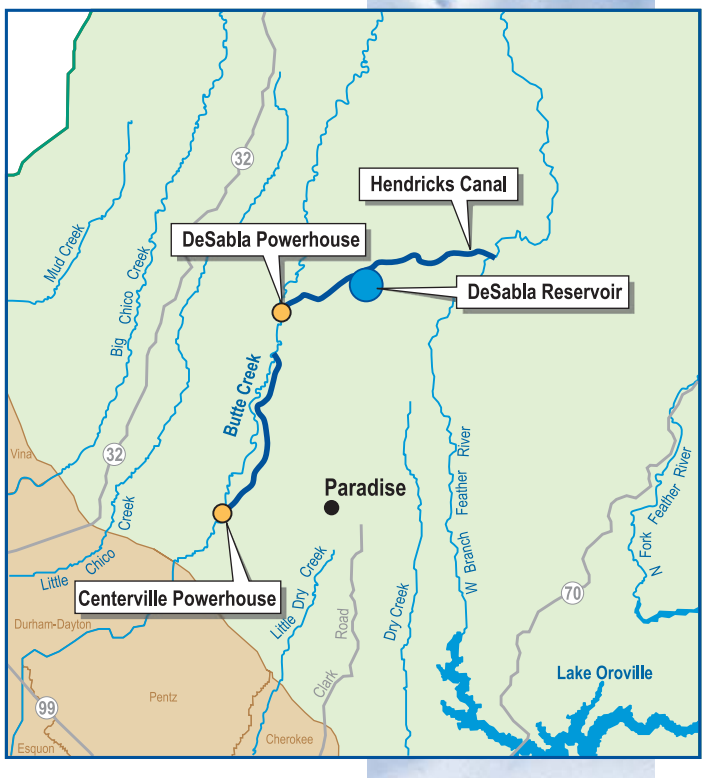
Option 1

Increase Fish Flows in Upper Butte Creek

This option would increase flows in Upper Butte Creek for fish. Flow in Butte Creek is affected by many factors beyond seasonal rainfall. Water is diverted from the West Branch of the Feather River through the Hendricks Canal into Butte Creek at the DeSabla Powerhouse. Just downstream of this inflow, PG&E diverts water for power generation at the Centerville Powerhouse.

One possibility for increasing fish flows in Butte Creek is to increase flow through the Hendricks Canal. The Hendricks canal is operated by PG&E and runs from a diversion on the West Branch of the Feather River to De Sabla Reservoir and is then released into Butte Creek at De Sabla Powerhouse where water is used to generate power. The canal's maximum flow is 120 cfs, and its average flow is 41 cfs. Flow capacity at the powerhouse is unknown.

One possibility for increasing flows in the upper reaches of Butte Creek is to reduce flows in the Lower Centerville Canal. PG&E diverts water at the Centerville Head Dam through the Lower Centerville Canal for power generation. The canal runs parallel to the creek for approximately 6 miles. Then the water is used to generate power at the Centerville Powerhouse. After the water is used to generate power, it is discharged back into Butte Creek. The reach of Butte Creek from the Sacramento River to the Centerville Head Dam is designated essential Salmon and Steelhead Habitat by California Department of Fish and Game. Centerville Head Dam does not allow fish passage.



Potential Benefits

- Increased flow in Butte Creek for fish.
- Improved habitat in Butte Creek, and potential improvement of water quality in Butte Creek.
- Beneficial use for State Water Project water allocated to Butte County.

