

Oso Creek/Oso Bay Numerical Modeling

Presented to the Oso Creek/Oso Bay
TMDL Stakeholders Meeting

By

Richard Hay – Center for Water Supply Studies

Dawn Lalmansingh – Center for Water Supply Studies



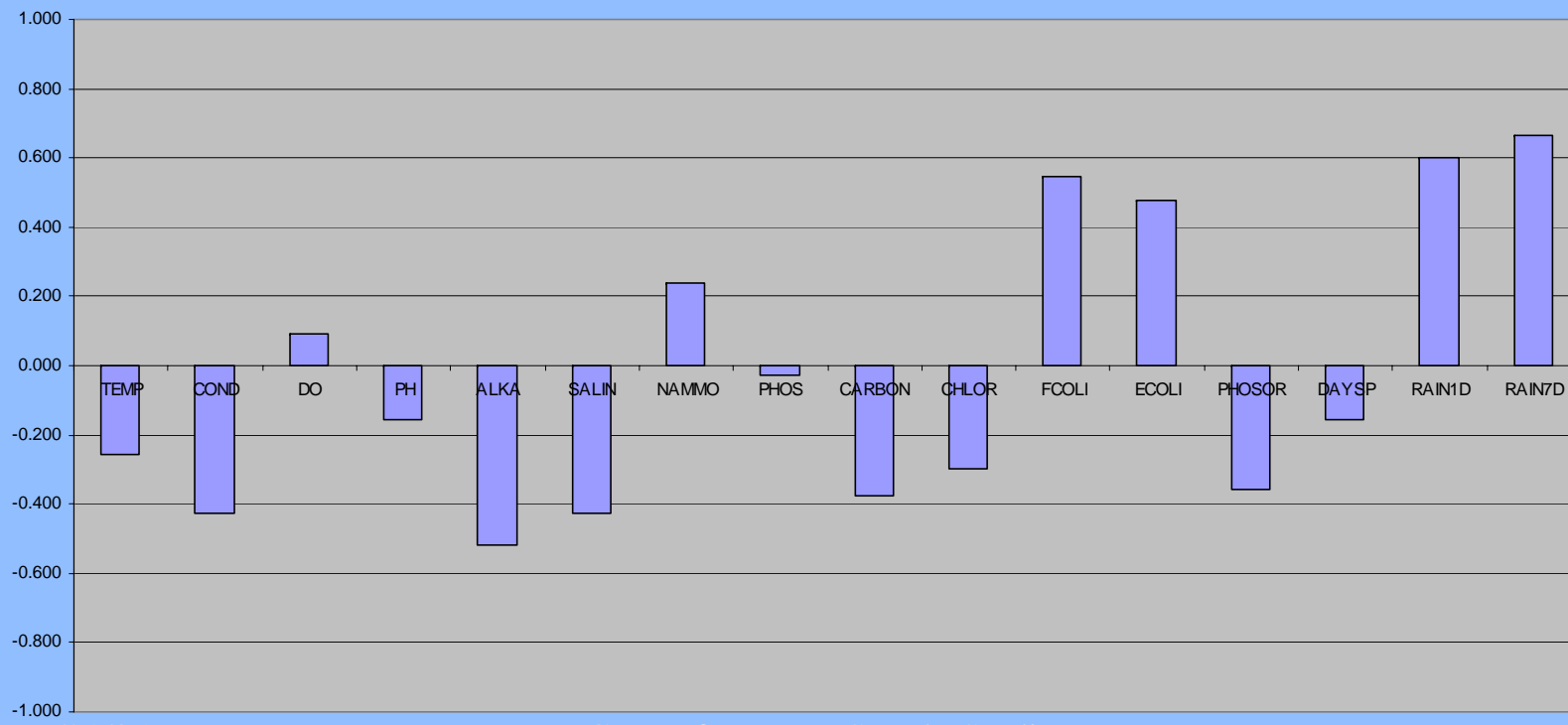
Review of Historic Data

- Historic water quality measurements were grouped into distinct time periods.
- Cross correlation coefficient matrix was developed to compare response/fluctuations of water quality parameters with each other.
- Check for use of other parameters as proxy for *enterococcus*.



Correlation Coefficients – Upstream Station 13029

- Moderate correlation between *enterococcus* and *E. coli*, fecal coliform, salinity (neg.), conductivity (neg.) and rainfall
- Indicates fairly strong influence of runoff.



