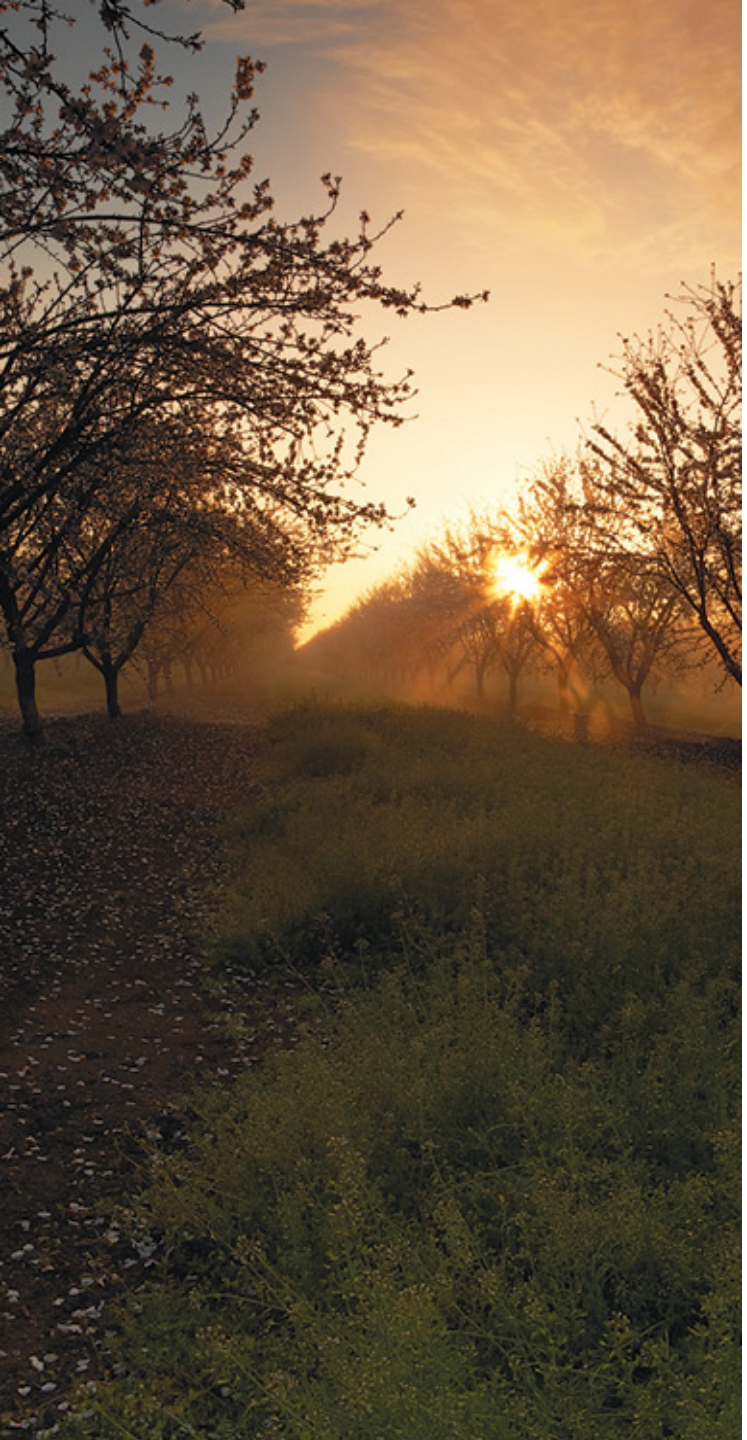
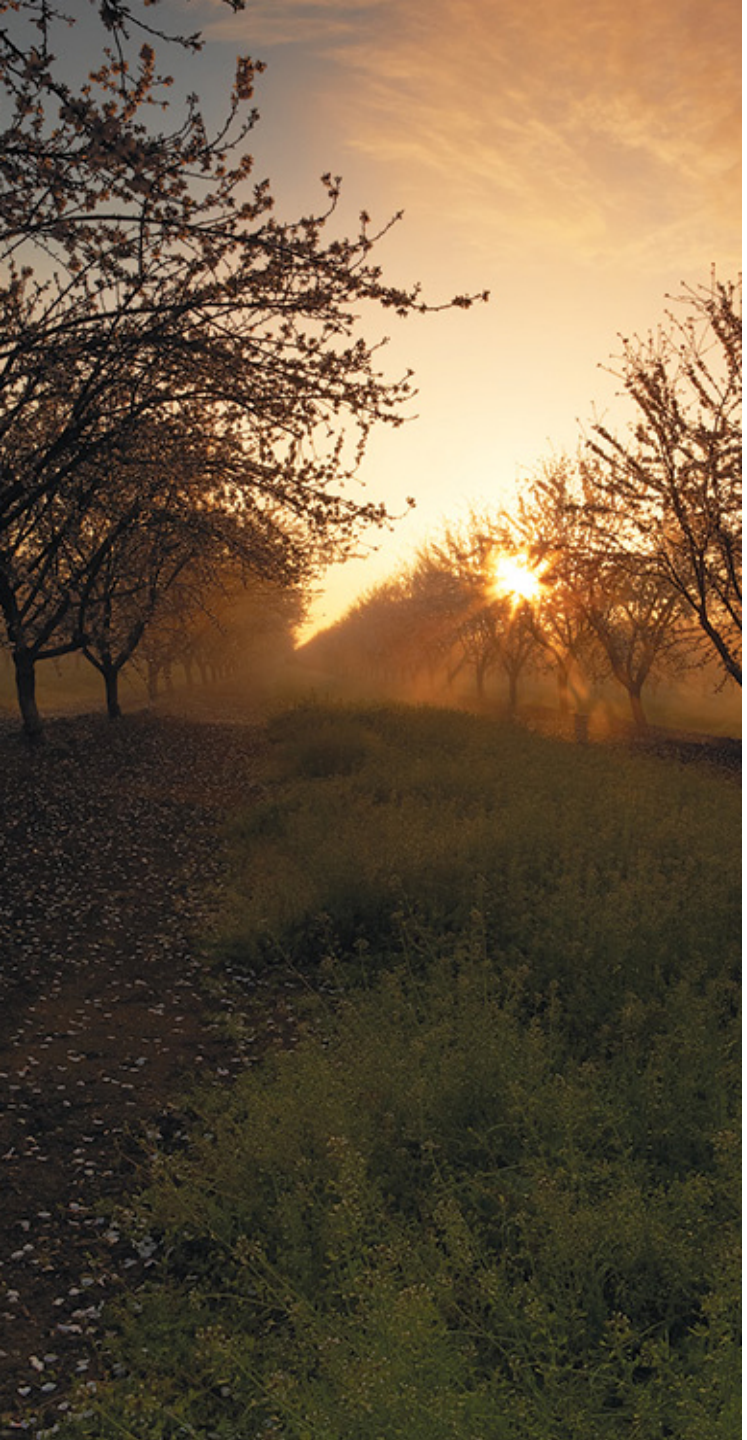


New Orchard Development: Site Evaluation through Planting

David Doll
Farm Advisor
UCCE Merced County



New Orchard Development

1. Site Evaluation
2. Site Sampling
3. Orchard Removal
4. Soil Amended/Modification
5. Soil Fumigation
6. Orchard Planting

Site Evaluation: Soil Differences

Learn from the old orchard!

