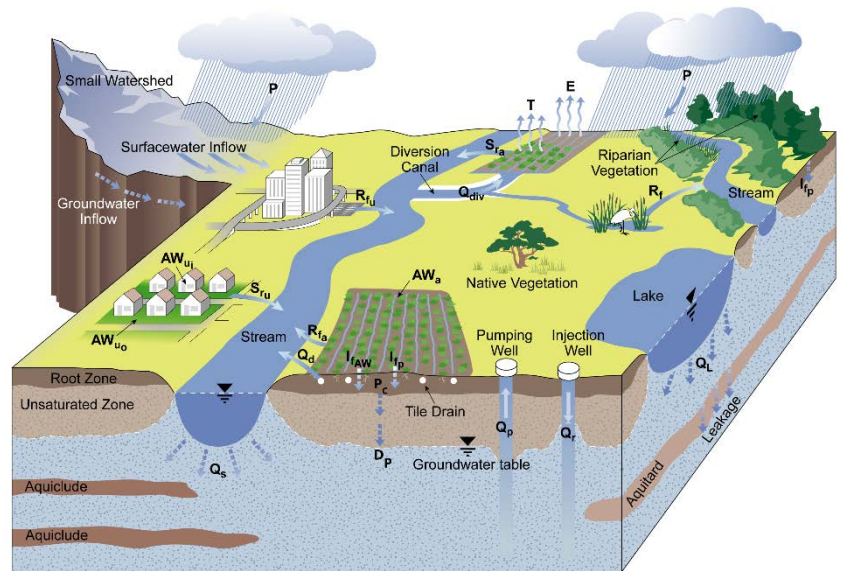




# Integrated Water Flow Model (IWFM)

IWFM (Integrated Water Flow Model) is a computer program used for water resources management and planning. It calculates groundwater flows, stream flows, soil moisture movement in the root zone, land surface flows and flow exchange between the groundwater and surface water systems that are generated by rainfall, agricultural irrigation and municipal and industrial water use. IWFM also calculates water demands using a land-use based approach: agricultural water demand is calculated based on crop types and acreages, soil conditions, rainfall rates and irrigation methods while urban water demand is calculated based on population and per-capita water use rates. Calculated water demands can be met by surface water diversions and groundwater pumping. IWFM is a powerful program that can help water managers understand the historical evolution of the surface and subsurface water flows within their basin, and to plan the use of groundwater and surface water to meet future agricultural, municipal and industrial water demands.



The *California Central Valley Groundwater-Surface Water Simulation Model (C2VSim)* and the *Sacramento Valley Simulation Model (SVSim)* developed by California Department of Water Resources (DWR) both use IWFM. Additionally, DWR is providing IWFM to Groundwater Sustainability Agencies (GSAs) to develop models for their respective basins to be used in the development of their Groundwater Sustainability Plans (GSPs).

Some example applications of IWFM include:

- Surface and subsurface flow modeling for SGMA compliance
- Water budget development as part of the GSP requirements
- Groundwater substitution studies (i.e. conjunctive water use)
- Quantifying the impact of climate change on surface and subsurface water resources
- Studies for Managed Aquifer Recharge (MAR) or MAR using flood waters (Flood-MAR)
- Development of Agricultural Water Management Plans using the IWFM Demand Calculator (IDC), IWFM's stand-alone land surface and root zone flow simulator

