

Summary of Reports and Documents  
Pertaining to Butte Creek's Water Quality, Hydrology, and Diversions

The Gathering Storm: A Sacramento Bee Special Report. This article was first printed as a series from Nov. 23-27, 1997 in The Sacramento Bee, but is now more easily obtained via the Internet at the following address:

[www.sacbee.com/news/projects/gathering\\_storm/index.html](http://www.sacbee.com/news/projects/gathering_storm/index.html))

Reporters Nancy Vogel and Tom Knudsen spent six months travelling 12 western states, interviewing over 150 flood-control experts and numerous citizens. The two reporters found numerous causes for concern, and the series of articles have excellent graphics depicting some of the conflicts between physical processes, land use, and the overall ideology surrounding the issue of flood control.

Beyond Flood Control: Flood Management and River Restoration. Put out by Friends of the River, this brief describes some of the technical aspects revolving around the issue of flood control: what is a floodplain; what is the 100-year floodplain and why it can change; why a watershed approach to problem solving widely accepted as a good idea; etc. The report has a good bibliography, and it highlights issues involving the Sacramento and American Rivers.

Flood Control vs. Flood Management Williams, Philip B. May, 1994. *Civil Engineering*. This paper looks at the philosophy behind restoring natural process to river systems as a way of achieving both flood "control" and establish healthier riverine ecosystems. Addresses rip-rap and alternatives to this method of bank stabilization.

Original title was: "PID Regional Stormwater Management and Analysis Report for the Magalia and Paradise Reservoirs Watershed October 1994 (revised Nov. 1994)."

The report sent to the BCWP by the PID was titled: "PID Water Quality Management Plan Project Report for the Magalia and Paradise Reservoirs Watershed." The original work obtained from Dr. Gina Johnston, CSU, Chico, Dept. of Geosciences, is listed as a reference in this report, and although the BCWP no longer has the original from Dr. Johnston, most of the information from the original report seems to appear in the latest report.

The report goes over the basic location, geology, and hydrology of Little Butte Creek and its tributaries above the Paradise and Magalia Resv.s. Lacking is information on the areas below the dams and down to the confluence with the Butte Creek main stem as explained below:

The report on page II-4 identifies four main pollution sources to the watershed: 1) nutrient and bacteria discharges from failed septic systems and grazing, 2) timber harvest related sediment and nutrient discharge, 3) nutrient and sediment from activities at the Meadowbrook Ranch and Trout Farm (the RWQCB issued a cleanup and abatement order), and 4) discharge of sediment and nutrient from CDF Magalia Nursery.

After speaking with Nancy Matthewson at the PID it was found that the PID does no testing below the Paradise Reservoir on Little Butte Creek. Also, the only release protocol they have for releases from the reservoir is the natural spill through the spillway when the reservoir level reaches the spillway height. Therefore, the BCWP has not been able to find solid information on water quality on Little Butte Creek below the reservoirs. Report is included in this work presented.

### Forks of Butte Hydroelectric Project: Draft Environmental Impact Report

This document had only one section that dealt directly with water temperature and quantity. There was no water quality data. There are two excellent (although plotted by hand and are not properly cited) thermographs that depict water temperatures during the summer of 1975--a year believed to be a 'drought' year. This could be compared to the DWR thermograph work done in wet years.

In Appendix B, page 3, there is an "Applicant Streamflow Agreement" between CDFG and the Energy Growth Group and Butte Creek Improvement Co. (together referred to as "the Company"). In order to maintain proper stream temperatures for aquatic species, the diversion dam must pass certain amounts of water if temps at a point just above the power house exceed certain temps. The agreement set up the following: "All streamflow releases and temperature requirements will be monitored by continuous recording stream gauges and recording thermographs at two sites approved by FISH AND GAME." They are to be operated and maintained by "the Company." Although the agreement in the report was unsigned, it appeared to be something that would have been implemented as it is discussed thoroughly throughout the document. If it is possible to find out if this was implemented (from CDFG?) this may provide the BCWP with some good data for future restoration projects.

The rest of the report contains some good information on upper canyon riparian vegetation and fisheries (NOT including salmon--they were left out since the study concentrated on the sections above Centerville Diversion Dam). This report is in the Chico State Library, and if detailed analysis of the area above the Centerville Diversion Dam is desired, it should be used in conjunction with the Nature Conservancy study done by Holtgreive, et al.

