ESTABLISHING A VINEYARD

UNIVERSITY OF CALIFORNIA

COOPERATIVE EXTENSION

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SO YOU WANT TO PLANT A VINEYARD!

ACKNOWLEDGMENT

- THIS PRESENTATION IS INTENDED TO HELP THOSE EITHER STILL DECIDING TO OR HAVE DECIDED TO ESTABLISH A GRAPE VINEYARD EITHER AS A HOBBY OR AS A COMMERCIAL VENTURE. THE CONTENT FOR THIS PRESENTATION IS MADE UP OF PUBLIC MATERIAL PULLED AND CLIPPED FROM MANY SOURCES. MOST HAS COME FROM ACADEMIC SOURCES LIKE IOWA STATE DEPT OF HORTICULTURE, PENN STATE COOPERATIVE EXTENSION, WASHINGTON STATE COOPERATIVE EXTENSION, CORNELL UNIVERSITY, AND UNIVERSITY OF CALIFORNIA, DAVIS. EACH OF THESE INSTITUTIONS WERE FOUND TO HAVE EXCELLENT INFORMATION ON ESTABLISHING A VINEYARD.

THINGS TO THINK ABOUT BEFORE DIGGING

- WHAT ARE YOUR INTENSIONS? (HOBBY, RETIREMENT, BUSINESS VENTURE, ETC.)
- WHERE DO YOU PLAN TO PLANT VINES AND IS LOCATION SUITABLE FOR GRAPES?
- WHAT ARE SOIL CONDITIONS AND ARE THEY SUPPORTIVE OF GROWING GRAPES?
- WHAT VARIETY OF GRAPES DO YOU PLAN TO PLANT?
- WHAT ARE THE COST'S TO PLANT A VINEYARD?
- WHAT DOES IT TAKE TO MAINTAIN A VINEYARD?
- WHERE DO YOU FIND RESOURCES TO HELP ALONG THE WAY?

WHAT ARE YOUR INTENTIONS?

- BEFORE PLANTING A VINEYARD, YOU NEED TO DETERMINE WHAT ARE YOUR INTENTIONS.
  - ARE YOU GOING TO DO IT AS A HOBBY OR A BUSINESS VENTURE. THIS IS IMPORTANT TO ANSWER BECAUSE IT HELPS DETERMINE VINEYARD SIZE, THE VARIETIES YOU MAY WANT TO PLANT, WHETHER A BUSINESS PLAN SHOULD BE DEVELOPED AND MORE.
- IT IS VERY COSTLY TO PLANT A VINEYARD AND IS A LONG TERM COMMITTMENT.
  - $10K/ACRE ON UP
  - GRAPES PLANTED TODAY MAY BE AROUND FOR GENERATIONS.
  - NO CROP PRODUCTION THE FIRST FEW YEARS. NOT UNTIL YEAR 4 OR 5.
  - AT LEAST ANOTHER YEAR IS REQUIRED TO PRODUCE THE FIRST VINTAGE.
  - SO IF YOU START WITH A VINEYARD, IT TAKES A MINIMUM OF 11 TO 13 YEARS TO GET INTO A POSITIVE NET INCOME POSITION IF YOU ARE MARKETING ONLY THE WINE THAT YOU PRODUCE FROM YOUR OWN GRAPES *.
- A VINEYARD IS A LOT OF HARD WORK WHICH REQUIRES YEAR ROUND ATTENTION
  - HARVEST TIME REQUIRES LONG DAYS AND FAMILY SACRIFICES
  - EVEN DORMANT TIME REQUIRES MANY ACTIVITIES AROUND THE VINEYARD

