Weed Control Methods for Perennial Crops

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Summary

Weeds compete with cash crops for nutrients and moisture, and may serve as hosts for pests and diseases. For that reason, producing most crops generally requires some level of weed control. Keeping soil devoid of vegetation has its own drawbacks, however, including loss of soil structure, erosion, compaction, and loss of habitat for beneficial organisms.

In annual cropping systems, such as grains and potatoes, yearly tillage and crop rotation help reduce weed problems. In long-lived perennial crops, such as berries and ornamental trees, these practices are seldom options and weed control has generally been accomplished either with repeated cultivation, herbicides, or a combination of both. This publication describes several weed control options for perennial crop production.

Cultivation

Mechanical cultivation can effectively control weeds and is an important part of perennial crop production, if conducted properly. Soil preparation to eliminate weeds and develop a good bed before planting normally involves repeated cultivation. Excessive cultivation, however, breaks down soil structure, which is the way that soil particles are held together. Good soil structure is important for water drainage, aeration, and root penetration. Particularly in heavy or wet soils, compacted layers form at the bottom of plow and cultivator blades, and interfere with water drainage and root penetration. Cultivation may also destroy crop roots and increase undesirable suckering in crops such as brambles. Improper

cultivation can actually increase weed problems by bringing buried seeds to the soil surface, and by cutting rhizomes on perennial weeds such as quackgrass and Canada thistle into small pieces, each of which can form a new plant. Dust from cultivation and bare alleyways may also contaminate and lower the marketability of fruit and ornamental crops, and increase mite problems.

For established perennial plantings, mechanical cultivation should be used primarily as a preparation for, or as a supplement to, other weed control methods. When cultivation is needed, keep it shallow (2 to 4 inches deep), ensure that the soil is not wet, and cultivate as little as possible with disks, harrows, or rototillers.

Shallow hand cultivation within crop rows can effectively control weeds in small plantings. While this practice does little or no damage to the soil and adds no herbicides to the environment, it requires substantial labor and is only marginally effective for perennial weeds.

Herbicides

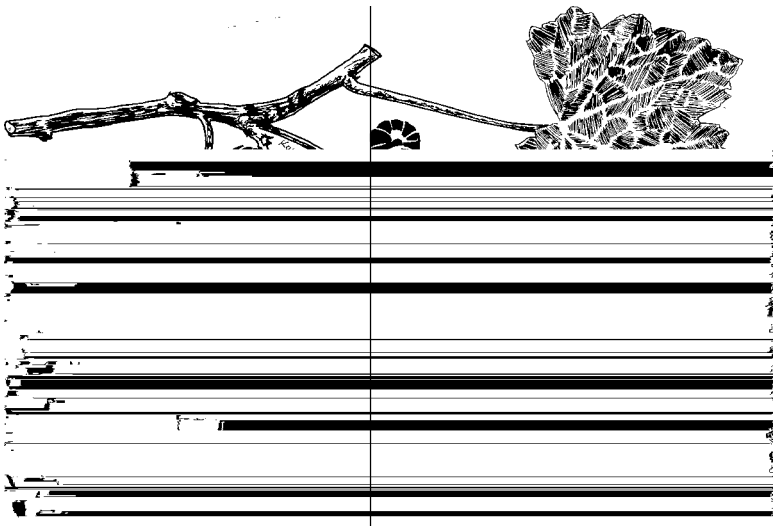
When properly selected and used, herbicides reduce or eliminate unwanted plant growth and effectively control weeds without harming the environment. Herbicide use reduces soil compaction, when compared to cultivation, by decreasing the number of equipment trips through fields. Heavy spray rigs, however, can still compact soil. Many herbicides are applied only once or twice per year, and require little labor, making this

a cost effective option. Many herbicides exist, but all fall into one or more of four basic categories: preemergence, postemergence, selective, and nonselective.

If properly selected and used, herbicides will not harm cash crops. The great benefit of preemergence herbicides is they can prevent weeds from ever becoming problems.

Most preemergence herbicides are applied in the winter or spring before weeds emerge, although some can be applied any time to weed-free soil. Some preemergence herbicides prevent seed germination or root growth, while others kill or inhibit new shoots. They are most effective against annual weeds and perennial weed seedlings, but generally do little to control established perennial weeds. If properly selected and used, herbicides will not harm cash crops. The great benefit of preemergence herbicides is they can prevent weeds from ever becoming problems.

