

Southern California Salinity Coalition

TDS Trends Study

Update for the Basin Monitoring Program Task Force

October 18, 2017

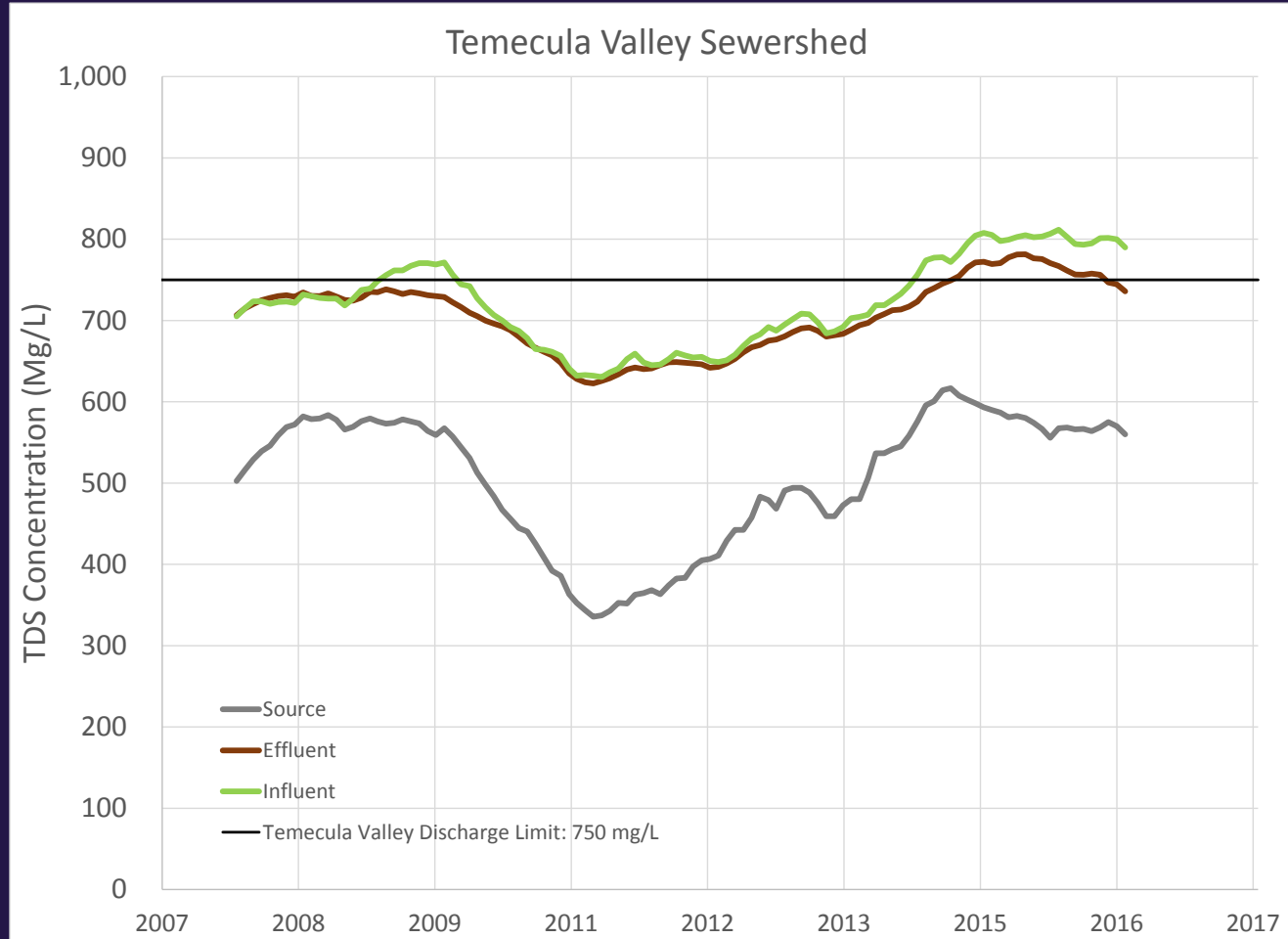


Problem Statement

1. Evaluate the long-term trends for salinity in wastewater and recycled water
2. Assess how periodic droughts and various conservation measures may influence these trends
3. Primary Research Questions:
 - a. What portion of the increment from use (IFU) can be attributed to water conservation measures?
 - b. If trends of conservation measures continue, what portion of the IFU can be attributed to water conservation measures



