

# Comparison of Indicator Bacteria Densities and their Relation to Turbidity in Kansas Streams

NWQMC  
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*By Patrick Rasmussen, Victoria  
Christensen, and Andrew Ziegler*

# Bacteria in Kansas

- FCB are primary reason for 303d impairments
- E. Coli will replace FCB as standard in 2003
- Annual Wichita Riverfest canceled in 2000



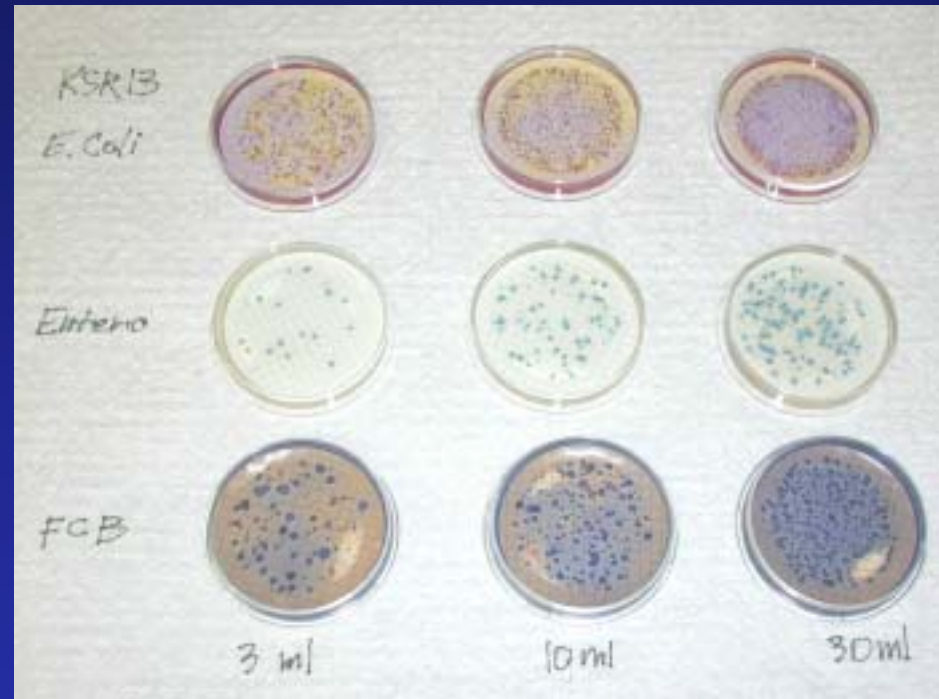
# Collection of Manual Samples

- Collected during a wide range water-quality conditions
- Analyzed for **bacteria** and other selected constituents

