

Sustainable Viticulture in the NORTHEAST

A publication of the Finger Lakes, Lake Erie, and Long Island
Regional Grape Programs



Soil & Water Conservation Practices for Vineyards

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Sustainability Concepts: *Surface runoff and resulting soil erosion are the principal means by which fertilizers, sediment, and pesticide residues reach surface waters. Infiltration of ponded runoff through permeable soils can move nitrogen and pesticide residues into ground water. Controlling water flow through and out of your vineyard will greatly reduce transport of contaminants off site, and will preserve your vineyard's productivity. Three proven methods of reducing runoff and erosion are to divert excess water around your vineyard, slow runoff out of your vineyard, and provide ground covers that break the force of raindrops before they reach the soil.*

Environmental effects: Soil erosion involves movement of soil particles from one area to another. In arid areas, disturbed soil is often moved by wind. In our region, however, water movement is the prime force behind soil erosion. Soil engineers recognize two types of soil erosion. Gully erosion involves the mass movement of soil from an area of concentrated flow, often following heavy rainfall. Gullies expand rapidly and are highly visible. Sheet and rill erosion, as the name implies, involves more subtle loss of soil across an entire area. It is more constant, but harder to spot, since it involves movement of an imperceptibly small layer of soil.

Runoff and soil erosion impacts surface water quality directly through deposition of sediments in waterways, streams, lakes and estuaries. It is also the principal

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Best Management Practices:

- Construct diversion ditches to break up slopes and reduce water flow through your vineyard.
- Use grassed field borders and headlands of adequate width to filter out soil particles carried with runoff.
- Plant vineyard rows across the slope to break up water flow.
- Use grassed waterways in areas of concentrated flow.
- Subsurface drainage tiles may reduce surface flow.
- Subsoiling to break up compacted soil layers can increase infiltration and reduce surface ponding.
- Use permanent cover crops or straw mulch in row middles to absorb the force of raindrops hitting bare soil.
- Avoid repeated tillage.
- In tilled row middles, use seeded cover crops to control erosion from fall to spring.
- Control gullies before they grow.
- Install temporary barriers during soil disturbance (e.g. following planting) to retard sediment flow.
- Consult with Soil and Water Conservation District (SWCD) and Natural Resources Conservation Service professionals (or other engineers) to identify potential problems before planting and laying out a vineyard.
- On irrigated sites, use drip irrigation and avoid over-irrigation by adjusting timing and rates to match vine demand and soil water-holding capacity.

Funding Opportunities for Environmental Stewardship

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Many in the wine and grape industry have recently experienced customers asking about the environmental stewardship being practiced in the growing of grapes. The new Sustainable Vineyard Practices Workbook, a component of New York State's Agricultural Environmental Management (AEM) Program, will help growers document their environmental stewardship and identify areas for opportunities to improve.

In New York State, there are a number of funding opportunities available to grape growers to help address environmental concerns on their farms. Working with the local Soil & Water Conservation District (SWCD), and USDA Natural Resources Conservation Service (NRCS), farmers can apply for cost share assistance to implement conservation practices.

A sound first step is to complete the Sustainable Vineyard Practices Workbook (AEM Tier 2) to determine your environmental strengths, needs, and opportunities. You can complete the workbook as a self assessment, or better yet, contact your local SWCD to assist you. Following the assessment, work with Cornell Cooperative Extension, SWCD, and/or NRCS representatives to develop an action plan to address the needs and opportunities identified. Knowing your needs and opportunities, as well as building a relationship with the SWCD and NRCS is the key to identifying cost-share programs to assist in implementing the conservation practices identified in your action plan. Each funding program has its own unique purpose, qualifications, and requirements. The following programs may be applicable to the grape farmer. More in-depth information may also be found at the

website listed with the program.

New York State's Agricultural Non-point Source Abatement and Control Grant Program (Ag NPS) assists farmers in preventing water pollution from agricultural activities by providing technical and financial assistance. Coordinated by the County SWCD, the program provides technical assistance and cost share funding up to 87.5% to construct or implement Best Management Practices identified in your action plan. In the past, grape farmers have used this program to construct agrichemical mixing facilities and to solve erosion control issues. More information is available at www.nys-soil-andwater.org.