Aerial image through Google Earth, walking the field

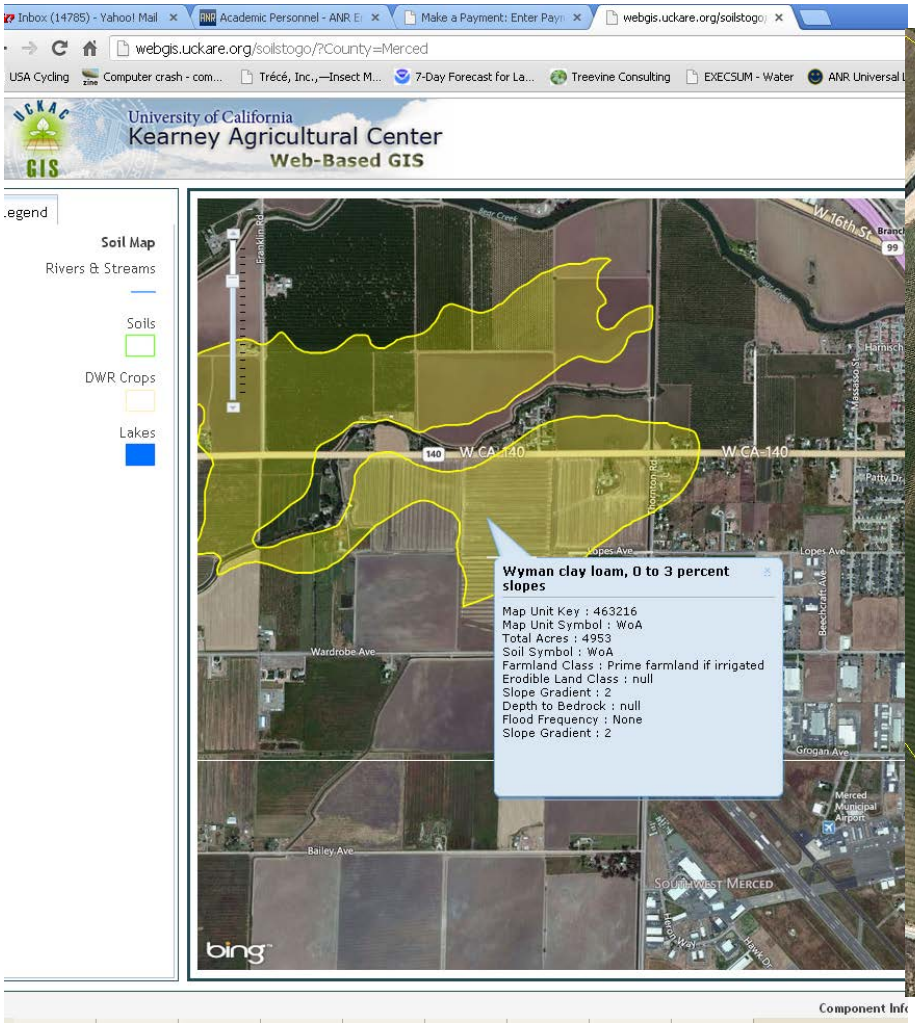
Determine areas of variability and address

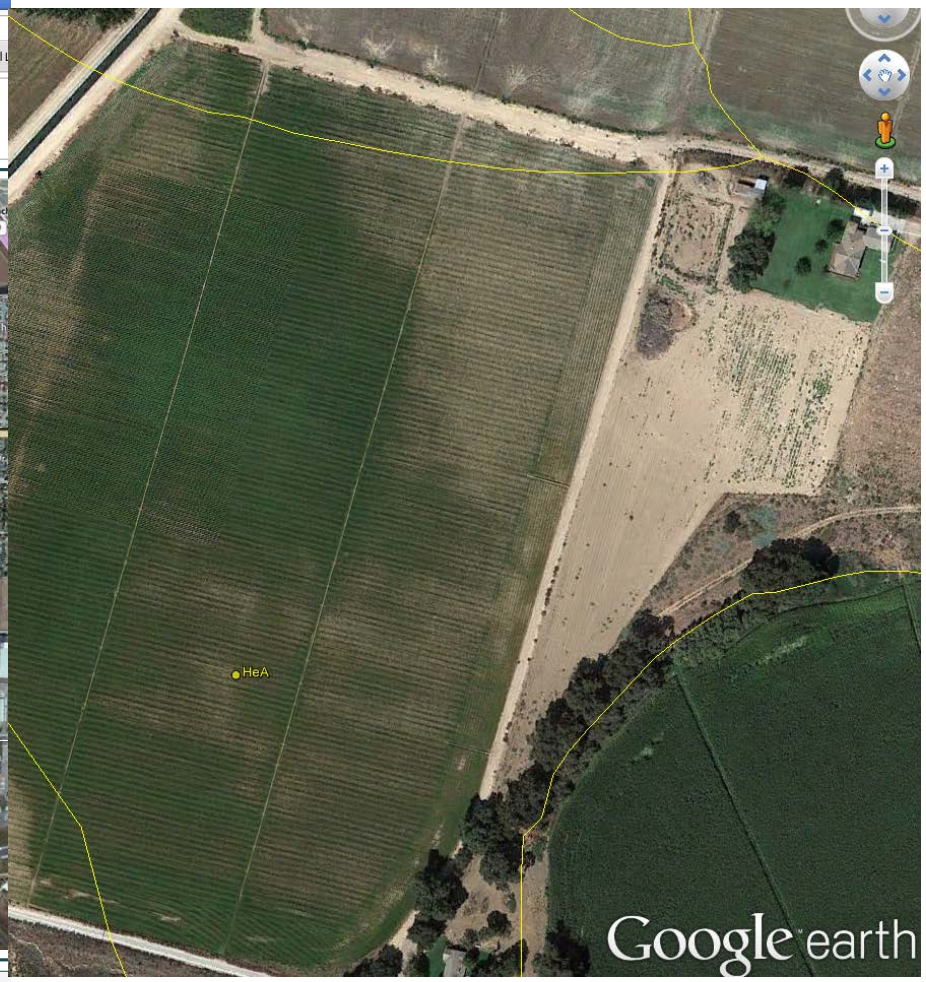
- Soil Modification – ripping, backhoeing, slip-plowing

- Irrigation system – High volume/low volume

- Rootstocks – Determine options for salinity, boron, alkalinity, high water table, etc.