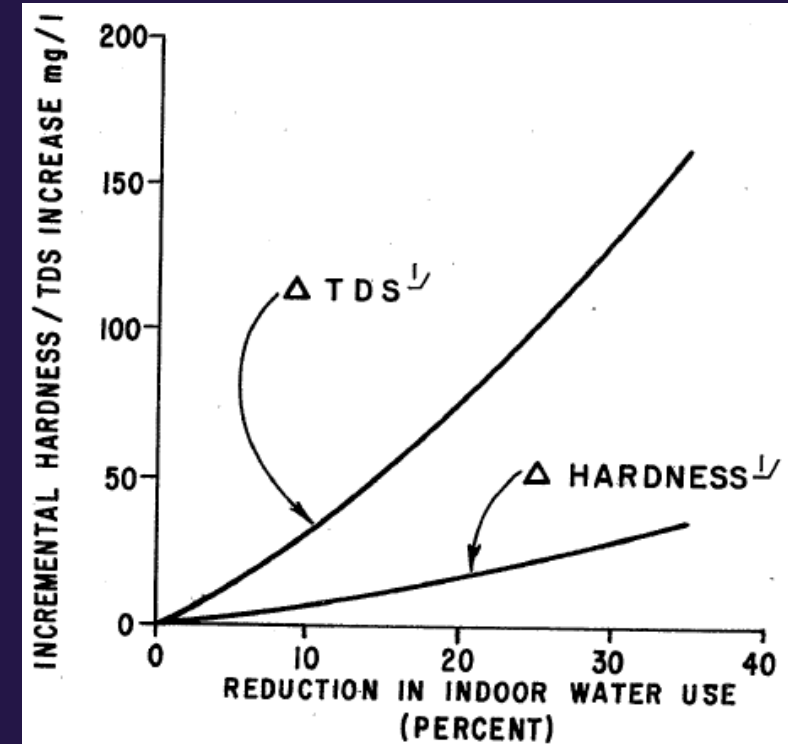
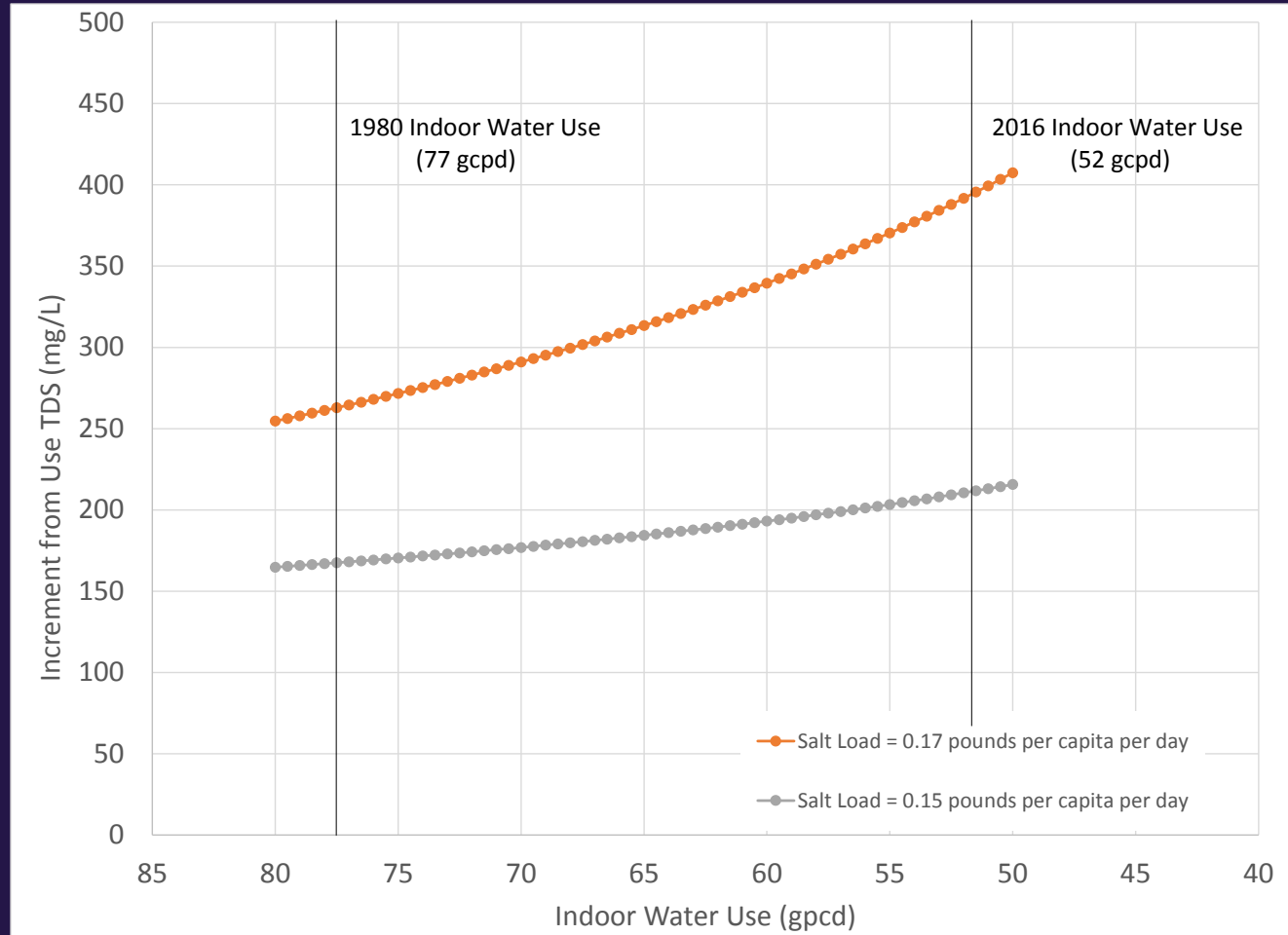
Problem Statement



