

State of California  
The Resources Agency

DEPARTMENT OF WATER RESOURCES  
Division of Operations and Maintenance

# STATE WATER PROJECT ANNUAL REPORT OF OPERATIONS 2002



December 2015

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Governor  
State of California

**John Laird**  
Secretary for Resources  
The Resources Agency

**Mark Cowin**  
Director  
Department of Water Resources

This Annual Report of Operations for the State Water Project has been published since 1974. The SWP Annual Reports have been made available on the World Wide Web at <http://www.woco.water.ca.gov>. It provides the State Water Service Contractors, public agencies, consultants, and others with the daily and monthly status of the Project's water and power operations.

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## Foreword

This is the twenty-ninth in a series of annual reports summarizing the water and energy operation of the California State Water Project. Although the reports in this series are published considerably after the reference year, they document the official record of operations and provide an important source of historical data. This report summarizes the operation of Project facilities during 2002 and includes any revisions to data previously published in the more timely monthly "State Water Project, Operations Data" reports.

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## Conversion Factors

Quantity	Multiply	By	To obtain
<b>Area</b>	acre	43,560	square feet
<b>Volume</b>	cubic foot	7.481	gallons
	cubic foot	62.4	pounds of water
	gallon	0.13368	cubic feet
	acre-foot	325,900	gallons
	acre-foot	43,560	cubic feet
	million gallons	3.07	acre-feet
<b>Flow</b>	cubic foot/second (cfs)	450	gallons/minute (gpm)
	gallons/minute	0.002228	cubic feet/second (cfs)
	million gallons/day	1.5472	cubic feet/second (cfs)
	cubic foot/second (cfs)	646,320	gallons a day
	cubic foot/second (cfs)	1.98	acre-feet a day
	million gallons/day (mgd)	1,120	acre-feet a year
<b>Pressure</b>	feet head of water	.433	pounds/square inch (psi)
<b>Power</b>	kilowatts (kW)	1.3405	horsepower (hp)

## Abbreviations and Units

The following abbreviations are commonly used throughout this report.

AF	acre-feet
Banks	Harvey O. Banks Delta Pumping Plant
California Aqueduct	Governor Edmund G. Brown California Aqueduct
CEA	Capacity Exchange Agreement
cfs	cubic feet per second
CVP	Central Valley Project
D-1485	Water Rights Decision 1485
DFG	Department of Fish and Game
DO	dissolved oxygen
DOI	Delta Outflow Index
DPR	Department of Parks and Recreation
DWR	Department of Water Resources
EC	electrical conductivity
FRSA	Feather River Service Area
ft	feet
KCWA	Kern County Water Agency
kv	kilovolt
kW	kilowatt
kWh	kilowatt-hour
LADWP	Los Angeles Department of Water and Power
MAF	million acre-feet
MW	megawatt
MWh	megawatthour
MWDSC	Metropolitan Water District of Southern California
NDOI	Net Delta Outflow Index
PG&E	Pacific Gas and Electric Company
PGP	Pumping Generating Plant
PP	Pumping Plant
SCE	Southern California Edison
SDWA	South Delta Water Agency
SRI	Sacramento River Index
SWP	State Water Project
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation

# Map 1 Project Facilities, Pumping Plants, and Powerplants

## Oroville FD

1. Hyatt Pumping-Generating Plant
2. Thermalito Diversion Dam Powerplant
3. Thermalito Pumping-Generating Plant

## Delta FD

4. Barker Slough Pumping Plant
5. Cordelia Pumping Plant
6. Banks Pumping Plant
7. South Bay Pumping Plant
8. Del Valle Pumping Plant

## San Luis FD

9. Gianelli Pumping-Generating Plant
10. Dos Amigos Pumping Plant

## San Joaquin FD

11. Las Perillas Pumping Plant
12. Badger Hill Pumping Plant
13. Devil's Den Pumping Plant
14. Bluestone Pumping Plant
15. Polonio Pass Pumping Plant
16. Buena Vista Pumping Plant
17. Teerink Pumping Plant
18. Chrisman Pumping Plant
19. Edmonston Pumping Plant

## Southern FD

20. Alamo Powerplant
21. Pearblossom Pumping Plant
22. Mojave Siphon Powerplant
23. Devil Canyon Powerplant
24. Oso Pumping Plant
25. Warne Powerplant
26. Castaic Powerplant



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## *Introduction*

The 2002 Annual Report of Operations for the State Water Project is divided into seven parts. The first two parts, "Highlights of 2002 Operation" and "Project Status in 2002," cover conditions and events of statewide significance. The following three sections cover water conditions, water operations, and energy operations in 2002. The sixth part, "Sacramento-San Joaquin Delta Operations," gives special emphasis to Delta operations, a key aspect of the SWP. The last part, "Project Operations by Field Division," provides details on activities by field division as outlined on Map 2.

### *Highlights of 2002 Operation*

Managing available water supplies during the 1987-1992 drought required activities designed to make the most beneficial use of water available to the SWP. The Department of Water Resources initially structured its plan of operations according to the concept of a firm yield. Firm yield is the quantity of water that can be made available on a firm annual basis to water contractors during a drought period. In 1991, after years of discussion, DWR changed its method of determining delivery amounts and replaced the concept of firm yield with the concept of variable yield. Operating on the basis of a variable yield makes efficient use of available water supplies during a drought. Annual Table A represents the total amount of project water that an SWP contractor may request each year, according to that contractor's long-term water supply contracts. Approved Table A (previously called entitlement) represents the amount of annual Table A requested by the contractors and approved for delivery by the Department, based on hydrologic conditions, current reservoir storage, and total requests by the SWP water contractors. DWR also developed programs to compensate for the lack of storage facilities. These programs include water transfers, exchanges, loans, storage, purchases, and carry-over entitlement for delivery at a later date.

SWP Contractors Table A entitlement allocation for 2002 totaled 4,125,031 AF, of which about 3.91 MAF was requested. DWR initially approved 824 TAF for long-term contractors. Based on water storage and the January 1<sup>st</sup> snow survey, the initial allocation was revised on January 11, 2002 to provide for about 45 percent of Table A or about 1.86 MAF. Based on snow surveys and increases in water storage, the allocation was increased on March 22, 2002, to about 2.27 MAF or about 55 percent of Table A entitlement. Additional rainfall allowed for an increase to about 2.47 MAF or 60 percent on March 28. Based on a May 1st 99 percent hydrology report, the allocation was again increased to about 2.68 MAF or 65 percent on May 14. Finally, based on water storage, operational constraints and contractor demands the allocation was increased to about 2.89 MAF or 70 percent of Table A entitlement, or about 74 percent of contractor's original Table A requests.

All regions of the State except the San Francisco Bay were drier than average with extremely dry conditions prevailing in Southern California. Statewide

precipitation was 80 percent of average. Mountain snowpack peaked at about 95 percent of average in late March, slightly earlier than normal. The timing of the snow accumulation was unusual, with little gain during January and February after a productive fall.

Eastern tropical Pacific Ocean surface temperatures were near average in fall 2001, and long-range weather forecasts were mixed. By fall 2002, the sea surface temperatures warmed to moderately above normal. The 2001-02 water year was classified as "dry" in both the Sacramento and San Joaquin River Indexes for the second year in a row.

The DWR-USBR Coordinated Operations Agreement monitors the daily difference between each agency's releases from storage and Delta exports. "Balanced" conditions are declared when releases are in danger of not meeting Delta outflow requirements. "Excess" conditions are declared when releases exceed Delta outflow requirements. DWR and USBR declared balanced Delta water conditions from June 3 through December 17 during 2002.

The SWP depends on a complex system of dams, reservoirs, power plants, pumping plants, canals, and aqueducts to deliver water. Although initial transportation facilities were essentially completed in 1973, other facilities have been constructed since then and still others are under construction or are scheduled to be built as needed. The SWP facilities now comprise 28 dams and reservoirs, 26 pumping and generating plants, and nearly 660 miles of aqueducts, as shown on Map 1 and Map 2.

Construction of Phase I of the East Branch Extension for San Bernardino and Riverside Counties continued with completion of the pipeline Reaches 1, 2, and 3 and initial filling of Crafton Hills Reservoir. The project, when completed, will convey water to the San Geronio Pass Water Agency service area.

The project continued to pay bondholders as scheduled and remained financially viable. The long-term water contractors continued to repay project construction bonds and operating expenses. In 2002, the SWP handled approximately \$733 million each in income and expenses, with general fund contributions limited to recreation facilities.

Energy resources totaled 9,562,141 MWh including generation of 6,174,265 MWh from SWP

# Map 2 Field Division Boundaries, Dams, and Reservoirs



- Oroville FD
  1. Frenchman Lake
  2. Lake Davis
  3. Antelope Lake
  4. Lake Oroville
  5. Thermalito Diversion Dam
  6. Thermalito Fish Barrier Dam
  7. Thermalito Forebay
  8. Thermalito Afterbay
- Delta FD
  9. Clifton Court Forebay
  10. Bethany Reservoir
  11. Lake Del Valle
  12. Cordelia Forebay
  13. Napa Turnout Reservoir
- San Luis FD
  14. O'Neill Forebay
  15. San Luis Reservoir
  16. Los Banos Reservoir
  17. Little Panoche Reservoir
- Southern FD
  18. Tehachapi Afterbay
  19. Tehachapi East Afterbay
  20. Silverwood Lake
  21. Devil Canyon 1 Afterbay
  22. Devil Canyon 2 Afterbay
  23. Quail Lake
  24. Pyramid Lake
  25. Elderberry Forebay
  26. Castaic Lake
  27. Castaic Lagoon
  28. Lake Perris

**Table 1. Project Pumping by Plant**  
**2002**  
(in acre-feet)

Pumping Plants	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Hyatt	23,600	19,127	21,336	23,707	16,168	1,804	0	0	0	0	0	0	105,742
Thermalito	25,168	19,375	25,335	29,271	19,595	1,832	0	0	0	0	0	0	120,576
Barker Slough	993	1,035	2,437	3,467	5,105	5,785	6,374	6,079	5,337	4,160	3,707	1,452	45,931
Cordelia	911	921	2,230	3,142	2,250	2,774	2,986	2,786	2,297	2,513	2,635	1,149	26,594
Banks													
State	397,017	274,484	239,304	125,217	38,455	127,719	315,791	372,498	183,607	81,320	174,768	254,341	2,584,521
Federal	0	0	0	0	0	0	43,824	21,699	57,509	20,519	12,303	0	155,854
Other 4/	0	0	0	0	0	0	22,993	19,751	4,719	4,431	0	0	51,894
Total	397,017	274,484	239,304	125,217	38,455	127,719	382,608	413,948	245,835	106,270	187,071	254,341	2,792,269
South Bay	0	16	4,930	10,203	17,749	17,678	18,408	19,043	15,638	9,401	3,292	2,976	119,334
Del Valle	0	0	0	2,288	5,195	189	33	0	0	0	0	0	7,705
Gianelli 1/													
State	236,881	115,084	80,820	-31	0	1,200	15,109	64,759	18,631	4,274	39,041	136,390	712,158
Federal	194,568	36,750	40,904	2,210	0	0	0	3,439	136,149	138,978	168,118	132,943	854,059
Total	431,449	151,834	121,724	2,179	0	1,200	15,109	68,198	154,780	143,252	207,159	269,333	1,566,217
O'Neill 2/													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	225,493	93,737	153,351	56,621	0	3,911	14,607	65,449	114,244	123,389	169,424	171,664	1,191,890
Total	225,493	93,737	153,351	56,621	0	3,911	14,607	65,449	114,244	123,389	169,424	171,664	1,191,890
Dos Amigos 1/													
State	142,424	154,352	170,827	210,285	248,542	358,751	354,478	269,421	236,476	220,297	180,846	142,146	2,688,845
Federal	31,126	87,567	86,741	82,536	100,206	186,510	183,518	143,452	30,775	0	17,411	42,397	992,239
Other 4/	0	377	0	0	0	0	22,080	19,171	4,651	4,359	0	0	50,638
Total	173,550	242,296	257,568	292,821	348,748	545,261	560,076	432,044	271,902	224,656	198,257	184,543	3,731,722
Las Perillas	4,689	2,446	5,077	8,309	11,483	14,884	15,582	13,587	9,430	7,275	3,802	3,857	100,421
Badger Hill	4,689	2,446	5,077	8,309	11,483	14,884	15,582	13,587	9,430	7,275	3,802	3,857	100,421
Devil's Den	1,580	1,565	2,175	2,577	3,734	2,778	3,018	4,026	3,726	2,947	2,100	2,197	32,423
Bluestone	1,475	1,457	2,028	2,423	3,615	2,633	2,834	3,830	3,539	2,769	1,991	2,077	30,671
Polonio Pass	1,612	1,615	2,203	2,593	3,669	2,793	3,028	3,902	3,625	2,898	2,089	2,237	32,264
Buena Vista	0	0	0	13,734	12,549	571	0	0	0	0	5,645	4,300	36,799
Teerink	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrisman	665	1,337	2,727	4,008	6,370	8,245	7,157	4,530	3,155	2,628	475	255	41,552
Edmonston	24	1,026	956	1,767	2,349	3,243	3,326	2,829	1,748	1,405	32	42	18,747
Oso	-12	-6	43	-8	-36	-27	-98	-138	-100	-86	-4	0	-472
Castaic 3/	36,722	39,599	63,235	71,750	89,900	71,170	82,803	58,272	50,613	40,554	75,873	76,224	756,715
Pearlblossom	2,702	2,665	4,172	5,842	7,517	9,666	11,275	10,777	9,243	6,511	4,136	3,034	77,540

1/ Joint state-federal facility.

2/ O'Neill Pumping Plant is a federal facility.

3/ Pumping at Castaic Pumping Plant is for the City of Los Angeles.

4/ Pumping at Banks for Cross Valley Canal water delivered to Westlands Water District.

energy sources, 1,650,327 MWh of purchases, and 1,737,549 MWh in Power Exchange (see Figure 4).

Energy loads of 9,562,239 MWh include sales of 1,168,441 MWh, 8,275,667 MWh used to deliver water to SWP contractors, and deviation (system losses and imbalances) of 118,131 MWh (see Figure 6).

SWP facilities delivered 5,162,766 AF of water to 42 agencies, including 27 long-term water contractors,

## ***Project Status in 2002***

### ***Project Facilities***

The SWP conserves water for distribution to much of California's population and to irrigated agriculture. It also provides flood control, water quality control, electrical power generation, new recreational opportunities, and enhancement of sport fisheries and wildlife habitat.

The SWP begins with three small lakes on the Feather River tributaries: Lake Davis, Frenchman Lake, and Antelope Lake. The branches and forks of the Feather River flow into Lake Oroville, the SWP's principal reservoir with a capacity of about 3.5 MAF. From Oroville, water flows through a complex system of power plants, then down the Feather River into the Sacramento River before reaching the Delta. From the northern Delta, water is supplied to Napa and Solano counties through the North Bay Aqueduct.

Near Byron, in the southern Delta, the SWP diverts water into Clifton Court Forebay for delivery south of the Delta. The Banks PP lifts water into Bethany Reservoir. The South Bay PP then lifts it into the South Bay Aqueduct. Through the South Bay Aqueduct water is supplied to Alameda and Santa Clara Counties. Most of the water from the Bethany Reservoir, however, flows into the Governor Edmund G. Brown California Aqueduct. At O'Neill Forebay, part of the water is pumped through the Gianelli PGP for storage in San Luis Reservoir until needed. DWR's share of storage in the reservoir is 1,062,183 AF.

Water not stored in San Luis Reservoir continues its flow south and is raised 1,069 ft by four pumping plants: Dos Amigos, Buena Vista, Teerink, and Chrisman. In the southern San Joaquin Valley, the Coastal Branch Aqueduct serves agricultural areas west of the California Aqueduct. At the Tehachapi Mountains, Edmonston PP raises the water 1,926 ft and the water enters 8.5 miles of tunnels and siphons. Once the water has crossed the Tehachapi Mountains, it flows through the California Aqueduct into the Antelope Valley.

The California Aqueduct then divides into two branches, the East Branch and West Branch. The East

in 2002 as shown on Table 2. This amount is about 986 TAF more than the total State and Federal water deliveries from the SWP in 2001. State contractor deliveries were 2,782,007 AF; including 2,498,890 AF of Table A water and 283,017 AF of other water; excluding Joint Facilities and prior water right deliveries. See the "Water Deliveries and Aqueduct Operations" section for more details on water deliveries.

Branch carries water through the Antelope Valley into Silverwood Lake. From Silverwood Lake, the water enters the San Bernardino Tunnel and drops 1,418 ft into Devil Canyon PP, then to Lake Perris, SWP's southernmost reservoir.

Work continued on the East Branch Extension of the California Aqueduct in 2002; with completion of pipeline Reaches 1, 2, and 3 used to supply water to San Bernardino Valley Municipal Water District (SBVMWD). It will convey 8,650 AF of SWP water annually to the SBVMWD and the San Geronio Pass Water Agency. In 2002, all contracts were under construction and it is anticipated that the Extension will be fully operational in early 2003. San Geronio is the last original contractor to receive SWP water. Initial filling of Crafton Hills Reservoir on the East Branch Extension began on May 3 and finished in September.

Water in the West Branch flows through Warne PP into Pyramid Lake. From Pyramid Lake the water flows through the Angeles Tunnel and Castaic PP into Castaic Lake, terminus of the West Branch. For the location of facilities cited here, see Map 1.

Lake Oroville and San Luis Reservoir are the primary conservation facilities of the SWP's 28 dams and reservoirs. The remaining 26 dams and reservoirs are used principally to regulate the conserved supply into water delivery patterns designed to fit local needs. Of those, the five largest are Lake Del Valle located in Alameda County; Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris, in Southern California. Lake Del Valle is approximately four miles from the city of Livermore. The four southern reservoirs--Pyramid Lake, Castaic Lake, Silverwood Lake, and Lake Perris--are near the metropolitan areas of southern California, where water supplies are mainly imported. Information about these reservoirs, including amounts of unimpaired runoff to Lake Oroville and storage levels for SWP's conservation, and other storage facilities are summarized in this report.

## Table 2. Five-Year Water Delivery Summary 1998-2002

(in acre-feet)

Agency	1998	1999	2000	2001	2002	TOTALS
<b>Oroville Field Division</b>						
Last Chance Creek W.D. (Local Supply)	10,046	12,241	13,502	10,959	9,903	56,651
Plumas Co. F.C. & W.C.D.*	-	-	-	-	61	61
County of Butte*	528	287	587	525	423	2,350
Thermalito I.D. (Local Supply)	2,271	2,567	2,478	2,516	2,389	12,221
Prior Water Rights and Local 1/ Yuba City*	870,937	1,094,989	1,083,590	1,066,057	1,121,232	5,236,805
	1,054	1,096	901	1,065	1,170	5,286
<b>Delta Field Division</b>						
Napa CO. F.C. & W.C.D. *(Local Supply)	5,359	5,304	4,958	9,345	6,875	31,841
Alameda Co. W.D.* (Local Supply)	26,580	29,544	27,962	25,914	27,972	137,972
A.C.F.C. & W.C.D., Zone 7* (Local Supply)	37,044	43,024	44,644	39,153	45,414	209,279
Santa Clara Valley W.D.*	39,610	52,945	78,258	47,922	58,875	277,610
Oak Flat W.D.*	4,286	4,871	4,508	3,592	4,885	22,142
Recreation Fish and Wildlife	114	139	145	196	146	740
Western Hills Water District	-	-	-	638	773	1,411
CVP Water	513	607	655	644	868	3,287
Solano Co. F.C.W.C.D.*	29,766	34,753	37,015	34,586	38,560	174,680
<b>San Luis Field Division</b>						
Dept. Parks & Rec. ( STATE )	72	93	73	126	86	450
Dept. Fish & Game ( STATE )	336	812	755	445	484	2,832
Fed. Customers ( F&G, P&R, + Joint-Use )	1,013,030	1,256,771	1,083,991	1,005,813	1,226,129	5,585,734
Fed. Customers (Kern Wheeling)	7,117	29	-	-	-	7,146
Westlands Water District (SWP)	136,519	130,969	-	30	43	267,561
<b>San Joaquin Field Division</b>						
Tulare Lake Basin W.S.D.*	17,677	262,451	178,360	60,519	71,027	590,034
Empire West Side I. D.*	542	3,176	1,799	1,860	1,405	8,782
County Of Kings*	15	4,000	3,600	1,560	2,849	12,024
Kern County Water Agency*	757,771	1,107,539	1,152,824	458,810	728,033	4,204,977
Dudley Ridge Water District*	55,450	59,611	58,873	47,977	50,436	272,347
Alameda County WD	3,780	16,100	13,380	-	-	33,260
A.C.F.C. & W.C.D., Zone 7* (Local Supply)	5,970	22,910	23,940	5,000	803	58,623
Federal Wheeling	14,081	10,476	28,962	35,998	71,060	160,577
USBR	-	-	-	-	22,126	22,126
General Wheeling	-	12,804	-	-	-	12,804
Westlands Water District	-	-	-	25,164	-	25,164
Castaic Lake Water Agency	311	4,086	8,395	1,238	26,737	40,767
M.W.D. of S.C.*	69,234	138,012	-	-	-	207,246
Santa Clara Valley WD*	23,800	30,000	23,730	-	-	77,530
San Luis Obispo County*	3,592	3,743	3,962	4,283	4,355	19,935
Santa Barbara County*	18,618	20,137	22,741	18,946	27,636	108,078
Madera Irrigation District	-	-	-	-	1,100	1,100
<b>Southern Field Division</b>						
A.V.E.K. W.A.*	54,271	70,512	84,938	64,090	59,541	333,352
M.W.D. of S.C.*	363,052	681,605	1,357,393	1,093,451	1,368,927	4,864,428
Littlerock Creek I. D.*	404	342	-	-	-	746
Mojave Water Agency*	4,580	6,705	10,019	3,048	2,976	27,328
Desert Water Agency*	70,647	58,100	58,234	15,010	27,640	229,631
Coachilla Valley Water District*	85,709	50,480	42,323	9,100	16,755	204,367
Crestline-Lake Arrowhead Water Agency*	704	1,145	1,458	1,657	2,189	7,153
San Gabriel Valley M.W.D.*	9,310	21,729	15,140	2,360	24,851	73,390
San Bernardino Valley M.W.D.*	1,878	12,874	18,399	26,488	37,069	96,708
Dept. Parks & Rec., L.A. Co. Rec. Dept.	1,585	3,279	6,559	2,166	2,994	16,583
Castaic Lake Water Agency*	19,782	28,813	33,674	35,632	42,475	160,376
Palmdale Water District*	8,752	13,278	9,060	10,427	18,496	60,013
Ventura County FCD*	1,850	1,850	4,048	1,850	4,998	14,596
<b>Totals</b>	<b>3,778,547</b>	<b>5,316,798</b>	<b>5,545,833</b>	<b>4,176,160</b>	<b>5,162,766</b>	<b>23,980,104</b>

\* Long-term contractors

1/ Includes Thermalito Afterbay, Palermo Canal, Upper Feather lakes deliveries.

## ***Outages and Limitations***

Major outages, construction, and operating limitations of SWP facilities during 2002 were:

### ***January***

- Hyatt PGP Unit 5 was out of service from January 2 to January 25 for annual maintenance and to replace a motor governor.
- Edmonston PP Units 2, 4, 6, 8, 10, 12, and 14 were out of service from January 2 to February 15 to repair discharge lines and discharge valves.

### ***February***

- Hyatt PGP Unit 3 was out of service from February 25 to March 15 for annual maintenance and to replace a motor governor.
- Banks PP Unit 1 was out of service from February 1 to February 22 to repair stator ground.
- Dos Amigos PP Unit 3 was out of service from February 11 to March 7 to repair a discharge line and install a new speed control.
- Pearblossom PP Units 5 and 6 were out of service from February 18 to March 9 to work on a transformer KYB.
- Warne PP Unit 2 was out of service from February 4 to March 1 for annual maintenance.

### ***March***

- Banks PP Unit 4 was out of service from March 4 to March 25 to replace a discharge valve "O" ring.
- South Bay PP Unit 9 was out of service from March 27 to April 13 to replace a pump and motor.
- Cordelia-Napa PP Unit 2 was out of service from March 5 to June 11 to overhaul a pump and motor.
- Gianelli PGP Unit 1 was out of service from March 29 to April 29 to work on Unit 2 and penstock. Unit 2 was out of service from March 11 to June 10 to overhaul unit, repair pump, replace field poles, rewind stator, repair butterfly valve, and work on penstock.
- Dos Amigos PP Unit 6 was out of service from March 11 to April 11 for annual maintenance and to install speed switch.
- Badger Hill PP Unit 6 was out of service from March 4 to April 11 to replace impeller and inspect rotor.
- Chrisman PP Unit 5 was out of service from March 11 to April 19 to recoat pump case.

- Devil Canyon PP Unit 2 was out of service from March 4 to April 1 for annual maintenance and to recoat turbine pit
- Oso PP Unit I was out of service from March 18 to June 7 for annual maintenance, to install automatic voltage regulator, and repair discharge line.

### ***April***

- Banks PP Units 1 through 3 were out of service from April 15 to May 31 for annual maintenance and to work on penstock gate, transformer KYA, and discharge line
- Del Valle PP Unit 2 was out of service from April 8 to April 29 to repair silicon controlled rectifier and replace cable
- Mojave Siphon PP Unit 3 was out of service from April 2 to April 18 for annual maintenance.

### ***May***

- Dos Amigos PP Unit 4 was out of service from May 22 to June 5 to install new speed switch.
- Chrisman PP Unit 8 was out of service from May 13 to December 20 to repair pump, motor, discharge valve, and stay vane.
- Edmonston PP Unit 10 was out of service from May 1 to expected completion date in 2003 to overhaul pump and repair disconnect switch.

### ***June***

- Dos Amigos PP Unit 1 was out of service from June 13 to July 15 to repair vane oil leak.
- Chrisman PP Unit 4 was out of service from June 8 to June 26 to repair exciter and field poles.
- Pearblossom PP Unit 6 was out of service from June 3 to June 20 to repair a rotor.

### ***July***

- Oso PP Unit 2 was out of service from July 22 to October 16 for annual maintenance and to install an automatic voltage regulator.

### ***August***

- Devil's Den PP Unit 3 was out of service from August 18 to September 6 to repair a discharge valve.
- Pearblossom PP Unit 1 was out of service from August 19 to expected completion date in 2003 to overhaul pump casing, repair discharge valve and motor, and install automatic voltage regulator.
- Mojave Siphon PP Unit 2 was out of service from August 5 to August 29 for annual maintenance and to replace turbine shaft seal.

### ***September***

- South Bay PP Units 1, 2, and 4 were out of service from September 27 to November 2 for annual maintenance, to repair discharge valve power unit, and work on pipeline. Unit 3 was out of service from September 27 to November 7 for annual maintenance, to replace pump, repair discharge valve power unit, and work on pipeline.
- Gianelli PGP Unit 1 was out of service from September 2 to expected completion date in 2003 to overhaul unit, replace field poles, rewind stator, overhaul butterfly valve, and work on penstock.
- Dos Amigos PP Unit 5 was out of service from September 30 to November 15 for annual maintenance and to install speed equipment and relays.
- Buena Vista PP Unit 4 was out of service from September 3 to December 12 for annual maintenance.
- Teerink PP Unit 4 was out of service from September 3 to December 10 for annual maintenance and to inspect discharge line.
- Devil Canyon PP Unit 1 was out of service from September 3 to September 26 for annual maintenance.
- Pine Flat PP Units 1 through 3 were out of service from September 23 to expected completion date in 2003 to work on turbine bypass.

