Production Water – Current and Ongoing work

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November 14th, 2018

SMART PATH Kickoff Meeting

How much *Salmonella* is in FL Surface Water?

18 sites in Central Florida
Public access
Rural – away from animal agriculture

August 2010 – 2011
202, 10 L water samples
E. coli & *Salmonella* MPNs, TPC

2 Lakes
1 Pond
6 Creeks
2 Streams
1 River
6 Canals

McEgan et al., AEM 79:4094-4105

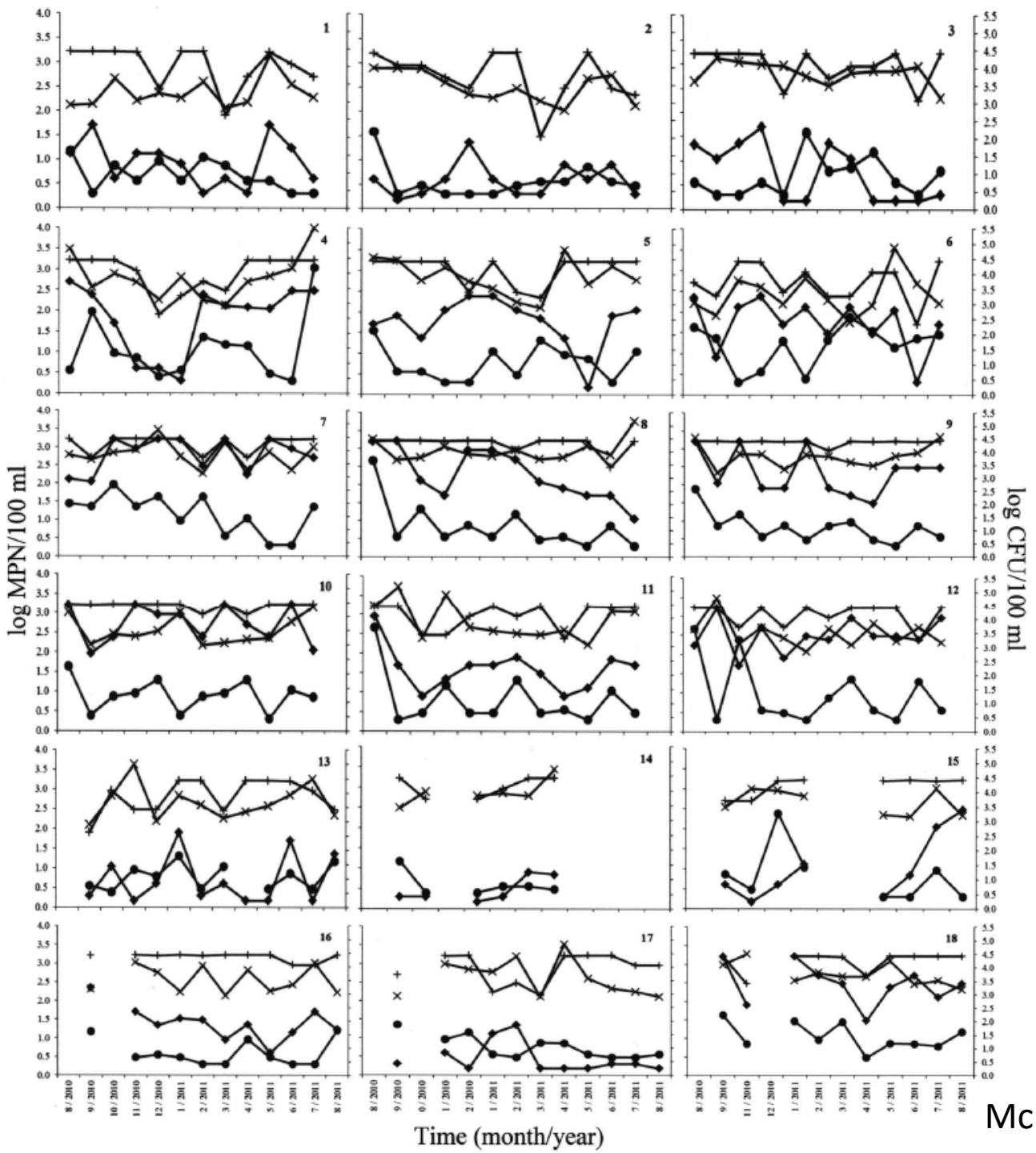


Figure. Populations of *Salmonella* enumerated via MPN enrichments in LB, TT broth, and isolation on XLT4 (●), *E. coli* ( ), and coliforms (＋) enumerated via MPN method using Colisure, all reported in log MPN/100 ml (left axis), and aerobic plate counts (×), enumerated on TSA and reported in log CFU/100 ml (right axis), as determined for each of eighteen Central Florida sites sampled monthly for a continuous twelve-month period.

McEgan et al, AEM 79:4094-4105

E. coli for predicting *Salmonella* concentrations

- *E. coli* log MPN/100 ml values not strongly linearly correlated with *Salmonella* log MPN values
- Multiple logistic regression analysis could be used to predict the probability of *Salmonella* concentration exceeding a given concentration

