Site suitability: Evaluation of climatic, water and soil factors

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Outline

- Climatic factors
  - Too cold? Hot?
  - Adaptation
- Water factors
  - Quantity & quality; impacts over time
- Soil factors
  - Limitations for vine growth? Sites to avoid?
  - Fundamental site capacity

Climatic factors

- Seasonal heat accumulation (or average temp) influences varieties/types of production
- Winter cold damage
- Frost risk – next presentation
- Heat damage
- Wind
- Influence of topography, location choice
- Adaptation/adjustment

Hobo 64k Pendant temp

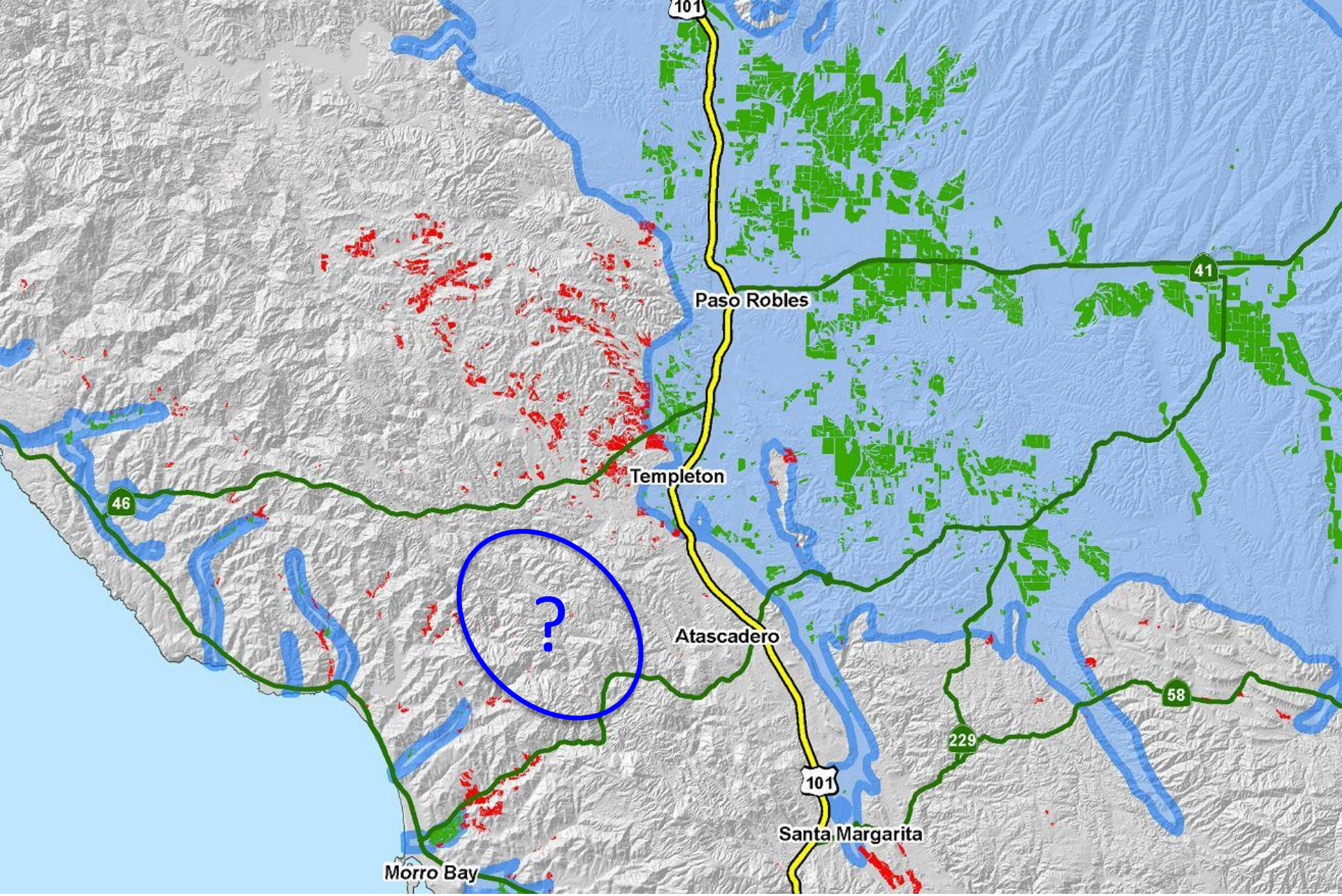
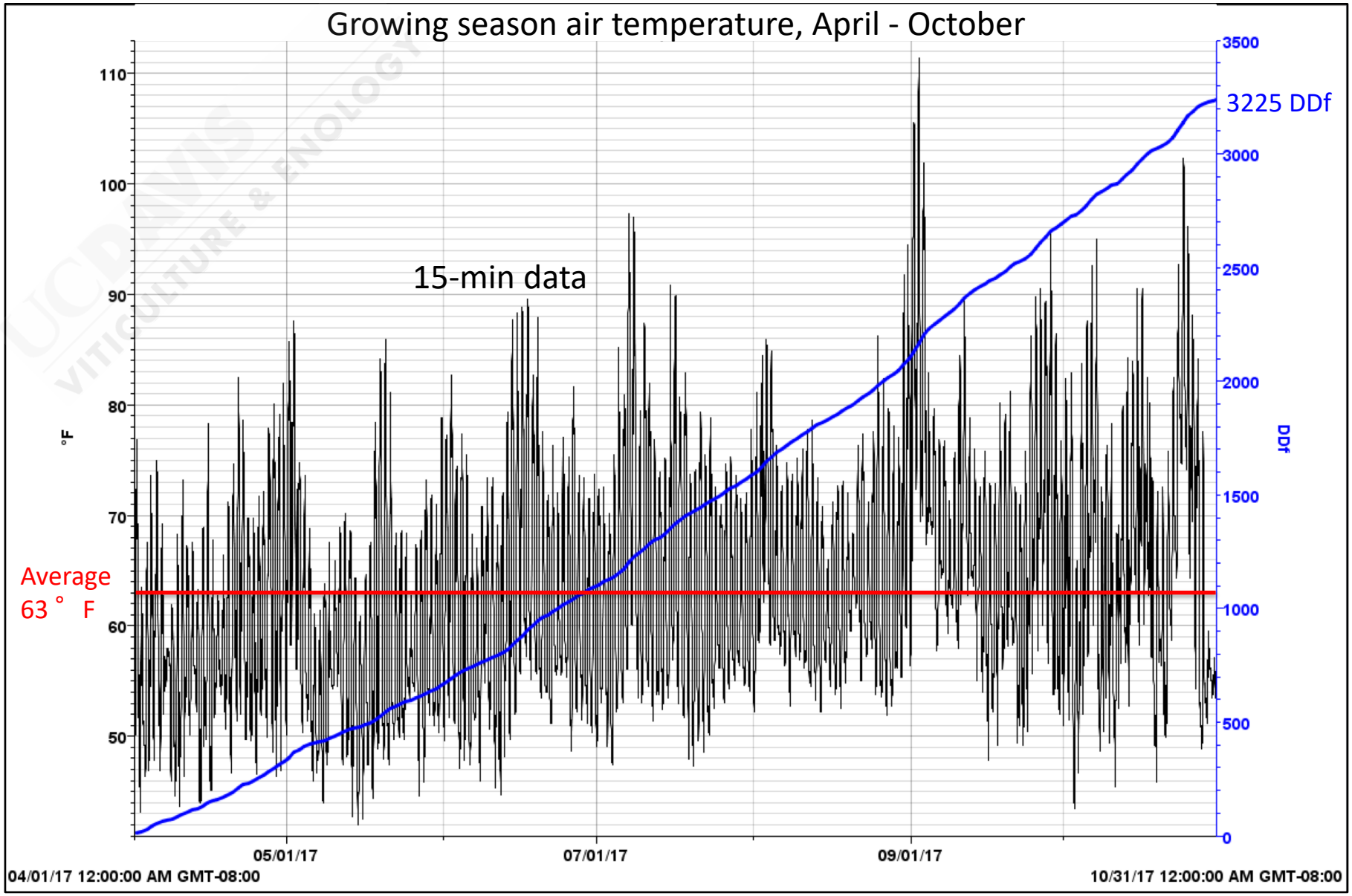


