# Supplemental Lake Water Quality Modeling for Canyon Lake

Presented by
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# AEM3D: Canyon Lake

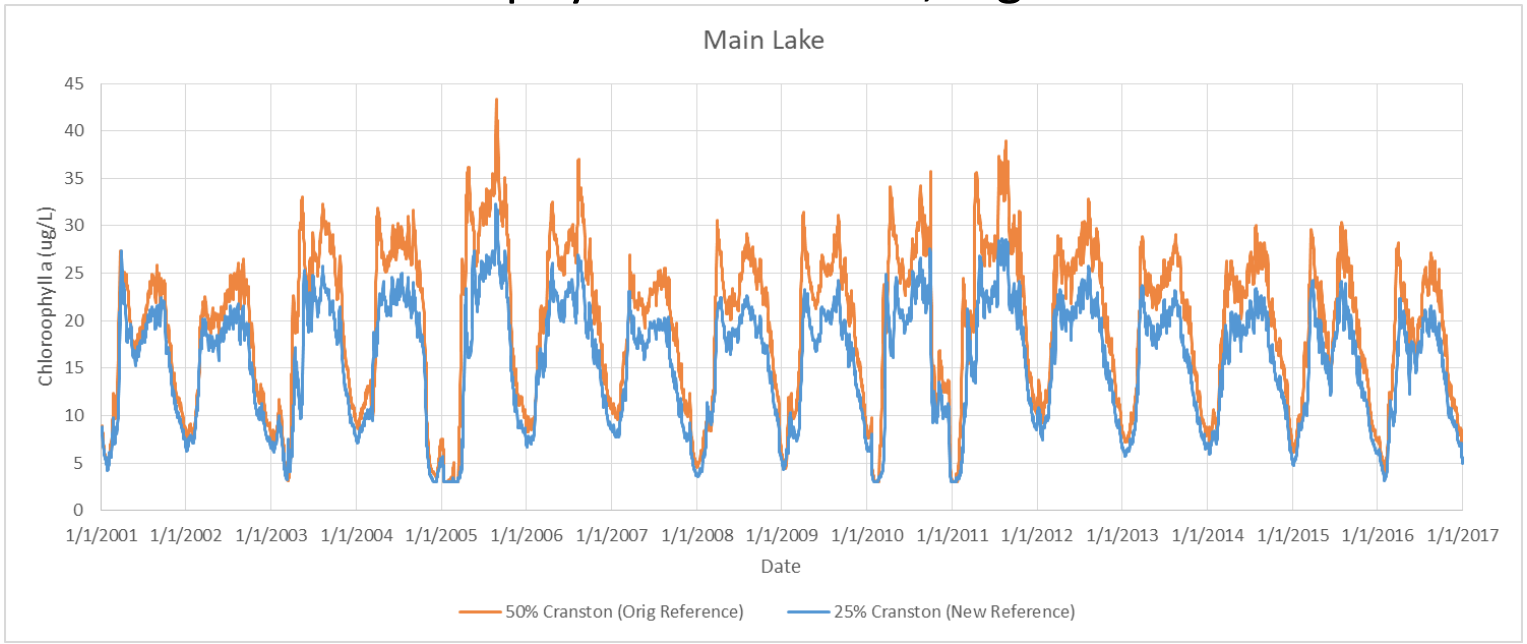
- AEM3D model of Canyon Lake was developed to replace ELCOM-CAEDYM which is no longer supported
- Input files from ELCOM-CAEDYM calibration simulation have been migrated over to AEM3D
- AEM3D reproduced ELCOM-CAEDYM results very well
  - lake level and thermal stratification reproduced almost exactly
  - DO, chlorophyll-a and nutrient concentrations reproduced closely
- Model simulation times remain very long (about 1 day/year simulated)

- Based upon discussions with Regional Board staff over the past several months, additional scenarios were identified

