

Weed Management

Young trees grow best with clean culture under the tree spread. Older trees grow and bear well in grass and sod. When present, grass should be mowed, and weeds should not be allowed to grow up through the trees. Care should be taken not to injure trees during mowing operations.

Mulches, applied 2 to 4 inches thick, control weeds effectively. Before choosing a mulch, consider availability, cost, and rodent protection. Mice can hide undetected in mulch; therefore, tree guards are a must. Mulches that are applied once during the growing season cut down on weeds significantly and conserve moisture.

Site Preparation

Site preparation should begin several years before planting to allow time for:

- Increasing soil organic matter by growing and incorporating “green manure” cover crops,
- Adjusting soil pH and nutrients for optimum tree growth,
- Eliminating problem perennial weeds and suppressing annual weeds, and
- Establishing permanent sod cover on ground subject to erosion.

Herbicides are chemicals that are used to control weeds. Several herbicides can be used during site preparation and may be classified by method of application and mode of action.

Preplant foliar, contact—These herbicides are applied to growing plants, and they damage or kill tissue on contact. An example is paraquat. Preplant foliar contact herbicides kill annual weeds and kill or injure biennial and perennial weeds. This type of herbicide is not translocated within the plant and is most effective against young weed plants.

Preplant foliar, systemic—These herbicides are applied to growing plants and are absorbed and translocated within the plant. Examples include 2,4-D and glyphosate. Preplant foliar systemic herbicides are effective against both annual and perennial weeds.

The site preparation period is an important time for management of weeds, particularly perennial weeds. Several herbicides are either dangerous to use near fruit plants or are not labeled for use with fruits. Thus, the only period when these chemicals can be used is during site preparation when the fruit crop is not present. Remember that the herbicide label is the final authority concerning legal and safe usage.

Mechanical weed control includes the manipulation of the soil to destroy weed growth. During the site-preparation process, mechanical control is often the initial phase. The mechanical movement of the soil is useful not only for weed management but also for incorporation of nutrients and organic materials. Keep in mind that disturbance of the soil surface can lead to soil erosion.

Deep Plowing

A moldboard or disc plow is used to completely invert the soil.

Advantages

- Destroys annual and biennial weeds.
- Inflicts damage to the root systems of perennial weeds.
- Brings the root systems of perennial weeds close to the soil surface, where they can be destroyed by desiccation or freezing.

Disadvantages

- Brings additional weed seeds to the soil surface, where they may germinate and cause additional problems if not managed.
- May have adverse effects on soil structure and soil fauna.

Chisel Plowing

A chisel plow is used to break the soil.

Advantages

- Action of the chisel plow can result in deeper freezing into the soil and destruction of perennial root systems.
- Perennial root systems are dragged to the soil surface, where they can be destroyed by desiccation or freezing.
- Chisel plowing results in less disturbance of the soil compared to deep plowing, reducing the risk of erosion and the movement of weed seeds to the surface.

Mechanical Cultivation

Movement of the soil by discs, tillers, harrows, rotary hoes, or other implements. Disturbance of the soil is shallow.

Advantages

- Effective for control of annual and biennial weeds.
- Shallow soil disturbance minimizes the number of weed seeds brought to the surface.
- Inflicts damage on the root systems of perennial weeds.

Disadvantages

- Not effective for control of certain perennial weeds.

Preplant Cover Crops

Tillage by plowing, discing, and rotovation may be needed to kill weeds and existing sod to prepare the ground for cover crops. Based on soil test results, ground should be amended to proper pH, phosphorus, potassium, and other nutrient levels required for tree fruit production. Prior to seeding, 40 to 50 lb of actual nitrogen per acre is needed to establish the crop and to promote rapid breakdown after incorporation.

Seeding rates are adjusted according to need, lower for soil erosion control and higher for weed suppression and maximum organic matter addition. A grass

or grain drill with press wheels is the preferred method for seeding crops. Broadcast seeding followed by rolling or cultipacking is acceptable when a drill is not available. Depending on the crop, plowing, discing, rototilling, or a combination of these may be required to incorporate “green manure” into the soil.

Where enough time is allowed before planting the orchard, several successive cover crops can be planted. Winter annual grains (barley, oats, rye, wheat) are seeded in late summer through early fall depending on region and incorporated the following spring. Summer covers (spring oats, buckwheat, sorghum-sudangrass, Japanese millet, annual ryegrass) are seeded in spring or early summer, grown, and then incorporated later in the season. Legumes (alfalfa, clovers, and vetch) are alternative covers that add nitrogen to the soil. Typically, they are seeded early or late in the growing season.