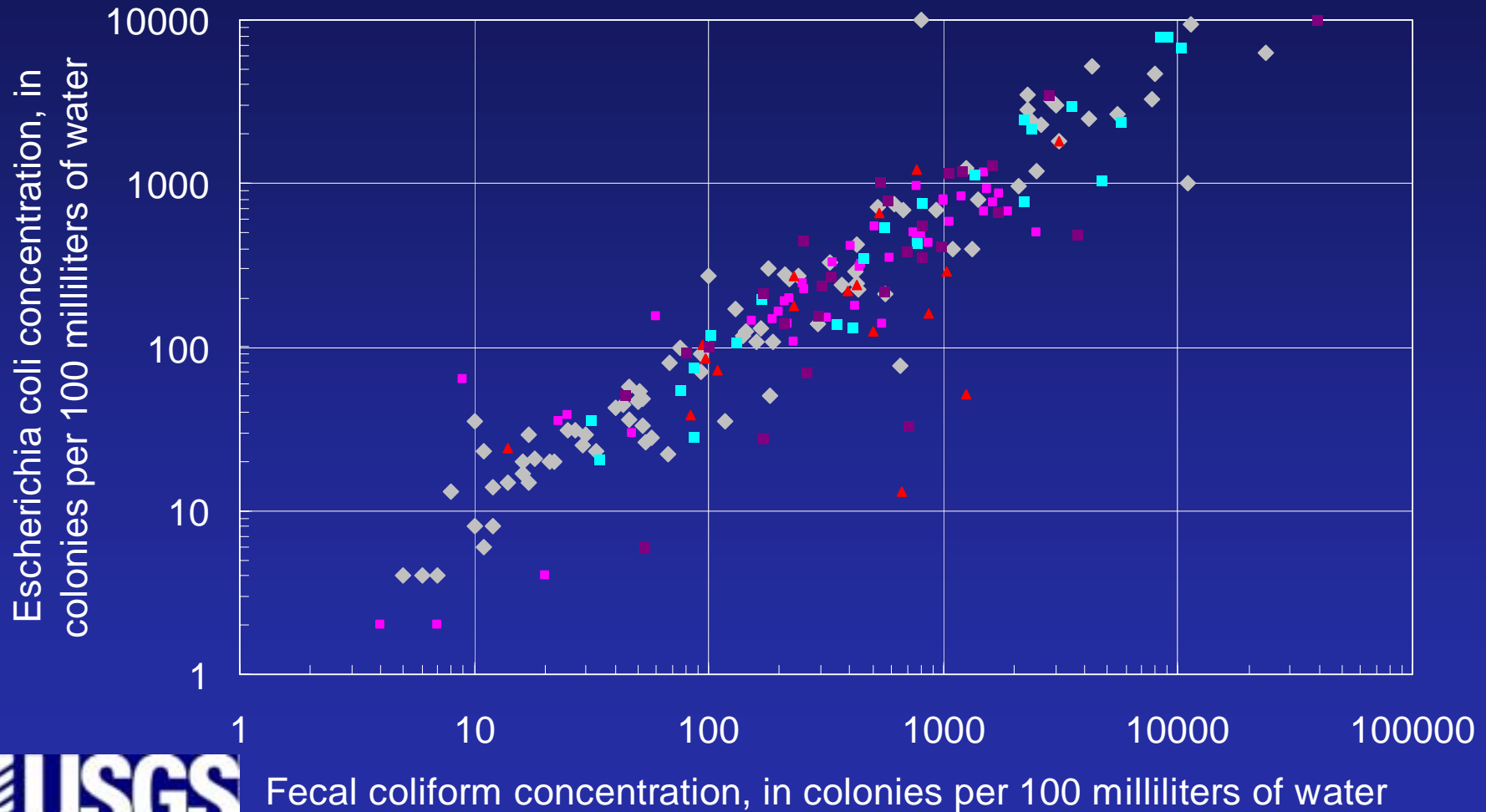


# Standard Change

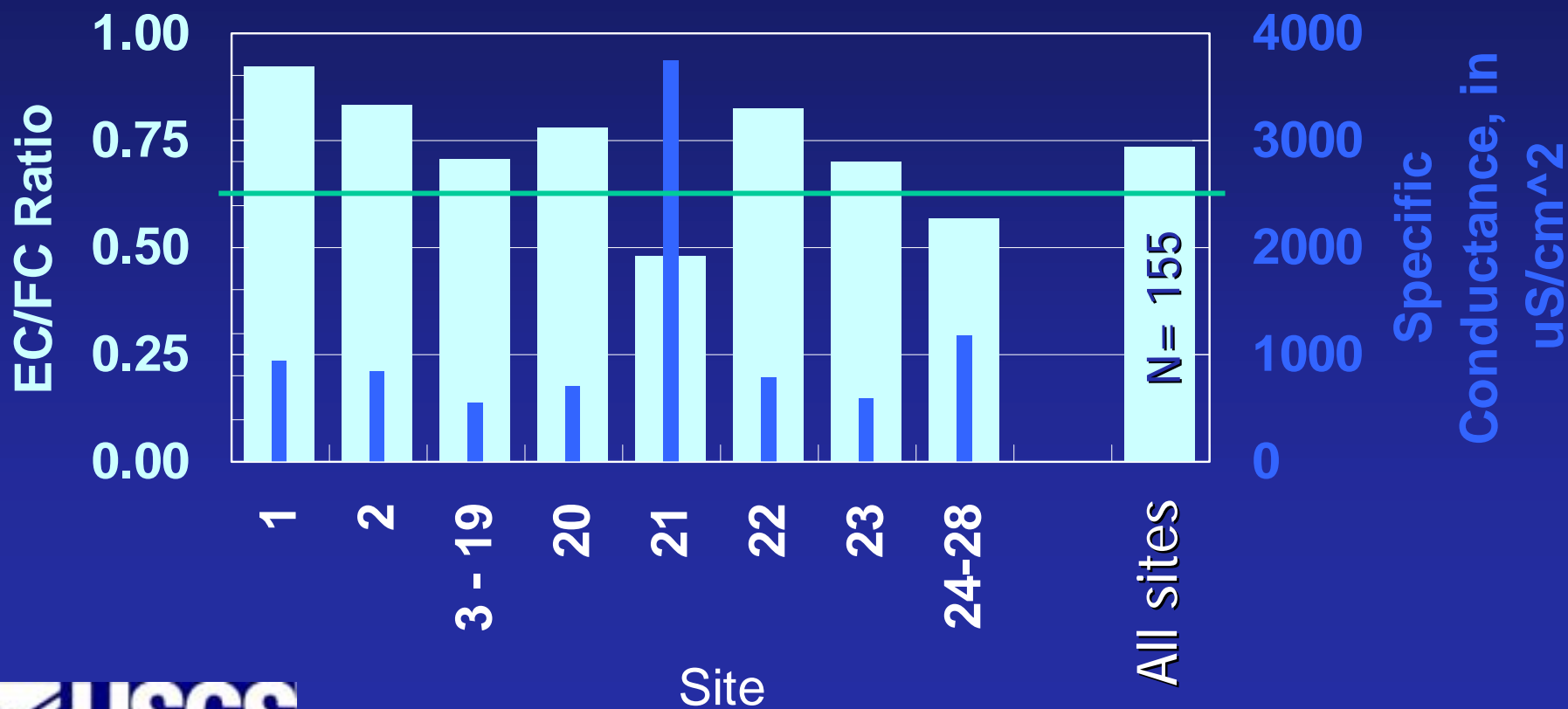
- FCB Standard =  
200 col/100mL
- ECB Standard =  
126 col/100mL
- The ratio between standards =  $126/200$   
or 0.63