6/21/05

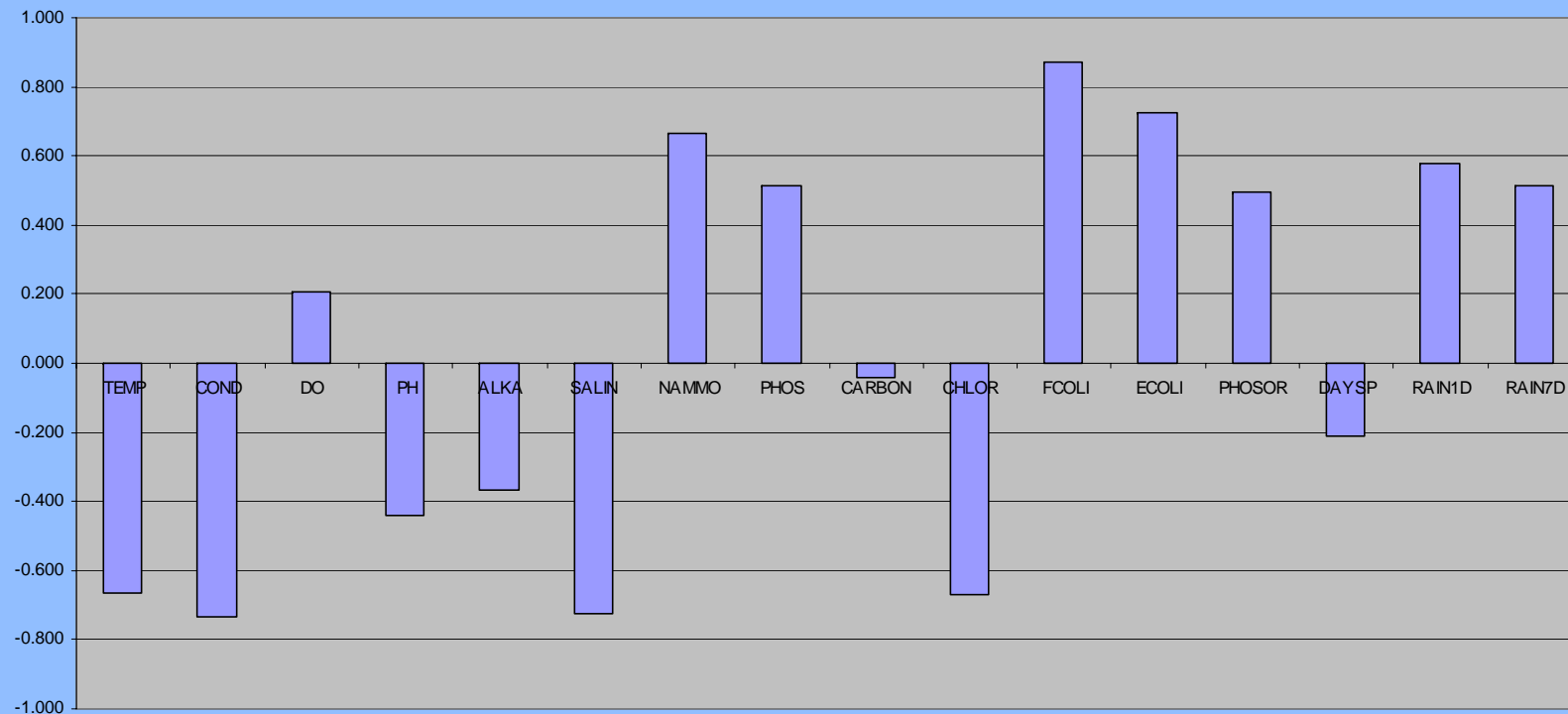
Centre for Water Supply Studies

3



Correlation Coefficients – Middle Station 13026

- Strong correlation between *enterococcus* and temperature (neg.), conductivity (neg.), salinity (neg.), N-ammonia, *E. coli*, fecal coliform, and chlorides.
- Indicates strong influence of runoff.



6/21/05

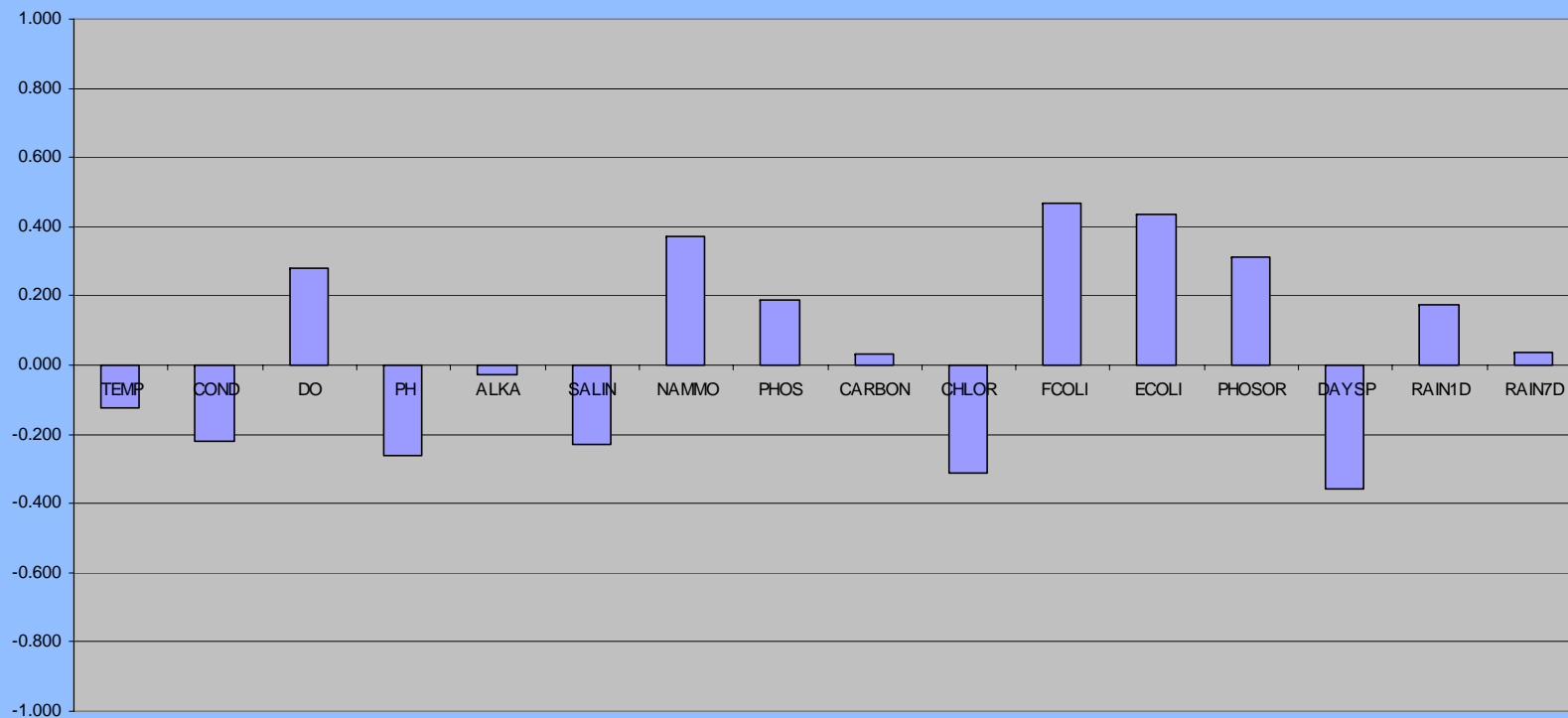
Centre for Water Supply Studies

4



Correlation Coefficients – Bay Station 13440

- Weak correlation.
- Indicates weak influence of runoff.



