CDM

Camp Dresser & McKee

Butte County Department of Water and Resource Conservation

Butte County Water Inventory and Analysis

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Water Inventory and Analysis Report

Executive Summary

California's water resources are highly variable, geographically, seasonally, and annually. Managing these resources in the face of increasing and competing demands will become increasingly difficult. Demand will increase as the state's population of 34 million increases by 30 percent between 2000 and 2020. The competition for water expanded beginning in the early 1990's as changes in water management resulted in increased environmental water use. Competition for water by urban, agricultural and environmental users is magnified during periods of drought. Water users both inside and outside of the county are interested in management of the water resources to meet demands.

Photograph by Chuck Lowery

The Butte County Board of Supervisors and Water Commission recognize that such management is essential to the long-term economic and environmental health of the county. To accomplish it, the Board has initiated an Integrated Watershed and Resource Conservation Program.

A major step in the program is to document the county's water resource inventory. The Butte County Water Inventory and Analysis provides a summary of Butte County's water resources through a collaborative effort between the Camp Dresser & McKee Inc. team, Butte County Department of Water and Resource Conservation staff, and the Department of Water Resource's Northern District staff. The Department of Water Resource's Northern District staff prepared a report, *Butte County Groundwater Inventory Analysis*, to support data needs for the overall inventory project. The results are used extensively in this report.

This report presents an overview of current water resource-related programs in addition to the water inventory. The county's urban, agricultural, and environmental water needs are estimated, reflecting current uses. Water supplies available to meet the needs are analyzed reflecting normal and drought hydrologic conditions. On this basis, potential imbalances between needs and corresponding water supplies are assessed for each hydrologic condition.

These budgets cover only the managed and measurable "applied" component of the water cycle. In California, only a small part of the total precipitation is part of this managed and measurable component. Approximately 65% of the precipitation is used by trees and other plants, and does not generate runoff through rivers or streams. Only part of the remaining precipitation produces runoff that is dedicated and managed. This water inventory only considers the dedicated runoff portion of the state's water.

The water inventory was performed to a considerable level of detail by dividing the county into water inventory units and sub-units. The six inventory units are Vina, West Butte, East Butte, North Yuba, Foothill, and Mountain. Within these, twenty inventory sub-units represent water districts or unorganized areas with common water sources and uses. Background supply and demand information for each region was compiled on the basis of interviews with sixteen water purveyors and users, discussions with numerous parties involved in water-related activities and assimilation of existing data.

The general methodology of the inventory parallels that used by DWR to produce Bulletin 160. However, this analysis focuses on Butte County with a greater level of detail than was used in Bulletin 160 for the whole state.

The supply and demand analysis was performed according to the following steps:

- For each sub-unit, demands were estimated from water usage for each sector (urban, agricultural and environmental) for normal and drought conditions;
- Available supplies during normal and drought years were estimated, from records of water deliveries, water demand estimates, major water rights, interviews with key water providers, and allowable allocation cutbacks;
- Applied water budgets and shortages were estimated by inflow-outflow analysis; and
- Regional impacts on groundwater were estimated by comparing groundwater extraction estimates with groundwater hydrology data.

For this analysis, the year 1997 was chosen to represent a normal year. The County was very close to current development patterns for agricultural, urban, environmental, and other water uses. In addition, this year was one of the few recent years with a long agricultural growing season. Many residents remember the flooding during January 1997, and assume that it was a very wet year. The precipitation, however, was very close to average values within Butte County, and the floods were caused because the rainfall came primarily during January. There was minimal rainfall after January, which meant that January's flooding did not result in wet soil conditions when the growing season started. The combination of a long growing season, full water supplies, and full development patterns make 1997 the best option to represent a normal year.

Summarized findings for this normal year scenario include:

- During normal years, the supplies are equal to the demands, with no shortages.

- Agriculture produces the majority of county demand, with 71% of the total demand. The remaining demand is composed of conveyance losses (15%), environmental demands (10%), and urban demands (4%).
- The primary water source within the county is surface water (55%), followed by groundwater (31%) and surface water reuse (14%).
- Supplies are distributed throughout the county in approximately the same pattern as demands, with the most water going to the East Butte inventory unit (64%), followed by West Butte (18%), Vina (10%), North Yuba (5%), Foothill (2%) and Mountain (1%).