* Cornell Horticulture Business Management and Marketing Program

BEFORE PLANTING A VINEYARD - RESOURCES

- THERE ARE SOME GREAT RESOURCES TO HELP IN UNDERSTANDING THE COST. IOWA STATE & AGRICULTURAL RESOURCE CENTER HAS AN EXCELLENT EXCEL WORKBOOK WHICH ALLOWS USER TO ENTER DATA AND UNDERSTAND A 10 YEAR PROJECTION ON COST'S. THE WORKBOOKS CAN BE FOUND AT THE FOLLOWING SITE:

  HTTPS://WWW.AGMRC.ORG/COMMODITIES-PRODUCTS/FRUITS/WINE/WINERY-AND-VINEYARD-FEASIBILITY-WORKBOOKS/

- ANOTHER SOURCE FOR DECIDING WHETHER TO ESTABLISH A VINEYARD IS FROM MARK CHIEN (FORMALLY OF PENN STATE COOPERATIVE EXTENSION NOW PROGRAM COORDINATOR, OREGON WINE RESEARCH INSTITUTE AT OREGON STATE). HE PROVIDES A GREAT GUIDE ON DEVELOPING A COMMERCIAL WINE VINEYARD. IT CAN BE FOUND AT:

  HTTP://WWW.PAWINEGRAPE.COM/UPLOADS/PDF%20FILES/NEW%20GROWER%20INFORMATION/DRAFT%20COPY%20OF%20A%20PRACTICAL%20GUIDE%20TO%20DEVELOPING%20A%20COMMERCIAL%20WINE%20VINEYARD.PDF

- UC DAVIS HAS A GOOD EXAMPLE OF SAMPLE COSTS TO ESTABLISH A VINEYARD AND PRODUCE WINE GRAPES. IT CAN BE FOUND AT:

  HTTPS://COSTSTUDYFILES.UCDAVIS.EDU/UPLOADS/CS_PUBLIC/DF/68/DF68D252-A08D-49D1-8EB6-965637C0B615/WINE-GRAPE-SN-2015.PDF

- **GROWING GRAPES - STARTING A VINEYARD**

  HTTP://ARTICLES.EXTENSION.ORG/PAGES/60308/GROWING-GRAPES-STARTING-A-VINEYARD

IS LOCATION SUITABLE ?

LOCATION

- LOCATION IS IMPORTANT TO HAVE HEALTHY, PRODUCING VINES WHICH THRIVE OVER MANY YEARS.
- SUFFICIENT SUNLIGHT IS IMPORTANT TO ENSURE PROPER RIPENING OF GRAPES AND PREVENTION OF DISEASES.
- FROST DURING SENSITIVE GROWING TIME (SPRING).
- AREAS TO CONSIDER WHEN SELECTING SITE
  - ELEVATION, INCLUDING SEA LEVEL AND VARIATION IN ELEVATION WITHIN THE SITE
  - SLOPE, OR THE DEGREE OF INCLINATION OF THE LAND (% SLOPE)
  - ASPECT (NORTH, SOUTH, EAST, OR WEST)
  - HISTORY OF THE SITE, INCLUDING PREVIOUS CROPS/VEGETATION, CHEMICALS, WEEDS AND DISEASES