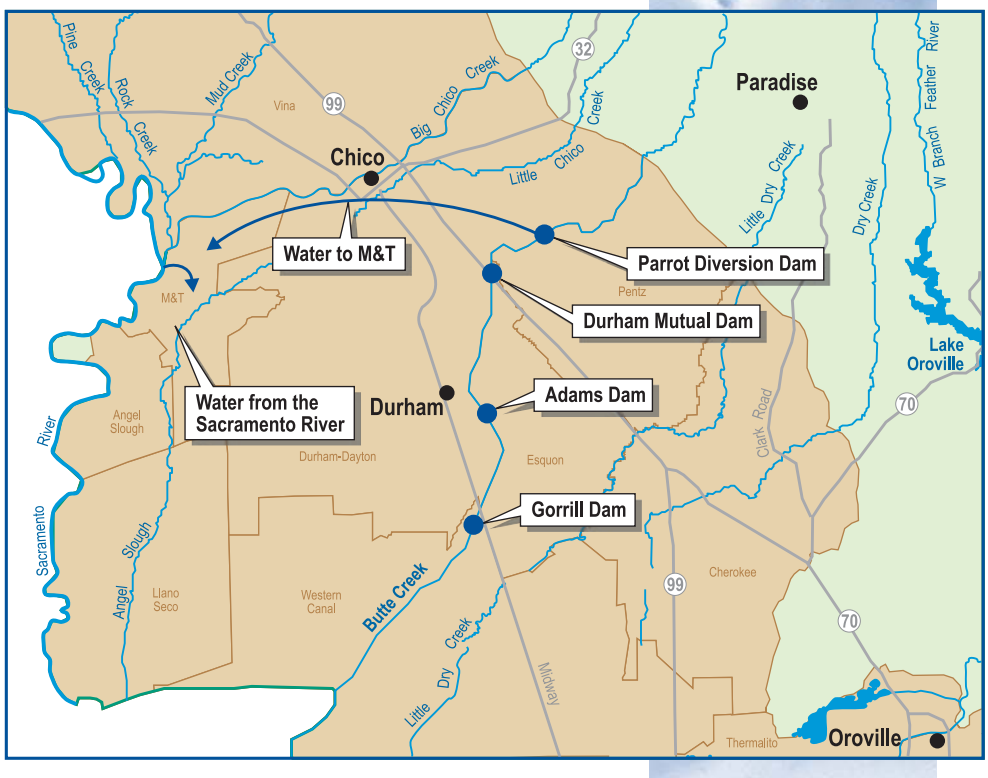
Potential Drawbacks

- Reduction of power generation resulting from reduction of flow in the Lower Centerville Canal.
- Increases in Hendricks canal flow will result in decreased flow in the West Branch of the Feather River.
- Potential impacts on anadramous fish in the West Branch of the Feather River.

Option 2

Increase Fish Flows in Lower Butte Creek

This option would decrease diversions from Lower Butte Creek to accommodate fish flows. Many factors beyond seasonal rainfall affect flows in Butte Creek. One possibility for increasing flow in Lower Butte Creek would be to reduce diversions for agricultural purposes. Water is currently diverted at Parrot Diversion Dam and delivered through Camanche Creek to the M&T and Llano Seco areas. In this option, diversions at the Parrot Diversion Dam would be replaced with water pumped from the Sacramento River. This would leave water in Butte Creek to benefit fish.



This option could apply to various other diversion dams on Butte Creek. If a replacement water source were available for irrigation, users could reduce their diversions from Butte Creek, which would increase fish flows. Conjunctive management projects could possibly supply some replacement water through increased groundwater use to allow for in-stream flows.

Potential Benefits

- Increased flow in Butte Creek for fish.
- Improved habitat and potential improvement of water quality in Butte Creek.

Potential Drawbacks

- Finding and funding replacement water for irrigation users may be difficult.
- Water users may be resistant to giving up their surface water rights use to accommodate increased in-stream flows.
- Decreasing flow in Camanche Creek may have impacts on riparian habitat.
- There could be groundwater recharge loss due to a reduction of water percolating from Camanche Creek.

Option 3

Restore a More Natural Flow Regime on the Feather River

This option would promote the restoration of a more natural flow regime on the Feather River below Lake Oroville. Benefits could include improved fisheries, improved riparian habitat, and improved recreational opportunities. Butte County's direct opportunity for participation in restoration of a natural flow regime on the Feather River is to use part or all of the County's SWP allocation (27,500 acre-feet) for this purpose. Because the water source is somewhat limited, Butte County could use this water to create pulse flows at environmentally important times rather than trying to create flows year-round.

Releases from Lake Oroville to the Feather River are currently managed to conserve water while meeting downstream water needs, including instream flow, temperature, water quality, and downstream diversions. An August 1983 agreement between Department of Water Resources (DWR) and Department of Fish and Game (DFG) entitled "Agreement Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish and Wildlife" quantifies the water needs discussed above. In general, instream flow requirements above the Thermalito Afterbay include maintenance of 600 cubic feet per second (cfs) for fisheries purposes. Instream flow requirements below the Afterbay outlet are 1,700 cfs from October through March and 1,000 cfs from April through September (DWR, September 2003). Temperature, diversion, Delta water quality, and flood management requirements can result in higher flows.

As part of Oroville Dam's FERC relicensing process, DWR is studying how changing flows in the low-flow channel (just downstream of Oroville Dam) could benefit fish. DWR indicates that the low-flow channel is the location of most natural spawning of anadromous salmonids. The existing flow regimes require 600 cfs in this channel year-round; however, this flow regime does not include cues for fish migration. Science suggests that increased discharges provide cues for juvenile outmigration. DWR may include increased flows as part of the new license application. This option could build on DWR's efforts to create flow patterns that help fish migration and spawning.