- Increment from use (IFU) typically ranges from 200 to 250 mg/L.
- IFU can drive effluent TDS above the discharge limit.
- How much of IFU is due to conservation measures?



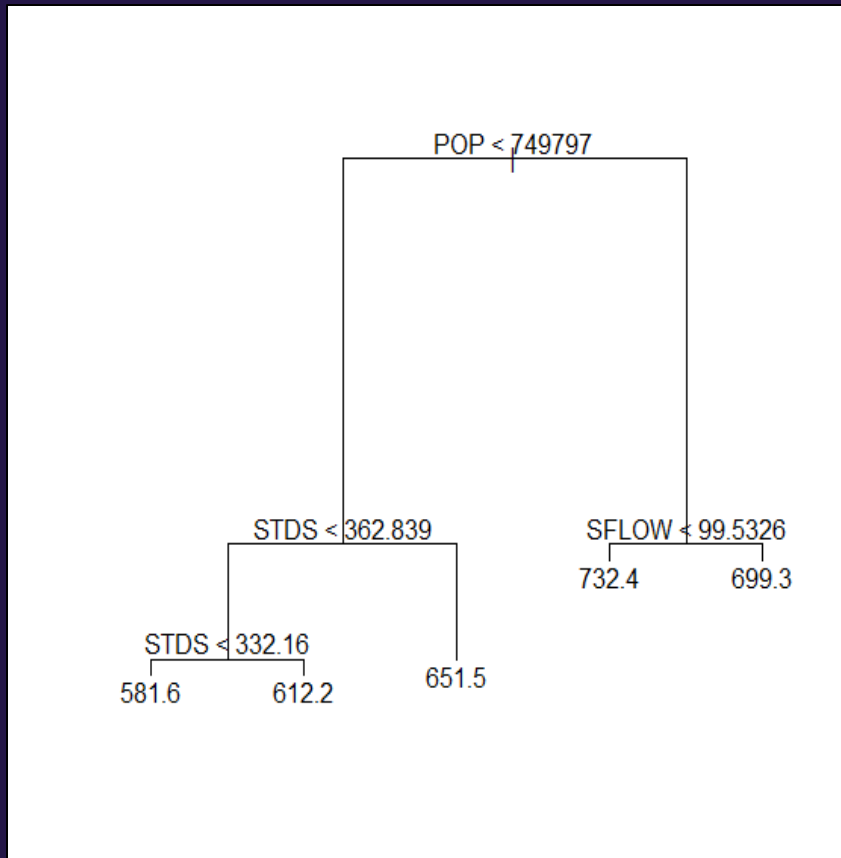
Increase in TDS from MSLs from Indoor Use



Based on mineral pickup in water due to domestic use of 300 mg/l TDS and 60 mg/l hardness. SOURCE: State Water Pollution Control Board Publication No. 9, 1954 (18).



Regression Tree Analysis for Influent TDS



- Indicates important explanatory variables:
 - Population (POP)
 - Source TDS (STDS)
 - Source Flow (SFLOW)



Principal Component Analysis

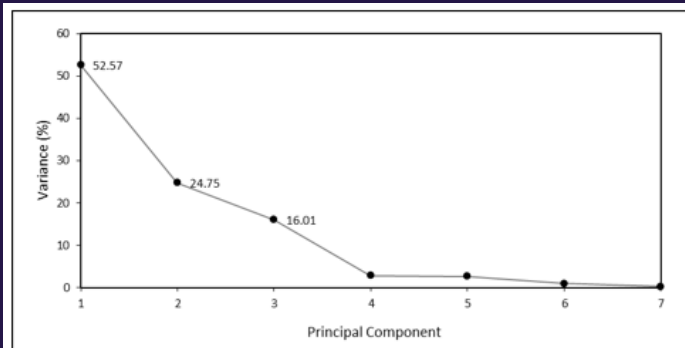


Figure 1.3-1 – EWMD PCA explanatory variables only scree plot.