6/21/05

Centre for Water Supply Studies

5

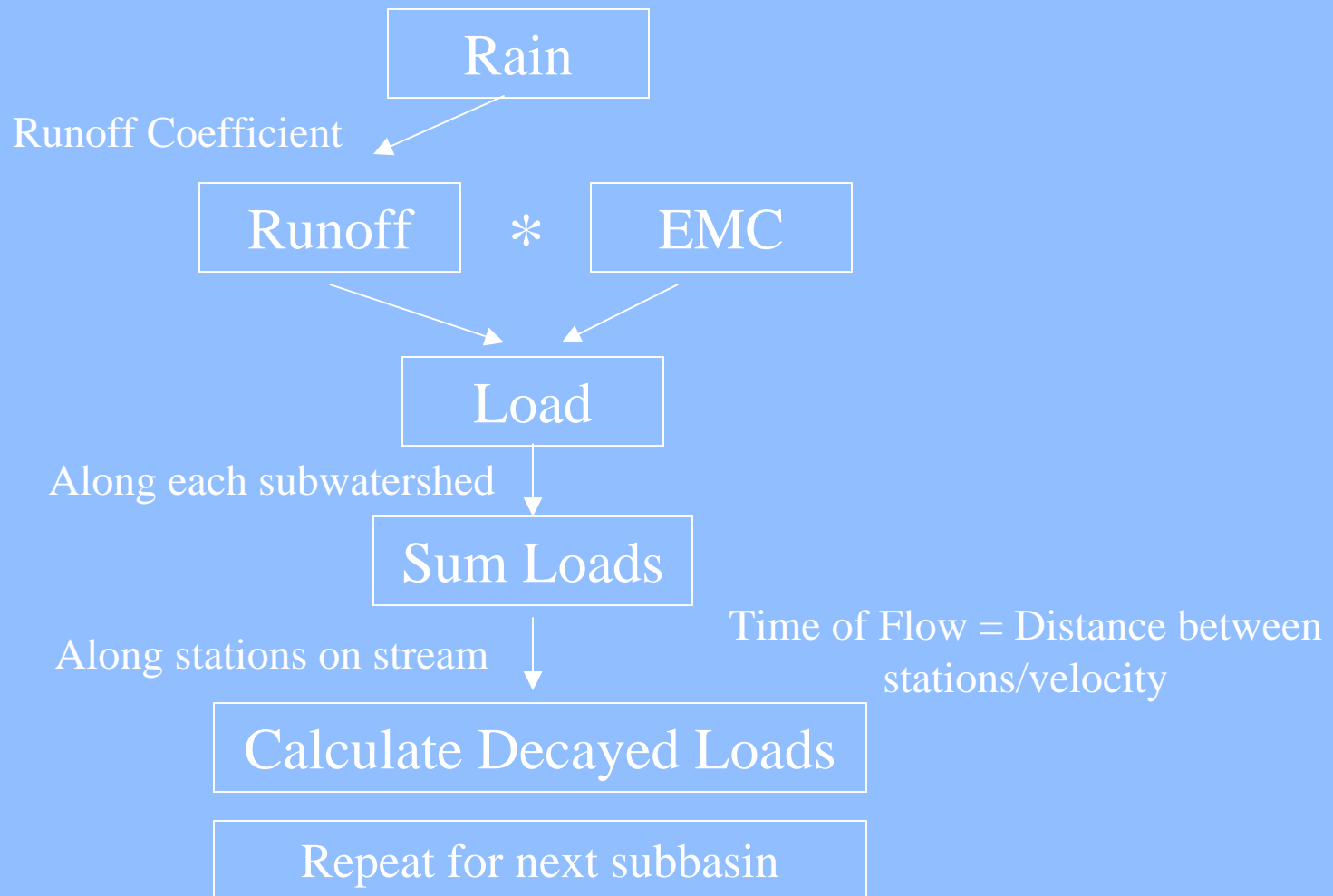


Correlation Coefficient Summary

- Upstream and middle tidal reaches respond well to runoff events.
- *E. Coli* and fecal coliform may be good proxies for *enterococcus* where *enterococcus* data is missing or unavailable.
- Bay section shows a weak correlation between *enterococcus* and other water quality parameters that may indicate an atypical runoff response.