Environmental Quality Incentives Program (EQIP) is a federal voluntary conservation program that promotes agricultural production and environmental quality. It is USDA's primary program to provide environmental improvements on farms. EQIP offers technical and financial assistance for the installation or implementation of structural or management practices on agricultural land. Cost share rates generally range from 50 to 75%. Nutrient management and pest management are examples of two practices that can be cost shared for the grape grower through EQIP. More information is available at www.nrcs.usda.gov/programs/eqip/

Conservation Reserve Enhancement Program (CREP)/Conservation Reserve Program (Continuous Sign-Up) are two very similar federal programs that place environmentally sensitive land near streams, lakes, and public wellhead protection areas into approved vegetative cover for a period of

10 to 15 years. In return, farmers are paid annual rental payments and reimbursed for establishing recognized conservation practices. Farms with riparian areas that are low producing, or too risky for crop production, may opt to earn money from that land through CREP/CRP. The money earned through the program could be used to install conservation practices on other parts of the farm. More information is available at www.fsa.usda.gov/pas/publications/facts/html/crpcont03.htm

Conservation Security Program (CSP) is a new federal conservation program that supports ongoing stewardship of private agricultural lands by providing payments for practices already in place to maintain and enhance natural resources. CSP identifies and rewards those farmers who are meeting high standards of conservation and environmental management. In addition to payments for existing practices, CSP can provide cost-sharing to do further improvements. The program will be staged annually in certain watersheds across the state until farmers in every watershed have had a chance to participate. Long Island was designated as a participating watershed in 2004, and over 20 grape growers qualified for payments due to their high level of environmental stewardship. The program has yet to visit the Finger Lakes watersheds. Details on the program can be found at www.nrcs.usda.gov/programs/CSP/cspinfo.html

The NY Sustainable Viticulture Program is an excellent resource, not only does it provide valuable agronomic and varietals management tools, but it also offers an important environmental management review. Participants will

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means by which fertilizers and pesticides (particularly herbicides) applied to a vineyard move offsite, as they are often attached to soil particles. Soil erosion also limits the productivity of vineyards. In almost any older vineyard in New York, one can find eroded knolls where subsoil layers are exposed, and swales or depressions with deep deposits of sediment. Much of this erosion can be traced to clean tillage and frequent disking practiced in Finger Lakes and Lake Erie hillside vineyards from the mid-1800s through the early 80s, and more recently on Long Island. This soil movement complicates vineyard management and leads to more variability in vine size and performance.

On Long Island, runoff accumulates in low areas of vineyards, where it can slowly infiltrate into groundwater. For these reasons, soil conservation practices that control water movement both into and out of vineyards, and limit the force of rainfall hitting the soil are the best means for maintaining sustainable production and avoiding off-site movement of pesticides and fertilizers.

Understanding Erosion. Topography, soil characteristics, rainfall, and ground cover determine the annual rate of soil erosion. Soil conservation professionals use a tool called the Revised Universal Soil Loss Equation (RUSLE) to estimate annual rates of soil erosion on a particular site. This equation predicts an annual rate of soil loss (A) based on several factors that influence erosion. These factors are:

- *Rainfall.* The amount and intensity of rainfall in a given climate influences the amount of runoff and leaching.
- *Soil type.* Soils differ in their ‘erosivity’ or ‘erodability’ based on composition, soil particle sizes, and reaction to freeze/thaw cycles.
- *Slope Length.* The longer a slope is, the more area it drains and the more water it carries.

- *Slope steepness.* Water runs faster and with more force down steeper slopes than down shallow slopes.
- *Crop Factor.* The type and sequence of crops grown affects erosion. For example, continuous corn would be more prone to soil loss than corn planted in rotation with alfalfa and small grains. Perennial crops like grapes with less frequent tillage and soil disturbance would have a lower crop factor than annually seeded crops.
- *Management Factor.* This factor is used to account for different management practices. For example, ‘no-till’ corn, where crop residues are left on the surface would reduce erosion compared with corn grown with clean tillage. Similarly, a vineyard with row middles disked four times annually would be more prone to erosion than one with permanent cover or straw mulch in row middles.

Soil conservation professionals use this as a planning tool to determine how different management practices or structures would affect the annual soil loss. For example, installing diversions or terraces would reduce erosion by reducing the effective slope length. The general goal is to reduce the annual estimated soil erosion (A) to less than the annual replacement or soil formation rate, generally between 3 to 5 tons per acre per year. If that sounds like a lot, consider that an acre-foot of soil weighs about 2 million pounds, and that 5 T/acre/year would amount to a layer about 0.03 inches thick.

Soil Conservation Practices

Soil conservation practices prevent erosion and maintain clean water in three ways. First, diversion of water around vineyards keeps water clean, because it doesn’t wash over disturbed soil in the first place. Filtering of water through soil (drainage systems) and ground cov-



Cereal rye seeded in row middles protects soil from the force of raindrops hitting bare soil.

ers removes soil particles and other material suspended in water that passes through vineyards. Finally, ground covers provide a protective barrier that breaks the force of raindrops that could otherwise dislodge soil particles. Key soil conservation practices used in vineyards are:

- *Diversion Ditches.* Diversion ditches are soil structures constructed at intervals across the slope. They collect water from slopes and divert it into natural drainage ways. They are seeded and gently graded, and slow the water down to reduce its erosive force. They can reduce the amount of water running through a vineyard by up to 80%.