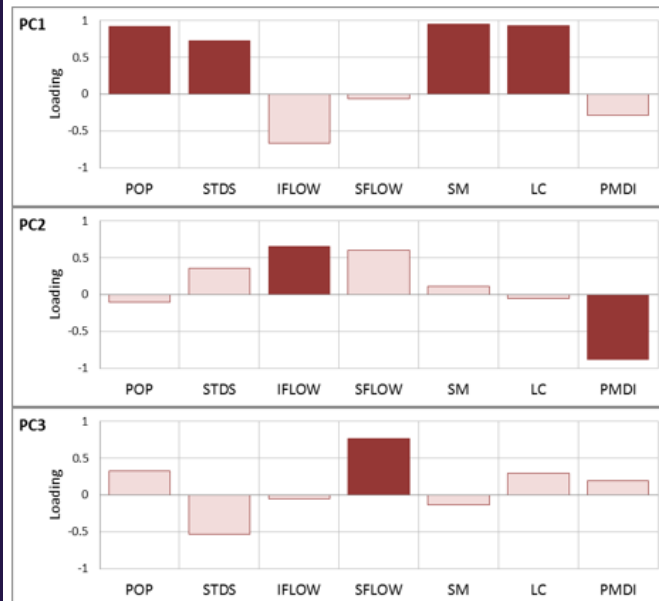


Figure 1.3-2 – EWMD PCA explanatory variables only component loadings.

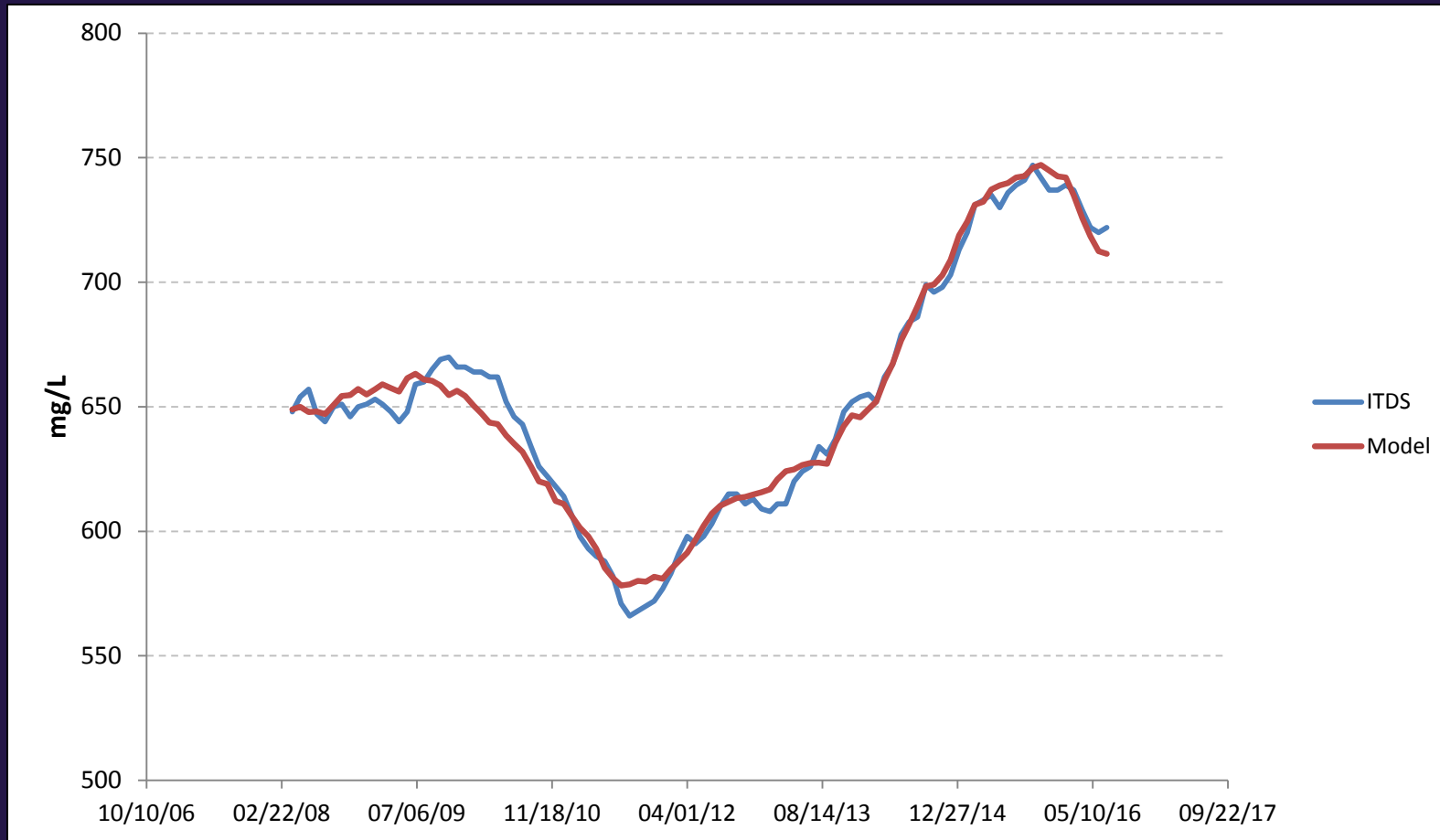
PCA indicates an initial EMWD multiple regression model:

