Modeling Tools Being Used for SGMA in the Northern Sacramento Valley

Integrated hydrologic models are useful for estimating and understanding water budgets for the interconnected surface water system, land surface system, and groundwater system. This type of modeling tool is being used by Groundwater Sustainability Agencies (GSAs) to support analysis and development of their Groundwater Sustainability Plans (GSPs) for the implementation of the Sustainable Groundwater Management Act (SGMA).

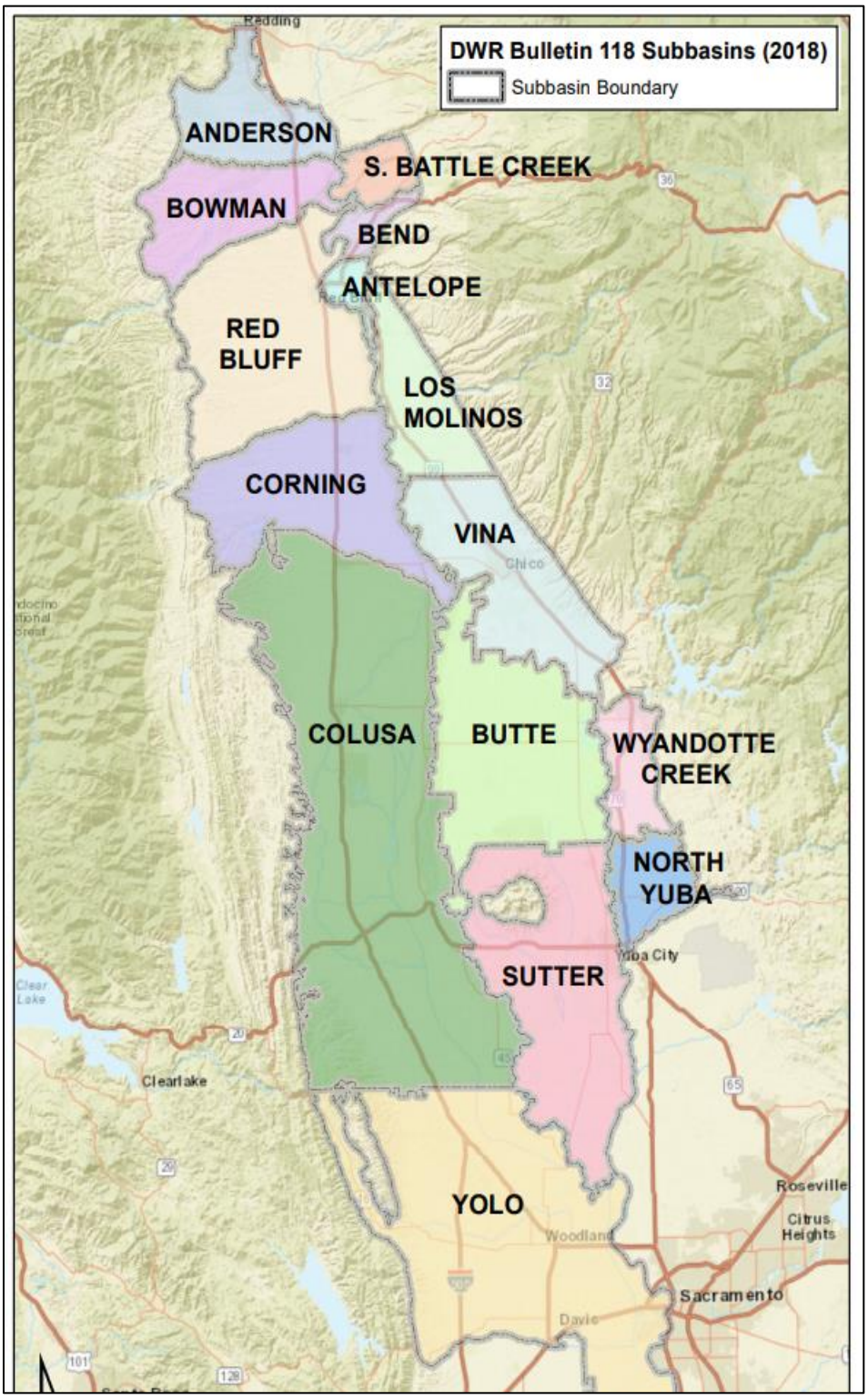
This fact sheet from an earlier Interbasin Groundwater Flow Project (2017) provides an explanation and overview of "why modeling?" https://www.buttecounty.net/wrcdocs/Reports/SpecialProjects/InterbasinGWFlow/FactSheet.pdf