### Department of Water Resources Bulletin No. 137: "Sacramento Valley East Side Investigation Appendix C Fish and Wildlife" June 1966.

Page 17 gives some 'historic' water temperatures. Pages 64 and 65 comment on several proposed projects and give water temperatures at those proposed sites. Several other proposed projects and their impacts are described but include no temperature or water quality data. Page 17 gives temperatures from Hayes' 1965 report (see bibliography at end of report).

EIR, Enlargement of Paradise Reservoir. Oct. 7, 1975. This document is older than the Kreiger and Stewart report but gives permit numbers for diversions, minimum flow requirements, and annual runoff for Little Butte Creek.

Butte Creek Contamination Controversy Chico News and Review, Sept. 8, 1977.

This article alludes to contamination in the summer of 1977. Reference to "SEPA" is made, but the acronym is never defined. SEPA contends that the creek is high in fecal coliform counts. The next report is interesting to view in context of the article.

Analysis of Coliform and Fecal Streptococcal Bacteria in Butte Creek and Big Chico Creek. A thesis by Donald Robert Williams. Spring 1978.

The report contains temperature and water pollution data, although the exact locations of sampling are given in "miles up Humbug Road", this data is very useful. Other than the DRAFT Butte Basin Water Quality Report from DWR and authored by Jan Kilbuck, this document may be the best for past pollution information. This study was done in the summer of 1977, a low flow period. Interesting conclusions may be drawn by re-sampling the creek now, in 1998, in the same way as was done in this report.

Hydrology and Hydrogeochemistry of Butte Creek During Low Base Flow A thesis by Melvin John Granskog. Fall 1979. This was a student of Dr. Behnke, CSU, Chico, Department of Geosciences, so he should be of help when it comes to replicating the sampling for total dissolved solids, etc. This report was from a low flow period as well. They report does give hydrographs for years up to 1974 for the Butte Meadows station and 1977 for the station near Chico. It also gives a recurrence interval graph for flows, but does not include the 1986 or 1997 floods, so the regression is going to be skewed quite negatively due to this and the relatively short period of record. For these reasons some of this report is not very useful. The basic hydrology of the creek is outlined, as well as the hydrogeochemistry. It is good in that they analyzed the water imported from the west branch of the North Fork Feather River. This report sets up the possibility of monitoring the same stations under "normal" spring and summer flow conditions, and comparing and contrasting the results.

A Summary of Water Resources in Butte County Jan 1, 1960. (Revised and Supplemented Jan, 1961) Butte County Dept. of Public Works.

This document has good water information for the whole county, as well as from Butte Creek. The precipitation data gives only the extremes (and only from 1904 (1914)-1959), so it is not the best out there. The water quality data is interesting (especially since the last dredge left the Canyon around 1958) since it comes from 1955. The rest of the data is interesting stream flow means, max.s and min.s, diversions from the West Branch of the Feather River, and annual discharge. Good historic stuff.

Evaluation of Groundwater Resources: Sacramento Valley DWR/USGS. Bulletin 118-6 Aug. 1978. (N.E. CAL. GB 1025 C2 C4 1978)

A joint USGS/DWR effort. This report will be helpful if analysis of Butte Creeks interaction with groundwater in the valley is to be explored. Good sub-surface geology and oblique air photographs (at least as early as 1978) of the areas lying from Chico to Lake Almanor and down to the Buttes. Butte Creek corridor through the valley is apparent.

Geologic Features and Ground-Water Storage Capacity of the Sacramento Valley, CA.  
Water Supply Paper 1497. United States Geological Survey. 1961.

Essentially the predecessor to the work done by the above report. This was a sole effort by USGS.

Sutter Bypass Fisheries Technical Memorandum II: Potential Entrapment of Juvenile Chinook Salmon in Proposed Gravel Mining Pond. Jones and Stokes Associates Inc. May 27, 1993. Contact: Warren Shaul.

When the time comes to analyze the Sutter By-pass and its role in Butte Creek fisheries, this documents introduction and background may be of some help.