LOCATION - ELEVATION

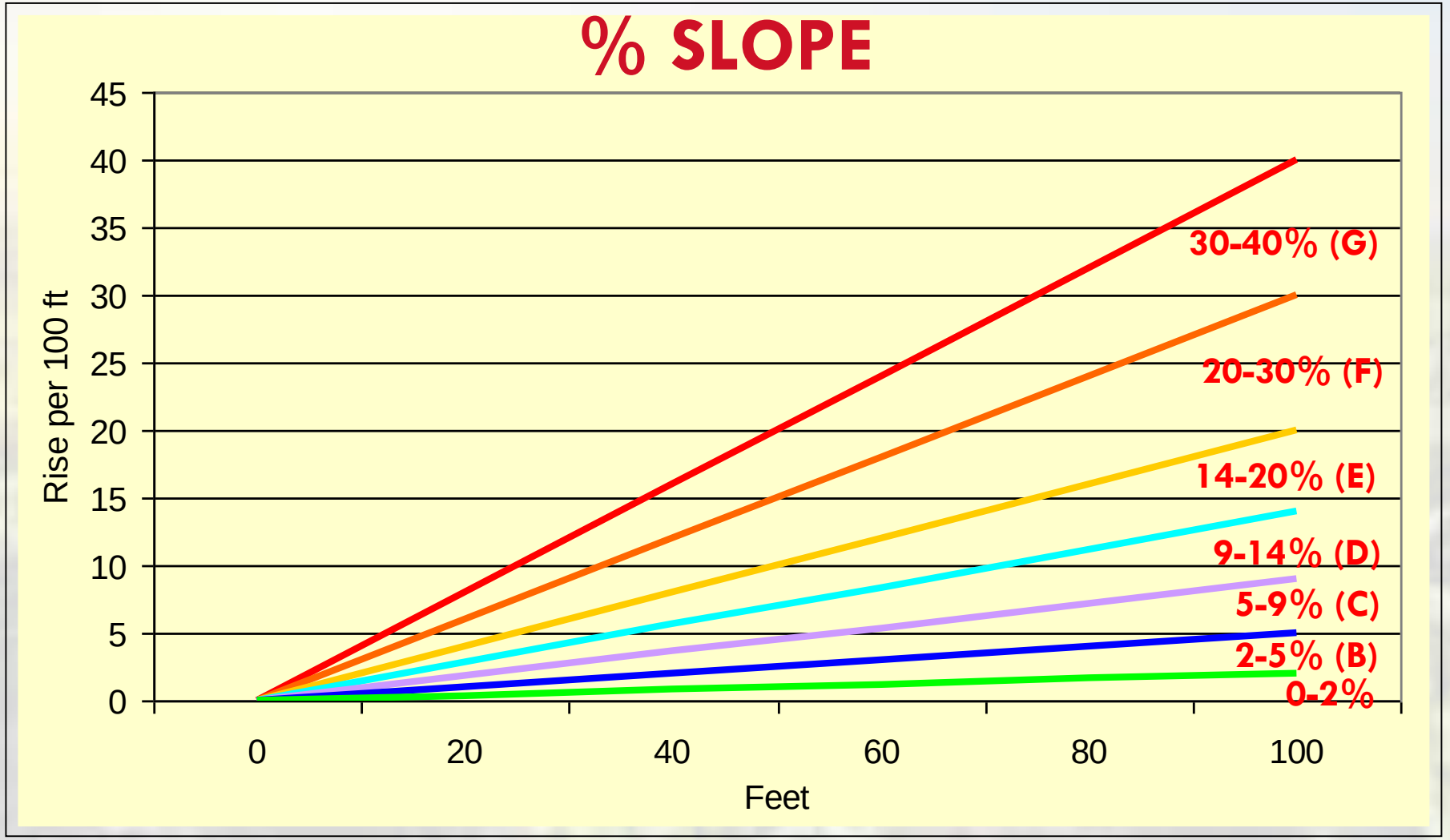
- ELEVATION REFERS TO EITHER THE ELEVATION WITHIN A CERTAIN LOCATION (HIGH POINT VS. LOW POINT) OR TO THE ABSOLUTE ELEVATION (FEET ABOVE SEA LEVEL).
- PLANTING A VINEYARD ON OR NEAR THE HIGHEST POINT ON ANY GIVEN LOCATION WILL PROMOTE BETTER AIR AND WATER DRAINAGE.
- AIR DRAINAGE IS ESSENTIAL IN FROST AND FREEZE EVENTS.
- COLD AIR IS HEAVIER THAN WARM AIR, SO IT SETTLES IN AREAS OF LOW ELEVATION.
- WATER DRAINAGE IS ALSO IMPORTANT BECAUSE STANDING WATER WILL LIMIT THE OXYGEN AVAILABLE TO THE VINE ROOT SYSTEM.