After a year or two of cover cropping, permanent sod can be established for the orchard, particularly on ground subject to erosion. Trees can then be planted into tilled or herbicide-“killed sod” strips. The advantage of this compared to full-field cultivation is the minimal disturbance to the soil, which reduces weed seed germination and soil erosion. However, growers should be aware that permanent sod could be very competitive with young trees and manage it accordingly.

Alfalfa is a perennial legume that requires a well-drained soil with a high pH (6.0 to 7.0). The most desirable periods for planting are early April to late May or late July to mid-August. The recommended seeding rate is 145 lb per acre. Alfalfa grows tall enough to become difficult to incorporate if allowed to overwinter from a spring seeding. The cost of alfalfa seed is much greater than the cost of clover seed. It is recommended that alfalfa seed be inoculated when seeded on an area for the first time.

Buckwheat can be seeded successfully on sites with low soil pH. While there is fast growth of the top portion of this grain, there is little organic matter contribution from the roots. The plants should not be allowed to mature, since reseeding will readily occur. Early seedings in late May or early June are

better than summer seedings in late July. Buckwheat may be seeded at 60 lb per acre.

Alsike, ladino, and white clovers have low to moderately upright growth and tend to establish a good legume stand in about 10 weeks. Alsike clover, a very short-lived perennial, can be established on low pH soils. Ladino and other common white clovers respond to high soil fertility (notably phosphorus) and high soil pH. All of these clovers are fair to moderately good nitrogen-producing crops. They establish best when seeded in early April to late May or from late July to mid-August. Early seedings in either season are more successful. A late fall or late winter broadcast application to open ground may be another effective method of seeding these crops, depending on the soil-seed contact that follows.

The cost of seed varies with the type of clover; common white clover and alsike clover are cheaper than ladino. The cost of seed per acre is low for clover preplant cover crops, since the recommended seeding rate is only 4 lb per acre of alsike and common white clover and 2 lb per acre for ladino. Volunteer clovers grow naturally in most fields, so it may not be necessary to inoculate clover seed; however, several pounds of seed can be treated with inoculant for only a few dollars.

Red clover produces a top growth of 12 to 18 inches and establishes relatively quickly, depending on soil moisture and seed bed conditions. Red clover grows best in soils with a pH of 5.6 or higher. Like other clovers, red clover should be seeded early in April or late May or from late July to mid-August. Early seedings in either season are more successful. As with white clovers, a late fall or late winter broadcast application on open, unfrozen soil may produce a successful seeding. Red clover is a good nitrogen-producing crop and is adapted to a broader range of soil conditions than alfalfa. The seeding rate for red clover is 8 lb per acre.

Sweet clover is a slow- to moderately fast-establishing biennial legume that responds better to higher soil pH than other clovers. It also responds well to soils with good phosphorus levels and is most easily established when seeded from early April to mid-May

or during the first half of August. Large, deeply penetrating roots and heavy top growth make large contributions of nitrogen and organic matter to the soil when incorporated. Second-year top growth may exceed 50 inches. However, this growth must be cut at a lower height and incorporated after cutting. The seeding rate is 12 lb per acre.

Hairy vetch is adapted to a range of soil conditions and is a moderately fast-growing winter annual when seeded in August or very early September. In the Northeast, the best practice to ensure good growth is early establishment. This vetch can supply much nitrogen to the soil when grown under ideal conditions. In the mid-Atlantic states, hairy vetch can provide up to 125 lb of nitrogen for the next crop. Hairy vetch is a true vetch with purple flowers and viney growth, and it should not be confused with another legume known as crown vetch, which is commonly seeded along highways for bank stabilization. Hairy vetch is seeded at a rate of 40 lb per acre.

Annual field brome is a fast-establishing winter annual grass and has a much more extensive and fibrous root system than most other green manure crops. Seedings made during July and August tend to be much more successful than seedings made in late spring. The following year's spring growth is rapid and, after the seeds ripen in July, the crop can be easily reestablished with no further seeding. Since this is not desirable with a preplant cover crop, thoroughly disc or plow down the heavy root system early in the spring. This seed is not readily available, so plans for obtaining it should be made well in advance of the seeding date. Annual field brome is usually seeded at a rate of 20 lb per acre.