### ***October***

- Banks PP Unit 6 was out of service from October 24 to expected completion date in 2003 for annual maintenance, to refurbish discharge valve, replace CO2 system, and work on penstock gate, transformer KYC, and discharge line. Unit 7 was out of service from October 24 to December 21 for annual maintenance, to refurbish discharge valve, replace CO2 system, and work on penstock gate, transformer KYC, and discharge line.
- South Bay PP Units 5, 6, 7, and 9 were out of service from October 31 to December 21 for annual maintenance and to work on pipeline. Unit 8 was out of service from October 31 to expected completion date in 2003 for annual maintenance, to replace pump, motor, and packing box sleeve, and to work on pipeline
- Gianelli PGP Unit 2 was out of service from October 1 to November 9 to work on Unit I and penstock.

- Devil's Den PP Unit 5 was out of service from October 30 to November 25 to repair discharge valve leak.
- Alamo PP Unit I was out of service from October 28 to November 16 for annual maintenance and to repair governor.
- Pearblossom PP Unit 4 was out of service from October 29 to November 19 to repair rotor.
- Warne PP Unit I was out of service from October 7 to November I for annual maintenance and to inspect Peace Valley Pipeline.

### ***November***

- Hyatt PP Unit 2 was out of service from November 18 to expected completion date in 2003 for annual maintenance and to replace governor.
- Del Valle PP Units 1 through 4 were out of service from November 18 to expected completion date in 2003 to replace DC motor speed control and repair pipeline.
- Devil Canyon PP Unit 3 was out of service from November 4 to November 22 for annual maintenance.

### ***December***

- South Bay PP Unit 3 was out of service from December 6 to December 26 to repair lower guide bearing and thrust bearing.
- Buena Vista PP Unit 3 was out of service from December 30 to expected completion date in 2003 for annual maintenance.
- Teerink PP Unit 9 was out of service from December 16 to expected completion date in 2003 for annual maintenance.
- Pearblossom PP Unit 5 was out of service from December 28 to expected completion date in 2003 to repair stator. Unit 6 was out of service from December 19 to expected completion date in 2003 to repair stator.

## ***Water Supply Conditions***

The SWP meets its contractual obligations by monitoring precipitation and calculating runoff to coordinate the operation of the complex system of dams and reservoirs. Information on those activities is based on the water supply conditions of the 2002 calendar year and the 2001-02 water year.

### ***Precipitation and Snowpack***

All regions of the State except the San Francisco Bay were drier than average, with extremely dry conditions prevailing in Southern California. Statewide precipitation was 80 percent of average, with percentages decreasing from north to south, a reversal of last year's pattern. Mountain snow pack peaked at about 95 percent of average in late March, slightly earlier than normal. The timing of the snow accumulation was unusual, with little gain during January and February after a productive fall.

Eastern tropical Pacific Ocean surface temperatures were near average in fall 2001, and long-range weather forecasts were mixed. By fall 2002, the sea surface temperatures warmed to moderately above normal.

After a slow start to the water year with half of average precipitation in October 2001, November and December were very wet. Northern Sierra precipitation accumulation rose above average in mid-November and reached 160 percent of average on January 1, 2002. Over a quarter of the water year's total precipitation fell in December, the most productive month of water year 2001-02. Snow accumulation in the northern Sierra rivaled the pace set in the very wet 1982-83 water year. This was the wettest start to the water year since 1997, and the snow pack on New Year's Day was 165 percent of average for the date.

In late December and early January warm storms brought higher snow levels. The result was more direct runoff, especially in the Sacramento Basin, and some limited melting of the snowpack at low elevations. For the second year in a row, January precipitation was well below average in the northern Sierra. Several dry weeks between storms at the beginning and end of the month caused precipitation to total only about half of average statewide. Cold temperatures lowered snow levels to the Sacramento Valley floor during the last week of January.

February was even drier, especially in the southern half of the State. Several inches of precipitation fell during storms centered in Northern California on February 7 and Central California on February 19, but the total was less than half of average, dropping season-to-date precipitation below average despite the wet fall. Little snow accumulated in February, ranging from less than an inch in the Kern Basin to nearly 5 inches in the upper Sacramento Basin. By

March 1, the snow pack had dropped to near or below average in all regions.

March statewide precipitation totaled only about two-thirds of average but a series of cool storms kept the snow pack near average in the Sacramento River Region. The statewide snow pack peaked on March 25 at 95 percent of normal, before dropping to 90 percent of average on April 1, the date of the historical maximum accumulation. Sunny weather at the end of March initiated the snowmelt, especially at lower elevations.

Statewide precipitation was about half of average in April and below average in May. An unseasonably active, cool storm arrived in Northern and Central California on May 19, producing thunderstorms, hail, and tornadoes. The snow pack was depleted to 45 percent of average by May 15. Sunny weather and night temperatures above freezing caused 24-hour melt at all elevations during the hottest periods, and three-quarters of the snow sensor sites were bare by June 1. Snow melted from all sites by late June, earlier than normal, but several weeks later than last year.

The summer was dry. A massive high-pressure area triggered 49 record high temperatures in California from July 8 to July 11. The water year concluded in September with the ninth consecutive month of below average statewide precipitation.

The Northern Sierra Eight Station Precipitation Index finished with 46 inches for the water year (92 percent of average). The Feather River Basin was again among the driest mountain basins, receiving less than 80 percent of average precipitation during the water year.

### ***Runoff and Storage***

Statewide river runoff totaled three-quarters of average in the 2001-02 water year, and was less than average in all months except December. Runoff in the Sacramento River and San Joaquin River Regions was 77 and 67 percent of average, respectively. Feather River unimpaired inflow to Lake Oroville was 3.1 MAF (65 percent of average) for the water year. While conditions were wetter than last year in many parts of the State, there were water shortages in areas of Southern California dependent on local runoff.

The Sacramento River Index for water year 2001-02 was 14.6 MAF (77 percent of average). The Sacramento Valley Water Year Hydrologic

Classification (40-30-30 Index) was *dry*. San Joaquin River system unimpaired runoff from the Stanislaus, Tuolumne, Merced, and San Joaquin Rivers was 4.1 MAF (67 percent of average). The San Joaquin Valley Water Year Hydrologic Classification (60-20-20 Index) was *dry*.

The 2002-2003 water year began dry, with statewide runoff about half of average in October. This changed with the November storms. By late November, daily inflow to foothill reservoirs in the Sacramento Region rivaled the highest inflows of all the previous water year. These inflows peaked at twice this level around January 1, 2003. Season to date runoff totals rose to 125 percent of average by the end of December, and much of it was captured in reservoirs. Reservoir storage statewide increased by 2 MAF to 21.2 MAF on December 31. Lake Shasta reached the top of its conservation limit in January 2003, but most major foothill reservoirs were below their maximum winter flood control limits by the end of January. Storm runoff receded slowly despite the abrupt cutoff in rainfall in early January, and Northern California runoff totaled only a little below average in January.

The highest water of the year occurred from January 3 to 5 when locally heavy rains caused a rise on the Sacramento River sufficient to cause overflows of 1.5 feet at Moulton Weir, 4.5 feet at Colusa Weir, 5 feet at Tisdale Weir, and 1 foot at Fremont Weir. Flood stage was reached at the Ord Ferry and exceeded at Tehama Bridge on the Sacramento River on January 3.

Statewide runoff in February dropped to 55 percent of average as dry weather continued. Inflows to

the Sacramento-San Joaquin Delta receded to less than half of historical average. At the end of March, the seasonal runoff since October was down to about 80 percent of average, which was still nearly double the flows for the same period in 2001. Statewide reservoir storage reached average in February, where it remained through April.

Low temperature records were set at dozens of locations throughout the State during the first 3 weeks of March. In contrast, the end of March and early April saw record high temperatures at several Central Valley locations. The high temperatures and sunny weather softened the snowpack and caused snowmelt runoff to peak in some northern Sierra basins by mid April. The snowmelt in the high Sierra peaked twice more, in middle and late May, interrupted by an unseasonably cool storm. San Joaquin Region runoff exceeded average in April, but was well below average for the remainder of the snowmelt season due to the early depletion of the snowpack. The flows in the Sacramento River Region were below average for the entire April-July period. Millerton Lake and Lake Kaweah filled to capacity by the end of May, but most other major reservoirs were not. Statewide storage peaked on June 1 at 75 percent of capacity.

With an early snowmelt and no significant summer rain, summer runoff was below half of average. The 2002-2003 water year ended with statewide reservoir storage at 51 percent of capacity.

Additional and more specific information is available via the Internet at:

<http://cdec.water.ca.gov/snow-rain.html>.

## ***Water Operations***

### ***Reservoir Operations***

Lake Oroville and San Luis Reservoir are the two main conservation facilities for SWP water supplies. Tables 8 and 13 summarize the operations of these reservoirs during the 2002 calendar year.

Lake Oroville began 2002 with 1,622,240 AF of storage, 102,702 AF less than it held at the start of 2001. Storage in Lake Oroville peaked on April 28, 2002 at 2,659,224 AF (75 percent of normal maximum operating capacity of 3,521,797) and ended the year at 46 percent of normal capacity or 1,624,337 AF. Total inflow into Lake Oroville during the 2002 calendar year was 2,848,475 AF. The net effect of operations and water conditions at Lake Oroville resulted in a increase in storage of 28,454 AF. See Table 8 for a complete summary of Lake Oroville operations.

At the beginning of 2002, Lake Del Valle held 38,308 AF (50 percent of maximum capacity of

77,110). Highest end-of-month storage was in August at 39,541 AF (51 percent of maximum capacity). At year's end Lake Del Valle held 39,428 AF (51 percent of normal maximum operating capacity).

At the start of 2002, San Luis Reservoir held 1,385,632 AF, 68 percent of its normal maximum operating capacity (2,027,835 AF); the SWP held 675,995 AF, 64 percent of its maximum operating capacity (1,062,183 AF). SWP storage at the end of 2002 decreased to 318,803 AF. End-of-year federal storage was 690,286 AF, for a year-end total of 1,010,089 AF.

SWP southern reservoirs (Pyramid, Castaic, Silverwood, and Perris) have a combined maximum operating storage capacity of 701,320 AF. The total combined storage of 634,595 AF at the beginning of 2002 increased to 679,101 AF by the end of the year.

The following tabulation compares normal operating capacity in the principal SWP reservoirs with end-of-year storage for 2001 and 2002:

Reservoir	Normal Maximum Capacity	End-of-year Storage 2001	End-of-year Storage 2002
Lake Oroville	3,537,580	1,595,882	1,624,337
Lake Del Valle	77,110	37,697	39,428
San Luis Reservoir (State Share)	1,062,183	675,995	319,803
Pyramid Lake	171,200	164,144	165,473
Silverwood Lake	74,970	72,102	71,017
Lake Perris	131,450	116,976	126,658
Castaic Lake	323,700	281,373	315,953
Totals	5,341,083	2,944,169	2,662,669

### ***Water Deliveries and Aqueduct Operations***

Generally, water diverted from the Sacramento-San Joaquin Delta is delivered to SWP storage facilities and to contractors through Banks PP and Barker Slough PP for a variety of beneficial uses. In addition to delivering Table A water to long-term water supply contractors, SWP transports water to other public agencies through exchanges or purchases; provides water for wildlife and recreational uses; and conveys water to meet local water rights agreements. Historical information about water deliveries made to long-term contractors and other agencies through 2002 has been organized in Table 2.

Pursuant to Article 56 of the Monterey Amendments, contractors can elect to store project water outside of their service area for later use within their service area. Qualified contractors can request carryover Table A amounts for delivery in the following year to the extent that such deliveries do not adversely affect current or future project operations. Factors that influence how much extended carryover water can be delivered include operational constraints of project facilities, filling of SWP conservation storage facilities, flood control releases, and water quality restrictions. If storage request exceed the available storage capacity, the amount available is allocated among the contractors requesting storage in proportion to their annual Table A amounts for that year. Four SWP contractors took delivery of 125,476 AF of 2001 approved Table A amounts carried over into 2002 as extended carryover. Kern County Water Agency had 8,000 AF of its extended carryover delivered to storage outside its service area.

The Monterey Agreement grew out of water allocation concerns that intensified during the 1987-1992 drought. Rather than negotiate only water allocation issues, the Department and water contractors decided on a major revision to SWP long-term contracts and their administration. The Monterey Agreement was released to the public December 16, 1994, in the form of 14 principles.

*Bulletin 132-95, Chapter 1*, explains the Monterey Agreement in detail.

Pursuant to Article 21 of the Monterey Amendments, Article 21 water replaces surplus, wet weather, and Article 12(d) water. The Article 21 water program allows a contractor to take delivery of water over the approved and scheduled Table A amounts for the current year. Article 21 water is available for delivery on a short-term basis as determined by the Department when water is still available after operational requirements for project water deliveries, water quality, and other requirements are being met.

The conditions for the Article 21 Water Program for 2002 were described in the January 30, 2002, Notice to State Water Project Contractors No. 02-02. Fourteen participants signed the notice, which indicated acceptance of the criteria, procedures, and charges for the program, and collectively received a total of 36,973 AF of Article 21 water.

Since Empire West Side Irrigation District had not signed the Monterey Agreement, it was still able to receive unscheduled water for agricultural purposes and received 26 AF of unscheduled water in 2002.

During 2002, SWP provided water service to 42 agencies, including 27 long-term water contractors. SWP facilities were used to convey non-project water for other agencies, including the CVP. In addition, SWP facilities were used to deliver water transfers, water purchased from the Dry Year Water Purchase Program, and transfers from one agency to another. Transfers were accomplished according to agreements negotiated with USBR throughout the year and with participants of existing three-party contracts for the use of the Cross Valley Canal, a water conveyance facility that connects with the California Aqueduct in Kern County.

The State Water Contractor's original request for delivery of Table A Entitlement water in 2002 was 3.91 MAF. Based on projected water supply and hydrology, the final approved amount was 2.89 MAF.

Total Project (State and Federal) deliveries for 2002 totaled 5,162,766 AF. This total includes State Contract Deliveries of 2,782,007 AF, Federal deliveries of 1,249,168 AF, Oroville Complex diversions of 1,120,646 AF, 10,550 AF of Upper Feather River deliveries, and 395 AF of Flexible Storage Withdrawal. State Contract Deliveries include a total of 2,498,990 AF of Table A and related water to 27 long-term contractors, plus 283,017 AF of other water. A graph showing the historical annual deliveries from SWP facilities is shown in Figure 1.

# Map 3 2002 Water Deliveries (in acre-feet)

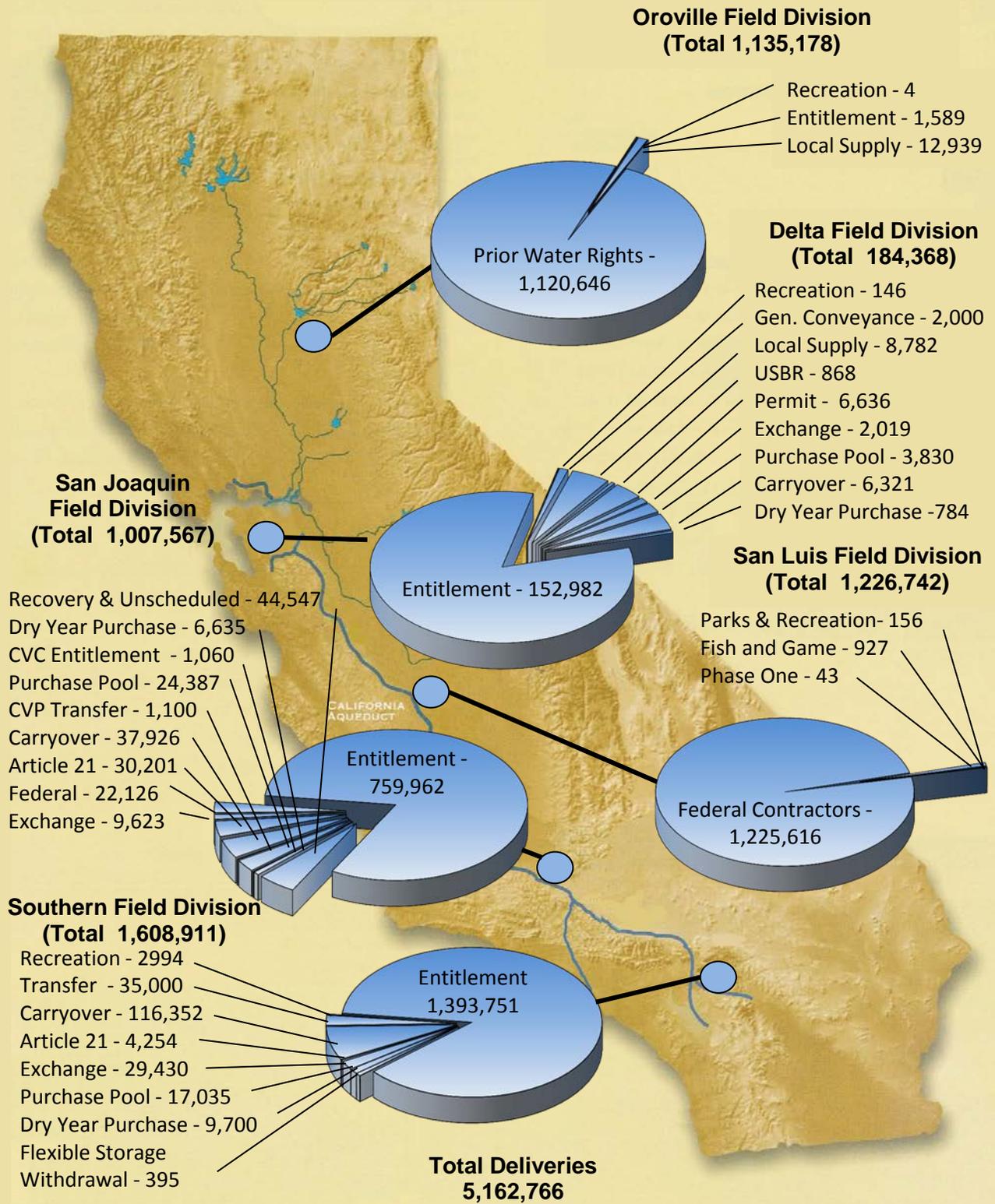
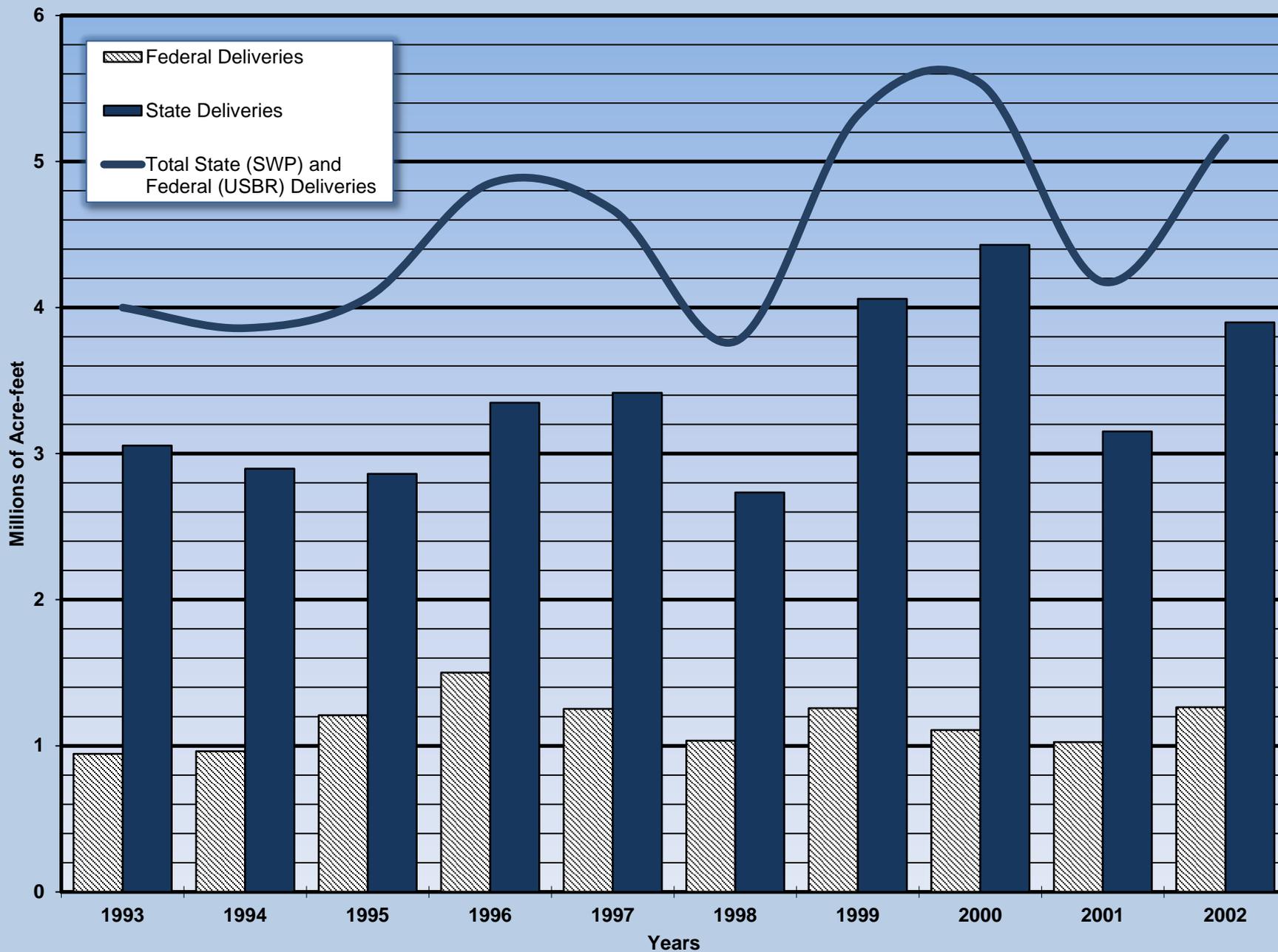


Figure 1. 10-Year Summary of Deliveries from SWP Facilities



Amounts of 2002 water deliveries are shown by field division on Map 2, and include Table A water, permit water, local supply, recreation, purchases, wheeling, and water transfers. Totals by agency are shown in Table 2.

The following table is a summary of Table A and other deliveries in 2002:

Table A Water		Other Water	
M & I	1,606,194	Purchase Pool A	26,160
Agricultural	695,224	Purchase Pool B	19,092
Article 21	36,973	General Wheeling	2,000
Ext. Carryover	125,476	Local	11,171
2001-02 Carryover	35,123	Recreation	3,709
		Permit	6,636
		Exchange Water	9,623
		Dry Year Purchase	17,119
		Transfer	38,545
		Pump in Recovery	39,799
		Unscheduled	26
		KWB Recovery	4,722
		Article 215 Exchange	3,456
		KWB Exch. Ent.	29,430
		Non SWP Exch.	2,019
		CVC Entitlement	67,604
		Non SWP Transfer	1,100
		Cattle Program, State	3
		EWA Exchange	803
<b>Total</b>	<b>2,498,990</b>	<b>Total</b>	<b>283,017</b>
<b>Total Table A and Other Deliveries</b>		<b>2,782,007</b>	

### *Significant Operational Activities*

#### *January*

- Even with near average precipitation, SWP allocations were still relatively low at 45 percent due to low Project carryover storage and conservative runoff forecasts for the remainder of the year, both influenced by the dry conditions in the previous water year.
- SWP diversions into Clifton Court Forebay were limited to 1,500 cfs from January 5 through January 9 to address adult delta smelt salvage concerns. EWA water was earmarked to insure that there would be no loss of water for the SWP. Excess conditions in the Delta lasted all month.
- Edmonston PP was limited to 2,254 cfs for a scheduled outage on West Wing discharge valves beginning January 2, 2002. Units 2, 4, 6, 8, 10, 12, and 14 were out of service to repair discharge valve seats, minimizing seat leakage. During the outage, Edmonston plant continued to make deliveries to the East and West Branches of the SWP with no curtailment in State Water Contractor deliveries.

#### *February*

- Excess conditions continued throughout the month. The fishery agencies agreed to flex the Export/Inflow (E/I) ratio (up to 45 percent) between February 1 and 16, and between

February 19 and 26. Two conditions were identified that would discontinue the action if either criterion occurred. The water associated with the increase of the E/I Ratio standard was pumped by SWP and stored in San Luis Reservoir. The EWA obtained a total of 75,952 AF of water during this 24-day period. These EWA assets were to be used prior to the end of February or beginning of March for an EWA fishery action. However, it was recognized that if an action did not occur, then these EWA assets would continue to be stored in San Luis Reservoir (even though the possibility existed that these EWA assets could convert to Project water should San Luis Reservoir fill. In this case, Delta pumping would be reduced by an amount equal to the rate the EWA water would convert to SWP water). By February 26, 2002, the E/I Ratio relaxation ended due to the presence of fish collected at the CVP and SWP export facilities.

#### *March*

- Excess conditions existed all month, and the percent-of-inflow diverted standard (E/I ratio) controlled operations from March 1 through March 22.
- DWR increased the 2002 allocation of entitlement water for long-term SWP contractors on March 22 to 55 percent, and again on March 28 to 60 percent.
- San Luis Reservoir physically filled on March 23, 2002. The Environmental Water Account had 94 TAF in San Luis, so SWP exports from the south Delta were effectively limited to direct demand, dropping from 5100 cfs on March 22 to 1200 cfs on March 23. By agreement, once the reservoir was physically full, the EWA portion was converted to SWP share each day by the amount of water that could have been pumped into the reservoir if the EWA portion wasn't there. Once the EWA portion was reduced to zero, the Project portion was considered full and delivery of interruptible water could begin. Rather than wait for this process, the water contractors and the EWA management agencies agreed that the contractors would take over the converted EWA portion but return half of the amount to the EWA at a later date. This allowed the contractors to begin interruptible deliveries sooner than otherwise and the EWA to eventually retain some water in San Luis that they would otherwise have lost. The agreement became effective on March 30, with SWP exports rising to 3300 cfs on that day and to 5300 cfs on March 31.

- The filling of San Luis Reservoir also instigated a daily share exchange between the SWP and CVP. For accounting purposes, the EWA portion was considered part of the SWP share of San Luis, so it appeared that the SWP was encroached on the CVP share. Once the reservoir filled, the SWP was obliged to make room for any water the CVP wanted to pump into San Luis (up to the total amount of the encroachment). Rather than physically spill the SWP water and pump the CVP water, a total of 33,300 AF was exchanged at O’Neill Forebay through the end of the month.

#### *April*

- A share exchange totaling 12,100 AF was made from USBR storage to DWR storage in O’Neill Forebay and from DWR storage to USBR storage in San Luis Reservoir.
- April started with DWR and USBR combined exports meeting demands. Water quality proved sufficient throughout the first 14 days. Exports were governed in part by concerns for X2. The Vernalis Adaptive Management Plan went into effect on April 15 and combined DWR and USBR exports were reduced to 1500 cfs through the end of the month.
- Even with near average precipitation, SWP allocations were still relatively low at 60 percent due to low Project carryover storage and conservative runoff forecasts for the remainder of the year; both influenced by the dry conditions in the previous water year.

#### *May*

- Combined Delta exports for May continued at 1500 cfs, first for the Vernalis Adaptive Management Plan testing and then for additional protection for delta smelt and juvenile salmon. On May 24, the Head of Old River barrier was breached. Just before and after the breach, the flap gates on the agricultural barriers were tied open. On May 16 and 25, the Operations Control Office directed a salvage sensitivity experiment, running the Banks pumps at high levels for several hours to test the effect on smelt salvage. During these tests the Forebay intake remained at about 650 cfs. There was a notable increase in delta smelt salvage with each pumping increase, especially on the 25<sup>th</sup>. No definitive conclusions were reached. However, many agency biologists agree that it is possible that high smelt salvage after VAMP results from rearing in CCFB during VAMP and are not indicative of south delta distribution.

- On May 15, DWR increased the 2002 allocation of SWP water for long-term contractors to 65 percent.