* Source: Xtension web site/*Eric Stafne, Mississippi State University*

LOCATION - SLOPE

- THE SLOPE OF A SITE REFERS TO THE DEGREE OF INCLINATION OF THE LAND.
- A SLIGHT TO MODERATE SLOPE CAN BE BENEFICIAL BECAUSE IT ACCELERATES COLD AIR DRAINAGE.
- GENERALLY, THE STEEPER THE SLOPE, THE FASTER COLD AIR MOVES DOWNHILL, IF THERE ARE NO BARRIERS TO AIR MOVEMENT SUCH AS TREES OR BERMS.
- AIR DRAINAGE IS IMPORTANT FOR PROTECTION AGAINST SPRING FROSTS.
- VEGETATION THAT SLOWS OR STOPS AIR DRAINAGE SHOULD BE REMOVED DURING SITE PREPARATION BECAUSE IT CAN ACT AS A DAM AND FORCE COLD AIR BACK UP THE SLOPE.
- STEEP SLOPES CAN CREATE ISSUES MANIPULATING MACHINERY.
- SOIL EROSION IS INCREASED ON STEEP SLOPES.
- SLOPES WITH GREATER THAN APPROXIMATELY 15 PERCENT (A 15-FOOT DROP IN ELEVATION FOR EACH 100-FOOT HORIZONTAL DISPLACEMENT) SHOULD BE AVOIDED.

* Source: Xtension web site/*Eric Stafne, Mississippi State University*



Soils with "B", "C" and "D" slopes are best suited for grapes.*

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LOCATION - ASPECT

- THE ASPECT OF A SLOPE REFERS TO THE COMPASS DIRECTION THE SLOPE FACES (NORTH, SOUTH, EAST, OR WEST).
- DEPENDING ON THE CLIMATE OF YOUR REGION, DIFFERENT SLOPES SHOULD BE SELECTED FOR THE GREATEST BENEFIT OF VINEYARD PRODUCTION.
- IN COOL CLIMATES WHERE SUMMERS ARE COOL AND GROWING DEGREE DAYS ARE LOW, NORTHERN SLOPES SHOULD BE AVOIDED AND SOUTHERN SLOPES (S, SE AND SW) ARE PREFERRED TO ALLOW MAXIMUM HEAT ACCUMULATION ON THAT SITE TO GROW AND RIPEN GRAPES.
- IN CLIMATES WITH WARM OR HOT SUMMERS AND COLD WINTERS, EASTERN, NORTHERN, AND NORTHEASTERN SLOPES ARE PREFERRED OVER SOUTHERN AND WESTERN EXPOSURES
    - SOUTHERN AND WESTERN EXPOSURES ARE WARMER THAN EASTERN AND NORTHERN EXPOSURES.
    - SOUTHERN EXPOSURES WARM EARLIER IN THE SPRING AND CAN SLIGHTLY ADVANCE BUD BREAK, THUS INCREASING POTENTIAL FOR FROST DAMAGE.
    - EASTERN ASPECTS HAVE AN ADVANTAGE OVER WESTERN ASPECTS BECAUSE EASTERN SLOPES ARE EXPOSED TO MORNING SUN.
    - VINES ON AN EASTERN SLOPE WILL DRY (FROM DEW OR RAIN) SOONER THAN THOSE ON A WESTERN SLOPE, POTENTIALLY REDUCING DISEASE RISK.
    - IN REGIONS WITH WARM GROWING AND LOWER HUMIDITY CONDITIONS, GROWERS MAY WANT TO AVOID FULLY WEST FACING SLOPES OR MAKE CHANGES IN ROW ORIENTATION TO REDUCE OVER-HEATING THE FRUIT.