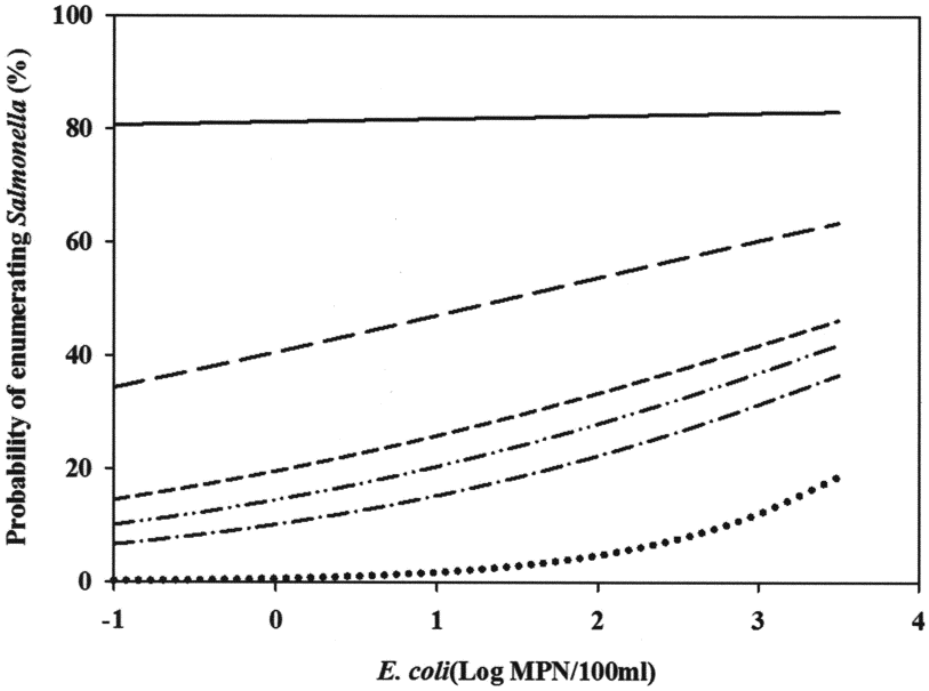


Figure: Logistic regression model for predicting the probability of enumerating: *Salmonella*
- ≥ 3 MPN/100 ml (solid line)
- ≥ 5 MPN/100 ml (long dashes)
- ≥ 10 MPN/100 ml (short dashes)
- ≥ 15 MPN/100 ml (dash two dots)
- ≥ 20 MPN/100 ml (dash one dot)
- ≥ 60 MPN/100 ml (dotted)

McEgan et al, AEM 79:4094-4105

McEgan et al., AEM 80:6819-6827

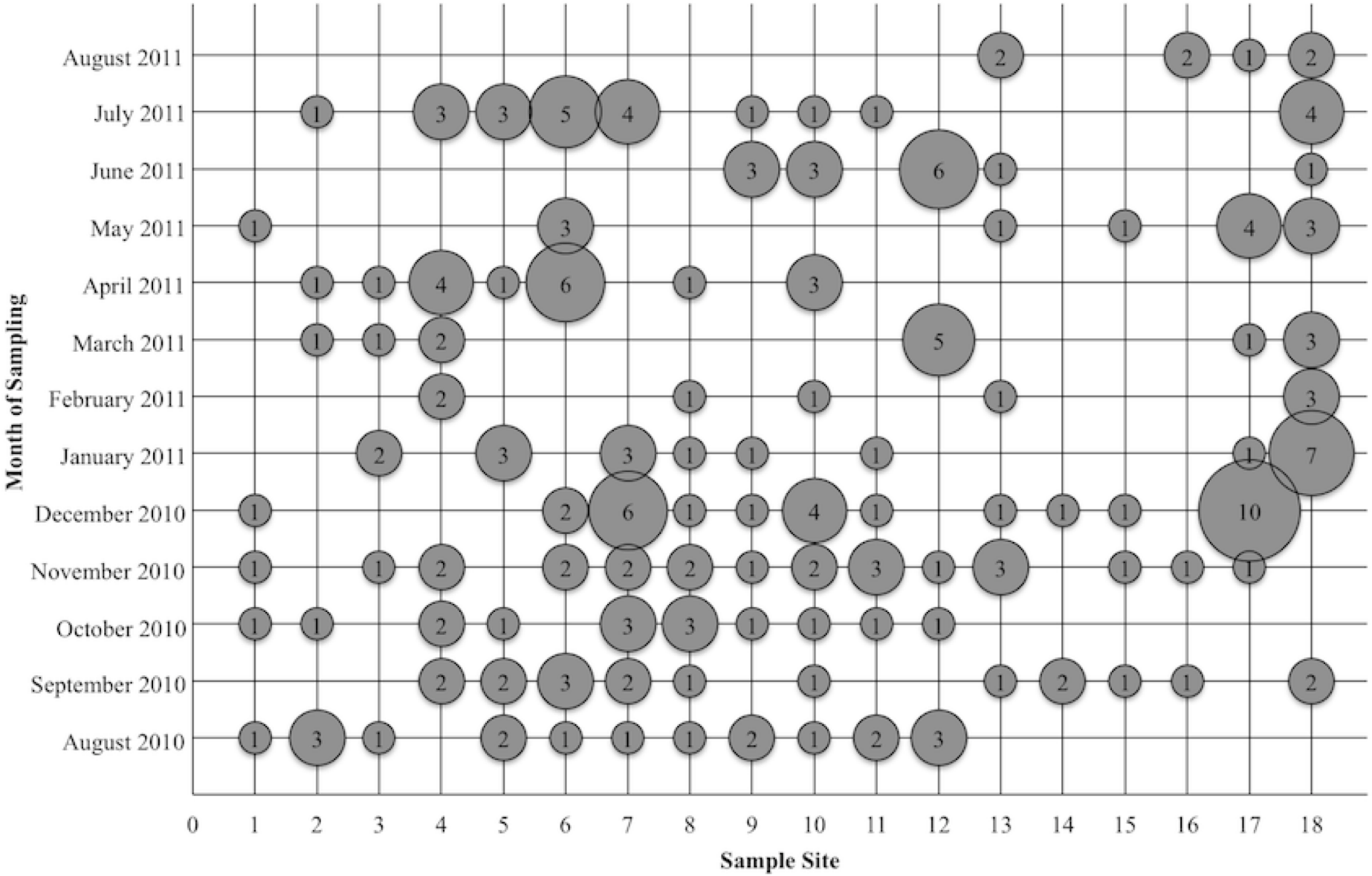


Figure 1. Unique *Salmonella* isolates from eighteen sampling sites over the 12 month survey (19). The bubble size represents the number of unique isolates collected at the specified sampling site and sample date.

