



***Physiology***

***Cultural Practices***

***Sustainability***





***How the vine works...***

***How we can make the  
vineyard work better...***

***For the next 100 years***







**Paul**



**Krista**



**Kerri**



**Julie**



**Kendra**



**Jungmin**

*Physiology*

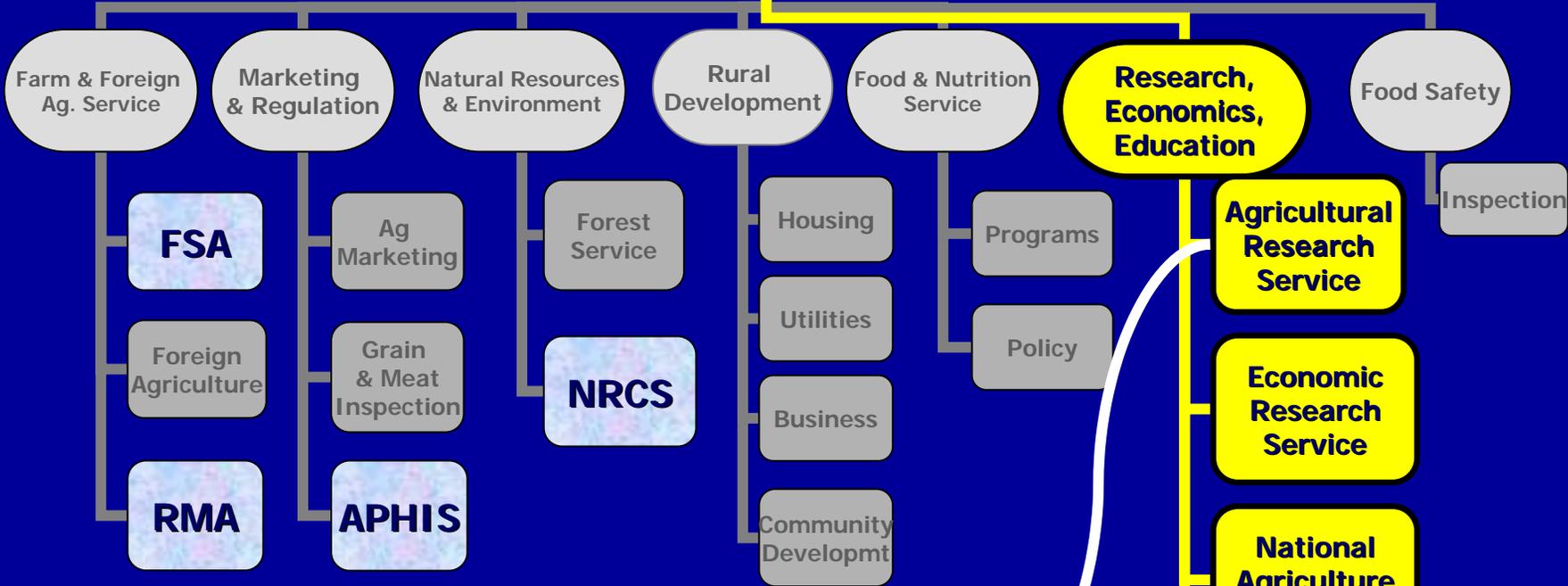
*Cultural Practices*

*Sustainability*



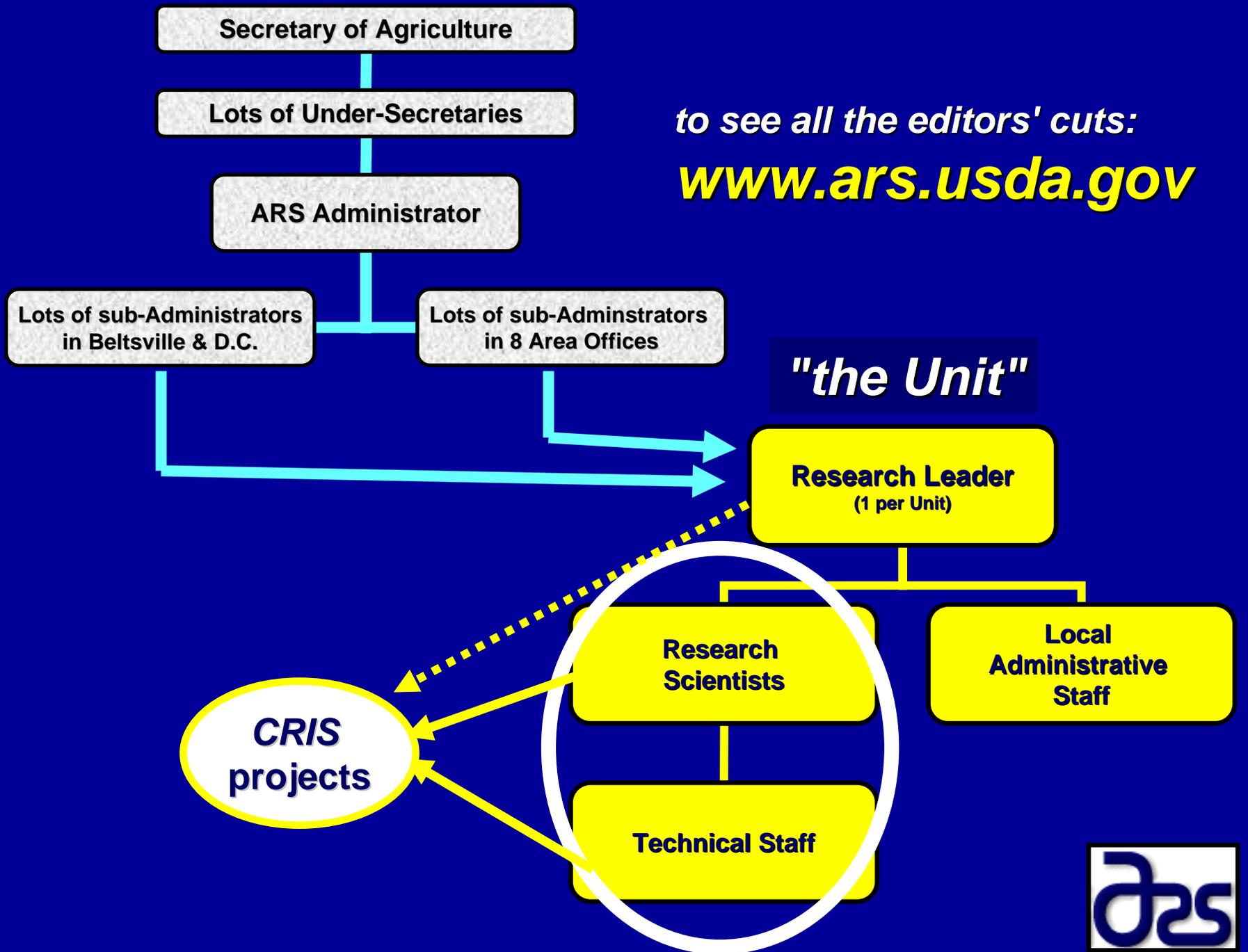
# The 'Brady Bunch' of Grape-ology

President



**USDA-ARS**  
*Grapevine Physiology*  
*Cultural Practices*  
*Sustainability*





# ARS Scientists:

## *What we are / what we do*

**R<sup>3</sup>** = research, research, research  
more basic,  
less basic, &  
some applied science

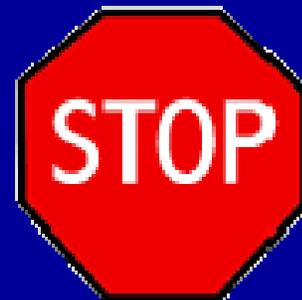
**P<sup>3</sup>** = publish, publish, publish  
peer-reviewed scientific journal papers

**Over careers, build international reputations  
in area of expertise**



# ARS Scientists:

What we are NOT!