* Source: Xtension web site/*Eric Stafne, Mississippi State University*

LOCATION – ASPECT

- GRAPEVINE IS A PLANT OF WARM CLIMATE: IT REQUIRES A SUFFICIENT AMOUNT OF HEAT FOR THE GROWTH. ITS DEVELOPMENT IS STRONGLY INFLUENCED BY DAILY TEMPERATURE.
- UNDERSTANDING THE GROWING DEGREE DAYS (GDD) IS CRITICAL TO UNDERSTANDING NUMEROUS KEY PARAMETERS:
  - VINE GROWTH STAGES
  - SELECTION OF VARIETIES
  - PEST DEVELOPMENT
  - TIMING TO APPLY FERTILIZER
  - HEAT STRESS

GROWING DEGREE DAYS -> WINKLER INDEX

- TO COMPARE ONE WINE GROWING REGION TO ANOTHER, A. J. WINKLER, DEVELOPED WINKLER INDEX (ORIGINALLY FOR CALIFORNIA) ON THE BASIS OF THE GROWING DEGREE DAYS, SUMMED OVER THE SEASON ON AVERAGE.
- HE CLASSIFIED CLIMATES OF WINE GROWING REGIONS INTO 5 REGIONS/CLASSES, AND IDENTIFIED TYPICAL GRAPE VARIETIES THAT CAN BE FIT TO EACH OF THOSE REGIONS.
- FOR THE CALCULATION, HE USED THE SUM OF DEGREE DAYS OVER 10°C FROM APRIL 1 UNTIL OCTOBER 31. WINKLER INDEX HAS SOME LIMITATIONS, SINCE FOR EXAMPLE IT DOESN'T TAKE INTO ACCOUNT SOIL TEMPERATURES, SUN EXPOSURE, LATITUDE, PRECIPITATION, AND THE RISK OF EXTREME WEATHER THAT CAN INFLUENCE ON GRAPEVINE GROWTH. HOWEVER, IT GIVES A ROUGH OVERVIEW ON THE CLIMATE OF VARIOUS WINE GROWING REGIONS, AND THE POSSIBILITY TO COMPARE ONE REGION TO ANOTHER.

Winkler index			
Region/class	**°F units**	**°C units**	**General ripening capability and wine style**
Region Ia	1500–2000	850–1111	Only very early ripening varieties achieve high quality, mostly hybrid grape varieties and some *V. vinifera*.
Region Ib	2000–2500	1111–1389	Only early ripening varieties achieve high quality, some hybrid grape varieties but mostly *V. vinifera*.
Region II	2500–3000	1389–1667	Early and mid-season table wine varieties will produce good quality wines.
Region III	3000–3500	1667–1944	Favorable for high production of standard to good quality table wines.
Region IV	3500–4000	1944–2222	Favorable for high production, but acceptable table wine quality at best.
Region V	4000–4900	2222–2700	Typically only suitable for extremely high production, fair quality table wine or table grape varieties destined for early season consumption are grown.

LOCATION - HISTORY

- IT IS IMPORTANT TO DETERMINE THE HISTORY OF CROP CULTIVATION OF YOUR LAND PRIOR TO PLANTING.
- THIS IS CRITICAL TO DETERMINE IF THERE ARE ANY CONCERNS WITH SOIL MODIFICATIONS AND PESTS/DISEASES.
- SOME CHEMICALS USED IN AGRICULTURE AND FORESTRY HAVE LONG PERIODS OF PERSISTENCE IN THE SOIL AND CAN DAMAGE NEW VINES.
- ROOT ROT DISEASES ARE ESPECIALLY A PROBLEM WHEN CERTAIN SHRUBS OR TREES, SUCH AS OAKS, WERE ON THE SITE PRIOR TO PLANTING.
- MANY FUNGAL ROOT DISEASES NEED A HOST (REMNANT ROOTS) TO LIVE ON AND CAN PERSIST IN THE SOIL, THUS A FALLOW PERIOD IS WARRANTED TO PREVENT ANY PROBLEMS WITH NEW PLANTINGS.
- CERTAIN PEST NEMATODES MAY CAUSE PROBLEMS IN VINEYARDS, AND POPULATIONS ARE TYPICALLY HIGHER IN SANDY SOILS.
- EXCESSIVE NITROGEN IN THE SOIL NEEDS TO BE IDENTIFIED AND "GROWN-OUT" OR THOSE SITES AVOIDED.