#### *June*

- Delta outflow requirements of 7,200 cfs governed Delta operations for most of the month.
- Salvage of delta smelt continued dropping but the 14-day running average of smelt salvage remained above 400 through the 26th; after which full operations of the Grant Line barrier in the South Delta was approved.
- Because there were no fish concerns during the last week of the month, the Fishery agencies agreed to flex the E/I Ratio to 45 percent (from 35 percent) but the opportunity to utilize the flex never materialized.

#### *July*

- Various flow changes and intake modifications to Hyatt were utilized to manage water temperatures at Robinson Riffle and the fish hatchery.
- Net Delta Outflow Index requirements controlled SWP operations in the Delta.
- There were some concerns over water levels in the South Delta, especially at Tom Paine Slough. Problems were mitigated by the use of portable pumps.
- DWR, on behalf of the Environmental Water Account and Dry Year Programs, purchased 157,050 AF of water from Yuba County Water Agency; and of that, 135,000 AF were for the EWA, and 22,050 AF were for the Dry Year. In July, the SWP exported 43,824 AF of water for the CVP as partial payment for the export curtailments taken at the CVP facilities in May and June 2002. The CVP provided the power for this action.

#### *August*

- Net Delta Outflow Index requirement for August was 3,500 cfs average for the month. This standard and the Percentage of Inflow Diverted standard of 65 percent governed Project operations in the Delta.
- Joint Point of Diversion and water transfers during August included about 36 TAF of Article 55 water, including CVC exchange to KCWA and Tulare Lake Basin Water Storage District and 8.4 TAF of Cross Valley exchange to Westlands Water District.
- The SWP exported about 44 TAF of water purchased by the EWA from Yuba County Water Agency. Of that, 21.7 TAF was pumped at

Banks for the CVP as payment for past export curtailments at the CVP. The remaining portion was pumped at Banks as payment for earlier SWP export curtailments.

- Shutters to the intake of Hyatt PP were removed regularly (about once a week) to maintain adequate water temperatures at Robinson Riffle and the fish hatchery.

### **September**

- Concerns for water quality, specifically the 250 mg/l chloride standard at Contra Costa Canal PP, governed Project operations in the Delta throughout the month. The Net Delta Outflow Index requirement for September was 3,000 cfs average, but values ranged as high as 5,500 cfs in an attempt to arrest salinity intrusion.
- The SWP exported about 5,800 AF of water for the EWA. Of that amount, 260 AF of water (purchased from the Sacramento Groundwater Authority) were pumped at Banks for the CVP as payment for the export curtailments taken at the CVP between May and June, 2002. The CVP provided the power for this action. The remaining amount of water represents the last portion of the water purchased by the DWR on behalf of the EWA from Yuba County Water Agency. In addition to the 260 AF mentioned above, the SWP pumped 57,240 AF during September for the CVP under the auspices of Stage 2 Joint Point of Diversion from SWRCB Water Right Decision 1641. The last of the summer's water transfers concluded in September.

### **October**

- Concerns for water quality continued and SWP exports were limited for that reason and to maintain adequate Delta outflow. The daily 250-mg/l-chloride standard at Contra Costa Canal PP was exceeded eight times despite improving conditions in Rock Slough and surrounding channels.

- An experiment to acquire more data concerning fish migration and effect of the Delta Cross Channel was conducted late in the month.
- Lake Oroville releases through the river valves were necessary during October for temperature control. A total of 27,000 AF of water was released during the last 15 days of the month.

### **November**

- Strong storm activity at the beginning of the month forced export cuts to prevent salinity intrusion in the Delta brought on by very high tides (storm surge). Subsequent runoff and neap tide cycle quickly freshened up most of the western and central delta alleviating most water quality concerns for the rest of the month.

### **December**

- Early in the month, exports were held constant to accommodate Delta Action 8 (a fish release, salvage, and flow experiment.) As part of the experiment, the Delta Cross Channel Gates were closed. Water quality began to degrade at an expected and acceptable rate until a strong storm surged tides severely aggravating salinity intrusion and forcing additional export cuts even as the DCC opened again. As the storm passed, the tides returned to normal levels and inflow to the Delta increased markedly. Subsequent water quality was very good and continued to improve through the remainder of the month, allowing for unrestricted operations.
- Edmonston scheduled a total outage on December 17 in conjunction with a prescheduled Edmonston-Pastoria 220KV line inter-company outage with PGE. The clearance was released on the December 19 and pumping was resumed at approximately 2000 hours. At 2100 hours the Edmonston operator reported arcing in the switchyard. Pumping was ceased, Edmonston-Pastoria 230kv line was de-energized, and another clearance issued for repairs. At 0630 on the December 20 the repairs were completed, the clearance was released, and Edmonston resumed pumping.

## ***Energy Operations***

### ***Significant Events***

Energy used at the 26 State Water Project pumping and generating plants totaled 8.39 million MWh, including 118 MWh of deviation.

The Department sold about 1.17 million MWh of energy to 15 utilities and 13 power marketers for total revenues of \$58.09 million in 2002. The Department also received \$24.67 million in revenues for capacity and exchanges, including \$17.14 million for transactions made through the California Independent System Operator.

The Department's energy purchases totaled \$62.41 million. Associated costs for capacity totaled \$21.07 million. Other SWP power costs, including transmission, operation, maintenance, and ISO ancillary services, totaled \$84.78 million.

The Department and Southern California Edison have two existing agreements (Power Contract and Capacity Exchange Agreement) for the exchange of energy. Under these agreements, the Department provides SCE with energy and capacity during the on-peak period, while SCE provides the Department with exchange energy during the off-peak period. These two agreements have provisions which allow SCE to curtail delivery of energy under certain circumstances. From June 1, 2000, through May 5, 2001, SCE curtailed the delivery of exchange energy to the Department under circumstances that were disputed by the Department. The dispute culminated in a December 26, 2002, Settlement Agreement, in which the parties agreed to revise certain agreement provisions pertaining to SCE's right to interrupt or curtail deliveries of energy to the Department. Additionally, SCE paid the Department \$30 million as compensation for curtailing exchange energy during 2000 and 2001.

### ***Energy Resources***

The State Water Project received energy from ten plants in 2002 including generation from SWP's eight hydroelectric plants (Hyatt, Thermalito, Gianelli, Warne, Castaic, Alamo, Mojave, and Devil Canyon) totaling 6,174,265 MWh, as illustrated in Figure 3.

The DWR-SCE Power Contract has been in effect since April 1983. Under this contract, part of the Hyatt Thermalito PP' generation and all of the output of Devil Canyon PP and Alamo PP are delivered to SCE. Total energy delivered to SCE in 2002 was 1,932,035, total returned from SCE was 3,639,434 MWh. The energy is generally delivered during on-peak periods and a greater amount of energy is returned during off-peak periods. SCE and

other entities combined return and additional credited to the SWP during 2002 was 1,707,399 MWh.

Since July 1983, DWR has received energy from Reid Gardner PP, a coal-fired facility near Las Vegas, Nevada. Reid Gardner consists of four units. DWR owns 67.8 percent of Unit 4 (169.5 MW based on nameplate capacity of 250 MW), while Nevada Power Company (NPC) owns the remainder of Unit 4, as well as all of units 1, 2, and 3. The SWP share of energy generated during 2002 totaled 1,619,965 MWh of energy.

Total energy resources, including power plant total of 6,174,265 MWh, purchases of 1,650,327 MWh, and net power exchange of 1,737,549 MWh for 2002 was 9,562,141 MWh, as shown in Figure 4.

### ***Energy Loads***

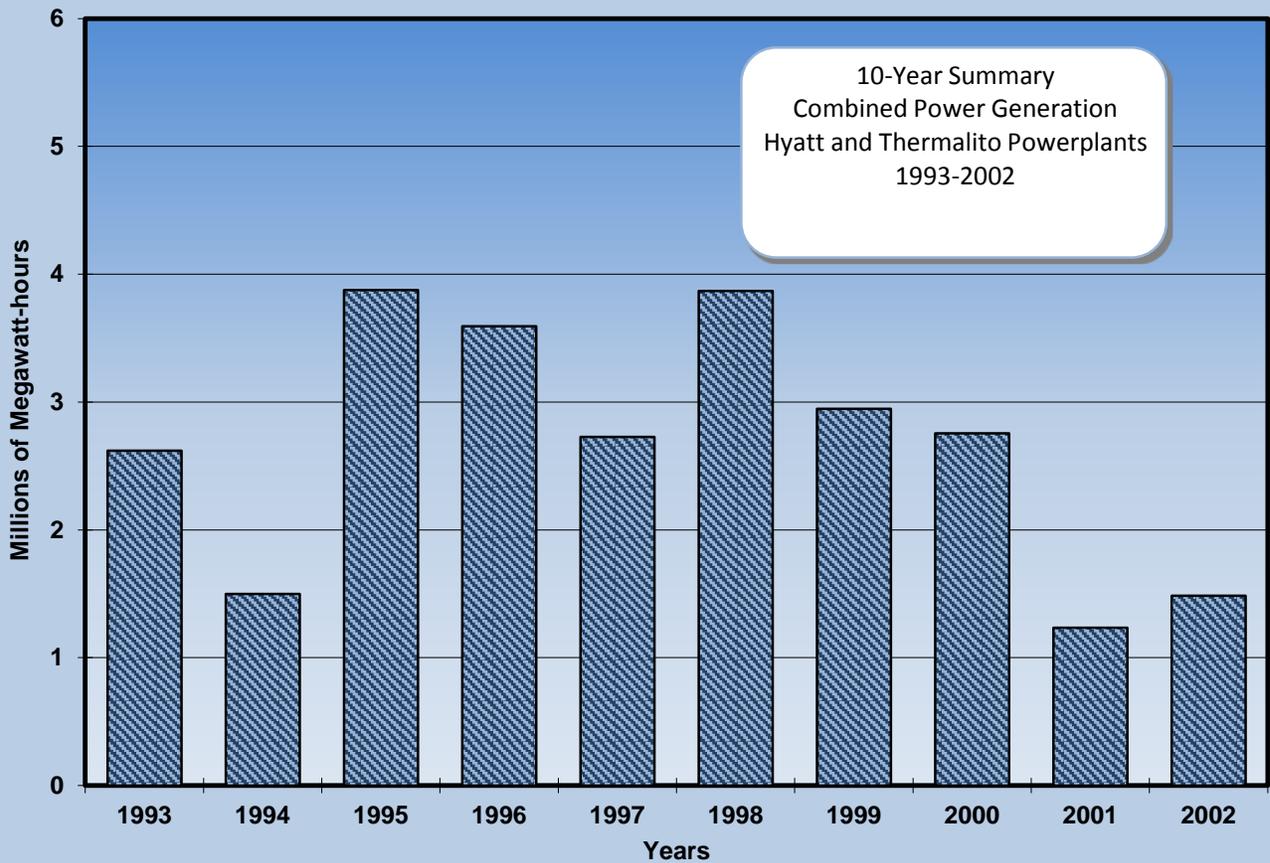
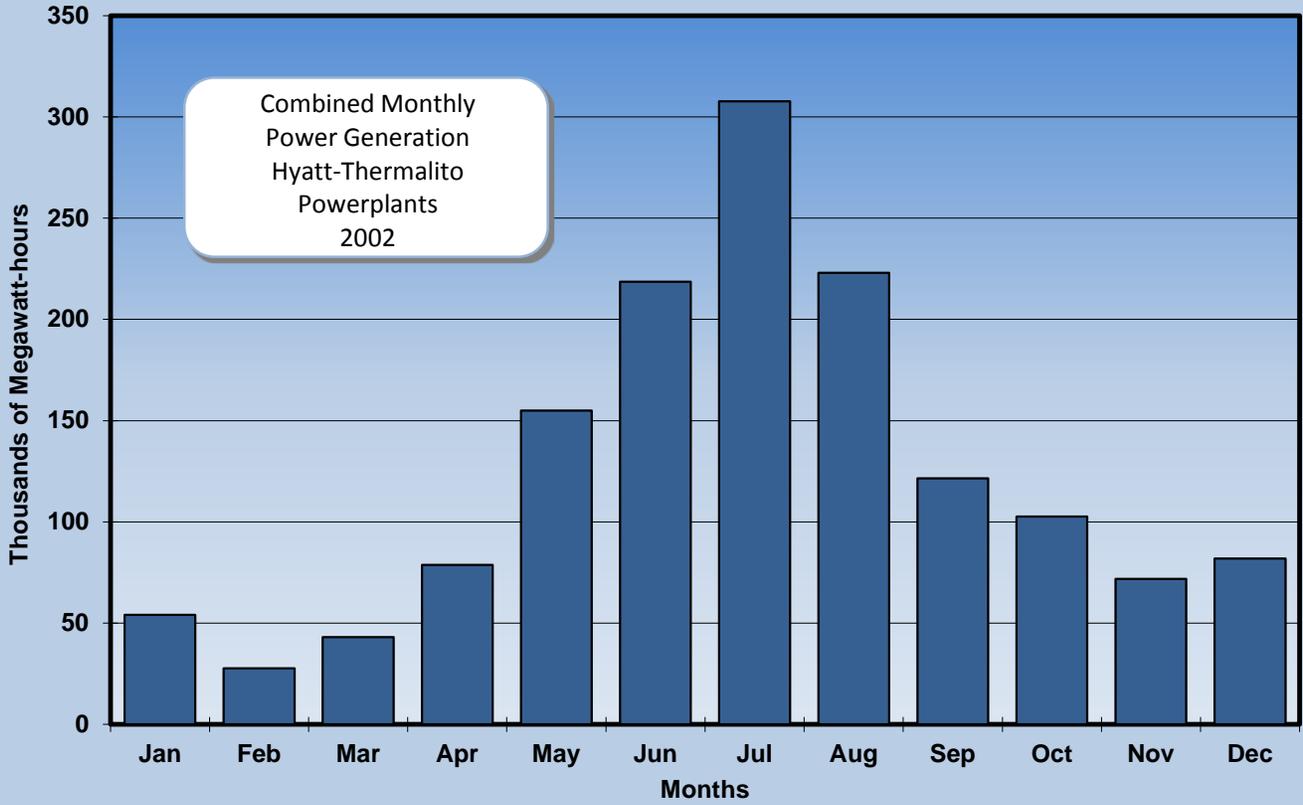
Energy load data (total energy used by the SWP) is summarized in Table 4, and Figures 5 and 6. For the purpose of balancing energy resources and loads, this report itemizes amounts meeting SWP supplies and demands separately from amounts meeting total DWR supplies and demands. Besides SWP energy loads of 8,275,667 MWh, total DWR energy loads include federal loads of 458,717 MWh, sales of 1,168,441 MWh, and deviation adjustment of 118,131 MWh, for a total of 10,020,956 MWh. A breakdown of energy loads by agency and by plant is summarized in Table 4 and Figure 6.

The San Joaquin Field Division normally accounts for over half of total project energy loads. In 2002, total energy loads included 5,959,595 MWh used in the San Joaquin Field Division, 59 percent of the state-wide total.

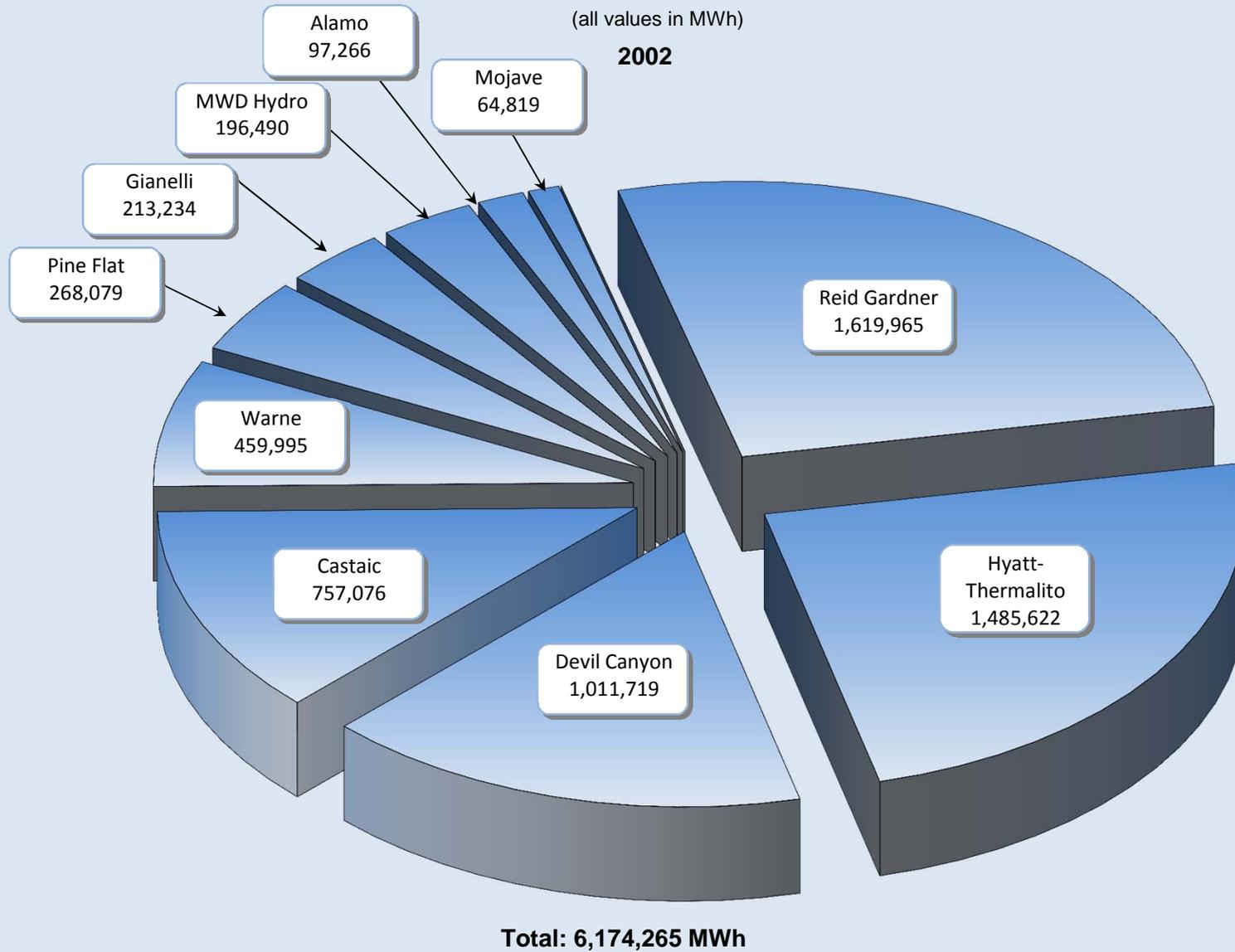
The Department of Water Resources sold power to 15 utilities and 13 California ISO power marketers for total revenues of \$58.09 million. The Department also received \$24.67 million in revenues for capacity and exchanges, including \$17.14 million for transactions made through ISO. See Figure 6 for a breakdown of sales by agency.

The source of energy data contained in this report is the State Water Project Analysis Office, Bulletin 132-03. No CAISO transaction data was used.

**Figure 2. Monthly and 10-Year Power Summary at Hyatt and Thermalito Powerplants**



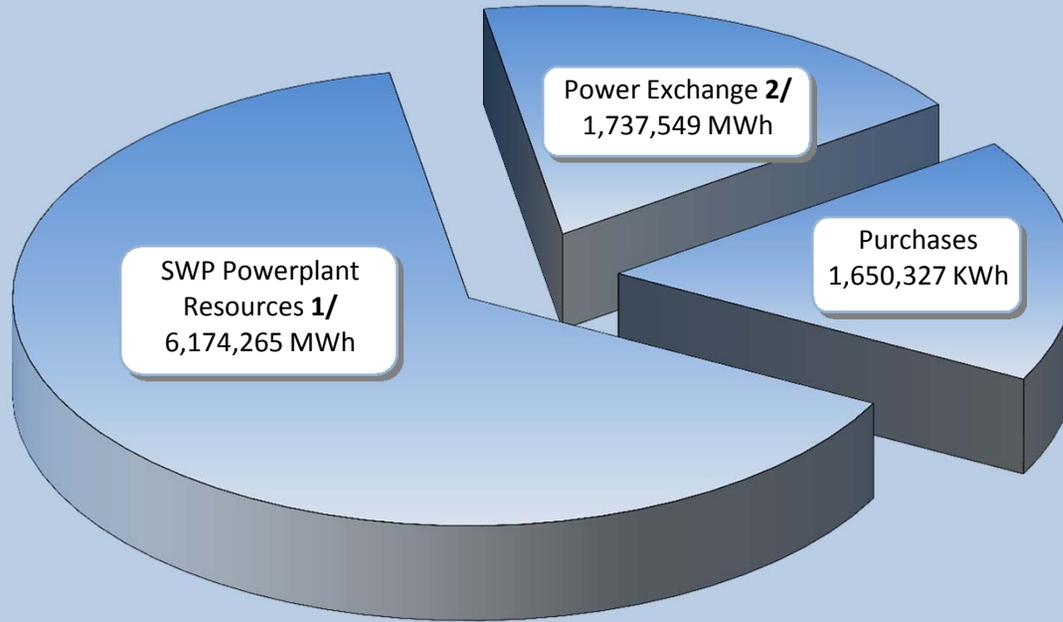
**Figure 3. SWP Powerplant Energy Resources**



Note: Purchases, Power Exchanges, and System Imbalances are not shown here. All values are metered readings at plants and are not adjusted for transmission losses.

**Figure 4. Total State Energy Resources**

(all values in KWh)  
**2002**



**Total: 9,562,141 KWh**

SWP Powerplant Resources

Sub-total 6,174,265

Purchases

BC Hydro, Powerex	1,328
Bonneville Power Administration	8,000
PacifiCorp	614,584
Portland General Electric	225
Seattle City Light	1,093
Sacramento Municipal Utility District	150
City and County of San Francisco	11,395
California Energy Resources Scheduling	139,160
Energy Marketers (Nine total)	874,392

Sub-total 1,650,327

Power Exchange

Received From Other Entities	2,610,912
Delivered To Other Entities	-2,580,014
Delivered to SCE	-1,932,035
Received from SCE	3,639,434
Power System Imbalances	-748

Sub-total 1,737,549

**Total 9,562,141**

**1/** See Figure 3 for a breakdown of SWP Energy Resources.

**2/** Includes Total Power Exchange of 1,738,297 MWh and System Imbalance loss of -758 MWh.

**Table 3. Total Energy Resources  
2002**

(in megawatt-hours)

Resource	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Hyatt-Thermalito 1/	54,056	27,758	43,077	78,699	155,011	218,519	307,655	222,950	121,503	102,656	71,772	81,966	1,485,622
Gianelli													
State	113	-402	-14	23,674	56,642	53,946	20,514	1,733	15,379	25,891	9,505	6,253	213,234
Federal	0	5,904	1,728	23,275	48,752	53,476	19,648	5,990	0	0	0	0	158,773
Total	113	5,502	1,714	46,949	105,394	107,422	40,162	7,723	15,379	25,891	9,505	6,253	372,007
Warne 2/	22,335	24,170	39,624	43,072	49,875	43,556	49,398	36,444	35,184	25,253	45,299	45,785	459,995
Castaic	33,634	39,862	66,674	71,324	83,431	73,092	83,431	56,928	57,010	39,802	73,567	78,321	757,076
Mojave	4,674	4,495	4,076	4,305	5,541	5,590	6,315	6,802	7,098	5,939	5,770	4,214	64,819
Alamo	7,225	7,086	6,318	7,134	9,081	9,282	10,439	10,805	10,819	8,248	4,282	6,547	97,266
Devil Canyon	76,004	68,436	63,960	67,607	87,782	87,067	97,134	105,580	108,663	93,654	86,776	69,056	1,011,719
MWD Hydro	24,385	14,124	9,677	8,993	13,622	22,419	24,535	17,641	16,407	14,907	17,727	12,053	196,490
Reid Gardner	151,061	124,274	169,246	159,876	172,762	103,195	134,543	109,749	139,258	115,348	98,697	141,956	1,619,965
Pine Flat	0	128	13,814	26,437	55,169	97,677	67,752	7,102	0	0	0	0	268,079
Purchases	143,800	202,000	152,700	124,592	95,700	98,740	183,126	185,892	122,175	118,035	109,170	114,402	1,650,332
System Imbalances	0	0	0	0	81	196	0	0	0	-957	-68	0	-748
Power Exchange Total 3/	149,551	124,715	131,205	118,271	90,718	75,427	71,926	201,300	178,711	105,433	222,660	268,380	1,738,297
Total SWP Energy Resources	666,838	636,646	700,357	733,984	875,415	888,706	1,056,768	962,926	812,207	654,209	745,157	828,933	9,562,146
Energy Sales	-20,615	-66,713	-64,595	-89,953	-113,186	-128,782	-164,846	-143,608	-75,663	-106,578	-50,101	-143,801	-1,168,441
Total Energy Resources	646,223	569,933	635,762	644,031	762,229	759,924	891,922	819,318	736,544	547,631	695,056	685,132	8,393,705

1/ Includes Table Mountain and Hyatt out adjusted to Tesla.

2/ Includes station-service energy.

3/ Amounts show actual energy available for SWP use and include transmission losses.

Total SWP Energy Resources 9,562,146

Less Energy Sales: -1,168,441

Net SWP Energy Resources: 8,393,705

Total Federal: 158,773

Total Energy Resources (Total Provided+Federal): 8,552,478

**Table 4. Total Energy Loads**

**2002**

(in megawatt hours)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Hyatt-Thermalito 1/	17,843	15,285	17,728	21,077	14,694	1,578	0	2	3	0	11	139	88,360
North Bay 2/	573	468	1,244	1,727	1,721	2,167	2,453	2,312	1,918	1,562	1,558	659	18,362
South Bay	261	301	4,133	8,317	14,577	14,908	15,734	16,316	13,219	7,572	2,702	2,366	100,406
Del Valle	9	9	6	164	404	17	9	9	7	6	7	8	655
Banks Total	112,444	77,299	67,680	35,404	11,087	36,411	127,849	108,807	74,499	18,837	49,884	68,808	789,009
State	112,444	77,299	67,680	35,404	11,087	36,411	108,001	96,496	56,016	11,426	46,230	68,808	727,302
CVP and CVC	0	0	0	0	0	0	19,848	12,311	18,483	7,411	3,654	0	61,707
Bottle Rock 3/	0	0	0	0	0	0	0	0	0	0	0	0	0
Gianelli Total	154,523	63,061	53,994	1,454	219	456	4,215	15,604	40,231	34,258	55,347	74,798	498,160
State	84,861	48,046	35,625	131	105	393	4,137	14,740	4,088	1,148	10,600	38,045	241,919
CVP and CVC	69,662	15,015	18,369	1,323	114	63	78	864	36,143	33,110	44,747	36,753	256,241
Dos Amigos Total	25,827	41,159	35,315	39,638	50,368	86,814	79,231	52,904	19,665	26,119	29,062	28,986	515,088
State	23,924	29,048	23,363	28,305	36,601	61,188	51,064	30,726	14,850	25,517	26,653	23,080	374,319
CVP and CVC	1,903	12,111	11,952	11,333	13,767	25,626	28,167	22,178	4,815	602	2,409	5,906	140,769
Pine Flat 3/	0	0	0	0	0	0	0	80	156	0	0	0	236
Las Perillas	361	190	389	632	888	1,154	1,217	1,044	730	569	293	290	7,757
Badger Hill	939	473	1,043	1,723	2,425	3,070	3,256	2,772	1,979	1,540	778	747	20,745
Devil's Den	1,151	1,150	1,565	1,843	2,616	2,050	2,156	2,804	2,596	2,083	1,500	1,590	23,104
Bluestone	1,099	1,090	1,482	1,760	2,546	1,971	2,063	2,699	2,503	1,985	1,440	1,516	22,154
Polonio	1,170	1,170	1,574	1,843	2,579	2,043	2,152	2,739	2,549	2,054	1,487	1,601	22,961
Buena Vista	24,094	25,923	32,681	36,267	44,904	44,919	49,574	43,240	40,940	31,874	37,889	33,651	445,956
Teerink	26,716	28,071	34,926	38,884	47,932	46,486	51,484	45,389	44,418	34,958	42,208	38,183	479,655
Chrisman	60,542	62,819	77,489	85,925	104,726	100,429	112,298	99,990	98,929	77,524	95,590	85,310	1,061,571
Edmonston	222,216	227,914	281,304	311,772	382,289	363,508	407,933	364,154	362,205	283,309	354,059	315,029	3,875,692
Oso	10,062	10,870	18,117	20,034	23,644	20,714	23,174	16,165	15,824	10,998	20,658	21,649	211,909
Mojave 3/	2	3	12	2	2	0	0	0	0	0	2	12	35
Pearblossom	38,964	38,487	35,000	37,569	47,314	48,142	53,369	57,512	59,587	50,589	48,779	36,734	552,046
Warne 3/	206	23	48	14	0	11	0	3	1	34	2	21	363
Alamo 3/	7	12	12	9	4	2	3	0	0	14	29	20	112
Devil Canyon 3/	7	4	10	21	0	0	0	0	0	1	0	5	48
<b>Energy Load</b>	<b>627,451</b>	<b>568,655</b>	<b>635,431</b>	<b>633,423</b>	<b>741,058</b>	<b>751,161</b>	<b>890,077</b>	<b>799,192</b>	<b>722,518</b>	<b>544,763</b>	<b>692,475</b>	<b>669,463</b>	<b>8,275,667</b>
<b>Actual Deviation</b>	<b>18,813</b>	<b>1,305</b>	<b>352</b>	<b>10,607</b>	<b>21,175</b>	<b>8,762</b>	<b>1,848</b>	<b>20,126</b>	<b>14,027</b>	<b>2,869</b>	<b>2,579</b>	<b>15,668</b>	<b>118,131</b>
<b>Total Energy Loads</b>	<b>646,264</b>	<b>569,960</b>	<b>635,783</b>	<b>644,030</b>	<b>762,233</b>	<b>759,923</b>	<b>891,925</b>	<b>819,318</b>	<b>736,545</b>	<b>547,632</b>	<b>695,054</b>	<b>685,131</b>	<b>8,393,798</b>

1/ Pumpback and Station Service

2/ Includes Barker Slough, Cordelia, and Cordelia Interim Pumping Plants.