Subbasins throughout the Northern Sacramento Valley are in various stages of developing and refining modeling tools to support GSP development and groundwater management in their subbasin. As part of the interbasin coordination effort, a table detailing the major characteristics of these modeling tools has been compiled. Here are a few highlights:

Highlights:

- In the 14 subbasins shown in the map, 7 different models are being developed and used (Anderson excluded)
- Two of these models were in use by local agencies before SGMA (by Butte County and Yuba Water Agency)
- Another three of these models are locally refined versions of C2VSim which is a Central Valley wide model developed by the Department of Water Resources (DWR). C2VSim also existed before SGMA and is in ongoing development by DWR. The SGMA states that DWR would provide C2VSim to GSAs as part of their technical support services role.
- Subbasins in Tehama County are using a refined version of another DWR developed model called SVSim, the Sacramento Valley Simulation Model.
- The model developed for the Yolo subbasin is a coupled Water Evaluation and Planning (WEAP) model with USGS's MODFLOW model. This couples a surface water model (WEAP) with a groundwater model (MODFLOW). The WEAP model was in use prior to the SGMA effort.
- These models (except Yolo) use the same groundwater-surface water modeling code (Integrated Water Flow Model (IWFM)) so there is consistency in the approach for estimating the water budget components. This is especially helpful for estimating irrigation water demands and stream-groundwater interaction.
- Each subbasin is refining the model for their respective area and particular objectives. All models have strengths and limitations and are best suited for addressing the questions that drove their development.
- Although there are many similarities between these models (the data and approaches they use), varying assumptions and refinements create localized differences in resulting water flows within and between subbasins.
- Consultants working on these models throughout the region are working together as they develop them to understand how these models compare or differ, and ensure that the basis for comparison is as consistent as possible, given local assumptions and data availability (this is a challenging task that even agencies that develop models, such as the USGS and DWR, have grappled with for a long time).

NORTHERN SACRAMENTO VALLEY INTER-BASIN COORDINATION



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Model Name of model
Model Ownership GSA or agency developing/maintaining the model
Technical Contact Name and contact information
Integrated Model Yes or No
Geographic Area List all the subbasins covered in part of in whole by the model domain or specify Sacramento Valley/Northern Sacramento Valley as model extent.
Basis for Model Layering Ex. DWR Geologic Cross sections or Aquifer Characteristics (pumping zones,unconfined/confined)
Boundary Conditions Brief narrative description

