Soil Mapping Technology, Data Interpretation and Winegrape Management Strategies

Coastal Viticultural Consultants, Inc.

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Vineyard Objectives

- Maintaining the health and productivity of the vineyard
- Meeting Winery (and Grower) goals for quality
- Minimizing excessive dehydration
- Achieving uniform ripeness

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Vineyard Uniformity

- Planning vineyard blocks (or sub-blocks) to limit variability.
- Using Soil-Water-Plant Relations in vineyard planning.

Planning vineyard blocks (or sub-blocks) to limit variability

- Understand soil variability prior to designing the vineyard - Soil mapping

Mapping Soil Variability

- Web Soil Survey, NRCS Soil Survey Maps
- Conventional Soil Mapping Techniques

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- Electromagnetic Technologies

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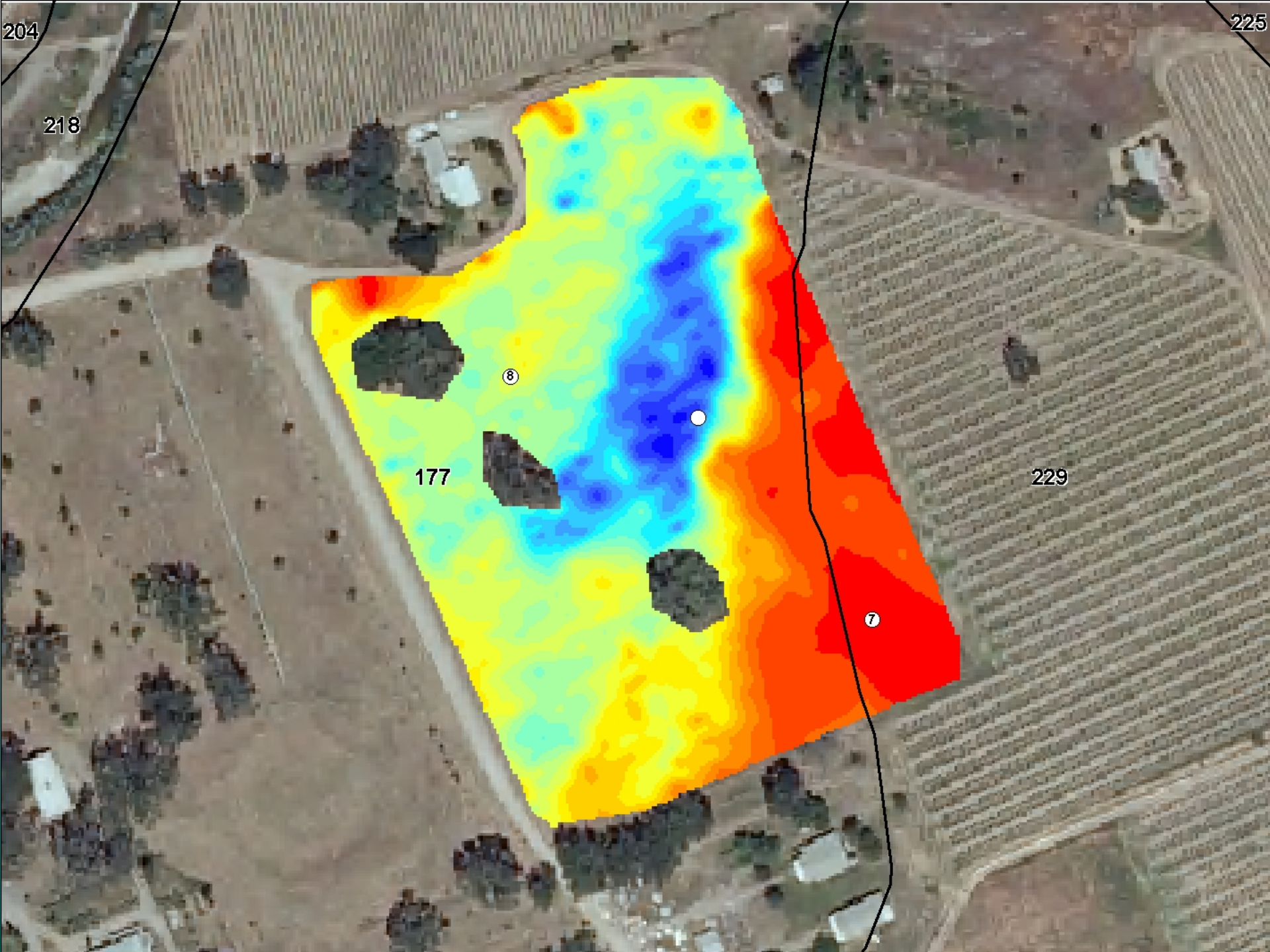