# E. coli versus Fecal Coliform

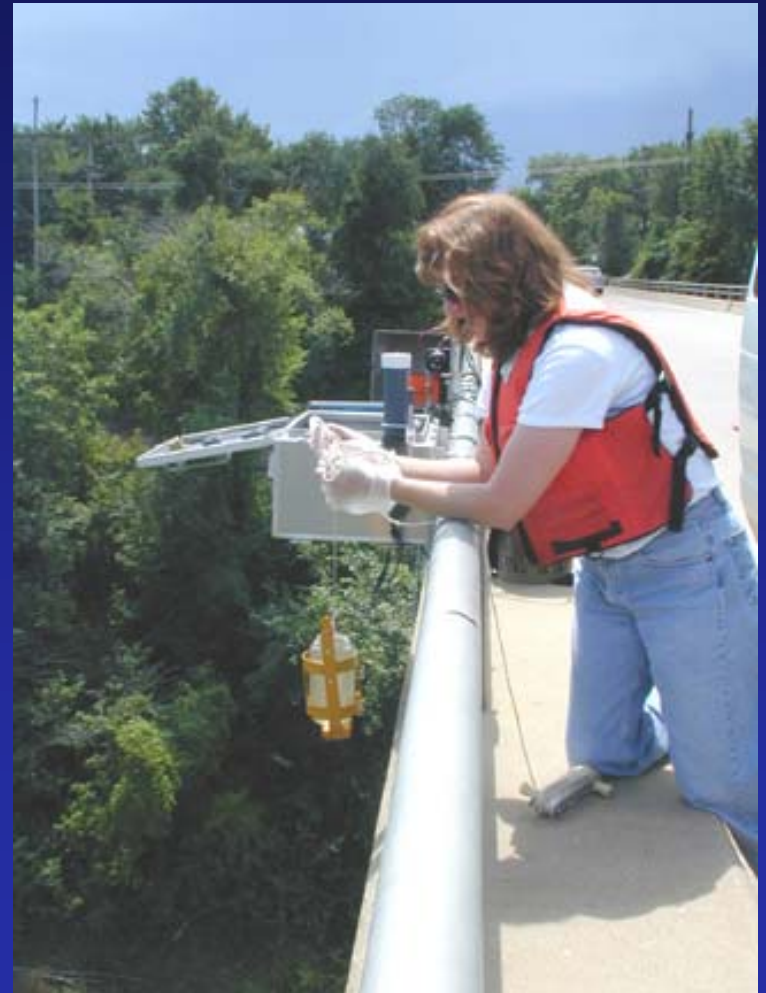


# E. Coli and Fecal Coliform Ratio



# Limitations of Conventional Water-Quality Monitoring

- Sample results aren't immediately available
- Seasonal, diurnal, and event driven WQ changes are missed
- Daily and annual concentrations estimates based on Q



