will likely be more succulent and much easier to work with than the second-year stand. Both sweetclovers will produce a strong tap root and can fix more nitrogen than alfalfa. Sweetclover seed should be mixed with inoculant prior to planting to ensure N fixation. Sweetclovers may become weedy if

allowed to go to seed, and some of their seeds can persist in the soil for years.

### Other Broadleaf Crops

- Brassica family cover crops are crops that include mustards (Figure 8), oilseed radish, and canola. These crops have variable winter tolerance and are more often grown as short-season summer cover crops, similar to buckwheat. They are very effective at smothering weeds, and their residues can inhibit weed seed germination and some diseases, but they can become troublesome weeds themselves if allowed to go to seed. They can also harbor club root, an important soilborne disease in brassica vegetables. Growing these cover crops is restricted in areas where commercial brassica seed (such as cabbage seed) is grown. Restricted areas include some parts of northwest Washington, Oregon's Willamette Valley, parts of central Washington, and central and eastern Oregon, thus limiting their use in the Northwest. To determine if you are located in a restricted area, check the following sites: for Washington go to <http://apps.leg.wa.gov/wac/default.aspx?cite=16-326&full=true#16326-010> and for Oregon go to [http://www.oregon.gov/ODA/PLANT/canola\\_summary.shtml#Maps](http://www.oregon.gov/ODA/PLANT/canola_summary.shtml#Maps).



**Figure 8. Mustard, member of the brassica family.**

### Cold-sensitive cover crops

The following cold-sensitive cover crop species can only be grown during the summer. However, they can provide cover for a garden space that is not planted in the current year, or they can be part of a planned garden rotation. These crops can break up soil compaction, help suppress weeds, and improve the tilth of a new garden. The use of both summer and winter cover crops further reduces weed problems in a new garden space by interfering with weed lifecycles.

### Other Broadleaf Crops

- **Buckwheat** (*Fagopyrum esculentum*) is a very popular summer cover crop and is well suited to the Northwest (Figure 9). It grows quickly in warm weather and in a wide range of soils. Buckwheat begins flowering in 4 to 6 weeks and is usually



Figure 9. Buckwheat in early bloom.

ready to turn under in 30–50 days. It is possible to grow several crops of buckwheat in a single summer. However, if crops are drought stressed, growth may be restricted. Termination must occur before seed is set to avoid reseeding. Although buckwheat is a broadleaf cover crop, it does not fix nitrogen. Its prolific growth will smother weeds, and it has been shown to suppress weed emergence for short periods after being turned back into the soil. But if allowed to grow too large, it becomes difficult to turn under and may begin to produce seed. If planted after days begin to shorten in July, it flowers before producing much plant material. Buckwheat is sensitive to frost, so it should not be planted in the spring until the danger of frost has passed. The white flowers attract pollinators, predators, parasitoids, and other beneficial insects.

#### Grasses

- **Sorghum-Sudangrass** (*Sorghum bicolor*) hybrids (Figure 10) are hot weather, drought-tolerant relatives of corn that can provide good mid-summer soil cover and weed suppression. These hybrids need soil temperatures in the 60s or higher to establish good germination, and they do best when planted in May and June. They have vigorous root growth and will produce large quantities of plant material if they have adequate heat, nutrients, and water. This makes them difficult to incorporate back into the soil. Because sorghum-sudangrass is sensitive to frost, they are sometimes left to freeze. The killed plants provide a weed-suppressing mulch over the winter, and in the following spring, they are easier to incorporate back into the soil.
- **Pearl Millet** (*Pennisetum glaucum*) is another grass that thrives in hot weather and is reasonably drought tolerant. It is adapted to higher soil pH found in many Inland Northwest soils. This grass requires soil temperatures above 65°F for germination and is not very competitive with weeds in the early seedling stage. However, this crop will produce a dense canopy of leaves once it is about 8 inches tall, which makes it more competitive with garden weeds. Pearl millet will grow to heights of



Figure 10. Sorghum-Sudangrass hybrid in midsummer.