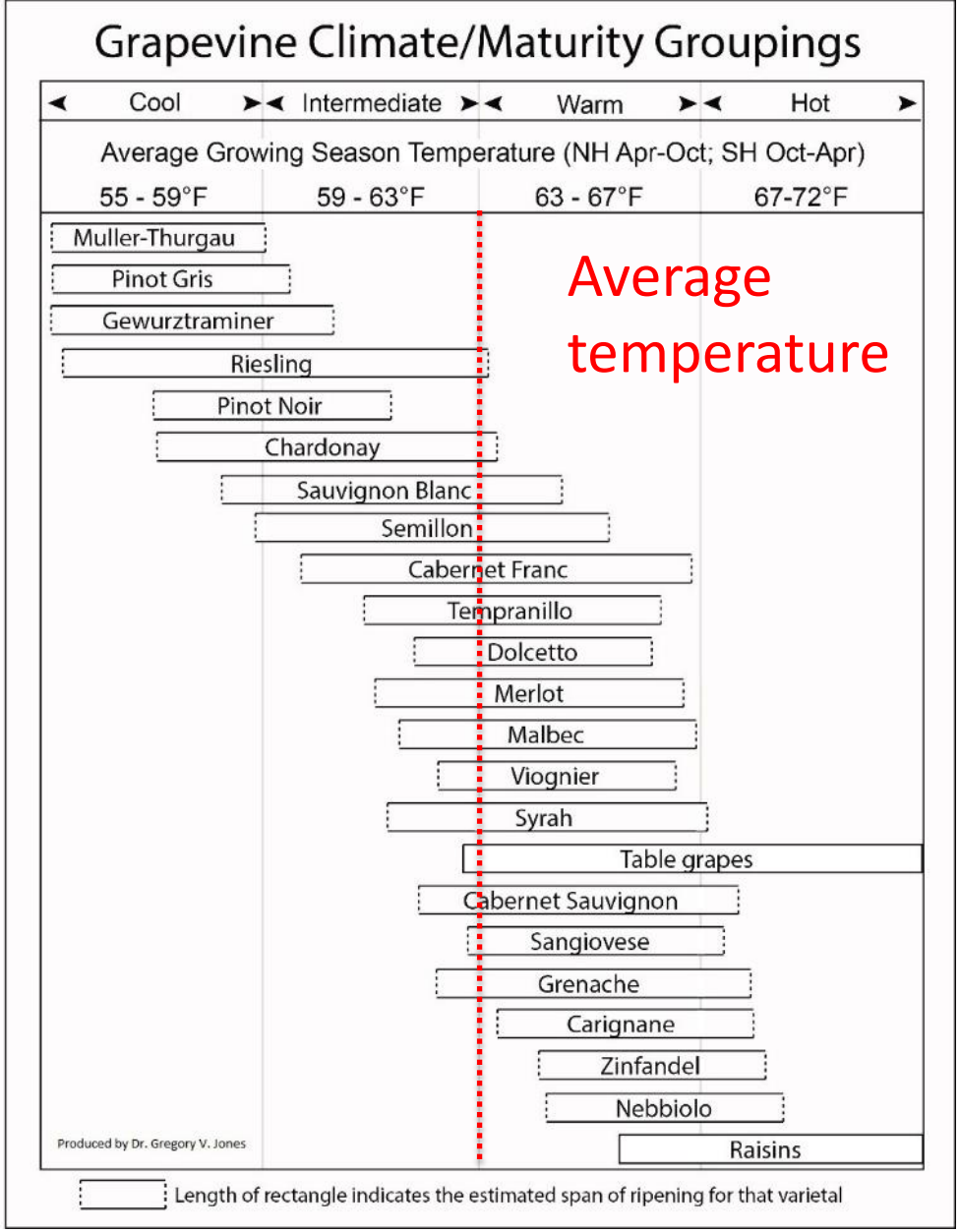
Image: SLO County Ag Commissioner


Growing season air temperature, April - October
15-min data
3225 DDf
Average
63 ° F
°F
DDf
110
100
90
80
70
60
50
3500
3000
2500
2000
1500
1000
500
0
05/01/17
07/01/17
09/01/17