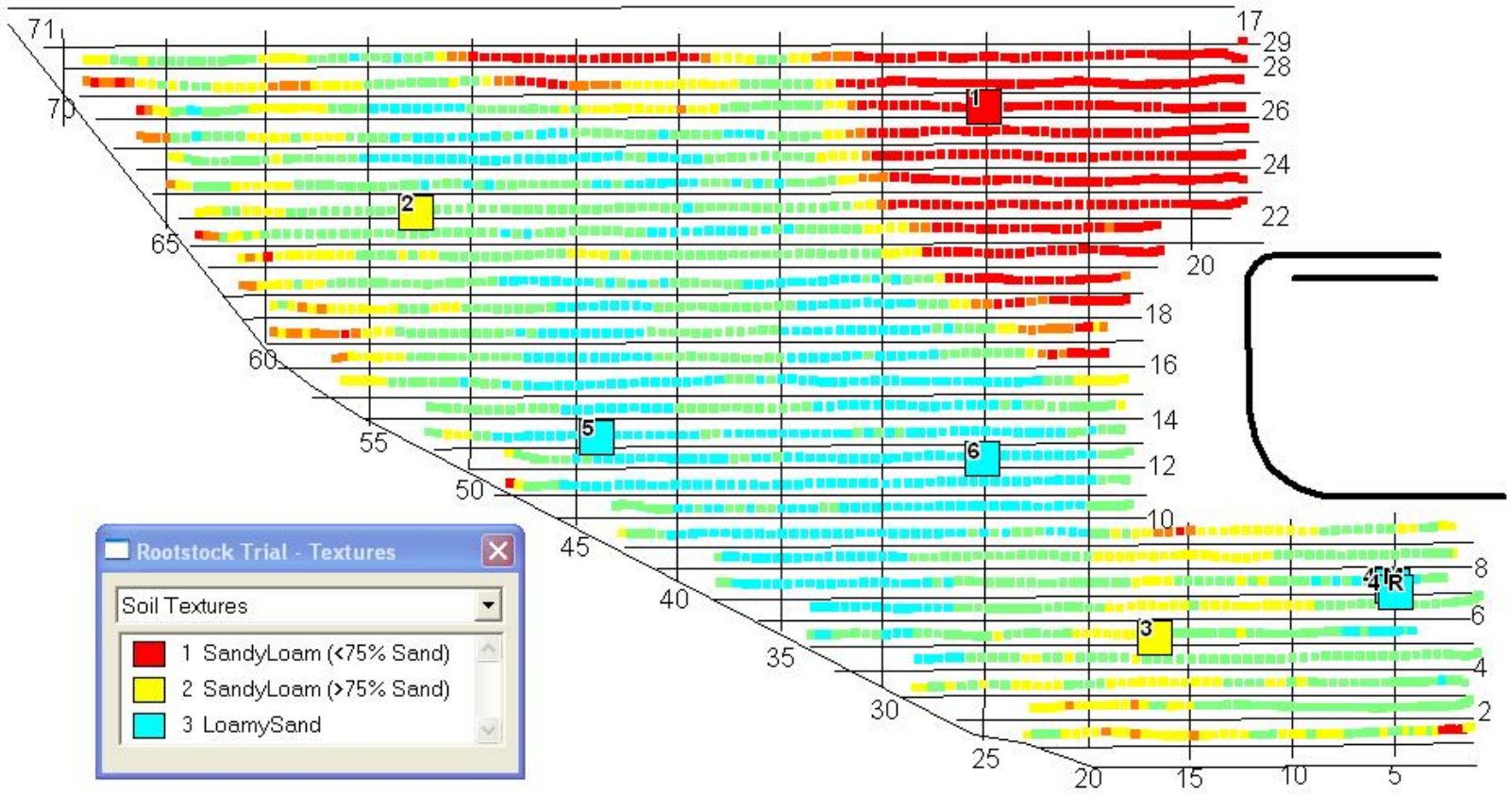
Site Evaluation: Soil Differences





Soil Map: Soils-2-Go, NRCS, Google Earth, etc.

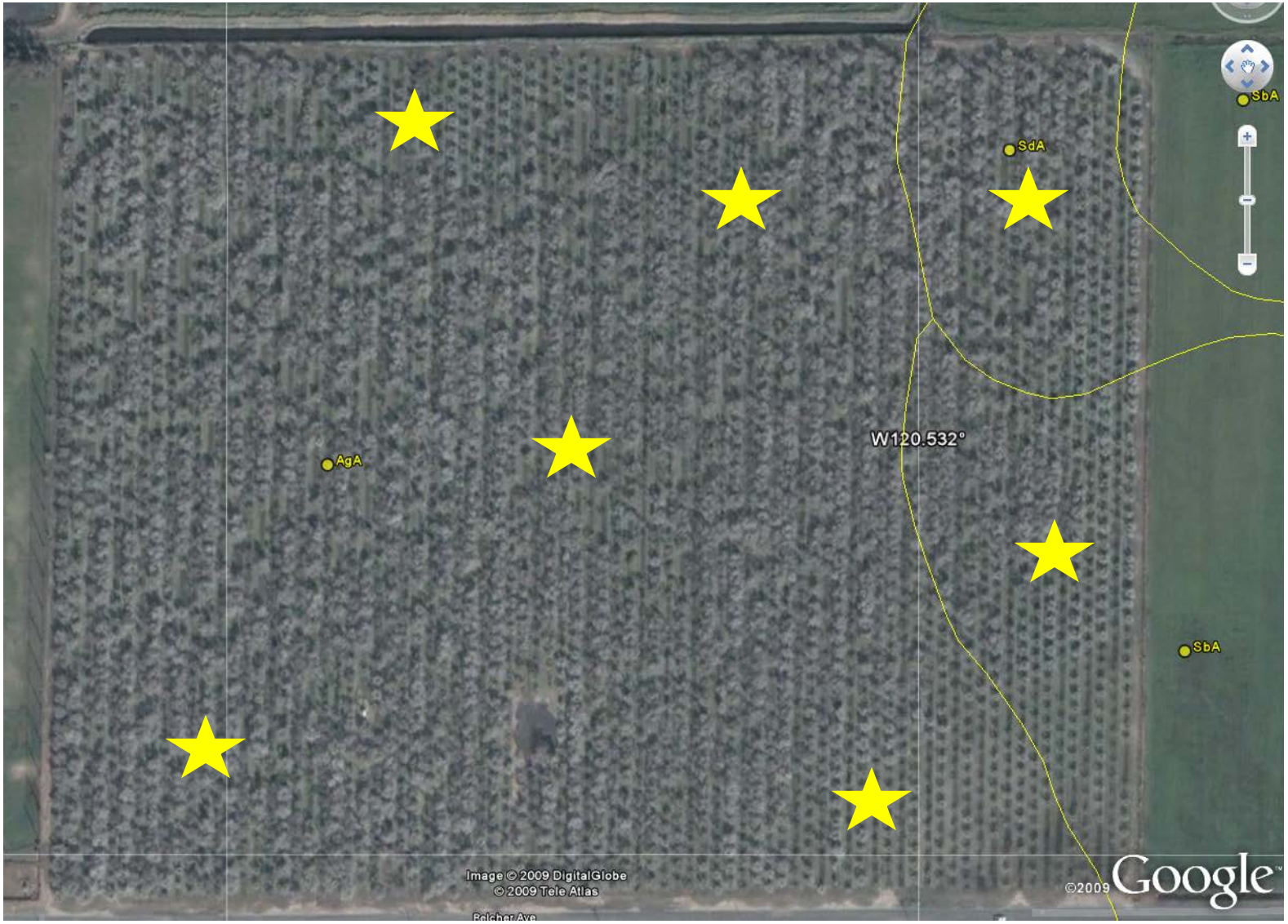
Site Evaluation: Electrical Conductivity Mapping



Measures the EC of the soil, which can relate to texture, salinity differences.

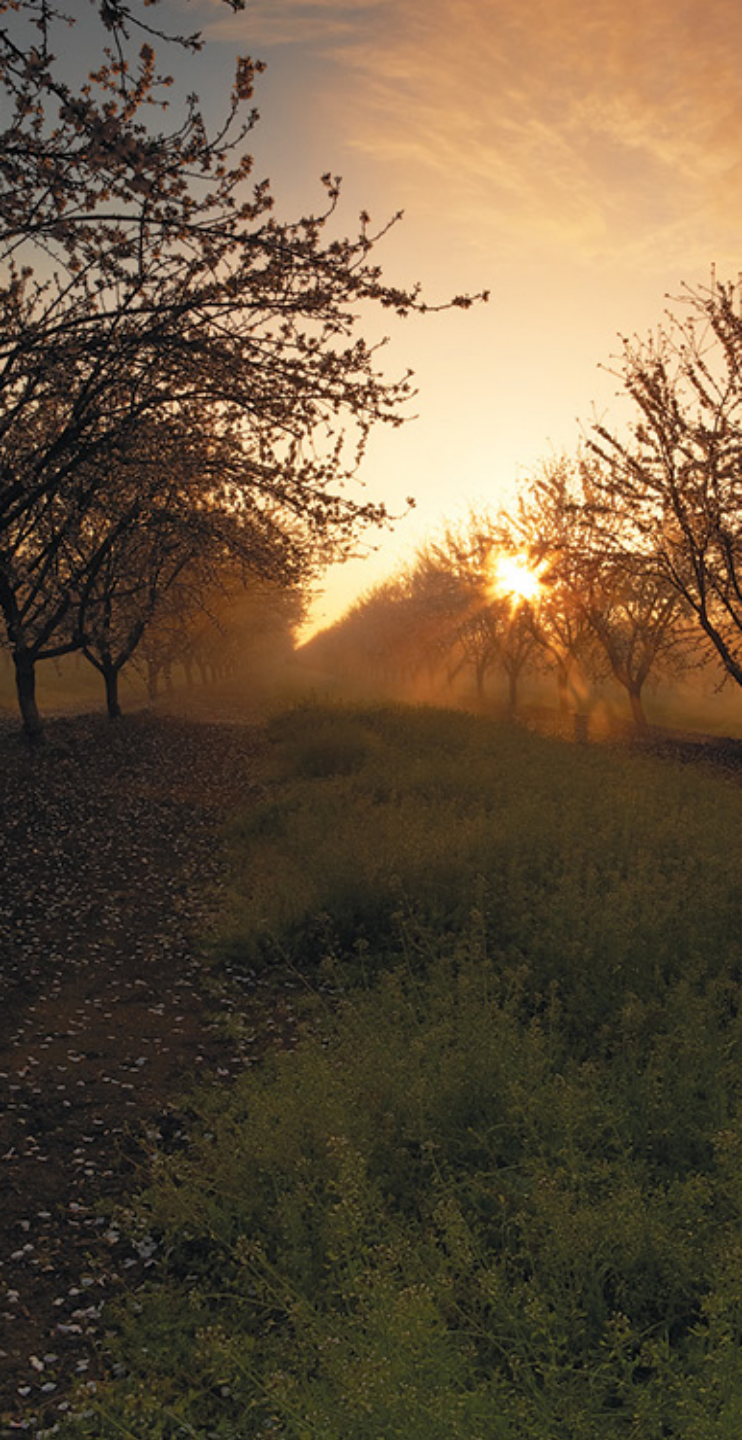
Can group areas by texture or type to increase water, nutrient efficiency, yield

