Establishing A New Vineyard
Soil and Nutrient Basics

• Establishing new vineyard – soil sampling
  – P and K must be amended before planting
  – P and K non-mobile in soil-incorporate into soil
  – Acidic soils, amend with lime before planting
  – Alkaline soils, amend with sulfur before planting

• Established vineyard (year 3) – petiole analysis
  – Perform yearly to start tracking nutrients
  – Perform if nutrient deficiencies visually apparent
Establishing A New Vineyard
Soil and Nutrient Basics

- Soil Test Results
  - $P_2O_5$
  - $K_2O$
  - $N$
- Plants take up
  - $H_2PO_4^-$ or $HPO_4^{2-}$
  - $K^+$
  - $NO_3^-$ or $NH_4^+$
- Soil mainly negatively charged
  - Clay particles
  - Organic matter
- $H_2PO_4^-$ or $HPO_4^{2-}$ form complexes with
  - $FE$
  - $AL$
  - $CA$

These complexes are relatively insoluble.
SOIL TEST REPORT

Results also available on-line at http://uwlab.soils.wisc.edu/reports
lab number: 5809 access code: q8h55

This Report is for:

DOOR CO UWEX OFFICE -
CO GOVERNMENT CTR, 421 NEBRASKA ST
STURGEON BAY, WI 54235

NUTRIENT RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Cropping Sequence</th>
<th>Yield Goal</th>
<th>Crop Nutrient Needs</th>
<th>Fertilizer Credit</th>
<th>Nutrients to Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>per acre</td>
<td>Ibs/a</td>
<td>Ibs/a</td>
</tr>
<tr>
<td>Grape, establishment</td>
<td>all</td>
<td>see below</td>
<td>0</td>
<td>250</td>
</tr>
</tbody>
</table>

There is no lime recommendation.

ADDITIONAL INFORMATION

Lime recommendations for apples and cherries apply only to pre-plant tests. Adjustment of pH is impractical once an orchard is established. Other perennial fruit crops must also be limed or amended with an acidifying material and incorporated prior to establishment.

Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.

This soil should be monitored more closely because of it has a relatively low potassium buffering capacity.

P2O5 and K2O nutrient application rates are provided for establishment of fruit crops. Nutrient application rates after the establishment year should be based on tissue testing with the goal of achieving and maintaining tissue nutrient concentration sufficiency.

Because of very high P levels, P2O5 applications from fertilizer or manure should be reduced and crops with a high P removal should be grown.

Year 1: Apply 1 ounce of N per plant two times during the establishment year. This rate applies for the establishment year only. After establishment use tissue testing to guide fertilizer application.

N-P-K Not required for calculation of lime requirement when soil pH is 6.6 or higher.

TEST INTERPRETATION

<table>
<thead>
<tr>
<th>Cropping Sequence</th>
<th>Very Low</th>
<th>Low</th>
<th>Optimum</th>
<th>High</th>
<th>Very High</th>
<th>Excessive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grape, establishment</td>
<td>PPPP</td>
<td>PPPP</td>
<td>PPPP</td>
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<td>Rotation pH</td>
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<td>XXXXXXXX</td>
<td>XXXXXXXX</td>
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<td>XXXXXXXX</td>
<td>XXXXXXXX</td>
</tr>
</tbody>
</table>

LABORATORY ANALYSIS

<table>
<thead>
<tr>
<th>Sample Identification</th>
<th>Soil ph</th>
<th>O.M. %</th>
<th>Phosphorus ppm</th>
<th>Potassium ppm</th>
<th>6-26-40 N Recommendation (Tons)</th>
<th>Calcium ppm</th>
<th>Magnesium ppm</th>
<th>Estimated CEC</th>
<th>Boron ppm</th>
<th>Manganese ppm</th>
<th>Zinc ppm</th>
<th>Sulfate-Sulfur ppm</th>
<th>Sulfur Avail. Index</th>
<th>Texture Code</th>
<th>Sample Density</th>
<th>Buffer ph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj. Averages</td>
<td>7.4</td>
<td>51</td>
<td>45</td>
<td>0</td>
<td>2</td>
<td>1.10</td>
<td>9</td>
<td></td>
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<td>0</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td>4.5</td>
<td>N.R.</td>
</tr>
</tbody>
</table>
1 oz. N/plant x 600 plants/acre x 2 = 68 lbs/N acre
1 oz. N/plant x 544 plants/acre x 2 = 68 lbs/N acre

102 lbs P/acre

90 lbs K/acre
SOIL TEST REPORT

Results also available on-line at http://uwlab.soils.wisc.edu/reports
lab number: 5839 access code: q8h55

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<th>Fertilizer Credit</th>
<th>Nutrients to Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grape, establishment</td>
<td>all</td>
<td>see below</td>
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<tr>
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</thead>
<tbody>
<tr>
<td>Grape, establishment</td>
<td>PPPPPP</td>
<td>KKKKKKK</td>
<td>PPPPPP</td>
<td>PPPPPP</td>
<td>PPPPPP</td>
<td>PPPPPP</td>
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<tr>
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</tr>
</tbody>
</table>