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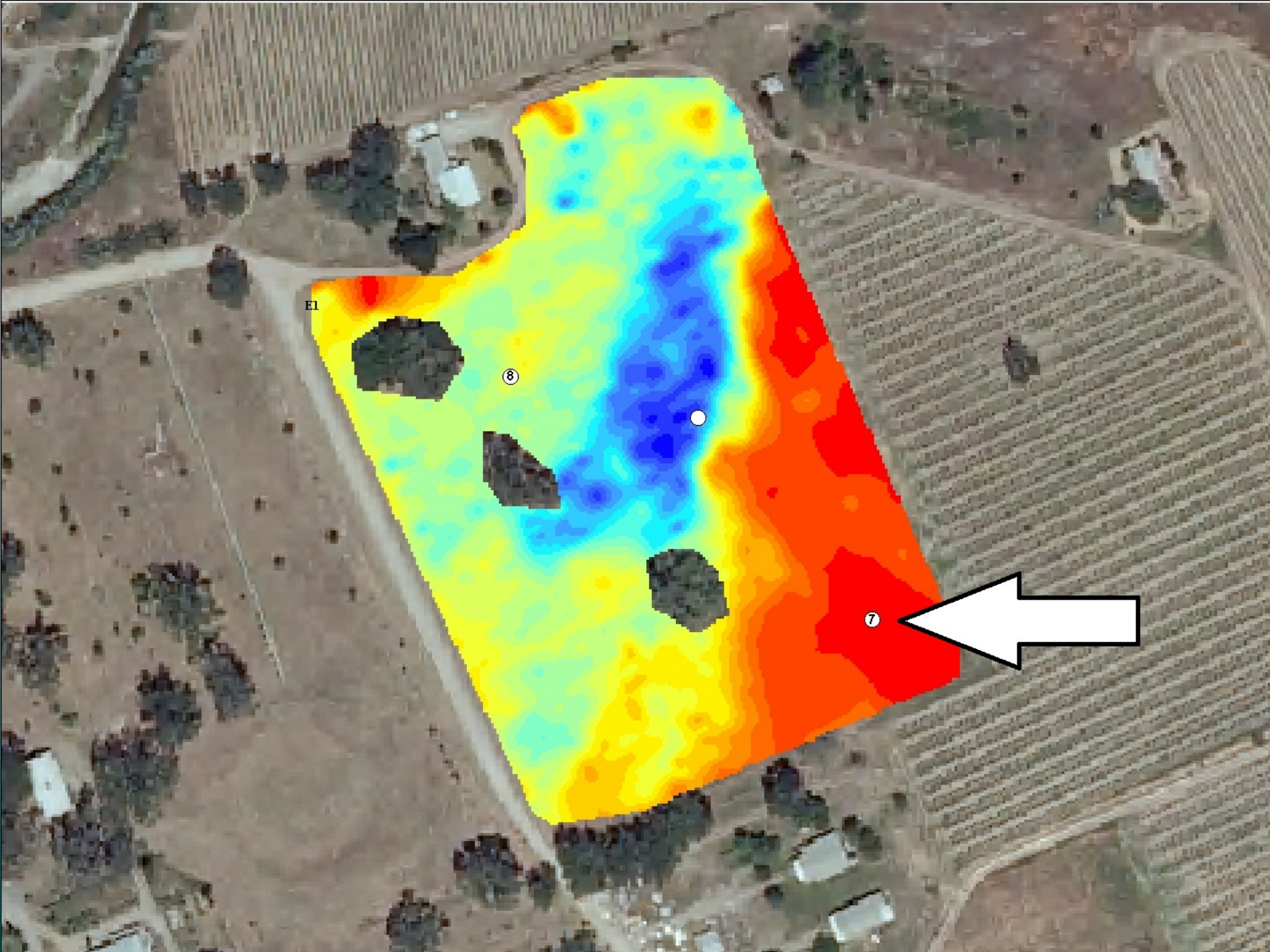
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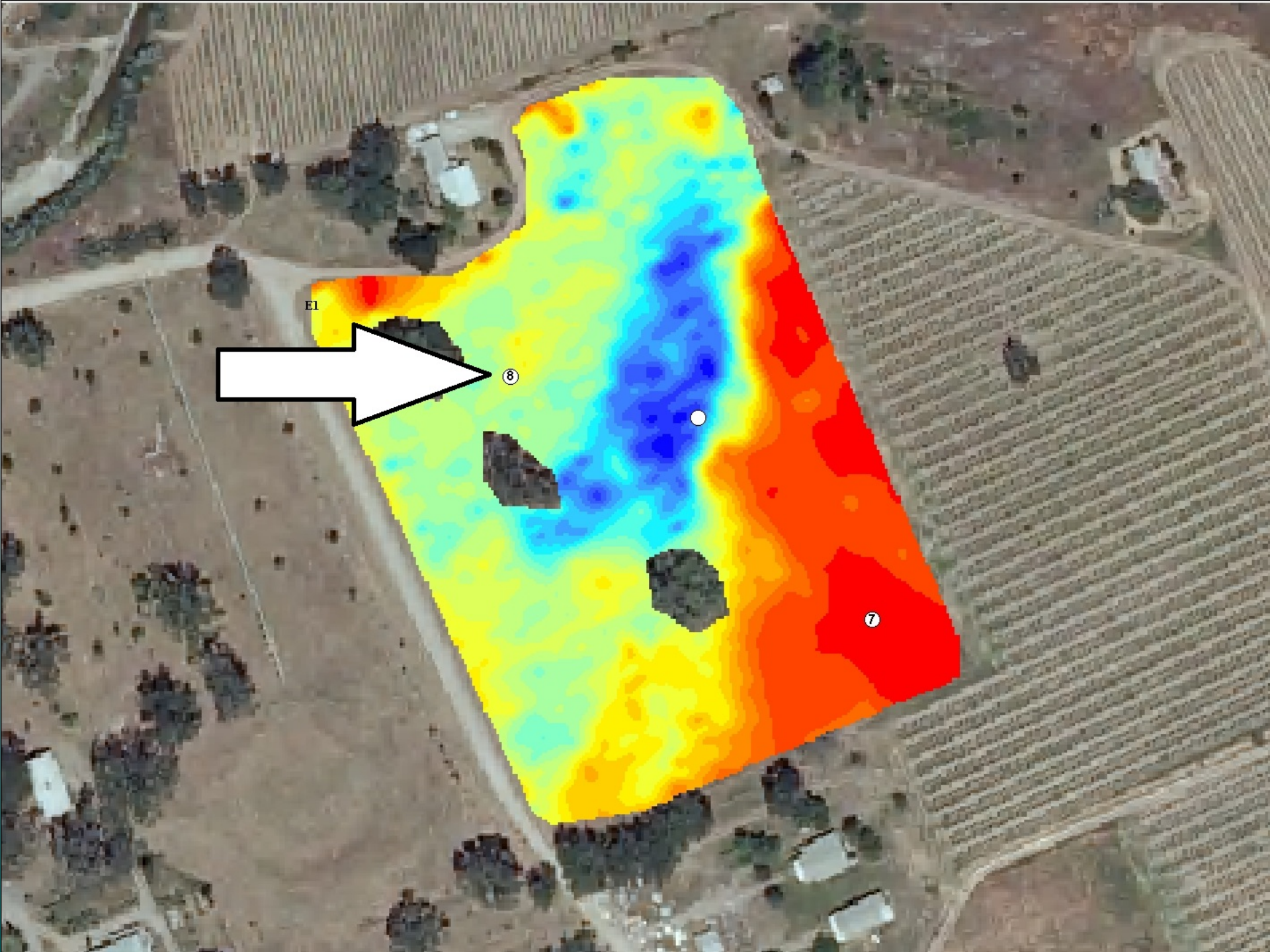
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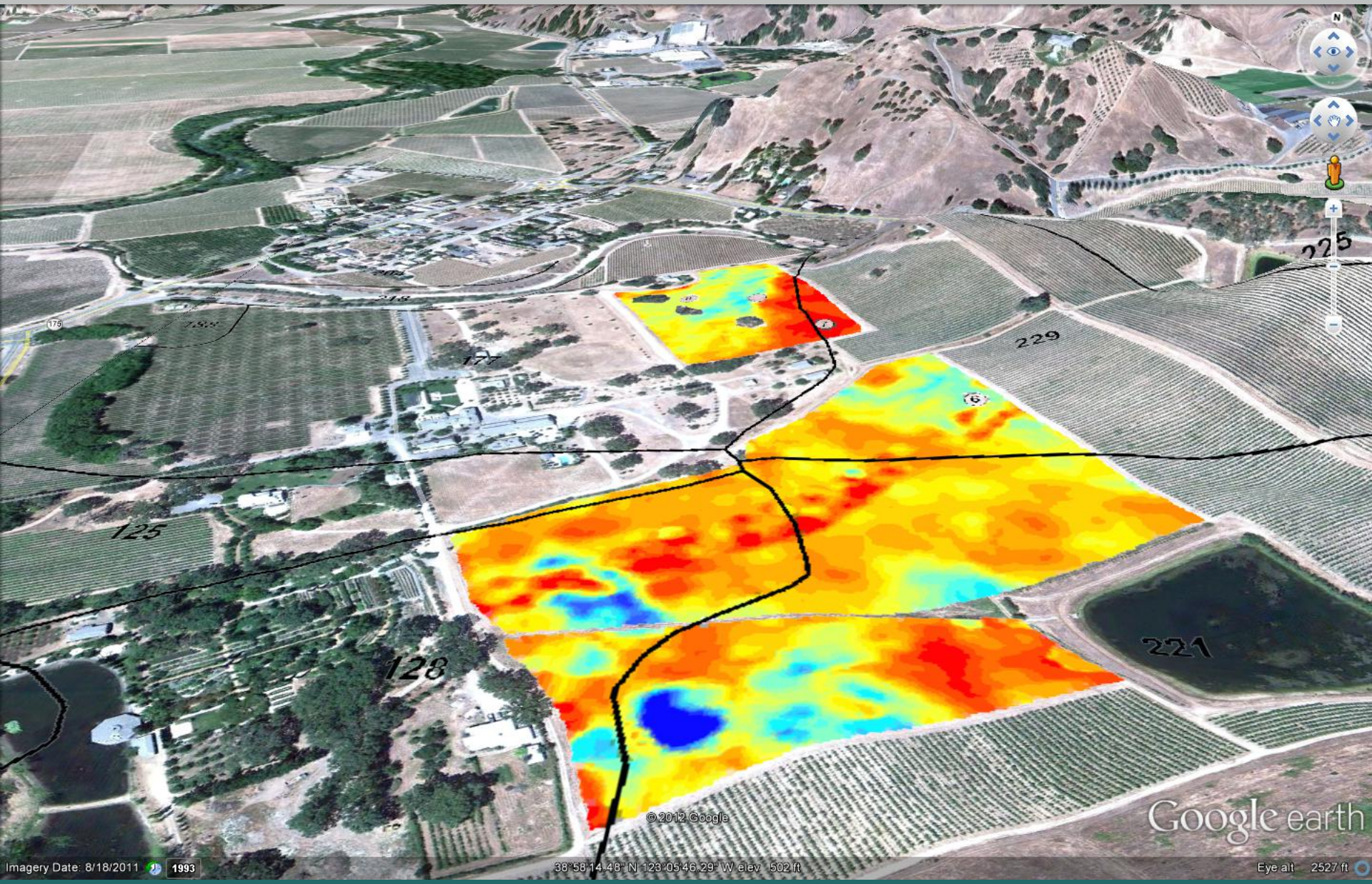
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© 2012 Google
Google earth
Imagery Date: 8/18/2011
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Eye alt 2527 ft

