

2020 DELTA SCIENCE FELLOW FINAL REPORT



Nicol Parker

Postdoctoral Fellow

University of California, Santa Barbara

Focus Pesticide risk analyses and management actions, chemical fate and transport

Award \$118,511

Research Mentor

Dr. Arturo Keller, UC Santa Barbara (Bren School)

Community Mentors

Dr. David Senn, San Francisco Estuary Institute,
Dr. Haw Yen, Texas A&M,
Dr. Yonping Yuan, Environmental Protection Agency

Rapid, spatially explicit pesticides risk analyses in the Bay Delta Watershed and bridging the gap between risk assessment and management actions

The Sacramento-San Joaquin Bay-Delta (Bay-Delta) watershed is home to a rich community of organisms that have suffered from chemicals, water withdrawal and habitat loss associated with agricultural and urban development. A major contributor to chemical stress in the Bay-Delta watershed is pesticides. Parker's project modeled the risk of pesticide pollution in 225 locations throughout the watershed. The model accounted for water management practices, land use, pesticide use rates and cumulative pesticide stress.

Research Conclusions

The Pesticide Management Prioritization Model (PMPM) was developed to enable rapid assessment of pesticide toxic loads in the Bay-Delta watershed. Tens of thousands of kilograms of pesticides are applied each year over a large expanse of the watershed, making the development of the PMPM a significant management tool. An important contribution of the PMPM is the ability to consider individual and cumulative pesticide toxicity on specific species, allowing managers to better understand impacts. To manage risks, it is essential for managers to understand the sources of pesticides and timing of application. The PMPM is designed to be accessible to diverse audiences, including local residents, rather than just experts.

Figure. Risk indices of pesticide application sites in the Bay Delta Watershed which are predicted to introduce the highest toxic loads to fish, cladocerans, and benthic invertebrates in waterbodies (only pesticides which account for 99% of toxic loads in the watershed are shown).

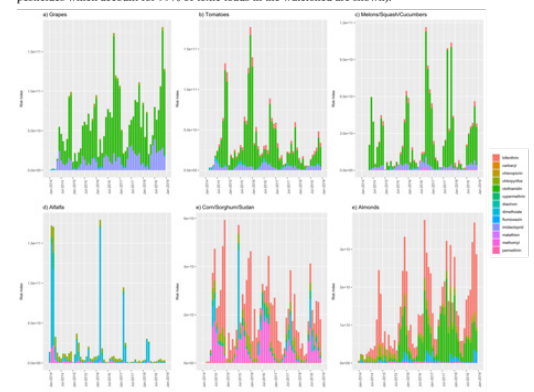


Figure. Predicted risk indices of pesticides which introduce 99% of toxicity to fish, cladocerans, and benthic invertebrates for the most recent 5-year period of available pesticide use reports (2014-2018). The risk indices quantify toxic loads of pesticides transported to waterbodies of the Bay Delta Watershed in runoff (non-sorbed a), eroded sediment b), as well as the net risk from runoff and eroded sediment c).

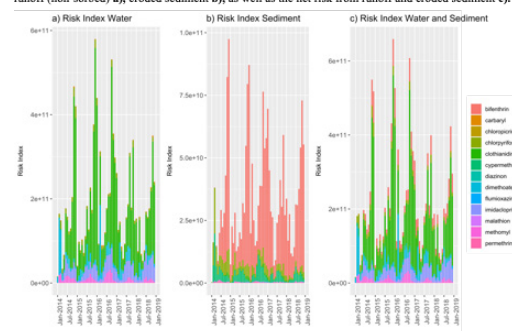


Figure. Watersheds near the Bay Delta with increasing toxic burdens.