Japanese millet is a fast-growing summer annual, which competes well with weeds and establishes faster on cooler soils than sudangrass. If planted between late May and mid-July, millet will grow 4 feet high in 7 to 8 weeks. Unlike small-seeded legumes and grasses, the large millet seed should be covered from 3/10- to 1-inch deep in a firm seedbed. The planting may be cut back and allowed to regrow at any time after reaching 20 inches of growth. Millet should not be allowed to mature and drop seed. Millet seed is relatively inexpensive; seed at a rate of 20 lb per acre.

Spring oats, when used as a very early spring green manure crop, should be planted in early to mid-April. Because of the fast spring growth, plan to incorporate the planting in early to mid-June. Oats will grow on soils of relatively low soil pH (5.5) and with moderately good fertility; however, this crop requires good soil drainage. A mid-August seeding will provide good growth and groundcover for protection against soil erosion during the fall and winter months. Oats will be gradually killed back by successive frosts and will not grow again in the spring. The dead plant residue is easily incorporated with very light tillage equipment. Three bushels of oats (approximately 100 lb) are usually seeded per acre.

Annual ryegrass seedlings establish very rapidly in spring or late summer. Ideal dates for spring seedings range from early April to early June; late-summer seedings are more successful when made from early August to early September. Heavy root growth and rapid seedling development make annual ryegrass a very desirable green manure cover crop in areas where good soil-water relations can be maintained. Ryegrass will die out early in the second year, leaving a heavy root system and a moderate top growth residue to incorporate into the soil. A seeding rate of 10 lb per acre is suggested.

Perennial ryegrass seedlings become established more quickly than seedings of other common perennial grasses such as timothy, bromegrass, and orchardgrass. The fibrous root system is extensive and, with the vigorous top growth, provides substantial material for incorporation into the soil in early spring. The dry matter root growth of perennial ryegrass is approximately equal to the top growth. For many other crops, the top growth represents 60 to 70 percent of the material turned under at plowing. A seeding rate of 25 lb per acre is recommended.

Winter rye, a cereal grain, establishes quickly from late summer and early fall seedings. However, fall seedings made after October 1 are likely to provide only winter cover and are slower to produce heavy spring growth. Excessive early spring top growth can create tillage problems if the crop is not incorporated by early to mid-May. This date will vary with the location and season. The seed is readily available and

is usually sold in bushel quantities of 56 lb. Use a seeding rate of 2 bushels per acre to establish.

Sudangrass is a summer annual that requires much heat for good growth. Seedings made in late May or early June will guarantee a more vigorous growth than seedings made in late June or early July. Hybrid sudangrasses may have larger seeds and should be planted at heavy rates. Like millet and sorghum-sudan hybrids, which also have large seeds, sudangrass should be seeded to a depth of 1/2- to 1-inch into a firm seedbed. Similarly, this summer annual will recover after being cut. Due to its tall growth habit, sudangrass should be cut back when growth exceeds 20 to 25 inches or plowed down if a second growth is not desired. Use a seeding rate of 80 lb per acre.

Sorghum-sudangrass hybrids require more heat for growth than sudangrass. It is more expensive to establish and fails to adapt to most soils as readily as Japanese millet. This crop will grow to a greater height than sudangrass under ideal conditions of heat, moisture, and fertility, but the 4- to 6-foot growth is very difficult to incorporate with small or moderately sized tillage equipment. Like sudangrass, this crop will make a second growth if climatic conditions permit. Growth will cease by mid-September if night temperatures drop to near freezing. The seeding rate will vary from 35 to 50 lb per acre, depending on seed size.

This section courtesy of W. Lord, I. Merwin, and J. Mitchell, *Bramble Production Guide*, NRAES publication #35.

Common Orchard Weeds

Annual Grasses

An inclusive term for several of the grassy weeds such as crabgrass, goosegrass, barnyard grass, fall panicum, giant foxtail, etc., which can be a problem because they grow tall, up to 4 feet, and require frequent mowing. They can interfere with spraying and harvest operations. All are annuals, reproducing from seed, and most are controlled with pre-emergent herbicides, or post-emergence grass control materials.

Perennial Grasses

These grasses live over from year to year. They spread by seed and by vegetative means. Examples are Johnsongrass, orchardgrass, and quackgrass. The systemic-type post-emergence herbicides such as Poast, Fusilade, and Roundup are effective for control but may require repeat applications for complete eradication. After killing the grass, a residual pre-emergence herbicide can retard new infestations. The combination of Gramoxone Extra plus Princep or other residual herbicide also can be effective in killing perennial grasses.