❌ Not Extension Specialists

❌ Not Farm Advisors

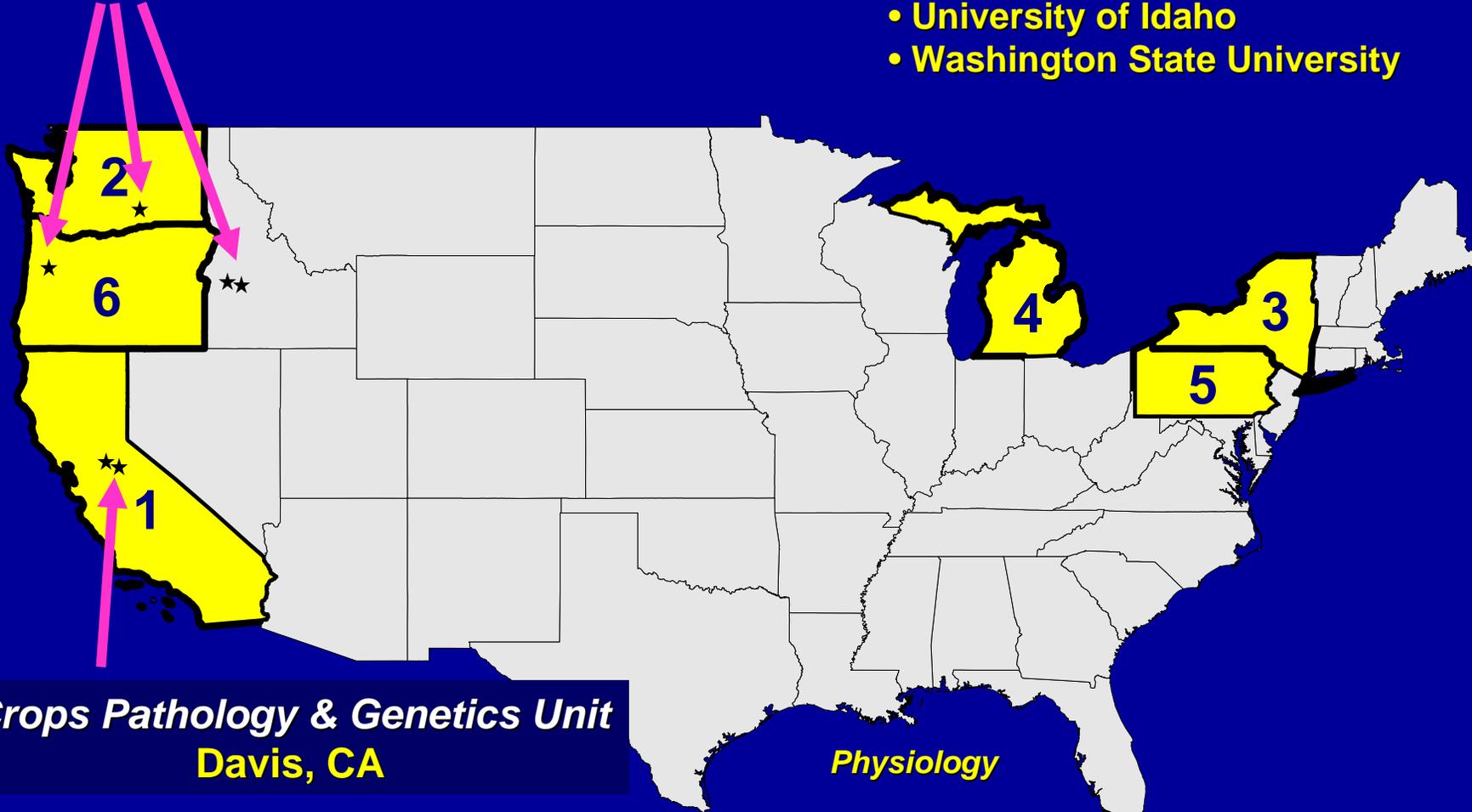
❌ Not Industry Programmers

❌ Not Lobbyists of any kind



**Horticultural Crops Research Unit**  
**Corvallis, OR + Prosser, WA + Parma, ID**

- Active collaborations @
- Oregon State University
  - University of California, Davis
  - University of Idaho
  - Washington State University



**Crops Pathology & Genetics Unit**  
**Davis, CA**

*Physiology*  
*Cultural Practices*  
*Sustainability*

\*door prize!



# Paul Schreiner

Established 2000

## ARS Unit:

*Horticultural Crops Research Unit*

**worksite:**

*Corvallis, OR*

## Origin:

Existing position (scientist retired)

Redirected by research leader to grapes & small fruits

## Research Focus:

Root physiology, nutrition & mycorrhizal fungi

Contact Paul: [schreiner@science.oregonstate.edu](mailto:schreiner@science.oregonstate.edu)

541-738-4084



# ARS' Mission Possible: Paul Schreiner's lab



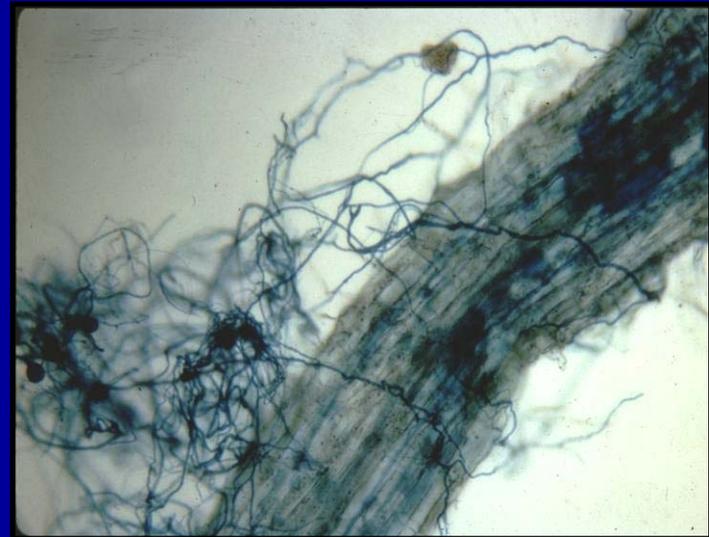
# Mycorrhiza ?

*Can I say that in front of my mother?*

- literally “fungus-root” (1885)
- recognized as symbiosis (1887)
- fungus becomes extension of vine's root system



**Ectomycorrhiza**



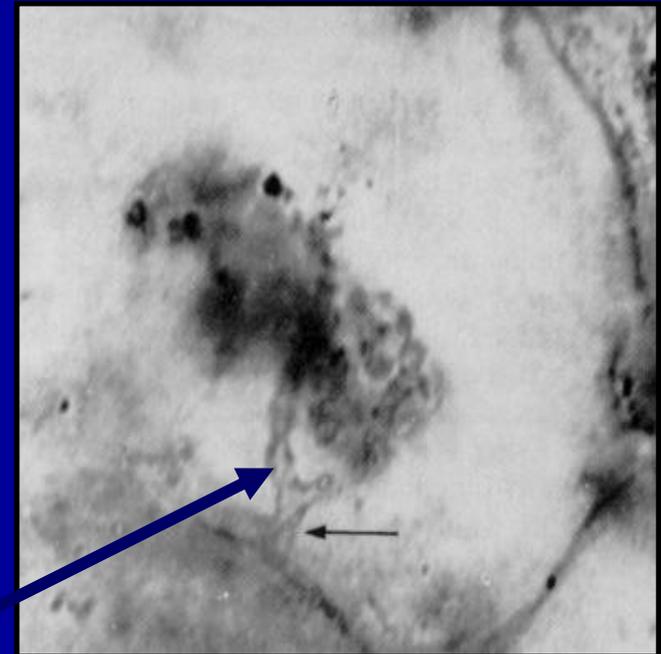
**Arbuscular mycorrhiza**

# Why bother with mycorrhizae ?

- Grapevines highly 'mycorrhizal'
- Enhance
  - ✓ nutrient uptake
  - ✓ water uptake
- Often suppress diseases
- Stabilize soil aggregates

400 million yr old fossilized mycorrhiza

? critical to initial  
colonization of land  
by plants ?