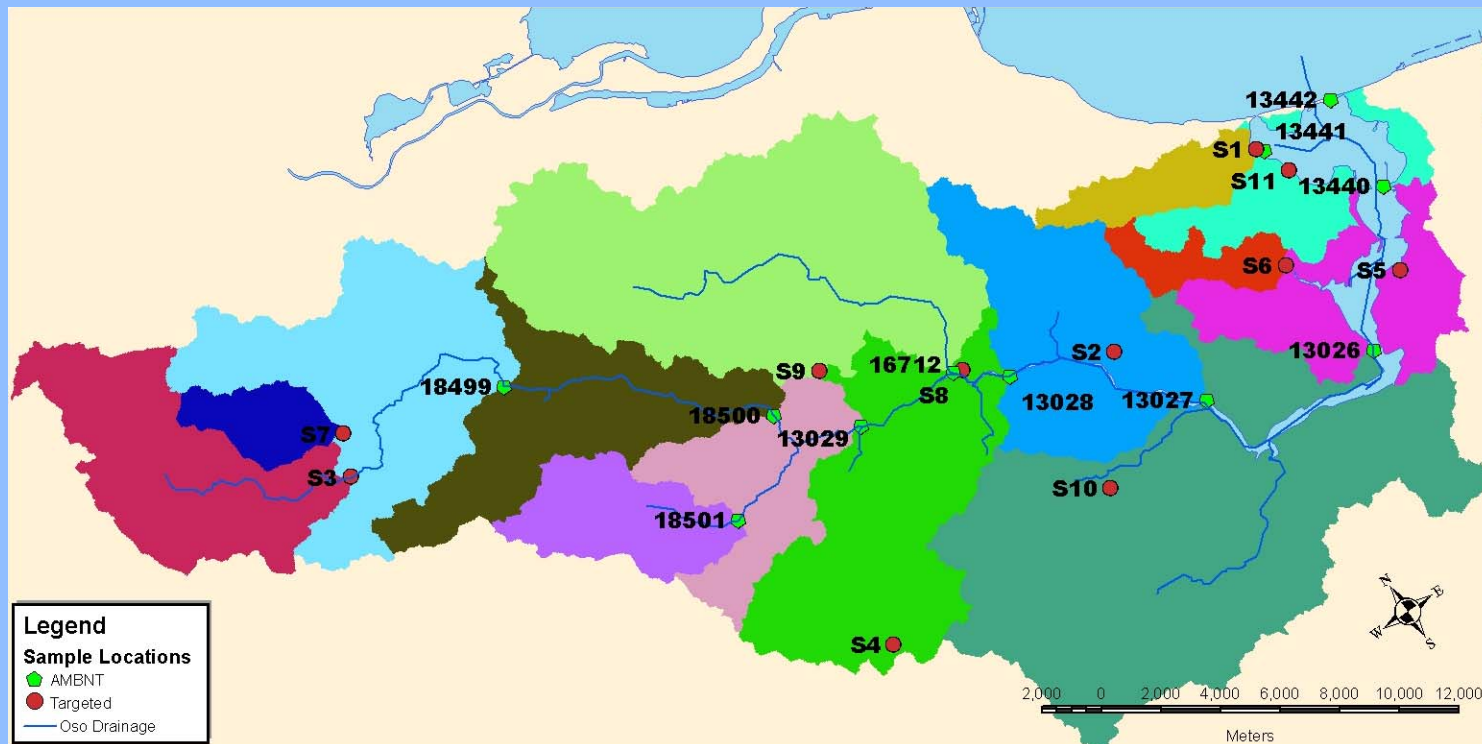


Modeling Process



Sub-basins of Oso Watershed

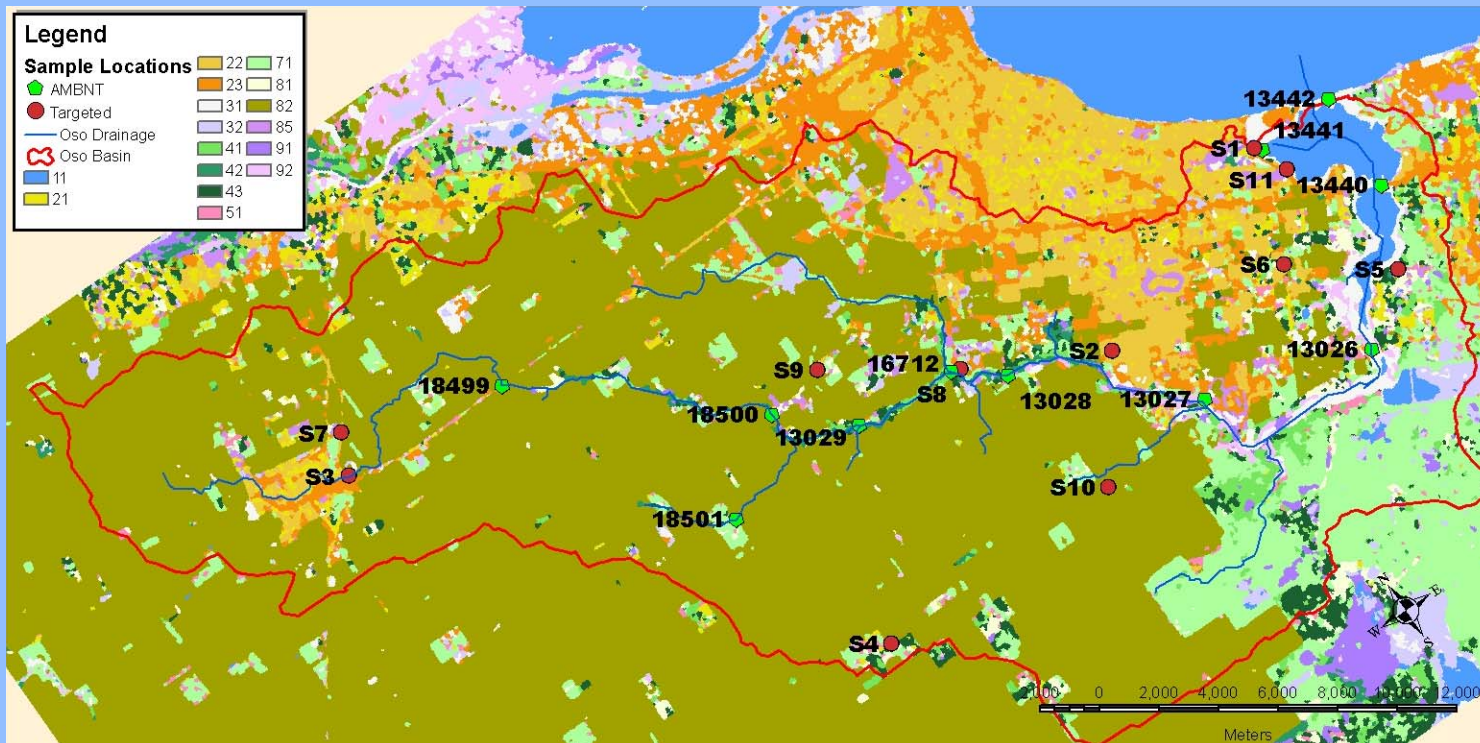
- Subbasins
- Conceptualized flow through bay
- Stations at subbasin outflow
- Natural Drainage



Land Use Land Cover

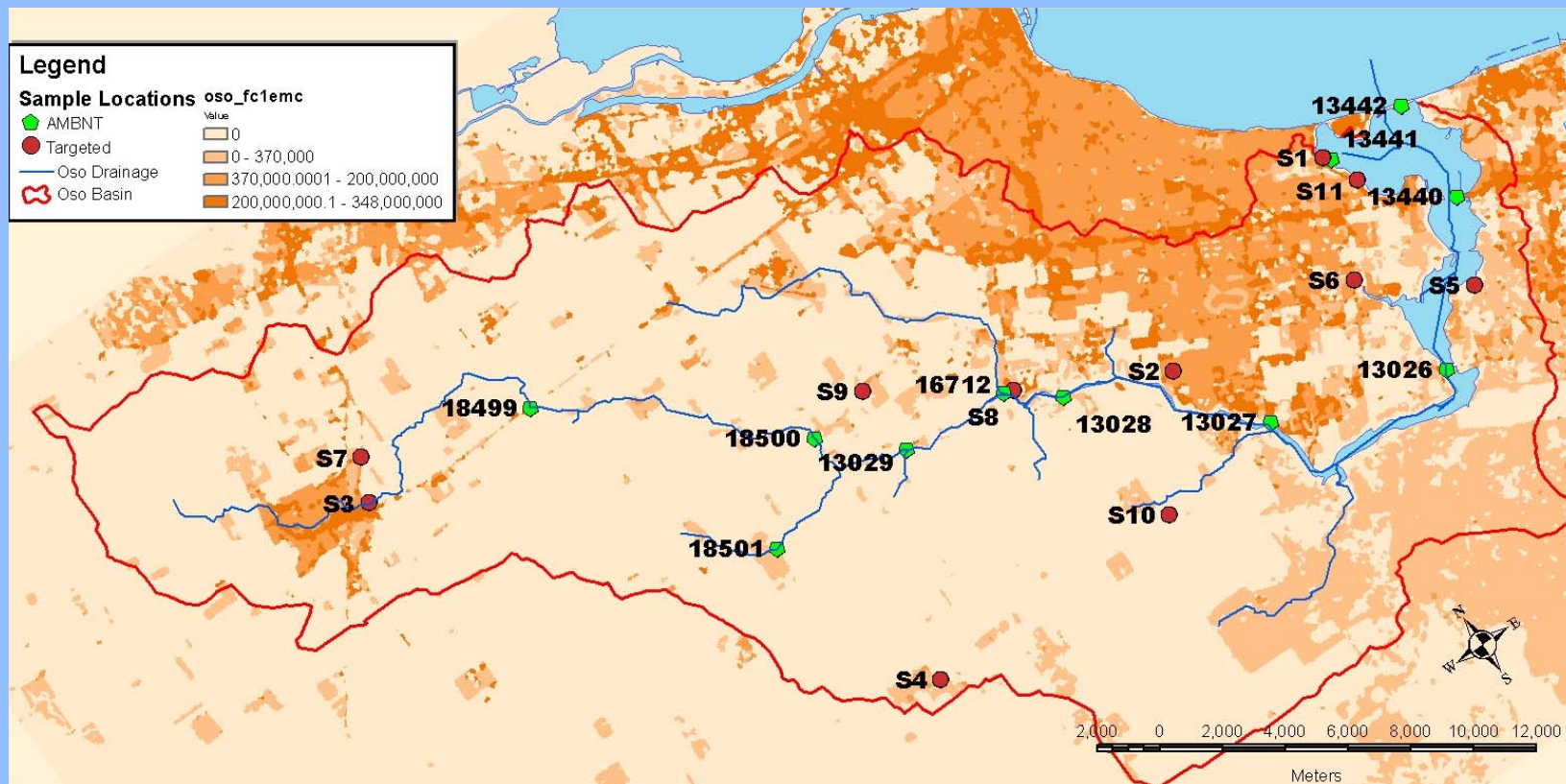
Landsat 7ETM - March 2003

- USGS NLCD classification
- Supervised training (maximum likelihood)