Annual Broadleaf Weeds

An inclusive term for many of the annual broadleaf weeds commonly found in orchards. Included are pigweed, prostrate pigweed, purslane, lambsquarter, etc. Most are reproduced only by seed, but some, such as purslane, can reproduce vegetatively. Most are readily controlled by the appropriate pre-emergence herbicides or by post-emergence broadleaf weed control materials.

Perennial Broadleaf Weeds

These pests persist for many years. Poison ivy, Canada thistle, climbing milkweed, and others are difficult to control and require repeated timely spot applications of a systemic post-emergence herbicide. Where severe problems have occurred, some growers have returned to grass cover under the trees and use a swing-arm mower for vegetation control.

Bindweed, Field and Hedge

Perennial weeds, reproducing from seed and from spreading roots, which can be very large. Field bindweed has a deep root system, while hedge bindweed has more shallow-growing, fleshy roots. Plant is a branched vine, spreading over the ground or over small trees or other plants in the orchard. Leaves are arrow-



head-shaped and 2 to 3 inches long. Flowers are white or pink, resembling morning glory. Very difficult to control because of the extensive root system.

Burdock

A biennial weed reproducing from seed. Taproot lives over one winter, flowers, and dies. Plant is a rosette the first year and develops an upright branched plant the second year that can reach 3 to 5 feet tall. Leaves are large, hairy, and roughly heart-shaped. Burs are about 1/2-inch in diameter and have hooked spines that readily catch on clothing and are thus spread.



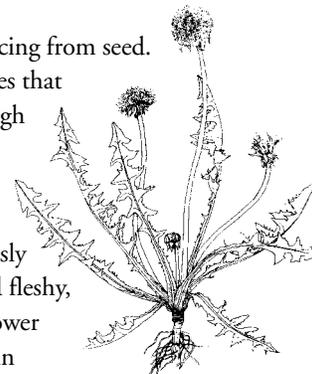
Canada Thistle

A very serious perennial weed reproducing both from seeds and from horizontal roots. Plants are vigorous and 2 to 4 feet tall. Leaves are large, with crinkled, spiny edges. Flowers are borne at the tops of plants and are purple or lavender. Seeds in flower heads have whitish down attached, and when mature the seeds are distributed by wind. A very persistent weed, it is considered legally noxious in most states. Control in orchards is primarily with post-emergence systemic herbicides such as Roundup before weeds flower.



Dandelion

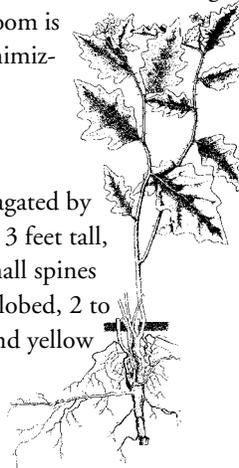
Perennial weed reproducing from seed. Plant is a rosette of leaves that can be 8 to 12 inches high and 6 to 15 inches in diameter. Leaves are 3 to 10 inches long and 1 to 2 inches wide, variously lobed. Root is thick and fleshy, branched, and deep. Flower heads are 1 to 2 inches in diameter, bright yellow, and upon maturing bear seed with down attached. Seeds detach readily and are wind



disseminated. Spring flush of dandelion bloom coincides with apple bloom and can compete for bee activity during the pollination period. Since 2,4-D is no longer registered for apple orchards, close mowing just before and during apple bloom is the only current method of minimizing this competition.

Horsenettle

Perennial broadleaf weed propagated by seed or roots. Weed grows 1 to 3 feet tall, usually branched, has many small spines or prickles. Leaves are oblong, lobed, 2 to 4 inches long. Fruit is round and yellow when mature. Difficult to control because of extensive, deep root system.



Milkweed, Climbing

A perennial climbing plant that is reproduced by seeds and by spreading roots. Stem is climbing and can be a problem both in young and bearing orchards. Stems can cause girdling in young trees. Distinguished by small whitish flowers and by a large seed pod that resembles the common milkweed pod, except that it is smooth. This is a difficult weed to control.