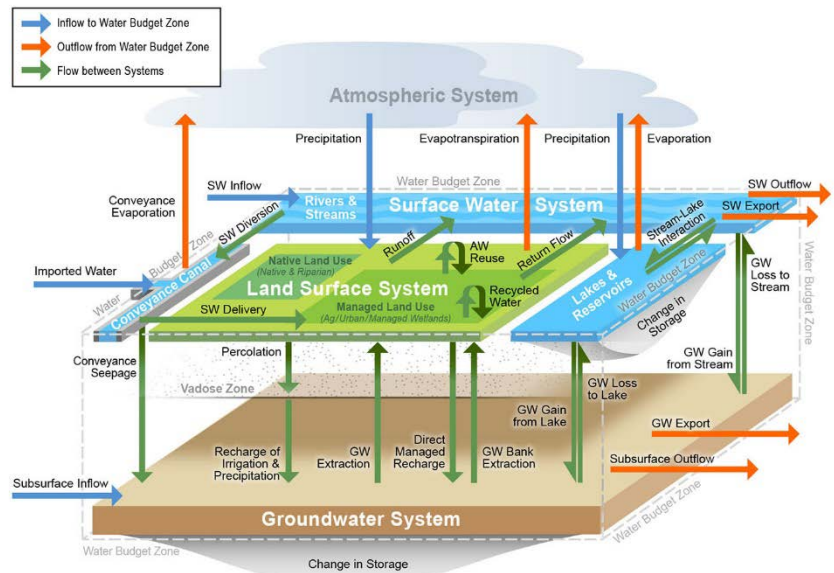


- Linkage of IWFM to reservoir systems analysis models such as CalSim
- Prediction of future cropping patterns based on water availability and economics by linking IWFM to agricultural economics models such as the Statewide Allocation Program (SWAP)

### Technical Support:

Bay-Delta Office (BDO) of DWR develops and maintains IWFM. BDO regularly organizes IWFM hands-on training workshops and provides technical support to IWFM users in developing their models. BDO also maintains a user e-mail list and organizes users group meetings to

distribute information on IWFM and to hear about users' IWFM applications. To get on the users list, e-mail [Can.Dogrul@water.ca.gov](mailto:Can.Dogrul@water.ca.gov). For additional technical support, e-mail [IWFMtechsupport@water.ca.gov](mailto:IWFMtechsupport@water.ca.gov).



### Additional Information:

For additional information, visit the IWFM web page at <https://www.water.ca.gov/Library/Modeling-and-Analysis/Modeling-Platforms/Integrated-Water-Flow-Model>.

### Selected Reports and Publications:

- Brush, C.F., E.C. Dogrul, T.N. Kadir. 2013. DWR Technical Memorandum: Development and calibration of the California Central Valley Groundwater-Surface Water Simulation Model (C2VSim), Version 3.02-CG. Bay-Delta Office, California Dept. Water Resources, Sacramento, California. (available at [https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Library/Modeling-And-Analysis/C2VSim/Files/Coarse-Grid-C2VSim-Model-Version-R374-C2VSim-CG\\_R374-Released-June-28-2013/C2VSim\\_Model\\_Report\\_2016-03\\_vR374.pdf?la=en&hash=F471430D9B83D8773FD872005FB56E7FE97C7D03](https://www.water.ca.gov/-/media/DWR-Website/Web-Pages/Library/Modeling-And-Analysis/C2VSim/Files/Coarse-Grid-C2VSim-Model-Version-R374-C2VSim-CG_R374-Released-June-28-2013/C2VSim_Model_Report_2016-03_vR374.pdf?la=en&hash=F471430D9B83D8773FD872005FB56E7FE97C7D03))
- Huang, G., T. Kadir. 2016. Estimation of natural and unimpaired flows for the Central Valley of California: WY 1922-2014. Bay-Delta Office, California Dept. Water Resources, Sacramento, California. (available at <https://msb.water.ca.gov/documents/86728/a702a57f-ae7a-41a3-8bff-722e144059d6>)
- Ercan, A. 2006. Verification problems for IWFM (available at [http://baydeltaoffice.water.ca.gov/modeling/hydrology/IWFM/Publications/downloadables/Reports/IWFM\\_Verification.pdf](http://baydeltaoffice.water.ca.gov/modeling/hydrology/IWFM/Publications/downloadables/Reports/IWFM_Verification.pdf))
- [Dogrul, E. C., C.F. Brush, T.N. Kadir. 2016.](#) Groundwater modeling in support of water resources management and planning under complex climate, regulatory, and economic stresses. *Water* 8, (12): 592.
- [Dogrul, E. C., T. N. Kadir, C. F. Brush, F. I. Chung. 2016.](#) Linking groundwater simulation and reservoir system analysis models: The case for California's Central Valley. *Environmental Modelling & Software* 77, (Mar): 168-182.
- [Dale, L. L., E. C. Dogrul, C. F. Brush, T. N. Kadir, F. I. Chung, N. L. Miller, and S. D. Vicuna. 2013.](#) Simulating the impact of drought on California's Central Valley hydrology, groundwater and cropping. *British Journal of Environment and Climate Change* 3, (Jul-Sep): 271-291.