6 feet if not cut, but it has the ability to rapidly regrow after cutting. It is critical to leave 8 inches of stubble height to promote regrowth. This can be accomplished in the home garden with a string trimmer. Use a pitchfork to rake off the millet, and place it in your compost bin for later garden reapplication. Two to four home garden cuttings may be possible during the growing season, depending on crop height when cut.

- **German Millet** (*Setaria italica*), also known as “foxtail millet,” is also adapted to hot weather and high pH soils. Like pearl millet, it is not very competitive with garden weeds until it reaches a height of 6 to 8 inches. It is best planted in late May to early June (when soil temperatures reach 60°F) after killing the early flush of garden weeds. German millet will grow up to nearly 36 inches tall with very wide and long leaves. The bright reddish, showy panicle seedhead has long bristled awns that may be saved for a dried flower arrangement. In late summer or fall, German millet can be directly tilled into the garden, mowed and tilled, or cut and removed for composting, which can be used for future garden application. Unlike pearl millet, German millet cannot be cut repeatedly during the growing season because it does not regrow after it has been cut

## Legumes

- **Annual alfalfa** (*Medicago sativa*) cultivar 'Nitro' is a non-dormant alfalfa for spring planting when the threat of frost has passed. Like its cousin, the hay-type alfalfa commonly grown in the region, annual alfalfa provides large amounts of biomass and fixes nitrogen in the garden. It is important to mix the bacterium, *Rhizobium meliloti*, with Nitro alfalfa seed to promote nitrogen fixation. Annual alfalfa will likely produce equal to greater biomass during the growing season compared with hay-type alfalfa. Depending on when Nitro alfalfa is planted, plan on one to three cuttings during the growing season. Biomass from Nitro alfalfa could be cut and processed like pearl millet (composting), but a 2-inch stubble height should be left rather than the 8 inches recommended for German Millet. This summer annual legume may be worth a try in home gardens in the Inland Northwest.



Figure 11. Rye X hairy vetch mix.

## Cover crop mixtures

Cover crops are commonly grown as mixtures, which can provide a wider range of benefits. Many seed companies sell mixtures, but the content of these mixtures and the ratios of their constituents should be reviewed carefully.

One commonly grown mixture contains a cereal grain and a legume. Cereals, such as rye and oats, typically germinate and grow readily through the fall and into the winter. They can be planted with legumes, such as vetch, which establish more slowly but can fix atmospheric nitrogen. By planting a mixture of a cereal and legume, the cereal's soil-covering and nitrogen-scavenging abilities are combined with the legume's nitrogen-fixing ability. A summer mixture of sorghum-sudangrass and vetch provides similar benefits.

Another commonly grown mixture is cereal rye and hairy vetch (Figure 11) typically planted in the garden at a seeding rate of 1/4 cup rye and 3/4 cup vetch per 100 sq ft. The vetch will germinate in the fall, but it grows slowly until spring. In spring, it will use the upright rye as a structure on which to grow. See Table 2 for a list of planting rates for various cover crop mixtures.

## How to Plan for Cover Crops?

Cover crops are more likely to perform well if you include them in your garden plan, rather than planting them as an afterthought. It is important to have seed available before you are ready to sow cover crops, or you are unlikely to get them established at the right time. By planning ahead, you will be ready to plant and turn under cover crops at the appropriate times.

Tables 3 and 4 show a range of planting dates for different cover crops. Crops that are planted earlier recover more nutrients, cover the soil more quickly, and produce more organic matter. By capturing more nutrients and covering the soil, these crops also protect water quality by reducing nutrient leaching, erosion, and water runoff. Cover crops planted later in the season are much less effective and must

Table 2. Examples of planting rates for cover crop mixtures east of the Cascades in Washington and Oregon.