Event Mean Concentration Fecal Coliform - CCBNEP

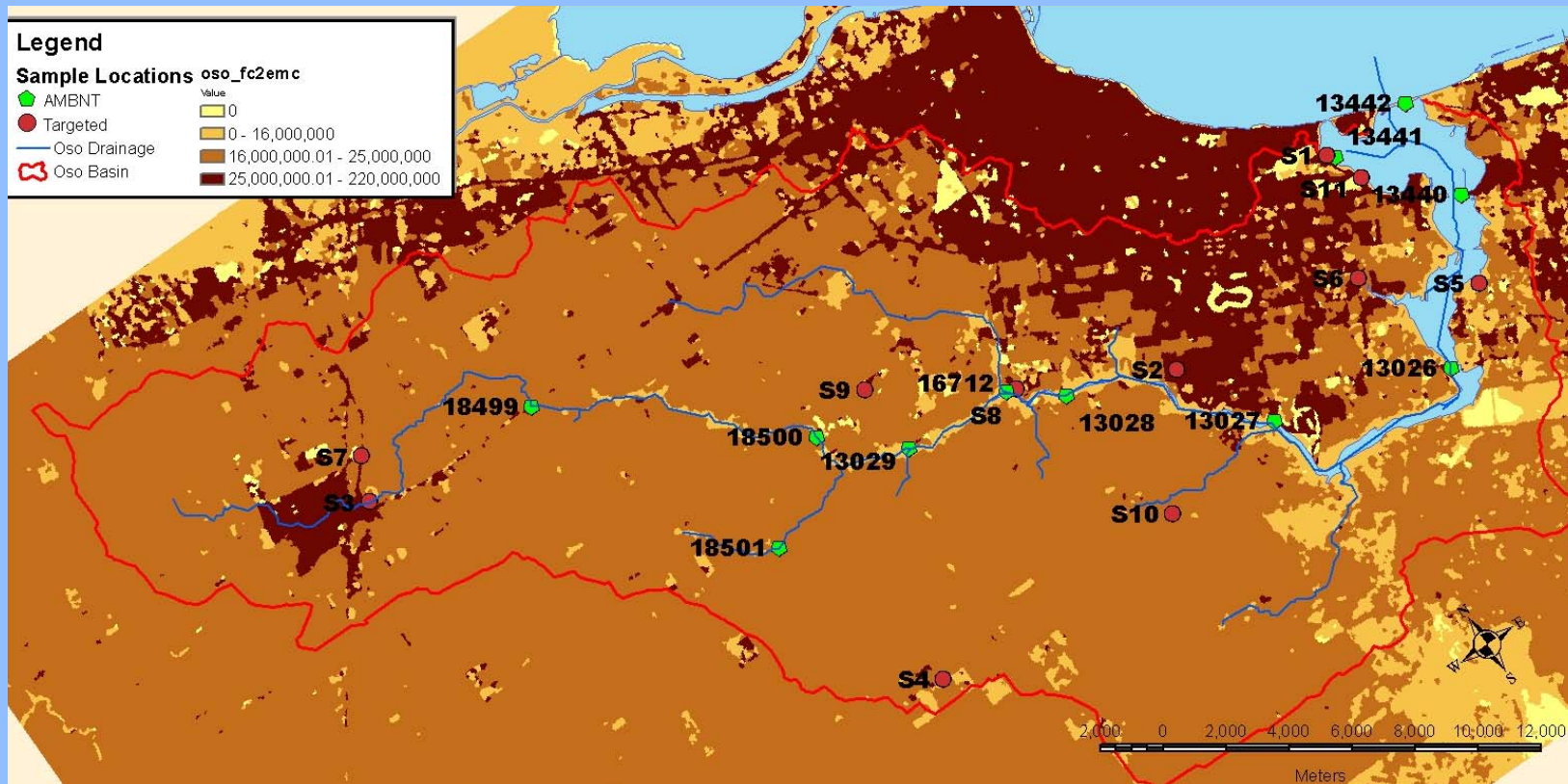
- Concentration of bacteria generated by land use per rain event.
- Data collected for the Corpus Christi Area applied to 2003 LULC



Event Mean Concentration

Fecal Coliform - GBNEP

- Concentration of bacteria generated by land use per rain event.
- Data collected for the Galveston Bay Area applied to 2003 LULC



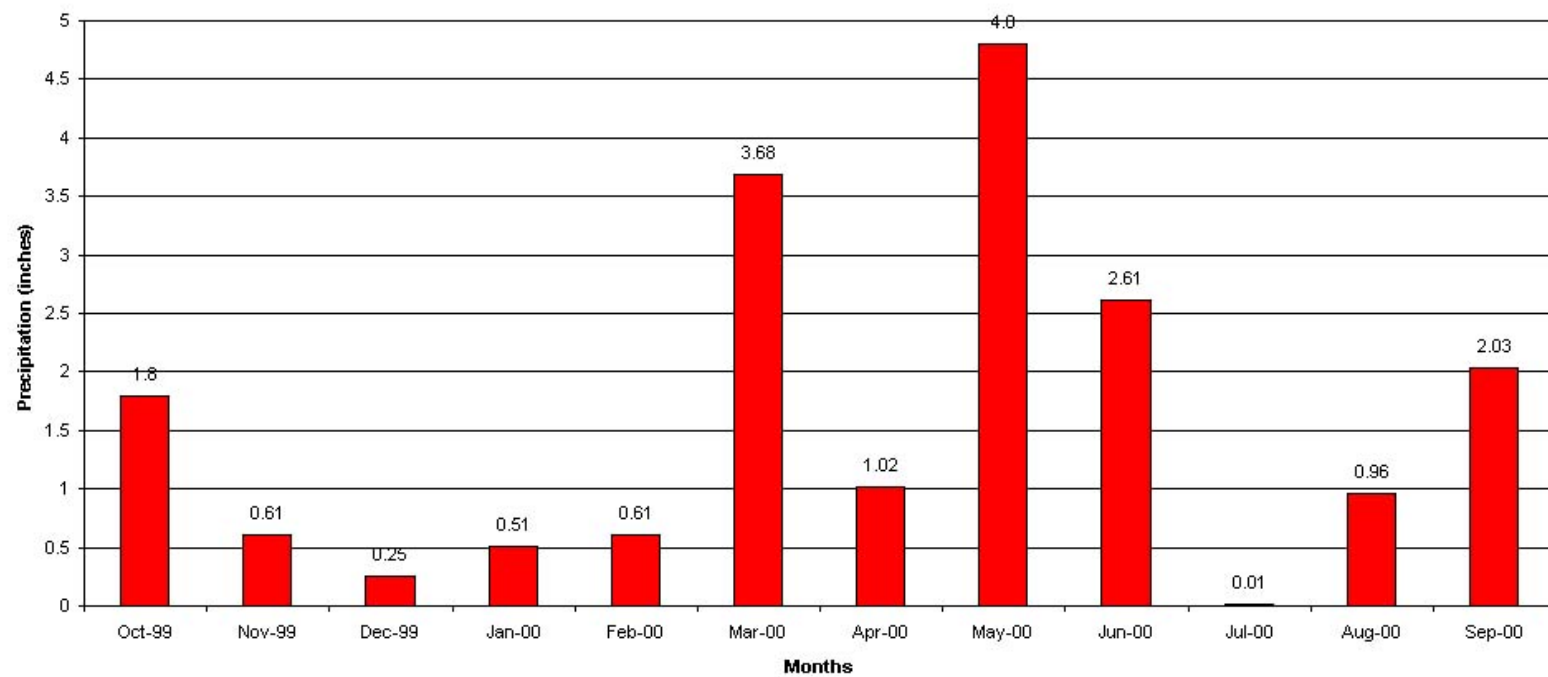
Model Calibration

- Calibration period
 - October 1999 through September 2000
- Monthly timesteps
- Target data *enterococcus*
- Data sets
 - 2003 Landuse/Land cover
 - Precipitation – NCDC
 - Event Mean Concentration (fecal coliform)
 - CCBNEP