- $ITDS \sim POP + STDS + SFLOW + PMDI + IFLOW$

Backward stepping from the initial model resulted in removal of first SFLOW and second PMDI:

- $ITDS \sim POP + STDS + IFLOW$

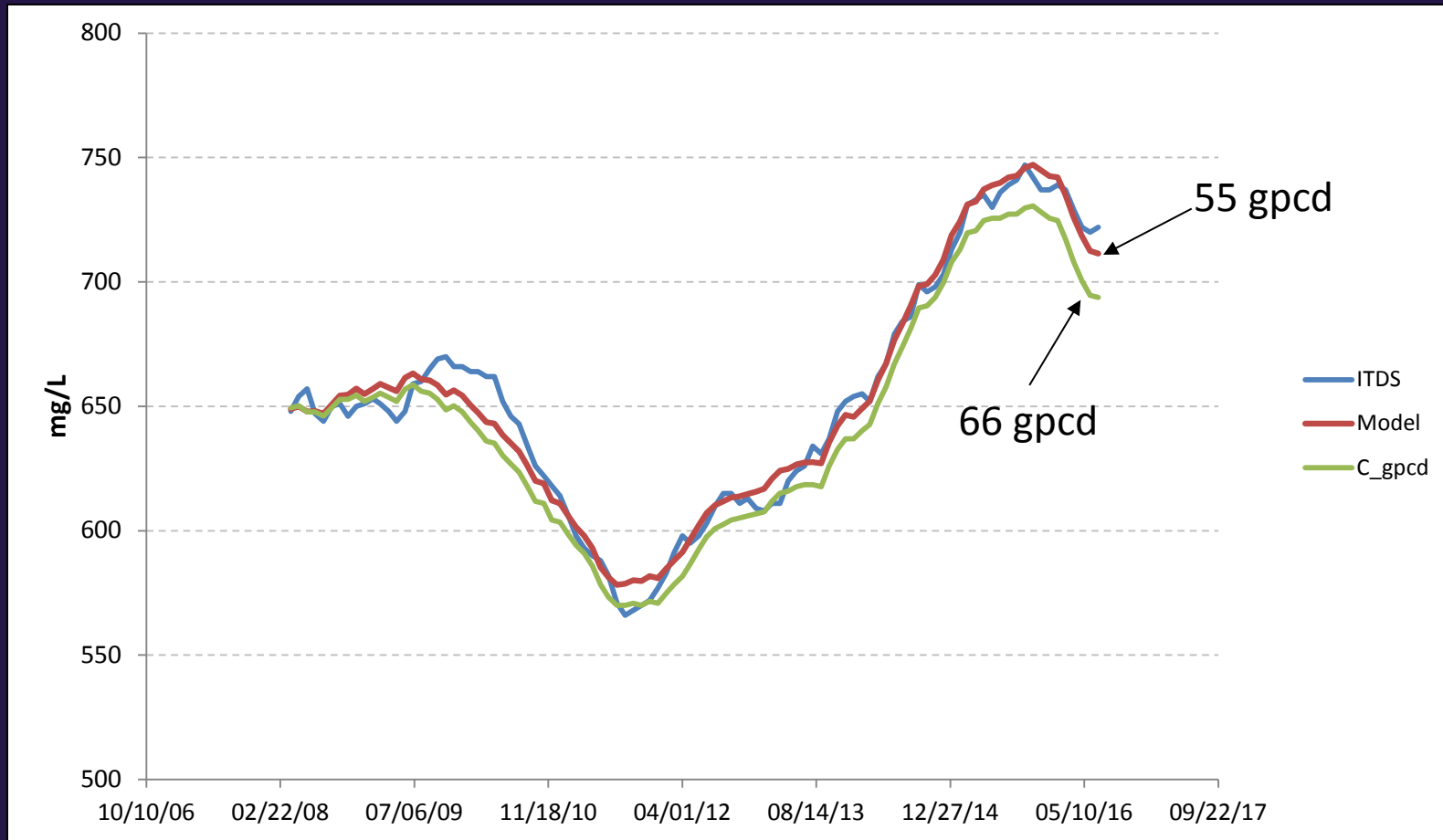
EMWD Multiple Regression Analysis



- Variables:
 - STDS: Source TDS
 - IGPCD: Influent per capita water use