Mixture	Rate (Cups/100 ft <sup>2</sup> )
Cereal rye + hairy vetch	1/4 + 3/4
Winter oats + common vetch	1/2 + 3/4
Annual ryegrass + crimson clover	1/4 + 3/8
Cereal rye + winter pea	1/4 + 3/4

be planted within the recommended timeframe if they are to be useful at all. If you plant beyond the recommended time, the cover crop may not establish itself. Even if it does get established, it will not provide much soil protection over the winter, although it may develop some plant material if allowed to grow in April and May.

You can plant cover crops in your garden by section, 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 October or November. Since this is too late for planting cover crops, these sections 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.

Gardeners should terminate winter cover crops before planting in the spring, either by turning them under with a shovel or tiller, or mowing them and leaving the surface residue for mulch. Earlier termination means less plant material and more succulent tissue, which will decompose more quickly thus avoiding nitrogen immobilization. Later termination increases plant material but delays garden planting until later in the spring. It is important to terminate winter or summer cover crops before they go to seed.

The following guidelines will help gardeners use cover crops successfully in their gardens:

- Develop a plan well before you plant cover crops. This plan should include decisions on how to terminate the cover crops and what crops will follow.

**Table 3. Recommended planting rates and dates for winter cover crops.**

Crops	Class	Benefits	Planting Rate Cups/ 100 ft <sup>2</sup>	Comments	Planting Dates													
					Aug			Sept			Oct							
					Begin	Mid	End	Begin	Mid	End	Begin	Mid	End					
Cereal Rye	Grass	Nitrogen scavenger, quick cover, rapid spring growth, and competes with weeds	1	Hardy and reliable														
Winter Wheat	Grass	Nitrogen scavenger, soil builder, quick cover, rapid spring growth	1															
Winter Oats	Grass	Nitrogen scavenger, quick cover, rapid spring growth, competes with weeds	1.5															
Triticale	Grass	Nitrogen scavenger	1	Leafier than rye														
Annual Ryegrass	Grass	Nitrogen scavenger, soil builder, quick cover, rapid spring growth	1/2	Tolerates wet soils														
Spring Barley	Grass	Nitrogen scavenger, quick cover, rapid spring growth, erosion fighter, competes with weeds	1	Winterkills														
Spring Oats	Grass	Nitrogen scavenger, quick cover, rapid spring growth, competes with weeds	1.5	Winterkill likely														
Hairy Vetch	Broadleaf	Legume nitrogen source, soil builder	1/2	Reliable legume														
Common Vetch	Broadleaf	Legume nitrogen source, soil builder	1/2	May winterkill														
Crimson Clover	Broadleaf	Legume nitrogen source, soil builder, erosion fighter	1/4	Easy to incorporate														
Austrian Winter Pea	Broadleaf	Legume nitrogen source, erosion fighter, quick growth	1	Not for wet soils														
Fava Bean	Broadleaf	Legume nitrogen source, soil builder	1	May winterkill														
Mustard or Canola	Broadleaf	Good weed competitor	1/8	Winterkills														

Cereal grains     
  Legumes  
 Other broadleaf crops

- Purchase seed early. Some cover crop seeds are harder to find and may need to be ordered. Excess seed can be stored for a year in a cool, dry area, free of pests.
- Start with a cover crop that is easy to grow and manage. For example, crimson clover does not produce excessive plant material and is easy to incorporate back into the soil. A rye-vetch mixture is quite reliable, but be prepared to terminate it in the spring before it gets too mature.
- Plant your cover crop in a smaller area of your garden, so the results can be compared to the rest of the garden.
- Try another cover crop that fits in a different niche of your garden plan after you have successfully used one cover crop. Then, when you gain experience, you can experiment with other cover crops, both those listed here and others that might work well in your garden.

For more information on planting, managing, and terminating cover crops (e.g., organic matter, nitrogen, water runoff protection, weed suppression, etc.), refer to the third fact sheet in this series, WSU Extension publication FS119E, *Methods for Successful Cover Crop Management in Your Home Garden*.

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