...and you thought the fungus in the back of your refrigerator was *old*

This is your new vineyard  
*without* mycorrhizae

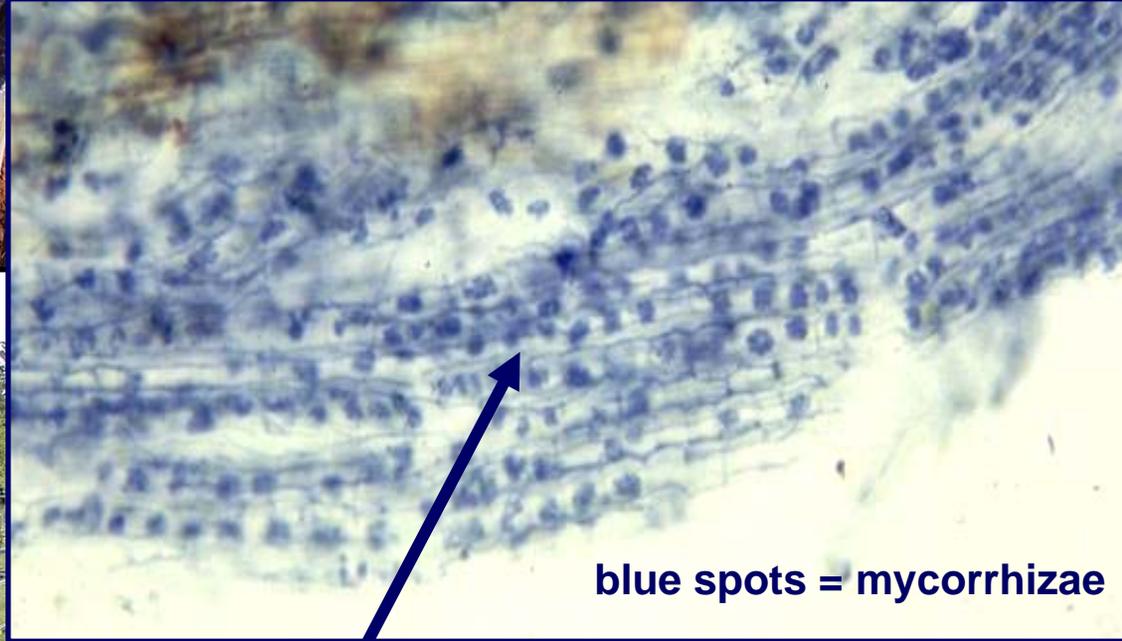


This is your new vineyard  
*with* mycorrhizae



***Any questions?***

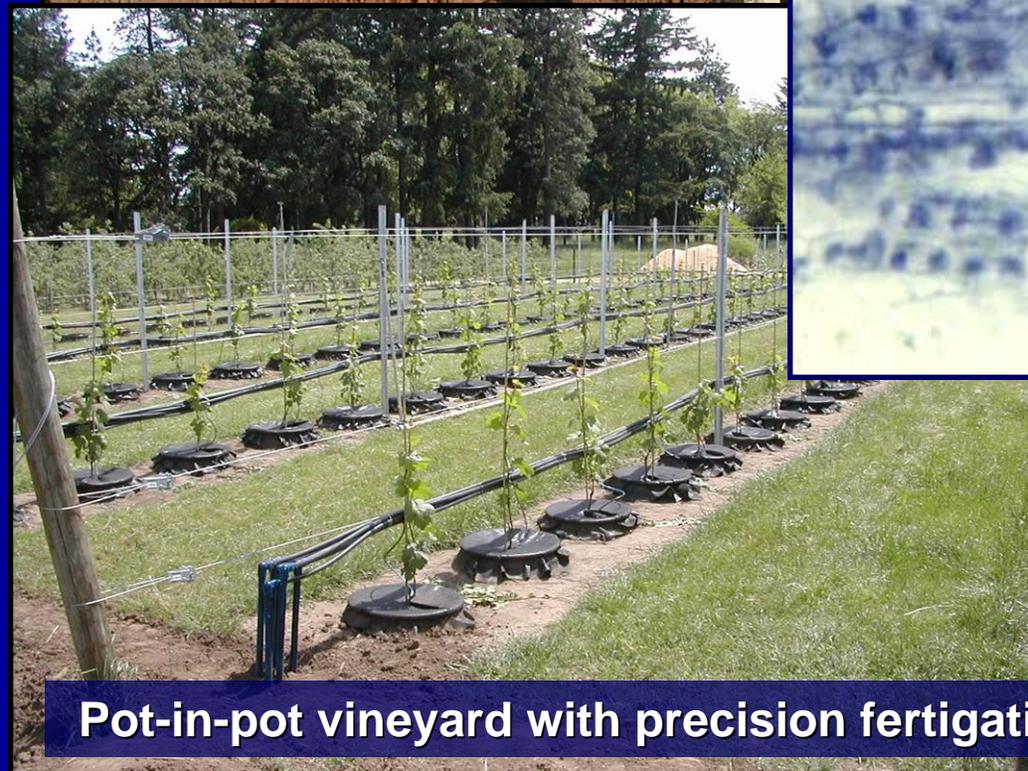
Even 'veteran' vines  
post their resuméés  
on *mycorrhizae.com*



blue spots = mycorrhizae

*Up close & personal:*  
Mycorrhizae in almost every  
cortex cell of fine roots

Pot-in-pot vineyard with precision fertigation



# Kendra Baumgartner

Established 2000

## ARS Unit:

*Crops Pathology & Genetics Unit*

**worksite:**

*Davis, CA*

## Origin:

New position via Congressional directive  
direct lobby by CAWG

## Research Focus:

Sustainable control of grapevine diseases  
*(including the nasty root diseases)*

Contact Kendra: [kbaumgartner@ucdavis.edu](mailto:kbaumgartner@ucdavis.edu)  
530-754-7461



Monty Baumgartner's  
***The Meaning of Life:***  
**Part 1.**

**Gallery of Oscar-Nominated  
Grapevine Diseases**

***Sonoma DVD edition subtitle:***

*Screenworthy biology for the no-nukes approach  
to disease control*

**Director's Footnote:**

*Pan out and shift focus  
away from pesticide dependence*

*And get me another latté —now!*

*KB.*



And this had better not be costing me more time & money, you egghead.

...and the new-fangled IPM control practice had better be practical enough that even this grower will use it.



\*door prize!

**Foreign film, Best Actor: *Xylella fastidiosa***  
**in '*Revenge of the Riparian Areas*'**



**Best set design:**

- *Periwinkle*
- *Himalayan blackberry*



**\* Best supporting actor: blue-green sharpshooter**  
**(*who else did you expect?*)**

# Indy film winner, 'Best Picture': *Armillaria* root disease



***starring:***  
The fungus  
that ate my  
lunch,  
and then  
my root  
system

***Now playing in over 500 species near you***

**\*door prize!**

**Monty Baumgartner's**  
**The Meaning of Life:**  
**Part 2.**  
**Not all Fungi are Bad Fungi!**

*mycorrhizae at a fraternity party*



*The lonely hypha*



*mycorrhizae lounging at the beach*



**This slide sponsored by:**

***The Society for the Prevention of Cruelty to Fungi***

# Kerri Steenwerth

Established 2004

## ARS Unit:

*Crops Pathology & Genetics Unit*

**worksite:**

*Davis, CA*

## Origin:

New position via Congressional directive  
direct lobby by CAWG

## Research Focus:

Weed ecology in vineyards &  
soil microbial ecology

Contact Kerri: [ksteenwerth@ucdavis.edu](mailto:ksteenwerth@ucdavis.edu)  
530-752-7535