Potential Benefits

- Potential for improved fishery, riparian habitat, and recreation.
- Local use of Butte County's SWP allocation.

Potential Drawbacks

- Without additional contribution, Butte County's SWP allocation may not achieve desired objective.
- County cost, without outside funding, would be approximately $1M annually.

Reference: DWR, September 2003. Recreation Facility Inventory and Condition Report. Oroville Facilities Relicensing. FERC Project No. 2100.

Option 4

Develop a Coordinated Water Quality Database

This option would result in the development of a coordinated water quality database that would be widely available to water resource stakeholders in Butte County. Water quality monitoring is performed in Butte County by a wide range of entities for various purposes. Although a significant volume of water quality data collected from within Butte County exists, a centralized database that contains this information does not exist.

Implementation of this option would require: identification of existing water quality databases; identification of parameters to be included in a coordinated database; development of data-sharing agreements; database development; development of protocols for inclusion of new data; quality control and assurance of new data; and identification of equipment, staff, and financing to maintain the database.

Currently, water quality data is either collected by or reported to various agencies for a variety of purposes, including surface water discharge monitoring, environmental cleanup sampling, baseline water quality studies, and many others. Agencies collecting water quality data or requiring water quality monitoring in Butte County include:

- Local citizen groups;
- Local watershed groups;
- Butte County Department of Water and Resource Conservation;
- Butte County Department of Health Services;
- California State University, Chico;
- California Department of Health Services;
- California Department of Water Resources;
- Central Valley Regional Water Quality Control Board;
- Local Water Utilities;
- Butte County Agricultural Commission;
- U.S. Environmental Protection Agency; and,
- U.S. Geological Survey.

Many entities maintain water quality databases. Examples include the California Department of Water Resources' Water Data Library and the Environmental Protection Agency's STORET water quality database. Additionally, numerous databases are maintained specifically for local projects.

A central database for water quality could reduce workload for monitoring entities by reducing a duplication of effort.

Potential Benefits:

- A centralized database could reduce sampling redundancy.
- County-wide water quality trends and patterns could be more evident with a large data set.

Potential Drawbacks:

- Assimilation and maintenance of data would be very time consuming.
- A long-term funding strategy would be required.

Option 5

Develop a Coordinated and Expanded Water Quality Monitoring Program

This option would coordinate and expand water quality monitoring activities in the County. The objective of the expanded and coordinated water quality monitoring program would be to proactively monitor surface water and groundwater that is determined to be of primary importance to the sustained environmental, social, and economic health of Butte County. As discussed in Option 5, "Develop a Coordinated Water Quality Database", various interests are conducting a wide range of water quality monitoring in the County currently.

Coordination and expansion of water quality monitoring would be accomplished by first identifying the range of water quality monitoring being conducted, both on a sustained basis and on a temporary, project-specific basis. Monitoring locations and parameters would be identified. The next step would be to assess current and future water quality monitoring needs, by both location and constituent. An expanded monitoring program would be identified by comparing water quality locations and parameters being monitored with the current and future monitoring needs. Coordination would be facilitated among parties conducting monitoring to assign responsibility for meeting additional water quality monitoring needs identified under the expanded program.

Potential Benefits:

- Proactive protection of water resources by thorough identification of water quality concerns at an early stage.
- Improvement in efficiency of data collection through coordination.

Potential Drawbacks:

- Coordination efforts would be extensive.
- Funding for sustained water quality is often subject to cuts or reduction.

Option 6

Implement an Environmental Monitoring Program

This option would employ a variety of data collection and analysis methods to increase the County's knowledge regarding environmental resources and water demands. Environmental Monitoring Programs generally include:

- Assessment of current habitats, usually done with air photos and field verification;
- Evaluation of in-stream flows and associated water requirements using either a model or a team of experts;
- Establishment of baseline conditions using satellite images;
- Estimation of environmental water demands for various habitats using a model that estimates evapotranspiration; and
- Design of a long term monitoring program.

This option could help protect biological resources and increase understanding of existing environmental conditions.

Potential Benefits

- Increases knowledge of current resources.
- Increases knowledge regarding the condition of some environmental resources.
- Provides a way to determine whether changes are occurring to the environment.

Potential Drawbacks

Option 7

Provide Guidance in Development of Basin Management Objectives to Support Vegetation

This option would provide guidance to stakeholders developing Basin Management Objectives (BMOs). As of December 2003, the County has developed a draft amendment to the County Code where groundwater management would be pursued through the development of BMOs. Current water management criteria in the draft BMO ordinance include water level, water quality, and subsidence monitoring to enable proper water management within areas of the county overlying groundwater basins.