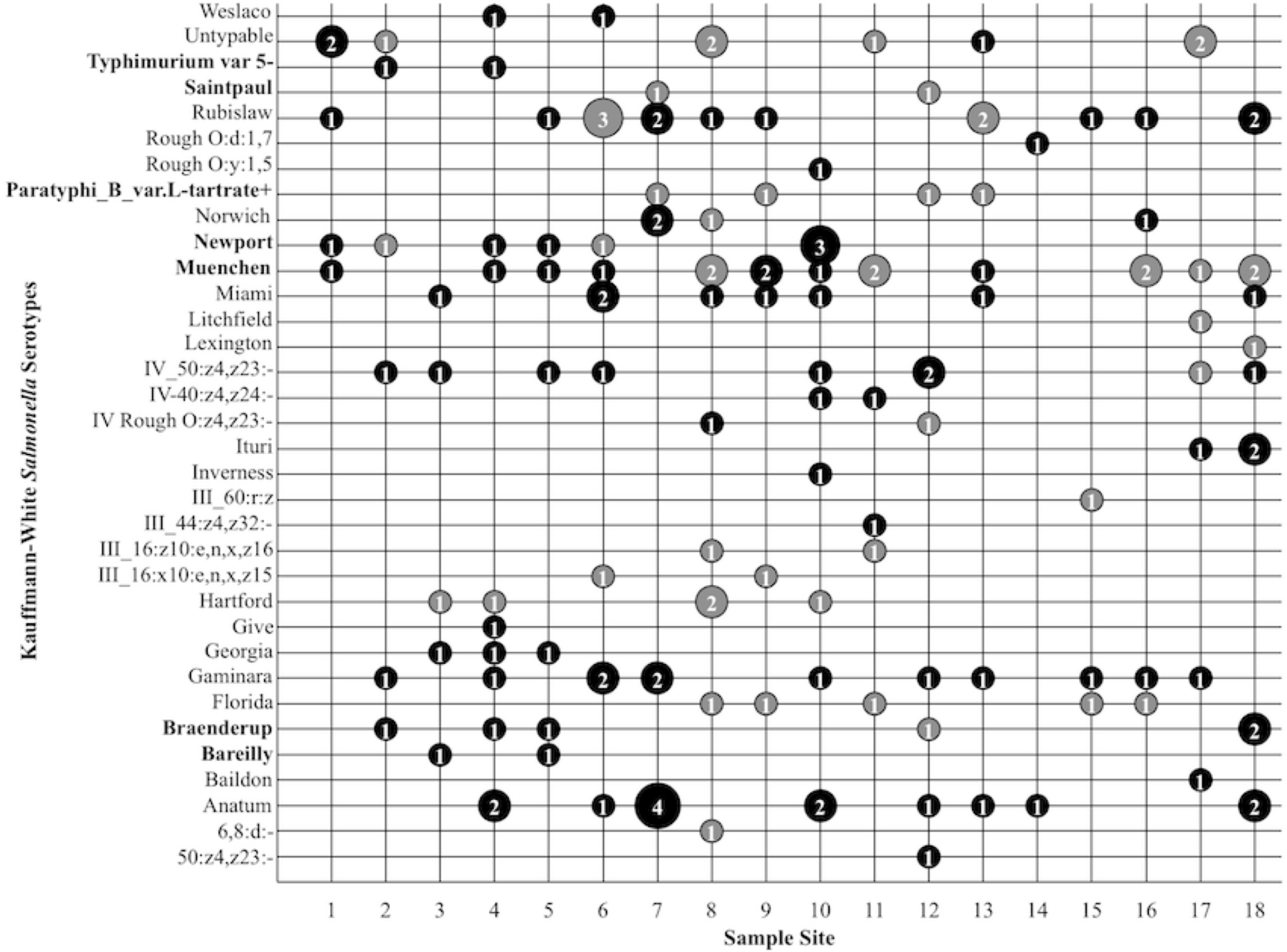


Figure 2. Frequency of isolation of each serotype by locations across all 12 sample times.

McEgan et al., AEM 80:6819-6827

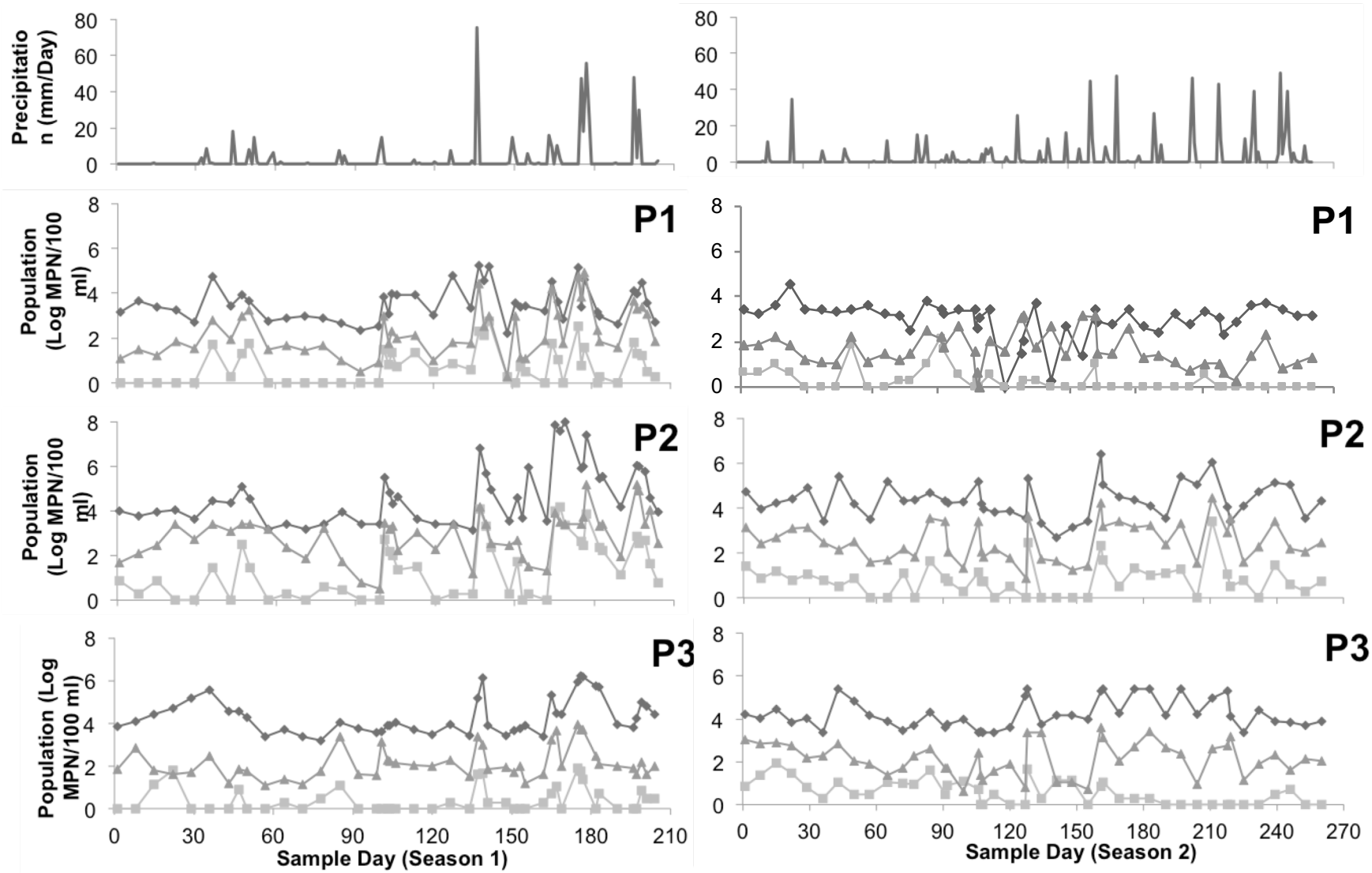
Does our water comply with current PSR Requirements?