Soil Properties That Influence Grapevine Performance

- Soil Physical Properties
- Cation Balance: ESP, Ca:Mg ratios or percentages
- Soil pH: nutrient uptake, aluminum toxicity
- Specific Ion Toxicity: chloride, boron, sodium
- Mineral Nutrition
- Soil Drainage

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Soil Physical Properties

- Available Waterholding Capacity
- Soil Structure
- Porosity
- Compaction
- Rock Content

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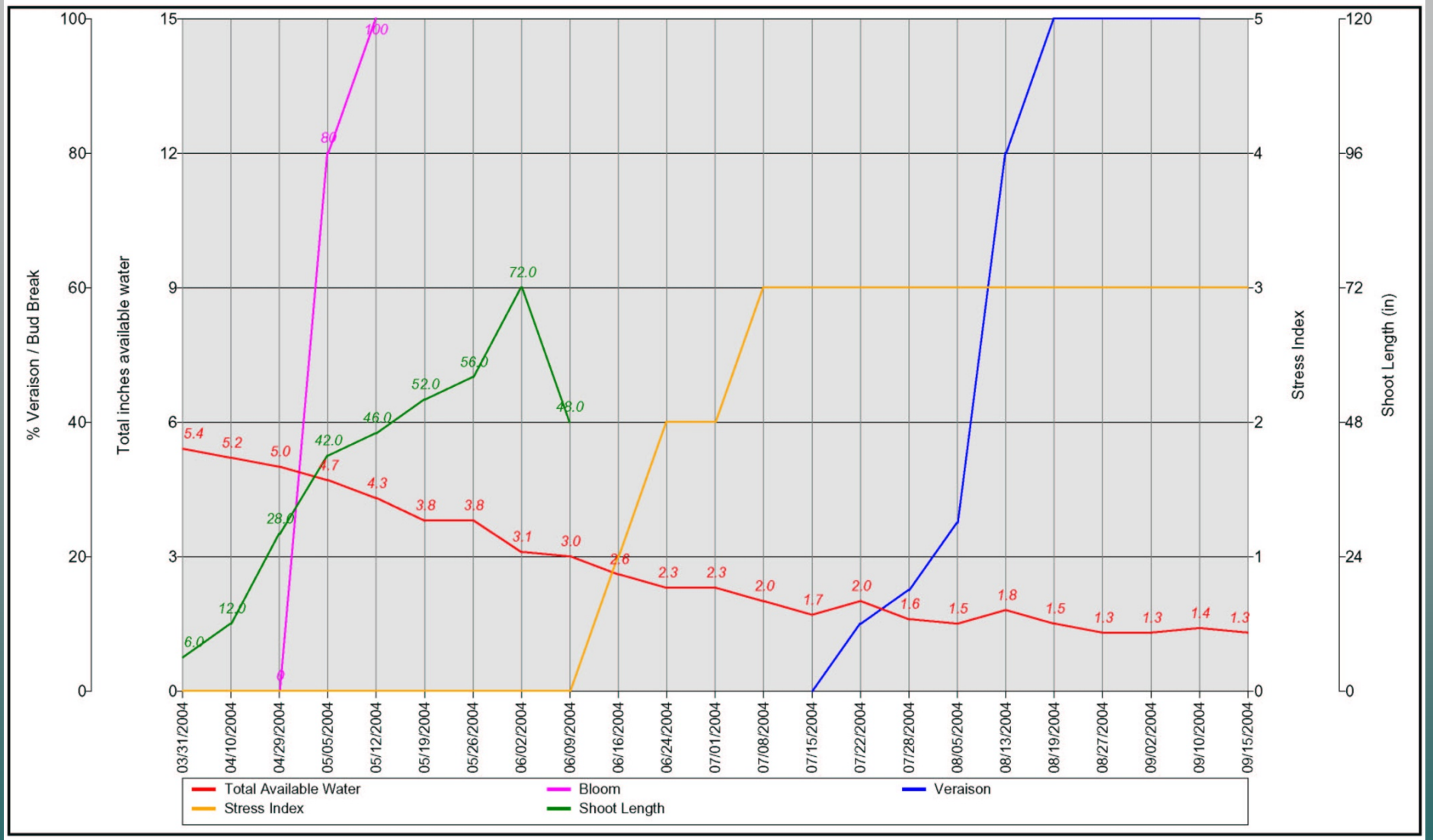
Soil-Water-Plant Relations

- Soil-Water-Plant relations is the term used to tie soil moisture, soil characteristics (chemical, physical) and plant responses together.
- Linear relationship between plant available water and grapevine growth.

CVC

Red Grape Curve

Plant Spacing: 7 Row Spacing: 5



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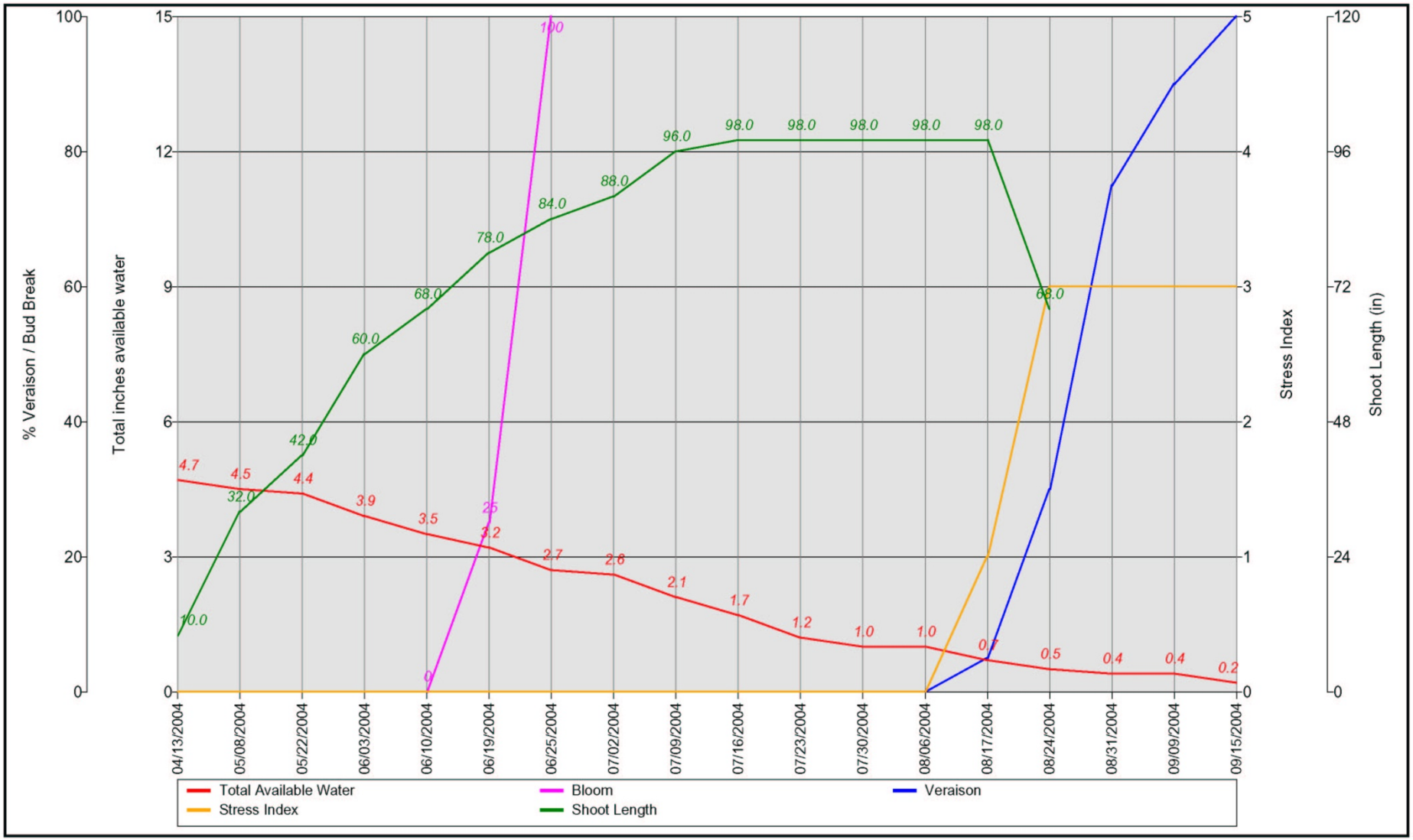
•BALANCED CANOPY