# Approach

1. Collect periodic manual samples
2. Upgrade selected USGS stream gages
3. Develop regression equations
4. Estimate concentrations and loads



# Real-time, Continuous Water-Quality Monitoring



- pH
- Water Temperature
- Dissolved Oxygen
- Specific Conductance
- **Turbidity**
- ORP
- Total Chlorophyll

# Surrogate used to Predict

Stage

Discharge

Specific Conductance

Chloride, alkalinity,  
dissolved solids,  
sulfate, triazine

Turbidity

Total suspended solids,  
suspended sediment,  
fecal coliform, *E. coli*,  
total nitrogen,  
total phosphorus

Fluorescence

Chlorophyll-a, Taste and odor

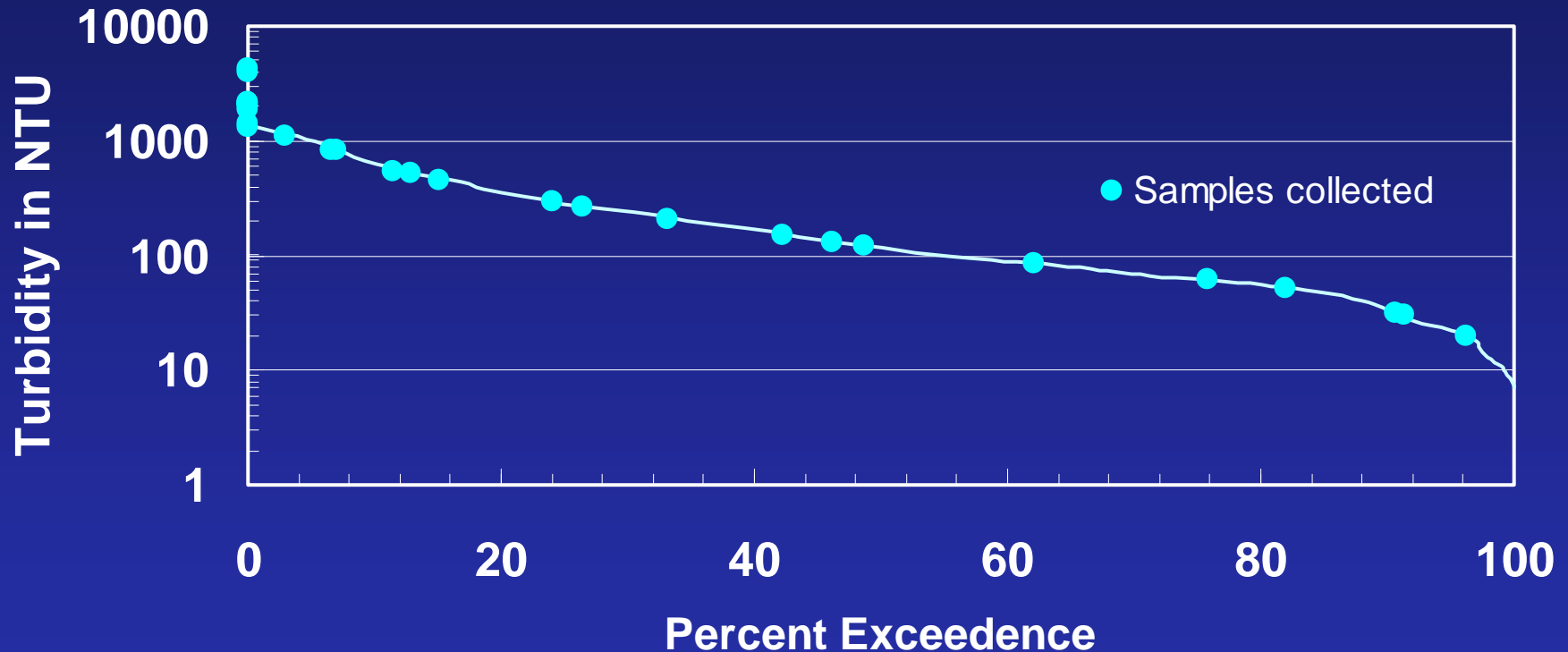
# Kansas River Alert Network



- Kansas Dept of Health and Environment (KDHE)
- Fecal Coliform vs. E. Coli
- Monitor TMDLs
- Alert downstream water suppliers
- Optimize sample collection frequency