- Six ponds sampled over two harvest years
  - Ponds all used as agricultural water
  - 2012-2013 and 2013-2014; October/November – May/June
  - 89 water samples in each pond
  - 5 additional water samples collected in 2014-15
- All samples evaluated for generic *E. coli*, coliforms, enterococci, and *Salmonella*

Pond Code	Approximate Pond Age (years)	The conditions around pond	Sunlight exposure
Pond 1	3	Grassed, elevated, low run off	High
Pond 2	45-49*	Open soil, not elevated, high run off, connected to a creek	Low
Pond 3	3	Grassed, not elevated, low run off	High
Pond 4	24	Grassed, not elevated, low run off	High
Pond 5	4-5	Grassed, not elevated, low run off	High
Pond 6	7	Lightly grassed, not elevated, medium run off	Medium

Topalcengiz et al., PLoS One 12(4): e0174889

Presence of indicators



Most Probable Number of Total coliform ( ), Generic *E. coli* (■), and Enterococci (▲) (Log MPN/100 ml) from six agricultural ponds (P1-P3) in Central Florida.

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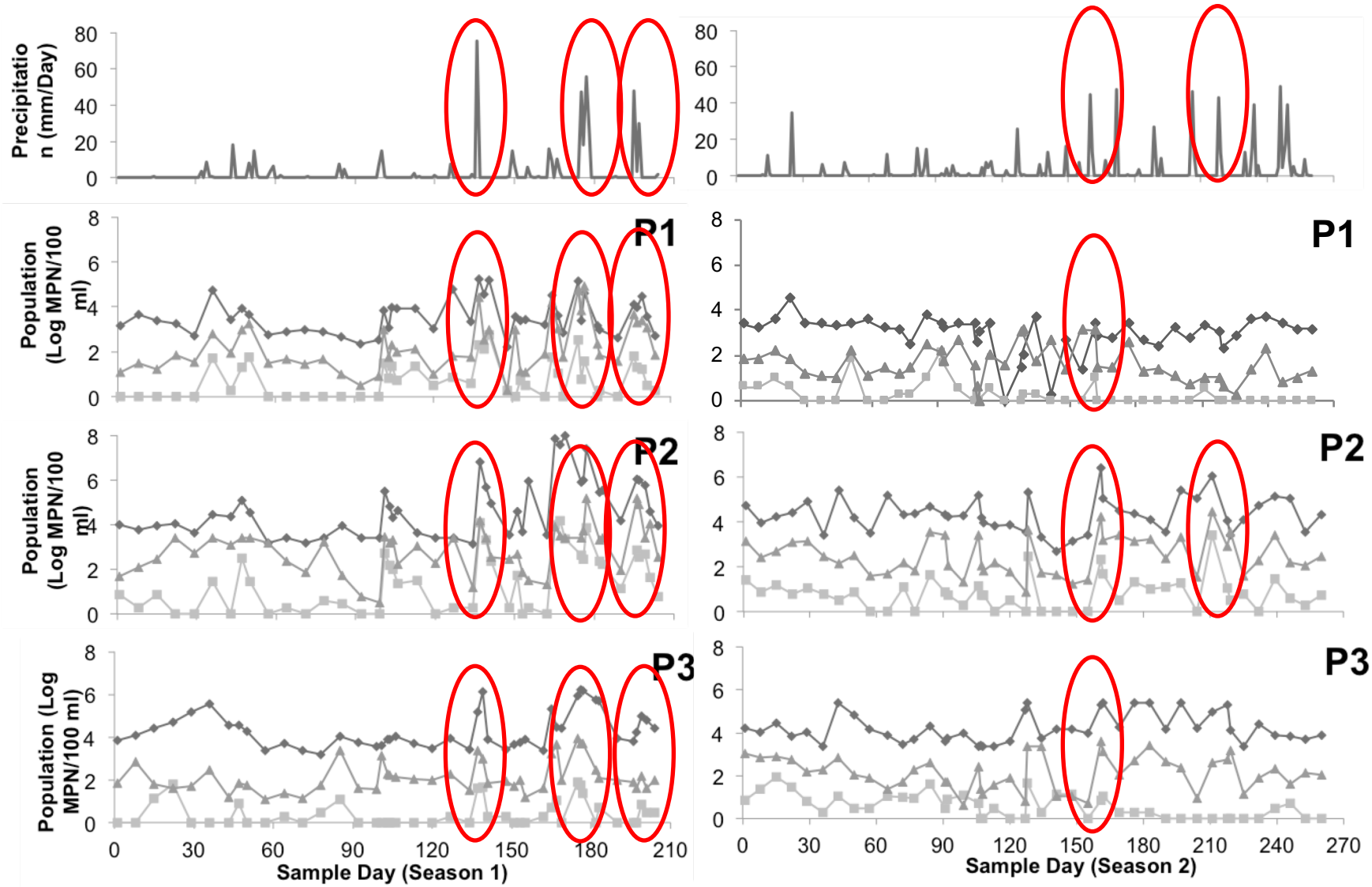

