Plants growing in a vineyard can be variously defined as weeds, resident vegetation, or a cover crop. Under normal conditions, if given exposed soil and adequate moisture, seed will germinate in the vineyard and plants will grow. Although annuals comprise the majority of species at any site, one or two perennial plant species are also commonly present. Plant life in the vineyard could be considered beneficial or harmful to the commercial production of grapes: the amount of vegetation and the time of year that it is present can cause various degrees of positive or negative impacts on grape production. Young vines, vines on shallow or low-nutrient (“weak”) soil, or areas that are commonly droughty are more susceptible to competition from other plants. However, when managed appropriately, plants may enhance vine growth by modifying soil fertility, improving water infiltration, and increasing organic matter.

Two basic cover cropping techniques can be used to change the species spectrum and degree of competition with the grapes: using resident vegetation as a cover crop and using planted crops for weed suppression. As with all weed management tools, regular monitoring of effectiveness is essential for success.

Using Resident Vegetation as a Cover Crop

Resident vegetation is the plant complex present at a site at any one time that is not planted specifically as a cover crop (fig. 9-1). Often this vegetation is a mixture of about two dozen species of annual grasses and broadleaf forbs. It may also include biennial broadleaves and perennial grasses and broadleaves. Plant populations vary from one vineyard to another, within a vineyard, and from year to year. The vegetation sometimes includes remnant cover crops or old pasture plants that reflect prior land-use history. At most sites, resident vegetation is mainly composed of introduced species with a few species that are native or naturalized. Resident vegetation competes well with grapevines, having adapted itself to specific site microclimate, soil,
and management conditions. For this reason it is often considered to be weeds.

Resident vegetation may, however, be considered the best cover crop because it represents a mix of adapted species and is easy to maintain. The plants seed profusely or have vegetative parts such as stolons, rhizomes, taproots, tubers or bulbs. This vegetation can be mowed repeatedly during the growing season. If the plants are annuals and are allowed to bear mature seed, the vineyard floor can be disked or otherwise cultivated in the spring or early summer and the plants will return the following year. If perennial plants are present, however, cultivation may divide vegetative parts and spread them over the vineyard. Mowing or cultivation when the soil is moist encourages many perennials such as Johnsongrass (*Sorghum halepense* [L.] Pers.), bermudagrass (*Cynodon dactylon* [L.] Pers.) dandelion (*Taraxacum officinale* Wigg.), and field bindweed (*Convolvulus arvensis* L.). When these perennial weeds dominate the species composition, the resident vegetation is often more competitive for nutrients and water than some planted cover crops. This may conflict with the grower’s objectives for vine management.

Resident vegetation can be manipulated by the use of selective herbicides or timely mowing to suppress seeding of undesirable species. Perennial grasses can be suppressed without injuring broadleaf plants by applying a selected herbicide in the spring and summer. The populations of broadleaf annuals can be reduced by adjusting the time of mowing so they do not seed. Since all plants produce seed at different times it is critical to monitor the flowering of the targeted species. It may take several years to shift plant species in this manner.

**Using Planted Crops for Weed Suppression**

Cover crop plants can be selected that have characteristics that are desirable from a vine management perspective (see chapter 3). Strong winter growth of a cover crop may be necessary to produce mulch that gives greater erosion control than can be provided by the resident vegetation. Cover crops can cause a competitive effect to slow vine growth, enhance organic matter, improve water infiltration, or produce other effects (see chapters 4 to 7). Planted cover crops can also be used to suppress resident weed growth (fig. 9-2).

**Weed Suppression between Vine Rows**

Any planted cover crop can interfere with the growth of resident plants. Cover crops do not target a single weed or family of weeds for reduction, but instead reduce the overall density of plant species in the vineyard. Weaker competitors are impacted first. Thus, if an aggressive weed is present, a cover crop may not significantly reduce its population. A dense cover crop population reduces weeds more than does a sparse stand or open-type growth habit. Below are three vineyard floor management strategies that use cover crops to suppress winter annual weeds.

