

SURFACE WATER QUALITY IN THE TREASURE VALLEY IN RELATION TO FSMA STANDARDS FOR WATER TESTING

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Introduction

The recently finalized produce safety rules, which are a component of the Food Safety Modernization Act (FSMA) require growers to establish and maintain water quality profiles for their farms. A major concern with the water testing provisions is how extensive the testing will need to be. Farms will be required to have water quality profiles for each separate water source that leads to contact with onions or other covered produce. Separate water quality profiles will be required when there is “known or reasonably foreseeable hazard” that would lead to a change in water quality. This condition could result in very fine scale water testing, with individual farms having multiple water profiles depending on the layout of their fields.

Although each farm will be required to maintain their own water quality profiles, there are provisions in the FSMA rules for sharing of water test results and for allowing third parties to collect water samples.

The FDA has indicated that testing could be done on a larger geographic scale rather than a farm-by-farm or field-by-field basis if it can be demonstrated that data collected at those broader scales reliably characterize water quality. Such a region-wide data collection program could significantly reduce the burden on individual growers to collect water samples.

Water quality monitoring will be required for compliance with the produce safety rules of FSMA. Field configurations and the complexity of irrigation systems in the Treasure Valley could mean individual farms would need significant numbers of separate water quality profiles.

Developing a regional approach that samples water at broad geographic levels and shares data among farms would significantly reduce the cost and time investment for individual growers.

Materials and Methods

We monitored generic *E. coli* levels on three canal systems in the Treasure Valley. The canals were the Farmers’ Coop Canal, Canyon County, and the Old Owyhee and Shoestring canals in Malheur County. For each canal we established four sampling “zones” with four sample sites within each zone (Fig. 1). Sample sites within zones were separated by 1 km (0.62 miles), and there was approximately 7 km (4.5 miles) between zones. Canals were sampled 4-5 times from late July through August to satisfy the FDA requirement that samples are to be collected as “close to harvest as practicable”.

In addition to locating the sample sites, we documented all places where water returned into each canal from drains, etc.

Water Quality Monitoring

- 3 Major Canals
- Sampled in July – August
- 4 Zones along each Canal
 - Zones 7 km apart
- 4 Sites within each zone
 - Sites 1 km apart

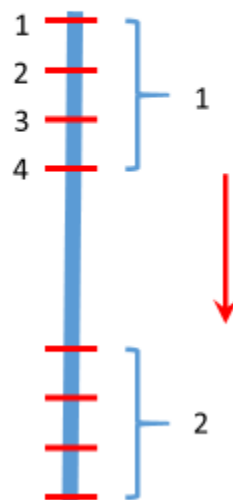


Figure 1. Schematic of water monitoring plan showing the arrangement of sampling sites within sampling zones.

Water quality profiles were developed for each canal to determine how variable results were among sites within and among zones. The water quality profiles were recalculated with the FDA die-off provisions (0.5 log per day die off over 4 days).

Water quality profiles are expected to be highly variable with a large proportion potentially not within the FSMA thresholds ($GM \leq 126$, $STV \leq 410$ CFU/100 ml). However, when recalculated with the die-off allowances, all sites should be well within standards.

Results

The sampling sites encompassed nearly the entire length of each canal. As expected, *E. coli* levels increased from upstream sites to downstream sites and more return flows entered each canal. We mapped several hundred return points in the systems.

The trend for increasing *E. coli* levels was less evident for the Farmers' Coop canal than for the canals in Malheur County, which originate from the Owyhee Reservoir. The Farmers' Coop Canal is supplied by a diversion from the Boise River, which flows through agricultural areas before the diversion. Consequently, upstream samples from the Farmers' Coop canal had higher *E. coli* levels than the Old Owyhee or Shoestring canals.