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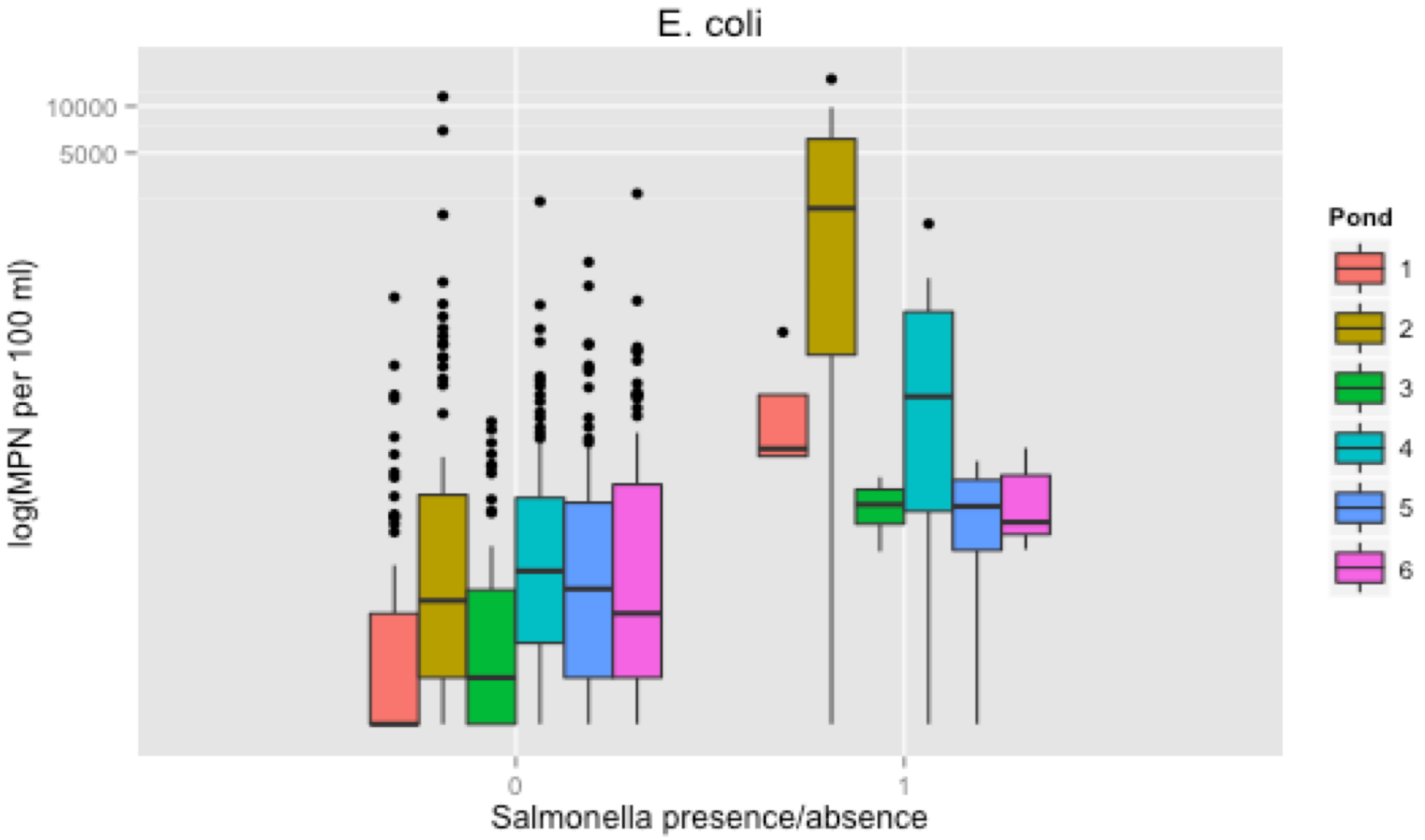
How does surface water in West Central Florida relate?

- ≥ 126 *E. coli*/100 ml geomean in at least 20 water samples over 2 years
  - All ponds compliant
- ≥ 410 *E. coli*/100 ml STV in at least 20 water samples over 2 years
  - All ponds compliant
- All ponds meet the baseline MWQP in the new proposed rule
- *Salmonella* was detected in 26/540 (4.8 %) 150 ml samples, in all ponds and both growing seasons.
  - 57.7 % (15/26) of the *Salmonella* positive samples were from ponds 2 and 4, where the WQP was the poorest.

Topalcengiz et al., PLoS One 12(4): e0174889

Is *E. coli* really a good indicator?



Six ponds in West Central Florida, each sampled 89 times in 2012-2014.

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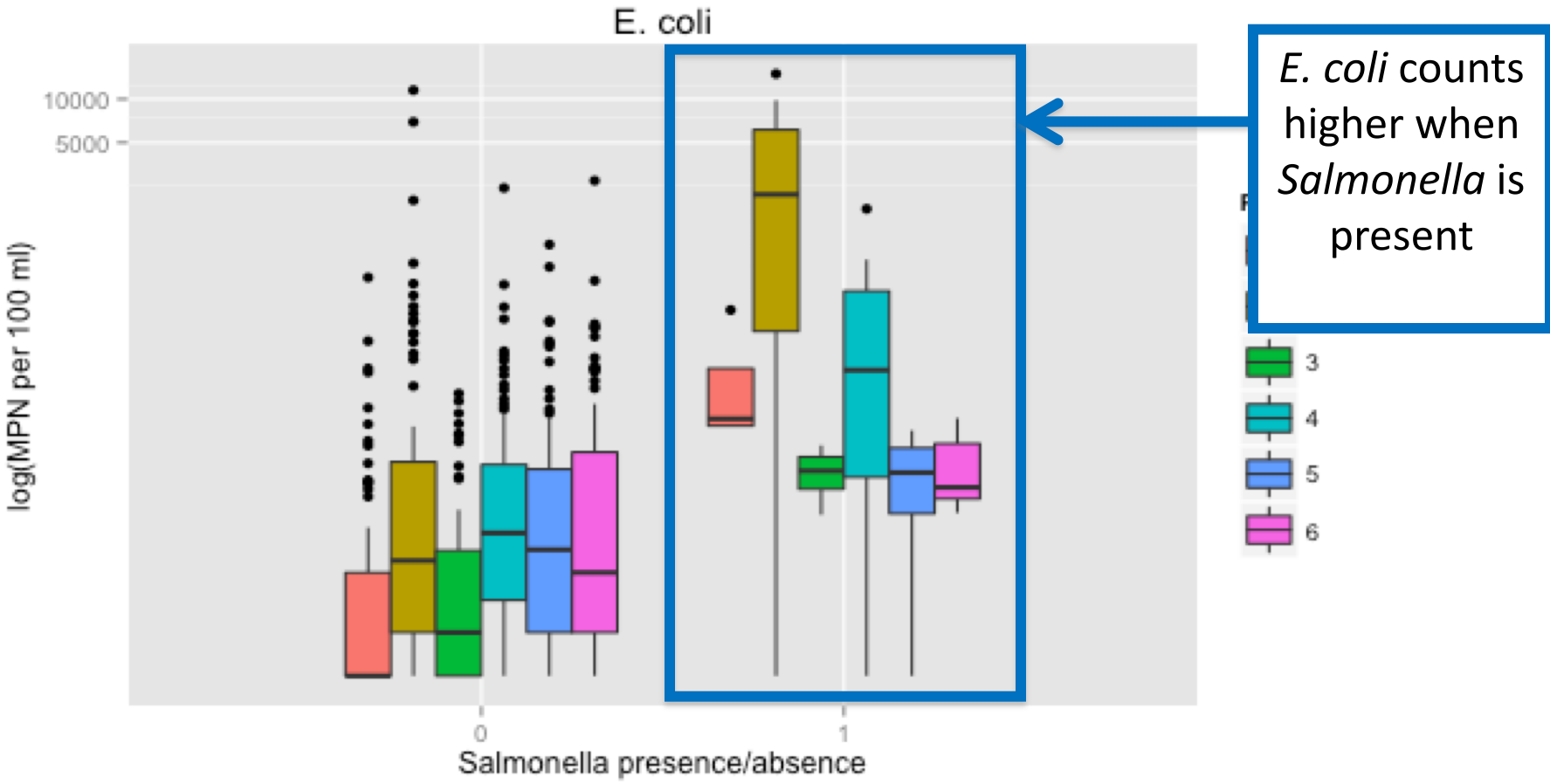