Butte Creek Canyon: Changing Utilization in the Sierra Nevada Foothills A thesis by Allison Furr. (F868 B82 F8 thesis)--was missing from the thesis section and is available in the Special collections Room, CSU, Chico Meriam Library.

This report, with many excellent photographs, profiles the changes in the canyon from the times of the Maidu to the 1970s. Gives information on the dredging in the canyon, dates and locations (goes good with the Ralph Hupp interviews listed next). The report lists the number of residences and people living in the canyon at the time of the thesis (pg 2). The most striking thing about the report are the photographs. There is an undated picture of the Centerville Power House that shows the bed of the creek at a much lower level than the present. This could have been pre-heavy mining, but without a date, no inferences can be made. The other photographs show extreme differences in vegetation before the times of massive fire suppression (Ralph Hupp pg. 9 Vol 1 alludes to the differences as well).

Humbug Road (N. E. CAL. F868 B8 H86) Two Volumes An interview with Ralph L. Hupp. Vol. 1: Humbug Road and Butte Creek Canyon to First Change Station. Vol. 2: Upper Ridge Areas. Association for Northern California Records and Research and CSUC Oral History Program, Northeastern California Project. Oct. 6 1973.

This excellent interview gives some wonderful information on the history of the canyon. Ralph is still sharp with the details, and as they go from Chico up Humbug (Centerville) Road, he points out many interesting points and tells stories. A 'must read' for a history of the area.

Cultural Resources Inventory and Management Plan for the Proposed Improvements to the DeSabra-Centerville Hydroelectric System, Butte Co. (FERC no. 803). Feb. 11, 1985. Prepared for PG&E by Public Anthropological Research, CA.

This large document lists the historical and cultural sites and describes them. Includes some historic photos. Excellent resource to go along with the next document.

Archeological Reconnaissance of the Forks of Butte Creek Timber Sale, Butte Co. 1975. Peter and Susan Jenson, Redding BLM.

Has an adequate bibliography. Most of the report alludes to Native American sites found by others, and the Jensons use others' identification codes for these sites. Still, for upper canyon Native American sites, nothing better was found.

DRAFT Butte Basin Water Quality Report. CA Department of Water Resources. Authored by Jan Kilbuck. 1997.

This is the most complete synthesis and analysis of water quality data available. Kilbuck as reviewed and included water temperature information, water chemistry, including pH, turbidity, minerals, nutrients, minor elements, and dissolved oxygen. The report includes many graphs, matrices showing raw data, tables, and figures. Pesticide information is covered as well. This document is in its draft stages, and should be completed and finalized by summer 1998.

A History of Irrigation in Butte, Sutter, Glenn, and Colusa Counties. Joint Water District Board. Authored by Joe P. McGee. 1980.

For a historical perspective of irrigation in the Butte Basin and surrounding areas, this is the document to get. It has newspaper articles, historic photographs, and histories of each of the many water and irrigation districts in the basin. This is the best way to understand how irrigation districts formed and have changed through time.

Butte Basin Study-Basic Data CA Department of Water Resources. Authored by Todd Hillaire. 1993.

This document is the best single resource for understanding the complex water system of the Butte Basin. The report describes the inflows, outflows, and water distributions in the Butte and Sutter Basins. It has streamflow records for various gauges and diversions in the basins. The majority of the report is made up of this flow information, in acre-feet, in a table format.

Land Acquisition Evaluation: Forks of Butte Creek Bureau of Land Management. Authored by Jim Snowden. 1995.

This is a summary and description of the possibility of acquiring parcels in Butte Creek Canyon in the area roughly bordered by the canyon walls themselves to the east and west, the Helltown area to the south and the area around Ponderosa Way to the north. The "BLM resource condition objectives for the Area of Critical Environmental Concern (ACEC) call for restricted logging and vehicular use, while mining and grazing is to be withdrawn. Enhancement of scenic quality and recreation use is emphasized."

Magalia Reservoir Watershed Limnology and Water Quality Study. CA Department of Water Resources. 1973.

This report was initiated by Paradise Irrigation District (PID) and local development interests in order to evaluate the effects of increased urbanization on water quality in Magalia and Paradise Reservoirs.

Paradise Irrigation District Water Supply Project CA Department of Water Resources. 1975.

This report gives findings on the application of PID for a construction loan under the Davis-Grunsky Act. Of interest in the report is a section noting that the State Department of Health advised PID that turbidity standards were not being met. It mentions how PID reservoirs are not treated, except for chlorination, and in some winters they become

turbid. It is not mentioned if the turbidity problem is the result of wave action on exposed shorelines, or if it is a function of sediment input from Little Butte Creek and its associated land uses, such as road building, timber harvest, and urbanization, that may have increased erosion.

Design Memorandum No. 2. Sacramento River and Major and Minor Tributaries, CA: Little Chico-Butte Creeks General Design. U. S. Army Corps of Engineers, Sacramento District. 1957.

As part of the Sacramento River and Major and Minor Tributaries Project which was authorized by the Flood Control Act of 22 December, 1944, Public Law 534, Little Chico-Butte Creeks project had general design criteria set up. This document outlines those criteria along with all hydrologic data, dimensions of the levees, cross-sections and channel profiles for the diversion channel from LCC to Butte Creek as well as Butte Creek from the Durham Mutual Dam down to the Durham Highway Bridge.

Final Environmental Statement: Sacramento River and Major and Minor Tributaries, CA. U.S. Army Engineer District, Sacramento, CA. 1975.

This document was completed to comply with NEPA requirements. It profiles some of the final flood control works to be completed in the system on the Sacramento River and many of its tributaries, including Butte Creek. It gives a history of when and how all of these projects were completed. It gives an index of species found in the project areas. Butte Creek projects were completed at this time.

Letter and Grant Proposal: Point Four Dam Removal CA Department of Water Resources and the Western Canal Water District. Authored by Shawn Pike. 1991.

This cover letter to Harvey Reading, State DFG, gives a cost break-down (DWR and WCWD splitting the \$320,000.00 dam removal and lateral extension 28% and 72% respectively) and thanks Harvey for his help in putting the proposal together. Attached to the letter is a detailed summary of the work to be done, along with maps and photographs of the dam and area.

Environmental Assessment for Oroville-Chico Highway Bridge at Butte Creek, Project 48253-83-1. Prepared by Butte Co. Department of Public Works and Eco-Analysts. 1985. A fairly short document prepared for the "Area of Possible Environmental Impact" (APEI) from construction of the bridge. No impacts were anticipated and no mitigations were found to be required. A list of native species found in the area, as well as maps of the site are included.

Report on Water Supply for Durham Ranch of Stanford University for the State Land Settlement Board by Frank Adams. 1918.

This very interesting report chronicles the investigation by Adams into the water rights situation for the Durham Ranch. The investigation was requested by a "Mr. Morgan."

Adams met with various county, state, and utility (Pacific Gas and Electric Co.) officials. The report notes that there is a map of the irrigation ditches of the ranch and surrounding areas prepared by Martin Polk, Butte County Surveyor that is included in "the pending suit of Central California Investment Co. v. John Crouch Land Co. et al." This map has not been located yet, but may prove useful in determining some of the original features of Butte Creek for restoration. At the end of the report is a letter, dated 12-18-1917, from P. G. & E. Co.'s "Hydro-Electric Chief Engineer P. M. Downing." This letter states that "During the dry six months, being July to December inclusive, we take all of the water out of Butte Creek into the Butte Creek ditch, but it is all returned to the natural water courses immediately below our Centerville power house." The De Sabla system flows at about 165 to 170 cfs for six months of the year, with flows during the other "short water season" six months dropping to 110 to 120 cfs. Downing also states that 90 to 95 cfs of the flow through the system during "flood water season", is from the West Branch of the North Fork of the Feather, with the balance coming from Butte Creek.

Water Resources Investigations 36-75: Flood Hydrology of Butte Basin, 1973 and 1974 Water Years, Sacramento Valley, CA--A Progress Report U. S. Geological Survey .  
Authored by R. G. Simpson. 1976.

Prepared in cooperation with the CA DWR and the US Army COE, this progress report chronicles the stage and discharge information obtained at various locations in the Butte Basin in an effort to describe the flooding in the Butte Basin. Most flooding comes from Sacramento river overflow, although local drainages and Butte Creek contribute as well. The report has flood profiles, flow distribution, peak discharge, and other information including maps and illustrations.

Water Resources Investigations 78-86: Flood Hydrology of Butte Basin, 1973-77 Water Years, Sacramento Valley, CA U. S. Geological Survey. Authored by R. G. Simpson. 1978.

This document is the final version of the 1976 report, including information from the 1975, '76 and '77 water years. Aerial photographs, both vertical and oblique, maps, discharge hydrographs and other information are covered in this comprehensive report.

Geology and Lahars of the Tuscan Formation, Northern California Authored by Philip Lydon. In: Studies in Volcanology, a memoir in honor of Howell Williams; Geological Society of America Memoir 116, p. 441-446.

This paper gives a thorough description of the Tuscan Formation, the predominant geologic formation in the upper Butte Creek watershed. The origin of the Tuscan is discussed, along with lithology, structure, distribution and volume of the Tuscan Mudflow, and theories on the mechanisms involved in the formation of the structure.

Agricultural Water Purchase Plan CA Department of Water Resources, Northern District. 1979.

This report chronicles the proposed "purchase of agricultural water supplies by the DWR from farmers or districts upstream of the Delta in order to increase Delta supplies during

drier years." The report focuses on an area within a 40-mile radius of the Sutter Buttes, and is an effort to increase the firm yield of the State Water Project. "The goal of this program for the next few years will be to establish the legal and institutional mechanisms necessary to implement the agricultural water purchase program."

Environmental Impact Report for the Butte Basin Overflow Area prepared for the Reclamation Board, Sacto., CA, by Woodward-Clyde Consultants, Walnut Creek, CA. Dec., 1986.

This EIR evaluates the work to be done on several Flood Relief Structures (FRSs) that "ensure the escape of overbank flow eastward into the Butte Basin that is necessary for the protection of the Sacramento River Flood Control Project downstream." Proposed work consisted of either "rock revetment" (rip-rap) or a palisades system to stabilize the channel, along with the raising of structures such as the Murphy Slough Plug on the M&T Ranch property and the reduction in height of the Parrott Plug. The EIR notes that inventories of sensitive species in the Butte Basin were not complete at the time the document was written, and because of this, all significant adverse impacts could not be fully identified. Also, it notes significant controversy over techniques utilized in channel stabilization, especially in light of the fact that the EIR identified "Potential significant adverse impacts would result from construction of rock revetment as the means of channel stabilization at the five sites proposed...includ(ing) loss of riparian vegetation and habitat adjacent to the river, and impacts to the habitat of the endangered Valley Elderberry longhorn beetle; reduction of salmon spawning and rearing habitat through the placement of rock on eroding banks; and removal of nesting sites of bank swallow populations".

Upper Sacramento River Basin Investigation Fish and Wildlife Evaluation of Tributary Developments and Butte Basin Flood Control CA Department of Fish and Game. 1968. This report outlines plans for three upstream storage reservoirs that were to have been built to enhance flows for the anadromous fishery. The report deals extensively with the Butte Basin, especially the Butte Sink area, where it names the diversions from lower Butte Creek and Butte Slough. It points out the fact that there was to be (and in fact there is) an increase in conversion from dry farmed lands and native vegetation to orchards and field crops. It also notices that, as the Butte Sink is mostly under private ownership in the form of waterfowl clubs, it has been preserved, and would likely have disappeared as valuable habitat long ago if it were not for these interests. For its time it was ahead of itself in the following quotes: "To date the [Butte Sink] owners have not applied to the State for entitlement to water for waterfowl [use]. The day is rapidly approaching when surplus and unappropriated water will be something of the past." This is now the case, and this report highlights some of the aspects of the butte Basin that are now gone. A good resource.

Water Requirements for the Waterfowl of Butte Basin, California prepared for the CA Department of Fish and Game by Philip H. Arend, Consultant Wildlife Associates. 1967. This report presents the basic data on the water requirements for waterfowl lands in the Butte Basin. The report states that, at the time of the report, there were 67 private duck

clubs totaling just more than 52,000 acres, and one public area, Gray Lodge, with about 7,000 acres. These 92,000 acres of waterfowl land were estimated to require one-acre-foot of water per acre, totalling a need of 92,000 acre-feet for waterfowl lands, compared to the 683,400 acre-feet needed by agriculture.

An Inventory of Published and Unpublished Fluvial-Sediment Data for California, 1956-1970 United States Geological Survey Open-File Report 72-0300. 1972.

This report is an inventory of published and unpublished fluvial-sediment data for water years 1956-1970. The Cherokee Canal is the only stream in the watershed listed in the document, and it is indicated that monitoring began in August of 1970, with daily readings. Cherokee Mine discharged large amounts of debris into the Dry Creek/Cherokee Canal system, and probably accounts for the reason it was the only stream in the watershed to be monitored.

Sacramento Valley Ground Water Levels: Butte County CA Department of Water Resources, Northern District. 1993.

This report is also available in an electronic form for \$25/set, enabling analysis of the data. The report itself is composed of a well location map, tables and hydrographs representing groundwater levels through time.

Flood Data for the Sacramento River and Butte Basin, Sacramento Valley, California, 1980-90 United States Geological Survey Open-File Report 93-68. 1994.

An excellent resource for understanding how the Butte Basin is unundated by flows from the Sacramento River during high-flow events. The authors surveyed 70 different locations including gauging stations, water-crest stage gauging stations, and through observations of historic high-water marks. Good maps and flow diagrams, showing overflow weirs, levees, plugged sloughs, etc.

Hydraulic Analysis of Floodflows in Butte Basin at State Highway 162, Glenn and Butte Counties, California United States Geological Survey Open-File Report 74-198. 1974.

Plans to improve sections of Highway 162 through portions of the Butte Basin resulted in an analysis of floodflows of Butte Creek and the Sacramento River relative to how they inundate this highway. Flood height information along the roadway at numerous bridges was collected and analyzed to determine the necessity of additional water crossings. Makes mention of vegetation in channels effecting flood heights relative to discharges.

Description of Chemical Analysis for Selected Wells in the Eastern Sacramento Valley, California United States Geological Survey Open-File Report 77-486. 1977.

This report, in table form, looks at several wells in the area in and around Rancho Esquon, several just to the east of Rancho Esquon, and still others northeast of Durham. Data describes the state well number, location, depth, use of water, owner, types of well logs available, depth to first opening, casing diameter, casing finish, construction methods, lift type and power source, altitude of land-surface, water level, discharge, and drawdown.

Historical Ground Water Levels in Sutter County CA Department of Water Resources, Central District. 1992.

This report is also available in an electronic form for \$25/set, enabling analysis of the data. The report itself is composed of a well location map, tables and hydrographs representing groundwater levels through time. Wells circle the Sutter Buttes, including the Butte Sink area.

Effects of Temperature, Flow, and Disturbance on Adult Spring-run Chinook Salmon

authored by Elizabeth A Campbell and Peter B. Moyle University of California Water Resources Center Technical Completion Report. Project W-764. August 31, 1992.

This report was only reviewed in a summary form, and a full-length version is available at the Water Resources Center (WRC) at UC Davis. This report includes field work by Moyle and Campbell, has a great reference list and is an excellent resource. Moyle authored another WRC report (project W-719) with G. Sato. It is titled "Ecology and conservation of spring-run chinook salmon" and came out in 1989.

Evaluation of 1989 Water Temperatures in Butte Creek from Lower Centerville Diversion Dam (LCDD) to Centerville Powerhouse Water Resources Unit of PG&E for the Battle-Butte Hydro Department. 1990.

The purpose of this study was to determine the success of the temperature-based operating scheme at maintaining water temperatures in accordance with the temperature objectives outlined in an agreement with USFWS and CDFG in 1983. The agreement stipulates that during the interim study period, "flow releases up to 40 cfs will be made from LCDD between July 1 and September 14, with water temperatures monitored in Butte Creek between May 1 and September 30." The rule-based operating plan allows a 50% exceedence of 20° C maximum at Pool 4 (a specific holding pool below the LCDD) when flows are adjusted to less than 40 cfs. The study period found that the release schedule provided the desired temperatures at pool 4.

DeSabra-Centerville Project (FERC 803) Butte Creek Interim Temperature Modeling Study: Final Report. Prepared for PG&E Technical and Ecological Services by BioSystems Analysis, Inc. Tiburon, CA. 1989.

This is the study used to come to the conclusions in the above report. The model that was used to come to the flow recommendations in the rule-based plan is outlined. This report includes raw data from stream monitoring stations, air temperature, and other parameters input into the model.