04/01/17 12:00:00 AM GMT-08:00
10/31/17 12:00:00 AM GMT-08:00

Degree day accumulation

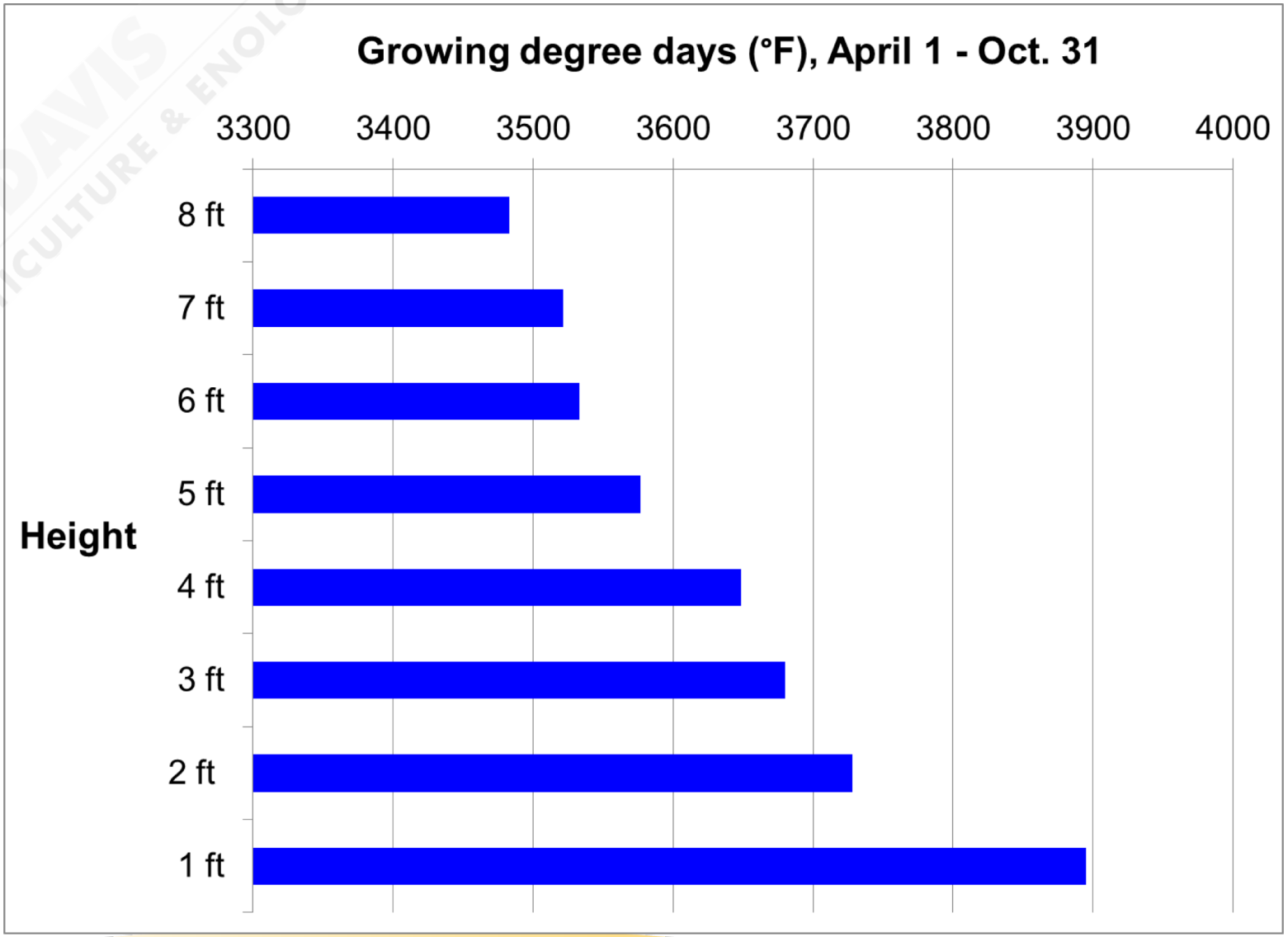
Table 2: Winkler Region Growing Degree-Day Limits and Wine Style Suitability (Winkler et al., 1974), updated by Jones et al. (2010).