As envisioned in the draft ordinance, water levels would be monitored and managed to support adequate future supplies for domestic, municipal, industrial and agricultural water well users. Sustaining natural vegetation above recharge zones is important for managing the groundwater levels. Natural vegetation enhances riparian areas and wetlands that recharge the aquifer. If the vegetation dies, water more quickly runs off of the wetland and vegetation areas, reducing recharge. Under this option, the County would provide guidance in the development of BMOs to support natural vegetation above recharge zones to manage groundwater.

The County is undertaking efforts to quantify the environmental water demand of native vegetation and to develop an environmental monitoring plan that would result in a periodic assessment of vegetative health as it relates to plant water availability. Completion and implementation of these efforts would be a significant step toward understanding the distribution and associated water requirement of native species.

Potential Benefits

- Groundwater levels would be managed to sustain native vegetation.
- Local quality of life is maintained in a setting with healthy native vegetation supporting robust animal life.

Potential Drawbacks

- Focus would be on terrestrial areas where native vegetation is reliant on groundwater.
- Implementation, including monitoring wells/stations, would be costly.
- Modification of the County Code to include BMO development associated with native vegetation may be difficult.

Option 8

Expand Urban Water Use Efficiency Measures

This option seeks to reduce urban water use through efficient practices. Butte County water agencies could work with the California Urban Water Conservation Council (CUWCC) to develop and implement best management practices (BMPs). In 1991 a Memorandum of Understanding established the CUWCC and identified 14 BMPs to conserve water:

1. Water Use Survey programs for single family and multi-family residential customers
2. Residential plumbing retrofit
3. System water audits, leak detection and repair
4. Metering with commodity rates for all new connections and retrofit of existing connections
5. Large landscape conservation programs and incentives
6. High efficiency washing machine rebate programs
7. Public information programs
8. School education programs
9. Conservation programs for commercial/industrial/institutional accounts
10. Wholesale agency assistance programs
11. Conservation pricing
12. Conservation coordinator
13. Water waste prohibition (through ordinances)
14. Residential ultra low flow toilet replacement programs

Collectively, the cities of Chico, Paradise, and Oroville have about 33,000 households and use approximately 325,000 gallons of water per household per year (U.S. Census 2000). Through urban water conservations, cities could reduce total water use.

Potential Benefits

- Reduce urban water needs and increase water use efficiency.
- Help meet supply needs on Paradise Ridge.
- Increase recharge in the Chico area through reduction in groundwater pumping.
- Complying with BMPs allows areas to be eligible for grant funding.
- Some measures may "pay for themselves" in reduced operations and maintenance costs.
- May offset supply at a lower cost than development of new supply.
- Support a countywide coordinated approach.