The drought year proved to be more difficult to select than the normal year because all drought conditions (such as precipitation, evaporation rates, and surface hydrology) did not exist in a single year. Therefore, several years were used to illustrate the worst recent examples of drought-year impacts. The 1976-77 drought had the lowest precipitation in recent years, but it was a relatively cool year and therefore had low levels of ET. From October 1976 to September 1977, the rain station in Chico is the lowest on record (10.55 inches) for a period from 1906 to 1999. The precipitation of 1976-77 is used, but the ETs from 1997 are used. The weather was very hot during 1997, which produced high pan evaporations and therefore high ETs. Per capita use information for urban demands was examined for recent years, and 1987 was chosen to represent urban per capita use because it was a hot, dry year with high demand. Key results of the drought scenario include:

- Shortages are primarily in the southwest portion of the county. Shortages are defined by lack of supply, which in most cases is limited by the groundwater infrastructure available, not by total water supply. The water shortage in the Ridge is somewhat different than the other sub-units, and is caused by a lack of surface water conveyance infrastructure.
- The composition of agricultural, municipal and industrial, and environmental demands does not appear to change substantially from the normal year. In a drought year, the majority of the demand is agricultural, at 74%, followed by conveyance losses (11%), environmental demand (10%) and urban demand (5%).
- There is more groundwater pumping and less surface water use than in the normal year. Surface water decreases from 55% of supply in normal years to 41% during a drought, and groundwater increases from 31% to 44%. Surface water reuse stays essentially the same, going from 14% in a normal year to 15% during a drought.

Butte County currently has adequate water resources available to meet demand within most areas of the county under normal hydrologic conditions. However, planning will be required to continue to meet the increasing and competing county

water resource needs and to develop a further understanding of the resource as solutions to increasing statewide water demand are pursued.

From the results of the water inventory, the following conclusions are drawn:

- The portion on the Sacramento Valley aquifer system under Butte County has recovered from the 1988-1994 drought. Long-term trends in groundwater storage indicate the basin groundwater aquifer is not in a state of decline. During normal to wet years, the aquifer system recharges to its maximum storage capacity by the following spring.
- Within the Foothill Inventory Unit and Mountain Inventory unit, overall groundwater supply is limited because groundwater occurs primarily in fractures and joints of the volcanic bedrock. Shallow, domestic wells could be susceptible to dewatering during periods of drought.
- Under the normal hydrologic scenario, Butte County currently has an adequate surface water and groundwater supply to meet current demands.
- Under the drought scenario evaluated, current demand can generally be met through increased groundwater extraction provided groundwater extractions are increased to offset reduced surface supplies. Additional groundwater wells and conveyance and distribution systems may be required to fully utilize the groundwater resource.
- Under the drought scenario evaluated, the Ridge Inventory Unit experiences water shortages.
- Future increases in demand will be associated with population growth and environmental regulatory requirements, both within and outside of the county.
- A significant amount of water supplied to meet demand remains available for use through deep percolation to groundwater and outflow to other areas.
- Environmental water use constitutes a substantial part of water demand in the county, extending water demand past the typical irrigation season. The trend in environmental water has increased in the recent past due to regulatory requirements.
- Impacts of normal and drought year water use on groundwater levels have been estimated for the Sacramento River Basin and Foothill areas.

With increasing pressure to meet current and projected water needs on a statewide level, northern California supplies will be evaluated by others as a component of the solution. A comprehensive Integrated Watershed and Resource Conservation Program is required to protect Butte County's interest and needs, as well as to adequately assess impacts of proposed state-initiated water resource projects. Initial key activities for formulating such a program should include:

- Facilitation and outreach with the county's stakeholders to develop water resource management goals and objectives, and for coordination of county interests with DWR and CALFED interests.
- Enhancement of the current land use, surface water monitoring, and groundwater monitoring data collection programs for use in a long-range integrated watershed and resource conservation plan.
- Groundwater is an important water source to Foothill and Mountain areas, but the fractured geology makes it very difficult to characterize. Additional monitoring and assessment should be performed in these areas to enhance understanding of groundwater availability and movement.
- Enhanced forecasting of agricultural, environmental and urban demand for use in such an integrated plan.
- Assessment of the Butte Basin Water Users Association groundwater flow model for use in the integrated plan.

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