Regions	Degree-Days (F° Units)	Degree-Days (C° Units)	Suitability
Region Ia	1500-2000	850-1111	Only very early ripening varieties achieve high quality, mostly hybrid varieties and some *V. vinifera*.
Region Ib	2000-2500	1111-1389	Only very early ripening varieties achieve high quality, mostly hybrid varieties and some *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.



Figures by Greg Jones

Daytime warmth near the ground



Winter cold

Temperature extremes

Summer heat

Wind

Increasing heat, lengthen season

Images:
Mari Vineyards, Michigan

Reducing sunburn

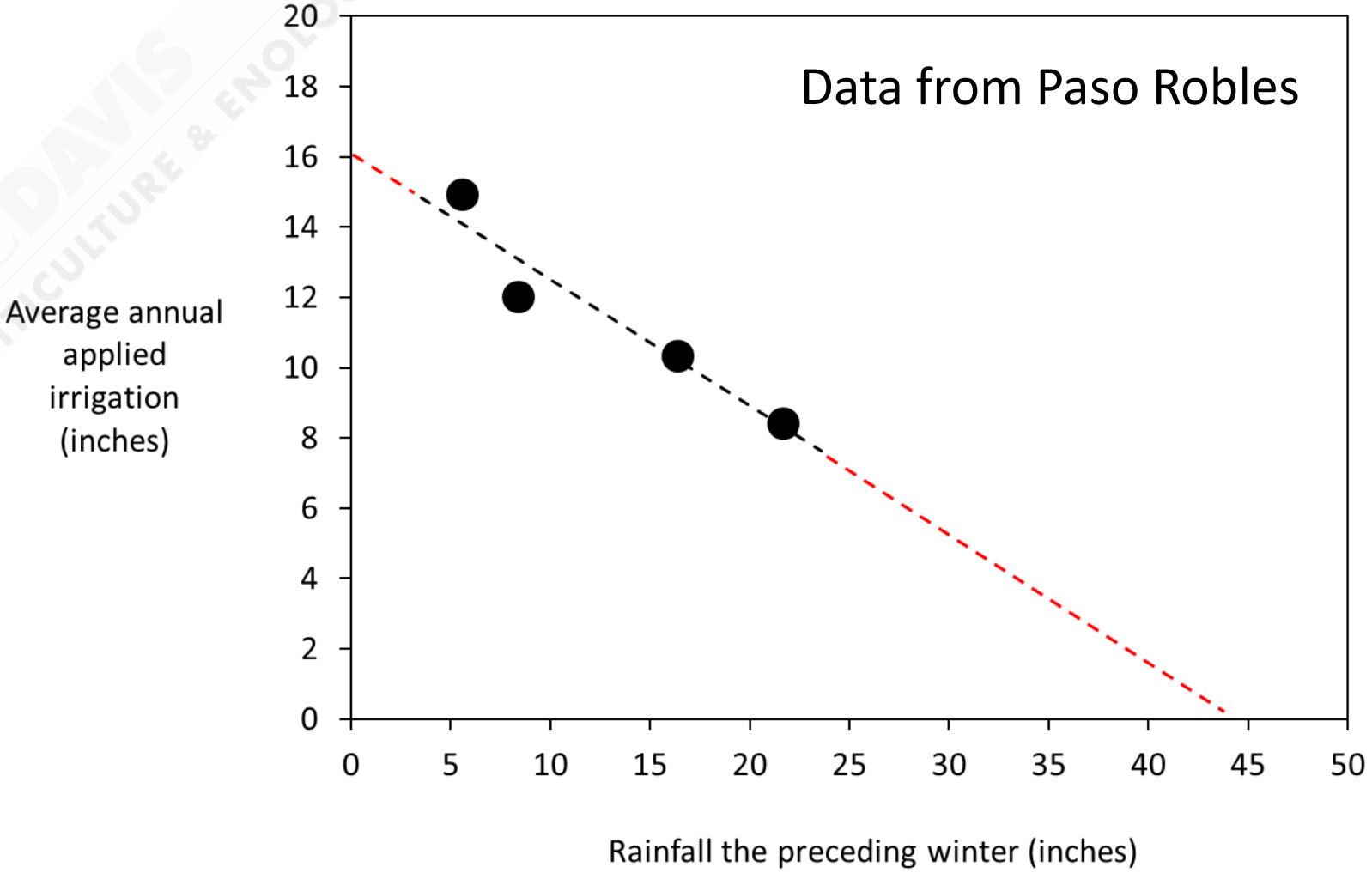
Reducing heat

Reducing wind

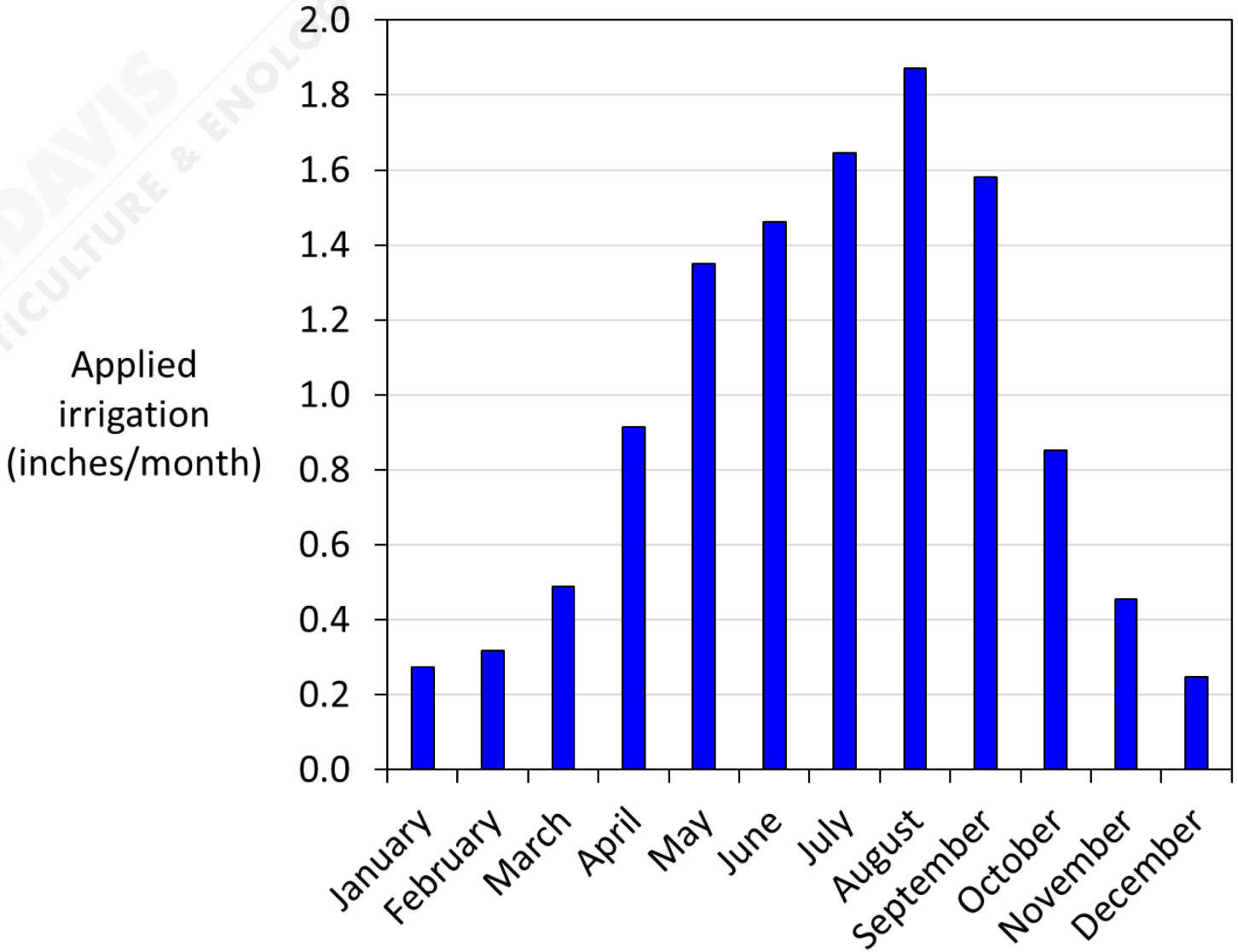
Water supply factors

- Old adage:
  - Wine grape vineyard ET roughly 18” per year
- Some is supplied by rainfall
  - Not all rainfall is “effective”
  - Varies by locale: Paso Robles vs. Mendoza
- The rest needs to be supplied by irrigation
- Will require a certain total volume, and flow rate to meet peak demand

Irrigation amount as a function of regional rainfall in CA



Paso Robles – Average monthly irrigation



Sites differ from these averages

- Differing soil water storage capacity of individual sites; consider:

- Deep soil, fine texture
  - Stores much more water, requires less irrigation

- Shallow soil, coarse texture
  - Stores much less water, requires more irrigation