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Acknowledgements – Funding Sources

- USDA NIFA Specialty Crops Research Initiative 2008-51180-04846

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Bridging The Gap: Effective Risk Mitigation Through Adoption Of Agricultural Water Treatment Systems

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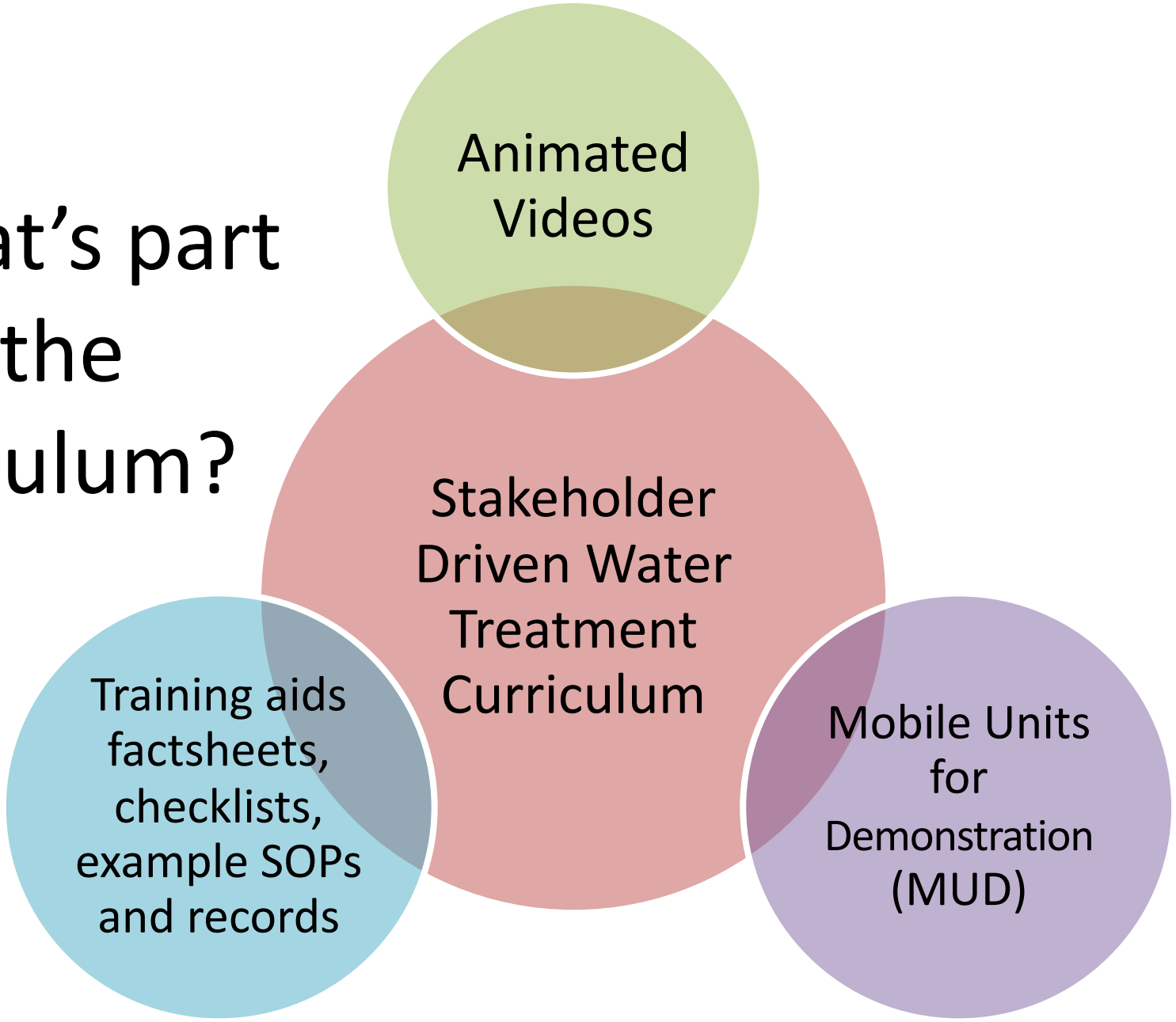
What are we doing?

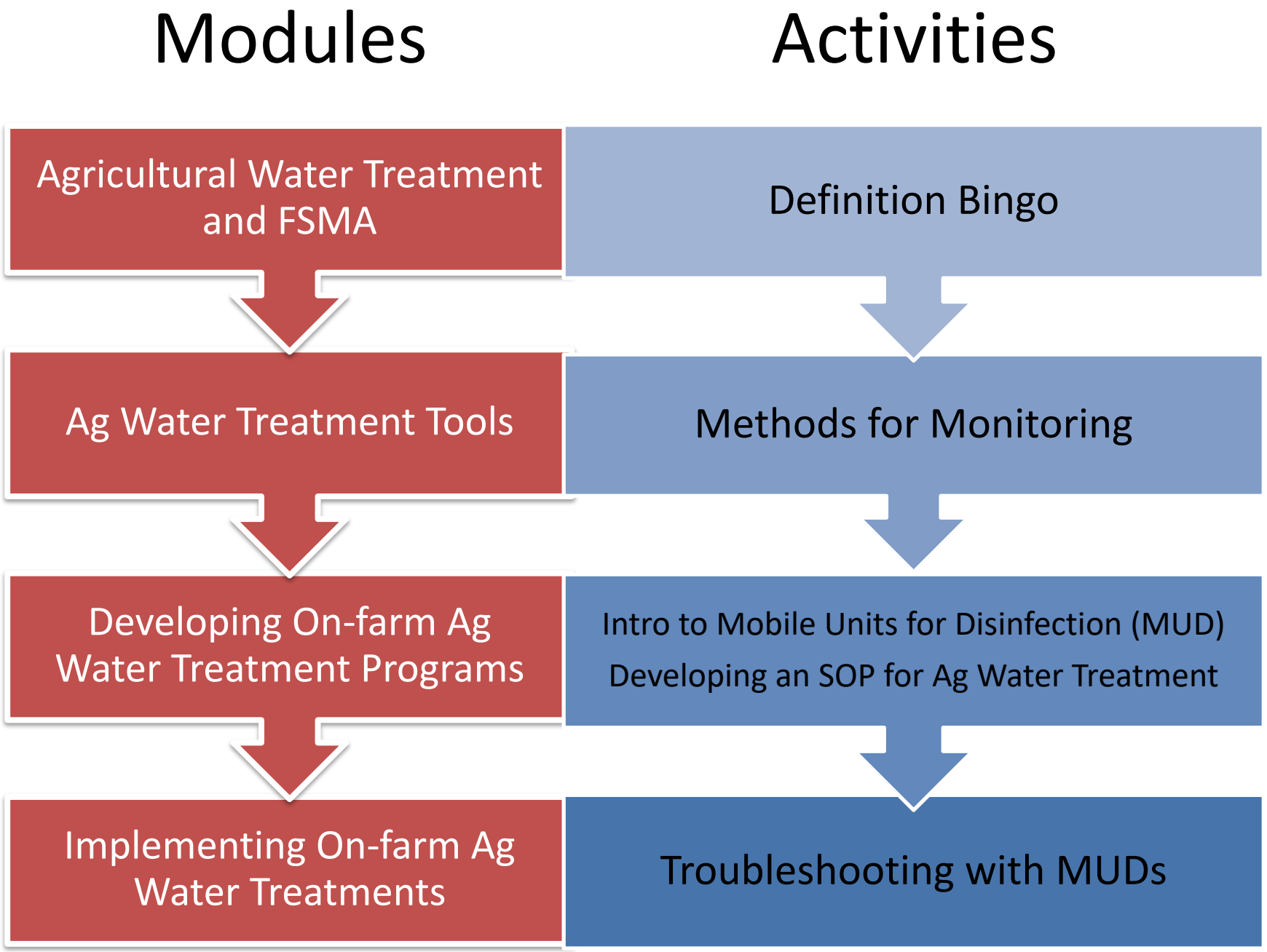
1. Stakeholder-driven curriculum development

