



7. Conclusions and Recommendations

7.1 Conclusions

The *2016 Water Inventory and Analysis Report* not only updates the analysis of the County's water supply and demand, but it fundamentally changes the County's analytical approach to help sustain water resources for future generations. One of the important changes is the integration of the Butte Basin Groundwater Model (BBGM) as a platform for developing and analyzing data for the *2016 Water Inventory and Analysis Report* and future analyses. The integration of the BBGM with the *2016 Water Inventory and Analysis Report* positions the Department with the long term ability to conduct water resource analyses as the need arises. An early benefit of this approach was realized through the *Assessment of Butte County Drought Impacts, 2012-2015* Technical Memorandum (Davids Engineering 2016, included as Appendix D). The obligation of the Sustainable Groundwater Management Act (SGMA) of 2014 to conduct water balance analyses necessitates having the capacity to perform novel analytical assessments. The completion of the *2016 Water Inventory and Analysis Report* and the updated BBGM prepares the County to meet these obligations.

Land use in the Butte County valley floor area has been relatively steady in recent years, with little change in irrigated agricultural lands and a modest decrease in non-irrigated lands. This decrease is offset by increases in developed lands and wetlands. Shifting of crops has occurred, including some increase in orchards (particularly walnuts) and a decrease in other, non-rice crops. There is the potential for marginal expansion of irrigation in some areas, particularly in the East Butte IU between Thermalito Afterbay and the Feather River and in the North Yuba IU between Oroville and Honcut Creek. Potential impacts of additional crop shifting and irrigation expansion will be evaluated using the BBGM and demand scenarios developed as part of the WI&A (as described in Section 6).

The primary climate variable affecting water conditions in the County is interannual differences in precipitation and snowfall. Variability from year to year impacts both the availability of surface water to meet demands and the amount of pumping required to meet crop irrigation requirements. In the future, temperatures are likely to increase as a result of climate change, resulting in less snowpack in the Feather River watershed and earlier runoff. These changes will make existing surface water supplies less reliable, increasing the need to rely on groundwater to meet demands. Climate change scenarios developed as part of the WI&A will allow for evaluation of the potential impacts of climate change using the BBGM (as described in Section 6).

Groundwater level declines have been observed in some areas of the County over recent years and are likely driven mainly by drought conditions leading to reduced deep percolation (potential recharge) and increased groundwater pumping. Pumping estimates developed as part of the WI&A suggest that these groundwater level declines may be related more to



reduced recharge, rather than increased pumping, though the frequent occurrence of dry and critically dry years in the past decade has resulted in increased pumping. Pumping appears to be influenced more by interannual precipitation than to other factors such as increasing crop acreage or crop shifting over time.

Surface layer water budgets developed as part of the WI&A provide valuable information describing land surface processes to support evaluation of the sustainability of available water supplies. The scale at which supplies and demands are quantified is critical to supporting effective water management. Subinventory water budgets underlying the IU water budgets presented in the WI&A (Appendix C) allow for direct engagement with local stakeholders and closer examination of current and historical conditions and trends, while also helping to identify data gaps that need to be addressed to better manage for sustainability in the future.

Ultimately, in the context of developing GSPs as part of implementing SGMA, water budgets will need to be expanded to include the underlying groundwater system. Development of these budgets will be supported by the WI&A and BBGM.

7.2 Recommendations and Next Steps

Recommendations and suggested next steps have been identified as part of developing the WI&A and include the following:

- While many of the large diversions are continuously monitored and recorded, limited information is available for others. Work with local stakeholders to better document surface water diversions, including investigation of riparian diversions in some SIUs and additional information describing water supplies for managed wetlands. Diversion estimates developed as part of the WI&A provide a good basis to support discussion with diverters.
- Groundwater pumping for irrigation has generally been estimated based on estimates of crop irrigation requirements in areas known to rely on groundwater. Look for opportunities to verify and refine groundwater pumping estimates by obtaining pumping data from cooperative landowners.
- Deep percolation in some areas may return to the surface layer through accretion in drains and natural waterways or may be consumed by phreatophytic vegetation. Further investigate the ultimate fate of deep percolation from agricultural lands. Through modelling of specific waterways and shallow groundwater, the BBGM will support this investigation.
- The relative proportion of non-consumed water returning as deep percolation or surface runoff for the WI&A does not explicitly account for percolation from stormwater retention ponds or releases from wastewater treatment plants to local waterways. Refine water budgets for developed lands to verify and refine estimates of non-consumed water.



- Further evaluate water budgets from the WI&A and developed for the groundwater system using the BBGM for historical and current drought periods to better understand factors contributing to recent historic low water levels in some areas.
- Identify and evaluate additional options to adapt to drought, future demands, and climate change.
- Continue public outreach regarding the WI&A and SIU water budgets to educate and inform the public regarding water resources in the County and to gather additional insights to support future water management efforts.
- Continue the process of updating and calibrating the BBGM through further refinement of input datasets and calibration of aquifer parameters to simulate historical water levels and streamflows.
- To retain local groundwater management authority, Butte County should continue to implement the Sustainable Groundwater Management Act (SGMA), including utilizing the WI&A and BBGM information to support development of Groundwater Sustainability Plans (GSPs). One of the key principles of SGMA is that groundwater is best managed at the local level. Developing a water budget and utilizing a groundwater model are requirements of groundwater sustainability plans. The WI&A provides a foundation for meeting these requirements.



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