•JULY - AUGUST

CVC

Plant Spacing: 10 Row Spacing: 7



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CVC STRESS INDEX

No Stress

Mild Stress

Increasing Stress

Moderate Stress

High Stress

Excessive Stress

Stress Index of 0 - Tendrils past the tips, vigorous growth

Stress Index of 1 - Growth begins to slow; tendrils are not very far past tips

Stress Index of 2 - Slower growth, growth has slowed to the point where expanding leaves are nearing or even with tips; canopy is green, and both sun and shade leaves are cool to the touch.

Stress Index of 3 - Tip growth has stopped, tips have fallen back behind expanding leaves, canopy is green, sun leaves feel warm at midday and shade leaves are still relatively cool.

Stress index of 4 - Tips are further behind expanding leaves, some basal leaves are yellowing, sun leaves feel warmer in the heat of the day and some shade leaves may feel warm. A few tips are dried up or missing.

Stress index of 5 - A significant number of the growing tips are dried up or missing. There is substantial yellowing in the canopy, leaf scorch and dried leaves. Sun leaves feel hot and shade leaves are very warm. Fruit damage is visible (dehydration, raisining).

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CHECKING LEAF TEMPS FOR VINE WATER STRESS

Soil-Water-Plant Relations

- Soil moisture measurements, plant mapping and fruit/wine quality can be used group available waterholding capacities (AWC) in vineyard soils.

CVC

Red Grape Curve

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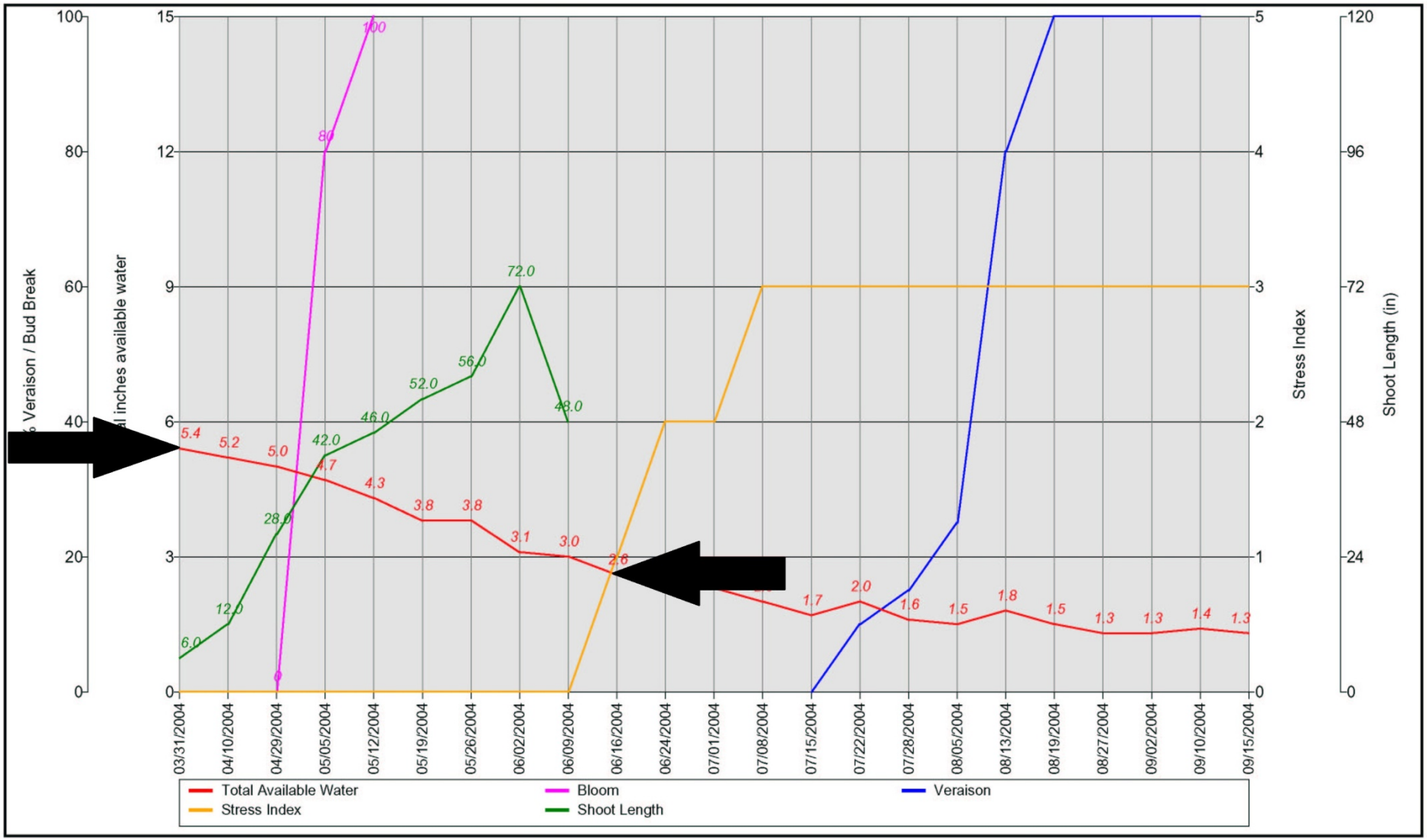