Differing canopy water requirements

Water quality concerns

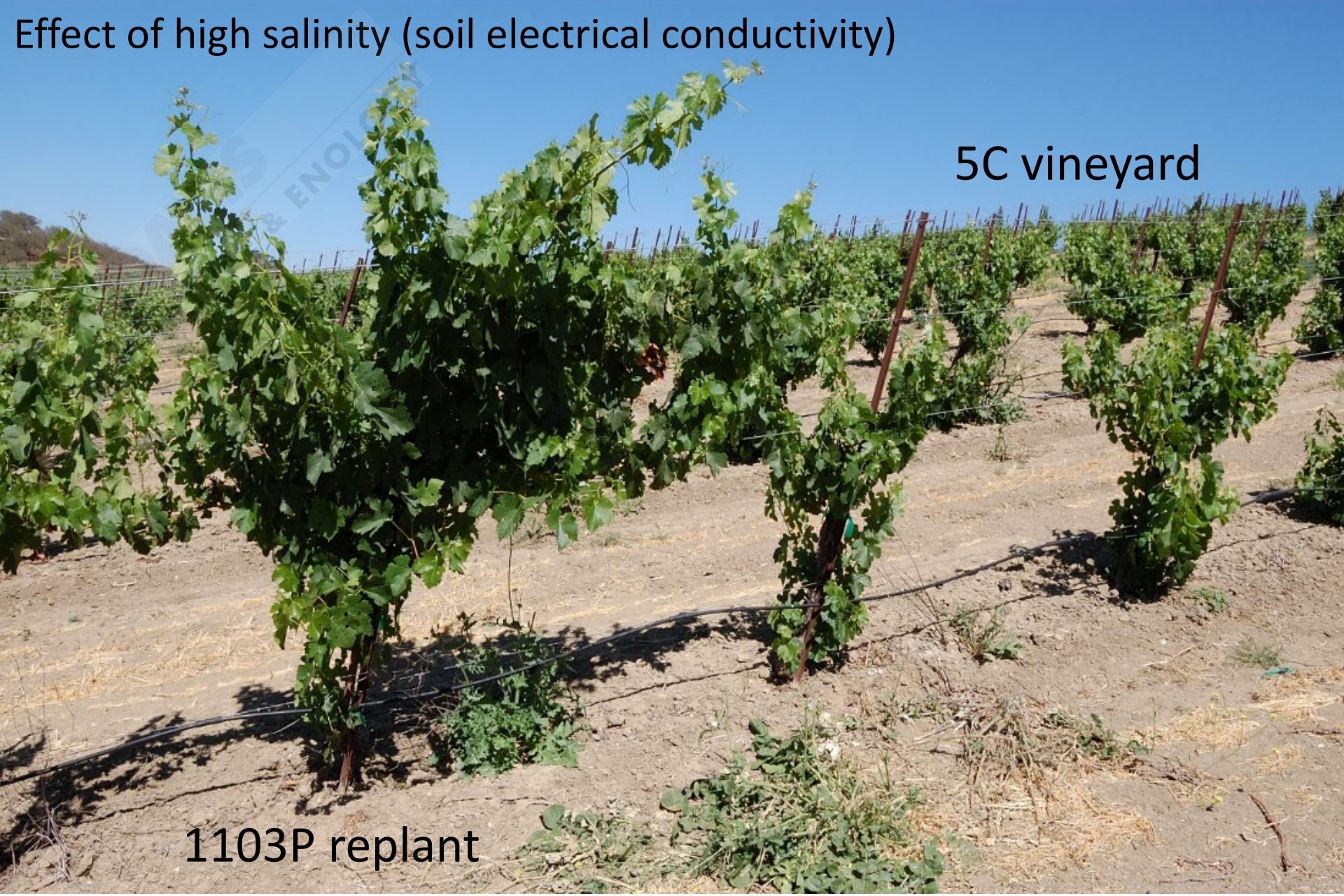
- Grapes are sensitive to issues which may not affect other crops, e.g. alfalfa, pasture
- High boron
- High salinity (TDS)
- Clogging potential – hardness, iron/manganese
- Chloride toxicity
- Sodium soil hazard, toxicity


