



## CHAPTER 3

Various management practices can be used to prevent or mitigate soil-related risks while ensuring good soil health and increasing sustainability of the vineyard.

# Ensuring Soil Quality

Soil is the foundation of winegrape production. However, growers may face significant risks from soil erosion and/or problems with soil structure or quality. Various management practices can be used to prevent or mitigate soil-related risks while ensuring good soil health and increasing sustainability of the vineyard.

### A. General Soil Management Practices

- Regularly evaluate the soil properties and nutrient status of the vineyard
  - Take yearly leaf samples (petioles and/or blades) for analysis of nitrogen content
  - Sample soil at least every 6 years (or 2-3 years if there are problems) to evaluate content of nutrients, minerals, organic matter, and other characteristics
  - Know your soil water-holding capacity and erosion potential. (For information about soil properties, including soil maps for many regions, see the Natural Resources Conservation Service website: <http://soils.usda.gov/>)
- Record results from analyses of soil and leaf samples and for soil amendments in a database
- Discuss nutrient management strategies with the winemaker and other vineyard consultants
- Adjust soil amendments or strategies according to assessed needs
  - Avoid excess nitrogen fertilization (see SWP Workbook, page 4-10)
  - Build organic matter (preferably to 1-3% in most sites) using tactics such as site-appropriate cover cropping (see below) and additions of compost
- Avoid compacting soil
  - Choose or modify equipment to minimize compaction
  - Avoid operating equipment in the vineyard during very wet soil conditions

Planting and maintaining cover crops is a key tool for protecting and enhancing soil quality in vineyards.

- Minimize potential for erosion and improve soil structure
  - Implement erosion control methods (See Chapter 2: Assuring Water Quality)
  - Plant cover crops, as explained below

### B. Choosing Methods for Nutrient Analysis: Why, When, and How Much?

Nutrient sampling is crucial for evaluating vineyard and plant health, timing amendments and other soil-related interventions, and troubleshooting nutritional problems. Growers who invest in sampling for nutrients and interpreting the results from analyses can make informed choices for soil management, thereby avoiding risks from over or under-use of amendments. Opinions differ about the most reliable methods for measuring the nutritional status of the vineyard (see Table 3.1). Although petiole (stem) sampling and analysis has been the most widely accepted method for assessing the nutritional status of grapevines, it may be inadequate for determining nitrogen levels. Soil sampling may be preferred for a more thorough analysis.

**Table 3.1 Methods for Nutrient Analysis**

Technique	Benefits & Disadvantages	Sample Timing & Size	*Approximate Cost for Analysis
Petiole Analysis	Standard method; must be analyzed immediately after picking; may not be good for N analysis	At bloom each year; include at least 75 petioles per average-sized block	\$32.00 per sample (complete analysis)
Leaf Blade Analysis	Good for analyzing nitrogen, but not good for other nutrients; controversial	At bloom or veraison each year; include at least 75 leaf blades per average-sized block	\$32.00 per sample (complete analysis)
Soil Sampling	Provides more comprehensive information; may be costly and difficult	Every 5-6 years or more (every 2-3 years if problems); include at least 15-20 cores per 20-40 acre block	\$13.00-\$32.00 per sample (depending on factors tested)

\*Source: A&L Western Laboratories, Inc. Costs will vary by vendor.

### C. Cover Crops and Their Multiple Benefits

Planting and maintaining cover crops is a key tool for protecting and enhancing soil quality in vineyards. Cover crops provide numerous benefits, including reducing soil erosion, adding nutrients, protecting and improving soil structure, retaining and improving soil moisture, increasing organic matter, improving the quality of nutrients in the soil, sequestering carbon, and providing habitat for beneficial insects (Ingles, et al., 1998). (See Figure 1.)

Cover crops are usually classified by temporal occurrence, divided into annuals (winter or summer) that last up to one year or perennials that last at least three years. Alternatively, cover crops may be classified by vegetative type, such as

legumes (e.g., clovers and vetches), grasses (e.g., barley and fescue), or managed native vegetation. The type of cover crop used should be based on the desired effect(s).

Winter covers are planted in late summer or fall to provide soil cover during the winter. To increase soil nutrients, for instance, legumes such as clovers, vetches, medics, or field peas may be mixed with cereals like rye, oats, or wheat. Summer covers are typically used as part of crop rotations and for soil enrichment (Sullivan, 2003). To prevent erosion, grasses are considered the most cost-effective cover crop.

