Vineyard Soil Management Throughout the Season

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Soil
Why it is important?
Terroir

- Climate
- Soil
- Genetic factors
- Human factor

Diagram showing the interplay between climate, soil, genetic factors, and the human factor in producing terroir, which ultimately influences wine quality.
Terroir

Climate

Soil
Type & Texture
Pedoclimatic
Color
Mineral composition
Water availability

Human factor

Genetic factors

Water availability
No single ideal soil to produce quality grapes

While very high-quality wines are grown on different soils, it is impossible to define the ideal soil for fine wines.

Soil
Type & Texture
Pedoclimatic
Color
Mineral composition
Water availability
Understanding your vineyard soil characteristics is important
(texture, water holding capacity, fertility, color...)

Appropriate strategies for soil management
Optimal soil management is important

Soil management can influence:

- Root depth
- Water availability
- Mineral composition
- Temperature
- Structure
- Disease and pest pressure

Influence on vineyard health and grape and wine quality
Key challenges in managing vineyard soils
Erosion

• Not just if you have a slope
  • wind, rain, human practices

• Accelerated by disturbing the soil (i.e. tillage) or no cover

• Major threat to vineyard health & productivity
Compaction

• Every pass in the vineyard increases compaction
  • decreased infiltration of water
  • decreased aeration
    • roots & microbes need $O_2$
  • continuous tillage can create a clay pan

• All leads to decrease in sustainable productivity
Chemicals

• Overapplication of plant nutrients and pesticides.

• Accumulation of salts, excess nutrients and chemicals, and toxic chemicals.

• Use chemicals wisely and when needed.
Weeds in Vineyards

Weed = a plant growing where it doesn’t belong.

Primary obstacle to overcome during establishment

• Water competition
• Nutrient competition - N
• Sunlight
• Reduced spray efficacy
• Harbor pests & diseases
Weeds influence vine growth

Figure 2. Effect of width of weed-free zone and irrigation on 1998 cane pruning weight (courtesy Alan Lakso, Cornell University).
Control weeds in new planted vineyard!!
Ultimate goals in soil management

- Sound soil structure (erosion, infiltration, compaction...)
- Competing vegetation under control
- Sufficient soil nutrients and moisture
- Healthy population, diversity, and activity of soil microbes
- Minimized pest & disease habitat
- Biodiversity in the vineyard
Texas Soil Diversity

Introduction to Water Management, C. Brauwer
What is considered part of a vineyard floor management?

- In row middle (between rows, between trellis)
- Under trellis* (in-row, under-row)
- Headlands

*3-4 feet swatch under the trellis where the vines are planted.
Vineyard Soil Management Options

- Between trellis: Shallow tillage
- Under trellis: Clean

- Between trellis: Vegetation (native or sowed)
- Under trellis: Clean

- Between trellis: Vegetation
- Under trellis: Vegetation

- Between trellis: Alternate tillage-vegetation
- Under trellis: Clean
# Vineyard Soil Management Options

How to read the table: example: If the “soil fertility is poor” → use 1st plan

<table>
<thead>
<tr>
<th></th>
<th>Between trellis</th>
<th>Between trellis</th>
<th>Between trellis</th>
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<tbody>
<tr>
<td></td>
<td>Shallow tillage</td>
<td>Vegetation</td>
<td>Vegetation</td>
<td>Alternate tillage-vegetation</td>
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<tr>
<td>Under trellis</td>
<td>Clean</td>
<td>and/or</td>
<td>Under trellis</td>
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<tr>
<td></td>
<td></td>
<td>mature</td>
<td>Clean</td>
<td>Clean</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Poor</th>
<th>Poor to high</th>
<th>High</th>
<th>Intermediate</th>
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<tbody>
<tr>
<td>Soil fertility</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Soil water holding capacity</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Intermediate</td>
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<tr>
<td>Vine age</td>
<td>New plantings</td>
<td>New plantings and/or mature</td>
<td>Mature</td>
<td>New plantings and/or mature</td>
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<tr>
<td>Vine vigor</td>
<td>Low</td>
<td>Low to high</td>
<td>High</td>
<td>Low to high</td>
</tr>
<tr>
<td>Rootstock vigor</td>
<td>Low</td>
<td>Low to high</td>
<td>High</td>
<td>Low to high</td>
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<tr>
<td>Stage</td>
<td>In-season</td>
<td>Dormancy and/or in-season</td>
<td>Dormancy and/or in-season</td>
<td>In-season</td>
</tr>
<tr>
<td>Water availability (rain/irrigation)</td>
<td>Low</td>
<td>Good</td>
<td>Good</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Erosion Potential</td>
<td>Low</td>
<td>Low to moderate</td>
<td>High</td>
<td>Low to moderate</td>
</tr>
</tbody>
</table>
Managing Vineyard Floor
2 strategies of management