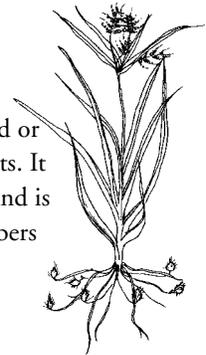
Milkweed, Common

The easily recognized milkweed plant is a perennial, reproducing from seed or from long, spreading roots. Stems are erect and become woody, reaching 3 to 4 feet, unbranched. Leaves are oblong and large, 4 to 8 inches long. When plant is injured, it exudes a milky juice. Flowers are borne on the upper part of the plant in ball-like clusters. Seed pods are large (2 to 5 inches long), pointed and spiny.



Nutsedge, Yellow

A grasslike plant growing to about 1 foot tall, with large, branched inflorescence; it reproduces from seed or from small nutlike tubers on the roots. It can be a problem weed in orchards and is difficult to control because of the tubers and the problem of spreading by cultivation.



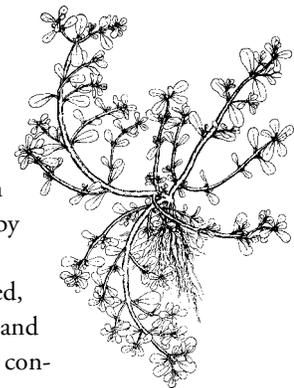
Poison Ivy

A woody perennial weed frequently found in orchards. Reproduces by seed, which may be spread by birds and by creeping stems that can spread some distance in a season. Plant is either an upright shrubby plant 2 to 3 feet high or, more commonly, a vine that climbs on trees and fences. Plants are distinguished by the three shiny leaflets on each leaf. Leaflet edges are smooth to roughly toothed and can be variable in shape. Flowers are small and insignificant, fruits are small (1/8-inch in diameter), round, and waxy white in color. Plants may be spread through birds eating the fruit and spreading the seed in their droppings. Leaves develop attractive autumn coloration of reds and orange. Plant contains poisonous oils that can produce a serious rash on contact or by being in the smoke of burning plants. A very troublesome weed to control in orchards, but control is important because of the hazard to persons pruning or harvesting



Purslane

Low-growing weed distinguished by its fleshy stems and leaves that break off easily. Leaves and stems sometimes are reddish. Root system is shallow. An annual weed reproducing by seed, but can reproduce vegetatively when cultivated, as plants tend to break up and spread farther. Not readily con-

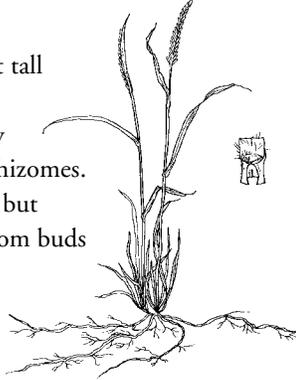




trolled by cultivation after the plants are established. Not usually a major problem in orchards, but can be troublesome in small fruit plantings.

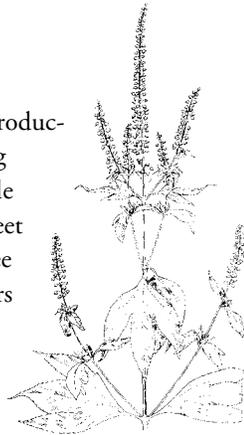
Quackgrass

Perennial grass 1 to 3 feet tall found in most orchard situations. Reproduces by seeds and underground rhizomes. Rhizomes are short-lived but produce new rhizomes from buds in the axils of leaf scales. Roots are produced only at the nodes. Can be a persistent weed.



Ragweed, Giant (Horseweed)

An annual broadleaf weed reproducing from seed that has a strong vigorous stem that under fertile conditions can grow 8 to 15 feet tall. Leaves are large, with three to five deep lobes. Male flowers on long spikes at tips of stems release large amounts of pollen. Readily controlled with a good herbicide or mowing program.



Smartweed, Pennsylvania

Annual weed, reproducing by seed, fast growing, branching, reaching 1 to 4 feet in height. Leaves are lanceolate, smooth, 2 to 6 inches long. Stems are topped by pink floral heads. Reproduced by seeds.



Velvetleaf (Buttonweed)

Annual weed growing 3 to 8 feet tall on sturdy, woody, light green stems. Leaves are large, heart-shaped on long petioles, and covered with velvety pubescence. Seed pods are prominent, persisting on the plant framework after leaves have fallen. Seed pods are upright, cup-like, and contain many seeds. More a problem in small fruit plantings than in well-managed orchards.