Site Evaluation: Backhoe Pits



Backhoeing Soil Pits – Why?

1. Determines soil layering
2. Uncovers the soil's secrets
3. Provides opportunity to sample various depths of soil



New Orchard Development

1. Site Evaluation
2. Site Sampling
3. **Orchard Removal**

Orchard Removal

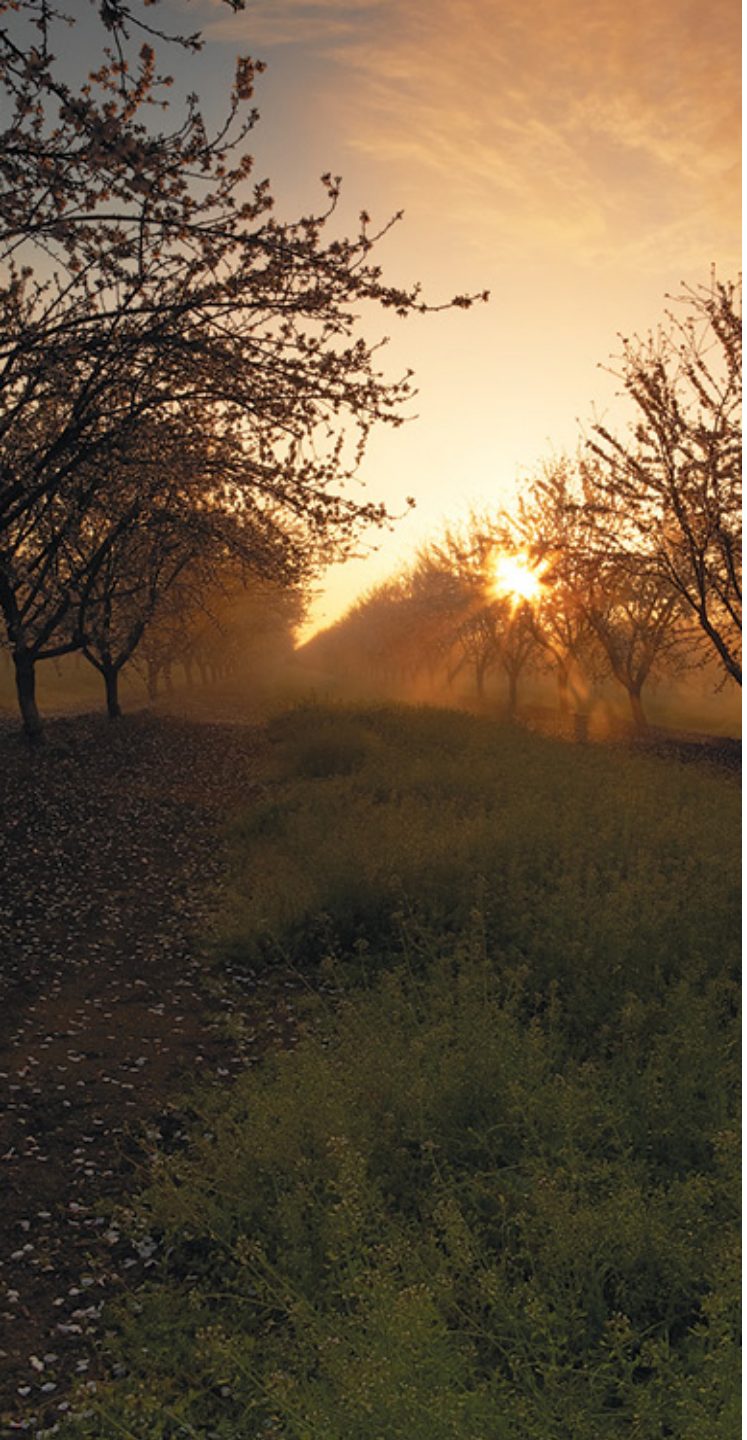
Tub Grinder

Pull and Burn

“Iron Wolf”

Orchard Removal - Generalizations

	Stack and Burn	Grind and Haul (Tub Grinders)	Grind, Shred, and Incorporate (Iron Wolf)
Removal Time	Fast	Medium	Slow
Required Permits	Yes – size and county dependent	No	No
Root Ripping/Removal	Yes 3-5 passes	Yes 3-5 passes	No
Soil benefits	Some	Minimal	Increased OM, microbial activity, more??
Growth Issues	Minimal	Some (piles)	Minimal



New Orchard Development

1. Site Evaluation
2. Site Sampling
3. Orchard Removal
4. **Soil Amending/Modification**

Soil Modification

Slip-Plow

Backhoe

Ripper

Soil Modification - Generalizations

	Ripping	Slip Plow	Backhoe
Strength	Shattering Hardpan	Mixing Layers	Mixing Layers
Cons	Doesn't Mix Layers – tend to reform	Expensive to break hardpans, settling, pulls up "bad stuff"	Expensive, settling
Areas of Use	Hardpan within the first 4 feet	Extensive fine and coarse layering, heavier soils	Area of layering, compaction, lighter soils

Soil Modification – Slip Plow?

1 foot of clay-loam, followed by 1 foot of sandy-loam, 1 foot of clay-loam

2 feet of “good” followed by multiple layers of clay, sand, etc.

Soil Modification – Slip Plow?

2 feet of sandy loam, followed by several feet of sandy clay-loam

3 feet of “good” followed by 3 feet of gravel.

Soil Modification – Slip Plow?