Postemergence herbicides are applied to established weeds. Only a few postemergence herbicides are registered for perennial crops. Some postemergence herbicides are designated as selective because they kill only certain types of plants. Fluazifop and sethoxydim, for example, kill or suppress grasses without harm to most broadleaf plants when used according to label directions. Herbicides that contain 2,4-D kill broadleaf plants but don't harm grasses. Some postemergence herbicides are not selective and kill most or all plants.



Of the nonselective postemergence herbicides, some kill only green tissues that they contact. Paraquat and diquat, for example, kill leaves and green stems that they contact, but move very little in plants and generally don't kill perennial roots or rhizomes. While these materials are effective against annual weeds and perennial weed seedlings, they generally aren't effective against established perennial weeds. Glyphosphate, on the other hand, translocates or moves readily from the leaves and green stems into the roots and rhizomes, killing both the roots and tops. Glyphosphate, which is effective against many annual and perennial weeds, is often used to kill all vegetation in a field or in strips within cover crop sods before planting a perennial crop. Nonselective postemergence herbicides are useful for spot spraying weeds, but be careful not to get them on the leaves or green stems of desirable plants.

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Herbicides can damage crops or the environment if used improperly, and some are toxic to humans, other animals, and fish. Repeated or excessive use of one or a few herbicides can result in weed populations that are resistant to those herbicides. Especially toxic herbicides, such as paraquat, are classified as "restricted use" and can only be used by people who are licensed by the Idaho Department of Agriculture. In order for you to legally use an herbicide, it must be registered for your particular crop. Registrations are limited and likely to become more so for most perennial crops. You must provide for safe, legal storage and disposal of pesticides and containers.

The best management practices for herbicides involve using

trol, you may have to use maximum legal rates. As the weed seed reserve in the soil and subsequent weed pressure decrease, you may be able to reduce your herbicide application rate. Timing is critical for herbicide effectiveness. Make sure you're using the right material in the right way at the right time. The Pacific Northwest Weed Control Handbook (revised yearly) lists recommended herbicides. A reference copy is available at most University of Idaho Cooperative Extension Offices. Herbicides are not registered for all crops. Be sure before you use any herbicide that it is registered for use on your particular crop. Always follow label registration and application instructions.

Nonliving mulches

Organic materials such as sawdust, straw, and bark have been used for centuries to "smother" weeds. By excluding light (and sometimes moisture and oxygen) these mulches inhibit seed germination of annual and perennial weeds, and may weaken or kill established, low-growing, weeds. As mulches decay, they contribute organic matter and nutrients to the soil.

Fire hazard is another consideration with organic mulches, and these materials can also greatly increase rodent problems.

One drawback with organic mulches is the cost of purchasing, transporting, and applying them. Mulches can also interfere with crop nutrition - especially nitrogen - as they are decomposed by soil microorganisms. Fine particles in mulches can also repel irrigation water or rain. The roots of some perennial crops, such as raspberries, tend to grow into sawdust mulches where they are more susceptible to drought, freezing injury, and damage from hand weeding. Organic mulches generally aren't effective in controlling perennial weeds like thistles and quackgrass. Fire hazard is another consideration with organic mulches, and these materials can also greatly increase rodent problems.

If you have a plentiful, inexpensive supply of an organic mulch, you can use it to control annual weeds. Be sure to eliminate perennial weeds, however, before you apply the mulch. Monitor your crop nutrition carefully and, if necessary, add fertilizers to offset deficiencies caused by the mulch. Coarse mulches, such as bark chips and chopped forages, will probably work better than finely-ground sawdust. If you use straw or chopped vegetation for a mulch, make sure it's free from weed seeds or you may increase your weed problems. Install rodent bait stations or traps and keep cover crops and surrounding vegetation mowed short to reduce rodent problems. Additional information on using organic mulches is contained in Using Bark and Sawdust for Mulches, Soil Amendments, and Potting Mixes - CIS 858, which can be purchased from Agricultural Publications, Idaho Street, University of Idaho, Moscow, ID 83844-2240.

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Weed barrier fabrics and plastic films are used to control weeds. The barriers prevent weeds from growing up through the fabrics and prevent the roots of germinating seeds from reaching the soil. Black plastic mulches inhibit germination and kill seedlings and established weeds primarily by excluding light. Except when used to solarize a field, as described below, clear plastic films are not very effective in preventing weed emergence. Because of cost, weed barrier fabrics and plastic mulches are generally used more often in home landscapes than commercial plantings. Another drawback is the materials create disposal problems for growers. Most plastic films last only a year or two.