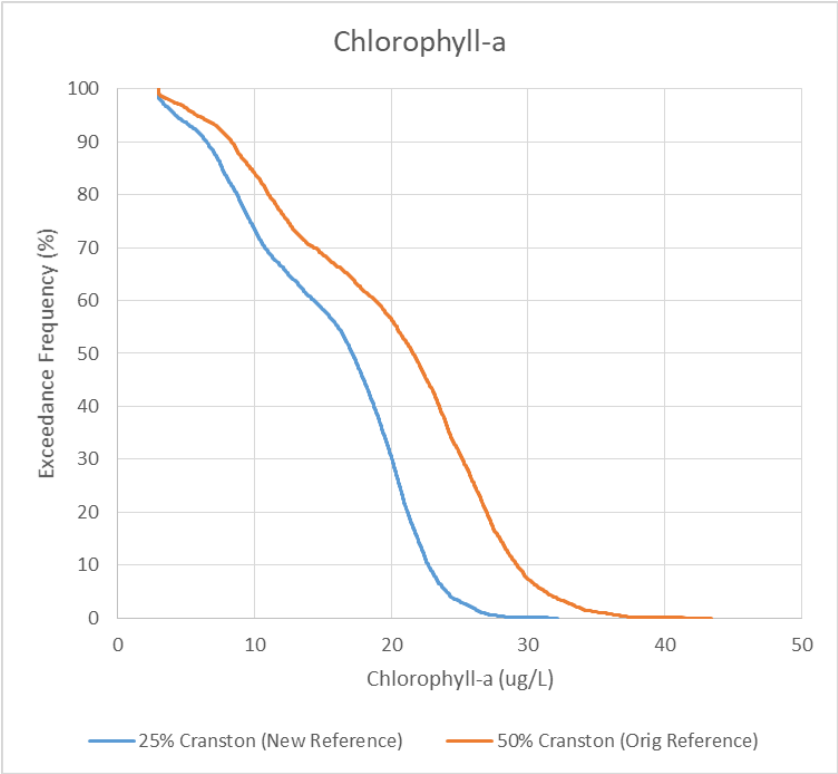
| Parameter | Existing Conditions | Scenario 1a: Reference Condition (2018) (50% Cranston) | Scenario 2: Alternative Reference Condition (25% Cranston) | Scenario 3: Sediment Flux Sensitivity (25% Cranston) | Scenario 4: Hydrologic Sensitivity (25% Cranston) |
|---|---|---|---|---|---|
| SJR Inflow TP (mg/L) | 0.69 | 0.32 | 0.16 | 0.16 | 0.16 |
| SJR Inflow TN (mg/L) | 2.16 | 0.92 | 0.68 | 0.68 | 0.68 |
| Salt Cr Inflow TP (mg/L) | 0.46 | 0.32 | 0.16 | 0.16 | 0.16 |
| Salt Cr Inflow TN (mg/L) | 2.40 | 0.92 | 0.68 | 0.68 | 0.68 |
| Sediment P Flux ($mg/m^2/day$) | 15.5 | 7.8 | 4.3 | 4.7 | 4.3 |
| Sediment N Flux ($mg/m^2/day$) | 44.0 | 22.0 | 13.1 | 14.4 | 13.1 |
| Runoff Flow | USGS gauges (2000 - 2016) | | | | 70% of USGS gauge (2000 - 16) |

# Effects of Lowered Inflow Concentrations (50% → 25% Cranston)

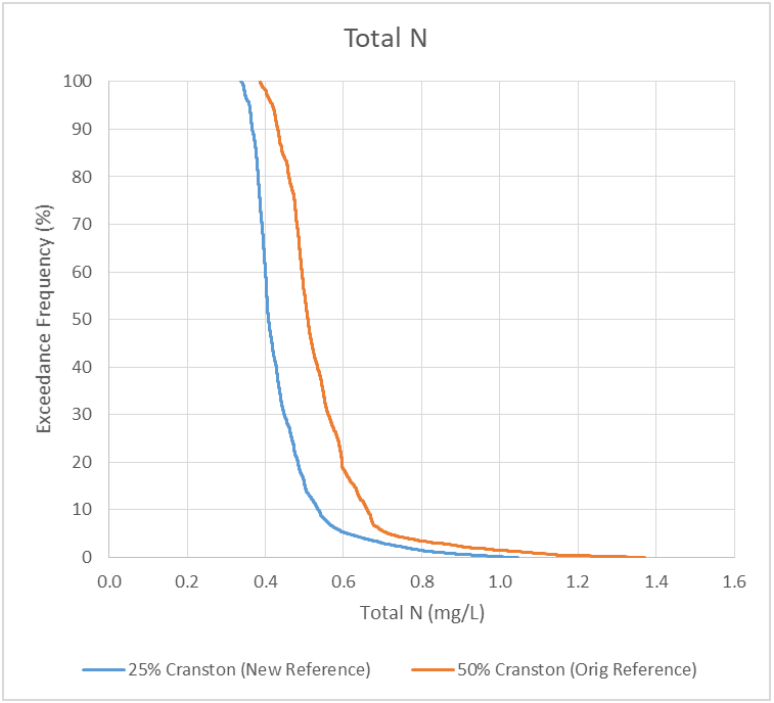
- Lowered inflow concentrations associated with 25th percentile Cranston Guard Station data yielded predictably lower levels of nutrients and chlorophyll-a in the lake, e.g.:

