



# Tools for Assessing Groundwater-Surface Water Connectivity Under the Sustainable Groundwater Management Act

FEBRUARY 2019

By Tara Moran, Tom Gleeson, Melissa Rohde, Ben Kerr and Christina Babbitt

In 2014, California enacted the Sustainable Groundwater Management Act (SGMA), which requires local agencies develop and implement groundwater sustainability plans (GSPs) in all groundwater basins designated by the California Department of Water Resources (DWR) as high or medium priority by 2020 or 2022, depending on basin condition. For the first time in California's history, agencies managing groundwater under SGMA must assess the impacts of groundwater pumping on water supply and surface water flows and avoid "significant and unreasonable adverse impacts on beneficial uses of the surface water."

SGMA's legal and regulatory requirements pertaining to interconnected surface water – defined in SGMA as, "surface water that is hydraulically connected at any point by a continuous zone to the underlying aquifer and the overlying surface water is not completely depleted," represent a significant step forward in recognizing the interconnected nature of surface water and groundwater, and for managing this resource accordingly.

However, because groundwater-surface water connectivity was not a common management consideration prior to the enactment of SGMA, many basins lack data, models or technical capacity to adequately characterize interconnected surface water (ISW) and evaluate the

impacts of groundwater pumping on these systems. Thus, meeting legal and regulatory requirements related to ISW may be hindered by a lack of information about both the location and timing of such waters, as well as the many beneficial uses and users that they support.

In March 2018, Water in the West, the University of Victoria, Foundry Spatial, The Nature Conservancy (TNC) and Environmental Defense Fund co-hosted a workshop on tools to assess ISW under SGMA. The workshop, which included a small, select group of hydrologists, water managers, water lawyers, nongovernmental organizations (NGOs) and academia, focused on four main areas:

- 1) Accounting for beneficial uses and users in GSP development and implementation;
- 2) Identifying physical or analytical approaches for characterizing, quantifying and monitoring ISW;
- 3) Using hydrological modeling to assess the effects of groundwater pumping on ISW and streamflow depletions; and
- 4) Understanding the functionality and use of decision support tools from other jurisdictions

Key findings and recommendations from the workshop are summarized below.

## Summary findings and recommendations

### For GSAs

- Only basins with ISW are subject to UR No. 6, thus GSAs will need to establish whether there is ISW in their basins. At present, there is limited information about the spatial and temporal connectivity of surface water and groundwater systems in many groundwater basins throughout the state.
- For existing guidance on legal challenges see Belin (2018) and Cantor et al. (2018). Building on work by Cantor et al. (2018), workshop participants developed Table D3 in Appendix D of the full report. This table provides an overview of some field- and model-based methods for assessing ISW, their benefits and limitations.
- There are advantages and disadvantages to using analytical versus numerical hydrological models for identifying and quantifying the impacts of groundwater pumping on streamflow. Integrating the use of analytical and numerical models across groundwater basins may be a means of capturing the best attributes of both model types.
- GSAs should take an iterative approach to understanding and monitoring the impacts of groundwater pumping on surface water and groundwater uses and users in their basin.

### For state and federal agencies

- DWR should develop expertise and guidance on local-scale identification, assessment and monitoring of ISW under SGMA. Developing this expertise at the state level and sharing it with GSAs would significantly improve their ability to meet the legal and regulatory requirements relating to ISW.
- Additional guidance, data and support from state and federal agencies and others would dramatically improve GSAs' assessments of ISW in their basins.

Specifically:

- As outlined in 23 CCR § 354.16(f), DWR should provide data on ISW for all high and medium priority basins.
- DWR should develop expertise and guidance for characterizing and monitoring ISW under SGMA.
- DWR, SWRCB, the California Department of Fish and Wildlife, NGOs and other institutions should summarize the methodologies used for the development of instream flow criteria to assist GSAs in basins without existing instream flow criteria with the development of minimum thresholds for ISW.
- Similar to work done on the Sacramento Valley Groundwater-Surface Water Simulation Model, DWR should modify the California Central Valley Groundwater-Surface Water Simulation Model to better evaluate ISW.
- DWR and/or the State Board should consider developing an online decision support tool for ISW.
- The importance of high quality, high resolution stream gauging data for understanding and modeling a watershed cannot be overstated, insufficient stream gauge data remains a major limitation in watershed hydrology research and management in California. Federal, state, regional and local agencies should work together to support the ongoing maintenance and expansion of California's stream gauging network including installing more gauges, providing more grants to support the existing gauge network and ensuring an adequate long-term funding stream for the maintenance of stream gauge networks.
- DWR and the State Board will need to take an iterative approach in evaluating GSPs, particularly with respect to ISW.

[waterinthewest.stanford.edu](http://waterinthewest.stanford.edu)

waterinthewest@stanford.edu

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This summary was created based on information from the original report “[TOOLS FOR ASSESSING GROUNDWATER-SURFACE WATER CONNECTIVITY UNDER THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT.](#)”

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