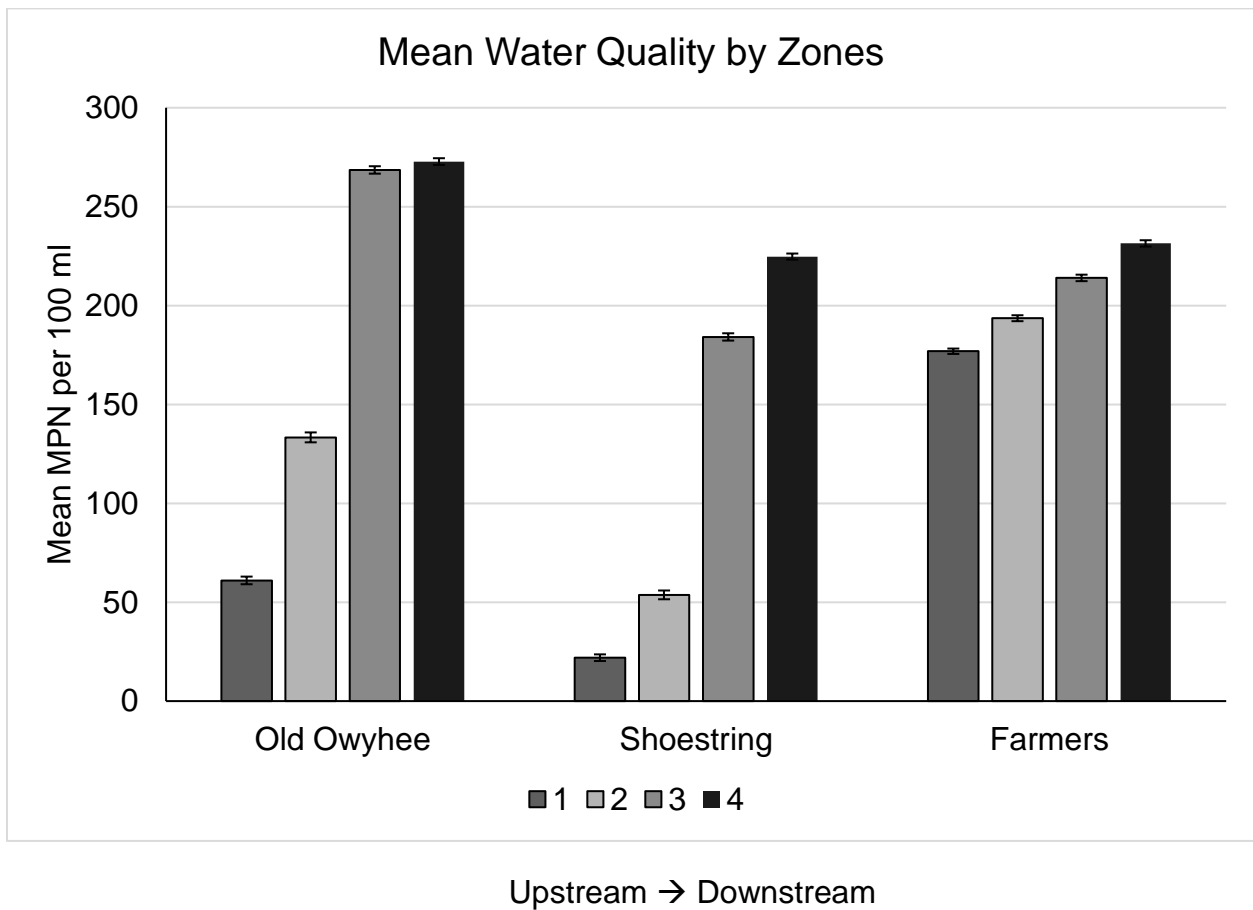
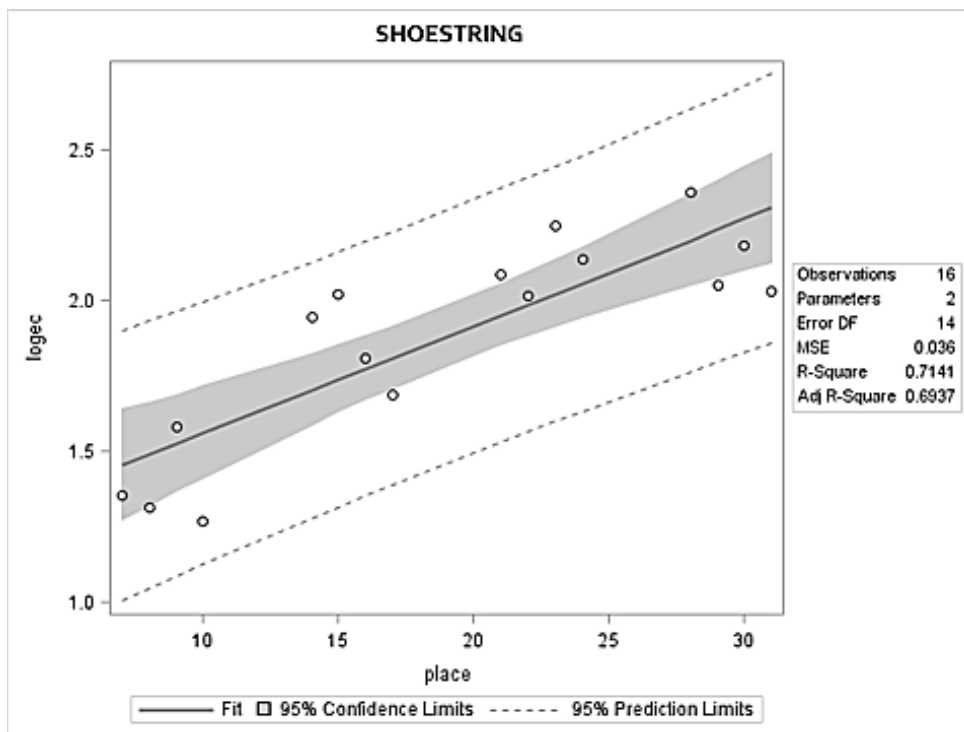