* Source: Xtension web site/*Eric Stafne, Mississippi State University*

WHAT ARE SOIL CONDITIONS?

SOIL

- SOIL PROVIDES THE FOUNDATION FOR GRAPE VINE GROWTH, PROVIDING THE NECESSARY WATER AND NUTRITION.*
- VINEYARD SOILS SHOULD BE EVALUATED IN THEIR FULL CONTEXT – PHYSICAL, CHEMICAL, AND BIOLOGICAL PROPERTIES.*
- SEEK A BALANCE OF THESE CONSTITUENT PARTS TO ACCOMMODATE THE PLANT AND CLIMATE AS WELL AS THE APPLIED VITICULTURE.*
- AN IDEAL VINEYARD SOIL IS DEEP, WELL-DRAINED, WITH MODERATE FERTILITY AND MODERATE WATER-HOLDING CAPACITY.*
- SOIL TEXTURE AND STRUCTURE HAVE AN IMPORTANT IMPACT ON NUTRIENT AVAILABILITY TO THE PLANT.**
- SOILS RICH IN ORGANIC MATTER ARE GENERALLY HIGH IN AVAILABLE NUTRIENTS, INCLUDING ZINC AND IRON. CLAY SOILS CAN FIX POTASSIUM IN SOIL, THEREBY DECREASING THE AVAILABILITY OF THIS NUTRIENT TO THE PLANT. RAPID LEACHING CAN DRAIN NUTRIENTS FROM SANDY SOILS.**

* Sources: Xtension web site/*Eric Stafne, Mississippi State University*

** **Vineyard nutrient needs vary with rootstocks and soils**
by Jean-Jacques Lambert, Michael M. Anderson
and James A. Wolpert

A quick primer on soil types

Alluvial - A combination of clay, silt, sand and gravel that forms over time from mineral deposits left by running water.

Calcareous - A soil primarily composed of calcium carbonate and high in chalk or limestone as well as fossilized shells.

Granite - A hard and granular rock with a high content of crystals, particularly quartz.

Jory - A volcanic soil composed mostly of basalt, which is in turn a hard and dense soil that often has a glassy appearance.

Limestone or Chalk - A soft soil made primarily from fossilized seashells.

Loam - A crumbly mixture of clay, sand and silt.

Marl - A crumbly mixture of different clays as well as calcium and magnesium carbonates with fossilized shells mixed in as well.

Sandstone - A combination of silica and sand compacted together by pressure and time.

Schist - A metamorphic rock derived mostly from clay, but it can be made from several other rocks. Schist is a soft rock that flakes and breaks easily.

Shale - Layers of clay-like, fine-grained sedimentary rock. On the surface where the shale breaks it often forms beds of sharp fragments.

Tufa - A mix of silica, calcium carbonate and sometimes volcanic ash that has been deposited over time by streams, lakes and other water sources.

Nutrient problems in grapevines are often a result of soil pH, because the nutrients are bound up in the soil or are in a form that the roots are unable to take up.

SOIL PH FOR GRAPES*

- **DESIRED RANGE:** *5.5 TO 6.5*
  - AMERICAN: 5.0 TO 6.5 (~ 6.0 OPTIMUM)
  - FRENCH HYBRID: 5.5 TO 6.5; (6.0 TO 6.5 OPTIMUM)
    - **WILL TOLERATE A PH UP TO ~ 7.0**

- **ADJUST SOIL PH:**
  - BELOW 6.0: BRING UP TO 6.0 OR 6.5 WITH LIME.
  - ABOVE 6.8: CONSIDER LOWERING TO 6.5 OR 6.0 WITH SULFUR, OR USING ACID FORMING FERTILIZERS (AMMONIUM SULFATE).