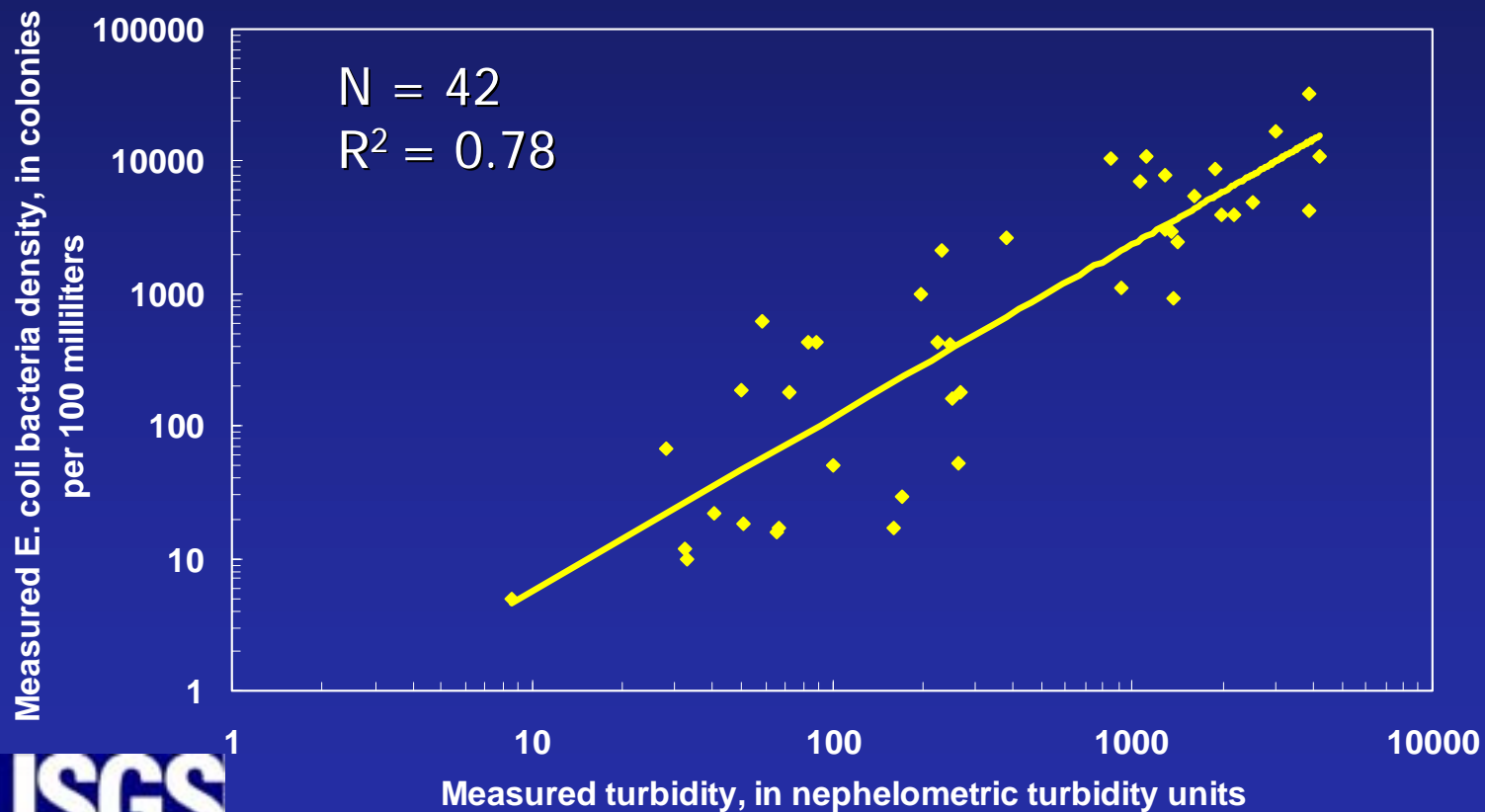
# Turbidity Duration Curve

## Kansas River @ De Soto

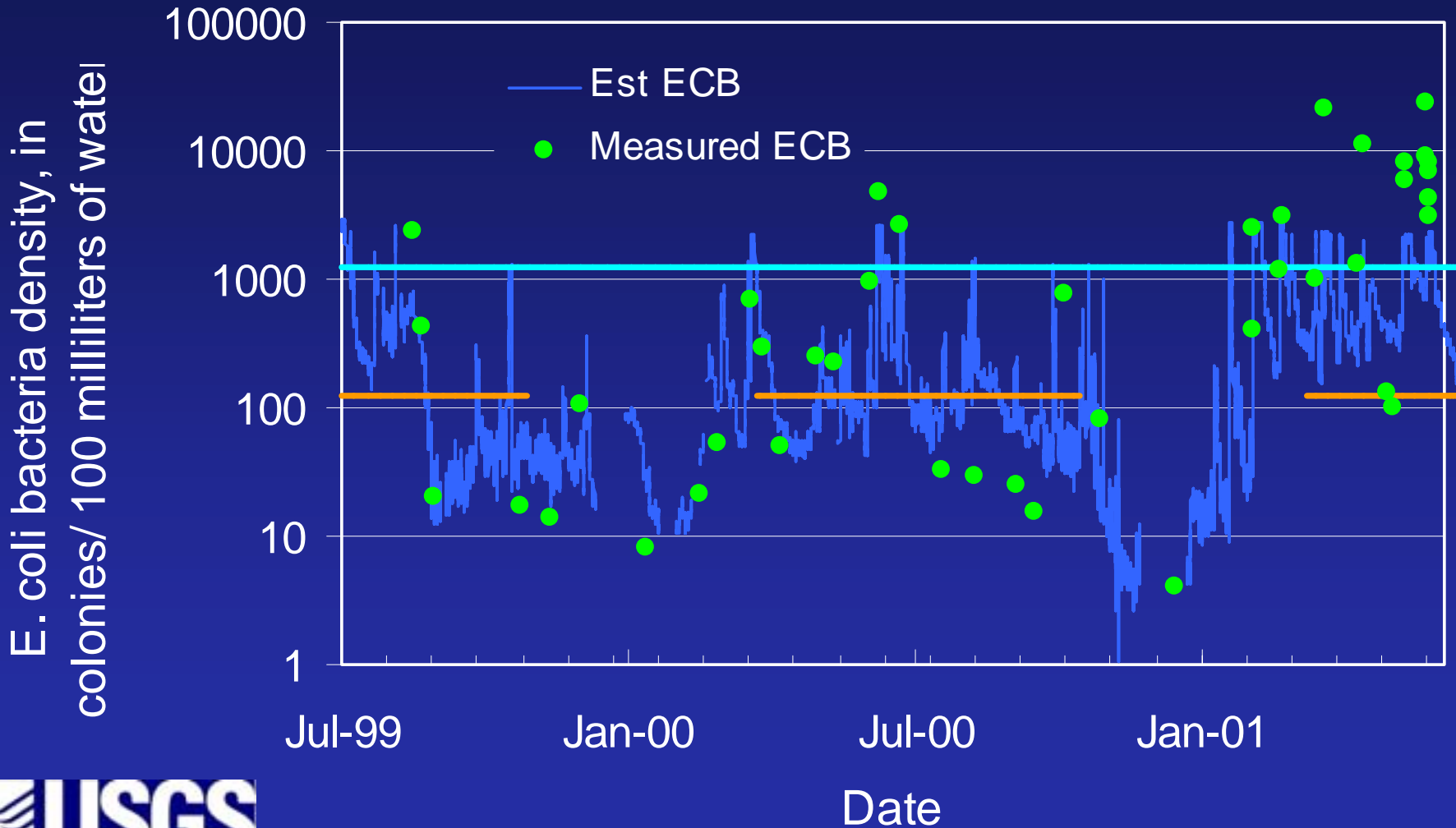


# Turbidity vs. Measured ECB Bacteria Densities

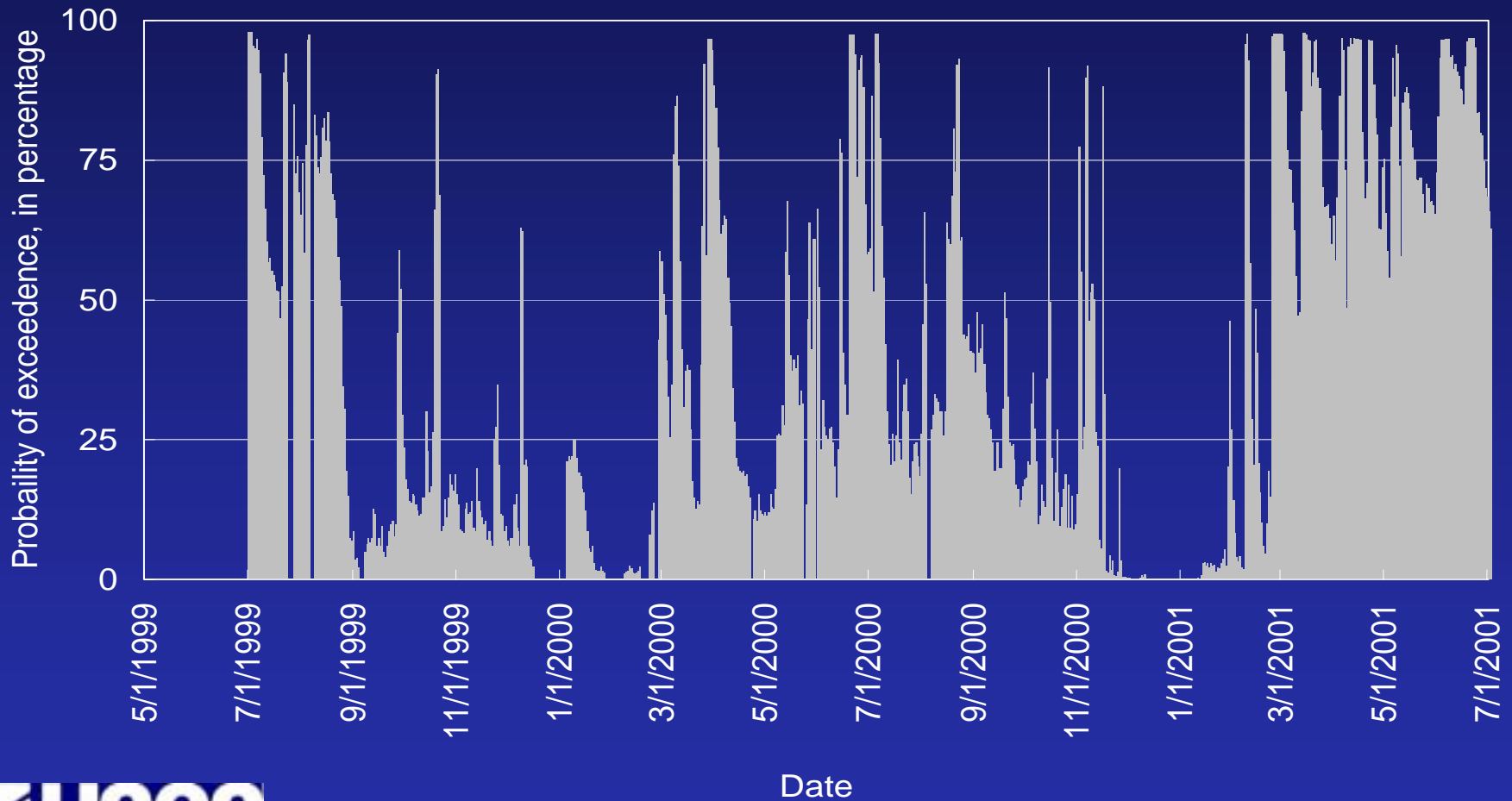
$$\log_{10} (ECB) = 1.30 \log_{10} (NTU) - 0.538$$



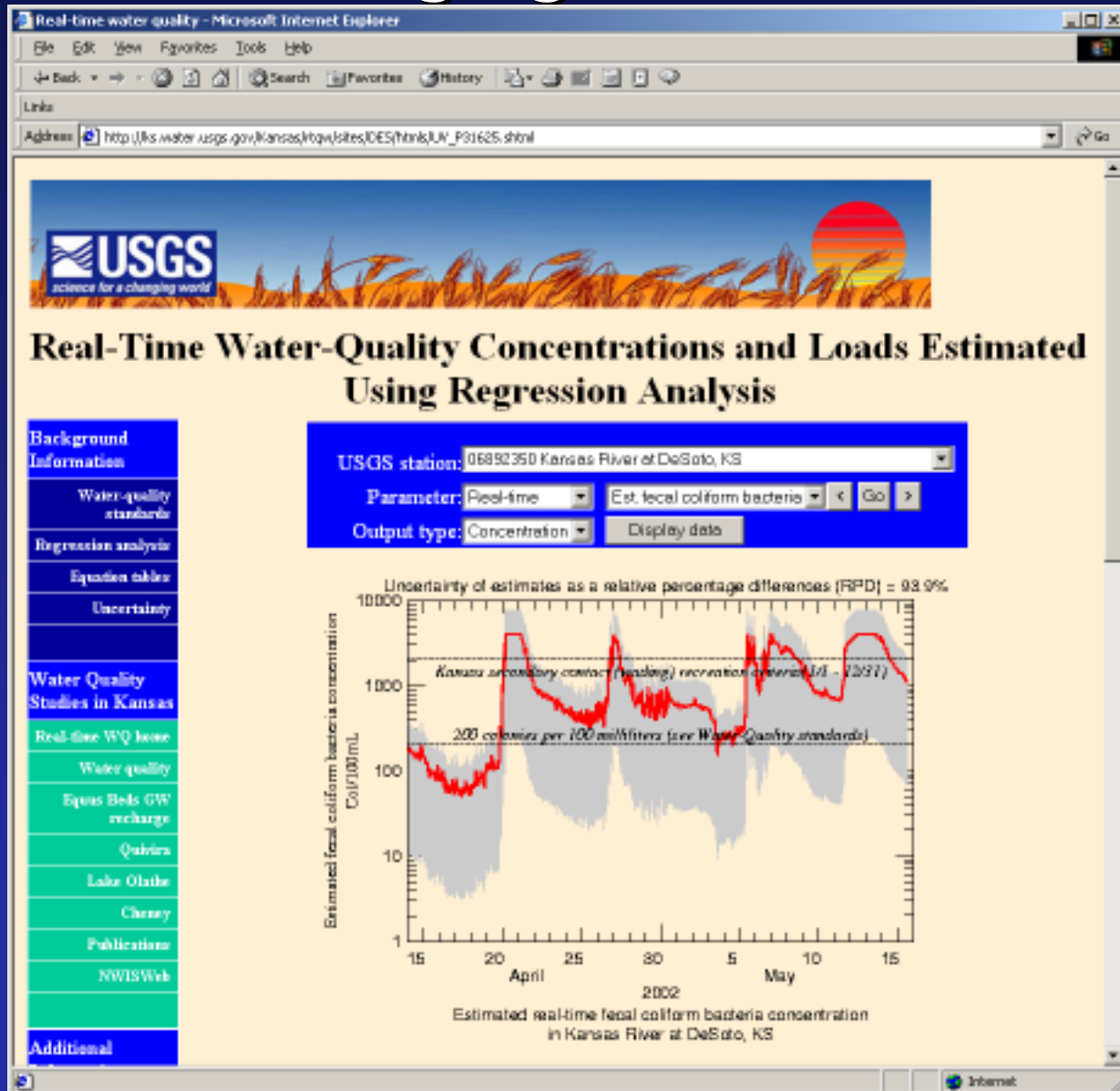
# Estimated E. Coli Densities



# Probability of exceedance



<http://ks.water.usgs.gov/Kansas/rtqw/>





# Summary

- E. coli standard is not equivalent to FCB
- Elevated salinity levels may decrease EC/FC ratio
- Turbidity provides continuous bacteria concentration estimates
- The only way to evaluate whole-body contact criteria in real-time
- All water users have access to current water quality information
- Evaluates BMPs and TMDLs

For more information on real-time water quality in Kansas:

<http://ks.water.usgs.gov/Kansas/qw/>

or

<http://water.usgs.gov/ks/nwis/>