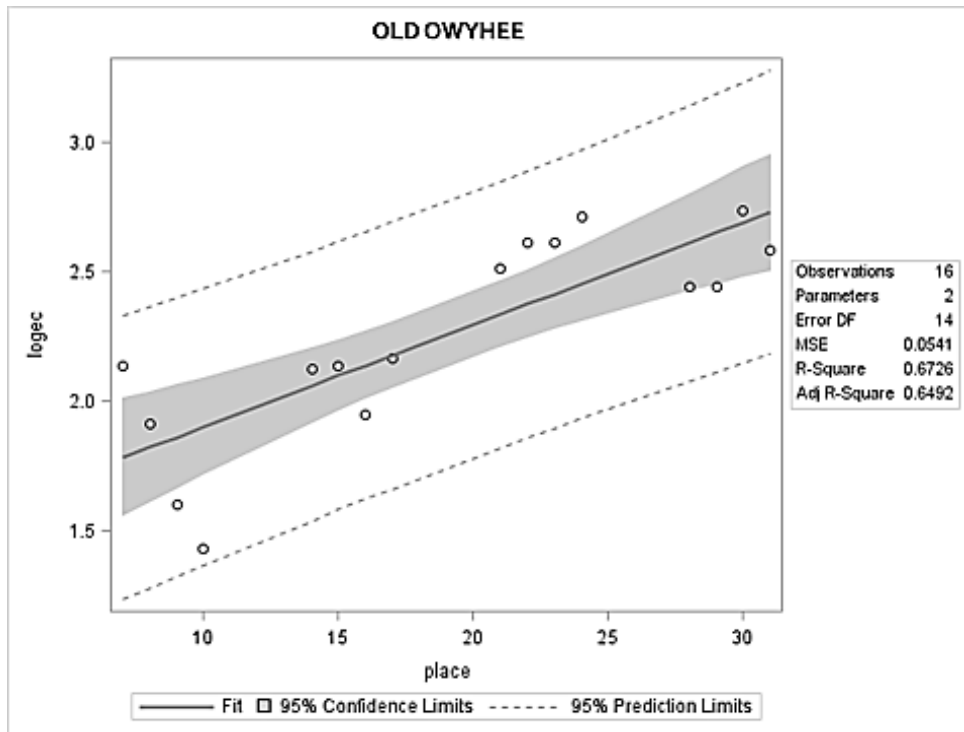