Diversion ditches channel excess water around vineyards, reducing potential runoff and erosion.

- *Water and Sediment Control Basins.* Raising a berm across a gully with a subsurface outlet pipe that discharges at the base of the slope will collect runoff, and stop erosion by slowing down water and collecting the sediment.
- *Buffer Strips.* All vineyards require headlands and grassed areas around their perimeters to allow machinery to turn around. These grassed areas also protect natural drainageways by filtering surface water that leaves vineyards before it gets to streams, drainageways and depressions. Generally, about 40 feet of headland around vineyards is adequate for a buffer strip.
- *Drainage Tile.* Subsurface drainage tile, commonly used in area vineyards, also helps protect water quality in two ways. Drainage tile reduces surface runoff that would otherwise occur when soils become saturated

with water. It also allows water to be filtered through the soil, which removes many contaminants that would be present in surface runoff.

- *Vineyard Layout.* Planting vineyards so that the rows run across the slope rather than up and down the slope can reduce erosion by up to 50 percent. This practice is common, because most slopes surrounding the Finger Lakes face east or west. Planting across the slope allows vineyard rows to be oriented north and south, which allows for maximum sunlight interception as well as soil conservation.

- *Vineyard Floor Management.*

This is the area in which changes in grape production practices have undoubtedly had the greatest positive effect on reducing soil erosion and improving water quality. Until the early 1980s, most growers practiced clean tillage between vineyard rows. This method of weed control, which involved up to four or five passes through a vineyard annually, left vineyards vulnerable to soil erosion during much of the growing season. Its use from the 1800s on has left a lasting legacy of highly eroded land, some of which no longer supports profitable grape production. Currently, there are many floor management options available that reduce soil erosion while eliminating unwanted competition from weeds.

Current herbicides allow growers to maintain a 30-inch wide weed-free strip under the vines while leaving permanent sod in row middles. Straw mulch is commonly applied in row middles, especially in eroded sites with less vigorous vines. Although expensive to apply, it has many beneficial effects—it conserves soil moisture, increases availability of soil nutrients, provides a barrier to reduce the force of rain drops, and can directly increase yield by up to 20 percent on some sites. No-till seeding of row middles is another practice used by some growers. Typically growers seed cereal rye in the fall, which germinates before winter. It then resumes growth in early spring, and is later mowed or killed with a contact herbicide. The decomposing straw left behind also has chemical substances that prevent new weeds from germinating and extends the ‘weed-free’ time. Reduction of tillage, while reducing soil erosion, also has the added benefit of allowing more timely operation of equipment after rainfall and reducing soil compaction from machinery.



This No-till seeder plants cover crops without the need for additional soil protection, maintaining protective stubble on the surface while the cover crop germinates.

Using cover crops and mulches to protect the soil surface has an enormous effect on annual rates of erosion. Mulches reduce the force of rainfall hitting the soil by 98%, according to Jim Balyczek, Yates County Soil Conservation District Manager. Use of permanent cover crops in row middles on a 10% slope with 200 ft slope length reduced potential annual erosion from 5.1 T/acre under ‘clean tillage’ to 0.39 T/acre, in an example provided by Tibor Horvath, NYS Conservation Agronomist, USDA Natural Resources Conservation Service.

Additional practices for new vineyards. Vineyards may be especially vulnerable to soil erosion during establishment. Many non-bearing vineyards are maintained with clean tillage to help vines get off to a strong start without undue competition from weeds. Small vines don’t develop much of a canopy to intercept rainfall before it reaches bare soils. The best time to consider and install soil conservation structures is while you are planning layout and design of the vineyard. So consider these steps when establishing a vineyard:

- Consult a soil conservation professional or engineer early in the planning stages. Discuss areas of concern, water flow patterns, and potential solutions to water management issues, and develop a plan with them to deal with specific situations.
- Consider the use of temporary measures such as straw bales or ‘silt fences’ in concentrated flow areas to interrupt water flow.
- Leave plenty of room for grassed filter strips around headlands and grassed waterways in concentrated flow areas.
- Design your vineyard with row breaks around swales,

where possible. Low areas are often frost pockets. Maintaining them in sod will help filter runoff and reduce erosion.

- Seed a cover crop in row middles by late summer to protect against winter runoff and erosion.