Chloride

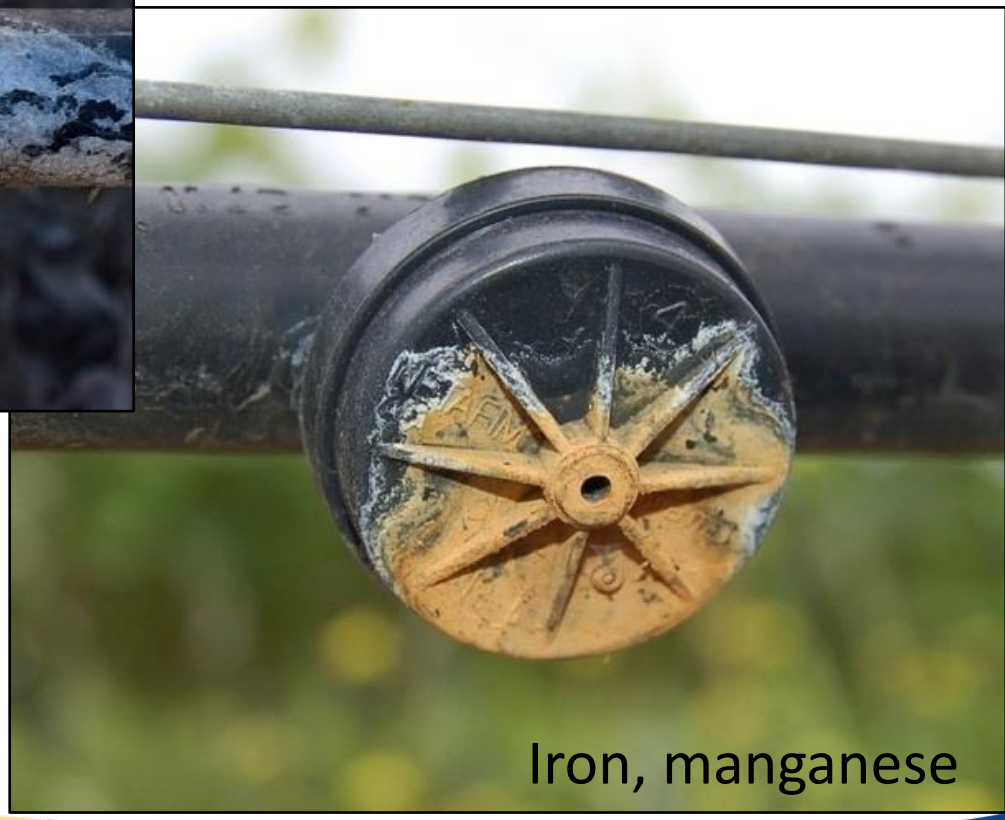

Boron


Sodium

Effect of high salinity (soil electrical conductivity)



Clogging potential



Sodium damage

- Destroys structure
- Impedes infiltration

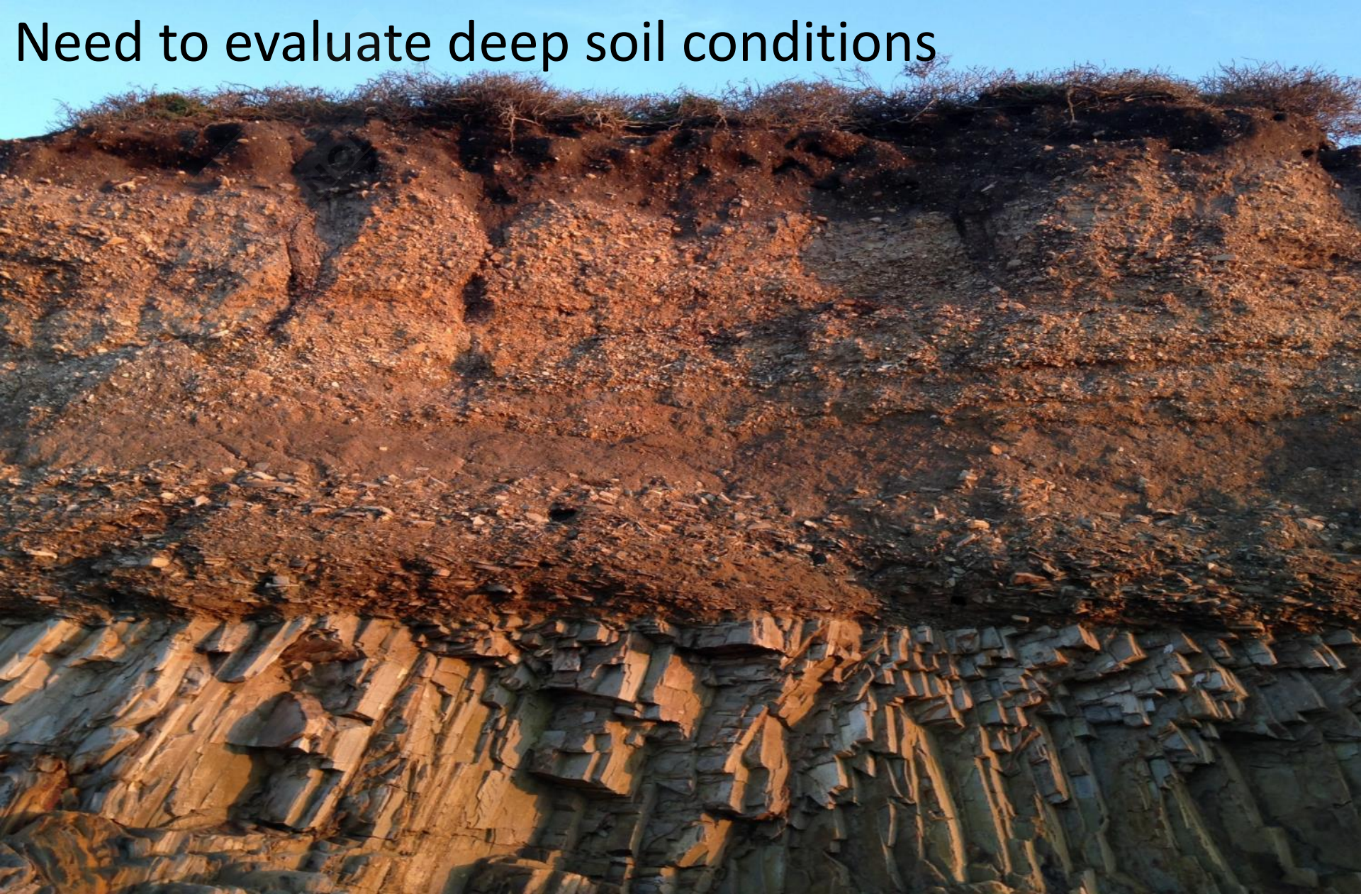
Water analysis is key

- Test for “irrigation suitability”
- Heed lab recommendations for:
  - Limitations with sensitive crops (example boron)
  - Need to treat with acid, adjust pH
  - Ongoing maintenance for sodium