3/ Station Service only.

SWP Energy Loads: 8,275,667

Plus Deviation: 118,131

Total Energy Loads: 8,393,798

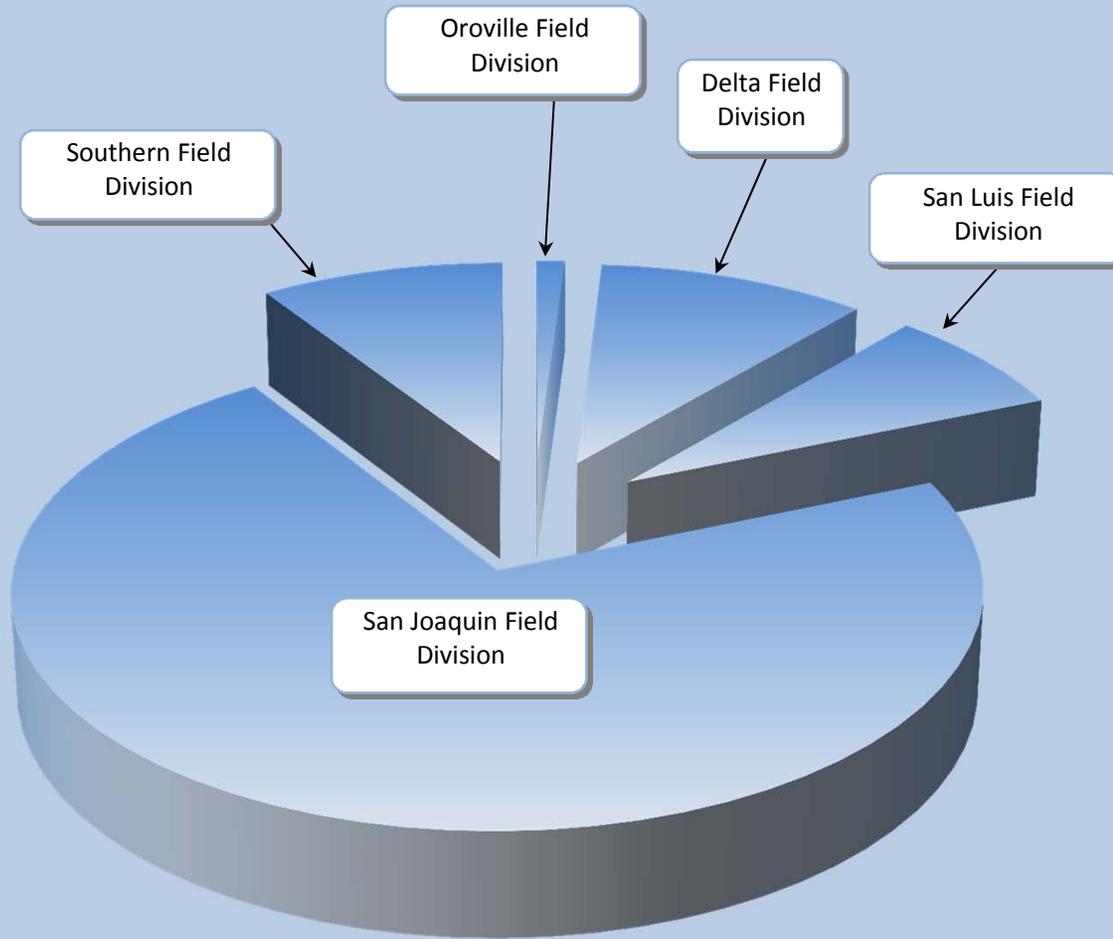
Total Sales: 1,168,441

Net SWP Energy Loads: 9,562,239

Total Federal: 458,717

Total Loads: 10,020,956

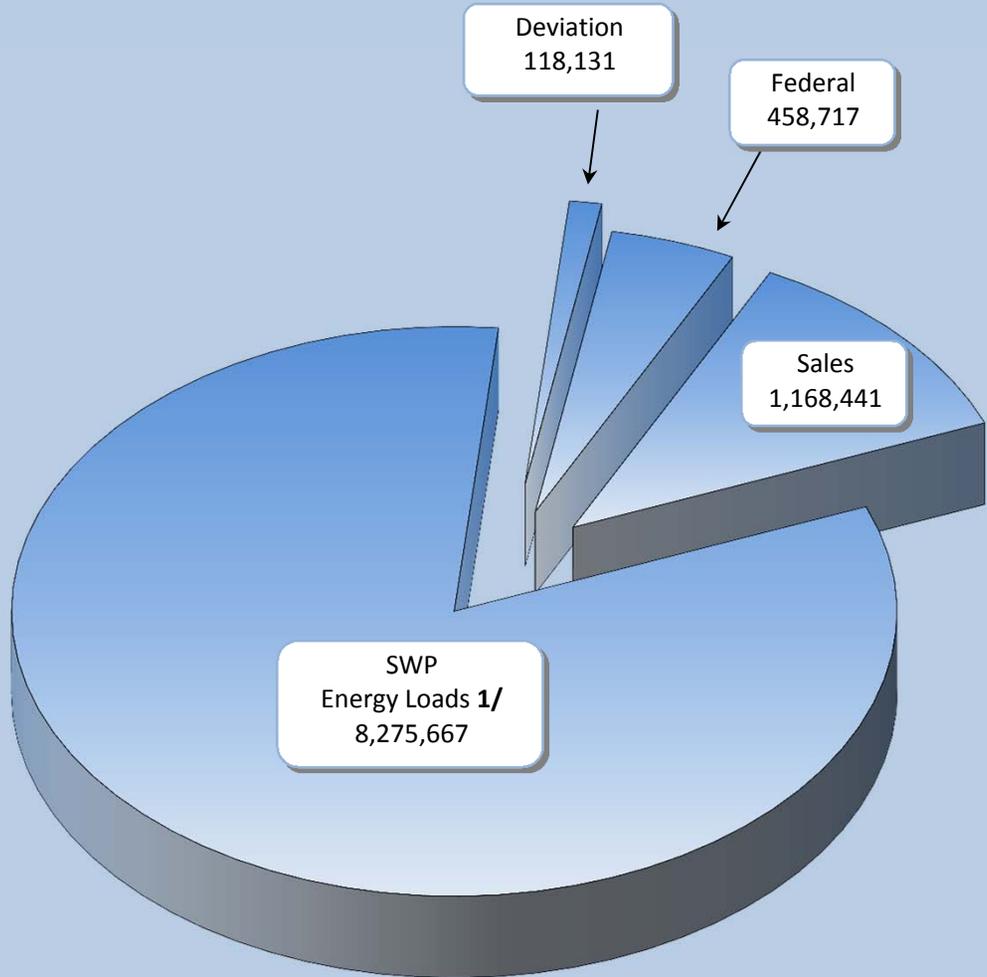
**Figure 5. SWP Energy Loads**  
**2002**  
 (all values in MWh)



**Total: 8,275,667 MWh**

<b>Oroville Field Division</b>	
Hyatt-Thermalito Complex	88,360
Sub-total	88,360
<b>Delta Field Division</b>	
North Bay	18,362
South Bay	100,406
Del Valle	655
Banks	727,302
Sub-total	846,725
<b>San Luis Field Division</b>	
Gianelli	241,919
Dos Amigos	374,319
Pine Flat (Station Service)	236
Sub-total	616,474
<b>San Joaquin Field Division</b>	
Las Perillas	7,757
Badger Hill	20,745
Devil's Den	23104
Bluestone	22154
Polonio	22961
Buena Vista	445,956
Teerink	479,655
Chrisman	1,061,571
Edmonston	3,875,692
Sub-total	5,959,595
<b>Southern Field Division</b>	
Oso	211,909
Mojave	35
Pearblossom	552,046
Warne (Station Service)	363
Alamo (Station Service)	112
Devil Canyon (Station Service)	48
Sub-total	764,513
<b>8,275,667</b>	

**Figure 6. Total Energy Loads**  
**2002**  
 (all values in MWh)



**Total: 10,020,956 MWh**

1/ See Figure 5 for breakdown of SWP Energy Loads.

**Sales**

Powerex	481
City and County of San Francisco	865
City of Redding	695
Northern California Power Agency	4,453
Sacramento Municipal Utility District	69,378
Department of Water Resources (CERS)	130,965
City of Azusa	15,770
City of Banning	4,613
City of Glendale	785
City of Riverside	81,760
City of Vernon	1,225
Los Angeles Dept. of Water and Power	4,564
San Bernardino Valley MWD	85
San Diego Gas and Electric	1,756
Nevada Power Company	323,565
Thirteen Marketers	527,481
Sub-total	1,168,441

**Deviation** 118,131

**Federal** 458,717

**SWP Energy Loads** 8,275,667

**Total State Energy Loads 1/** 10,020,956

## ***Sacramento - San Joaquin Delta Operations***

### ***Delta Resources and Environmental Issues***

The 738,000-acre Delta is the heart of California's water environment. The Delta, at the convergence of the Sacramento and San Joaquin Rivers, is a network of islands, sloughs, marshes, and reclaimed farmland that stretches from Sacramento to San Francisco Bay. A source of drinking water for about two-thirds of California's population, the Delta also provides irrigation for the Central Valley, which produces about 55 percent of the country's fruits and vegetables.

The State Water Resources Control Board has adopted water quality control plans and policies to protect the Delta's water quality and ecosystem while at the same time maintaining SWP water supply reliability.

### ***CALFED Bay-Delta Program***

In June 1994, a Framework Agreement between federal and State governments was established which defined a joint federal-State cooperative process for developing a long-term solution to water supply, water quality, and ecosystem problems of the Delta. Hence, the CALFED Bay-Delta Program came into being with the goal of developing a long-term Delta solution. It put into place an extensive public outreach and input program as an important element of its planning methods. In 2002, the CALFED Bay-Delta Program continued to work on a comprehensive, long-term solution for the Delta.

In 2002, CALFED continued the Surface Storage Program as part of the ongoing evaluation of the appropriate role of storage, both groundwater and surface storage, in the CALFED solution. Surface Storage Investigations staff continued to evaluate five potential reservoir projects—In-Delta Storage, Los Vaqueros Reservoir Enlargement, Shasta Lake Enlargement, North-of-the-Delta Off-stream Storage, and the Upper San Joaquin River Basin Storage.

CALFED's Environmental Water Account had its second year of operation in 2002. EWA is designed to provide water at critical times to meet environmental needs at no uncompensated cost to SWP/CVP water users. To do that, EWA buys water from willing sellers or diverts surplus water when safe for fish. EWA then banks, stores, transfers, and releases the water as needed to protect fish and compensate water users. Between 2001 and 2002, acquisition of assets for EWA's use was achieved through annual contracts with willing water sellers and source-shift participants.

CALFED's South Delta Improvements Program (SDIP) purpose is to improve the reliability of

existing SWP facilities; ensure that water of adequate quantity and quality is available for diversion to the South Delta Water Agency's service area; and reduce the effects of SWP exports on both aquatic resources and direct losses of fish in the south Delta.

In 2002, CALFED staff applied for and received a \$515,000 CALFED grant to construct a continuous monitoring station at Vernalis for organic carbon and other key constituents. The proposed construction date is spring 2004.

The Department of Water Resources actively participated in the formulation of CALFED's Water Transfer Program through the Bay-Delta Advisory Council Water Transfer Work Group and the Transfers Agency Group. The program proposed a framework of actions, policies, and processes to facilitate water transfers and further develop a statewide water transfer market.

### ***Net Delta Outflow Index***

Delta outflow cannot be measured directly due to the tidal influence in the Delta. Instead, an approximation of Delta outflow is calculated using measured inflows, exports, and estimated Delta water use. NDOI, introduced in the 1995 Bay-Delta Plan, now part of D-1641, guided operations in 2002. It provides a more accurate method for calculating Delta outflow by including inflows of the Sacramento River, Yolo Bypass system, the eastside stream system (consisting of the Mokelumne, Cosumnes, and Calaveras Rivers), the Sacramento Regional Treatment Plant, and a measurement of San Joaquin River flow at Vernalis. The NDOI calculated flows cannot be directly compared to the Delta Outflow Index (DOI) used prior to 1995, because DOI does not include all of the above-listed flows. The calculation of in-Delta consumptive use is also different in NDOI. Table 5 shows the computed daily NDOI for 2002.

The NDOI calculated flows cannot be directly compared to the prior Delta Outflow Index, as the Sacramento River bypass flows and several eastside stream flows were not included in the earlier DOI calculations. Those flows can be quite substantial during high flow periods. The Sacramento River flows contributed 85 percent of total Delta inflow, San Joaquin River 9 percent, Yolo Bypass flows 3 percent, East Side Streams 2 percent, and Sacramento Treatment Plant only contributed 1 percent of total Delta inflow of 15.49 MAF. A comparison of Delta Inflow and NDOI is plotted on Figure 7. The NDOI, Delta exports, and Delta Consumptive Use are plotted on Figure 8.

The 2002 daily NDOI averaged 12,457 cfs for the year and was 1,100 cfs more than the 2001 daily average. The greatest mean monthly NDOI occurred in January at 37,812 cfs and the greatest mean daily was 103,539 cfs on January 7. The lowest daily average NDOI for the month occurred in August (3,586 cfs) and the year's lowest daily NDOI was on August 26 with 2,585 cfs.

The term Sacramento River accretions/depletions refers to the difference between the amounts of water released to the Sacramento and its tributaries by the CVP and SWP, and the amount which flows past Sacramento and into the Delta. Depending on the time of year and hydrologic conditions, this amount may represent a net gain (accretion) or a net loss (depletion). Accretions/Depletions are forecasted for both short-term and long-term operations planning purposes. Short-term forecasts, up to about seven days in the future are used to estimate inflows to the Delta, at key points on the Sacramento River, and to provide guidance to project operators on predicting release requirement 5-7 days in advance (the maximum travel time from Keswick Dam to the Delta). Such short-term predictions of accretions/depletions may make use of real time flow data, temperature and weather forecasts, travel time, non-project reservoir releases, existing trends in accretions and depletions, and on advice and input from some of the major districts using water on the Sacramento. Accretions/Depletions, total Delta exports, and total lagged storage withdrawals are plotted on Figure 9. Figure 10 shows total exports plotted to show both SWP and CVP shares.

Longer-range forecasts of accretions and depletions are made for purposes of planning operations on a seasonal or monthly basis. For this purpose, accretion/depletions are treated as monthly quantities and are customarily forecasted or estimated

for 12 months into the future. This discussion will focus on the long-range forecasts of accretions/depletions.

Annually, the net accretions/depletions has ranged from about 1.0 MAF (in 1977) to over 20 MAF (1983). The range of this quantity, in addition to the scope and complexity of the processes within the Sacramento Valley add to the problems of forecasting accretions/depletions accurately. Fortunately, certain predictable tendencies help to characterize the accretions/depletions. Furthermore, operational considerations limit the range of accretions which have any practical effect on project operations to periods of Delta balanced conditions. When Excess conditions exist, the projects are storing and exporting as much water as possible. Thus the accuracy of the estimate of accretions/depletions is significant to project operations only within the range that is associated with the projects capability to respond operationally.

Forecasts of Delta requirements are perhaps the most difficult to make. There are so many factors that can influence conditions in the Delta that it is unlikely that any forecast will succeed in correctly identifying them all. For example, there are four major water export locations in the Delta, but literally hundreds of minor exporters. There are forecasted tide tables, but no long-term forecasts of barometric pressure, which can affect the magnitude of the tide; and there are no long-term forecasts of daily meteorological events. Despite the inaccuracies, forecasts of Delta requirements are necessary. Without them, planning for upstream reservoir operations and south of the Delta water deliveries would be impossible and the reliability of the projects would be compromised. Table 6 includes monthly totals for the Sacramento River accretion/depletions.

**Table 5. Net Delta Outflow Index  
2002**

(in cfs-days except as noted)

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	45,994	11,223	12,671	10,478	13,171	9,474	5,202	4,898	2,639	5,013	4,528	3,841
2	48,408	10,676	11,891	10,378	13,113	7,762	4,381	4,614	2,642	4,670	4,608	3,498
3	56,687	10,140	11,602	9,431	12,217	7,218	3,710	4,077	3,075	4,831	4,221	3,664
4	54,663	9,814	11,663	9,331	12,244	5,959	4,665	3,623	3,099	4,484	4,824	3,778
5	68,832	9,170	11,585	10,172	11,579	6,232	4,585	4,570	3,378	4,890	5,725	4,490
6	101,787	8,938	11,140	9,713	11,116	6,276	4,579	4,207	3,902	4,654	7,134	4,932
7	103,539	8,758	14,871	9,279	10,493	5,830	4,867	4,700	3,731	4,803	5,708	5,538
8	85,547	9,876	19,178	9,713	11,115	5,468	5,369	4,526	3,845	4,417	12,863	6,024
9	75,425	10,072	22,693	9,627	10,898	6,018	5,442	4,120	3,111	3,736	24,108	6,322
10	62,320	9,860	24,411	10,197	10,818	5,206	4,510	3,715	3,558	3,576	26,404	6,248
11	54,771	9,875	27,263	10,374	10,553	4,874	4,442	3,462	2,656	3,541	22,935	7,415
12	50,955	10,244	23,916	10,065	10,444	5,024	4,317	3,208	2,717	4,451	20,770	7,385
13	45,717	8,286	23,857	10,356	10,798	4,671	4,914	3,549	3,090	4,116	13,820	6,502
14	39,522	8,340	22,179	10,097	10,532	5,872	4,651	3,541	3,610	3,946	5,807	9,460
15	32,623	9,192	19,938	14,071	10,679	6,769	4,853	3,000	3,155	3,804	4,897	20,188
16	26,734	9,497	16,557	16,071	10,647	6,970	5,614	3,281	3,390	3,746	3,998	21,446
17	23,714	10,626	14,728	16,373	10,691	7,222	5,462	3,243	3,984	3,682	3,487	57,225
18	21,379	12,824	15,462	16,371	10,905	7,101	5,425	3,347	3,690	3,813	3,476	53,859
19	19,417	11,824	14,722	16,753	11,834	6,611	5,516	3,451	3,712	4,146	4,245	50,910
20	17,876	11,898	13,435	16,028	13,341	6,567	5,471	3,082	4,584	4,256	2,637	55,709
21	15,924	13,511	12,394	15,218	18,587	6,685	4,263	4,048	5,534	3,751	3,317	60,034
22	14,478	15,455	11,600	14,556	23,309	8,313	4,383	4,113	5,316	3,604	3,664	48,452
23	13,580	22,666	15,169	14,147	23,810	7,121	5,281	3,841	5,249	3,069	4,007	45,367
24	12,176	23,677	19,061	13,094	23,593	8,347	5,643	3,954	5,207	3,962	4,073	47,532
25	11,495	19,805	21,907	11,842	22,793	8,737	5,932	3,089	4,844	3,919	3,973	43,767
26	10,563	17,296	24,987	12,068	17,291	7,279	6,162	2,585	4,927	3,928	3,896	34,749
27	11,253	15,502	24,175	12,213	14,930	7,030	6,054	2,589	4,173	3,789	3,816	31,331
28	12,025	13,687	19,919	12,167	13,951	7,107	5,858	2,726	4,724	3,531	3,805	26,669
29	11,890		15,086	12,731	12,784	7,664	5,771	2,717	5,587	3,852	3,856	28,515
30	11,644		12,011	12,674	12,473	8,672	6,743	2,688	4,642	4,375	3,517	39,298
31	11,239		10,350		11,444		6,783	2,603		4,643		44,653
Total	1,172,177	342,732	530,421	365,588	422,153	204,079	160,848	111,167	117,771	126,998	224,119	788,801
Ave.	37,812	12,240	17,110	12,186	13,618	6,803	5,189	3,586	3,926	4,097	7,471	25,445
Max.	103,539	23,677	27,263	16,753	23,810	9,474	6,783	4,898	5,587	5,013	26,404	60,034
Min.	10,563	8,286	10,350	9,279	10,444	4,671	3,710	2,585	2,639	3,069	2,637	3,498
Total In AF	2,325,013	679,809	1,052,090	724,376	837,340	404,791	319,042	220,500	233,599	252,214	444,540	1,564,587

Annual Total = 9,057,901 acre-feet

**Table 6. Sacramento Basin and Sacramento-San Joaquin Delta Operations  
2002**

(in thousands of acre-feet except as noted)

Month	Upstream Reservoir Releases to River			Sacramento River Accretions or Depletions <sup>2/</sup>	Delta Inflow				Net Delta Consumptive Use	Delta Exports					Net Delta Outflow Index
	Keswick <sup>1/</sup>	Oroville <sup>1/</sup>	Nimbus		Sacramento River at Sacramento <sup>3/</sup>	Miscellaneous Inflows <sup>4/</sup>	San Joaquin River at Vernalis	Total Inflow		Clifton Court Forebay Intake <sup>5/</sup>	Barker Slough Pumping Plant	Tracy Pumping Plant	Contra Costa Pumping Plant	Total Exports	
Jan	422	36	93	2,016	2,404	347	172	2,924	-67	398	1	254	13	666	2,325
Feb	222	32	83	655	1,027	41	105	1,173	7	276	1	200	9	486	680
Mar	333	36	178	744	1,329	63	131	1,523	-37	239	2	257	10	508	1,052
Apr	289	34	216	308	884	64	152	1,100	107	123	3	127	14	268	725
May	549	54	160	4	805	61	176	1,042	102	38	5	53	7	102	838
Jun	720	156	159	-259	822	31	86	939	223	130	6	151	24	310	405
Jul	897	316	203	-296	1,163	18	79	1,260	268	379	6	267	20	673	319
Aug	727	253	120	-84	1,061	15	71	1,147	233	416	6	266	6	694	220
Sep	470	186	89	41	820	12	69	901	157	246	5	254	5	511	233
Oct	425	110	93	-38	624	13	95	732	115	107	4	251	4	366	251
Nov	364	82	94	139	714	20	97	831	-26	187	4	218	4	412	445
Dec	294	78	101	1,124	1,711	86	118	1,914	-116	256	2	205	3	465	1,565
<b>Total</b>	<b>5,712</b>	<b>1,373</b>	<b>1,589</b>	<b>4,354</b>	<b>13,365</b>	<b>770</b>	<b>1,351</b>	<b>15,487</b>	<b>966</b>	<b>2,794</b>	<b>46</b>	<b>2,503</b>	<b>119</b>	<b>5,462</b>	<b>9,059</b>

1/ Time lagged values (Keswick: 5 days; Oroville: 3 days).

2/ Positive values are accretions; negative values are depletions.

3/ These values are based on a measured daily average taken from the Sacramento River at Freeport and include Sacramento County Regional Waste Treatment Plant.

4/ Includes Yolo Bypass, Eastside Streams, and Miscellaneous Inflows.

5/ Includes Byron Bethany Diversion Canal.