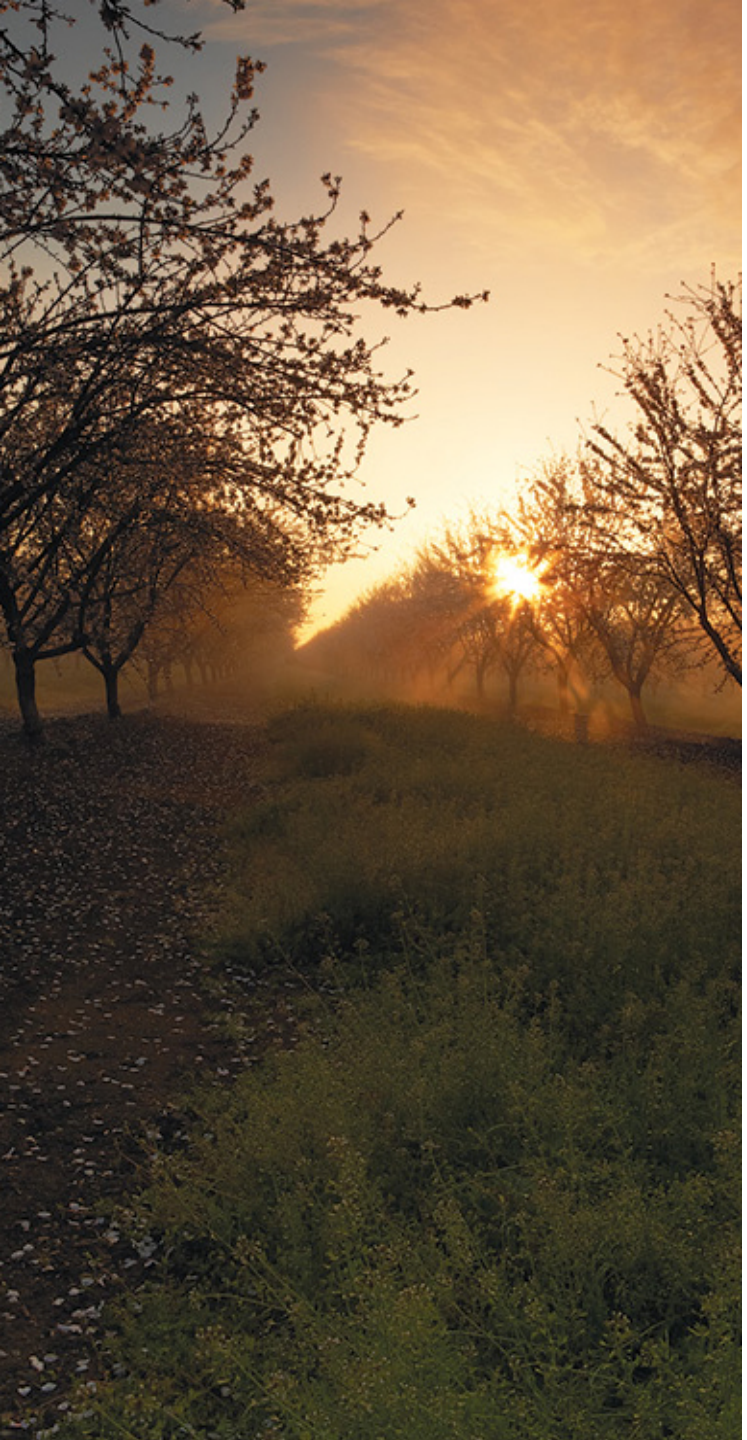
Year	Tree Age (years)	Slip Plowed (lb/ac)	Non-Slip Plowed (lb/ac)
2000	4	894	830
2001	5	1070	1243
2002	6	2725	2761
2003	7	2165	2323
2004	8	1869	1865
2005	9	1548	1841
2006	10	2910	2862
2007	11	2770	2571
2008	12	3771	3686
Cumulative		**19722**	**19982**

Arbuckle Sandy Loam, with clay underlayer, Micro-sprinkler irrigated

Slip-plowing brought rocky layer to surface

Slip Plowing probably still benefits highly layered soils

Edstrom, J., and S. Cutter. 2008. Nickels Soil Lab Projects



New Orchard Development

1. Site Evaluation
2. Site Sampling
3. Orchard Removal
4. Soil Amended/Modification
5. **Soil Fumigation**

Orchard Replanting – Replant Problems

Healthy (L) and replant disease-affected (R) almond trees, Madera County 2007

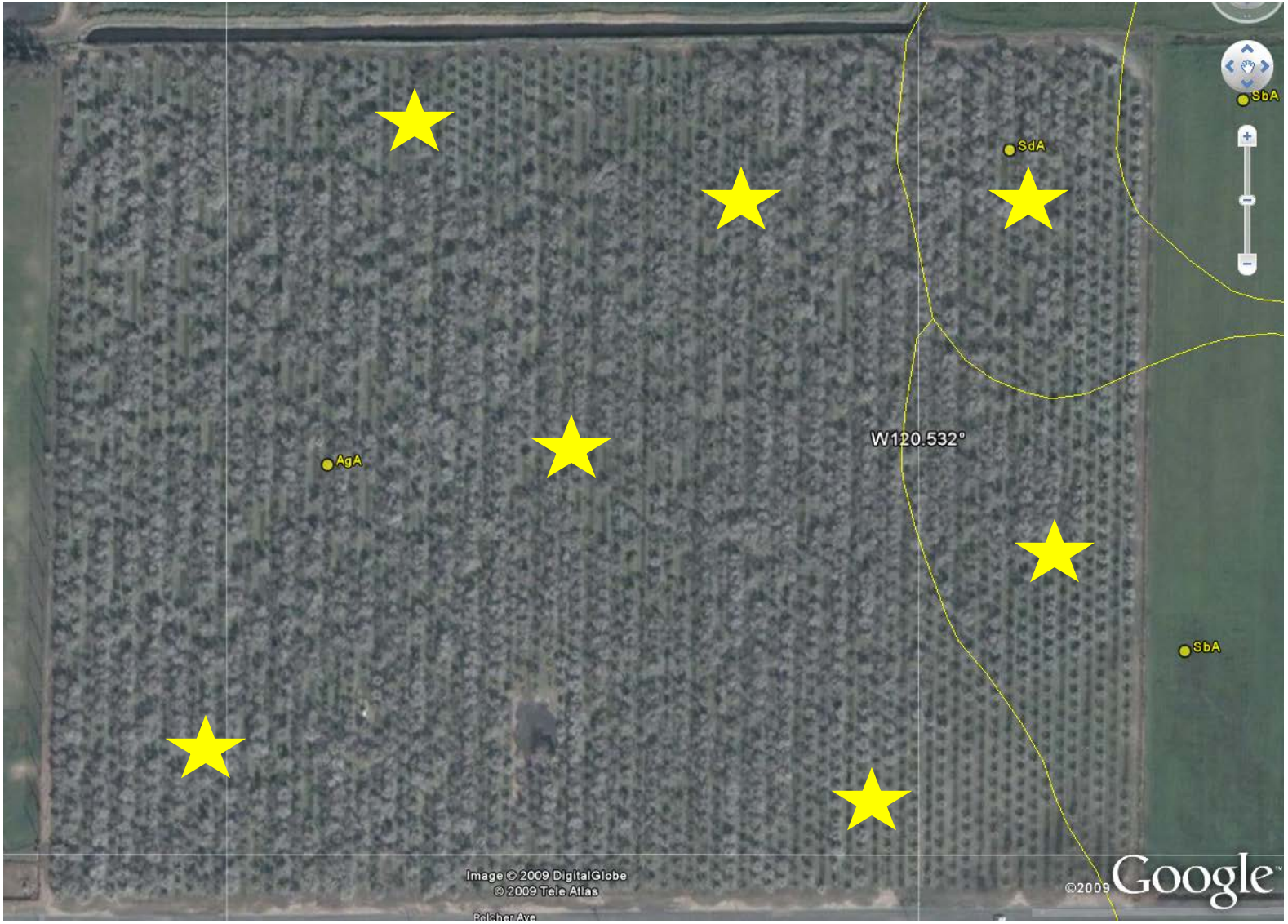
Orchard Replanting – Replant Problems

- **Abiotic factors** (physical, chemical conditions related to previous production)
- **Aggressive pathogens, pests** (*Phytophthora*, *Armillaria*, *Verticillium*, Ten-Lined June Beetle) –localized, not managed completely by fumigation
- **Plant-parasitic nematodes** (ring, lesion, root knot), approx. 35% of almond and fresh stone fruit acreage, 60% of cling peach acreage infested (McKenry)
- **Replant disease (RD)** Microbe-induced growth suppression; incidence nearly universal in *Prunus* after *Prunus,* but severity varies greatly