Figure 2. Mean seasonal water quality results for three canal systems in the Treasure Valley. Each bar represents the mean for a sampling zone comprised of 4 sample locations separated by 1 km. (MPN = most probable number)



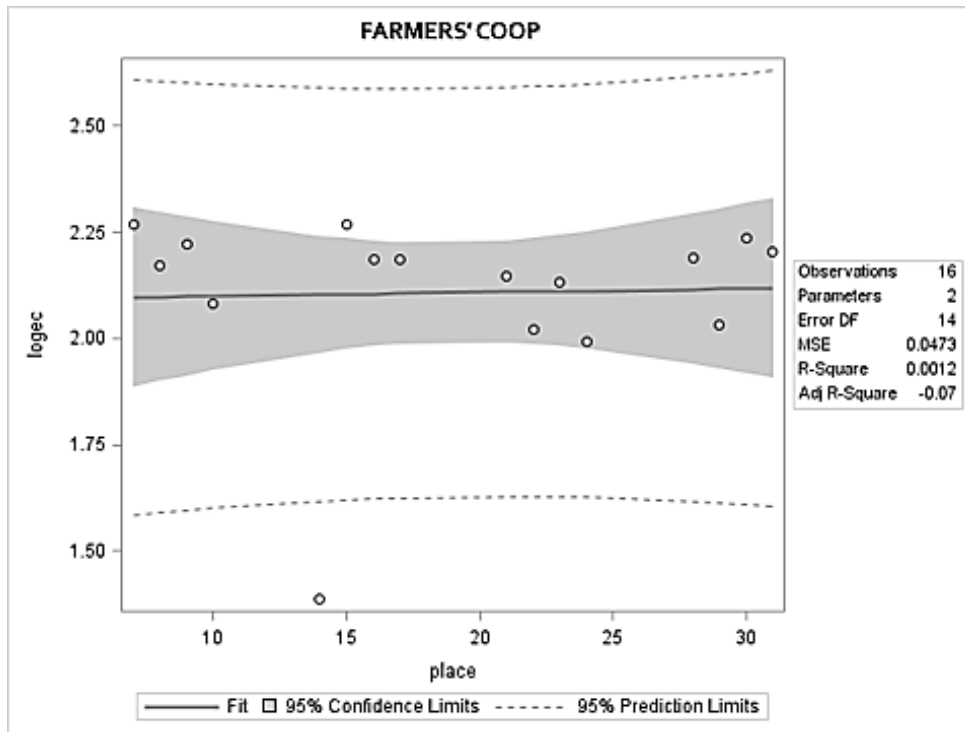


Figure 3. Representative water quality results from each of the three canal systems that were monitored. Results are from a single sample day for each canal. The x-axis (place) denotes the distance from the canal origin to the sample site (in kilometers). The y-axis (log_ec) denotes the logarithmic value of generic *E. coli* levels (most probable number [MPN]) in each sample. For reference a value of 1.0 = 10 MPN per 100 ml of water, 1.5 = 31.6 MPN, 2.0 = 100 MPN, 2.5 = 316 MPN, and 3.0 = 1000 MPN.

Although most water quality profiles computed based on raw results for the sampling zones exceeded the FSMA standards for the geometric mean and statistical threshold value, all zones were in compliance with just a 1-day die-off allowance (note: FDA is allowing up to a 4-day die-off period).