Soil conservation and Cost-sharing. Many conservation practices used to control soil erosion, as well as structures, practices, or facilities used to reduce potential impacts on water quality (e.g. such as pesticide mixing and loading facilities) may be underwritten, in part through conservation programs administered through your local Soil and Water Conservation District and the USDA’s Natural Resources Conservation Service. A brief description of these programs is included as a sidebar in this issue. Contact your local offices for details.



Vineyard floor management (top to bottom): permanent sod, straw mulch, seeded row middle, and killed sod in row middle.

Water Management and Soil Conservation at Red Tail Ridge

Jamie Hawk
Sustainable Viticulture Community Educator

Controlling water flow through vineyards benefits both the grower and the environment. Practices that limit runoff conserve topsoil, the life-blood of vineyard production, and reduce the transport of contaminants (sediment, fertilizers, agri-chemicals, etc.) off the farm. Mike Schnelle and his wife Nancy Irelan, owners of Red Tail Ridge Winery in Dresden, understand the importance of proactive water management. “Look at this piece of land and you know the water’s not going anywhere but straight down the hill,” Schnelle points out. “Whenever you till up soil like that and the water gets any momentum, it’s all gone. So I knew I had to do something, but exactly what and in what capacity I didn’t know, so that’s where Soil & Water helped me out quite a bit.”

Schnelle and Irelan came to the area two years ago from California with 15 plus years of viticultural experience between them. They knew right away that managing the flow of water on their land would be a top priority. “I’ve been in construction and used to do a lot of earthwork, so I know what water does,” notes Schnelle. “After seeing the first 15-minute, inch-and-a-half rain storm, I knew the job

needed to be done or I’d be fighting that hill every time.” Schnelle

began working with the Yates County Soil & Water Conservation District office to develop and implement water management practices while he was still designing the vineyard layout. “Basically I just called them up and they would come out and pretty much do everything – survey the land, design the diversion ditch, stake it out, then come back and check it after the construction. Working with them was real easy, and if you plan in advance with them they can find conservation money to help pay for 70-80% of the job. It has to be to their specifications and meet all of their criteria, but with that kind of funding, it’s real easy to conform to any extras.”

To highlight the effectiveness of the diversion in their Pinot noir vineyard, Schnelle relates this story: “We knew exactly where the diversion ditch was going to go, so I planted the vines around that area, though it was about three weeks before we were able to build the



Mike Schnelle, Red Tail Ridge Vineyards



Diversion ditches separating two young vineyard blocks. Note standpipe in foreground.

ditch. I wish we had built it three-and-a-half weeks earlier, because about three days after I planted we got two big rain storms right in a row and the whole hill washed out. It was just so depressing seeing all those plants come down the hill. Fortunately, I found them all and brought them back up and replanted them. But ever since that diversion ditch went in, it stopped the washouts.”

Schnelle faced a unique challenge with his diversion – where to send the water once he’d collected it: “I can’t run it down to the ditch because I don’t own down to the creek, and I can’t all of a sudden just blow it into the neighbor’s yard – so what do I do?” Enter Soil & Water again: “They came up with putting it into a pipe and taking it all the way down to the road ditch, and they helped me get the permit and do the state-required hydrology study. In the long run we ended up getting it all put in, and it’s worked out great.”

One drawback of the Soil & Water cost-sharing is the time from consultation to funding. “I think it takes about 18

(Funding Opportunities, continued from page 2) be provided resources that will maximize economic viability and environmental responsibility. Sustainable Viticulture is a component of the NYS Agricultural Environmental Management (AEM) program which can be a direct link to the funding opportunities described in this article, as well as other potential funding sources. Contact your local SWCD and NRCS offices to learn more about AEM and cost share opportunities.

months for the whole process,” adds Schnelle. “I got lucky on that one – they had permitted money from a job that fell through, so they had some room for my project without the wait. The cost-share was great to get, but I probably would have done it all without it because it needed to be done. Think of all the aggravation you’d have and the potential losses – it just makes sense to do it in the beginning and just be done with it.”

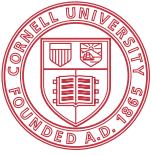
Schnelle has also utilized drain tile to remove ponding in a field that is now planted to Riesling, and he addresses individual erosion spots using rocks picked from the fields to fill the rills and slow the water. He’s a strong proponent of establishing cover crops for erosion control as well. “I’ve gone to the practice of using permanent sod. The water rushes in between the vines, but that sod will grab and hold the soil back so it doesn’t come down the hill.”

Schnelle’s take-home message? “If at all possible, get all your ground work done before you plant. Planting first then trying to work around it afterward is always much more of a headache.”

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Using soil conservation practices helps maintain productive vineyards.



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