- R -squared = 0.979
- Relative Importance
 - STDS: 88.2
 - IGPCD: 11.8



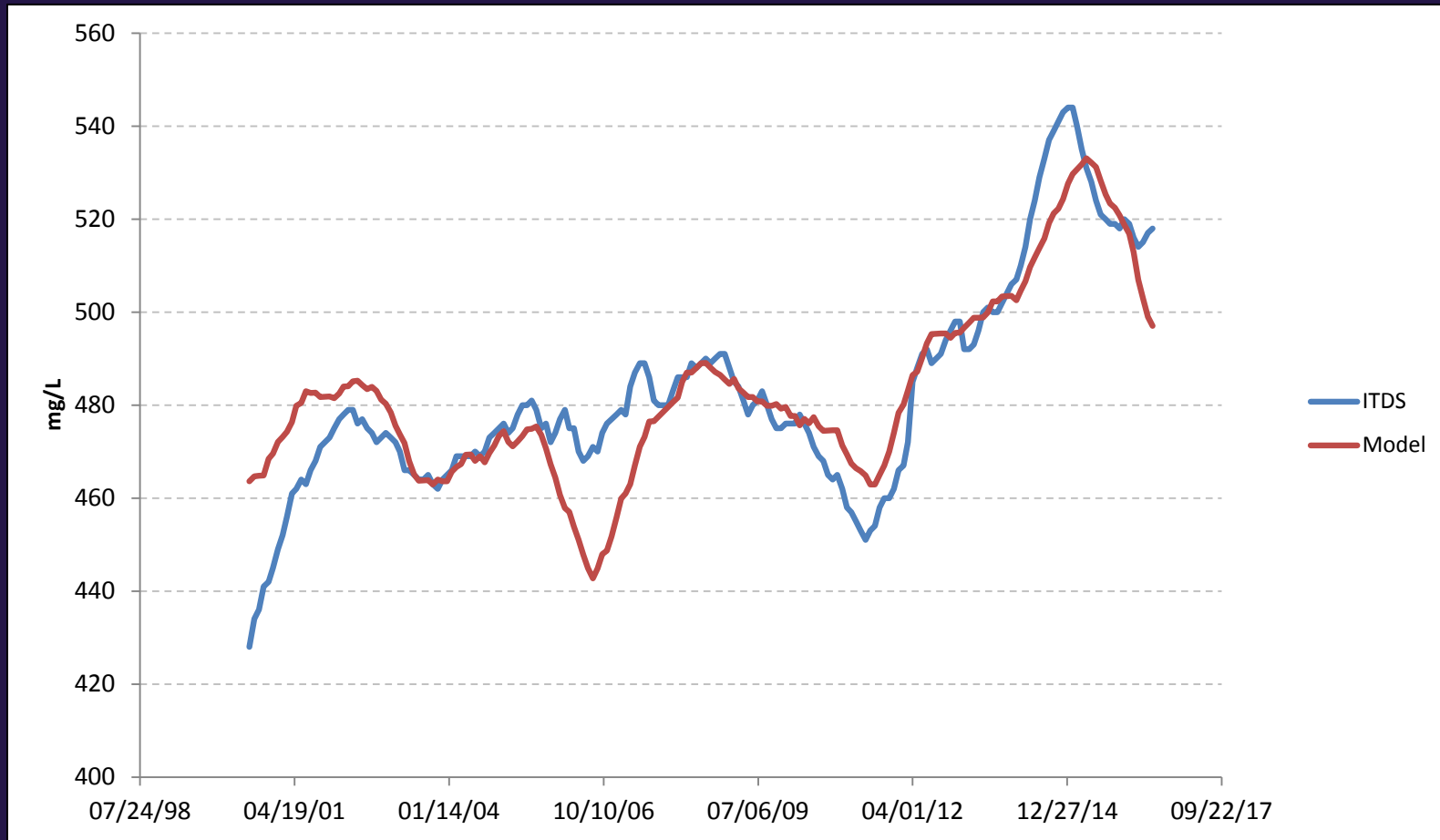
EMWD Multiple Regression Analysis



- Variables:
 - STDS: Source TDS
 - IGPCD: Influent per capita water use
- C_gpcd: Constant water use of 66 gpcd (no conservation)
 - IFU Difference: ~18mg/L