# ***Sustainable Practices for the Vineyard Floor***

**Because we just can't  
keep spooking  
the wildlife  
(or the neighbors)  
like this!**



# Better weed management for mature vineyards

- Reduce use of pre-emergent herbicides
- 'Softer' chemicals
- Grapevine sensitivity to herbicides



*Posing for a photo because Peter Cousins made me.*



*Identifying surviving weed species after tilling*

*Double CD set soon to be a V&E classic:*

**'You Broke My Heart on My Vineyard Floor'**

**'Soil Ain't a Dirty Word No More'**

- tillage & mowing
- cover crop residues
- soil carbon cycling



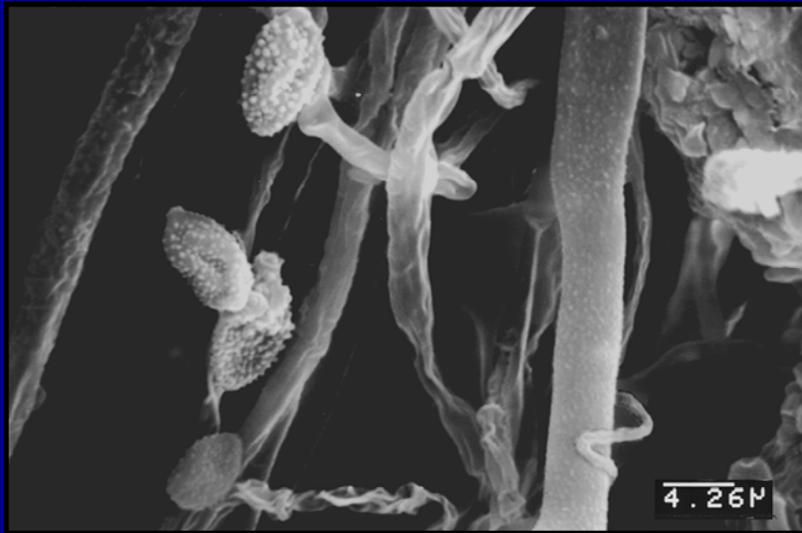
*'two for the price of one' special:*  
**floor management  
&  
grapevine physiology**

*Cover crop photosynthesis & soil respiration*

# Make the soil work for you...

- soil microbial communities  
*(the good, the bad, & the ugly)*
- nutrient cycling

*Actinomycetes: more of the 'good guys'*



...so you & the vines  
don't have to work so hard

soil + floor management + grapevine physiology = fruit quality

# Krista Shellie

Established 2001

## ARS Unit:

*Horticultural Crops Research Unit*

**worksite:**

*Parma, ID*

## Origin:

New position by Congressional directive  
direct lobby, *Univ. of Idaho & Idaho Wine industry*

## Focus:

Geographic adaptation (varietals)

Irrigation & cultural practices: fruit quality

Contact Krista: [kshellie@uidaho.edu](mailto:kshellie@uidaho.edu)

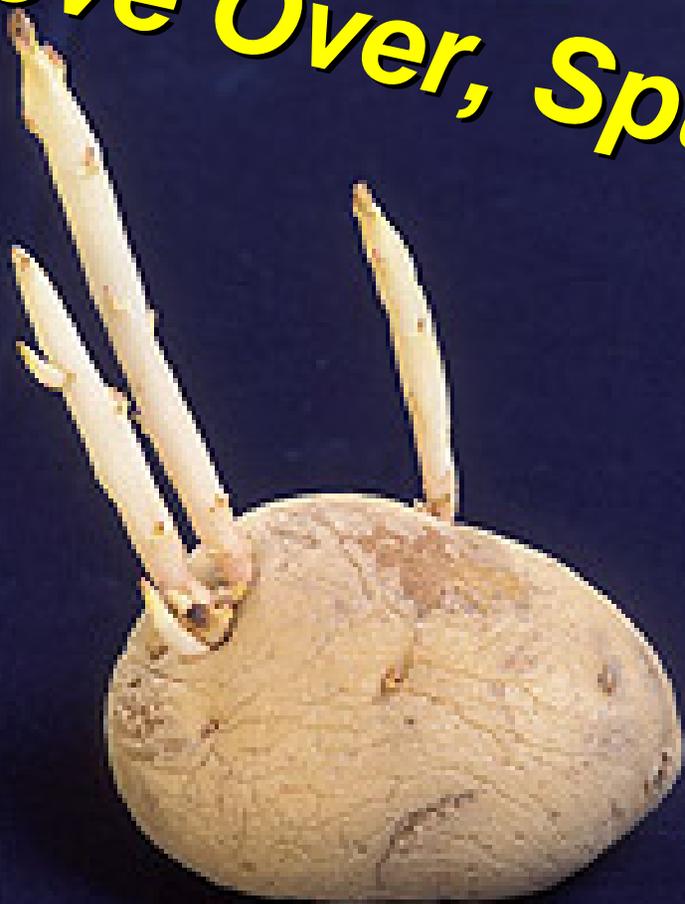
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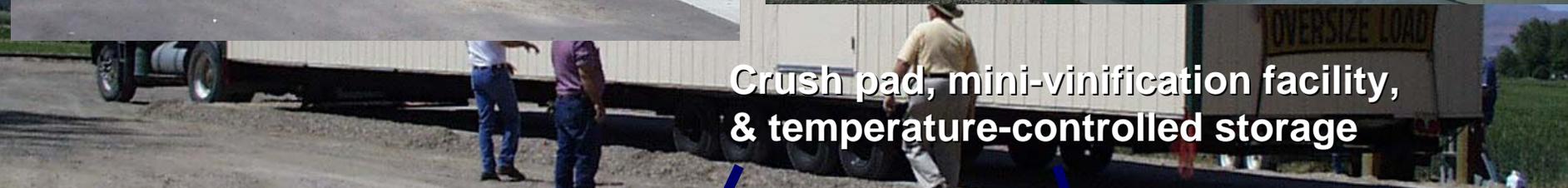


# TDAHO

Great Potatoes. Tasty Destinations.

**Move Over, Spud!**





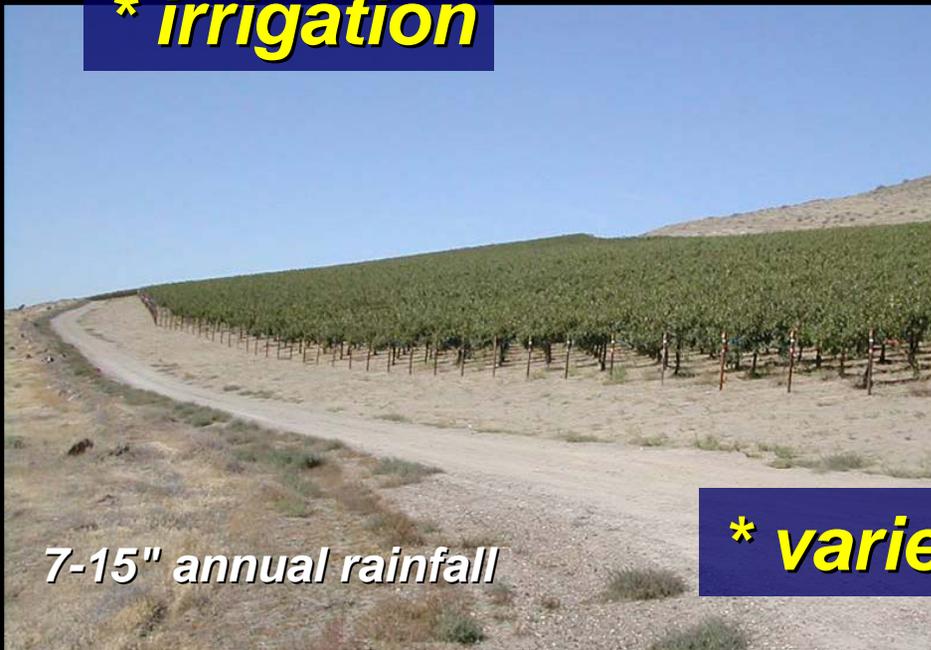
Crush pad, mini-vinification facility,  
& temperature-controlled storage