Soil factors

- Tilth: physical suitability for growing a crop
- Physical limitation: poor drainage, barriers
- Chemical limitations: lime, high magnesium
- Fertility: excess, insufficiency
- Variability: challenge for uniform growth

Need to evaluate deep soil conditions



Topography challenges

Shallow bedrock

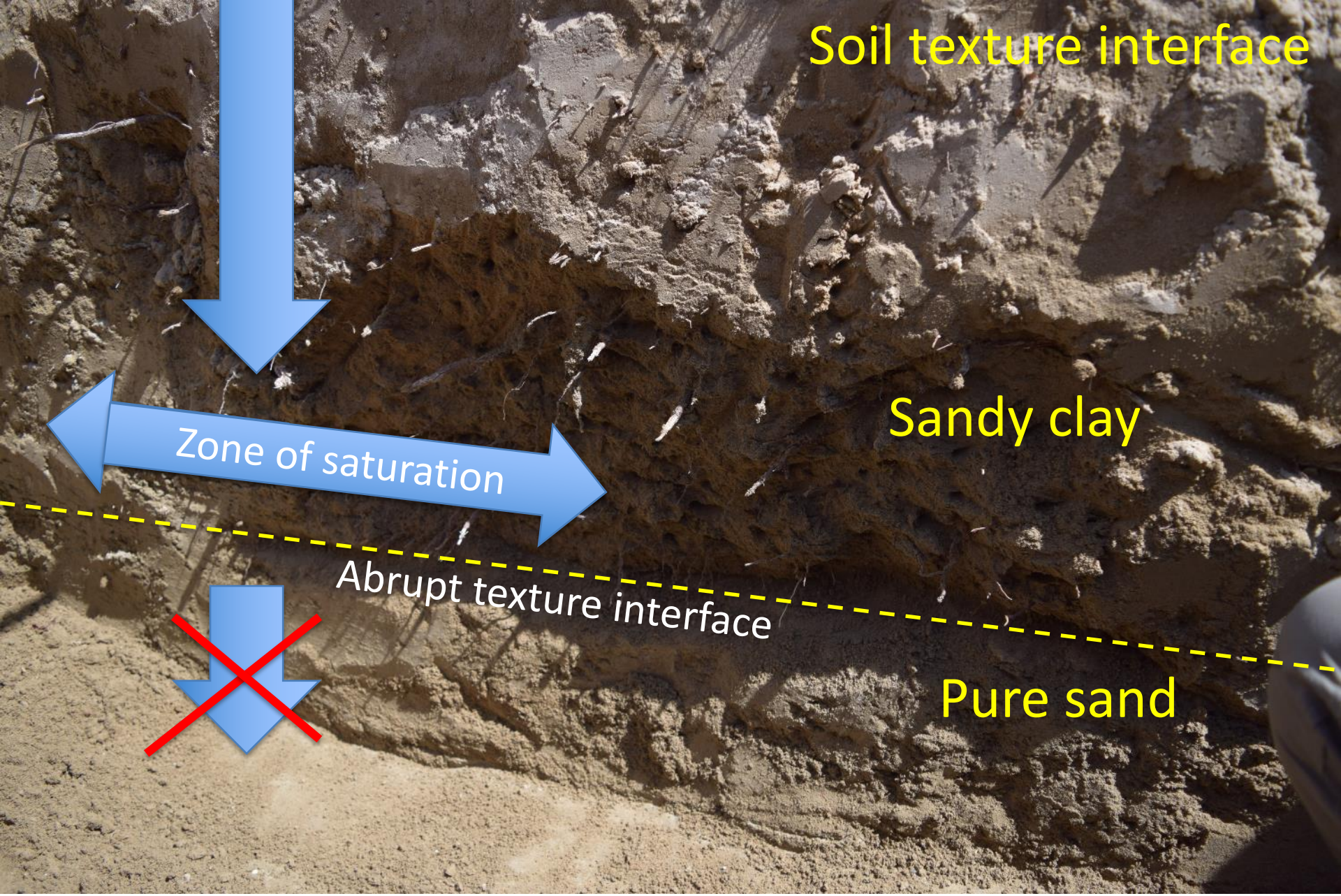
Maharashtra, India

Deep restricted drainage

Hardpan

Impermeable clay layer

Water-logged soils?


Soil texture interface
Sandy clay
Zone of saturation
Abrupt texture interface
Pure sand

Excessive fertility, nitrogen

Lime chlorosis


High magnesium – serpentine
Dense, poorly structured

Assessing variability


Loam + rocks
Well drained
Well aerated


Heavy clay
Poorly drained
Poorly aerated

Limitations to changing soil

Rock harvester

Gypsum

Deep ripper

Image: Dan Munk

Sulfur

Questions?