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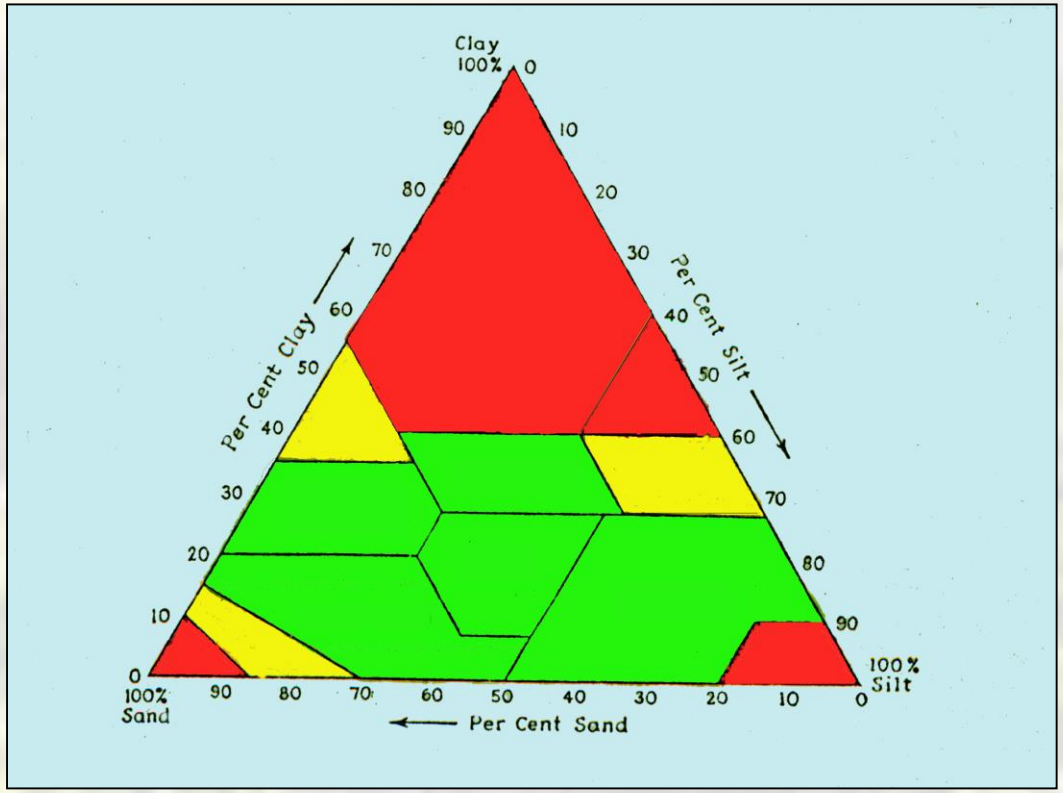
Soil Moisture Holding Capacity*

Determine the need and frequency of irrigation.

Available Moisture

Texture	Inches Per foot
Sand	0.5
Loamy sand	1.0
Sandy loam	1.5
Loam	2.0
Silt loam	2.5
Clay loam	2.5
Clay	2.0



Soils shaded in green are generally the best suited for grapes because they have good moisture holding capacity & aeration.*

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WHAT VARIETY OF GRAPES?

THERE ARE A NUMBER OF FACTORS INTO DECIDING GRAPE VARIETY

- **AGAIN, THE QUESTION: WHAT ARE MY INTENTIONS?**

  AN ACRE OF VINES CAN EASILY PRODUCE 10,000 LBS OF GRAPES.