**Practices for sustainable value to the grower in challenging climates**

**\* irrigation**



*7-15" annual rainfall*

**\* varietal selection**

**vinifera-focused industry**

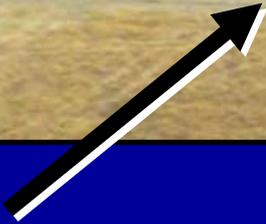


# When to turn 'on' or 'off' the tap for fruit quality & vine balance



*Skyline vineyards, Nampa, ID*

**\*there are absolutely no Idaho spuds interplanted in this vineyard**



**Wine grape varietal vineyard**  
**Univ. of Idaho R & E Center,**  
**Parma**  
**19 reds; 4 whites**



# Jungmin Lee

Established 2004

## ARS Unit:

*Horticultural Crops Research Unit*

**worksite:**

*Parma, ID*



## Origin:

**New position by Congressional directive**

**residual lobby, *Univ. of Idaho & Idaho Wine industry***

## Focus:

**Chemical analysis: wine grapes & wine (quality attributes)**

**Contact Jungmin: [jlee@uidaho.edu](mailto:jlee@uidaho.edu)**

**208-722-6701 x. 282**





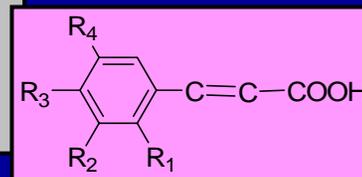
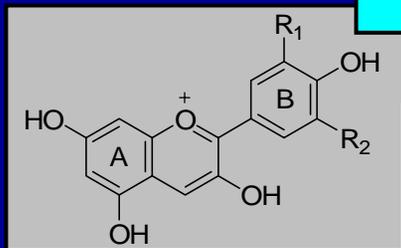
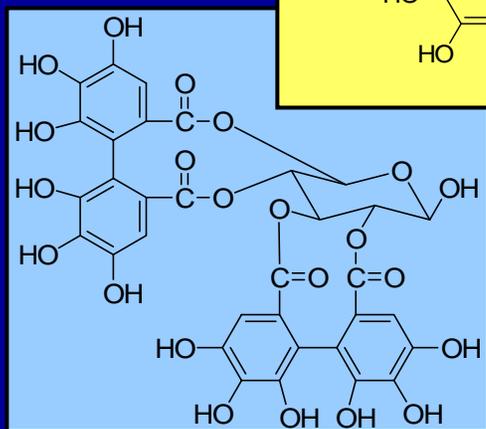
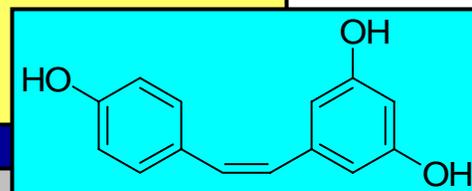
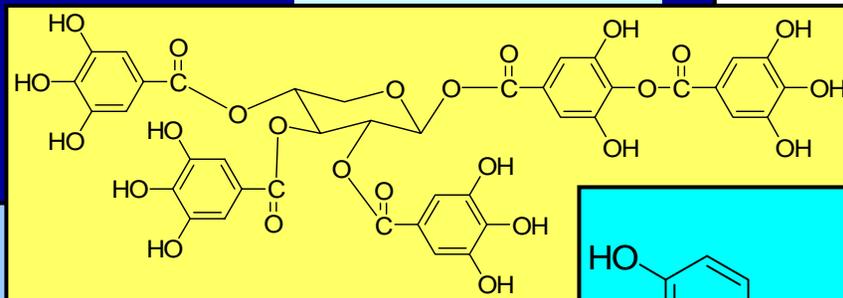
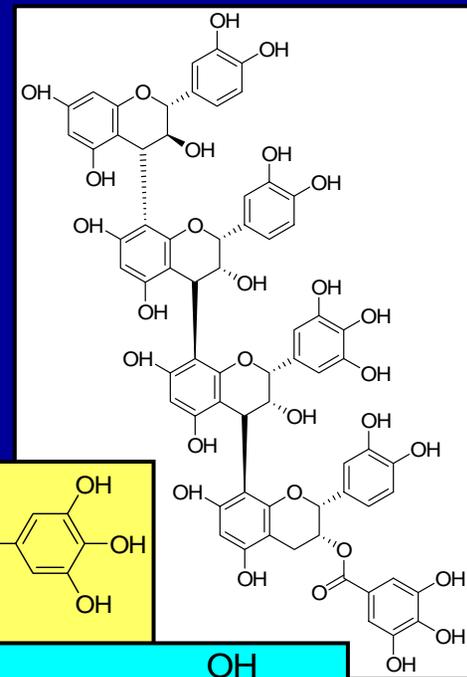
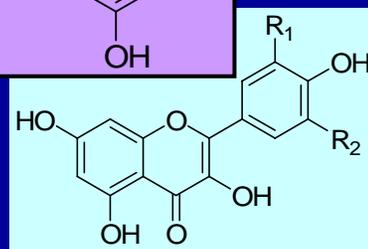
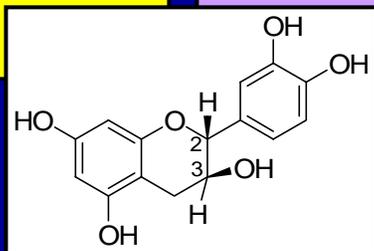
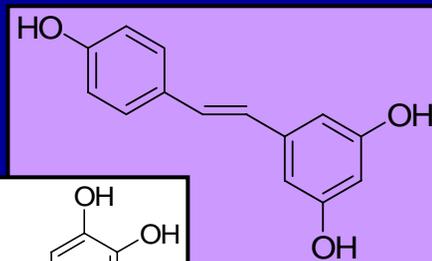
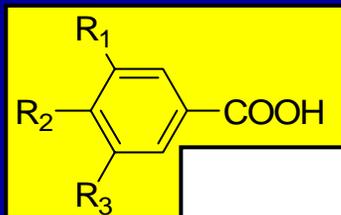
***new digs!***