Figure 7. Delta Tide, Inflow, and Outflow Index  
2002

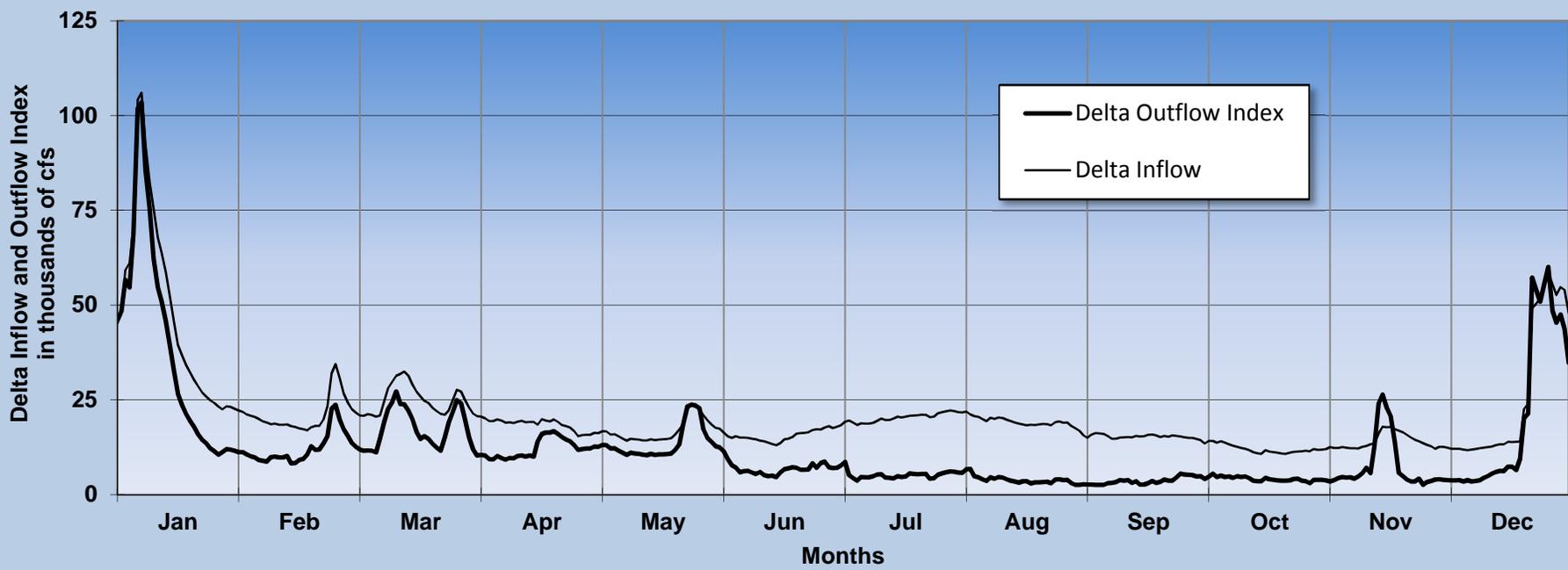
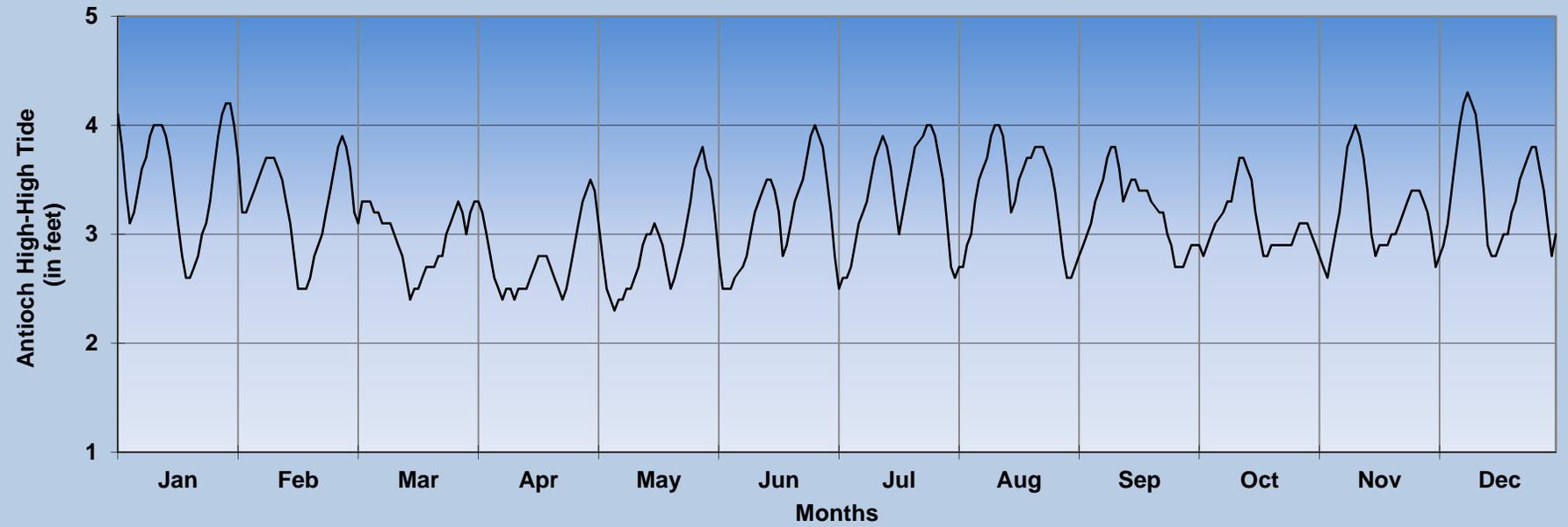
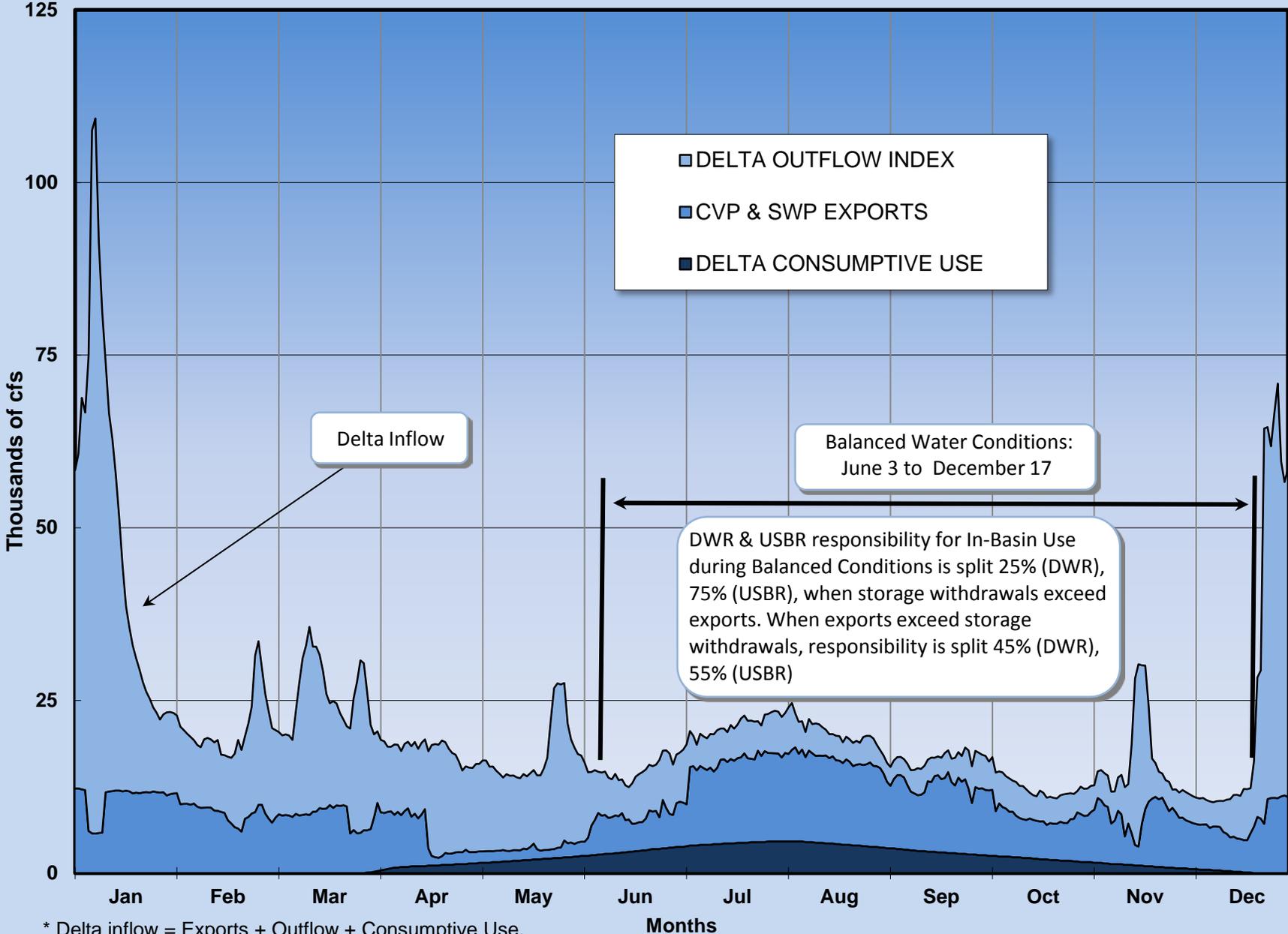


Figure 8. Coordinated Delta Operations  
2002



**Figure 9. Coordinated Delta Operations  
Lagged Storage Withdrawals  
2002**

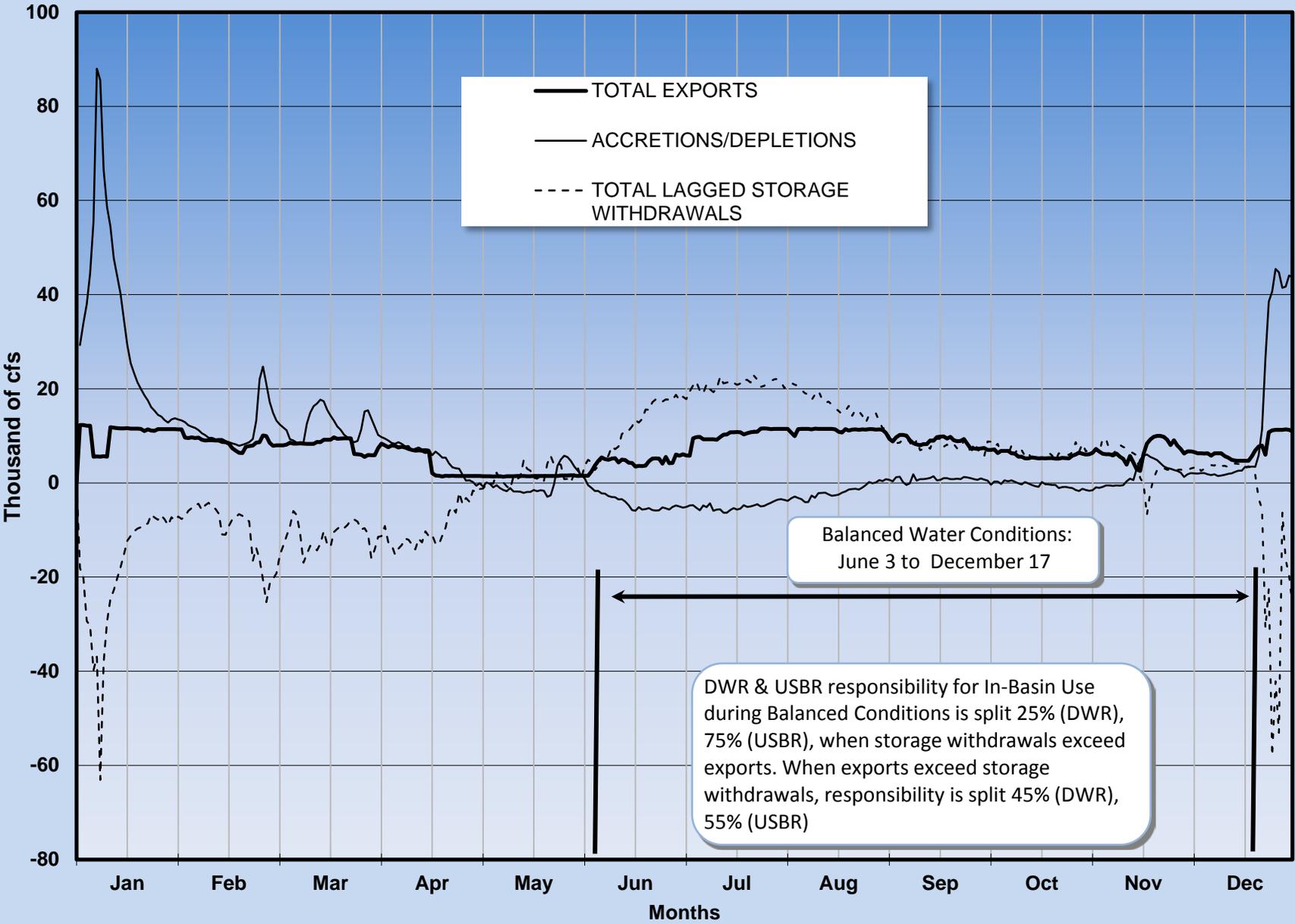
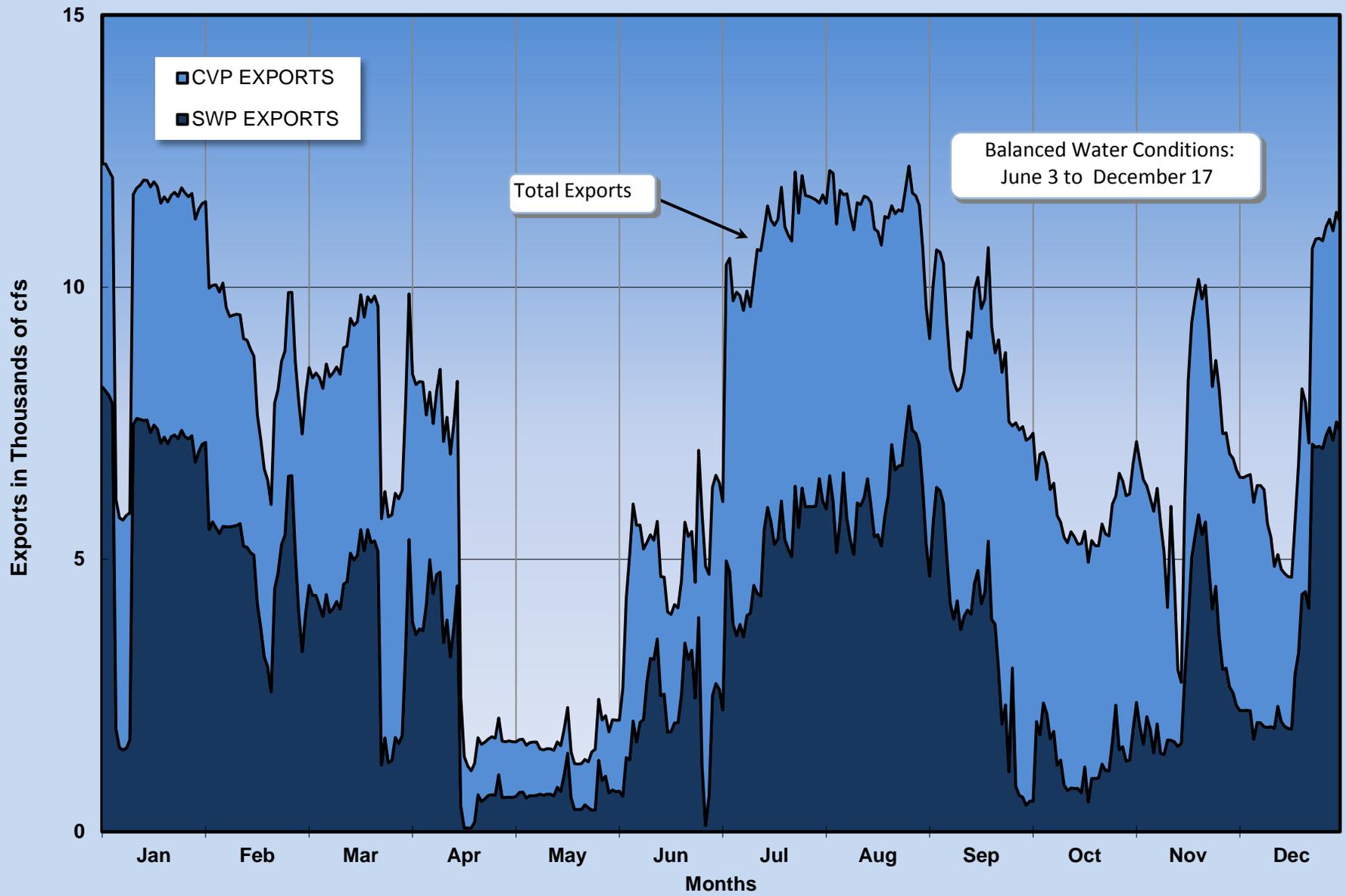


Figure 10. Coordinated Delta Operations  
SWP and CVP Exports  
2002



# *Project Operations by Field Division*

## *Oroville Field Division*

### *Water Storage*

SWP water storage facilities in the Oroville Field Division include Lake Oroville, Thermalito Forebay and Afterbay (Oroville-Thermalito Complex) and upper Feather River reservoirs consisting of Lake Davis, Frenchman Lake, and Antelope Lake. Lake Oroville operations store winter and spring runoff for later SWP use for power generation, flood control, recreation, fish and wildlife enhancement, in addition to water supply.

The Upper Feather River Reservoirs have a combined capacity of 162,000 AF. Monthly operations for the three Upper Feather River reservoirs are presented in Table 7. The table below compares storage capacity with the largest end-of-month storage for each reservoir for the last five years:

Year	Reservoir		
	Antelope (Capacity: 22,566)	Frenchman (Capacity: 55,477)	Davis (Capacity: 84,371)
2002	(Apr) 23,333	(May) 34,823	(Apr) 52,349
2001	(May) 18,075	(Apr) 42,821	(Mar) 57,491
2000	(Apr) 23,409	(Apr) 54,627	(Apr) 71,573
1999	(May) 23,437	(Apr) 57,555	(May) 80,204
1998	(Apr) 24,030	(Apr) 56,894	(Jun) 74,142

The total amount of unimpaired runoff to Lake Oroville for the 2001-02 water year totaled about 3.08 MAF, (65 percent of average). Lake Oroville storage at the beginning of 2002 was 1,662,240 AF (46 percent of normal maximum operating capacity). Storage peaked on April 28, 2002 at 2,659,224 AF, (75 percent of normal maximum operating capacity). Lowest storage in Lake Oroville in 2002 was 1,182,694 (33 percent of normal maximum operating capacity) on December 12.

Lake Oroville's computed inflow is tabulated in Table 8 and plotted along with releases, diversions, and storage withdrawals on Figure 11. A ten-year historical summary of Lake Oroville's storage and inflow is illustrated on Figure 12.

Water temperatures on and below the lake's surface are monitored very closely throughout the year at various locations around the lake. Two intakes to the power plant have shutters that control the depth from which water enters the plant. The temperature of water entering the fish hatchery can then be controlled by adding or removing shutters as necessary. A complete illustration of water temperature and intake operation is shown on Figure 14.

### *Water Deliveries*

Project water stored in the Upper Feather Area Lakes flows into Lake Oroville through the North and Middle Forks of the Feather River. Prior water rights deliveries from Frenchman Lake totaled 9,903 AF of local supply to Last Chance Creek WD, 586 AF to land owners Valverdi-Romelli, and 61 AF to Plumas County were made out of Lake Davis (Non-project).

Water stored in Lake Oroville is released into the Thermalito Diversion Dam Pool, from which specified quantities are released into both the Feather River and the Thermalito Power Canal. The power canal supplies water first to the Thermalito Forebay and then to Thermalito Afterbay. From the Thermalito Afterbay, additional water is released to the Feather River and several local distribution systems used to deliver water to prior water right holders. These deliveries are collectively called the Feather River Service Area (FRSA) diversions. FRSA diversions are not considered SWP benefits, as they predate the SWP construction, and would have occurred in the absence of the SWP to the limit of available natural river flows.

Total deliveries in the Oroville Field Division were 1,135,178 AF in 2002. Included in this amount were deliveries of Local Supply to Thermalito Irrigation District of 2,389 AF, Upper Feather River Local Supply of 647 AF, Last Chance WD of 9,903 AF, Table A water to Yuba City of 1,170 AF, County of Butte of 419 AF, Recreation of 4 AF, and FRSA prior water right deliveries totaling 1,120,646 AF. All FRSA prior water right deliveries are detailed below:

Sutter Butte Canal	619,790
Richvale Canal	156,550
Sunset Pumps	10,790
Western Canal Lateral	4,200
Western Canal	295,012
Tudor Mutual	3,514
Garden Highway	15,658
Plumas Mutual	7,955
Oswald Water District	287
Dana Brothers	1,058
Palermo Canal	5,812
<b>Total in AF</b>	<b>1,120,646</b>

Table 2 shows a breakdown of total deliveries by agency, Map 3 shows a breakdown by water type.

**Table 7. Upper Feather Area Lakes Monthly Operation**

**2002**

(in acre-feet except as noted)

Month	Lake Storage			Outflow						Inflow	
	Water Surface Elevation (in feet)	End of Month Storage	Storage Change	Regulated Release			Total Regulated Release	Spill	Estimated Evaporation and Seepage	Total Outflow	Computed Inflow
				Stream-Flow Maint.	Prior Water Rights						
				Local Supply	Non-Project						
<b>Antelope Lake</b> Capacity 22,566 acre-feet											
Jan	4993.33	15,317	723	307	0	0	307	0	51	358	1,081
Feb	4994.69	16,344	1,027	278	0	0	278	0	59	337	1,364
Mar	4997.69	18,754	2,410	307	0	0	307	0	96	403	2,813
Apr	5002.69	23,210	4,456	149	0	0	149	2,110	181	2,440	6,896
May	5002.36	22,900	-310	0	0	0	0	3,138	301	3,439	3,129
Jun	5000.97	21,620	-1,280	1,055	0	0	1,055	264	414	1,733	453
Jul	4998.89	19,773	-1,847	1,230	0	0	1,230	0	727	1,957	110
Aug	4996.71	17,945	-1,828	1,230	0	0	1,230	0	629	1,859	31
Sep	4994.77	16,406	-1,539	1,071	0	0	1,071	0	498	1,569	30
Oct	4992.72	14,869	-1,537	1,131	0	0	1,131	0	412	1,543	6
Nov	4991.56	14,040	-829	1,190	0	0	1,190	0	114	1,304	475
Dec	4991.38	13,914	-126	1,230	0	0	1,230	0	78	1,308	1,182
Total	---	---	-680	9,178	0	0	9,178	5,512	3,560	18,250	17,570
<b>Frenchman Lake</b> Capacity 55,477 acre-feet											
Jan	5568.69	29,945	660	123	0	0	123	0	75	198	858
Feb	5569.41	30,723	778	111	0	0	111	0	75	186	964
Mar	5570.99	32,474	1,751	123	0	0	123	0	133	256	2,007
Apr	5572.93	34,716	2,242	117	30	0	147	0	214	361	2,603
May	5570.72	32,171	-2,545	0	2,985	0	2,985	0	382	3,367	822
Jun	5567.47	28,654	-3,517	0	2,815	0	2,815	0	882	3,697	180
Jul	5565.14	26,285	-2,369	0	1,702	0	1,702	0	729	2,431	62
Aug	5562.60	23,835	-2,450	0	1,714	0	1,714	0	798	2,512	62
Sep	5561.70	23,010	-825	14	498	0	512	0	373	885	60
Oct	5560.95	22,318	-692	67	127	0	194	0	544	738	46
Nov	5561.21	22,553	235	119	32	0	151	0	145	296	531
Dec	5562.07	23,342	789	123	0	0	123	0	100	223	1,012
Total	---	---	-5,943	797	9,903	0	10,700	0	4,450	15,150	9,207
<b>Lake Davis</b> Capacity 84,371 acre-feet											
Jan	5763.89	46,037	657	615	0	0	615	0	199	814	1,471
Feb	5764.17	46,845	808	555	0	0	555	0	230	785	1,593
Mar	5765.35	50,336	3,491	615	0	0	615	0	354	969	4,460
Apr	5765.96	52,195	1,859	581	0	0	581	0	609	1,190	3,049
May	5765.65	51,245	-950	553	61	0	615	0	1,011	1,626	676
Jun	5764.94	49,107	-2,138	544	0	51	595	0	1,954	2,549	411
Jul	5764.08	46,584	-2,523	369	0	239	608	0	1,965	2,573	50
Aug	5763.20	44,083	-2,501	417	0	198	615	0	1,917	2,532	31
Sep	5762.43	41,962	-2,121	501	0	94	595	0	1,556	2,151	30
Oct	5761.84	40,379	-1,583	592	0	4	596	0	1,079	1,675	92
Nov	5761.93	40,618	239	595	0	0	595	0	425	1,020	1,259
Dec	5762.69	42,671	2,053	615	0	0	615	0	297	912	2,965
Total	---	---	-2,709	6,551	61	587	7,200	0	11,596	18,796	16,087

**Table 8. Lake Oroville Monthly Operation  
2002**

(in acre-feet except as noted)

Capacity 3,537,577 acre-feet

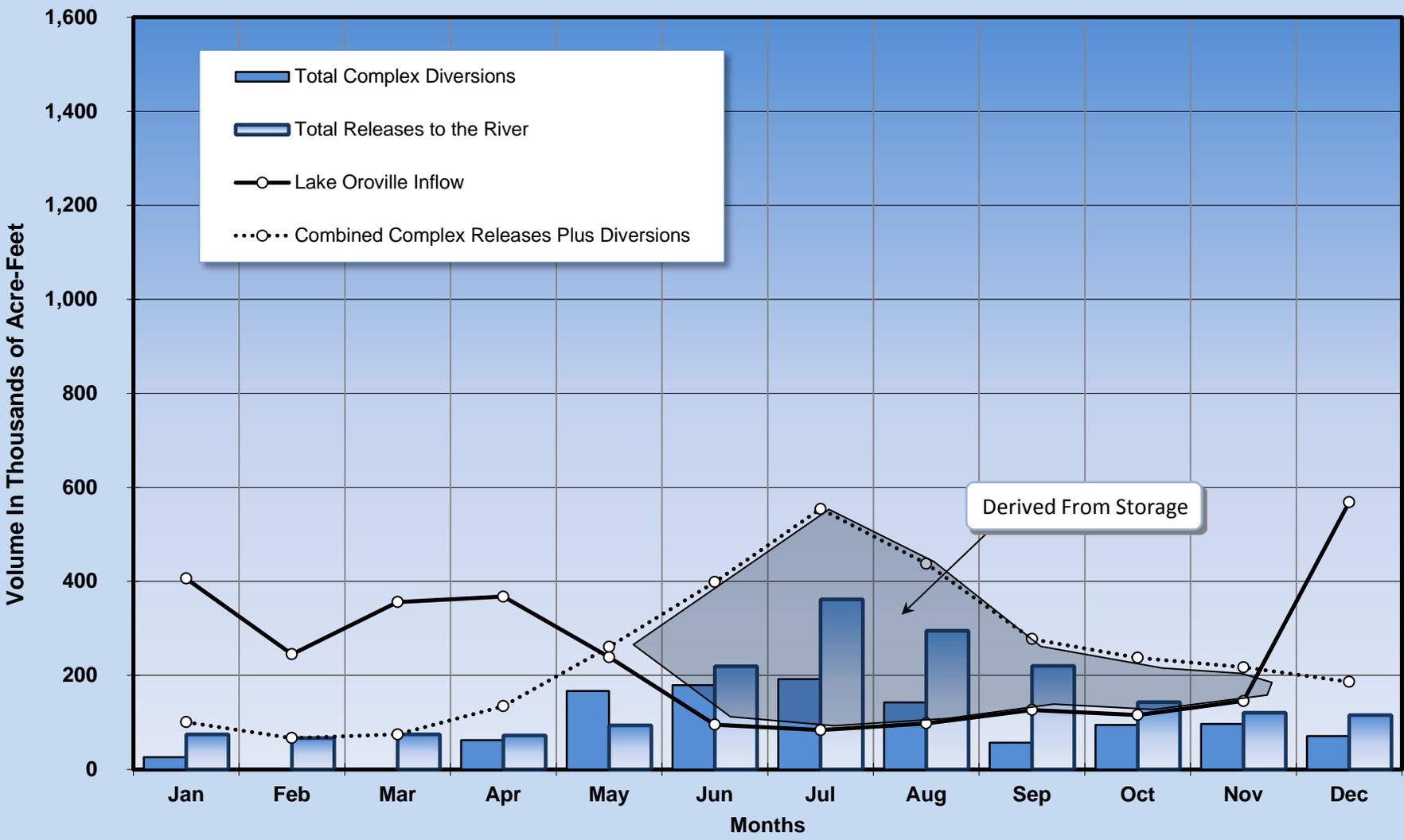
Month	Water Surface Elevation (in feet)	Storage	Storage Change	Outflow					Hyatt Pumpback	Computed Inflow 3/
				Hyatt Generation 1/	Palermo Canal	Evaporation	Spill 2/	Total Outflow		
Jan	774.37	1,915,916	320,034	108,932	14	946	0	109,892	23,600	406,326
Feb	793.58	2,120,159	204,243	58,635	0	1,338	0	59,973	19,127	245,089
Mar	819.11	2,414,816	294,657	80,053	0	2,818	0	82,871	21,336	356,192
Apr	838.66	2,659,095	244,279	142,965	217	4,015	6	147,203	23,707	367,775
May	837.14	2,639,509	-19,586	267,611	822	6,282	0	274,715	16,168	238,961
Jun	814.00	2,353,690	-285,819	373,297	835	8,809	0	382,941	1,804	95,318
Jul	771.15	1,883,126	-470,564	544,626	979	8,649	0	554,254	0	83,690
Aug	734.74	1,539,412	-343,714	433,763	985	7,010	0	441,758	0	98,044
Sep	718.30	1,399,662	-139,750	259,062	995	6,341	0	266,398	0	126,648
Oct	703.34	1,280,304	-119,358	202,806	942	3,803	27,678	235,229	0	115,871
Nov	696.41	1,227,434	-52,870	145,230	34	1,792	51,614	198,670	0	145,800
Dec	744.23	1,624,336	396,902	169,034	0	738	2,087	171,859	0	568,761
<b>Total</b>	---	---	28,454	2,786,014	5,823	52,541	81,385	2,925,763	105,742	2,848,475

1/ Includes bypass flows.

2/ During October, November, and December water was released through the river valves for temperature control.