  - ***SELL GRAPES TO WINERY***
    - WHAT DO THEY WANT?
      - WHITE WINES, RED WINES, SWEET, DRY, TARGET MARKET…..
    - DO YOU HAVE COMMITMENTS TO BUY NOW/FUTURE?
  - ***MAKE MY OWN WINE***
    - STYLE
    - WHAT DOES MARKET WANT?
  - ***GROW TABLE GRAPES***
    - HOME USE
    - SELL

THERE ARE A NUMBER OF FACTORS INTO DECIDING GRAPE VARIETY

- **WHAT ARE MY SOIL CONDITIONS?**
  - CERTAIN VARIETIES ARE GOING TO PERFORM BETTER ACCORDING TO SOIL TYPE*

TABLE 1. Rootstock characteristics

Rootstock	Parentage	Vigor*	Drought resistance	Lime tolerance†	Salt resistance	Wet feet‡	Soil preference§
				%			
St. George	*V. rupestris*	H	Var	14	M/H	L/M	Deep, uniform, loam
1616C	*V. solonis* × *V. riparia*	L	L	L/M	M/H	H	Deep/fertile
3309C	*V. riparia* × *V. rupestris*	L/M	L/M	11	L/M	L/M	Deep, well-drained
44-53	*V. riparia* × 144M	M	M/H	10	na	H	Loam/good fertility, high Mg
101-14	*V. riparia* × *V. rupestris*	L/M	L/M	9	L/M	M/H	Heavy, moist clay
420A	*V. berlandieri* × *V. riparia*	L	L/M	20	L	L/M	Fine texture, deep/fertile
5BB	*V. berlandieri* × *V. riparia*	M	L/M	20	L/M	Var	Moist clay
5C	*V. berlandieri* × *V. riparia*	L/M	L	20	M	Var	Moist clay
1103P	*V. berlandieri* × *V. rupestris*	H	H	17	M	H	Adapted to drought, saline soils
110R	*V. berlandieri* × *V. rupestris*	M/H	H	17	M	Var	Hillside soils, acid soils, moderate fertility
Freedom	1613 C × *V. champinii*	H	M/H	M	L/M	L	Sandy to sandy loams
Harmony	1613 C × *V. champinii*	M/H	Var	M	L/M	L	Sandy loams, loamy sands
Ramsey	*V. champinii*	VH	H	M	H	L/M	Light sand, infertile soils
O39-16	*V. vinifera* × *V. rotundifolia*	H	L	L	L	na	Poor on coarse, sandy soils

* L = low; M = medium; H = high; VH = very high; Var = variable; na = not available.
† Tolerance to lime-induced chlorosis (percent by weight of finely divided calcium carbonate in soil that can be tolerated by the rootstock).
‡ Wet feet = tolerance to excessive moisture caused by poor soil drainage.
§ Actual performance characteristics of these rootstocks on specific soils and scions may vary.
Source: Christensen (2003) and Pongracz (1983).

*** Vineyard nutrient needs vary with rootstocks and soils**
by Jean-Jacques Lambert, Michael M. Anderson
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THERE ARE A NUMBER OF FACTORS INTO DECIDING GRAPE VARIETY

- **WHAT IS MY LOCATION?**
  - SUNLIGHT, SLOPE, PRECIPITATION, FROST ARE OTHER FACTORS AFFECTING VARIETY THAT WILL PERFORM BEST.

RESOURCES

- A PRACTICAL GUIDE TO DEVELOPING A COMMERCIAL WINE VINEYARD

Root Stock Guide

UC Davis offers an excellent resource for selecting the proper root stock at the following website: http://iv.ucdavis.edu/files/24347.pdf

SOURCES

Sources:
Growing degree days, Oregon viticulture
Growing degree-day, Wikipedia
Growing degree days, farmwest
Winkler's climate regions, WineWisdom by Sally Easton MW
Temperature, wineskills
Arnold J. Bloom, UC Davis; Presentation: Using Satellite and Ground Data to Examine Climate Change and Premium Wine Production in California
eVineyard: Urska