***cool chemistry stuff  
for the new digs***

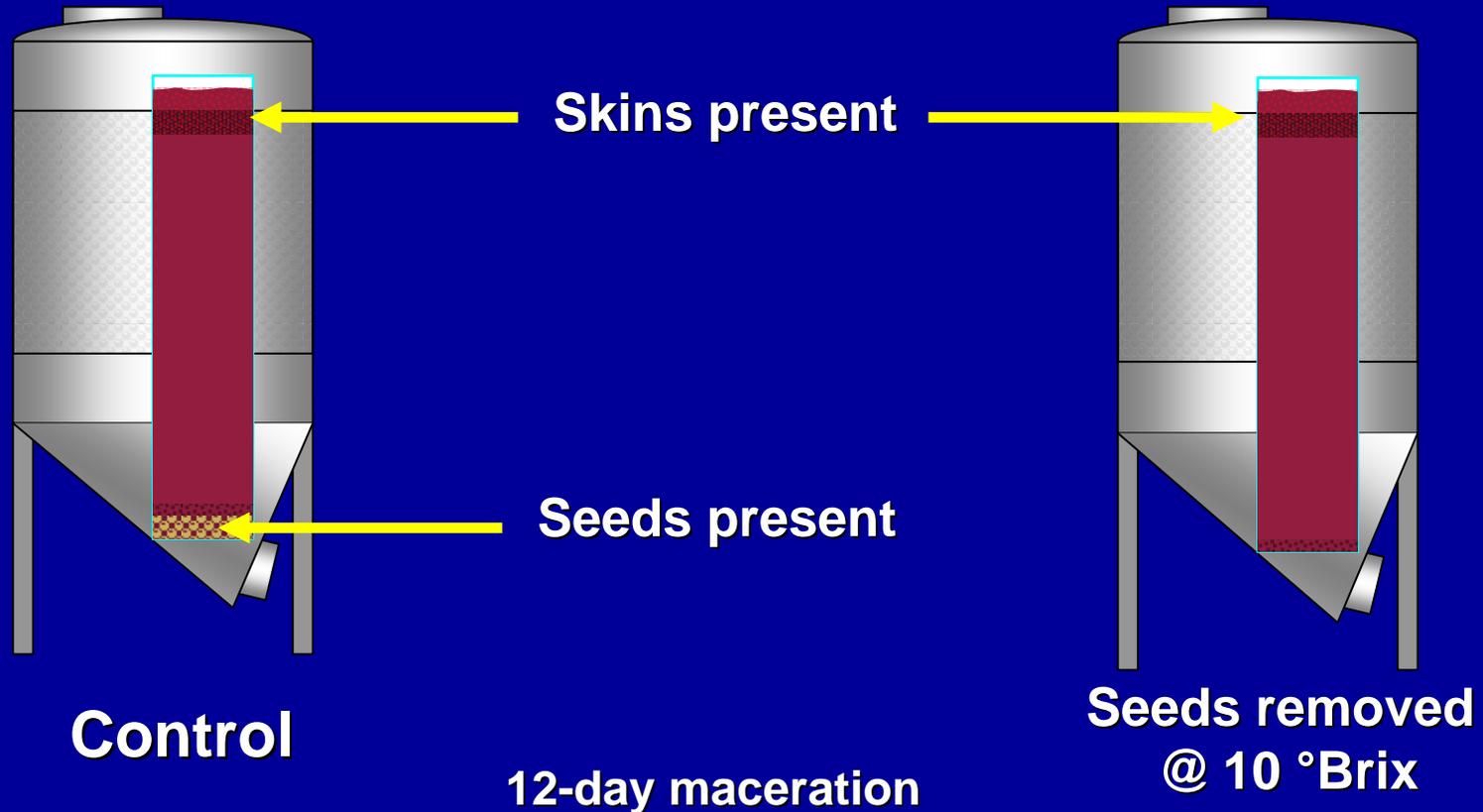


# Establish analytical protocols



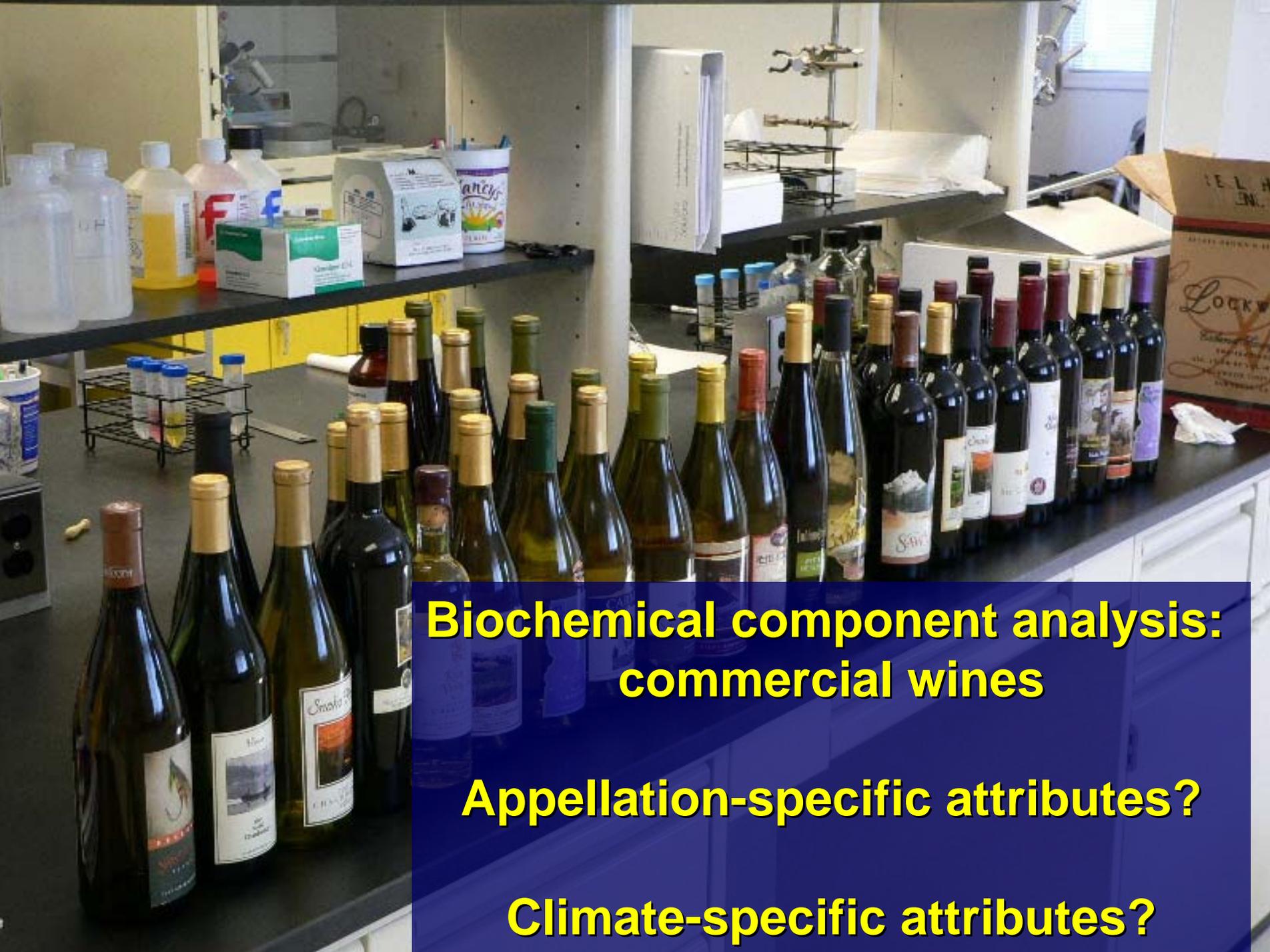
Collaborate with viticulturists: production practices & fruit, wine quality

# Seed removal at different stages of fermentation- Merlot



**Analysis: grapes, must, seeds, finished wine**  
*(anthocyanins, total phenolics, total tannins)*





**Biochemical component analysis:  
commercial wines**

**Appellation-specific attributes?**

**Climate-specific attributes?**

**No worries... I love polymerized tannins!**



**ARS annual report?  
What annual report??**



# Julie Tarara

Established 1998

## ARS Unit:

*Horticultural Crops Research Unit*

## worksite:

*Prosser, WA*

## Origin:

New position by Congressional directive  
direct industry lobby by

*Northwest Center for Small Fruits Research*

## Focus:

Vine-environment interactions (micrometeorology)

Contact Julie: [jtarara@wsu.edu](mailto:jtarara@wsu.edu)