Healthy tree RD-affected tree

Symptoms of replant disease on almond

Orchard Replanting – Replant Problems

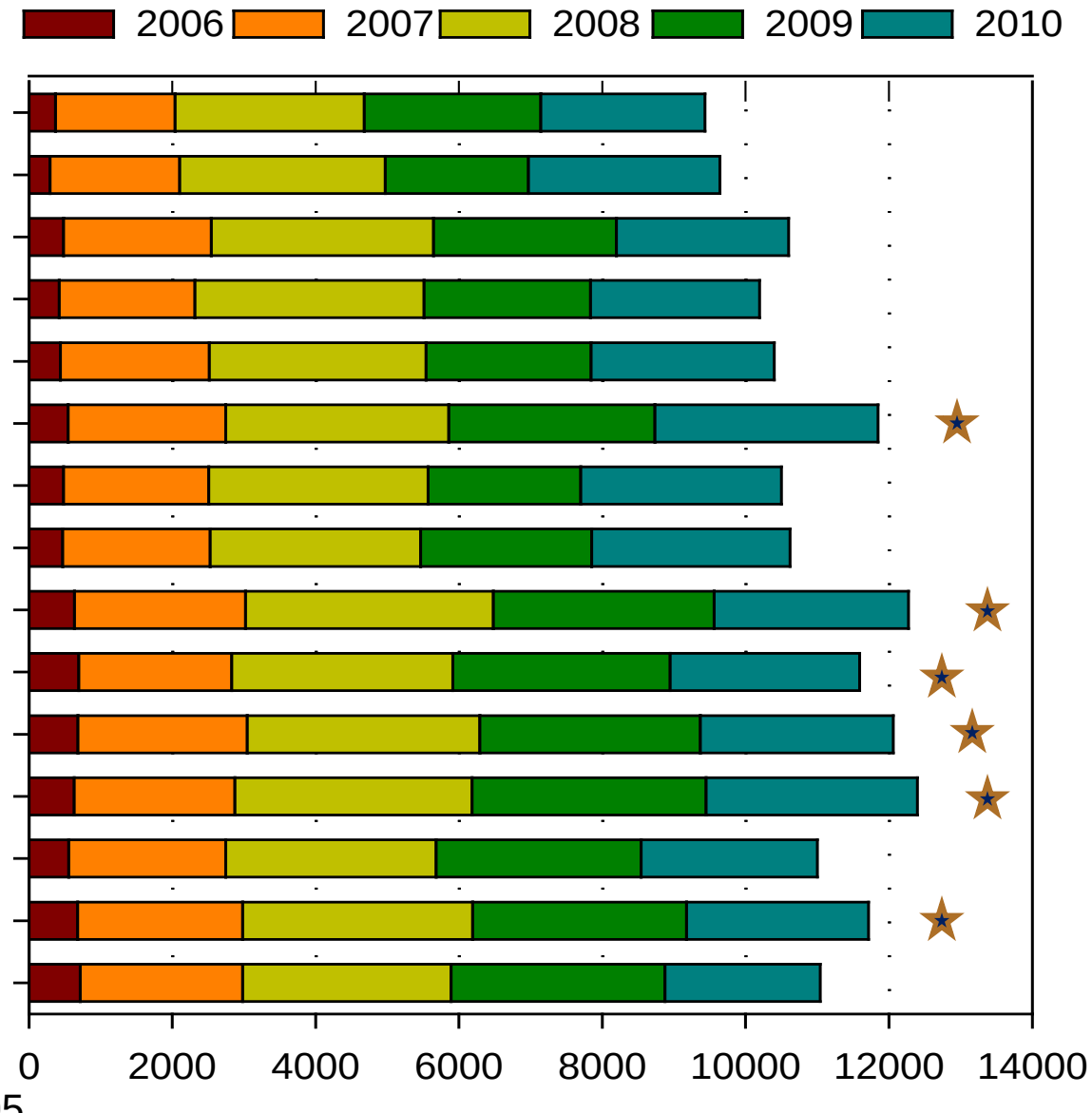


Orchard Replanting – Replant Problems

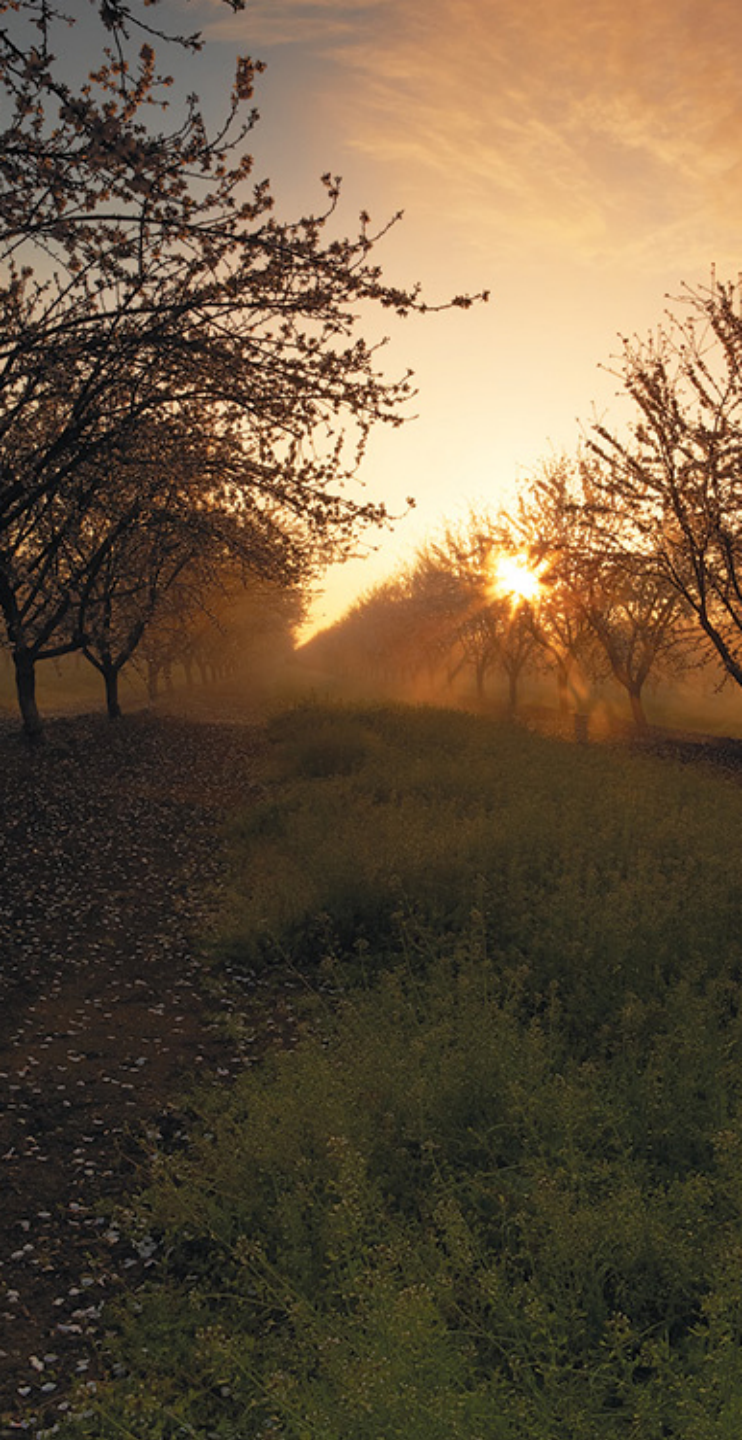
	Not Advised	Broadcast Telone II	Rowstrip C35, Chloropicrin
No Orchard History -Fallow Field, no nematodes	**X**		
No Orchard History – w/Nematodes		**X** – Population dependent	**X** – Population dependent
Orchard History, No Nematodes, Sandy Loams or coarser			**X** – C35
Orchard History, No Nematodes, Silt/Clay Loams or finer	Possible		Some benefit
Orchard History w/Nematodes		**X**- Population dependent	**X**- Population dependent
Orchard History with Aggressive Pathogens			Some benefit

