

GROUNDCOVER MANAGEMENT

Management of the orchard floor is an essential and often expensive piece of the overall orchard management scheme. A poorly designed and managed orchard floor will increase costs in several important ways, including increased mowing costs, reduced yield due to weed competition, and wear and tear on equipment. Several orchard floor management options to consider are:

1.) Clean Cultivation/Fall Cover

This option can be effective with young trees, in particular as a management system that eliminates weed competition and encourages tree growth. These benefits do not come without cost. Soil erosion in particular is a real risk. Late summer seeding to a fall cover crop such as spring oats is essential to limit erosion. This fall cover must be planted early enough to allow ample autumn growth to protect soil from cold penetration in winter. Loss of organic matter with this system is another liability -soil organic matter is broken down quickly with repeated cultivation. In addition to these potential risks, calcium availability to trees may be reduced and soil compaction problems may develop.



2.) Mulch

Mulching offers some attractive potential benefits, including improved soil moisture retention and weed suppression. Unfortunately, mulching also offers a couple of key liabilities that make it impractical as a general orchard practice. Perhaps most importantly, mulch provides an ideal habitat for voles (mice). Also, while the use of mulch will increase levels of organic matter and key nutrients including potassium and magnesium, its use will likely lead to reduced calcium levels.

The use of wood-based mulch such as wood chips and bark may be valuable on excessively-drained soils

3.) Permanent Sod

Permanent sod, often including an under-tree herbicide strip, is the orchard floor management system most commonly used. A permanent sod offers many important benefits. It reduces soil erosion; gives support (especially important when soils are wet) for heavy equipment needed for brush removal, pesticide application, and mowing; reduces dust and dust deposits on fruit; reduces tree rack or wobble during wind events; insulates against cold penetration in winter; increases movement of key nutrients including calcium into the tree root zone; and may provide winter refuge for a beneficial mite species.

A permanent sod also allows soil organic matter levels to increase over time, a condition which when coupled with proper soil pH management, eliminates the need to apply phosphorous throughout the life of the orchard.

The key to success with this system is establishment (preferably prior to planting) of a permanent sod floor. Combinations of slow-growing grass types such as dwarf hard fescues and perennial ryegrasses are preferable.

The process of establishing an orchard floor should include elimination of perennial weeds and grasses through use of an herbicide such as glyphosate (Roundup). In addition, correction of soil drainage deficiencies, soil pH and nutrient adjustment based on soil test recommendations, and preparation of a smooth, stone-free soil surface for seeding are all key elements for success. A 2-year soil preparation process that includes a full summer of cover cropping with a vigorous cover crop such as Sudan grass or Japanese millet is ideal. Seeding of a new orchard floor is best done in late summer or early autumn.

In older plantings, the permanent sod is often a 'wild' mix of more vigorous grasses and herbaceous plants, a mix that requires extensive management including several mowings annually. In addition, the orchard floor is often rough and rutted from years of equipment traffic and dotted with rock outcroppings, adding to the management cost.

Some drawbacks are associated with permanent ground cover. Certain plant species such as alfalfa can promote pest populations (e.g., tarnished plant bug). Ground cover also provides competition for water and nutrients, especially to young trees. If not properly managed, it also provides habitat for voles. These drawbacks can be

minimized with appropriate management of the orchard floor.

Mowing is the most important orchard floor management tool. Establishment of an orchard floor composed of slow growing grass species can reduce mowing requirements significantly. With an orchard floor composed of vigorous ‘wild’ species, several timely mowings will be required to prevent undue competition for trees and reduce vole populations by limiting their preferred habitat. A final mowing in late autumn using a flail type mower) can reduce the potential apple scab infection risk the following spring.

Herbicides are generally used to manage groundcover around tree trunks and in that portion of the under-tree area that is difficult to mow. For mature trees on seedling or semi-dwarf rootstock, this herbicide strip may extend up to 6 feet or more out from tree trunks. With dwarf rootstock trees, the herbicide strip generally extends 2 feet or less out from the trunks. Maintaining herbicide strips as narrow as practical is important in reducing the risk of soil erosion and tree rack as well as cold penetration into the root zone of trees.

In addition, narrow strips may facilitate movement of mite predators from the orchard floor into trees in summer. Less total herbicide is used per acre when these strips are narrow, reducing risk for environmental problems including herbicide leaching and runoff.



It is important to use herbicides judiciously for maintenance of these strips. Ideally, the use of herbicides will leave a living groundcover and root system or a mat of killed ground cover to protect soil from erosion and cold penetration. The overuse of herbicides, even in narrow strip systems, will lead to a barren soil strip and a high risk of erosion, tree rack, and cold temperature injury to tree root systems.

Herbicide timing should be chosen so as to assure that live groundcover, or a matting of killed groundcover will be present when soil erosion is likely, especially during the dormant season, and when thunderstorms are likely. Practices that promote extensive moss growth have not been identified, but it is evident that some herbicides inhibit moss establishment and others do not.

Maintaining or increasing soil organic

matter (humus) should be an objective of orchard groundcover management in New England. Soil organic matter is much more than the dead leaves, stems, and roots produced by the groundcover and orchard trees. As plant tissues decay, through the activity of soil microorganisms (bacteria, actinomycetes, fungi, algae, protozoa, and nematodes) they produce **humus**, a complex mixture of organic compounds that gives topsoil its characteristically dark brown color. The soil microbes themselves die, contributing to the total pool of biomass that forms humus. In sod-covered soils, humus typically constitutes the bulk of soil organic matter. But humus is not permanent. Its constituents undergo a slow, but continuing process of decay. If soil is kept bare, the major food source for soil microorganisms is eliminated, and humus can then be expected to disappear faster than it is formed.

Humus is a major source of nitrogen, phosphorous, and sulfur. These three essential elements are abundant in biological tissue, the source of humus. Humus also has a controlling influence on the availability of essential micro-nutrients, not because its parent biological tissues were high in micro-nutrients, but because humus can form “chelates” with copper, zinc, manganese, etc. that are released from soil minerals. Chelated micronutrients are held against leaching from the soil, and under the right conditions, are available to plant roots.

Another value of humus derives from its electrostatic attraction for oppositely charged nutrient elements, protecting them against leaching. This property, called cation exchange capacity, is also exhibited by clay particles. Cation exchange capacity, together with chelation, allow soils to hold nutrients until picked up by plant roots. Soils in which these properties are at a low level, as in soils with little clay or organic content, are naturally low in agricultural productivity, because they cannot supply as much mineral nutrition as the crops are capable of using.

Additional benefits of soil organic matter are:

- It increases moisture-retention in sandy soils. Organic matter can hold up to 20 times its weight in water.
- It acts as “glue” to hold very small soil mineral particles together in units called aggregates. Aggregation permits a loose, open, granular condition that aids penetration by water, air, and roots, and resists erosion.
- It has the ability to absorb many organic pesticides, holding them near the soil surface, where they are more likely to be degraded by biological activity and sunlight, rather than leach to groundwater.