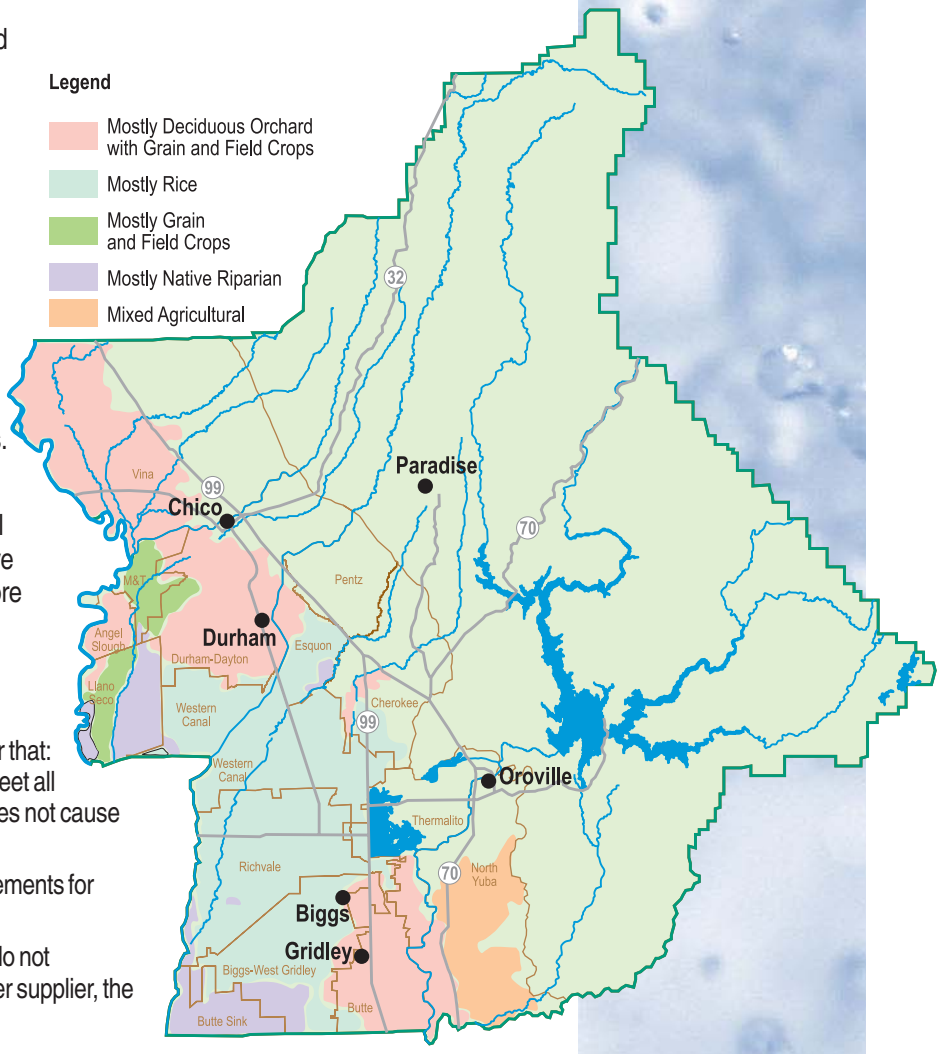
Potential Drawbacks

- Public disapproval of measures such as metering, conservation pricing, and water waste prohibition.
- Long term costs for programs. To receive funding, the County must demonstrate that water is "saved."
- Reductions in surface water use would decrease groundwater recharge.
- Reductions in surface water use would decrease urban tailwater flows from Chico into the Sacramento River.

Option 9

Expand Agricultural Water Use Efficiency Measures

Butte County water and irrigation districts could work with the Agricultural Water Management Council to prepare Water Management Plans and implement efficient water management practices (EWMPs) to conserve agricultural water. The Agricultural Water Management Council was established by a 1996 DWR Memorandum of Understanding (MOU) to support the CALFED Agricultural Water Use Efficiency Element and assist in the development and implementation of Water Management Plans. The MOU also defined a list of EWMPs for agricultural water suppliers.



The EWMPs include general practices, applicable to all water suppliers, and technical practices, which must be demonstrated to have potential net benefits to the water supplier before they are implemented. The technical EWMPs include the following practices:

- Facilitate alternative land use.
- Facilitate use of available recycled water that: would not be used beneficially; would meet all health and safety requirements; and does not cause harm to crops or soils.
- Facilitate the financing of capital improvements for on-farm irrigation systems.
- Facilitate voluntary water transfers that do not unreasonably affect the water user, water supplier, the environment or third parties.
- Line or use pipe for ditches and canals.
- Increase flexibility in water ordering by, and delivery to, water users.
- Construct and operate Contractor spill and tailwater recovery systems.
- Optimize conjunctive use of surface and groundwater.
- Automate canal structures.

Potential Benefits

- Water conservation would reduce applied water and provide purveyors with surplus water that could be used by government programs or other water districts.
- Grants may be available to water agencies complying with EWMPs.

Potential Drawbacks

- Some EWMPs may not be cost-effective, especially when the cost of water is low.
- Conservation could reduce groundwater recharge. Reductions in surface water use in crop fields and unlined distribution systems would decrease groundwater percolation.
- May require dual delivery systems. For example, if growers installed drip irrigation for orchard crops, the orchards would require a separate system for frost protection.

Option 10

Inform and Educate the Public About Water

This option would include implementing one or more methods to distribute information and teach water-related concepts. This option could include: information dissemination through publications; interaction with the public in meetings or other settings; provision of water data; development and/or distribution of school curricula; and other methods. Topics for the educational program could range from the water cycle and "how we use water" to more complex topics such as water efficiency, management, and conflicts.

Any newly developed education programs would be coordinated with existing programs. For example, the California Water Services Agency currently conducts an educational program in which a representative visits local schools and discusses efficient water use and other water-related issues. A new program would expand on these efforts, rather than duplicate them.

Potential Benefits

- Potential for more involvement from the public on water issues.
- Understanding and support for other management options.
- Identification, understanding, and removal of barriers to local control.
- Protection of public health and water quality.
- Accessibility of data for the public.

Potential Drawbacks

- Requires dedication of resources.
- Difficult to assess and quantify benefits.