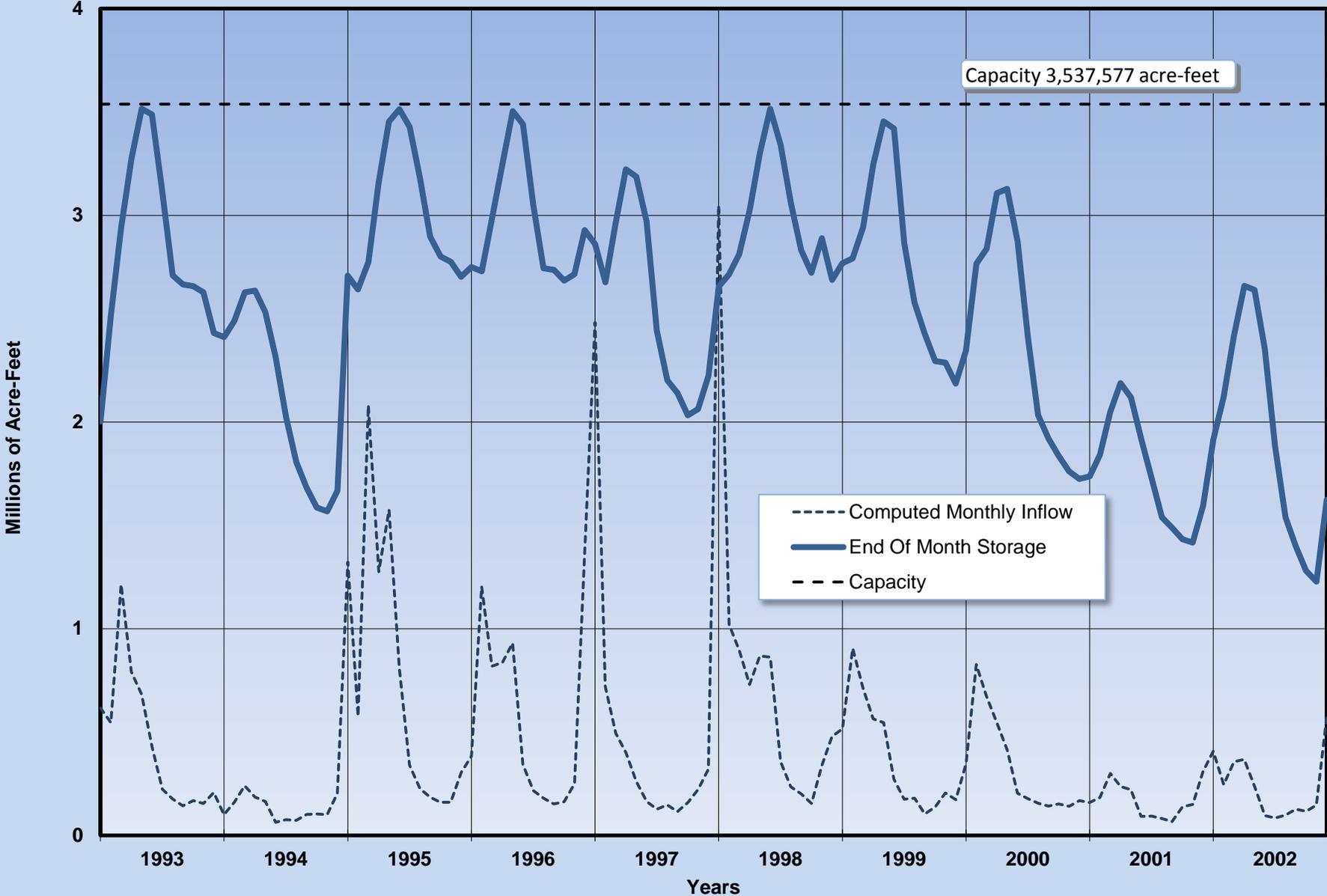
3/ Does not include pumpback.

**Figure 11. Oroville-Thermalito Complex**  
 Inflow, Releases, and Diversions  
**2002**



Note: Releases include flows at fish barrier dam, fish hatchery, and afterbay river outlet. Diversions include Butte County, Thermalito Irrigation District, Sutter Butte Canal, Western Lateral, Richvale Canal, Sunset Pumps, and Western Canal. The area between the plotted lines above the Inflow line represents amounts derived from storage.

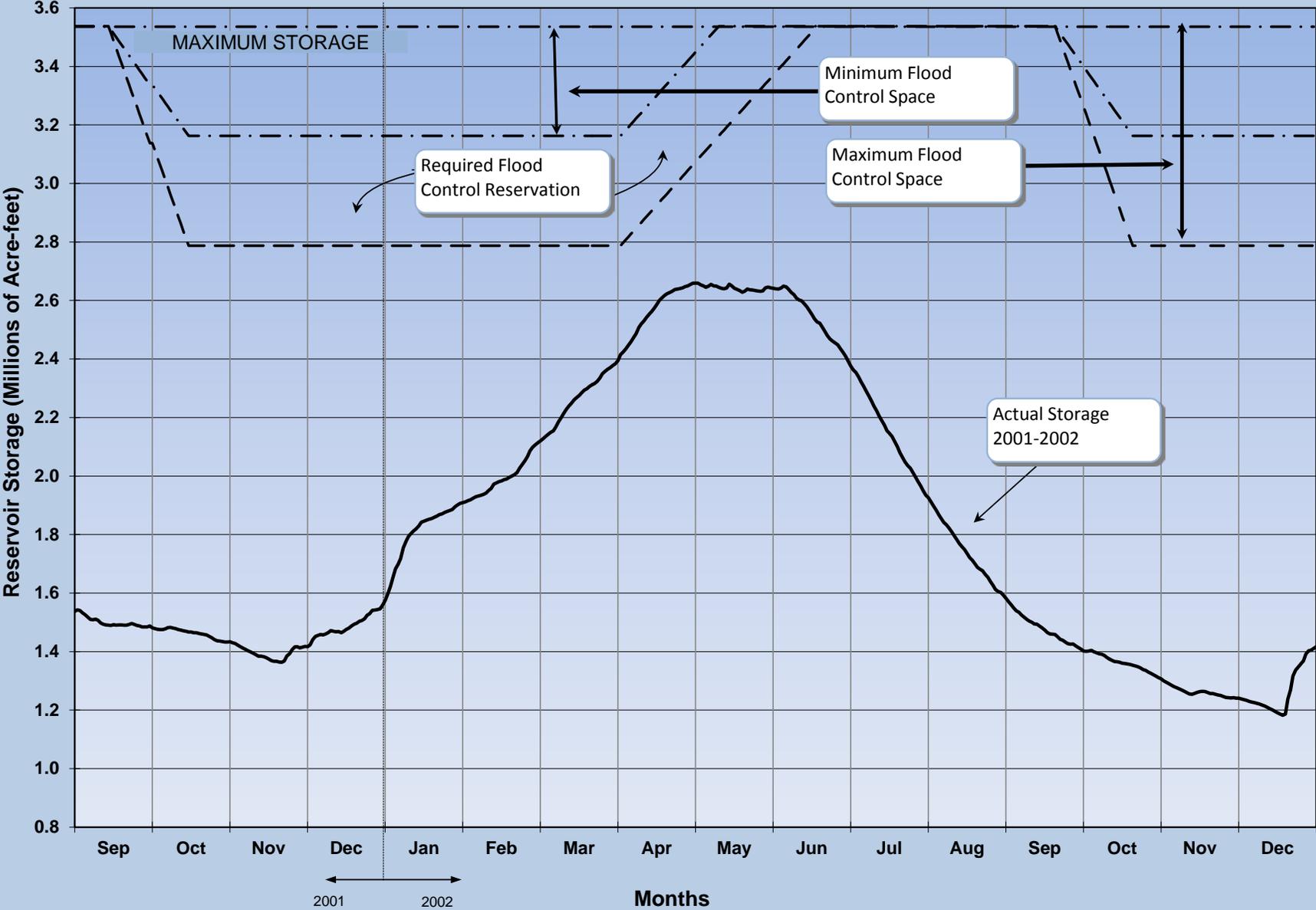
Figure 12. 10-Year Summary of Lake Oroville Operation



\* Excludes pumpback.

Figure 13. Operation of Lake Oroville for Flood Control

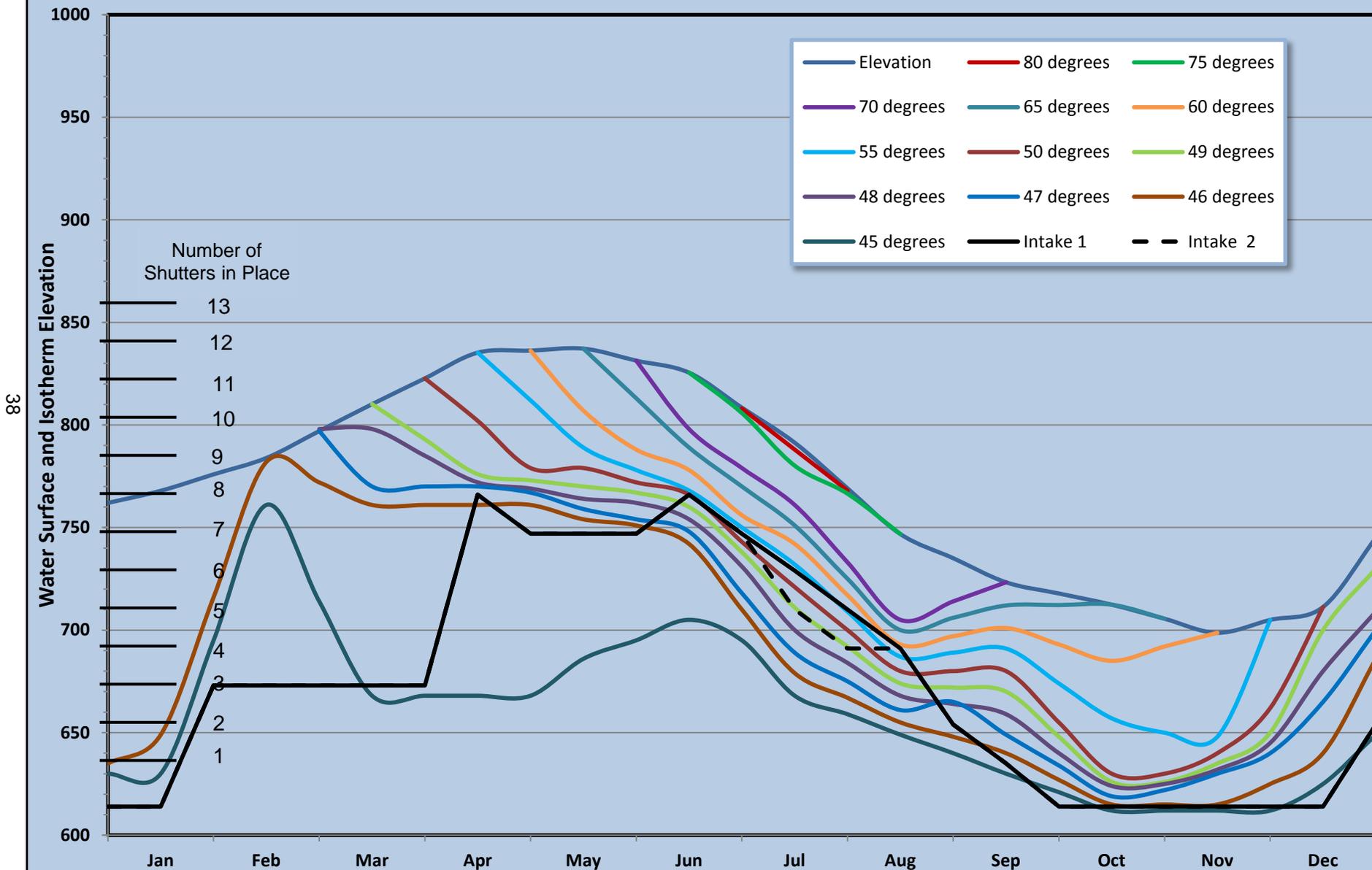
2001-2002



### Figure 14. Lake Oroville Temperatures

2002

( isotherms in degrees Farenheit )



Note: Temperature data is taken once per month and averaged for the rest of the year.

**Table 9. Thermalito Forebay Monthly Operation  
2002**

Including Diversion Pool and Power Canal  
(end of month storage in acre-feet)

Month	Storage 1/	Storage Change	Inflow			Outflow					Losses (-) And Gains (+)
			Lake Oroville Releases 2/	Kelly Ridge Generation	Thermalito Pumpback	Thermalito Generation 3/	Butte County	Thermalito Irrigation District	Releases To River 4/	Hyatt Powerplant Pumpback	
Jan	23,257	-937	108,932	12,926	25,168	91,615	67	0	38,643	23,600	5,962
Feb	25,045	1,788	58,635	14,257	19,375	37,985	15	0	34,387	19,127	1,035
Mar	23,908	-1,137	80,053	15,767	25,335	66,113	1	33	38,719	21,336	3,910
Apr	23,874	-34	142,971	14,789	29,271	123,366	15	180	37,586	23,707	-2,211
May	23,884	10	267,611	15,447	19,595	251,214	39	261	38,229	16,168	3,268
Jun	24,026	142	373,297	14,914	1,832	354,822	41	378	37,950	1,804	5,094
Jul	23,362	-664	544,626	15,295	0	526,214	48	448	44,080	0	10,205
Aug	23,742	380	433,763	11,838	0	402,502	59	390	49,133	0	6,863
Sep	24,183	441	259,062	2,823	0	223,431	59	313	37,900	0	259
Oct	24,554	371	230,484	9,607	0	209,819	7	248	39,100	0	9,454
Nov	23,975	-579	196,844	14,218	0	178,762	23	138	37,680	0	4,962
Dec	24,421	446	171,121	15,739	0	157,254	46	0	38,740	0	9,626
<b>Total</b>	<b>---</b>	<b>227</b>	<b>2,867,399</b>	<b>157,620</b>	<b>120,576</b>	<b>2,623,097</b>	<b>420</b>	<b>2,389</b>	<b>472,147</b>	<b>105,742</b>	<b>58,427</b>

1/ Sum of Thermalito Forebay and Diversion Pool.

2/ Sum of releases from Lake Oroville through Hyatt plant, spill, and spillway leakage.

3/ Includes bypass flows.

4/ Sum of Diversion Dam generation plus Hatchery.

**Table 10. Thermalito Afterbay Monthly Operation  
2002**

(end of month storage in acre-feet)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow	Outflow						Losses (-) And Gains (+)
				Thermalito Generation 1/	Sutter Butte Canal	Western Canal Lateral	Richvale Canal	Western Canal	River Outlet	Thermalito Pumpback	
Jan	133.18	43,529	4,227	91,615	17,820	5	8,050	292	35,890	25,168	-163
Feb	128.74	28,093	-15,436	37,985	0	0	0	0	32,360	19,375	-1,686
Mar	129.67	31,064	2,971	66,113	0	0	0	0	35,875	25,335	-1,932
Apr	128.55	27,504	-3,560	123,366	35,870	232	8,600	16,060	34,691	29,271	-2,202
May	130.92	35,277	7,773	251,214	89,470	609	19,230	52,980	55,497	19,595	-6,060
Jun	127.54	24,470	-10,807	354,822	96,770	894	23,250	55,560	181,448	1,832	-5,875
Jul	130.45	33,663	9,193	526,214	101,400	1,040	26,040	61,320	317,752	0	-9,469
Aug	133.10	43,223	9,560	402,502	87,060	765	16,870	37,130	245,851	0	-5,266
Sep	128.16	26,312	-16,911	223,431	44,700	12	5,990	5,980	182,340	0	-1,320
Oct	128.62	27,720	1,408	209,819	51,890	155	20,560	21,700	103,934	0	-10,172
Nov	125.98	20,119	-7,601	178,762	52,360	382	13,920	29,800	82,929	0	-6,972
Dec	128.40	27,042	6,923	157,254	42,450	106	14,060	14,190	76,820	0	-2,705
<b>Totals</b>			<b>-12,260</b>	<b>2,623,097</b>	<b>619,790</b>	<b>4,200</b>	<b>156,570</b>	<b>295,012</b>	<b>1,385,387</b>	<b>120,576</b>	<b>-53,822</b>

1/ Includes bypass flows.

## ***Delta Field Division***

### ***Water Storage***

The Delta Field Division consists of the North Bay Aqueduct, the South Bay Aqueduct, and the California Aqueduct from Clifton Court Forebay to Check 12. Along these waterways, water storage operations take place at Clifton Court Forebay, Bethany Reservoir, Travis Tank, Napa Terminal Tank, the California Aqueduct, and Lake Del Valle. Water storage data at the South Bay Aqueduct are not reported; storage changes are assumed to be zero for operational purposes.

Pumping from Lake Del Valle back into the Aqueduct usually occurs in the fall and is detailed in Table 11. Storage in Lake Del Val reached a maximum of 39,928 AF (52 percent of maximum operating capacity) on June 5, 2002, and a minimum of 26,438 AF (34 percent of maximum operating capacity) on December 13. Inflow and storage changes for the last ten years at Lake Del Valle are shown on Figure 15. Losses for 2002 totaled 2,577 AF.

Project water flows from the Delta into Clifton Court Forebay through the Clifton Court control gates. A schedule of daily gate operation is published in the *SWP Monthly Report of Operations*. In 2002, 2,821,045 AF flowed into Clifton Court Forebay. Monthly inflows to Clifton Court Forebay along with corresponding storage changes are shown in Table 12.

### ***Water Deliveries***

The North Bay Aqueduct system, completed in May 1988, begins in the North Delta at the Barker Slough Facilities. Sacramento River water is conveyed to the Barker Slough PP. From the pumping plant, water is conveyed by pipe for 24 miles to contractors in Napa and Solano Counties and to the Cordelia PP. Deliveries are made to Solano County water users via turnouts along the pipe's length. From the Cordelia PP, the North Bay Aqueduct terminates at the Napa Terminal Tank. The Aqueduct supplied 45,435 AF to Napa and Solano counties.

The South Bay Aqueduct system, 43 miles long, begins at South Bay PP and terminates at the Santa Clara Terminal Reservoir. South Bay PP exports project water flowing through Bethany reservoir. In 2002, this system supplied 132,261 AF of deliveries to Zone 7, Alameda Co. WD., and Santa Clara WD.

The California Aqueduct, beginning at Banks through Check 12, delivered 6,526 AF of Project and CVP water in the Delta Field Division to Oak Flat, Western Hills, Musco Olive, VA Cemetery, and Tracy Golf.

Total deliveries in the Delta Field Division were 184,368 AF in 2002. Included were 149,661 AF to SWP Table A contractors, 8,782 AF of Local Water to Alameda Co. FC&WCD, Zone 7, and to Alameda County WD, 868 AF of Federal Wheeling to Musco Olive, Tracy Golf Course, and the V. A. Cemetery, 2,000 AF of General Wheeling to Alameda County Flood Control and Water Conservation District, Zone 7, 146 AF of Recreation water, and 22,911 AF to miscellaneous purchases, Article 21, permit water, carryover, and dry year purchase. These and other deliveries are summarized in Table 2.

### ***Pumping Plants***

Delta Field Division pumping plants include Barker Slough PP and Cordelia PP on the North Bay Aqueduct, Banks on the California Aqueduct, and South Bay and Del Valle PPs on the South Bay Aqueduct. Monthly pumping data is summarized for the year in Table 1.

Banks PP was originally built to accommodate 11 units. Initially, seven pumps were constructed for a total pumping capacity of 6,400 cfs. Construction of the final four pumps was completed in 1990, each with a design capacity of 1,067 cfs and a new total capacity of 10,500 cfs. Export pumping rates are increased on weekends to take advantage of less costly off-peak electricity. This produces sharp peaks in the export rate at about 7-day intervals. Pumping at Banks was curtailed to less than 1,000 AF per day from April 15 to June 1 to accommodate the Vernalis Adaptive Management Plan (VAMP) and concerns over Delta smelt salvage..

In 2002, the SWP diverted 2,792,269 AF of water at Banks PP, including 155,854 AF of CVP water and 51,894 AF of CVC water wheeled by the Department. Below is a five-year summary of federal, State, and total pumping at Banks:

Banks Pumping Plant			
Year	Federal And Other	State	Total
2002	207,748	2,584,521	2,792,269
2001	195,286	2,116,684	2,311,970
2000	235,119	3,500,533	3,735,652
1999	35,704	2,671,131	2,706,835
1998	28,087	1,659,323	1,687,410

**Table 11. Lake Del Valle Monthly Operation  
2002**

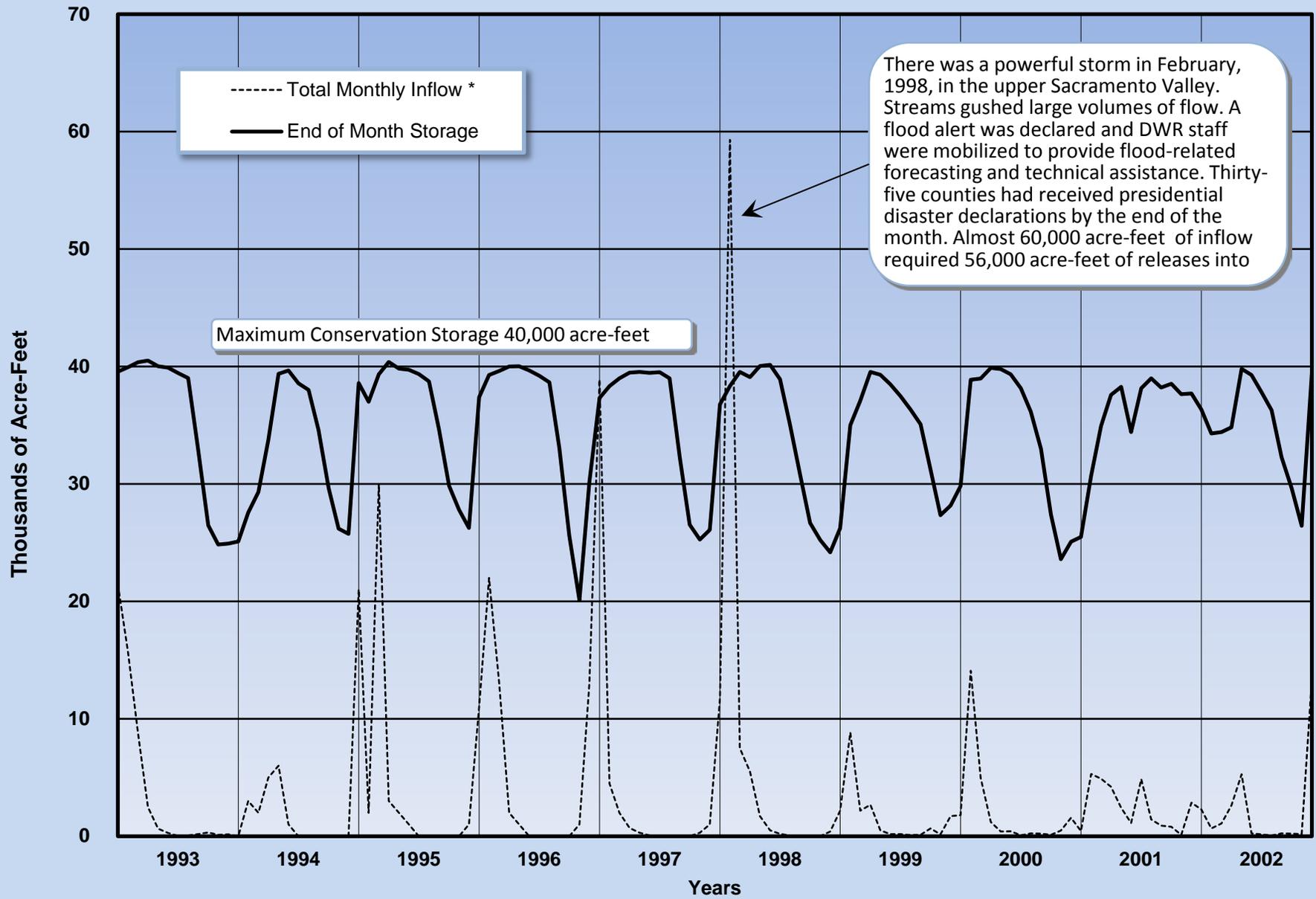
(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow		Outflow					Precipitation (inches)
				Natural 1/	From South Bay Aqueduct	Arroyo Valle	South Bay Aqueduct	Recreation Deliveries 2/	Evaporation	Total	
Jan	697.79	36,331	-1,366	2,273	0	503	3,063	3	70	3,639	1
Feb	694.69	34,303	-2,028	665	0	0	2,596	2	95	2,693	1
Mar	694.86	34,412	109	1,092	0	0	819	4	160	983	2
Apr	695.50	34,824	412	324	2,288	0	1,997	7	196	2,200	1
May	702.84	39,801	4,977	88	5,195	0	0	13	293	306	1
Jun	702.10	39,281	-520	45	189	0	331	23	400	754	0
Jul	700.00	37,827	-1,454	122	33	0	1,113	29	467	1,609	0
Aug	697.69	36,267	-1,560	57	0	0	1,164	26	427	1,617	0
Sep	691.47	32,278	-3,989	246	0	0	3,817	22	396	4,235	0
Oct	687.03	29,625	-2,653	212	0	0	2,608	12	245	2,865	0
Nov	681.26	26,438	-3,187	167	0	0	3,224	3	127	3,354	3
Dec	702.30	39,421	12,983	13,359	0	303	0	2	71	376	8
<b>Total</b>	---	---	1,724	18,650	7,705	806	20,732	146	2,947	24,631	16

1/ Total inflow from stream gaging station above Lang Canyon and accretions/depletions.

2/ To East Bay Regional Park District.

Figure 15. 10-Year Summary Lake Del Valle Operation



There was a powerful storm in February, 1998, in the upper Sacramento Valley. Streams gushed large volumes of flow. A flood alert was declared and DWR staff were mobilized to provide flood-related forecasting and technical assistance. Thirty-five counties had received presidential disaster declarations by the end of the month. Almost 60,000 acre-feet of inflow required 56,000 acre-feet of releases into

Maximum Conservation Storage 40,000 acre-feet

\* Natural and pumped inflows.

**Table 12. Clifton Court Forebay Monthly Operation  
2002**

Month	End of Month Water Surface Elevation In Feet	End of Month Storage In Acre-feet	Total Monthly Storage Change In Acre-feet	Total Monthly Inflow In Acre-feet
Jan	-0.64	16,886	559	397,576
Feb	0	18,780	1,894	276,378
Mar	0.05	18,371	-409	239,627
Apr	-1.11	15,876	-2,495	125,790
May	-1.47	15,102	-774	41,679
Jun	-0.47	17,252	2,150	134,813
Jul	-1.96	14,051	-3,201	383,721
Aug	-1.15	15,790	1,739	420,813
Sep	-0.91	16,305	515	249,889
Oct	-0.68	16,800	495	107,893
Nov	-0.84	16,456	-344	186,801
Dec	-0.02	18,220	1,764	256,105
<b>Total</b>	---	---	1,893	2,821,085

## *San Luis Field Division*

### *Water Storage*

San Luis Reservoir reached its maximum end-of-month storage for 2002, 2,027,963 AF (100 percent of maximum operating storage), at the end of March. Maximum operating storage capacity in San Luis is 2,027,835 AF. Minimum end-of-month storage for the year of 643,876 AF (32 percent of maximum operating storage) occurred in August. The State's share of San Luis Reservoir end-of-month storage reached the maximum of 1,074,297 AF in March (101 percent of State's maximum operating storage), and the minimum of 219,436 AF (21 percent of State's maximum operating storage) was reached in November. Table 13 and Figure 16 show San Luis Reservoir operations during 2002. Table 14 shows the monthly operation of O'Neill Forebay during 2002.