**Winter cereals.** In the fall, plant and fertilize tall-growing cover crops such as cereal grains (oat, cereal rye, barley, wheat, triticale) that grow faster than the weeds. After 2 or 3 years of continuous cover cropping, populations of resident low-growing winter annuals such as common chickweed (*Stellaria media* L.), annual bluegrass (*Poa annua* L.), filaree
(Erodium spp.), and miner's lettuce (Claytonia perfoliata Wild.) will be reduced. However, since these resident plants are not very competitive, reducing their number may not be advantageous. Winter cereal cover crops do not significantly impact perennial weeds such as field bindweed, johnsongrass, bermudagrass, and yellow or purple nutsedge (Cyperus spp.) because these weeds are dormant in the winter.

**Mixtures of cereals and legumes.** Plant a mixture of tall winter cereal and a vetch or peas available to fill in the open areas to further reduce the amount of light available to the soil and inhibit growth of winter annuals. Maximum effects are achieved by planting early in the fall or in the late summer into a prepared seedbed followed by an irrigation to increase germination, early growth, and soil cover.

**Perennials.** Plant a perennial cover crop such as strawberry clover, white clover, birdsfoot trefoil, ‘Berber’ orchardgrass, or perennial ryegrass and plan to mow frequently, which reduces both winter and summer annual weed populations. Most perennial cover crops take more than 1 year to become thoroughly established. This type of management may have other impacts. It may favor low-growing perennial weeds such as bermudagrass, dallisgrass (Paspalum dilatatum Poiret), dandelion, and nutsedges. Additionally, these cover crop plants are generally very competitive and will reduce vine growth in shallow or weaker soils (Snaddon and Smart 1987; Wolpert et al. 1993), especially if the vines are young and the cover is allowed to grow into the vine row. Growers frequently note increased gopher activity where perennial legumes are used.

**Management considerations.** It is often more desirable to plant a cover crop with known capabilities than to work with the resident population. Species can be selected that give a desired benefit and reduce both winter and summer annual weeds (see chapter 2). The most successful cover crops will be those best adapted to your vineyard environment and conditions. Soil type and depth, nutrient level, amount and frequency of available water, and disease resistance of the cereal grains or legumes are factors that dictate what cover crops will be best for a particular site. No single cover crop seed mixture is suitable for all purposes or for all sites.

Most research has focused on how selected winter annual cover crops affect weed control and vine response due to concerns about water use, nutrient competition, and difficulty of maintaining a cover in the vine row (Bugg et al. 1996; Elmore et al. 1997; Fourie and Van Huyssteen 1987; Snaddon and Smart 1987; Wolpert et al. 1993). In vineyards with low nitrogen fertility, subterranean clovers have been successful in reducing both winter and summer annual weeds (fig. 9-5). Since they grow during the cool season utilizing winter rainfall, they compete well with weeds. However, in low-nutrient or low-moisture conditions, clovers can compete enough to reduce grape yields. In sites with high levels of nitrogen, subterranean clovers do not establish or grow well and weed species dominate. Annual ryegrass, a vigorous competitor regardless of where it is planted in the vineyard floor, has been shown to reduce vine growth and yields (Snaddon and Smart 1987). ‘Berber’ orchardgrass has reduced vine growth when planted between rows (Wolpert et al. 1993).
Select cover crops that have known characteristics that can be used to manage weed growth in the vineyard:

- Select a species or mix with the desired characteristics for your site
- Observe and adjust management practices that favor your cover crop
- Plant early, irrigate, and fertilize for strong establishment
- Monitor the growth and desired impacts
- Decide annually whether to continue or modify cultural practices
- Shift cover crops for desired effects.

**Weed Suppression in the Vine Rows**

Weeds in the vine row can be suppressed by preventing the light required for seed germination from reaching the soil directly under and between the vines. This can be done by using live plant material or by applying various types of mulches.

**Live plant material.** Although not recommended as a general rule, cover crops can be planted in the vine row to suppress weeds. When considering this control method, carefully review the cover crops’ stature, aggressiveness, and competitive ability before planting in the vine row. There is a fine line between planting a cover crop for weed control and reducing the growth and yield of the grapevines. Although dense plant growth in the vine row may lend itself to weed control, it will also compete with the vines.

Traditionally, the primary reason for using herbicides in a strip under and between vines has been to reduce weeds in the immediate vicinity of the vine and thus reduce competition for light, water, and nutrients (figs. 9-3 and 9-4). This no-till weed-free area allows the vine to root near the soil surface, where most of the feeder roots are located. As vines become larger and older than 5 to 6 years old, they may tolerate more competition from cover crops and still produce well. Vines on deep soil may also fare better under these circumstances.