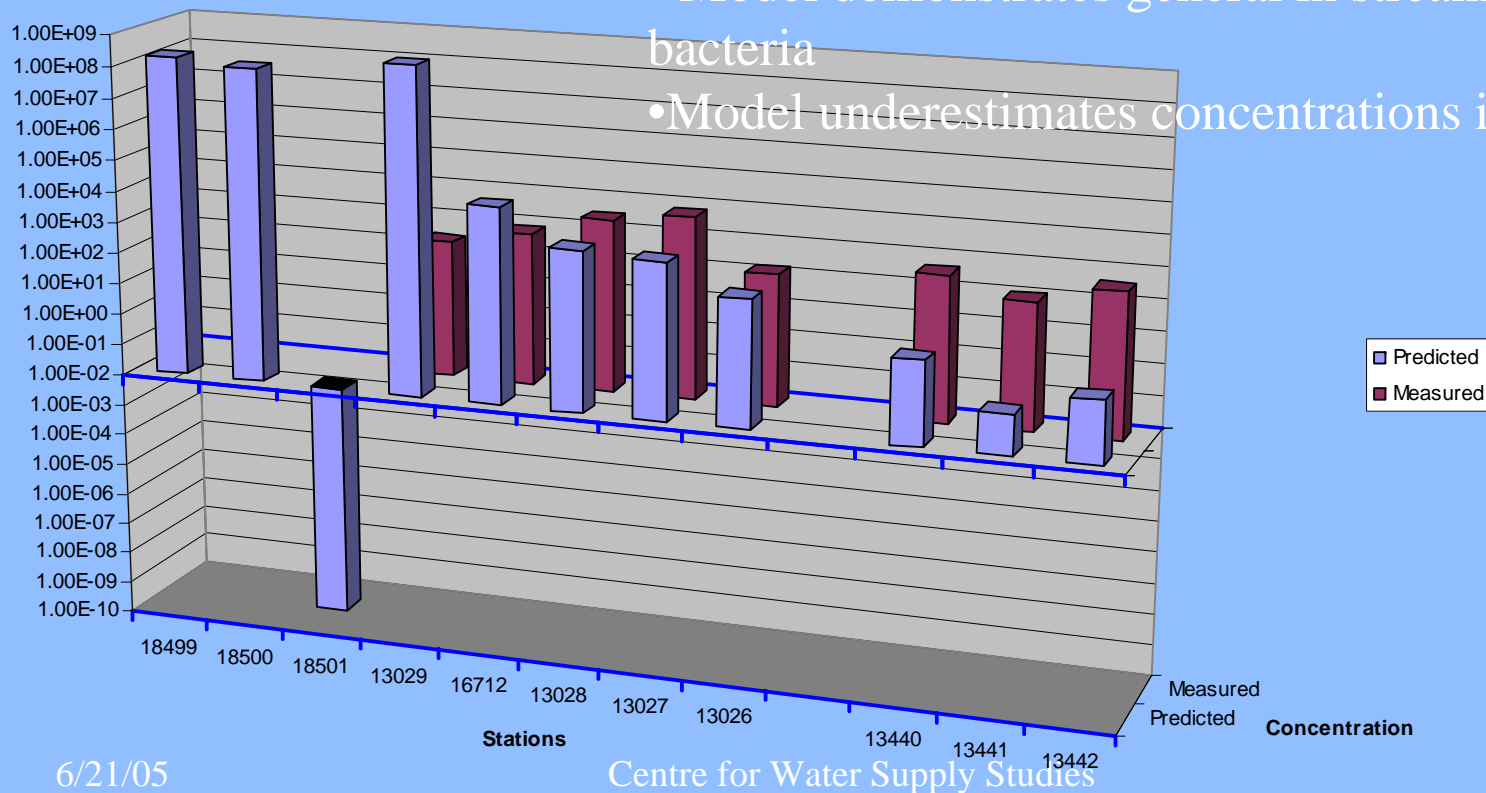
Monthly Precipitation From October 1999 - September 2000



Preliminary Results

Bacteria concentrations in February 2000

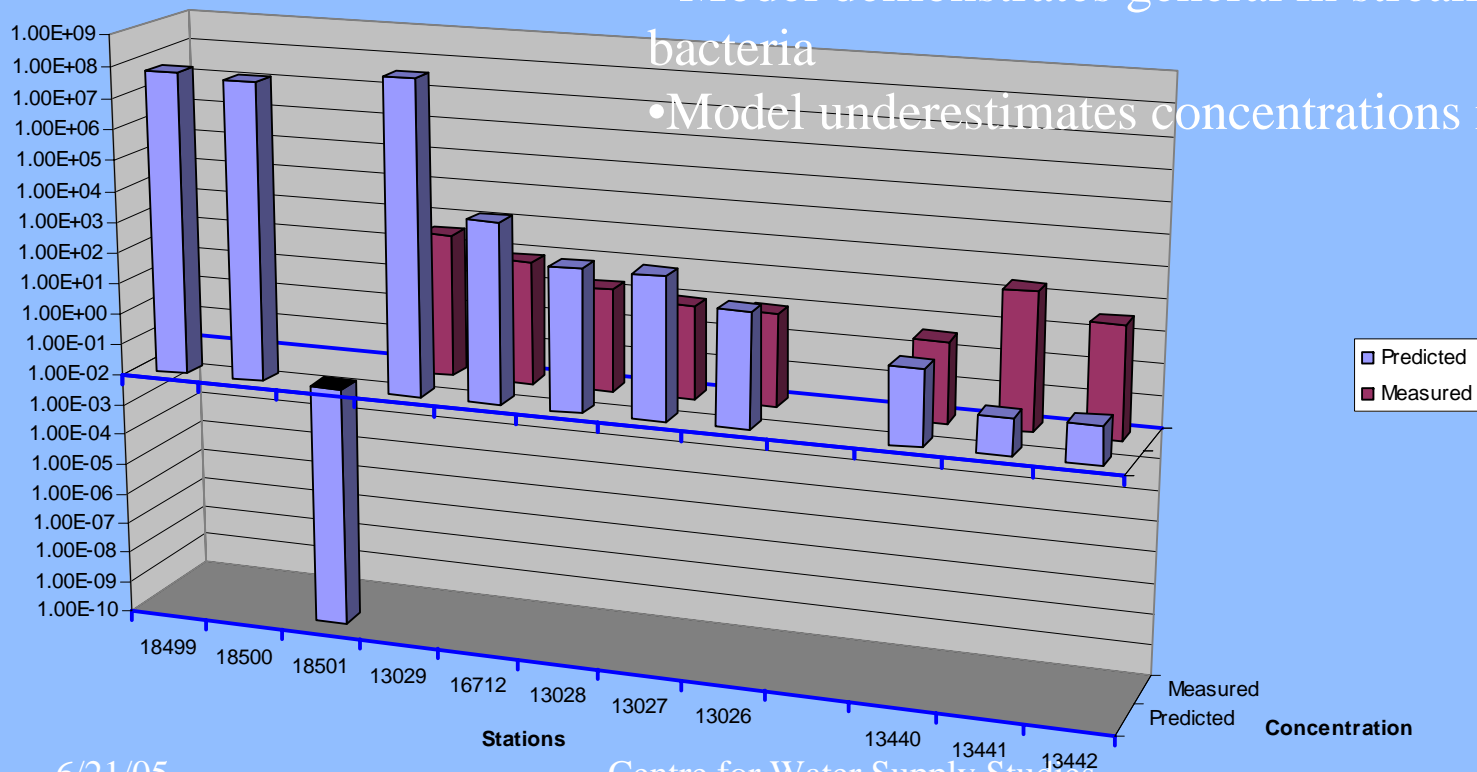
- Rainfall 0.61" at CCIA
- Upstream sites show high concentrations
- Model demonstrates general in stream decay of bacteria
- Model underestimates concentrations in bay