A significant benefit of cover crops is the supplement of organic matter (Ingles, et al., 1998; Sullivan, 2003). In addition, some cover crops may prevent leaching of soil nitrate by storing it during the wet season. Other nutrients stored by cover crops include phosphorous, potassium, calcium, magnesium and sulfur. Cover crops can aid in weed management by utilizing light and space otherwise used by weeds. Some varieties of mustards may also reduce the development of nematodes. Some cover crops enhance the appearance of a vineyard, especially when they are in bloom (Ingles, et al., 1998; Sullivan, 2003).

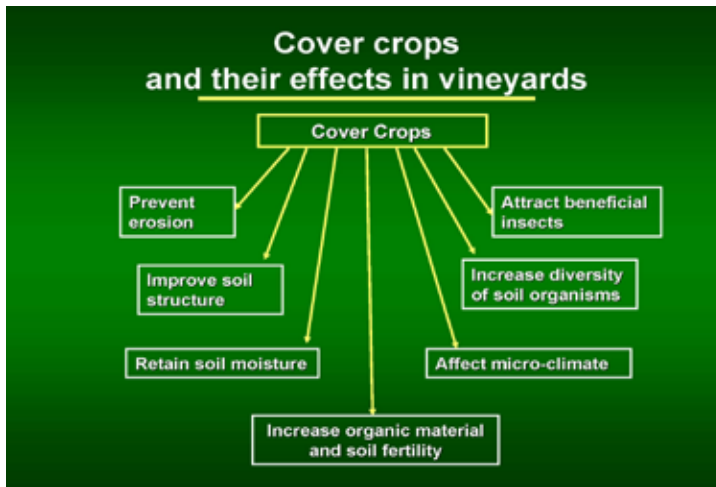


Figure 1: Cover crops and their functions (Thrupp, 2004)

In addition to expected benefits, considerations for selecting cover crops should include geographical location, topography, soil, climate, and water availability.

#### D. Potential Drawbacks of Cover Crops

Possible adverse consequences of cover cropping include undesired competition with vines for water and nutrients – although some competition may be acceptable or even desirable. Some cover crops, such as those that grow under-the-vine, can create habitats conducive to increased populations of rodent pests. Other cover crops may reseed in undesired places, essentially becoming weeds. Cover crops can also reduce the solar warming of soil, increasing the risk of frost damage to vines during the spring. This risk can be mitigated by planting cover crops in alternate rows, selectively using overhead irrigation, or timely mowing. In general, the benefits of cover crops outweigh these potential concerns.

Costs associated with cover cropping depend on the type of cover crop used, existing infrastructure such as irrigation systems and type of machinery used, and prices of inputs such as seeds, labor, and water. Because cover crops have many functions, quantifying the value of their benefits is complex. (See UC Davis Cost and Return Studies at <http://coststudies.ucdavis.edu/current.php>.)

In addition to expected benefits, considerations for selecting cover crops should include geographical location, topography, soil, climate, and water availability.

## References and Resources

*California Sustainable Winegrowing Alliance, Wine Institute, and California Association of Winegrape Growers (2006). Code of Sustainable Winegrowing Practices Self-Assessment Workbook.*

*Ingles, C. A., et al. (1998). Cover Cropping in Vineyards – A Grower’s Book, University of California Division of Agriculture and Natural Resources*

*Thrupp, L. A., et. al. (2008). Biodiversity Conservation Practices in California Vineyards: Learning from Experiences. Available at [http://www.sustainablewinegrowing.org/docs/2008-Biodiversity\\_in\\_Vineyards.pdf](http://www.sustainablewinegrowing.org/docs/2008-Biodiversity_in_Vineyards.pdf)*

*Thrupp, L. A. (2004). Biodiversity in Vineyards, presentation from ASEV (American Association of Ecology and Viticulture) annual conference, Seattle, WA.*

*Tourte, L., et al. (2003) Central Coast Conservation Practices – Estimated Costs and Potential Benefits for Perennial Hedgerow Planting. UC Cooperative Extension. Available at: [http://coststudies.ucdavis.edu/conservation\\_practices/files/12748.pdf](http://coststudies.ucdavis.edu/conservation_practices/files/12748.pdf).*

*A detailed list of cover crops, their management, can be found at: Sullivan, P. (2003). Overview of Cover Crops and Green Manures – Fundamentals of Sustainable Agriculture. ATTRA Publication #IP024. Available at: <http://www.attra.org/attra-pub/covercrop.html#economicse>*

*For information about soil properties, including soil maps for many regions, see the Natural Resources Conservation Service website: <http://soils.usda.gov/>*

*UC Davis Cost and Return Studies at <http://coststudies.ucdavis.edu/current.php>.*

## NOTES: