Blueberry Production Techniques

Profitable Niche Farming: North Coast

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Land Preparation

- Debris Removal
- Leveling
- Ripping
- Fumigation?
- Etc.

Soil Test

- Analysis should incorporate a basic panel
- pH
- Bicarbonates
- Electro-Conductivity

Soil Acidification

- Soil Sulfur
- Sulfuric Acid
- Citric Acid
- Others

SJV Soil-Reaction ranges
from neutral to moderately alkaline.....

Typical application, 3 to 5 tons per acre

$$2HCO_3 + H_2SO_4 \rightarrow SO_4 + 2H_2O + CO_2$$

The field must be flooded with sufficient water to incorporate the acid

Crop Establishment
Soil Prep

- Apply soil amendments
- Apply pre-plant fertilizer
- Apply organic material (pine bark/wood)
- Incorporate all materials
- Shape Berms
- Cut V on top of Berm

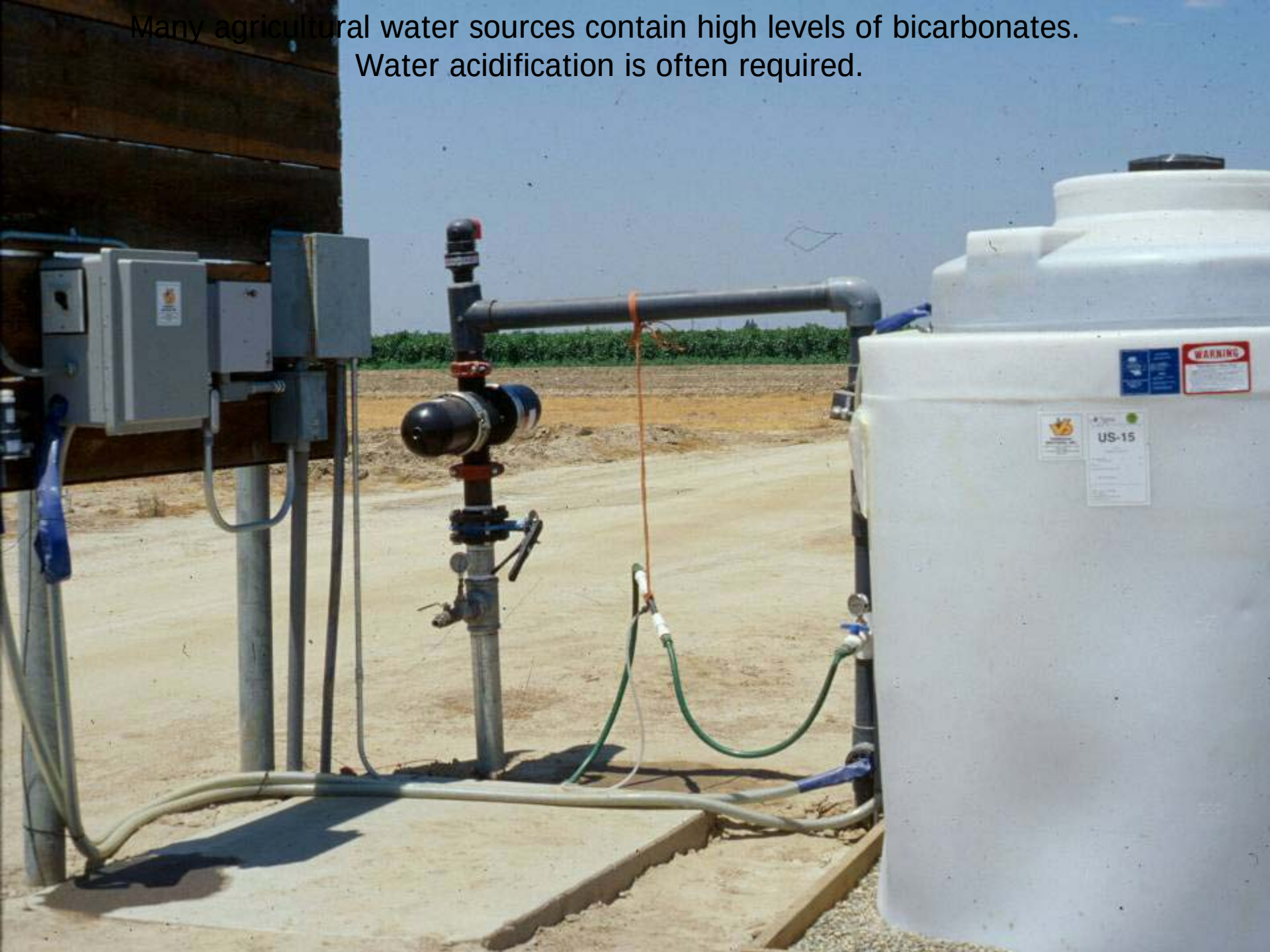
Crop Establishment Blueberry Planting

- Plant on Berm
- Apply topical mulch
- Install 2 hoses (18-12” emitter spacing @ 2L/hr./emitter)

Irrigation Water Acidification

- Sulfuric Acid
- Urea Sulfuric Acid
- Citric Acid

Many agricultural water sources contain high levels of bicarbonates.
Water acidification is often required.



Acid pumps require accurate Calibration

Pollination

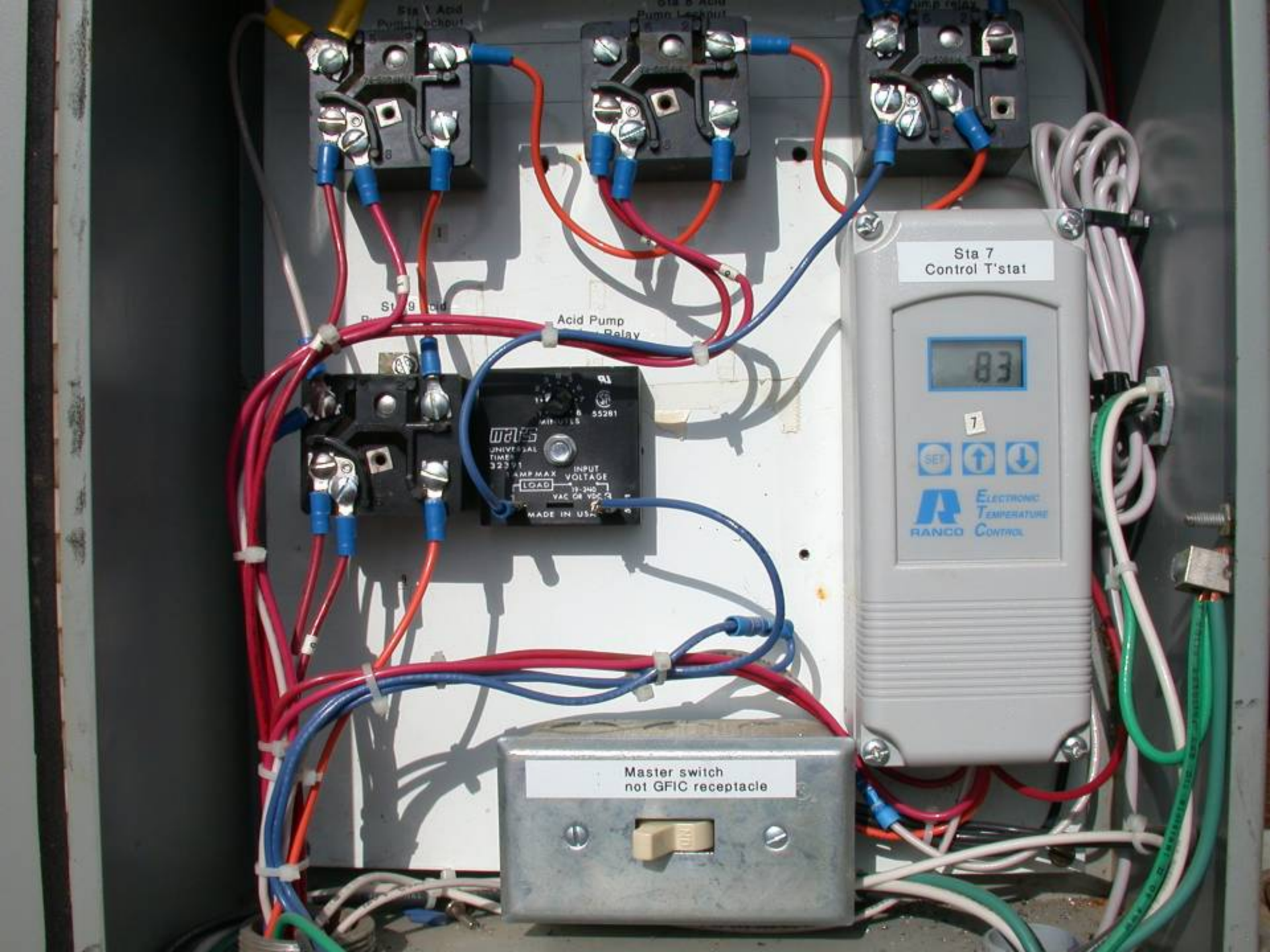

Bees are required for better fruit set

Hoophouse Culture


Plastic Culture for early production


Hoop house

Ambient Temperature Cooling


Sta 7
Control T'stat
83
7
SET
RANCO
Electronic
Temperature
Control
Acid Pump
Relay
Master switch
not GFIC receptacle
INPUT
VOLTAGE
LOAD
MADE IN USA

Important Blueberry Cultivars


Cultivar: Misty


JEWEL


EMERALD


Cultivar: Oneal


STAR


SOUTH MOON
107


REVEILLE


LEGACY
108

Dr. Carlos Crisosto
Post-Harvest Physiologist ,KAC
Has been conducting post harvest work on blueberries

Postharvest Research Studies
Dr. Carlos Crisosto

Parameters for Selected Cultivars 6/25/05

Cultivar	Firmness[1] (lbs.)	Weight[2] (g)	SSC (° Brix)
Southmoon	1.7	84.2	14.5
Oneil	1.3	55.7	11.8
Reveille	1.8	26.5	17.3
Misty	1.6	56.0	12.2
Star	1.6	77.1	12.9
Emerald	1.7	47.2	12.9
Jewel	1.2	50.6	14.0
Legacy	1.5	75.1	11.9

[1] Compression to a depth of 4mm

[2] Weight of 30 fruit harvested at random


Driscoll's
Blueberries
Driscoll's
Blueberries
Driscoll's
Blueberries

Blueberry Research

UC Kearney Research & Extension Center
Parlier, CA

- Plant Spacing
- Plant Size Evaluation
- Southern Highbush Cultivar Comparison
- Pruning Evaluations
- Irrigation Study
- Mulch Comparisons
- Integrated Pest Management
- Mulch decomposition Study (new)
- Mulch, Plant Health (new)
- Soil pH Demonstration
- Post-Harvest Studies
- Herbicide Phyto-toxicity / Efficacy

Cultivar Comparison

Lbs per plot (7 plants)

	2007	2006	2005	2004	2003	Cum.
Jewel	123.11 a	142.92 a	44.58 b	62.02 a	55.66 a	**428**
Emerald	104.00 ab	98.02 b	56.96 a	49.60 ab	44.51 b	**353**
Legacy	89.66 b	77.38 c	65.42 a	49.50 ab	38.63 bc	**321**
Jubilee	45.79 c	41.43 de	28.67 c	41.63 bcd	34.66 c	**192**
Star	91.15 b	52.83 de	20.25 c	49.50 ab	32.01 cd	**246**
Southmoon	86.59 b	58.48 cd	25.05 c	29.80 d	24.92 de	**225**
Misty	59.13 c	43.08 de	39.09 b	51.18 ab	23.60 e	**216**
Sharpblue	43.68 c	33.15 e	24.97 c	31.40 cde	22.89 e	**156**
Oneal	51.45 c	38.33 de	20.30 c	18.90 e	8.85 f	**138**
CV	*22.95*	*21.07*	*18.43*	*22.44*	*22.44*	
LSD	*25.86*	*20.02*	*9.73*	*13.79*	*7.94*	

** Treatment means followed by different letters are significantly different (P < 0.05).*

Factors Influencing Cultivar Health & Productivity

- Differential irrigation requirements
- Crop nutrition
- Plant spacing
- Productive life potential
- Susceptibility to insect & disease pressure
- Pruning method

Plant Spacing Trial
Lbs. per plot
(Cultivar: Misty)

Plant Spacing	2003	2004	2005	2006	2007	Cum.
18”	40.6 a	55.8 a	40.6 ns	57.3 ns	56.33 ns	**251**
24”	34.6 ab	48.2 ab	41.3 ns	49.1 ns	46.29 ns	**219**
30”	30.2 bc	54.3 a	42.9 ns	53.5 ns	54.31 ns	**235**
36”	26.8 cd	56.3 a	42.0 ns	52.0 ns	54.83 ns	**232**
42”	21.3 de	38.6 b	35.3 ns	53.5 ns	40.25 ns	**189**
48”	17.4 e	42.6 b	35.7 ns	49.8 ns	52.30 ns	**198**
CV	*16.1*	*13.4*	*25.6*	*15.3*	*14.19*	
LSD	*6.91*	*9.93*				

** Treatment means followed by different letters are significantly different (P < 0.05).*

Plant Size Evaluation

Lbs. per plot (7 plants,)

Cultivar: Misty

Treatment	2003	2004	2005	2006	2007	Cum.
1 gal. grow bag	25.7 a	55.5 a	46.1 a	47.9 ns	38.20 *	**223**
1 liter liner	11.7 b	44.2 b	41.0 ab	54.2 ns	81.36 ns	**198**
2X5 field pot	0 c	44.8 b	36.4 ab	46.3 ns	73.94 ns	**175**
Rooted cutting	0 c	32.3 c	34.4 b	46.8 ns	76.46 ns	**162**
2” cell	0 c	42.0 bc	33.5 b	58.6 ns	76.05 ns	**174**
3.5” pot	0 c	40.9 bc	33.5 b	48.0 ns	85.88 ns	**165**
CV	*54.4*	*14.9*	*12.8*	*16.7*	*23.37*	
LSD	*4.17*	*9.75*	*10.01*			

- *Treatment means followed by different letters are significantly different ($P < 0.05$).*

**Gopher Damage*

Mulch Study

Lbs./Plot

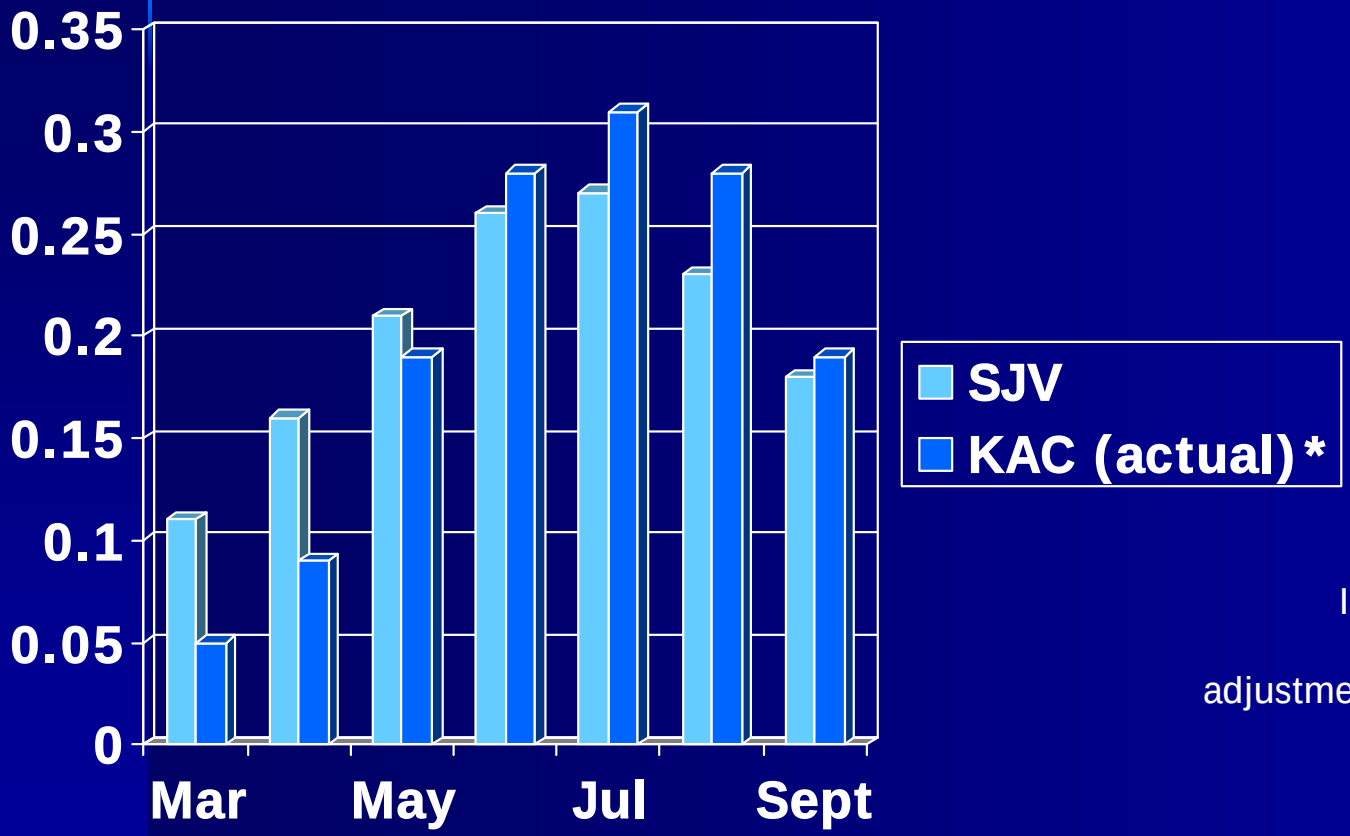
	2007	2006	2005*	2004	2003	Cum.
Pine Mulch	72.48 ns	49.83 ns	17.12 ns	33.10 ns	28.18 bc	**201**
Black Plastic	74.86 ns	57.51 ns	15.20 ns	34.78 ns	38.30 a	**221**
Almond Shells	73.41 ns	51.33 ns	13.60 ns	33.55 ns	35.06 ab	**207**
Pine Mulch > 4 years	87.64 ns	41.23 ns	12.70 ns	29.43 ns	24.29 c	**195**
Untreated Check (5)	63.73 ns	43.58 ns	12.18 ns	32.73 ns	26.90 bc	**179**
Untreated Check (3)	49.36 ns	43.78 ns	11.76 ns	31.58 ns	30.19 abc	**167**
CV	*25.98*	*20.81*	*38.69*	*25.34*	*18.44*	
LSD					*8.48*	

*Botritus


Blueberry Research initiated 1997, KAC

KAC Blueberry Irrigation based on Estimated Reference Evapotranspiration (ETo)

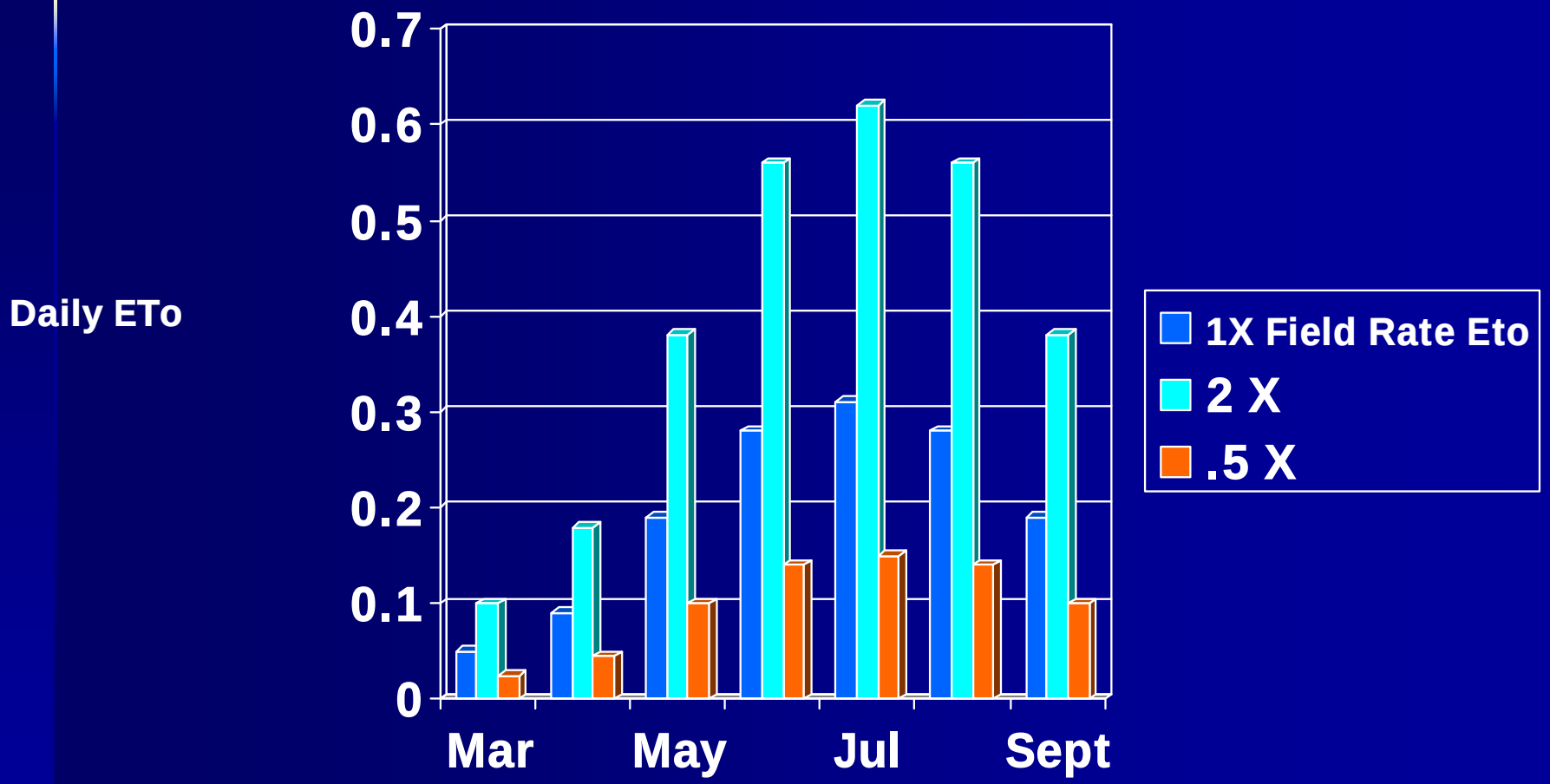
for the San Joaquin Valley (inches/day)



Irrigation Schedule is set
By historical ETo rates
adjustments are dependent on soil probe

Blueberry Irrigation Trial

Water Rates



Irrigation Trial

Variety: Oneal

Treatment	2003	2004	2005	2006	2007	**Cum.**
Single hose: 1L (.5 X)	8.6 ns	14.6 ns	22.5 ns	50.0 ns	56.00 ns	**151.71**
Double hose 1L (1 X)	8.9 ns	18.3 ns	21.4 ns	38.7 ns	63.23 ns	**150.53**
Single hose 2L (1 X)	11.6 ns	14.0 ns	21.1 ns	53.0 ns	62.25 ns	**161.95**
Double hose 2L (2 X)	8.9 ns	17.5 ns	19.2 ns	37.2 ns	70.09 ns	**152.76**
CV	*32.4*	*16.6*	*24.8*	*20.1*	*17.39*	
LSD	*--*	*--*	*--*	*--*		

Irrigation Management Study (new)

- Dr. Larry Schwankyl, University of California, Irrigation Specialist


1000 lbs
Lime/Acre


No Soil
Amendments
Added

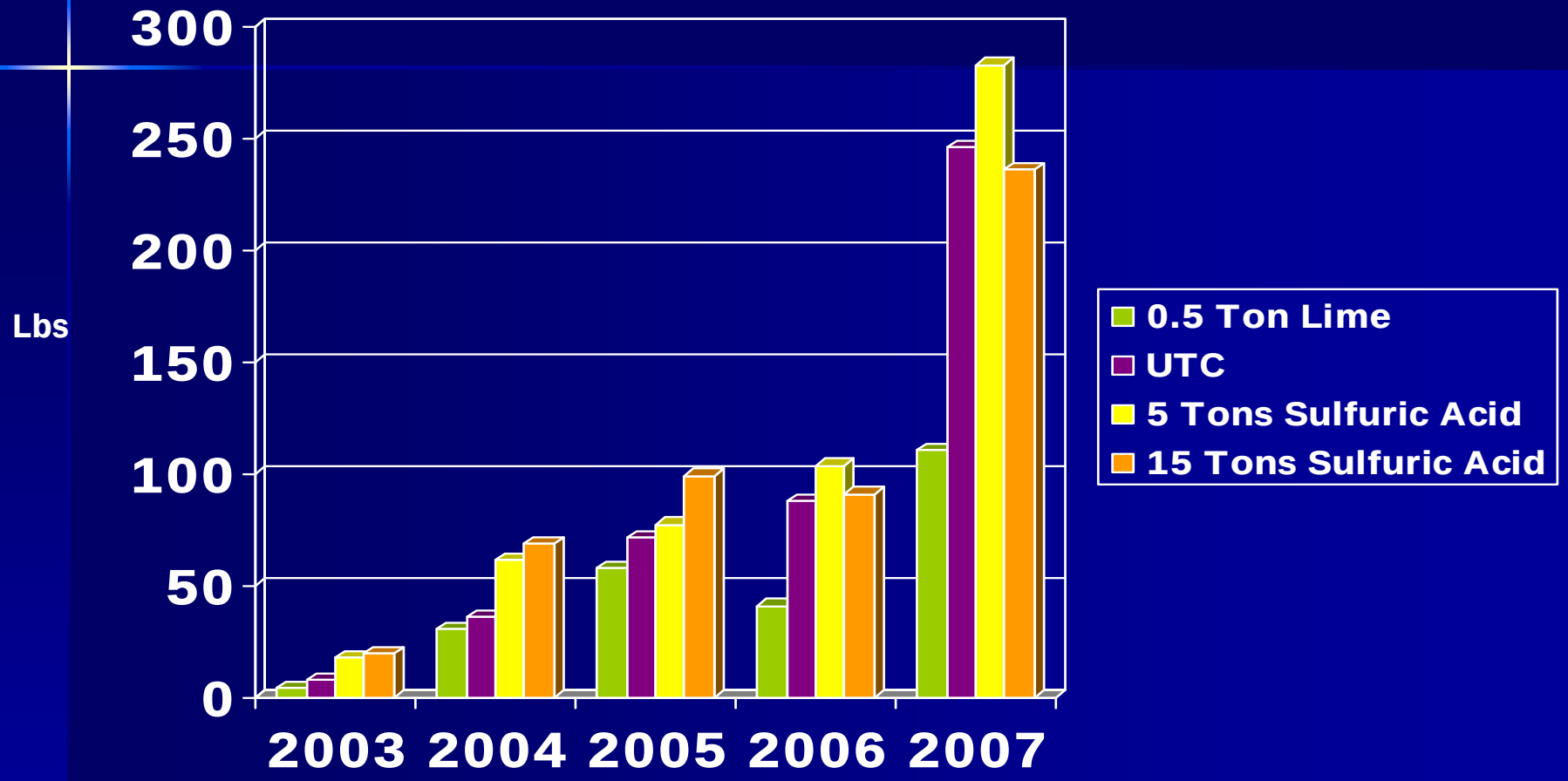

ECHOTA
November 2005

Soil pH demonstration
Lbs./Plot

Treatment	Soil pH 2003	2003	2004	2005	2006	2007	Cum.
0.5 Ton $CaCO_3$	7.1	4.1	30.1	57.6	40.85	110.35	243
Untreated	6.4	7.7	35.9	71.3	87.85	246.20	449
5 Tons H_2SO_4	6.0	17.6	61.2	77.2	103.55	282.8	542
15 Tons H_2SO_4	5.6	19.6	68.4	99.1	90.85	236.20	514

Soil pH Demonstration

Yield/Plot



Soils & Plant Health

- Blueberries grow best in sandy and sandyloam soils
- Blueberries are difficult to grow in clay soils
- pH is probably not as critical as irrigation water bi-carbonates

Trips injury

David Haviland, Kern Co.
conducting research

Weed Management

Herbicide Plant Injury Trial

- Sandea, Rely, Gramoxone, Ignite, Shark Chateau & Roundup Weathermax
- Nearly all the contact herbicides resulted in some foliar injury
- Soil incorporated Sandea caused significant plant injury
- Nut grass control, poor


Crop losses from Bird feeding

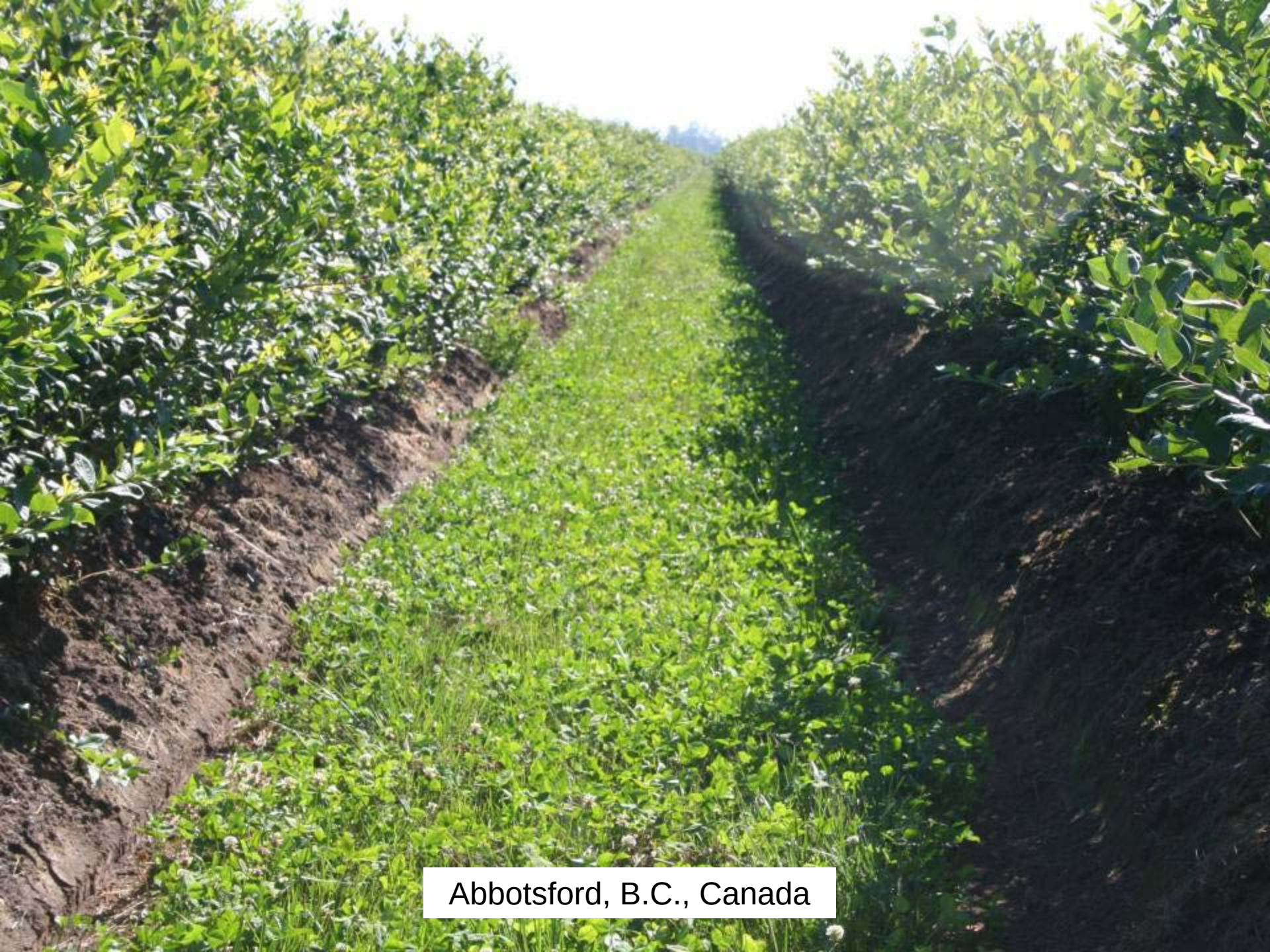
Fruit Losses Caused by Birds

- Migratory birds, i.e. Cedar WaxWing caused greatest losses
- Many species are protected by law
- Small fields adjacent to bird habitat also have significant losses.


Georgia: Highbush


Georgia: 20 year plants


Los Reyes, Michoacan, Mexico


Abbotsford, B.C., Canada

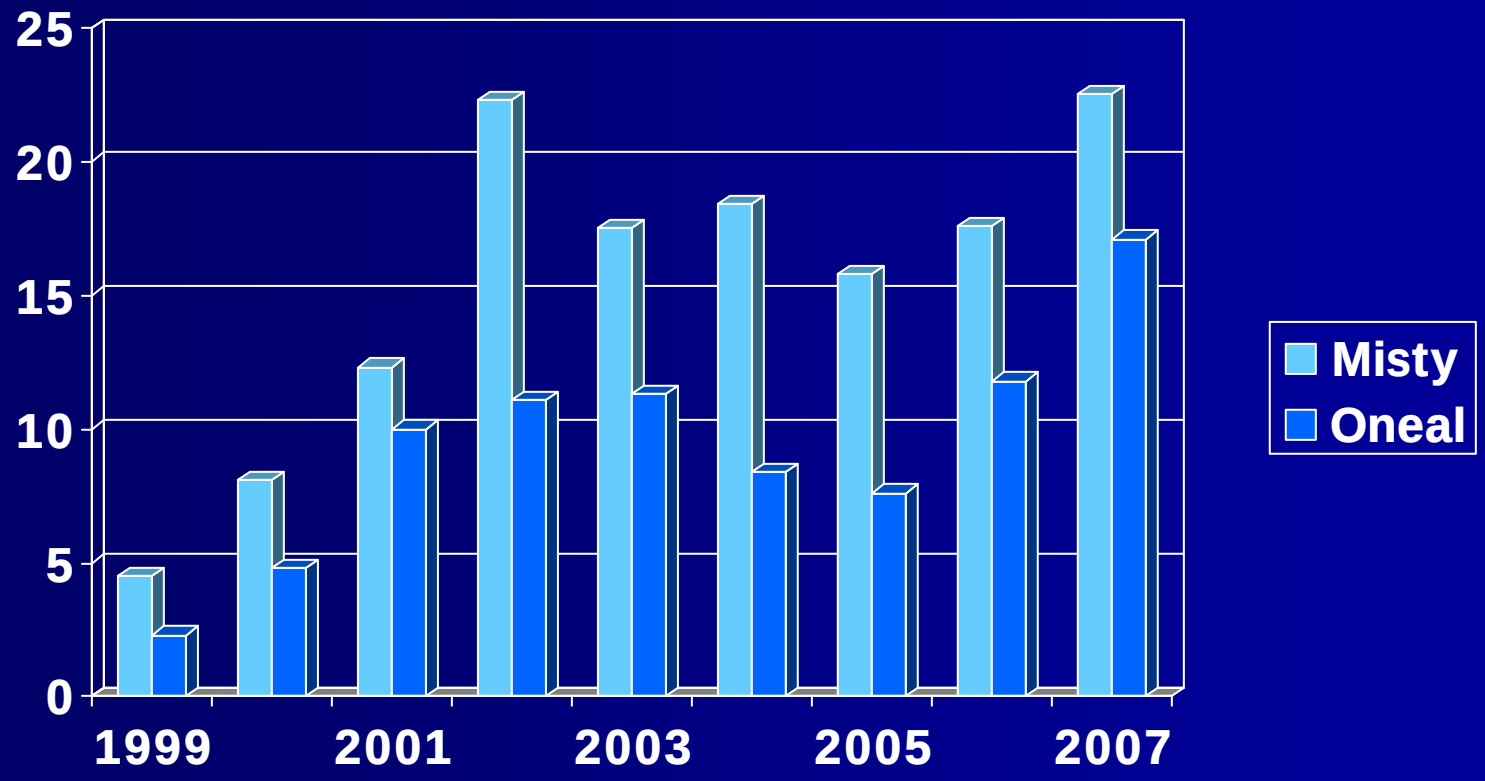

Botrytis Flower blight
Economic losses 2005

Splitting and post-harvest rot caused by rains 2005

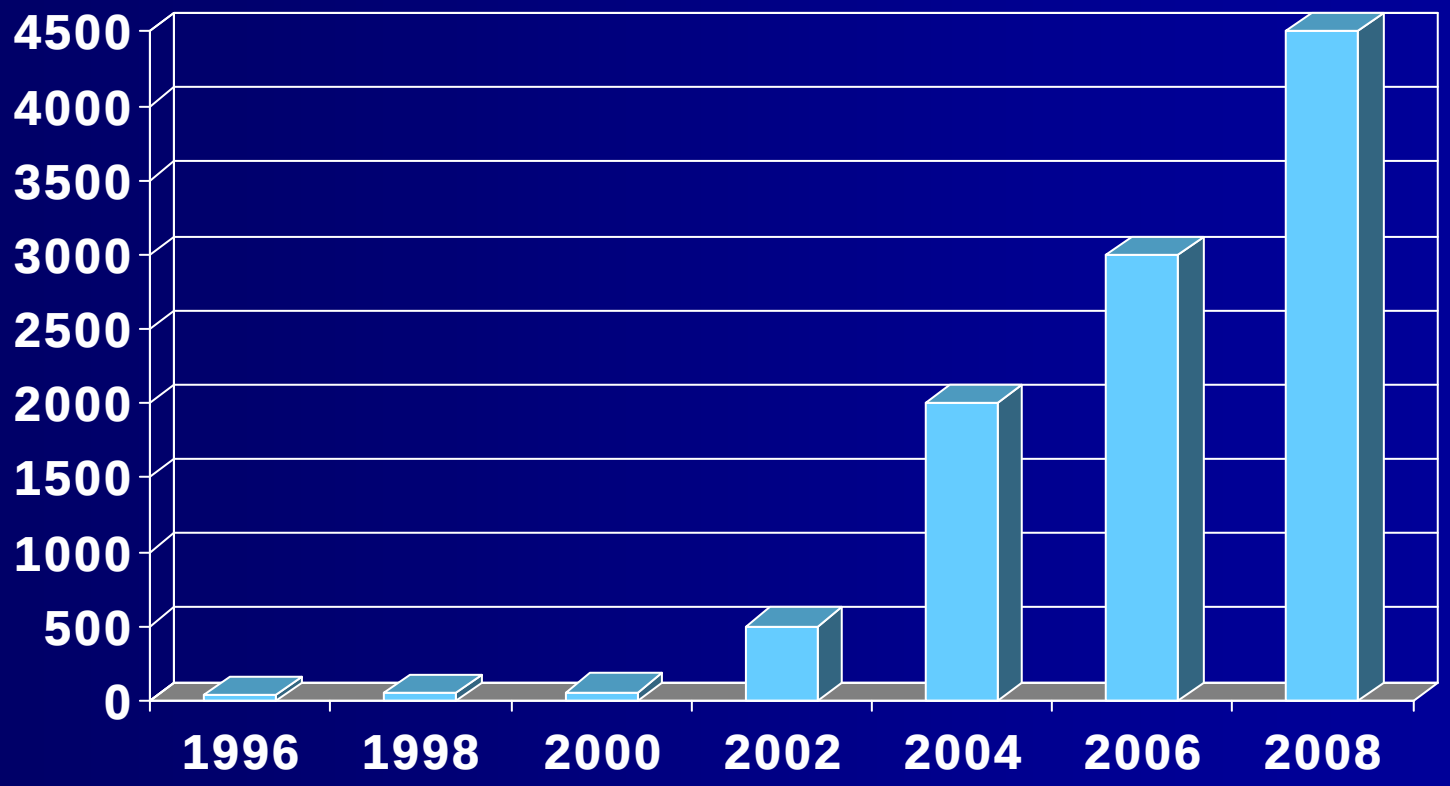
Variety: Jewel


Adverse Weather: Hail damage and Fruit softness
caused by excess heat

Observational Yield Trial
Lbs. per plant



California Blueberry Acreage Estimate



Blueberry Acreage in California
Total 4,800 ± 200 Acres

Northern San Joaquin Valley
20%

Southern San Joaquin Valley
65%

Central and Southern Coast
15%

Thank you

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