Bio-degradable plastic films have generally not worked well to date because most only degrade when exposed to sunlight and create litter from blowing fragments as they break down. Buried films may not degrade at all. Some weeds, such as nutsedge and quackgrass, penetrate even heavy barrier mats. Roots from germinating weed seeds can penetrate many weed barrier fabrics, especially if the fabric is covered with soil or leaf litter. Nonporous films prevent oxygen from moving into the soil, and can inhibit root development. If you use plastic films for weed control, slit the plastic every 2 or 3 feet to provide air ex-

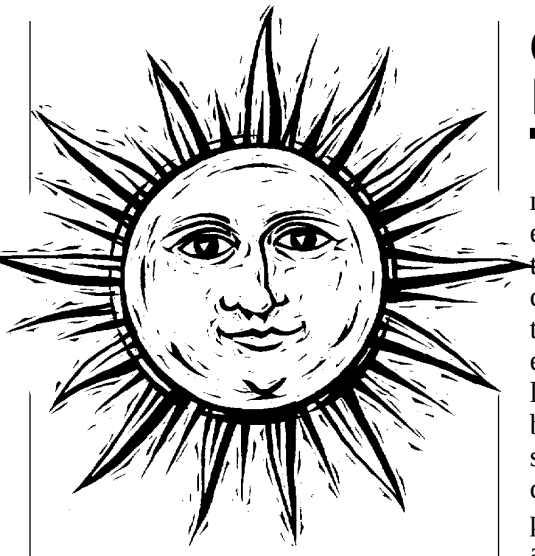
change. The films also interfere with irrigation and fertilization. Barrier fabrics may be damaged when digging nursery stock. Weed barriers and plastic film mulches normally aren't used in crops that send up suckers within and between rows from rhizomes, such as red raspberries or elderberries. Plastic mulches and weed barrier fabrics can be used with trees and all other non-suckering crops or crops that produce new suckers from the plant crown. If you use plastic mulches to control weeds, porous weed barrier fabrics will probably give better control and fewer problems than black plastic, and should last much longer. Don't allow soil or debris to build up on the mulch.

Solarization

Solarization is the practice of managing weeds and soil pathogens by heating the soil using solar energy. In solarization, one or two layers of clear plastic are laid directly over moist soil. Heat trapped by the plastic kills some pathogens and weed seeds directly. In other cases, weed seeds germinate in the warm, moist conditions, and the seedlings are then killed by the high temperatures.

> Disturb the treated soil as little as possible during planting to avoid bringing viable weed seeds to the soil surface.

Because it requires long periods of full sun and relatively high temperatures, solarization is most effective in warm, dry areas like California or the southwestern United States. Idaho growers, especially in southern Idaho, might also benefit from solarization. For perennial crops, solarization is most



useful in preparing a field or row for planting.

To solarize, lay clear plastic, 1 to 6 mils (.001-.006 in) thick, over soil that has been cultivated at least 4 inches deep, smoothed, and irrigated. If possible, do this during the early summer. Spread the plastic over the cultivated area and bury the edges in trenches to secure the plastic and seal in heat. After at least 4 to 6 weeks, depending upon the weather and the weed species present, remove the plastic and plant immediately. Disturb the treated soil as little as possible during planting to avoid bringing viable weed seeds to the soil surface. You might also solarize planting strips during the late summer or early fall to promote weed seed germination and emergence just before lethal freezing temperatures.

Potential benefits of solarization include weed control without herbicides and reduced soil pathogens and nematodes. Disadvantages include the loss of crop production during solarization; costs of purchasing, installing, and disposing of the plastic; and reduced effectiveness of solarization in cool climate or overcast areas. Temperatures under the plastic seldom rise to the point that the soil is sterilized, so some weed seeds and pathogens usually survive, especially in deeper soil layers.

Cover crops and living mulches

Cover crops and living mulches have been used by farmers for at least 2000 years to control weeds. By definition, cover crops are grown for their benefits to the soil and cash crops, and generally aren't harvested for sale or livestock food. They control weeds by competing for light, moisture, space, and nutrients. Certain cover crops also release chemicals that prevent other plants from growing around them (allelopathy). Living mulches are cover crops inter-

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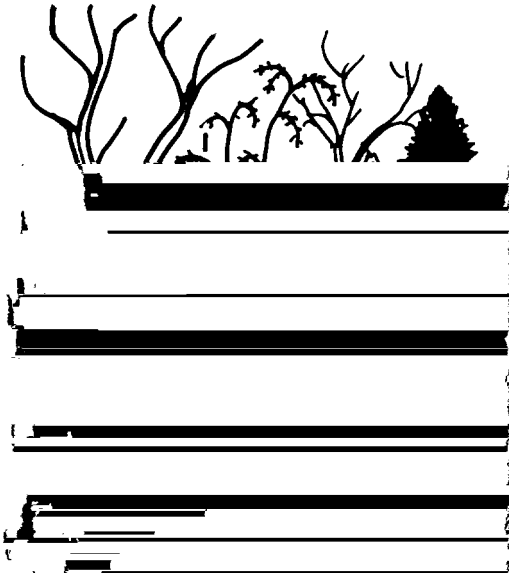
Table 1. Suggested cover crops for Idaho