- Entire vineyard
- Strips under vines

**Cultural**

Light tillage & discing to remove:
- Tree roots
- Perennial crops

**Chemical**

Pre-plant applications of glyphosate in summer and fall

*Always follow the label – it’s the law*
Planting and Establishment

Goal
- Weed free entire vineyard.
- Weed-free strip under trellis (3-4’).
  • Larger the weed free strip the less competition exists.

- Young vines most sensitive to weed pressure.
- Inadequate control = poor vine growth and productivity.

“Mowing row centers and not addressing weeds under the trellis accomplishes little” – Jim Kamas
Established Vineyard
(4\textsuperscript{th} leaf+)

- Between trellis
  - Shallow tillage
  - Vegetation (native or sowed)
  - Under trellis
  - Under trellis
  - Clean

- Between trellis
  - Vegetation
  - Under trellis
  - Vegetation

- Between trellis
  - Alternate tillage-vegetation
  - Under trellis
  - Clean
How to attain your goals in vineyard floor management?

- Mechanical control
  - By hand
  - Mechanical tillage
- Weed eating
- Mulching
- Weed blocks
- Chemical control – Herbicides
- Cover cropping
Mechanical control – By hand

**Advantages**
- Simple tools
- Hobby vineyards
- Persistent areas

**Disadvantages**
- Time
- Cost
- Labor/morale
- Perform every 2-4 weeks during season
Mechanical tillage

Can be applied both under vine and row middles

Disadvantages
Vine injury #1 - disease (ex. crown gall)
Disturbing soil structure
  Loss of OM & fertility over time
  Decreased microbial activity
Poor aeration and water infiltration/holding capacity in the long run
Initial cost $$$
Weed eating

Advantages
Simple tool
Faster than hand hoeing
Affordable

Disadvantages
High risk of trunk injury even with grow tubes
Resist the temptation!
Mulching under trellis

**Advantages**
- Conserves soil moisture
- Weed control (initially)
- Deposition of OM

**Disadvantages**
- Costly
  - Trucking, labor, mulch
  - $4,000/acre+

Conserves soil moisture

If you can use it: 4” layer; maintained every year
Weed block

**Advantages**
- Excellent weed control
- Long lasting
- Erosion control

**Disadvantages**
- Costly
- Difficult to install
- Labor intensive
- Not permanent
Chemical control

Why use herbicides?

Often inexpensive
High level of control
Easy to apply
Quick to apply
Requires minimal equipment
Sprayer options

Backpack sprayer

Boom sprayer

Over the row boom sprayer

Designated Herbicide Sprayer
Application of herbicides

Should use in addition to cultural controls

Know what product to use and when
Cover cropping

- Does not compete excessively and adds surface OM
- Improve soil structure
- Increase mineral fertility
- Suppress weeds
- Minimize erosion and run-off
- Soften tractor compaction
- Habitat for beneficial insects and predators
- Increase biological diversity and activity
Cover cropping

Options

Cereals & grasses

Legumes

Brassicas (Mustards and forage radish)

Common in Texas: elbon cereal rye, triticale, buffalo grass + blue grama, winter rye grass

Legumes often avoided in fertile soils
Novel technologies
What vineyard soil look like?

Determine the goals of your system
Questions?

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