Rotation pH

Sample Identification | Soil pH | OM % | Phosphorus ppm | Potassium ppm | 60-94 Lime Req (lbs) | Manganese ppm | Zinc ppm | Sulfate-Sulfur ppm | Sulfur Avail. Index | Texture Code | Sample Density | Buffer pH |
<table>
<thead>
<tr>
<th></th>
<th></th>
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<td>1</td>
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<th>Legume N (lb/a)</th>
<th>Fertilizer Credit (lb/a)</th>
<th>Nutrients to Apply (lb/a)</th>
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</thead>
<tbody>
<tr>
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<td>all</td>
<td>see below 0</td>
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Rotation pH

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<th>Potassium ppm</th>
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<th>Calcium ppm</th>
<th>Magnesium ppm</th>
<th>Estimated CEC</th>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1.10</td>
<td>N.R.</td>
</tr>
</tbody>
</table>
Ideal pH for sandy soils

Ideal pH for clay/loam soils

Results of soil test
# Lowering Soil pH

<table>
<thead>
<tr>
<th>Desired reduction in soil pH</th>
<th>.5 - 2</th>
<th>2 - 4</th>
<th>4 - 6</th>
<th>6 - 8</th>
<th>8 - 10</th>
<th>&gt; 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>261</td>
<td>784</td>
<td>1220*</td>
<td>1742*</td>
<td>2309*</td>
<td>2700*</td>
</tr>
<tr>
<td>0.50</td>
<td>522</td>
<td>1525*</td>
<td>2439*</td>
<td>3485*</td>
<td>4617*</td>
<td>5445*</td>
</tr>
<tr>
<td>1.00</td>
<td>1045*</td>
<td>3049*</td>
<td>4879*</td>
<td>5227*</td>
<td>9235*</td>
<td>10890*</td>
</tr>
</tbody>
</table>

* Do not apply more than 870 lb/acre per year; retest soil between applications.

Adapted from: A2809 Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin
Raising Soil pH

- This will be available on soil test report
- Do not worry about raising soil pH if within 0.2 units of target pH
- Lime recommendations are for plow depth of 0 to 7 inches
  - If tilling deeper for planting use multiplier
- Lime needs to be incorporated into soil

<table>
<thead>
<tr>
<th>Plow depth (inches)</th>
<th>Lime adjustment multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 7.0</td>
<td>1.00</td>
</tr>
<tr>
<td>7.1 to 8.0</td>
<td>1.15</td>
</tr>
<tr>
<td>8.1 to 9.0</td>
<td>1.31</td>
</tr>
<tr>
<td>&gt;9.0</td>
<td>1.46</td>
</tr>
</tbody>
</table>

Adapted from: A2809 Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin
Established Vineyards
Petiole Analysis

• Why petiole sample
  – Gauge needs of vines
  – Response to fertilizers
  – Detect nutrient deficiencies before they manifest

• When to petiole sample
  – Full bloom = 2/3 of caps shed
  – Early verasion
  – Visual deficiency observed
    • Nutrient deficiencies in vineyards are often site specific
      i.e. top of hill, rock outcrop, etc
Established Vineyards
Petiole Analysis

• What to sample
  – Petioles opposite basal clusters

• When to sample
  – At full bloom
  – Early veraison

OR

• What to sample
  – Petioles from recently developed mature leaf
Established Vineyards
Petiole Analysis

• Don’t use petiole analysis results as justification to apply nutrients until ...
  – Nutrient deficiency was visually apparent at petiole sampling
  – Establish nutrient levels over time
    • Track year to year trends and establish baseline
    • Always sample at same time each year
  – Results are only a snapshot at time of sampling
    • If trends develop i.e.
      – Certain nutrients declining over time and deficiencies manifest, then action is required
  – Be aware that nutrients may be available in soil at sufficient amounts, but unavailable to vine because of pH, organic matter, or chemical interactions
Subsoiler Ripper
Site Preparation
Weed Management
Weeds Controlled by Post-emergence Herbicides

<table>
<thead>
<tr>
<th>Product</th>
<th>Broadleaf</th>
<th>Grasses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual</td>
<td>Perennial</td>
</tr>
<tr>
<td><strong>Aim</strong></td>
<td>Most</td>
<td></td>
</tr>
<tr>
<td><strong>Venue</strong></td>
<td>Most</td>
<td></td>
</tr>
<tr>
<td><strong>Fusilade</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goal</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Most</td>
<td></td>
</tr>
<tr>
<td><strong>Gramoxone Inteon</strong></td>
<td>Most</td>
<td>Suppress</td>
</tr>
<tr>
<td><strong>Poast</strong></td>
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<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>Vines must be trellised and ≥3 feet in height.
## Weeds Controlled by Post-emergence Herbicides