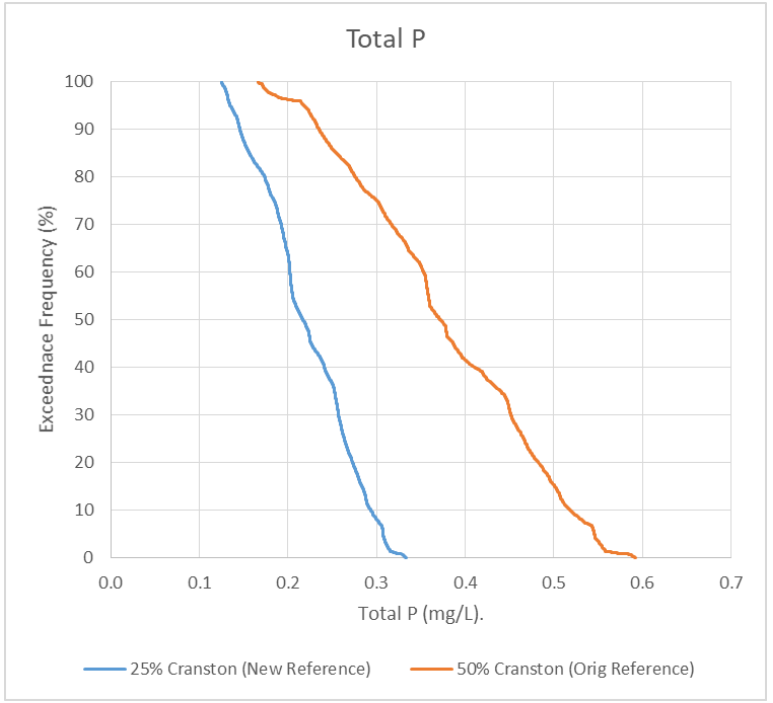


- Concentrations presented as CDFs were thus also shifted to lower values using 25$^{th}$ percentile Cranston Guard Station inflow data
- Median chlorophyll-a concentrations decreased from 21.6 to 17.2 µg/L (21% reduction)
- Maximum concentrations decreased from 43.4 to 32.2 µg/L (26% reduction)

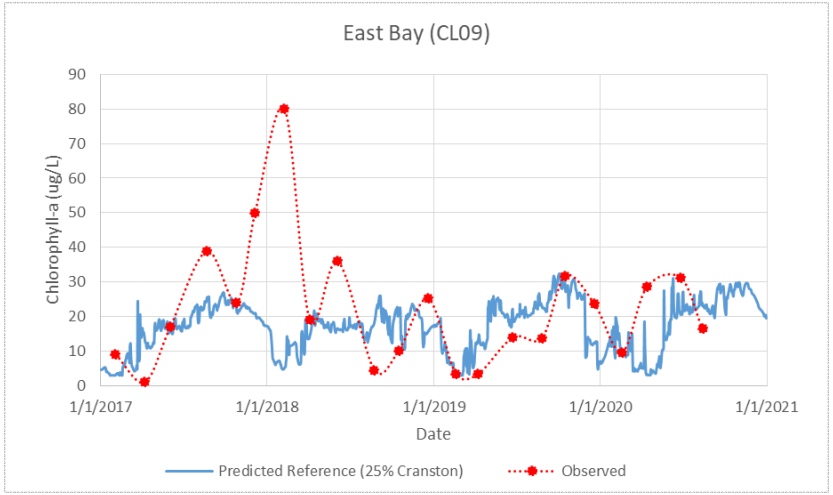


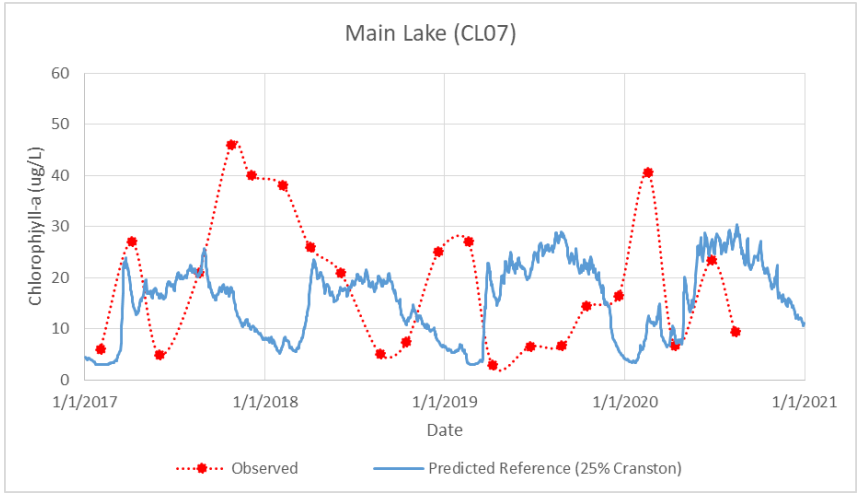
- Nutrient concentrations, presented as CDFs, were thus also shifted to lower values using 25$^{th}$ percentile Cranston Guard Station inflow data



# How does Canyon Lake water quality compare with new Reference?




- East Bay chlorophyll-a concentrations were in line with 25% Cranston-predicted concentrations for most of past 4 years
- Main Lake concentrations deviated more, seasonal trends distorted

# Sensitivity/Uncertainty Analysis

- Simulations in which sediment flux was increased, or inflow volumes were decreased, shifted CDFs for 25% Cranston reference