Importantly, there was little variation among sample sites within each zone (Figs. 2 and 3). With the die-off provisions, large-scale geographic testing of water should adequately characterize the quality of different canal systems (Fig. 4). These results raise the potential that FSMA-related water testing could be done on a regional basis and growers can share water testing results. This could reduce some of the water testing burdens and costs on individual growers.

With I-EOOC and grower association approval, information will be communicated to the FDA to determine if broader scale monitoring would be an acceptable approach.

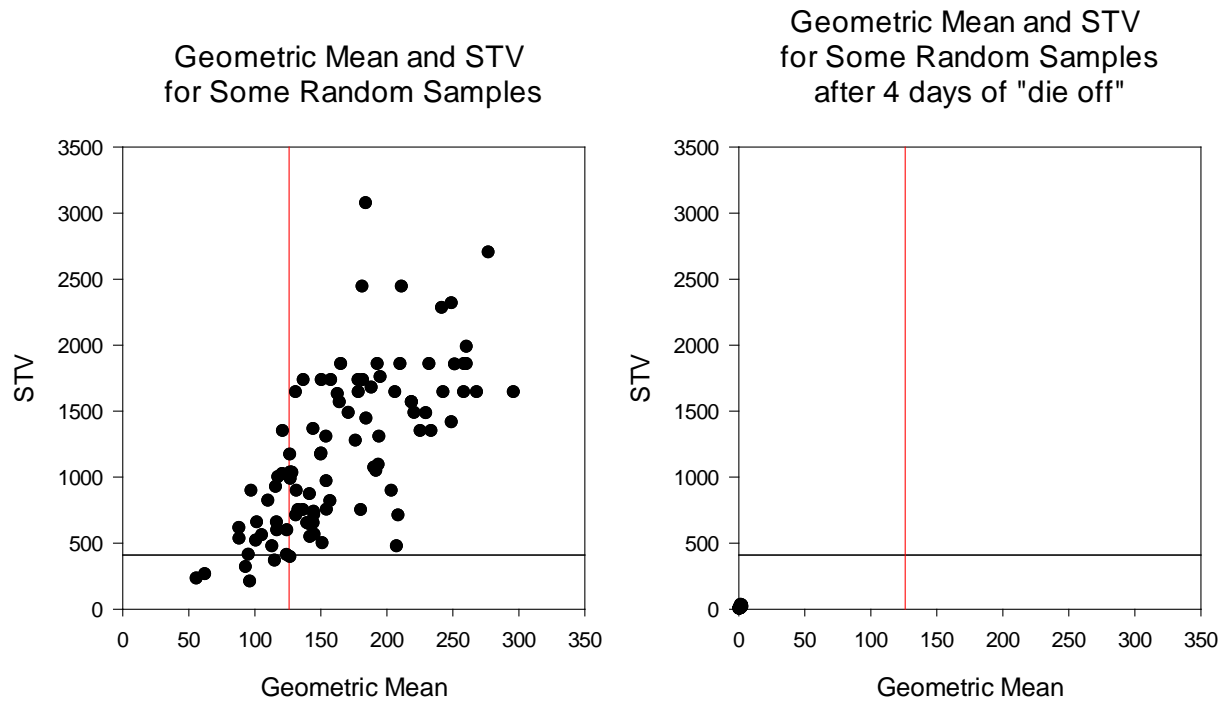


Figure 4. Water quality profiles based on previous monitoring results collected across the Idaho-Eastern Oregon onion growing region. These results demonstrating the changes in profiles with the 4-day 0.5 log per day die-off allowance. Graph on the left are profiles based on actual test results. Profiles in the lower left quadrant of both graphs meet the compliance standards. STV = statistical threshold value.

Acknowledgments

I appreciate the technical assistance of Ian Trenkel, Nicole Drake, Darvee Stevens, Katelyn Nelson, Megan Travis, and Kelsey Alexander, and the staff at Western Laboratories, Parma, Idaho. The project was supported by the Idaho-Eastern Oregon Onion Committee.