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Annual</td>
<td>Perennial</td>
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<tr>
<td>Reglone</td>
<td>Most</td>
<td></td>
</tr>
<tr>
<td>Rely</td>
<td>Most</td>
<td>Most</td>
</tr>
<tr>
<td>Roundup</td>
<td>Most</td>
<td>Most</td>
</tr>
<tr>
<td>Weathermax</td>
<td>Most</td>
<td>Most</td>
</tr>
<tr>
<td>Scythe</td>
<td>Most</td>
<td>Most</td>
</tr>
<tr>
<td>Select</td>
<td>Most</td>
<td></td>
</tr>
</tbody>
</table>
Planting

- Select North-South row orientation
- Spring plant into well tilled weed-free soil
- Row spacing greater than trellis height
- Plant spacing 6-8’ apart
- Root prune vs. plant all roots
  - Excessively long roots cut back
  - Prevent twisting and entangling of roots
- Plants pruned back to 2-3 expanding buds
  - Best done after bud swell
Planting

Proper planting depth

Own-rooted

Grafted

Image credit: Bruce Bordelon Purdue University
Trellis Construction

- Trellis responsible for vine + crop weight
  - Provides platform for pruning and training
  - Needs to function for 20-30 yrs.
  - Construct once and only once
- In place year one preferred
  - Wire available for initial shoot
  - Keep shoots off of ground
- Training systems for trellis
  - Cane pruning
  - Spur (2-3 bud cane) pruning
Major Trellis Components

- **Posts: Wood (preferred)**
  - **Line Posts**
    - Spaced 21, 24 or 28 ft apart - Dependent on vine spacing
  - **End Posts**
    - Anchored: earth anchor or tie-back post for rows less than 600 ft.
    - Braced: H-brace or slant brace for rows over 600 ft.

- **Wire Support**
  - High-tensile galvanized steel wire-12 gauge
    - High cordon, or Kniffen: 1 to 3 wires
    - Vertical shoot positioning: 5 to 7 wires
    - Geneva Double Curtain: 3 or 4 wires
Anchored End Post System with an Earth Anchor

Suitable for rows up to 600 ft, but this is affected by soil texture and anchor’s helix diameter.

- 3-4” x 8’ line post
- 5” x 10’ end post
- 6’ tall
- 2’ deep
- 3 - 4’ deep
- Earth anchor 4-6” helix x 40”

Figure credit: Paul Domoto, Department of Horticulture, Iowa State University
http://viticulture.hort.iastate.edu/info/pdf/domototrellis.pdf
Anchored End Post System with a Tie-back Post

Suitable for rows up to 600 ft. Cost of materials will often determine whether an earth anchor or tie-back post is used.

- 3-4” x 8’ line post
- 5” x 10’ end post
- 2’ deep
- 3’ - 4’ deep
- 6’ tall
- 60°
- Brace wire
- Tie-back Post 5-6” x 5-6’

Figure credit: Paul Domoto, Department of Horticulture, Iowa State University [http://viticulture.hort.iastate.edu/info/pdf/domototrellis.pdf]
H-Brace End Post System

Required for rows over 600 ft

3-4" x 8' line post

Brace post

5-6" x 9-10' end post

Brace pin

Brace wire

6' tall

2' deep

3-4' deep

Requires 4 additional posts per row to construct the braces.

Figure credit: Paul Domoto, Department of Horticulture, Iowa State University

http://horticulture.iastate.edu/rhio/pdf/domototrellis.pdf
Line Post

Line Post
Should be positioned between vines

3-4” x 8’ line post

2’ deep

Figure credit: Paul Domoto, Department of Horticulture, Iowa State University [http://vh.culture.hort.iastate.edu/pdb/domoto/strainers.pdf](http://vh.culture.hort.iastate.edu/pdb/domoto/strainers.pdf)
Pruning and Training

Initial Pruning from planting to fruiting

High Bi-Lateral Cordon
Relies on downward combing of new growth
Training Methods

High Cordon

Use for trailing grape cultivars

Low Cordon

Use for upright grape cultivars
Training Methods

Low-Cordon Vertical Shoot Positioning
Site Preparation Basics

1. Start site preparation at least 1 year before planting vines
   1. Weed control
   2. Herbicide carryover

2. Soil Sampling

3. Layout vineyard

4. Consider irrigation

5. Trellis system materials
   1. Vine supports
   2. Grow tubes
Resources

• Sampling Soils For Testing
  https://extension2.missouri.edu/programs/soil-and-plant-testing-laboratory

• USDA Plant Hardiness Zones
  http://planthardiness.ars.usda.gov/PHZMWeb/

• Climate information in Missouri
  http://climate.missouri.edu/climate.php
Resources

• Midwest Regional Climate Center – County climate data
  https://mrcc.illinois.edu/

• Web Soil Survey
  http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

• SoilWeb-Real Time Soil Descriptions
  http://casoilresource.lawr.ucdavis.edu/drupal/node/902
Resources

• For More Information on Vineyard Site Selection and Layout.


• ViNEWS IPM Scouting Reports – weekly reports sent weekly during growing season

https://gwi.missouri.edu/