**Dry organic mulches.** Although a dry, dead mulch produced from organic material can prevent germination of weed seed, it does not kill existing weeds very well. It can, however, reduce moisture and temperature fluctuations near the soil surface, which may result in better vine growth.

A dry mulch can be made from a vigorous cover crop grown between the vine rows by chopping it and moving the clippings into the vine rows. Or, mulch can be purchased from an outside source and evenly spread under the vines. Mulching is especially effective at reducing weeds in the vine row if the weeds are controlled prior to mulch application using residual or preemergence herbicides or recent in-row cultivation. This assures a weed-free surface for the initial mulch application. Dry mulch can, however, be a serious fire hazard in the vineyard.

On fertile sites with moisture, cover crops can produce adequate mulch biomass between the vine rows (fig. 9-6). A winter cover crop can be chopped and distributed evenly along the vine rows prior to seedhead development (fig. 9-7). This produces a band of “green chop” mulch, which dries into a wind-resistant layer (figs. 9-8 and 9-9). Cover crops that have worked best with this technique are the forage oat (‘Ogle’ cultivar) and cereal rye (‘Merced’ cultivar). Either of these grasses mixed with vetch has also produced excellent quantities of biomass.

Growers can make use of any organic mulch that is free of weeds and toxic salts. Many types and sources of mulch have been tried, from fine-textured grape pomace to coarse-textured chopped...
tree limbs. Each mulch type must be field-tested to determine optimum use rates for local weed populations. Keep in mind the basic principles of plant competition, timing of mulch application, and amount and duration of mulch residue; also keep records of observations on weeds, other pests, and vine growth and yield.

Applications of coarse mulch at 4 to 8 tons per acre (9 to 18 t/ha) 3 to 5 inches (7.5 to 12.5 cm) deep have effectively controlled many annuals. To consistently reduce weed populations, repeat applications of several tons per acre of dry matter should be evenly spread in the vine row over a 2- to 3-year period. Reapplication of mulch is necessary to replace the loss due to degradation.

Mulch persistence depends to a large degree on the coarseness of the mulch and the type of cover crop used to generate it. Weed control effectiveness is generally related to the coarseness as well as the amount of residual mulch maintained in the vine row at any given time. The coarser the mulch, the longer it will last; however, more of the coarse material must be applied to get the optimum soil surface shading. Mulch generated from a cereal grain such as oat or cereal rye lasts much longer than mulch from vetch or a vetch-oat mixture. Cereal grain straw with a high carbon to nitrogen (C/N) ratio generally remains in the vine row for months. In Northern California, about two-thirds of the cereal straw degrades each year. A legume mulch degrades more rapidly and may favor certain
weeds such as common chickweed that thrive on the nitrogen produced.

The method of irrigation, frequency of wetting, and cultivation practices also affect the persistence of the mulch. Drip irrigation on top of the mulch speeds degradation, whereas mulch on top of berms built up for furrow or flood irrigation remain dry and thus persist longer. Adding mulch each year compensates somewhat for any degradation that occurs. The mulch must be distributed evenly to get uniform weed suppression. If cultivation is used between the rows rather than mowing, the cultivator may pull mulch from the row or throw soil over the mulch and reduce its effectiveness. The mulched area may also need supplemental weed control by a hand crew or by a spot treatment of postemergence herbicide to kill escaping weeds.

The population and activity of rodent pests must be monitored when using mulch in the vine rows (see chapter 11). In addition to potential negative impact on vines, rodent activity disturbs the mulch and exposes the soil surface to sunlight, thus reducing the effectiveness of mulch. When growing large amounts of biomass between the vine rows, tall, loose vegetation favors rodent populations.

Field bindweed, a perennial, has not been affected by organic mulches. There is little research information on the effects of mulches on other perennial weed species at this time.

For effective use of dry mulch for weed suppression:
- Start with weed-free soil
- Apply mulch to completely shade the soil, preventing weed germination
- Distribute dry mulch evenly at 4 to 8 tons per acre (9 to 18 t/ha) dry material
- Reapply mulch at least annually
- Eliminate escaping weeds before they produce seed
- Do not expect mulch to control perennial weeds
- Check effectiveness regularly and keep records.

Bibliography