**Updated Evaluation of Nutrient Loads and Trends to the Bay Delta from Upstream the Sacramento and San Joaquin River Watersheds**

Lead: Dina Saleh (CA-WSC, Sacramento, CA), [dsaleh@usgs.gov](mailto:dsaleh@usgs.gov), ph: (916)278-3273, Joe Domagalski (CA-WSC, Sacramento, CA).

**Proposed work:** Statistical analyses and water quality modeling identified treated wastewater effluent from the Sacramento Regional County Sanitation (Regional San) District's Wastewater Treatment Plant (WWTP) as one of the main sources of nitrogen (N) and phosphorus (P) to the Sacramento San Jaquan Delta (Saleh and Domagalski 2015, Domagalski and Saleh, 2015, Jassby and others, 2002, and Novick and others 2015). Ongoing treatment plant improvements at the Regional San WWTP is expected to decrease Total Nitrogen (TN) and Total Phosphorus (TP) loads in the Delta in the future (Krich-Brinton and others 2012). For this study we are proposing using data from twelve monitoring sites in the Sacramento and san Joaquin Rivers watershed (four in the Sacramento Basin and eight in the San Joaquin Basin) to evaluate nutrient loads and trends using the Weighted Regressions on Time, Discharge, and Season (WRTDS) model developed by Hirsch et al. (2010) for the 1975 to 2019 period, this time period will capture a transition from extreme wet years (1997) through extreme draught years (2012-2014). Loads and trends estimation will include total nitrogen (TN), nitrate (NO3), ammonia (NH3), and total phosphorus (TP). TN includes all forms of nitrogen, including particulate organic N. Similarly, TP includes both dissolved and particulate forms. Concentration and discharge data for the twelve sites for the time period of the study are available from U.S. Geological Survey National Water Inventory System (NWIS). These loads and trend estimations will provide a baseline understanding of nutrient concentration in the Delta and can be compared to future estimation after the upgrades to the Regional San WWTP have been implemented. In this study we also propose to use results from the newly developed 2012 SPARROW (SPAtially Referenced Regressions On Watershed attributes) to evaluate the sources, spatial distribution, and transport of nutrients to the Delta. This will help identify the main source of TN and TP to the Delta from upstream watersheds. Previous evaluation of the 2002 SPARROW model indicated that effluent form the Regional San WWTP is responsible for 50% and 67% of TN and TP loads (respectively) to the Delta.

**Products:** USGS Open-File report describing major finding completed by September 30, 2019.

**Affirmation:** It is understood that award funds will need to be expended within FY ’19, all products will be completed by the end of FY ’19, no additional PES funds are assumed, and funds awarded cannot carried be carried over to FY’20.

**Funding Request:** to complete this work I am requesting $40,000 for 300 hours of Dina Saleh’s time be expended within FY ’19.

**REFERENCES**

Domagalski, Joseph and Dina Saleh, 2015. Sources and Transport of Phosphorus to Rivers in California and Adjacent States, U.S., as Determined by SPARROW Modeling. Journal of the American Water Resources Association (JAWRA) 1-24. DOI: 10.1111/1752-1688.12326

Jassby, A.D., J.E. Cloern, and B.E. Cole, 2002. Annual Primary Production: Patterns and Mechanisms of Change in a Nutrient-Rich Tidal Ecosystem. Limnology and Oceanography 47(3):698-712.

Krich-Brinton, A., J. Sager, M. Trouchon, and R. Warren, 2012. Technical Evaluation of a VariancePolicy and Interim Salinity Program for the Central Valley Region. Larry Walker Associates, Memorandum. <https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/variances/variance_LWA_2012.pdf>

Novick, E., R. Holleman, T. Jabusch, J. Sun, P. Trowbridge, D. Senn, M. Guerin, C. Kendall, M. Young, and S. Peek, 2015, Characterizing and Quanitfying Nutrient Sources, Sinks and Transformations in the Delta: Synthesis, Modeling and Recommendations for Monitoring, December 2015

Saleh, Dina and Joseph Domagalski, 2015. SPARROW Modeling of Nitrogen Sources and Transport in Rivers and Streams of California and Adjacent States, U.S. Journal of the American Water Resources Association (JAWRA) 1-21. DOI: 10.1111/1752-1688.12325