Annual cover crops /Common name	Seeding rate	Establishment rate	Annual nitrogen requirement	Representative cultivars
Barley (spring)	120 lb/A	fast	30-50 lb/A	Columbia, Steptoe
Barley (winter)	120	med-fast	30-50	Mal, Scio
Buckwheat (common)	35-60	med-fast	10-20	Common Gray, Japanese, Silverhull
Buckwheat (tartary)	25	med-fast	10-20	Common varieties
Oats (spring or winter)	120	med-fast	30-50	Amity (W), Walken (W), Grey Winter (W), Cayuse (S), Border (S), Kanota (S), Otana (S)
Peas (winter or spring)	120	med-fast	by soil test	Austrian Winter (W or S), Melrose (S) Miranda (S)
Rye grass (annual)	30	fast	30-50	Common variety
Wheat (spring)	120	med-fast	20-50	Treasure, Bliss, Owens, Dirkwin, Fieldwin, Twin
Wheat (winter)	120	medium	30-50	Basin, Stephens, Dusty, Ute
Grain/Pea	80/100	fast	20-30	Use varieties recommended in this table
Perennial cover crops				
Grasses Fescue (hard)	20	slow	20	Durar
Fescue (sheep)	20	very slow	20	Covar
Fescue (tall)	25	medium	20	Alta, Fawn, Forager, Kenhy
Perennial rye	25	fast	30	Elka, Linn, Manawa (H1), Manhattan, Norlea, Pennfine
Russian wildrye	30	slow	20	Vinall, Swift, Cabree, Bozoisky
Siberian crested wheat grass	35	medium	20	P-27
Standard crested wheat grass	25	medium	20	Nordan
Clovers				
White clover	4	medium	0	Dwarf types, English wild white
Strawberry clover	4	medium	0	Common varieties

W = winter variety S = spring variety



Living mulches intended for permanent sods should be low-growing, tough, durable, tolerate mowing, and require little care.

Drawbacks to cover crops are that they require money and labor to establish and may require irrigation, periodic mowing, fertilization, and pest and disease control. Establishing some permanent cover crops can be difficult and may require sprinkler irrigation. Depending on when they are grown, cover crops may compete with cash crops for nutrients and moisture. Even clover cover crops utilize soil nitrogen in their early growth stages. Some cover crops harbor pests and diseases that attack perennial crops. Gophers and other rodents can become problems when certain legumes are used because the plants produce hard seeds and fleshy roots which the rodents feed upon.

Living mulches intended for permanent sods should be low-growing, tough, durable, tolerate mowing, and require little care. Various fescues and dwarf perennial ryes often make good living mulches. Dwarf clovers also make good semipermanent sods (they have to be replaced about every 2 years) and also fix atmospheric nitrogen. Mixing dwarf clover with

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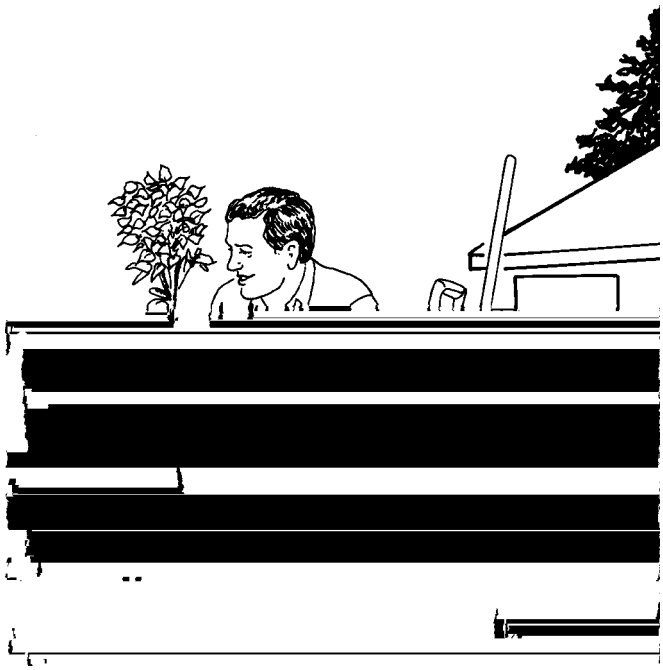

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