Preliminary Results

Bacteria concentrations in July 2000

- Rainfall 0.01” at CCIA
- Upstream sites show high concentrations
- Model demonstrates general in stream decay of bacteria
- Model underestimates concentrations in bay



6/21/05

Centre for Water Supply Studies

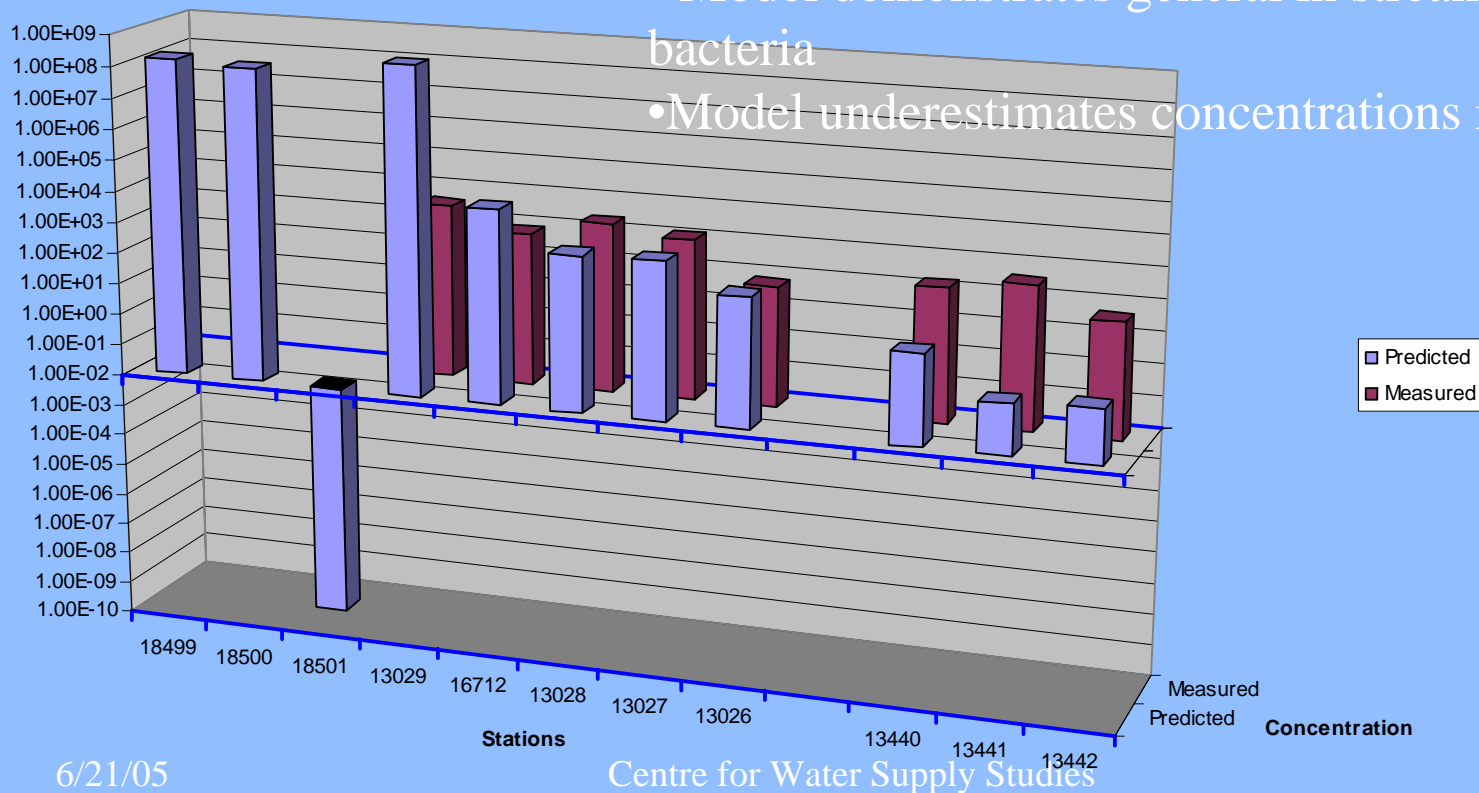
15



Preliminary Results

Bacteria concentrations in August 2000

- Rainfall 0.96" at CCIA
- Upstream sites show high concentrations
- Model demonstrates general in stream decay of bacteria
- Model underestimates concentrations in bay



6/21/05

Centre for Water Supply Studies



Observations

- Model calculates high concentrations of bacteria in upper reach of basin.
- Model responds well to bacteria die-off rate and transport down stream.
- Model does well in reflecting runoff loadings through tidal creek segment.
- Model does not reflect apparent increase in bacteria as water moves through Oso Bay.



Summary

- Continue model calibration
- Investigate issues with low bay concentrations.
 - Other loadings?
 - Low Runoff estimate to bay?
- Investigate issues with high loadings in upper basin
 - Improve rainfall distribution
 - NWS
 - Alternate runoff model
 - NWS
- Review newly collected targeted data for potential loading sources