Subbasin	Model	Model Ownership	Lead Consultant Team	Integrated Model (Y/N)	Geographic Area	Timestep	Simulation Period (Water Years)	Number of Layers	Basis for Model Layering	Agricultural Demand Estimation Model	Stream-Aquifer Interaction Method	Boundary Conditions
Butte	Butte Basin Groundwater Model- 2020	Butte Co. Dept. of Water and Resource Conservation	Davids Engineering/Woodard and Curran	Yes	Boundaries: North - Deer Creek; West - Sacramento River; South - Yuba River; East - Sierra foothills	Daily	1971- 2018	9	Delineated based on DWR cross-sections of major geologic units within the model domain. Documentation under development.	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.0	North - No flow boundary; West - Specified head boundary condition using C2VSim; South - General head boundary condition using C2VSim; East - No flow boundary; stream inflows from outside of groundwater model domain
Vina	Butte Basin Groundwater Model-2020	Butte Co. Dept. of Water and Resource Conservation	Davids Engineering/Woodard and Curran	Yes	Boundaries: North - Deer Creek; West - Sacramento River; South - Yuba River; East - Sierra foothills	Daily	1971- 2018	9	Delineated based on DWR cross-sections of major geologic units within the model domain. Documentation under development.	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.0	North - No flow boundary; West - Specified head boundary condition using C2VSim; South - General head boundary condition using C2VSim; East - No flow boundary; stream inflows from outside of groundwater model domain
Wyandotte Creek	Butte Basin Groundwater Model-2020	Butte Co. Dept. of Water and Resource Conservation	Davids Engineering/Woodard and Curran	Yes	Boundaries: North - Deer Creek; West - Sacramento River; South - Yuba River; East - Sierra foothills	Daily	1971- 2018	9	Delineated based on DWR cross-sections of major geologic units within the model domain. Documentation under development.	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.0	North - No flow boundary; West - Specified head boundary condition using C2VSim; South - General head boundary condition using C2VSim; East - No flow boundary; stream inflows from outside of groundwater model domain
Corning	Refined version of C2VSim-FG v.1.0 (pending DWR release of v.1.0)	Corning Sub-basin GSA and Tehama County GSA (TCFCWCD)	Montgomery & Associates	Yes	Original model includes the entire Central Valley; Corning GSP model was revised to only include the Northern Sacramento Valley - from Redding Basin to the southern boundary formed approximately by a line south of Willows to Oroville - including portions of the Colusa and Butte Subbasins.	Monthly	1973-2015	4	Roughly major aquifer units	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.2	South- specified flow boundary using C2VSimFG; Small watersheds inflow at Sierra foothills and Costal Ranges; stream inflows from outside of groundwater model domain; main reservoir releases at model boundaries.
Colusa	Refined version of C2VSimFG Beta 2	CGA & GGA refinement of DWR model	Davids Engineering	Yes	Central Valley	Monthly	1922 - 2015	4	Roughly major aquifer units, as described by Brush et al. 2013. Fourth base layer later added by DWR for numerical stability; documentation by DWR not yet released.	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.2	Same as C2VSimFG as established by DWR: Small watersheds inflow at Sierra foothills and Coastal Ranges; stream inflows from outside of groundwater model domain; main reservoir releases at model boundaries.
Antelope	Tehama County Integrated Hydrologic Model (revised SVSim model)	Tehama County	Luhdorff & Scalmanini Consulting Engineers (LSCE)	Yes	Tehama County, plus 5 mile buffer to the north and to the south	Monthly	1973 - 2018	9	SVSim, uses refined textural database based on analysis of recent well logs	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration	North and South - general head boundary conditions using water levels derived from C2VSim; small watersheds inflow at Sierra foothills and Coastal Ranges
Bend	Tehama County Integrated Hydrologic Model (revised SVSim model)	Tehama County	Luhdorff & Scalmanini Consulting Engineers (LSCE)	Yes	Tehama County, plus 5 mile buffer to the north and to the south	Monthly	1973 - 2018	9	SVSim, uses refined textural database based on analysis of recent well logs	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration	North and South - general head boundary conditions using water levels derived from C2VSim; small watersheds inflow at Sierra foothills and Coastal Ranges
North Yuba												
Bowman	Tehama County Integrated Hydrologic Model (revised SVSim model)	Tehama County	Luhdorff & Scalmanini Consulting Engineers (LSCE)	Yes	Tehama County, plus 5 mile buffer to the north and to the south	Monthly	1973 - 2018	9	SVSim, uses refined textural database based on analysis of recent well logs	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.2	North and South - general head boundary conditions using water levels derived from C2VSim; small watersheds inflow at Sierra foothills and Coastal Ranges
Los Molinos	Tehama County Integrated Hydrologic Model (revised SVSim model)	Tehama County	Luhdorff & Scalmanini Consulting Engineers (LSCE)	Yes	Tehama County, plus 5 mile buffer to the north and to the south	Monthly	1973 - 2018	9	SVSim, uses refined textural database based on analysis of recent well logs	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.2	North and South - general head boundary conditions using water levels derived from C2VSim; small watersheds inflow at Sierra foothills and Coastal Ranges
Sutter	C2VSimFG	Sutter County GSA	Woodard & Curran	Yes	Tehama County, plus 5 mile buffer to the north and to the south	Monthly	1991-2015	4	C2VSim and Sacramento Valley hydrogeologic studies	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.3	Same as C2VSimFG as established by DWR
Red Bluff	Tehama County Integrated Hydrologic Model (revised SVSim model)	Tehama County	Luhdorff & Scalmanini Consulting Engineers (LSCE)	Yes	Tehama County, plus 5 mile buffer to the north and to the south	Monthly	1973 - 2018	9	SVSim, uses refined textural database based on analysis of recent well logs	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.2	North and South - general head boundary conditions using water levels derived from C2VSim; small watersheds inflow at Sierra foothills and Coastal Ranges
South Battle Creek	Tehama County Integrated Hydrologic Model (revised SVSim model)	Tehama County	Luhdorff & Scalmanini Consulting Engineers (LSCE)	Yes	Tehama County, plus 5 mile buffer to the north and to the south	Monthly	1973 - 2018	9	SVSim, uses refined textural database based on analysis of recent well logs	IWFM Demand Calculator (IDC)	IWFM Version 2015 - Stream Configuration 4.2	North and South - general head boundary conditions using water levels derived from C2VSim; small watersheds inflow at Sierra foothills and Coastal Ranges