There are two accounting procedures for calculating storage shares in O'Neill Forebay. One calculates storage shares using actual SWP/USBR deliveries. The other method calculates storage shares in O'Neill using amounts pumped at Dos Amigos PP for each agency derived from scheduled energy. There is always a mis-match between actual Federal deliveries and scheduled amounts pumped with USBR energy to meet Federal deliveries. The differences are accumulated and carried over into subsequent months. These mismatches are used to "under-schedule" or "over-schedule" USBR energy and pumping at Dos Amigos to bring the mismatch back into alignment or closer to zero. The end-of-year mismatch at Dos Amigos was 1,765 AF over-pumped for 2002.

### *Pumping and Generating Plants*

Total pumping in 2002 at Gianelli Pumping-Generating Plant was 1,566,217 AF. Water released from San Luis Reservoir to O'Neill Forebay for generation was 1,766,439 AF. Total pumping at Dos Amigos PP in 2002 was 3,731,722 AF, about 1,253,667 AF less than was pumped in 2001. The total water pumped at Dos Amigos PP includes 50,638 AF of CVC water wheeled by SWP for Cross Valley Canal exchanges and transfers, 992,239 AF for the USBR, and 178,257 for the SWP. Table 15 summarizes joint-use plant activity on a monthly basis.

### *Water Deliveries*

Water deliveries in the San Luis Field Division during 2002 totaled 1,226,742 and included 1,083 AF of State and Federal deliveries to the DFG and the Department of Parks and Recreation (DPR) from the O'Neill Forebay and San Luis Reservoir (Reach 3 and 3A) and San Luis Canal (Reach 5). The following tabulation details the components of these recreation deliveries:

O'Neill Forebay and San Luis Reservoir (Reach 3 and 3A)			
	DPR	DFG	Total
State	11	551	562
Federal	8	450	458
Sub-total	19	1001	1020
Pools 16, 17, & 18 (Reach 5)			
	DPR	DFG	Total
State	0	35	35
Federal	0	28	28
Sub-total	0	63	63

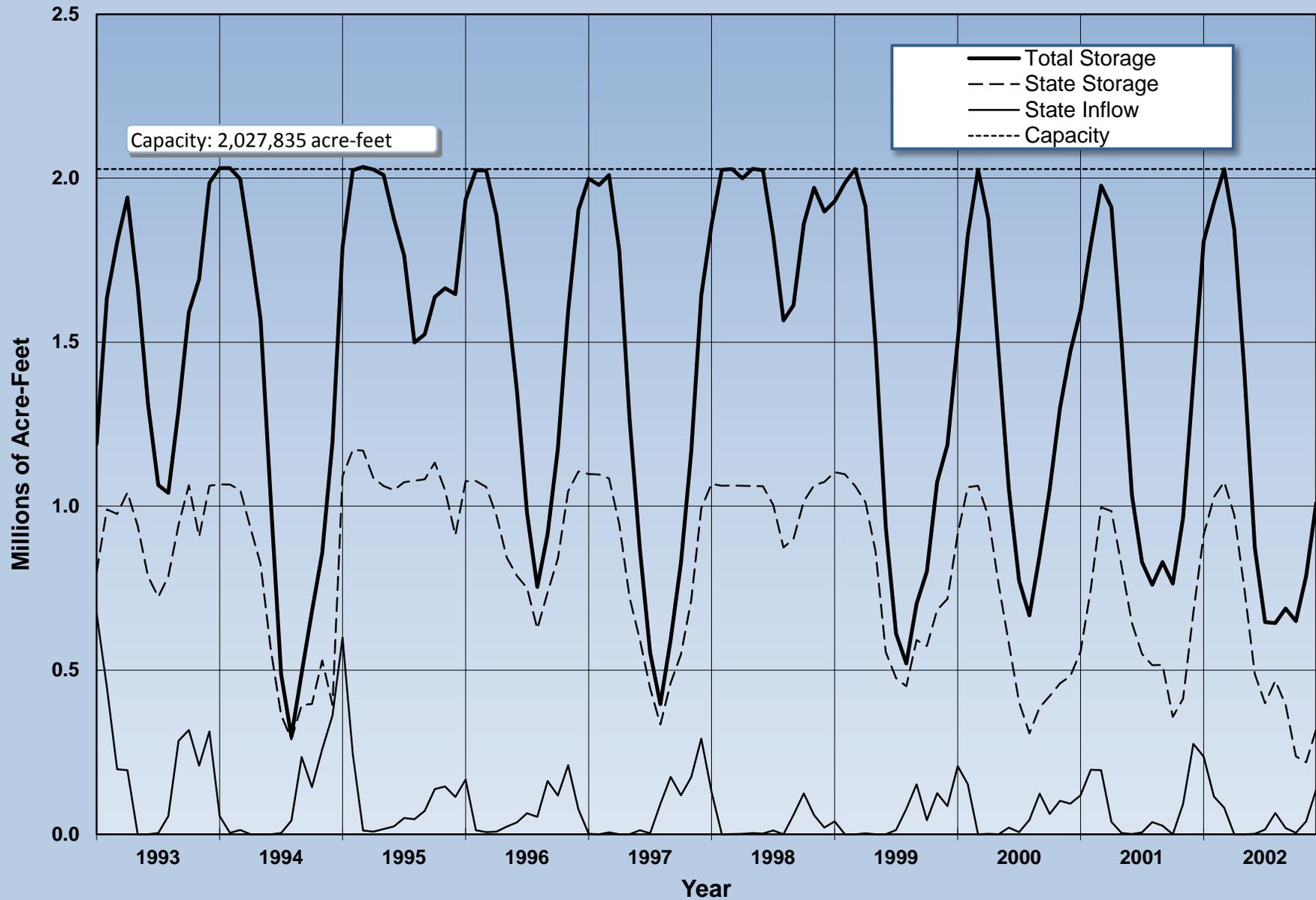
Also included were federal deliveries from the joint-use facilities totaling 1,225,616 AF, and 43 AF of non-chargeable water WWD.

**Table 13. San Luis Reservoir Monthly Operation  
2002**

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow	Outflow			Gain (+) And Loss (-)
				Gianelli P-G Plant Pumping	Gianelli P-G Plant Generation	Pacheco Tunnel	Parks and Recreation Deliveries	
Jan	525.28	1,807,066	421,434	431,449	0	9,043	0	-972
Feb	534.86	1,925,324	118,258	151,834	21,820	10,666	0	-1,090
Mar	543.01	2,027,963	102,639	121,724	6,598	9,905	1	-2,581
Apr	528.31	1,844,188	-183,775	2,179	174,392	13,875	1	2,314
May	490.76	1,402,950	-441,238	0	427,232	16,276	1	2,271
Jun	439.91	873,969	-528,981	1,200	522,507	14,320	2	6,648
Jul	414.97	646,887	-227,082	15,109	228,799	15,327	2	1,937
Aug	414.62	643,876	-3,011	68,198	47,559	15,271	2	-8,377
Sep	419.74	688,435	44,559	154,780	89,572	14,808	2	-5,839
Oct	415.30	649,730	-38,705	143,252	156,580	17,639	1	-7,737
Nov	430.72	787,573	137,843	207,159	56,693	11,915	1	-707
Dec	453.79	1,010,089	222,516	269,333	34,687	9,704	1	-2,425
Total	---	---	-375,543	1,566,217	1,766,439	158,749	14	-16,558

Figure 16. 10-year Summary San Luis Reservoir Operation



**Table 14. O'Neill Forebay Monthly Operation**

**2002**

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow				Outflow				Gain (+) And Losses (-)
				Pump In 1/	O'Neill P-G Plant Pumping	Gianelli P-G Plant Genertion	California Aqueduct Check 12	O'Neill P-G Plant Genertion	Gianelli P-G Plant Pumping	Dos Amigos Pumping	Deliveries	
Jan	223.82	53,242	2,089	0	225,493	0	381,169	0	431,449	173,550	223	649
Feb	219.40	41,605	-11,637	0	93,737	21,820	261,115	0	151,834	242,296	707	6,528
Mar	221.52	47,125	5,520	0	153,351	6,598	223,309	0	121,724	257,568	818	2,372
Apr	222.78	50,459	3,334	0	56,621	174,392	106,874	33,842	2,179	292,821	794	-4,917
May	219.90	42,893	-7,566	0	0	427,232	18,429	92,264	0	348,748	1,354	-10,861
Jun	219.45	41,733	-1,160	0	3,911	522,507	101,012	72,091	1,200	545,261	1,840	-8,198
Jul	223.73	53,001	11,268	0	14,607	228,799	336,964	1,150	15,109	560,076	2,314	9,547
Aug	222.96	50,939	-2,062	0	65,449	47,559	371,879	0	68,198	432,044	1,506	14,799
Sep	220.61	44,740	-6,199	0	114,244	89,572	220,728	0	154,780	271,902	790	-3,271
Oct	221.62	47,388	2,648	0	123,389	156,580	88,758	2,970	143,252	224,656	685	5,484
Nov	219.37	41,528	-5,860	0	169,424	56,693	171,310	4,240	207,159	198,257	269	6,638
Dec	220.03	43,230	1,702	0	171,664	34,687	235,274	0	269,333	184,543	204	14,157
Total	---	---	-7,923	0	1,191,890	1,766,439	2,516,821	206,557	1,566,217	3,731,722	11,504	32,927

1/ Pump-in located at Mile 79.67R.

2/ Includes 864 AF to DFG at O'Neill Forebay, 137 AF to Parks and Recreation, 5 AF Cattle, and 10,498 AF to WWD.

**Table 15. Monthly Operations Summary, State-Federal San Luis Joint-Use Facilities  
2002**

(In acre-feet except as noted)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Check 12													
State	381,169	261,115	223,309	106,874	18,429	57,188	315,265	314,370	200,209	76,455	171,310	79,420	2,205,113
Federal	0	0	0	0	0	43,824	21,699	57,509	20,519	12,303	0	155,854	311,708
Total	381,169	261,115	223,309	106,874	18,429	101,012	336,964	371,879	220,728	88,758	171,310	235,274	2,516,821
O'Neill P-G Plant													
Amount Pumped													
State	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal	225,493	93,737	153,351	56,621	0	3,911	14,607	65,449	114,244	123,389	169,424	171,664	1,191,890
Total	225,493	93,737	153,351	56,621	0	3,911	14,607	65,449	114,244	123,389	169,424	171,664	1,191,890
Generation													
Federal	0	0	0	33,842	92,264	72,091	1,150	0	0	2,970	4,240	0	206,557
O'Neill Forebay													
End-of-Month Storage													
State *	29,088	22,763	29,414	25,637	19,841	18,078	28,060	28,138	23,117	21,354	20,780	19,949	---
Federal *	24,154	18,842	17,711	24,822	23,052	23,655	24,941	22,801	21,623	26,034	20,748	23,281	---
Total	53,242	41,605	47,125	50,459	42,893	41,733	53,001	50,939	44,740	47,388	41,528	43,230	---
San Luis Reservoir													
End-of-Month Storage													
State	912,338	1,028,384	1,074,297	973,606	744,783	488,165	399,482	468,199	394,044	237,481	219,436	319,803	---
Federal	894,728	896,940	953,666	870,582	658,167	385,804	247,405	175,677	294,391	412,249	568,137	690,286	---
Total	1,807,066	1,925,324	2,027,963	1,844,188	1,402,950	873,969	646,887	643,876	688,435	649,730	787,573	1,010,089	---
Gianelli P-G Plant													
Amount Pumped													
State	236,881	115,084	80,820	-31	0	1,200	15,109	64,759	18,631	4,274	39,041	136,390	712,158
Federal	194,568	36,750	40,904	2,210	0	0	0	3,439	136,149	138,978	168,118	132,943	854,059
Total	431,449	151,834	121,724	2,179	0	1,200	15,109	68,198	154,780	143,252	207,159	269,333	1,566,217
Generation													
State	0	-1,560	187	89,832	230,073	261,474	114,856	10,635	89,572	156,580	56,693	34,687	1,043,029
Federal	0	23,380	6,411	84,560	197,159	261,033	113,943	36,924	0	0	0	0	723,410
Total	0	21,820	6,598	174,392	427,232	522,507	228,799	47,559	89,572	156,580	56,693	34,687	1,766,439
Pacheco Tunnel													
Federal	9,043	10,666	9,905	13,875	16,276	14,320	15,327	15,271	14,808	17,639	11,915	9,704	158,749
Dos Amigos P.P.													
State	142,424	154,352	170,827	210,285	248,542	358,751	354,478	269,421	236,476	220,297	180,846	142,146	2,688,845
Federal	31,126	87,567	86,741	82,536	100,206	186,510	183,518	143,452	30,775	0	17,411	42,397	992,239
Other	0	377	0	0	0	0	22,080	19,171	4,651	4,359	0	0	50,638
Total	173,550	242,296	257,568	292,821	348,748	545,261	560,076	432,044	271,902	224,656	198,257	184,543	3,731,722

\* Negative storage values indicate a deficit in storage withdrawals versus amounts stored and positive values larger than the reservoir capacity indicate a surplus of amounts stored versus storage withdrawals.

## ***San Joaquin Field Division***

### ***Water Deliveries***

A total of 1,007,567 AF of deliveries were made in the San Joaquin Field Division in 2002. Water types include Table A water, purchase water, federal wheeling, dry year purchases, carryover, and general wheeling. Kern County Water Agency (KCWA) represented 72 percent of the total SWP water delivered within the Division.

In addition to 823,741 AF of SWP deliveries, total San Joaquin Field Division deliveries included 22,126 AF of Federal deliveries to Kern National Wildlife Refuge, 71,060 AF to Cross Valley Canal agencies (Pixley I.D., Kern-Tulare, Fresno County, Tulare County, Rag Gulch, Lower Tule River, Hills Valley, and Tri-Valley), and 90,640 AF of non-entitlement related deliveries.

The San Joaquin Field Division is the only field division in the SWP where there are no water storage facilities. All deliveries made from the Aqueduct are summarized in Table 22, and are totaled by agency on Table 2 and by water type on Map 3.

### ***Pumping Plants***

Pumping plants in the San Joaquin Field Division include Las Perillas and Badger Hill on the Coastal Aqueduct, and Buena Vista, Teerink, Chrisman, and Edmonston on the California Aqueduct. A complete monthly summary of amounts pumped at all of these plants is shown on Table 1. A summary of energy used to pump at each plant is shown on Table 4.

During 2002, 2,740,401 AF of State water and 36,787 AF of Federal water flowed past Check 21 into the San Joaquin Field Division. The total water pumped at Edmonston PP in 2002 was 1,718,888 AF compared to 1,288,666 AF in 2001.

## ***Southern Field Division***

### ***Water Storage***

There are four storage reservoirs in the Southern Field Division (Pyramid, Castaic, Silverwood, and Perris) with a combined storage capacity of 701,320 AF. Combined storage at the beginning of the year was 634,595 AF. End-of-year combined storage was 679,101 AF. Complete monthly operation tables for all four reservoirs plus Elderberry Forebay and Castaic Lagoon, along with historical inflow and storage data for the last ten years, is summarized in Tables 16 through 21 and Figures 17 through 20.

### ***Water Deliveries***

SWP deliveries in the Southern Field Division totaled 1,608,911 AF. Thirteen agencies received the water, which included Table A, Water Bank recovery, Article 21 interruptible, extended carryover, flexible storage withdrawal, dry year purchase, Purchase Pool A, Purchase Pool B, local, and recreation.

### ***Pumping and Generating Plants***

Pumping plants in the Southern Field Division include Oso and Castaic on the West Branch, Pearblossom on the East Branch, and Cherry Valley, Green Spot, and Crafton Hills on the East Branch extension. A complete monthly summary of amounts pumped is shown on Table 1. A summary of energy used to pump and station service energy at each plant is shown on Table 4.

Generating plants in the Southern Field Division include Warne and Castaic on the West Branch, and Alamo, Mojave Siphon, and Devil Canyon on the East Branch. Energy available from each generating plant is summarized in Table 3. Combined generation at all five plants in 2002 totaled 2,390,875 MWh compared for the second year in a row

**Table 16. Pyramid Lake Monthly Operation  
2002**

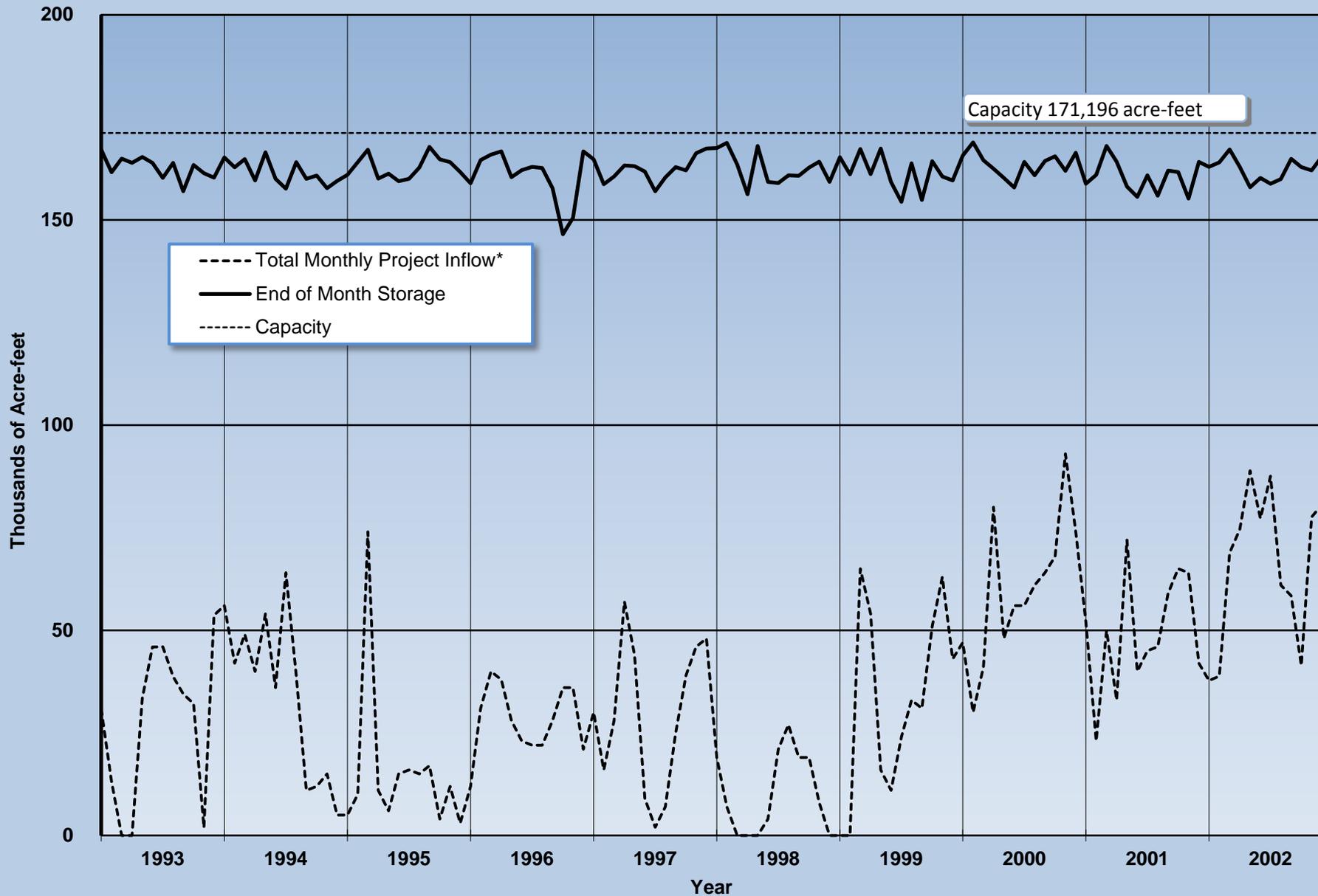
(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Natural Inflow Storage Shares	Storage Change	Inflow			Outflow			Computed Losses (-) Ans Gains (+)
					Project		Natural Stream Flow	Project		Natural To Piru Creek 2/	
					Castaic Powerplant Pumpback 1/	Warne Powerplant		Castaic Powerplant Generation	Recreation Deliveries		
Jan	2572.51	162,910	-129	-1,234	45,799	37,756	996	82,857	1	382	-2,545
Feb	2573.39	164,018	195	1,108	21,402	38,841	787	58,024	1	463	-1,434
Mar	2575.88	167,179	357	3,161	11,585	68,880	918	75,868	1	756	-1,597
Apr	2572.54	162,948	-475	-4,231	54,689	74,543	733	130,842	2	1,565	-1,787
May	2568.53	157,962	-1,614	-4,986	80,580	88,880	522	170,957	2	1,661	-2,348
Jun	2570.38	160,250	-2,911	2,288	108,701	77,277	289	179,585	2	1,586	-2,806
Jul	2569.21	158,800	-4,235	-1,450	97,504	87,554	213	181,558	152	1,537	-3,474
Aug	2570.15	159,964	-5,516	1,164	82,180	60,987	253	137,760	620	1,534	-2,342
Sep	2574.09	164,902	-6,692	4,938	64,378	58,401	309	113,674	1,050	1,029	-2,397
Oct	2572.46	162,847	-6,181	-2,055	50,423	41,382	408	90,898	1,265	353	-1,752
Nov	2571.82	162,045	-6,050	-802	33,900	77,574	507	110,740	70	378	-1,595
Dec	2574.54	165,473	-5,733	3,428	34,298	80,629	693	110,906	0	376	-910
<b>Total</b>	---	---	---	1,329	685,439	792,704	6,628	1,443,669	3,166	11,620	-24,987

1/ Pumpback by Los Angeles Department of Water and Power (LADWP) from Elderberry Forebay through Castaic powerplant.

2/ Portions of these amounts are used to satisfy fishery enhancement agreement.

Figure 17. 10-Year Summary of Pyramid Lake Operation



\* Excludes pumpback by LADWP through Castaic Powerplant.

**Table 17. Elderberry Forebay Monthly Operation  
2002**

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow		Outflow			Computed Losses (-) And Gains (+)
				Castaic Powerplant Generation	Natural Stream Flow	Castaic Powerplant Pumpback 1/	To Castaic Lake		
							Natural	Project	
Jan	1517.87	22,342	552	82,857	43	43	36,679	45,799	173
Feb	1510.57	19,404	-2,938	58,024	55	55	39,544	21,402	-16
Mar	1511.32	19,696	292	75,868	49	49	63,186	11,585	-805
Apr	1521.72	23,979	4,283	130,842	21	21	71,729	54,689	-141
May	1522.93	24,505	526	170,957	2	2	89,898	80,580	47
Jun	1522.40	24,274	-231	179,585	0	0	71,170	108,701	55
Jul	1525.21	25,509	1,235	181,558	0	0	82,803	97,504	-16
Aug	1519.86	23,181	-2,328	137,760	0	0	58,272	82,180	364
Sep	1516.64	21,831	-1,350	113,674	0	0	50,613	64,378	-33
Oct	1514.86	21,103	-728	90,898	0	0	40,554	50,423	-649
Nov	1516.50	21,773	670	110,740	0	0	75,873	33,900	-297
Dec	1515.58	21,396	-377	110,906	1	1	76,223	34,298	-762
<b>Total</b>	---	---	-394	1,443,669	171	171	756,544	685,439	-2,080

1/ Pumpback by Los Angeles Department of Water and Power (LADWP) through Castaic Power Plant.

**Table 18. Castaic Lake Monthly Operation  
2002**

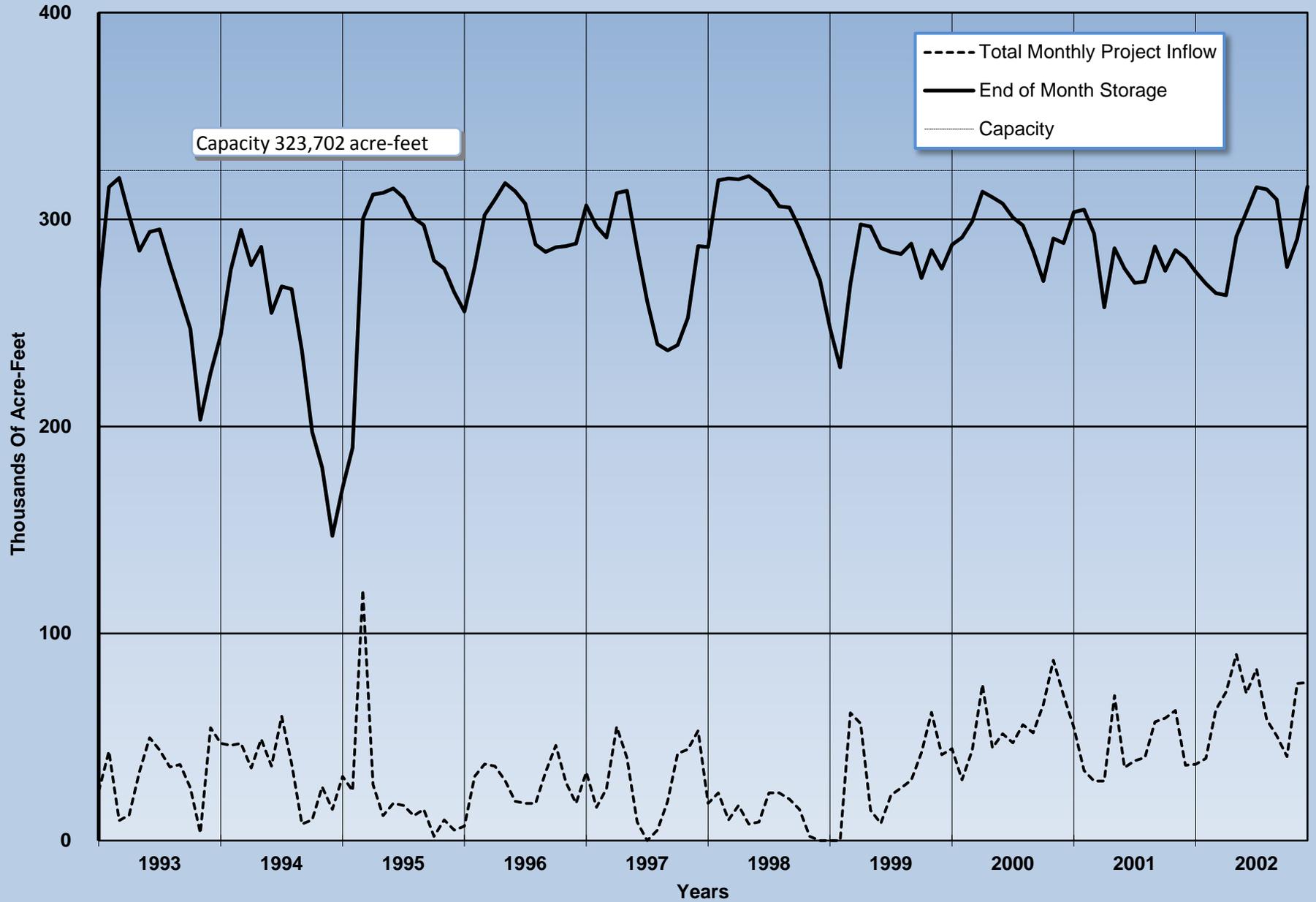
(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Natural Inflow Storage Shares	Storage Change	Inflow			Outflow		Computed Losses (-) Gains (+)
					From Elderberry Forebay		Natural	Deliveries	Released To Castaic Lagoon 1/	
					Natural	Project				
Jan	1,492.06	274,791	0	-6,582	43	36,679	121	43,036	592	203
Feb	1,489.21	269,042	115	-5,749	55	39,544	118	45,623	58	215
Mar	1,486.91	264,445	-1	-4,597	49	63,186	117	68,157	282	490
Apr	1,486.37	263,372	-5	-1,073	21	71,729	58	72,344	83	-454
May	1,500.27	291,754	0	28,382	2	89,898	24	59,537	603	-1,402
Jun	1,506.12	304,188	0	12,434	0	71,170	2	57,932	412	-394
Jul	1,511.31	315,513	0	11,325	0	82,803	0	69,209	501	-1,768
Aug	1,510.88	314,567	0	-946	0	58,272	0	56,994	291	-1,933
Sep	1,508.62	309,623	0	-4,944	0	50,613	0	54,293	0	-1,264
Oct	1,493.15	277,009	0	-32,614	0	40,554	0	74,191	0	1,023
Nov	1,499.70	290,557	4	13,548	0	75,873	4	60,919	397	-1,013
Dec	1,511.51	315,953	65	25,396	1	76,223	60	50,314	0	-574
<b>Total</b>	---	---	---	34,580	171	756,544	504	712,549	3,219	-6,871

1/ Includes 720 AF of natural inflow and 2,499 AF of recreation water.