Orchard Replanting – Replant Problems

Fumigant[a]	Treated area[b]	Mulch	lb/treated acre[c]
Control	None	None	0
Control	None	VIF	0
MB	Br. (100%)	None	400
MB	R. strip (38%)	None	400
MB	R. strip (38%)	VIF	400
Telone II	Br. (100%)	None	340
Telone II	R. strip (38%)	None	340
Telone II	R. strip (38%)	VIF	340
Telone C35	Br. (100%)	None	535
Telone C35	R. strip (38%)	None	535
Midas	Br. (100%)	None	400
Midas	R. strip (38%)	None	400
CP	Br. (100%)	None	400
CP	R. strip (38%)	None	400
CP	R. strip (38%)	VIF	400



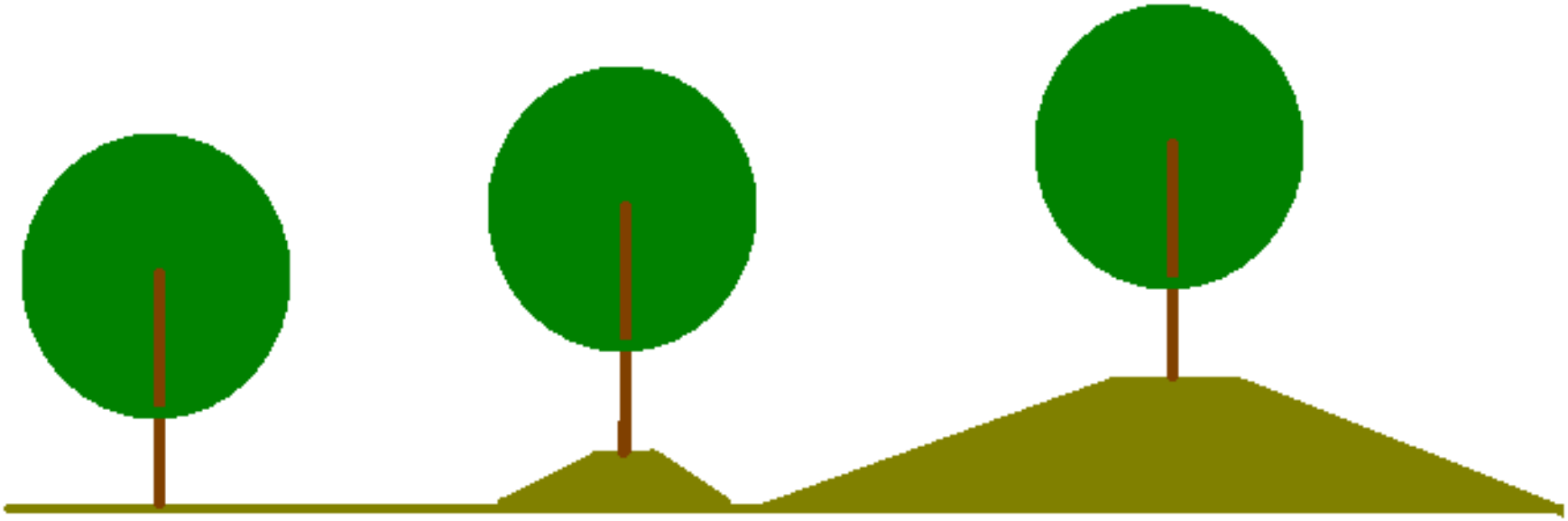
★Significance at p<0.05



New Orchard Development

1. Site Evaluation
2. Site Sampling
3. Orchard Removal
4. Soil Amended/Modification
5. Soil Fumigation
6. **Tree Planting**

Tree Planting: Berms?



Flat:
- Easiest to use with equipment
- Use only in soils with quick drainage (loamy sands-sands)

Standard Berm:
- 8”+ in height, 5’ wide
- Drains water away from crown, keeps roots out of water
- Issues with harvest, weeds, equipment
- Generally recommended

Raised Bed:
- 20”+ in height, 11’ wide
- Possible use in shallow soils
- Increase in yield v/s berm
- Issues with equipment
- Experimental, but feasible

Tree Planting – Method

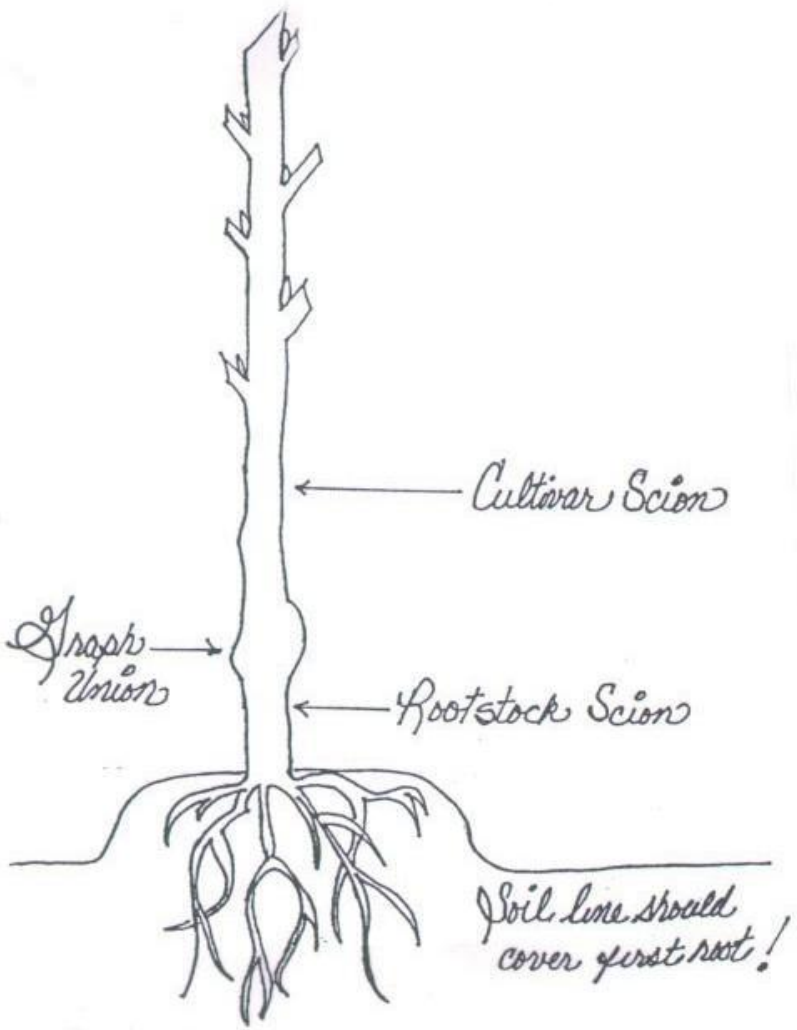
Machine Planting

1. Plants Quickly, Accurately
2. Can create berm as it plants
3. Fewer issues with planting (improper hole size)
4. Limitations on heavy soil and rains?