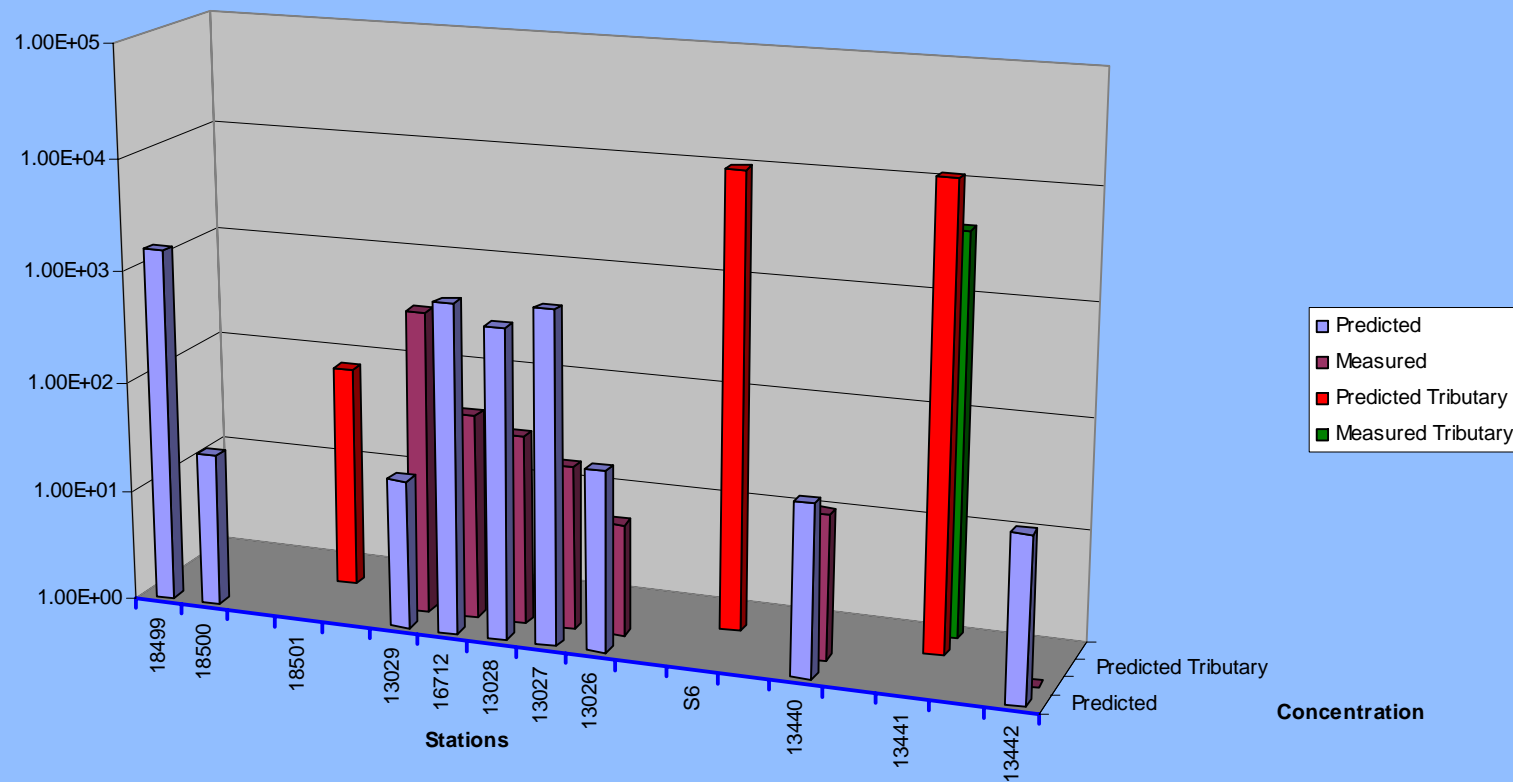
More Model Calibration

- Models can always be improved
- No perfect model
- Calibration process is iterative
- Model development start with simple and grows to the complexity required to answer the questions posed.

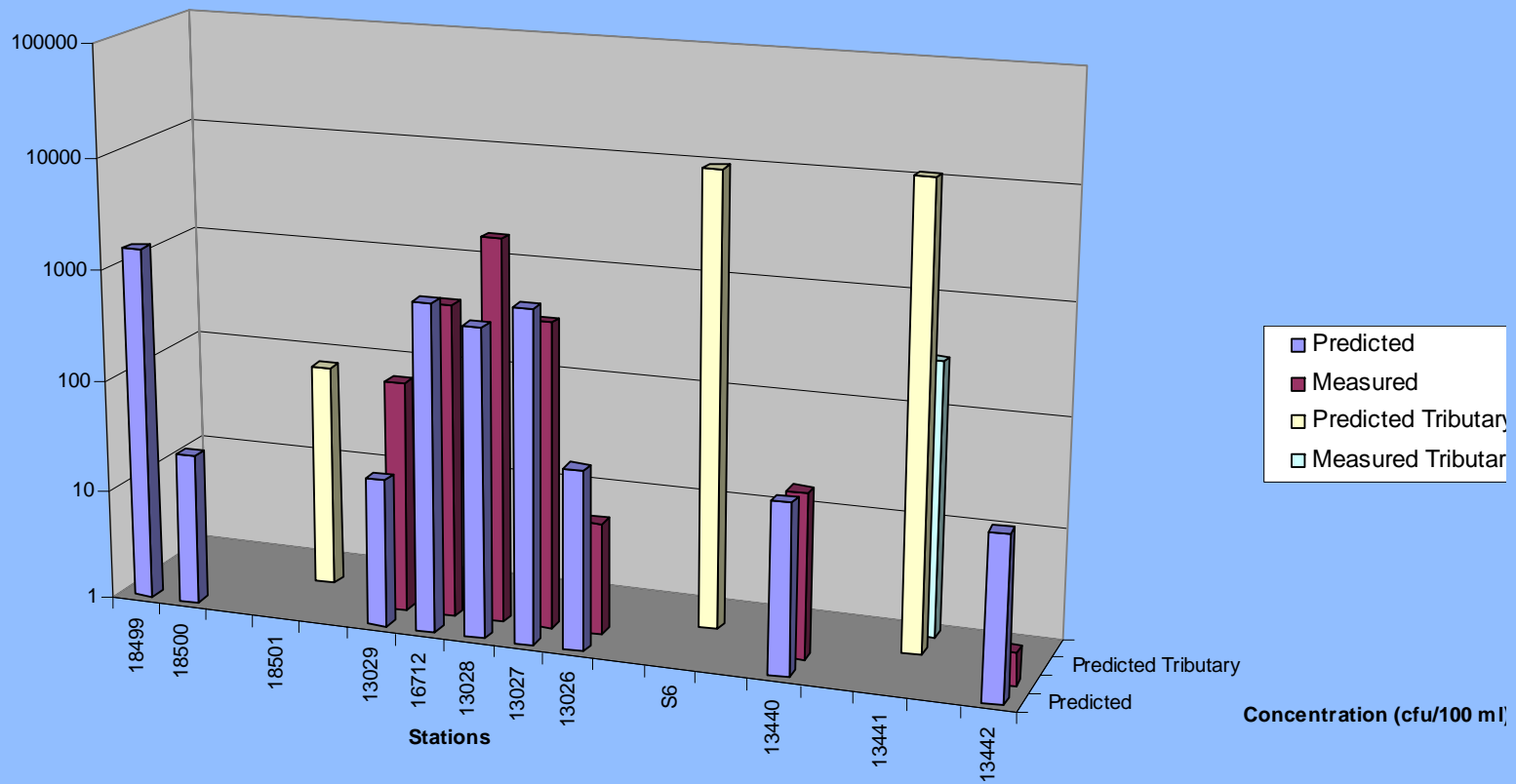


Next Iteration of Model

(*enterococcus* May 2000)



May 2000 with Fecal coliform target



Questions?