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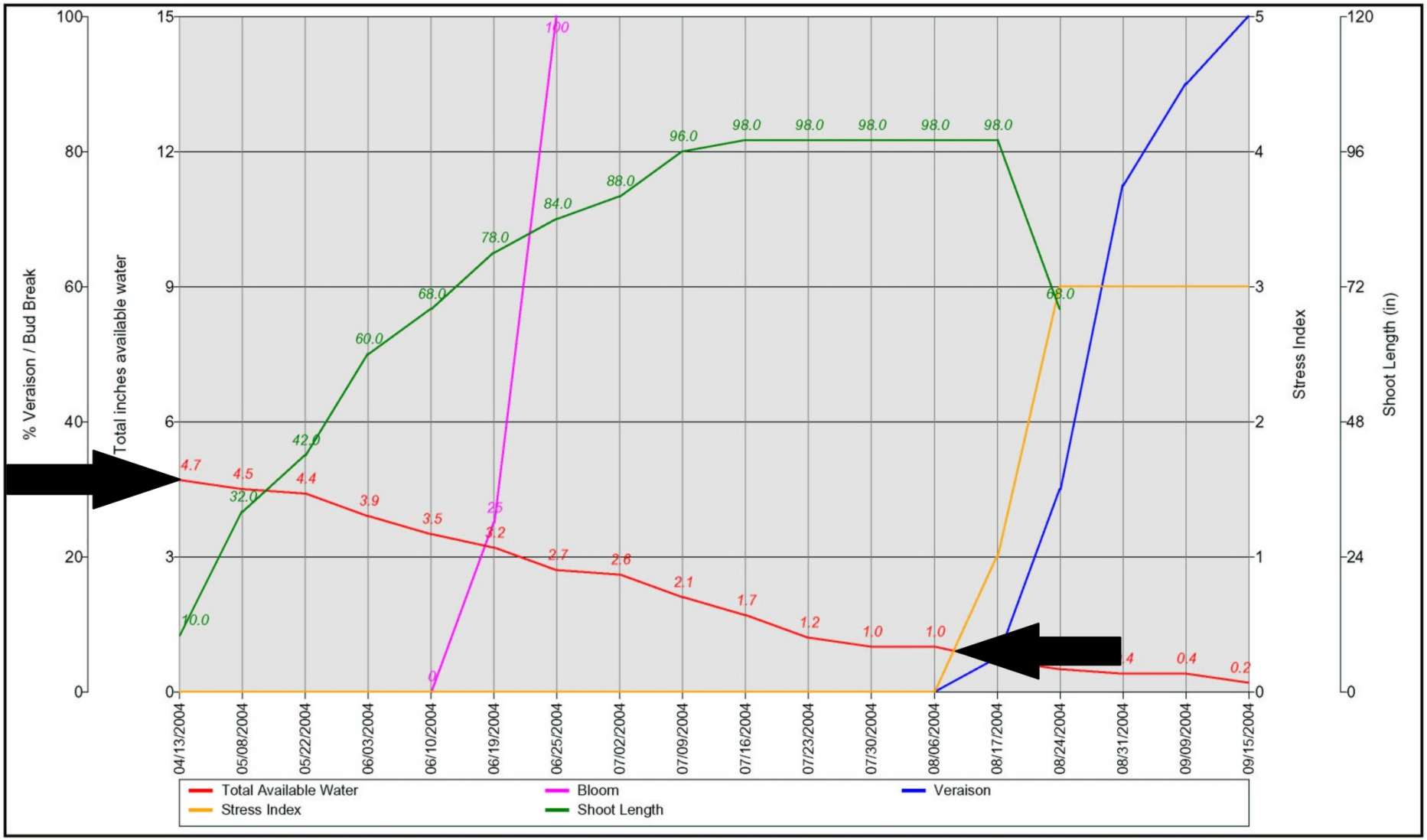


AWC Group	Root Zone Available Water (Vit-Stress Index 3)	Vigor Capability Rating	Comments
Group 1	Below 2.5”	V. Low	Drought sensitive rootstocks prone to excessive water stress. Irrigation required.
Group 2	2.5” to 3.49”	Low	Optimal for most red varietals. Irrigation is required.
Group 3	3.5” to 4.49”	Moderate to High	Optimal for most red varietals with proper vineyard design. Irrigation is usually required. Vigorous rootstocks may cause excessive growth.
Group 4	4.5” to 6.0”	High	Use de-vigorizing rootstocks. A competing cover crop could be required.
Group 5	Above 6.0”	Very High	Both shallow rooted, de-vigorizing rootstocks and a competing cover crop are most likely required.