Hand Planting

1. More control on the planting conditions
2. Can adjust for larger rooting trees
3. No limited on soil types, conditions
4. Possible problems with “scoop, ball, and shove” method on root development

Tree Planting - Method

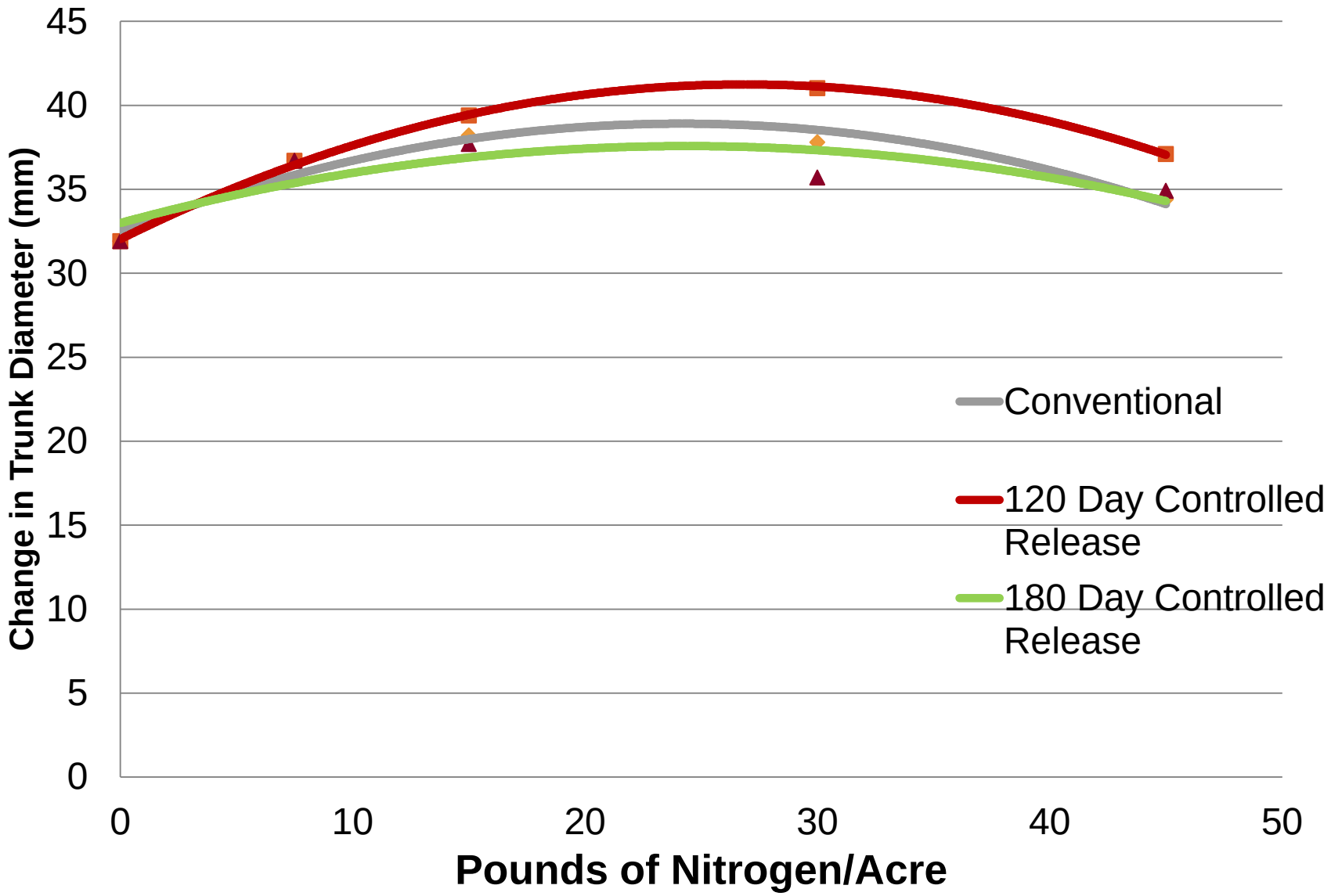


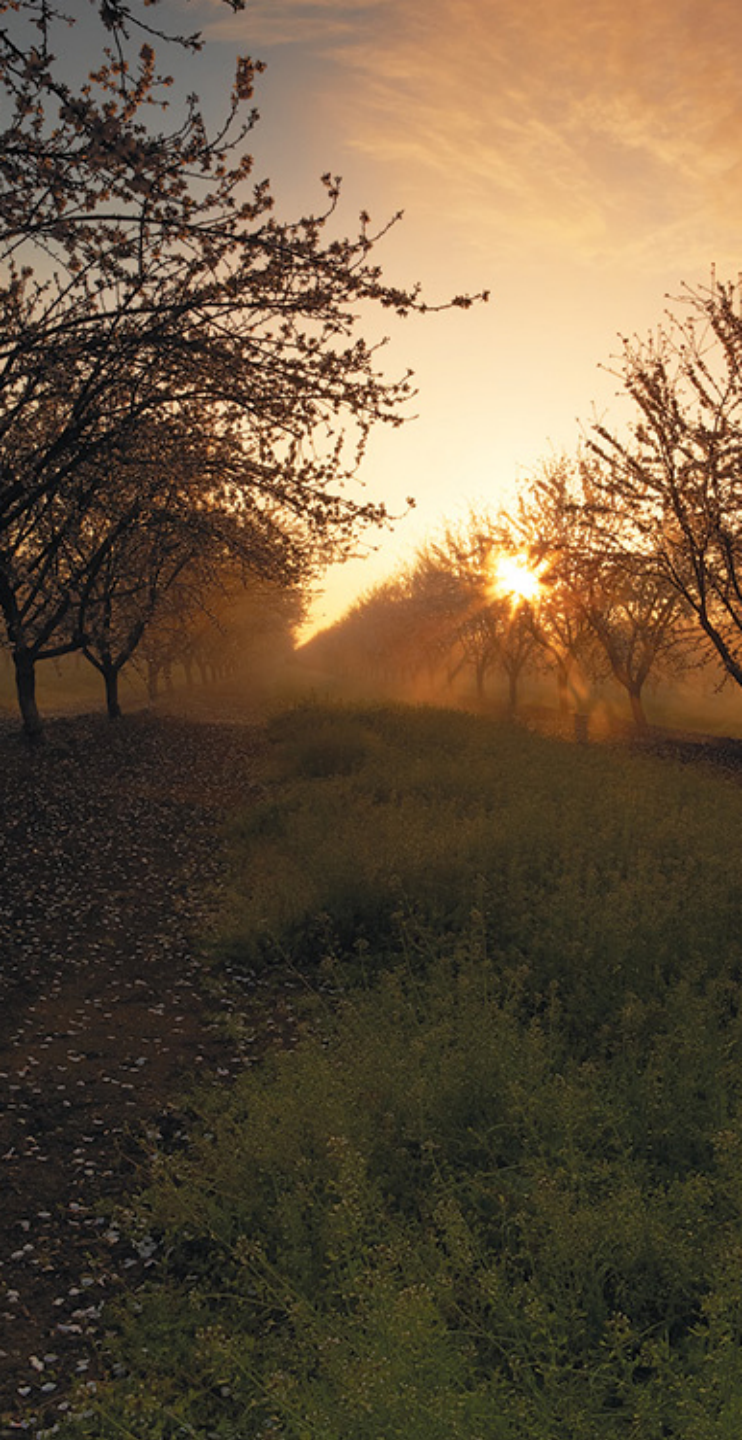
Drawing by Brent Holtz

- **Dig a big hole**
- **Plant high**
  - **Highest root should be covered with a few inches of soil**
  - **Graft union must be above soil line**
  - **Allow 3-4 inches for settling**
- **Tank in the tree with 3-5 gallons of water**
  - **Re-tank if needed (i.e. hot weather)**
- **Trim branches, high heading cut (36”+)**

Tree Planting - Problems

Fertilizing First Year Trees





New Orchard Development

Conclusions

Conclusions

“Ounce of prevention is worth a pound of cure”

Only time in the orchards life that soil can be thoroughly evaluated, modified, fumigated.

Pulling berms after planting is a mistake as it often buries the graft union

Planting the tree properly prevents windthrow, crown gall, and increases vigor

Still working on young orchard nitrogen rates!