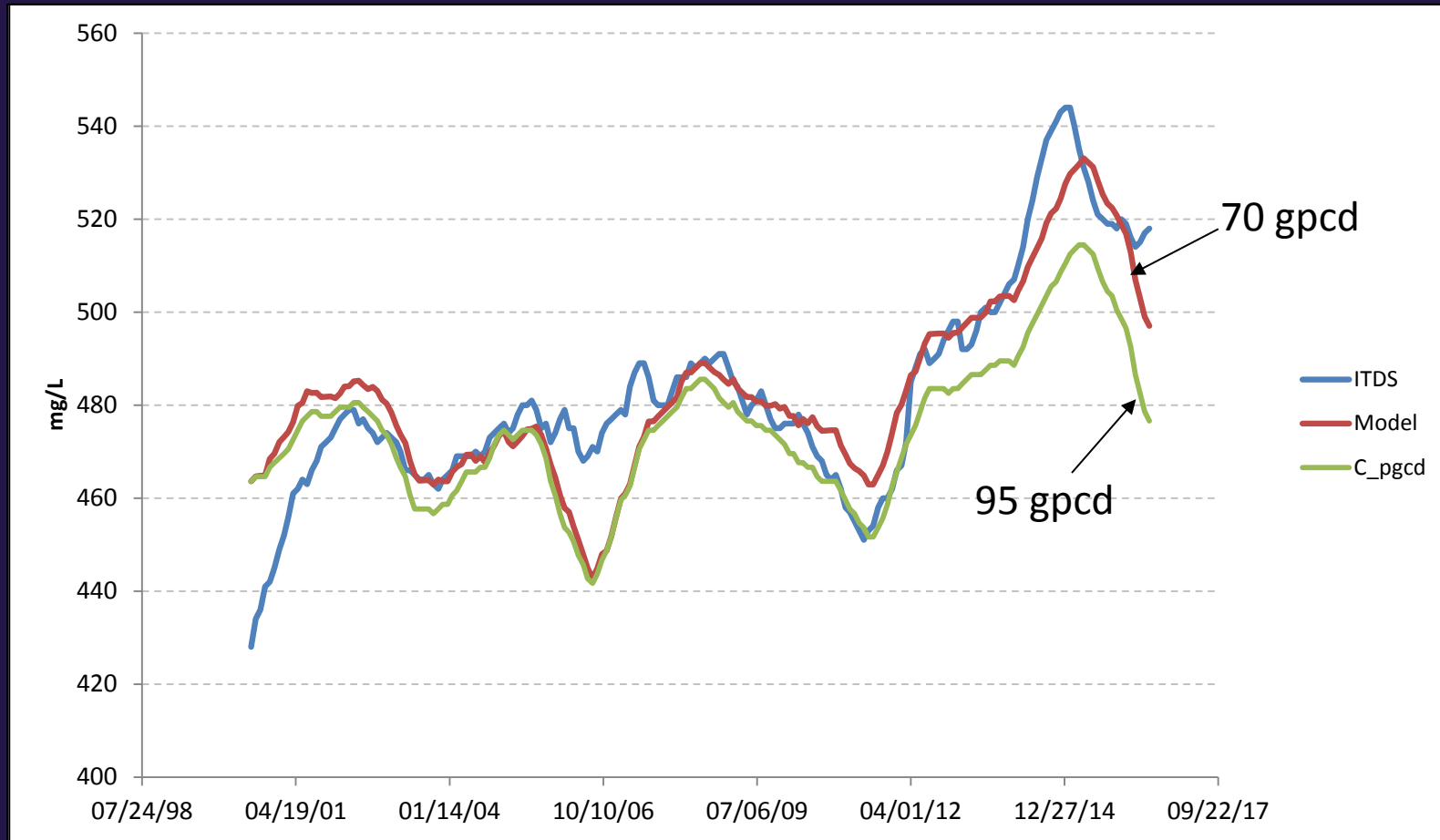
IEUA Multiple Regression Analysis



- Variables:
 - STDS: Source TDS
 - IGPCD: Influent per capita water use
- R -squared = 0.75
- Relative Importance
 - STDS: 67.2
 - IGPCD: 32.8