Mitigating Soil Variability in Vineyards

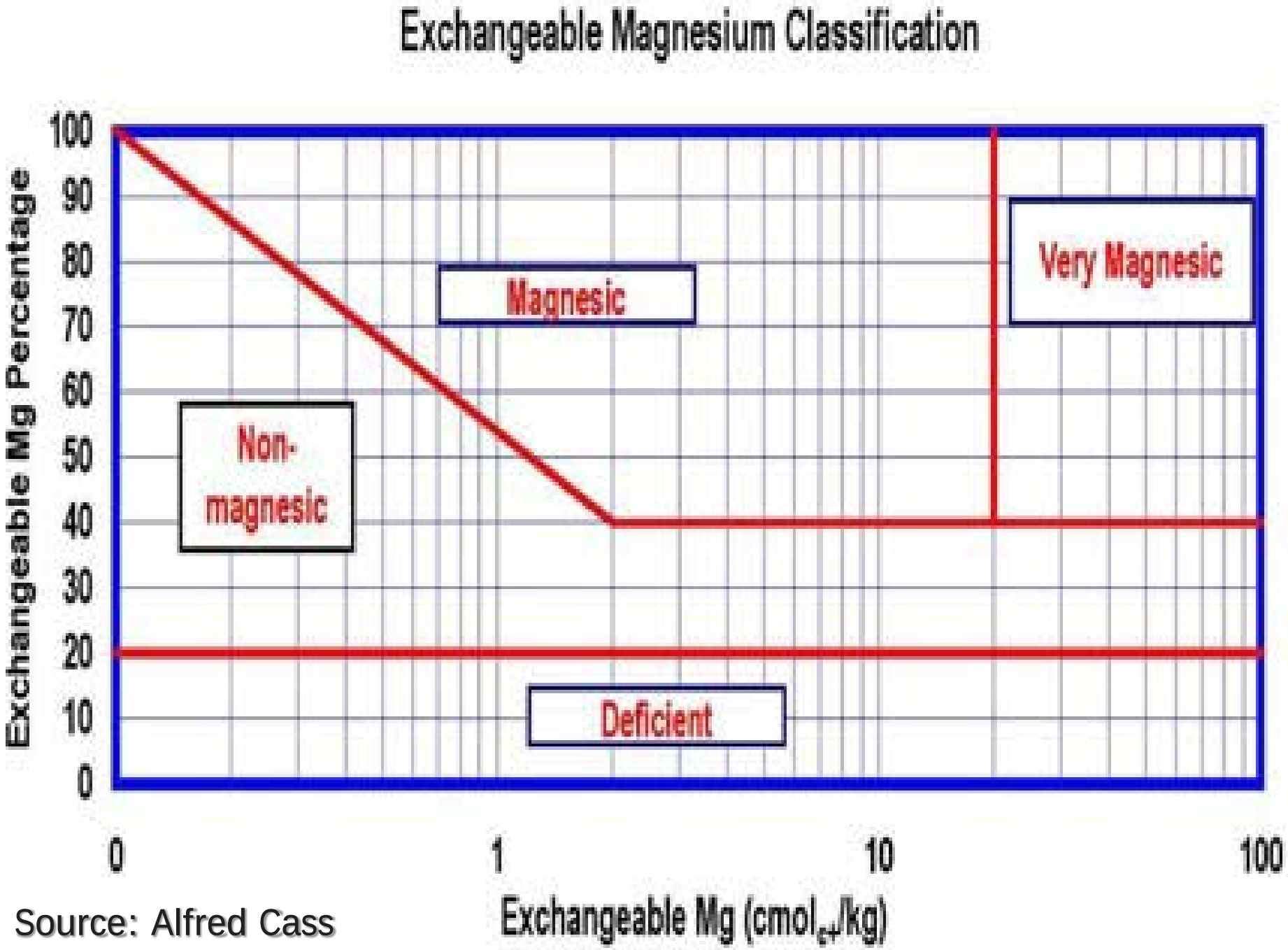
- Irrigation system design – the system should allow soils in very different AWC Soil Groups to be irrigated separately
- Rootstocks – select rootstocks to best fit the soil conditions within each AWC Soil Group

Cation Balance in Vineyard Soils

- Relative amounts of calcium and magnesium in vineyard soils
- How magnesic soils impact vineyards
- Mitigation measures

Calcium and Magnesium in Vineyard Soils

- Calcium > Magnesium
- Ratios: Minimum Ca:Mg ratio 1:1
- Percent Exchangeable Ca or Mg



Source: Alfred Cass

CVC

Report of Soil Analysis

Date Sampled: 06/05/2012

Lab No: 12-188

Date Reported: 06/08/2012

No.	Description	Depth Inches	OM %	Olsen P04-P ppm	Am. Act. Extraction K ppm	Ca ppm	Mg ppm	Na ppm	pH	Buff. Index	CEC	Percent Cation Saturation K %	Ca %	Mg %	Na %	Ca : Mg	NO3-N ppm	Zinc ppm	Free Lime	Soluble Salts dS/m	Sat. B ppm
	Site 7	0-28	0.8	4.3	43	532	144	12	6.0	6.9	4.7	2.3	56	25	1.1	2.2	6.0	0.2	L	0.2	0.2
		28-39	1.2	4.0	72	1448	928	62	6.0	6.9	18.0	1.0	40	42	1.5	0.9	6.4	0.1	L	0.5	0.3
		39+	1.1	6.5	48	1870	3491	793	7.2	7.2	41.6	0.3	22	69	8.3	0.3	7.2	0.1	L	0.1	0.1
	Site 8	0-11	1.3	4.0	76	637	217	27	5.5	6.3	7.1	2.7	45	25	1.6	1.8	6.2	0.5	L	0.1	0.1
		11-36	1.4	4.7	45	535	105	9	5.5	6.5	5.0	2.3	54	17	0.8	3.1	1.9	0.2	L	0.1	0.1
		36+	0.9	0.9	89	1676	504	19	6.2	7.0	14.6	1.6	57	29	0.6	2.0	1.5	0.1	L	0.1	0.1
	High			>20.0	>400				>8.5						>10	>8.0		>1.0			>1.0
	Acceptable			6.0 - 20.0	150-400				6.0 - 8.5							1.5 - 8.0		0.8 - 1.0			0.2 - 1.0
	Questionable			2.0 - 5.9	100-149				5.5 - 5.9							1.0 - 1.4		<0.8			
	Low			<2.0	<100				<5.5							<1.0					<0.2

All comments are based upon the results of the laboratory analysis. The lab results, although believed to be reliable, cannot be guaranteed by CVC.

Soil Study Site 8
Acceptable Cation
Balance
8
E1
Soil Study Site 7
Magnesic Subsoil
7

Impacts of Magnesic Soils

- Inhibits potassium uptake – magnesic soils limit soil potassium (K) availability in grapevines
- High magnesium can be detrimental to soil structure
- Metal Toxicity - nickel

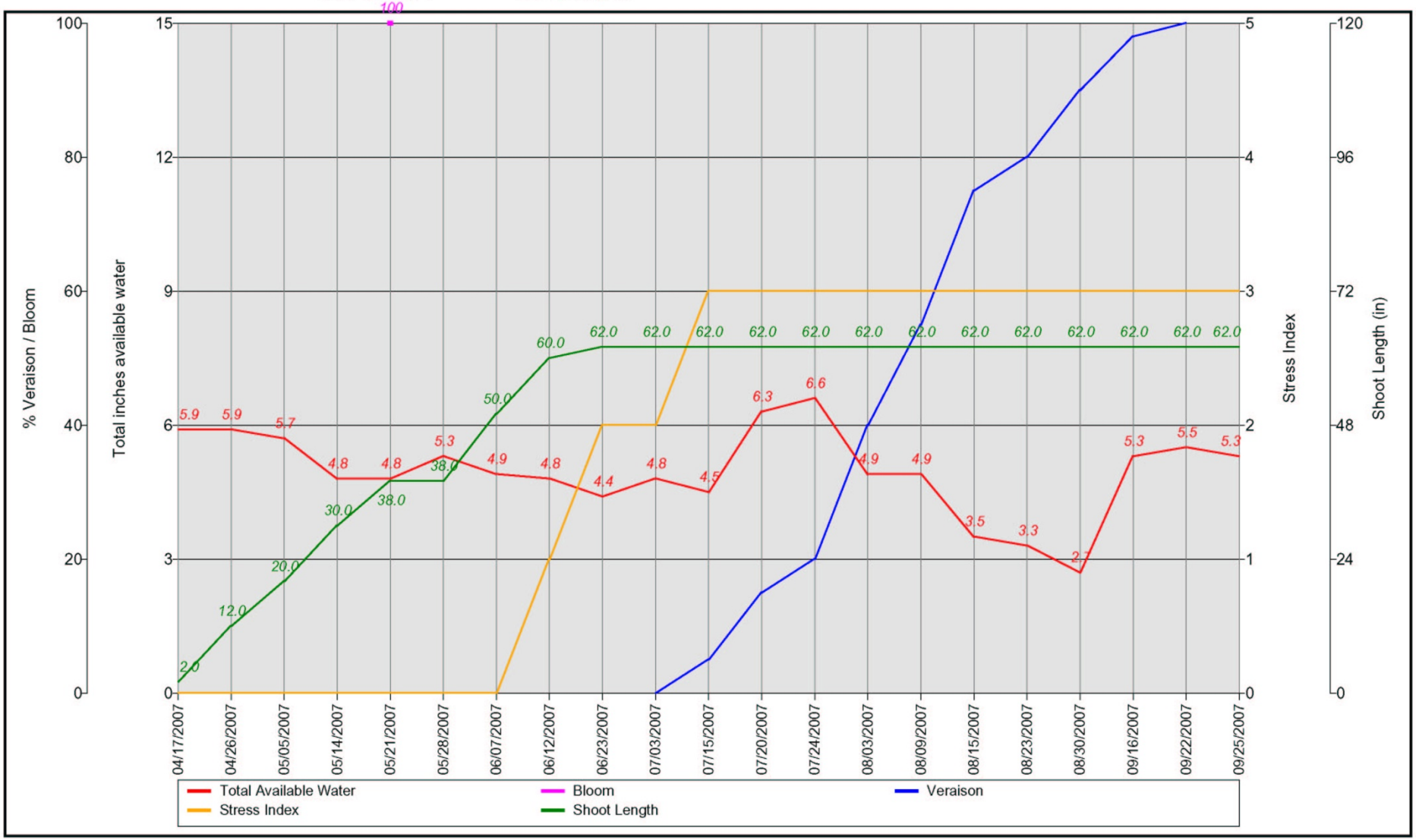
Potassium Deficiency

- Water uptake and cell membrane function can be reduced
- Leaves exhibit interveinal chlorosis yellow and leaf scorch /or early senesence
- Delayed fruit maturity or fruit does not ripen

CVC

Slow Ripening

Plant Spacing: 6 Row Spacing: 10



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TROUBLE LN
DAM RD

Mitigating Magnesic Soil in Vineyards

- Use rootstocks that take up potassium well. Shallow rooting may be desirable .
- Choose varietals with lower potassium demand
- Add soil applied calcium sources to offset the magnesium – gypsum, lime

Mitigating Magnesic Soil in Vineyards – Page 2

- Apply liquid calcium fertilizer through the drip system during or prior to potassium applications
- Use foliar fertilizers to supplement soil or drip applied materials
- Reduce yields until fruit reaches acceptable maturity

Questions or Comments?

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