509-786-9392



***Make the vineyard microclimate  
work better for you***

***The micrometeorology "fab four"***



**Temperature**

**Humidity**

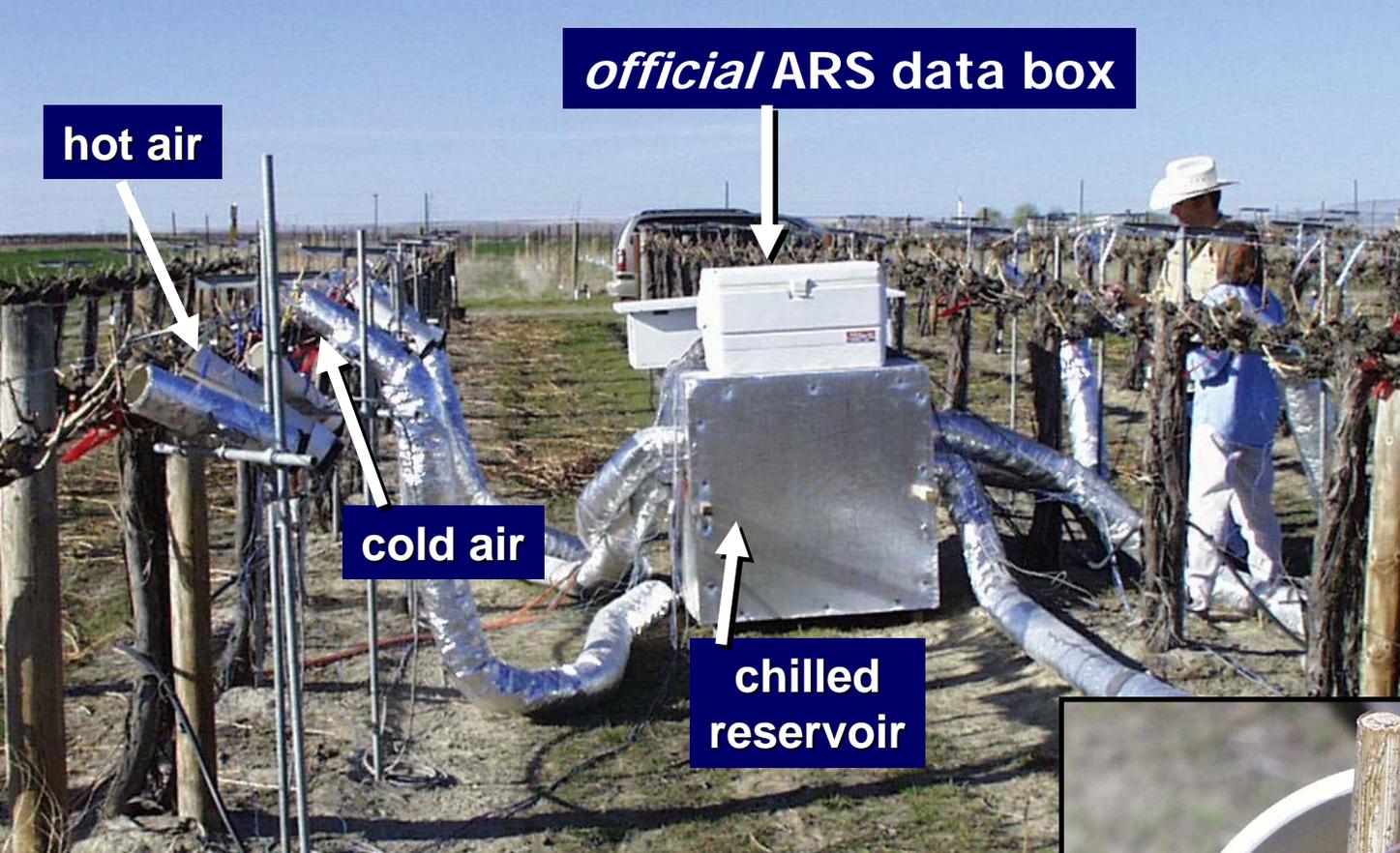
**Wind**

**Radiation**

***...plus a few eclectic field supplies***



*duck tape...*



hot air

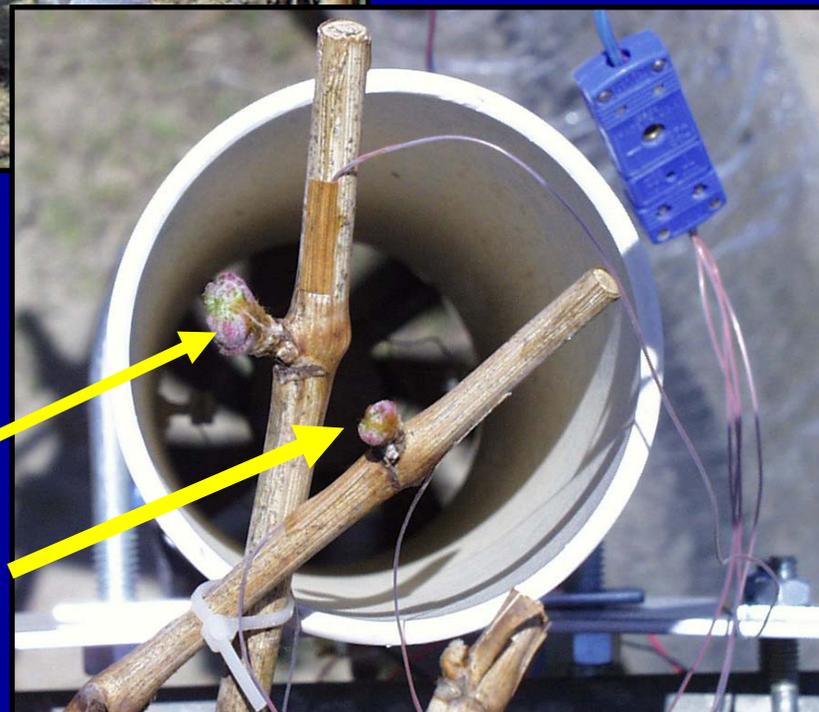
official ARS data box

cold air

chilled reservoir

"If there aren't a lot of wires and aluminum foil involved, I'm not running the experiment"

*--anonymous ARS scientist, Prosser, WA*



heated buds



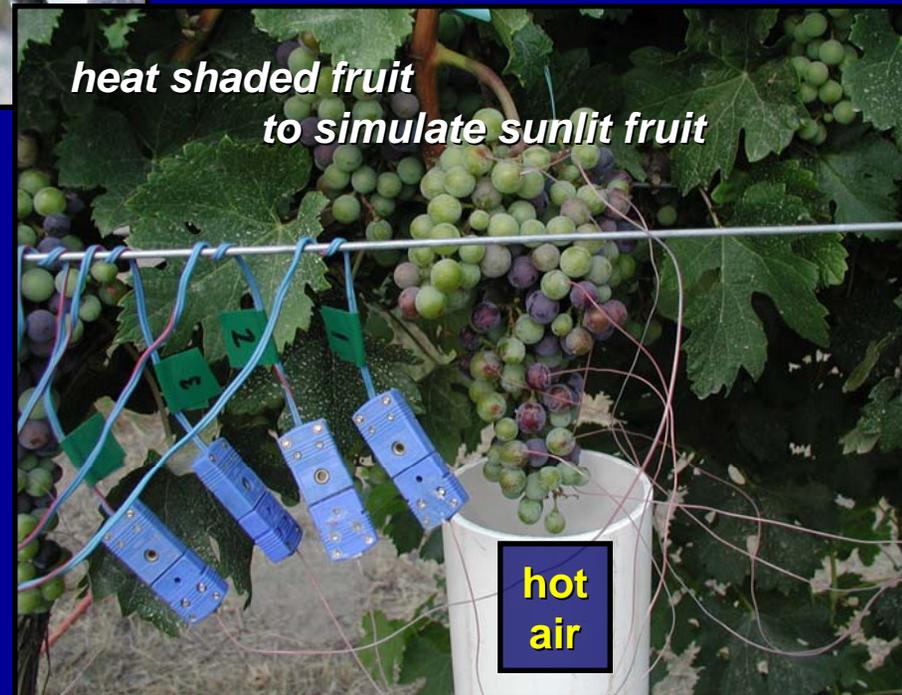
## Temperature *and*:

- bud burst
- shoot growth
- flowering/fruit set
- fruit maturation
- fruit scalding