2. Curriculum delivery
   - Stakeholders in FL, NC, TN, VA
   - Train-the-trainer

3. Evaluation (FL, NC, TN, VA)
   - Short and medium outcomes

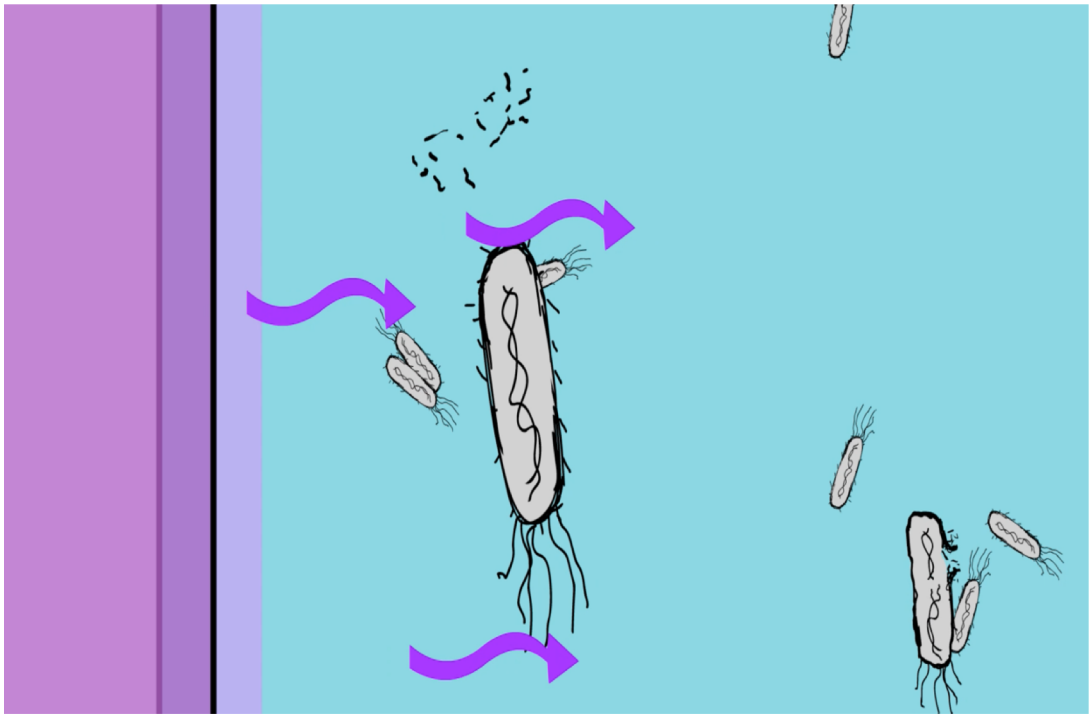
So what's part of the curriculum?




Modules
Activities
Agricultural Water Treatment and FSMA
Definition Bingo
Ag Water Treatment Tools
Methods for Monitoring
Developing On-farm Ag Water Treatment Programs
Intro to Mobile Units for Disinfection (MUD)
Developing an SOP for Ag Water Treatment
Implementing On-farm Ag Water Treatments
Troubleshooting with MUDs

MUDs

- Portable demonstration unit
- Facilitates hands-on learning activities
- Approximately $3,500



Animated Videos

- Introductory video
- UV light
- Tablet chlorination
- Chemigation highlighting peroxyacetic acid (PAA)

Interactive Chlorine Test Strip Lab

01

Can growers select the correct test strips?

02

Can they follow directions on the label?