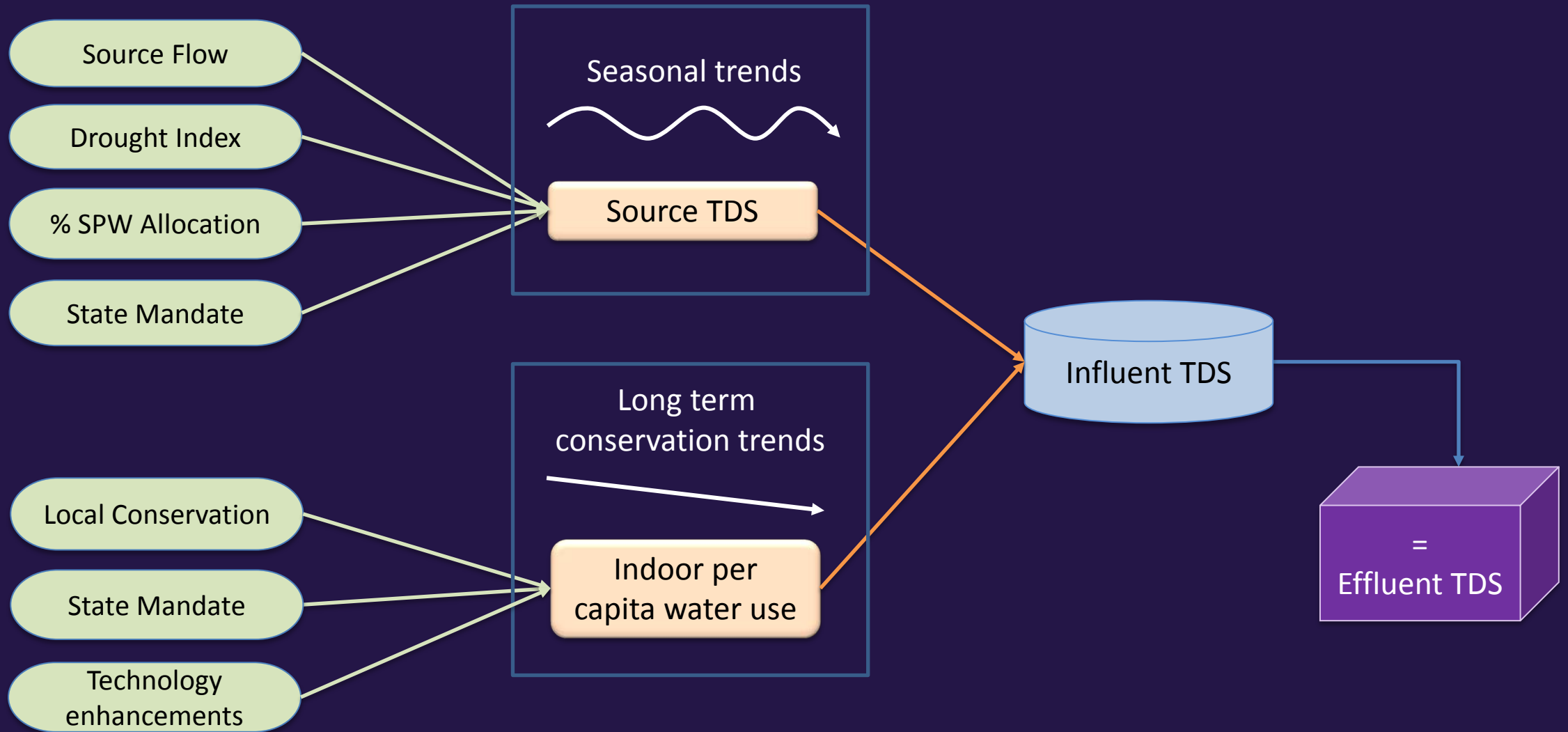


IEUA Multiple Regression Analysis



- Variables:
 - STDS: Source TDS
 - IGPCD: Influent per capita water use
- C_gpcd: Constant water use of 95 gpcd (no conservation)
 - IFU Difference: ~20mg/L





Summary

- Unintended consequences from water conservation measures
 - lower water quality (higher TDS)
 - less quantity of recycled water
 - less revenue
 - infrastructure O&M
- Observation data from groups of sewerage agencies rather than individual WWTP is more reliable due to the following factors
 - Population (city boundaries, sewerage boundaries)
 - Operations can divert flows from plant to plant



Summary

- Drought impacts both source water quality and an agency's source(s) of supply.
- "...drought, and the conservation strategies that are often enacted in response to it, both likely limit the role reuse may play in improving local water supply reliability."