**Temperature  
+  
Radiation**

*Oh, honey, you should  
have used SPF 30 today*

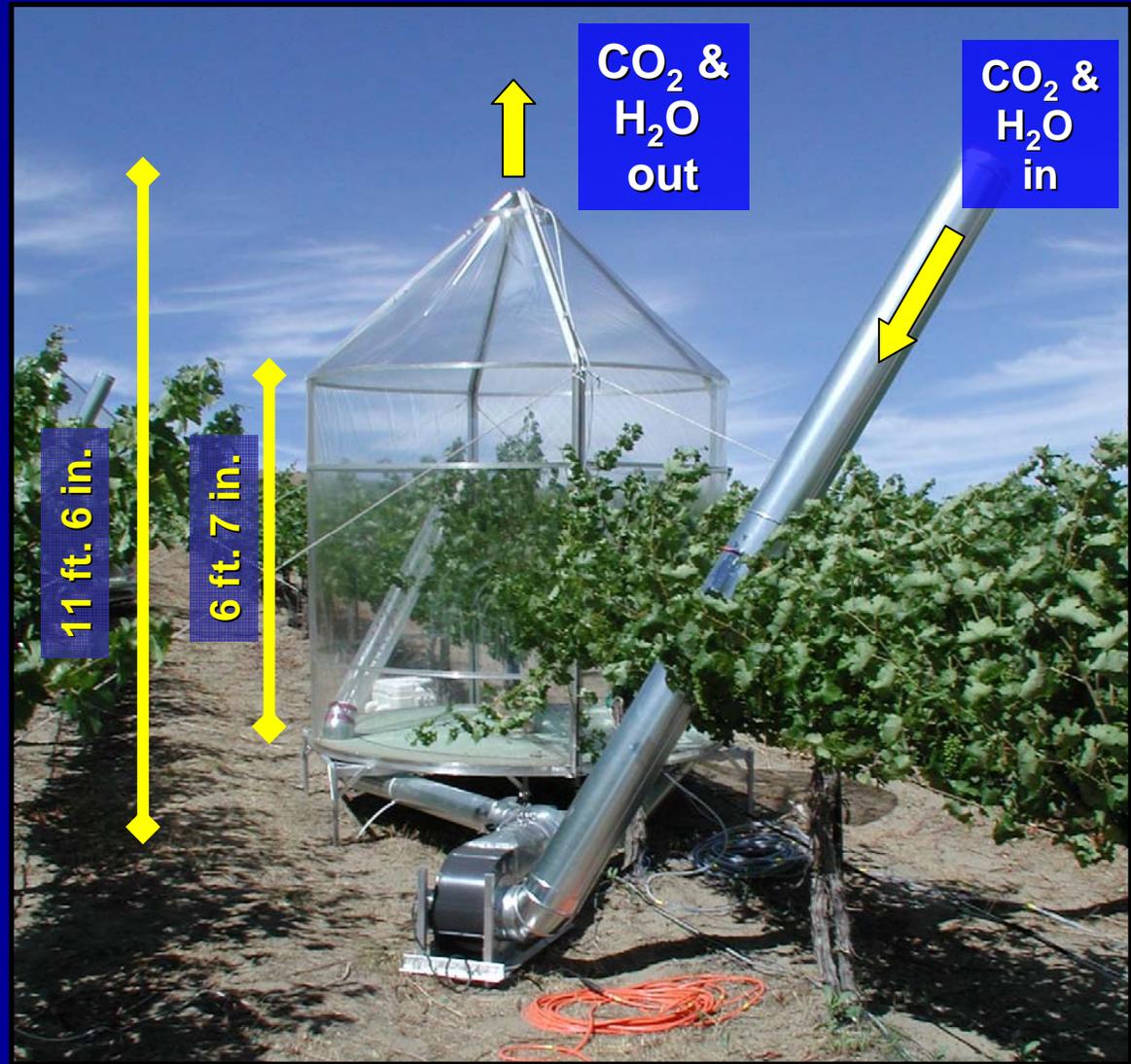


# Temperature + radiation + humidity (+ wind)

photosynthesis  
+ transpiration



water,  
canopy,  
& crop load  
management



\*no actual bread wrappers were harmed during this experiment

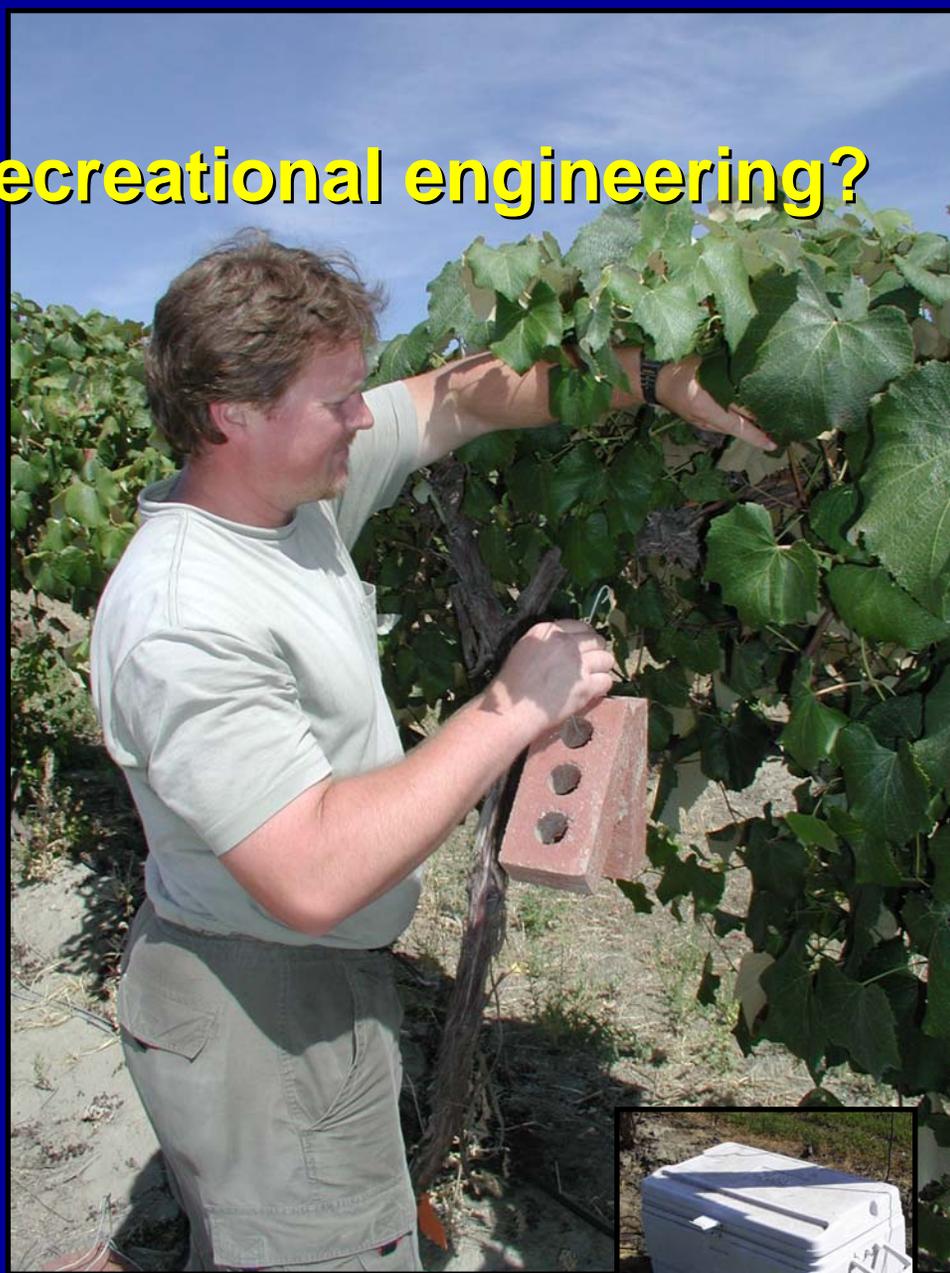


another official ARS data box

# Forget the 'Fab Four'— how about a little recreational engineering?



*You spent the  
money on the  
trellis. Now let it  
really work for you*



Are you sure they're really  
ARS 'data' boxes?