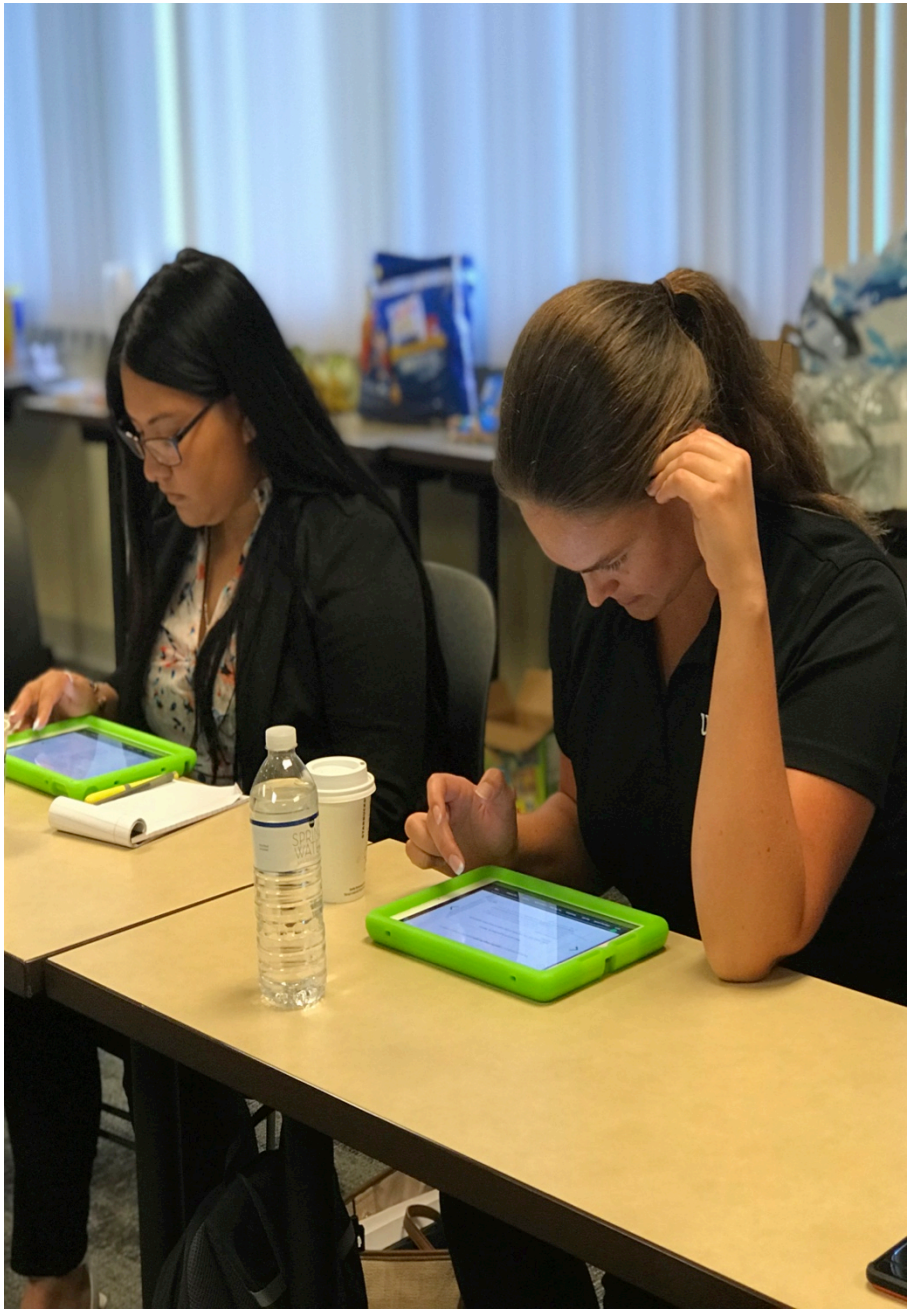
03

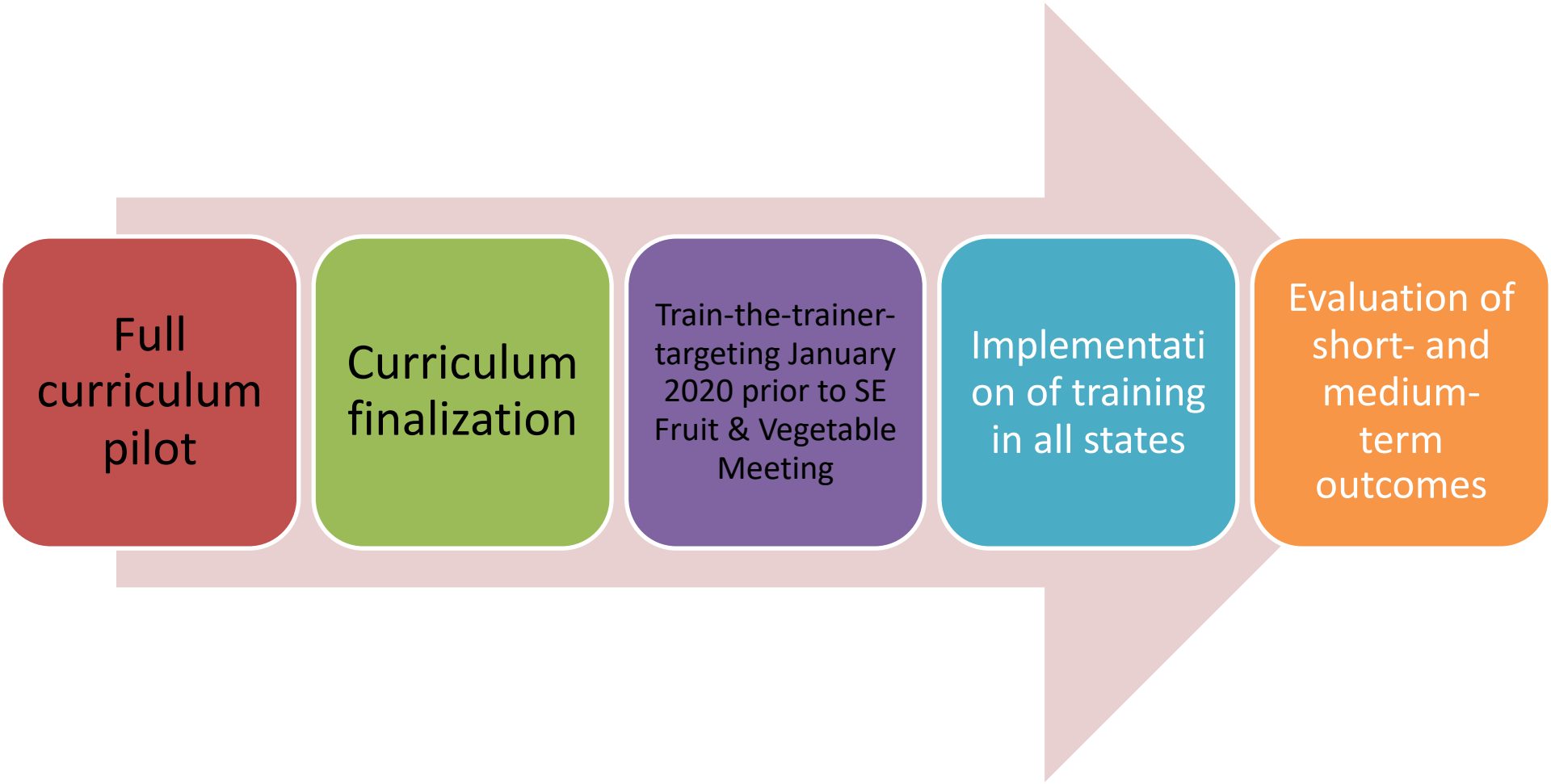
Do they understand the difference between a valid and invalid result?

04

Do they understand a result with higher that labeled values necessitates corrective actions?


EXIT





Implementation