Figure 18. 10-Year Summary Castaic Lake Operation

55



**Table 19. Castaic Lagoon Monthly Operation  
2002**

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow	Natural Outflow		Deliveries to Recreation	Computed Losses (-) And Gains (+)
					Release From Castaic Lagoon			
					Surface	Sub-Surface		
Jan	1134.41	5,352	362	592	0	184	0	-46
Feb	1133.88	5,250	-102	58	0	116	0	-44
Mar	1134.18	5,308	58	282	0	151	0	-73
Apr	1133.38	5,155	-153	83	0	160	0	-76
May	1134.76	5,420	265	21	0	230	582	1,056
Jun	1135.12	5,490	70	2	0	200	410	678
Jul	1135.71	5,605	115	0	0	279	501	895
Aug	1135.42	5,548	-57	0	0	215	291	449
Sep	1133.86	5,246	-302	0	0	153	0	-149
Oct	1132.48	4,984	-262	0	0	182	0	-80
Nov	1133.48	5,174	190	0	0	94	397	681
Dec	1132.70	5,025	-149	0	0	113	0	-36
<b>Total</b>	---	---	35	1,038	0	2,077	2,181	3,255

**Table 20. Silverwood Lake Monthly Operation  
2002**

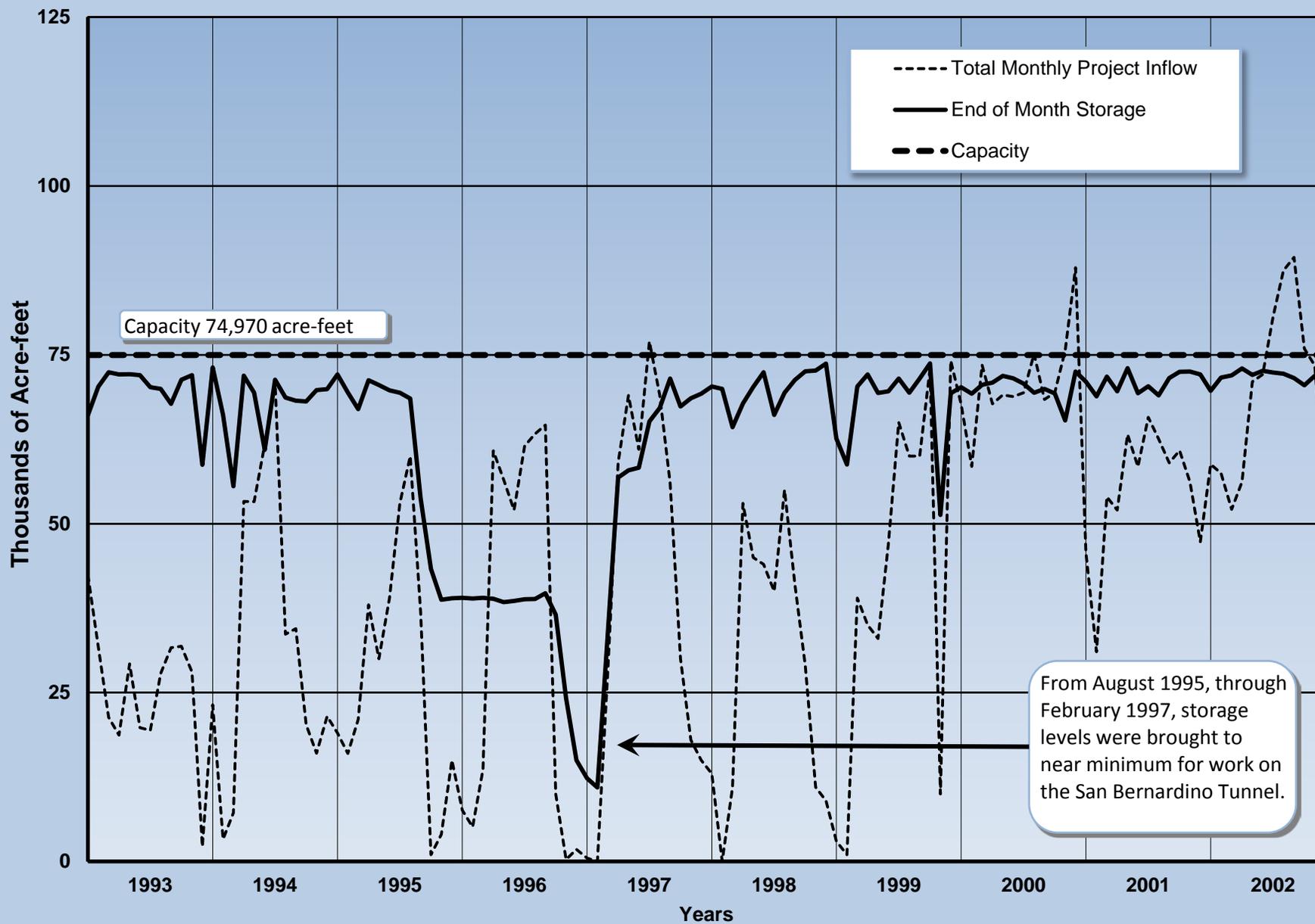
(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow			Outflow				Computed Losses (-) And Gains (+)	Total Natural Inflow Released 2/
				Mojave Siphon Powerplant	Mojave Bypass Flume	Natural 1/	Project			Natural Inflow to Mojave River		
							Delivered to CLAWA	Recreation	San Bernardino Tunnel			
Jan	3,349.48	69,688	-2,414	58,757	0	54	113	2	61,444	11	345	11
Feb	3,351.55	71,644	1,956	57,431	0	57	115	1	55,500	10	94	24
Mar	3,351.88	71,958	314	52,044	0	69	95	2	51,821	11	130	11
Apr	3,352.96	72,993	1,035	56,131	0	54	117	5	55,064	11	47	11
May	3,351.96	72,035	-958	70,993	0	27	170	8	71,744	12	-44	12
Jun	3,352.58	72,619	584	72,116	0	0	236	9	71,491	11	215	39
Jul	3,352.32	72,379	-240	80,635	0	0	296	12	80,012	11	-544	11
Aug	3,352.14	72,207	-172	87,474	0	0	296	12	87,255	11	-72	11
Sep	3,351.47	71,568	-639	89,434	0	0	249	11	89,960	11	158	11
Oct	3,350.32	70,478	-1,090	75,900	0	0	202	9	77,173	11	405	11
Nov	3,351.79	71,873	1,395	73,437	0	10	159	4	71,595	10	-284	10
Dec	3,350.89	71,017	-856	54,861	0	59	141	2	56,187	10	564	10
Total	---	---	-1,085	829,213	0	330	2,189	77	829,246	130	1,014	172

1/ Includes 0 AF of Houston Creek appropriation.

2/ Total releases made from Mojave Siphon to Las Flores Ranch Co., in exchange for natural inflow stored in lake, and from Silverwood Lake to Mojave River from outlet for Mojave W.A. The difference between this total column and the natural inflow released to Mojave River equals the Las Flores Ranch.

Figure 19. 10-Year Summary Silverwood Lake Operation

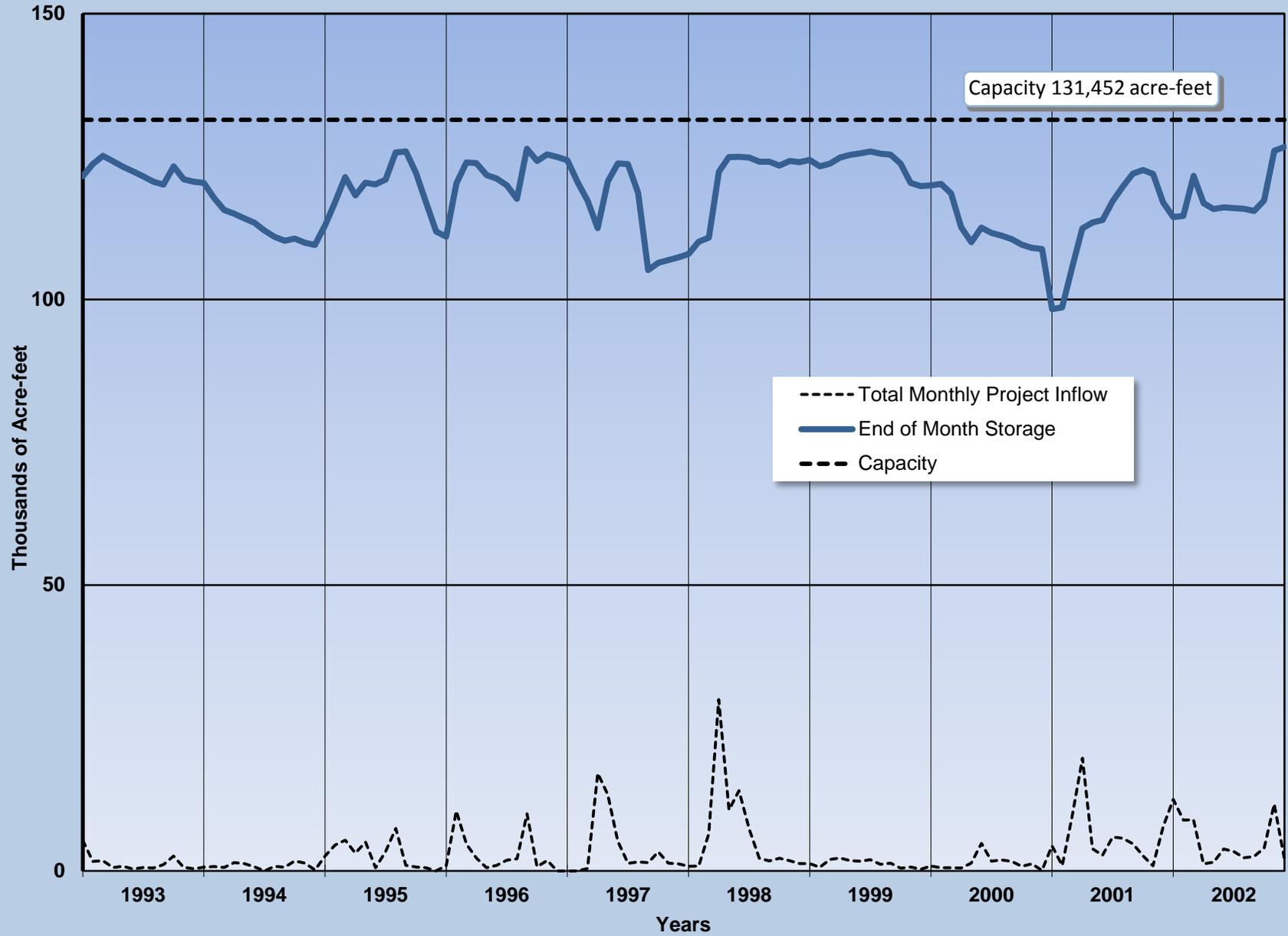


**Table 21. Lake Perris Monthly Operation  
2002**

(in acre-feet except as noted)

Month	Water Surface Elevation (in feet)	Storage	Storage Change	Inflow 1/	Outflow 2/	Computed Losses (-) And Gains (+)
Jan	1,582.47	114,408	-2,568	12,510	12,933	-2,145
Feb	1,582.57	114,629	221	8,882	6,924	-1,737
Mar	1,585.70	121,610	6,981	8,973	346	-1,646
Apr	1,583.58	116,865	-4,745	1,209	4,686	-1,268
May	1,583.10	115,800	-1,065	1,528	1,335	-1,258
Jun	1,583.24	116,101	301	3,814	1,258	-2,255
Jul	1,583.18	115,977	-124	3,362	1,262	-2,224
Aug	1,583.12	115,844	-133	2,291	336	-2,088
Sep	1,582.95	115,468	-376	2,505	863	-2,018
Oct	1,583.79	117,331	1,863	3,987	530	-1,594
Nov	1,587.65	126,040	8,709	11,679	460	-2,510
Dec	1,587.92	126,658	618	2,026	340	-1,068
<b>Total</b>			9,682	62,766	31,273	-21,811

Figure 20. 10-Year Summary Lake Perris Operation



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**Table 22. Summary of California Aqueduct Operation**

**2002**

(in acre-feet)

Description	Jan	Feb	Mar	Apr	May	Jun
<b>DELTA FIELD DIVISION</b>						
Note: North Bay Aqueduct, South Bay Aqueduct, and Lake Del Valle they are shown here						
<b>North Bay Aqueduct</b>						
Pumped at Barker Slough Pumping Plant	993	1,035	2,437	3,467	5,105	5,785
Deliveries (Travis & Fairfield/Vacaville)	63	99	140	225	2,632	2,844
Pumped at Cordelia Pumping Plant	911	921	2,230	3,142	2,250	2,774
Deliveries (Benicia, Vallejo, A.C. 1&2, & Napa)	911	921	2,230	3,142	2,250	2,774
Computed Losses (-), Gains (+)	-19	-15	-67	-100	-223	-167
<b>California Aqueduct</b>						
Pumped at Banks Pumping Plant	397,017	274,484	239,304	125,217	38,455	127,719
Pumped at South Bay Pumping Plant	0	16	4,930	10,203	17,749	17,678
Deliveries to State and CVP Agencies	98	129	333	779	1,178	1,260
Change in Storage	-317	-828	-58	831	-370	123
Outflow at Check 12	381,169	261,115	223,309	106,874	18,429	101,012
Computed Losses (-), Gains (+)	-16,067	-14,052	-10,790	-6,530	-1,469	-7,646
<b>South Bay Aqueduct</b>						
Pumped at South Bay Pumping Plant	0	16	4,930	10,203	17,749	17,678
Inflow from Lake Del Valle	3,063	2,596	819	1,665	0	331
Natural Inflow Release from Lake Del Valle	0	0	0	332	0	0
Outflow, To Lake Del Valle	0	0	0	2,288	5,195	189
Deliveries to Contracting State Agencies	3,063	2,612	5,739	9,902	12,544	17,810
Computed Losses (-), Gains (+)	0	0	-10	-10	-10	-10
<b>Lake Del Valle Operation:</b>						
Inflow from South Bay Aqueduct	0	0	0	2,288	5,195	189
Natural inflow	2,273	665	1,092	324	88	24
Releases to South Bay Aqueduct	3,063	2,596	819	1,997	0	331
Releases to Arroyo Valle	503	0	0	0	0	0
Deliveries to EBRP District	3	2	4	7	13	23
End-of-Month Storage	36,331	34,303	34,412	34,824	39,801	39,281
Change in Storage	-1,366	-2,028	109	412	4,977	-520
Computed Losses (-), Gains (+)	-70	-95	-160	-196	-293	-379
<b>SAN LUIS FIELD DIVISION</b>						
<b>O'Neill Forebay Operation</b>						
End-of-Month Storage	53,242	41,605	47,125	50,459	42,893	41,733
Inflow, California Aqueduct	381,169	261,115	223,309	106,874	18,429	101,012
Inflow, O'Neill P.- G. Plant	225,493	93,737	153,351	56,621	0	3,911
Inflow, Gianelli P.- G. Plant	0	21,820	6,598	174,392	427,232	522,507
Deliv. to Dept. of Parks & Rec. (Cattle program)	1	1	1	0	0	0
Deliveries to Dept. of Fish and Game (State)	42	34	47	25	28	40
Deliveries to Dept. of Fish and Game (Fed.)	34	29	37	20	23	34
Deliveries to Dept. of Parks & Rec. (State)	1	0	2	8	10	12
Deliveries to Dept. of Parks & Rec. (Fed.)	0	1	1	8	7	10
Deliveries to Fed. Customers	145	642	730	733	1,286	1,744
Outflow, O'Neill P.- G. Plant	0	0	0	33,842	92,264	72,091
Outflow, Gianelli P.- G. Plant	431,449	151,834	121,724	2,179	0	1,200
Outflow, Dos Amigos P.P.	173,550	242,296	257,568	292,821	348,748	545,261
Change in Storage	2,089	-11,637	5,520	3,334	-7,566	-1,160
Computed Losses (-), Gains (+)	649	6,528	2,372	-4,917	-10,861	-8,198
<b>San Luis Reservoir Operation</b>						
State End-of-Month Storage	1,028,384	1,074,297	973,606	744,783	488,165	399,482
Total End-of-Month Storage	1,807,066	1,925,324	2,027,963	1,844,188	1,402,950	873,969
Inflow, Gianelli P.- G. Plant	431,449	151,834	121,724	2,179	0	1,200
Outflow, Gianelli P. - G. Plant	0	21,820	6,598	174,392	427,232	522,507
Deliveries to Dept. of Parks & Rec. (Fed.)	0	0	0	1	0	1
Deliveries to Dept. of Parks & Rec. (State)	0	0	1	0	1	1
Deliveries to San Felipe (Fed.)	9,043	10,666	9,905	13,875	16,276	14,320
Change in Storage (Total)	421,434	118,258	102,639	-183,775	-441,238	-528,981
Computed Losses (-), Gains (+)	-972	-1,090	-2,581	2,314	2,271	6,648

**Table 22. Summary of California Aqueduct Operations**

**2002**

(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
are not within the Edmond G. Brown California Aqueduct, for completeness.							<b>DELTA FIELD DIVISION</b>
							<b>North Bay Aqueduct</b>
6,374	6,079	5,337	4,160	3,707	1,452	45,931	Pumped at Barker Slough Pumping Plant
3,230	3,173	3,118	1,871	1,159	287	18,841	Deliveries (Travis & Fairfield/Vacaville)
2,986	2,786	2,297	2,513	2,635	1,149	26,594	Pumped at Cordelia Pumping Plant
2,986	2,786	2,297	2,513	2,635	1,149	26,594	Deliveries (Benicia, Vallejo, A.C. 1&2, & Napa)
-158	-120	78	224	87	-16	-496	Computed Losses (-), Gains (+)
							<b>California Aqueduct</b>
382,608	413,948	245,835	106,270	187,071	254,341	2,792,269	Pumped at Banks Pumping Plant
18,408	19,043	15,638	9,401	3,292	2,976	119,334	Pumped at South Bay Pumping Plant
1,210	738	417	273	88	23	6,526	Deliveries to State and CVP Agencies
1,044	-1,157	-114	432	-191	-423	-1,028	Change in Storage
336,964	371,879	220,728	88,758	171,310	235,274	2,516,821	Outflow at Check 12
-24,982	-23,445	-9,166	-7,406	-12,572	-16,491	-150,616	Computed Losses (-), Gains (+)
							<b>South Bay Aqueduct</b>
18,408	19,043	15,638	9,401	3,292	2,976	119,334	Pumped at South Bay Pumping Plant
1,113	1,164	3,817	2,608	3,224	0	20,400	Inflow from Lake Del Valle
0	0	0	0	0	0	332	Natural Inflow Release from Lake Del Valle
33	0	0	0	0	0	7,705	Outflow, To Lake Del Valle
19,478	20,197	19,445	11,999	6,506	2,966	132,261	Deliveries to Contracting State Agencies
-10	-10	-10	-10	-10	-10	-100	Computed Losses (-), Gains (+)
							<b>Lake Del Valle Operation:</b>
33	0	0	0	0	0	7,705	Inflow from South Bay Aqueduct
143	57	246	212	167	13,359	18,650	Natural inflow
1,113	1,164	3,817	2,608	3,224	0	20,732	Releases to South Bay Aqueduct
0	0	0	0	0	303	806	Releases to Arroyo Valle
29	26	22	12	3	2	146	Deliveries to EBRP District
37,827	36,267	32,278	29,625	26,438	39,421	- - -	End-of-Month Storage
-1,454	-1,560	-3,989	-2,653	-3,187	12,983	1,724	Change in Storage
-488	-427	-396	-245	-127	-71	-2,947	Computed Losses (-), Gains (+)
							<b>SAN LUIS FIELD DIVISION</b>
							<b>O'Neill Forebay Operation</b>
53,001	50,939	44,740	47,388	41,528	43,230	- - -	End-of-Month Storage
336,964	371,879	220,728	88,758	171,310	235,274	2,516,821	Inflow, California Aqueduct
14,607	65,449	114,244	123,389	169,424	171,664	1,191,890	Inflow, O'Neill P.- G. Plant
228,799	47,559	89,572	156,580	56,693	34,687	1,766,439	Inflow, Gianelli P.- G. Plant
0	0	0	0	1	1	5	Deliv. to Dept. of Parks & Rec. (Cattle program)
56	37	42	57	36	31	475	Deliveries to Dept. of Fish and Game (State)
45	31	34	48	28	26	389	Deliveries to Dept. of Fish and Game (Fed.)
18	10	8	6	0	0	75	Deliveries to Dept. of Parks & Rec. (State)
13	10	6	5	0	1	62	Deliveries to Dept. of Parks & Rec. (Fed.)
2,182	1,418	700	569	204	145	10,498	Deliveries to Fed. Customers
1,150	0	0	2,970	4,240	0	206,557	Outflow, O'Neill P.- G. Plant
15,109	68,198	154,780	143,252	207,159	269,333	1,566,217	Outflow, Gianelli P.- G. Plant
560,076	432,044	271,902	224,656	198,257	184,543	3,731,722	Outflow, Dos Amigos P.P.
11,268	-2,062	-6,199	2,648	-5,860	1,702	-7,923	Change in Storage
9,547	14,799	-3,271	5,484	6,638	14,157	32,927	Computed Losses (-), Gains (+)
							<b>San Luis Reservoir Operation</b>
468,199	394,044	237,481	219,436	319,803	- - -	- - -	State End-of-Month Storage
646,887	643,876	688,435	649,730	787,573	1,010,089	- - -	Total End-of-Month Storage
15,109	68,198	154,780	143,252	207,159	269,333	1,566,217	Inflow, Gianelli P.- G. Plant
228,799	47,559	89,572	156,580	56,693	34,687	1,766,439	Outflow, Gianelli P.- G. Plant
1	1	1	0	1	0	6	Deliveries to Dept. of Parks & Rec. (Fed.)
1	1	1	1	0	1	8	Deliveries to Dept. of Parks & Rec. (State)
15,327	15,271	14,808	17,639	11,915	9,704	158,749	Deliveries to San Felipe (Fed.)
-227,082	-3,011	44,559	-38,705	137,843	222,516	-375,543	Change in Storage (Total)
1,937	-8,377	-5,839	-7,737	-707	-2,425	-16,558	Computed Losses (-), Gains (+)

**Table 22. Summary of California Aqueduct Operation**

**2002**

(in acre-feet)

Description	Jan	Feb	Mar	Apr	May	Jun
<b>SAN LUIS FIELD DIVISION (Cont.)</b>						
California Aqueduct (Pools 14 thru 21)						
Inflow, Dos Amigos P.P.(State)	142,424	154,352	170,827	210,285	248,542	358,751
Inflow, Dos Amigos P.P.(Fed. and Other)	31,126	87,944	86,741	82,536	100,206	186,510
Total Inflow, Dos Amigos P.P.	173,550	242,296	257,568	292,821	348,748	545,261
Flow into Aqueduct	0	0	0	0	0	0
Deliveries to Dept. of Fish and Game (State)	1	0	1	0	1	0
Deliveries to Dept. of Fish and Game (Fed.)	51	1	0	1	0	1
Miscellaneous Outflow (Phase 1)	0	8	0	0	0	0
Deliveries, Transfers to Fed. Customers	0	0	0	0	5,250	5,250
Deliveries to Fed. Customers	39,732	85,809	74,959	85,882	113,773	186,767
Outflow, Check 21 (State)	134,202	158,205	188,925	207,178	238,946	364,809
Outflow, Check 21 (Fed.)	808	1,085	0	6,148	89	280
Change in Storage	-96	864	214	488	-1,395	1,803
Computed Losses (-), Gains (+)	1,148	3,676	6,531	6,876	7,916	13,649
<b>SAN JOAQUIN FIELD DIVISION</b>						
California Aqueduct, Check 21 to Buena Vista Pumping Plant						
Inflow, Check 21 (State)	134,202	158,205	188,925	207,178	238,946	364,809
Inflow, Check 21 (Fed.)	808	1,085	0	6,148	89	280
Total Inflow, Check 21	135,010	159,290	188,925	213,326	239,035	365,089
Kern River Intertie (Inflow)	0	0	0	0	0	0
Kern River Intertie (Outflow)	0	0	0	0	0	0
Deliveries to Contracting State Agencies	26,304	45,089	43,260	57,044	44,217	148,240
Deliveries to Fed. Customers	808	1,085	0	6,148	89	280
Friant CVP Inflow	0	0	0	13,734	12,549	571
Outflow, Buena Vista P.P.	99,463	107,157	135,201	150,332	186,960	186,965
Coastal Br. Diversion	4,689	2,446	5,077	8,309	11,483	14,884
Change in Storage	-248	-382	686	-25	-117	95
Computed Losses (-), Gains (+)	-3,994	-3,895	-4,701	-5,252	-8,952	-15,196
California Aqueduct, Buena Vista P.P. to Teerink Pumping Plant						
Inflow, Buena Vista P.P.	99,463	107,157	135,201	150,332	186,960	186,965
Deliveries to Contracting State Agencies	1,525	4,749	7,987	7,626	10,630	15,423
W.R.M.W.S.D. Pumpback						
Outflow, Teerink Pumping Plant	101,741	106,427	133,444	148,385	183,009	176,295
Change in Storage	23	-181	287	91	-367	299
Computed Losses (-), Gains (+)	3,826	3,839	6,517	5,770	6,312	5,052
California Aqueduct, Teerink Pumping Plant to Chrisman Pumping Plant						
Inflow, Teerink Pumping Plant	101,741	106,427	133,444	148,385	183,009	176,295
Deliveries to Contracting State Agencies	665	1,337	2,727	4,008	6,370	8,245
Outflow, Chrisman Pumping Plant	100,893	103,384	127,507	142,271	172,035	163,552
Change in Storage	-25	5	3	3	-8	-53
Computed Losses (-), Gains (+)	-208	-1,701	-3,207	-2,103	-4,612	-4,551
California Aqueduct, Chrisman Pumping Plant to Edmonston Pumping Plant						
Inflow, Chrisman Pumping Plant	100,893	103,384	127,507	142,271	172,035	163,552
Deliveries to Contracting State Agencies	24	1,026	956	1,767	2,349	3,243
Outflow, Edmonston Pumping Plant	98,424	100,922	124,218	138,202	169,524	161,200
Change in Storage	28	-49	-138	93	-52	73
Computed Losses (-), Gains (+)	-2,417	-1,485	-2,471	-2,209	-214	964
Coastal Branch, California Aqueduct						
Inflow, Las Perillas P.P.	4,689	2,446	5,077	8,309	11,483	14,884
B.M.W.S.D. Pumpback	0	0	0	0	0	0
Deliveries to Contracting State Agencies	4,525	2,482	5,210	8,264	11,437	14,317
Deliveries to Fed. Customers	0	0	0	0	0	0
Change in Storage	-5	-6	-8	23	-22	13
Computed Losses (-), Gains (+)	-169	30	125	-22	-68	-554

**Table 22. Summary of California Aqueduct Operations**

**2002**

(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
							<b>SAN LUIS FIELD DIVISION (Cont.)</b>
							California Aqueduct (Pools 14 thru 21)
354,478	269,421	236,476	220,297	180,846	142,146	2,688,845	Inflow, Dos Amigos P.P.(State)
205,598	162,623	35,426	4,359	17,411	42,397	1,042,877	Inflow, Dos Amigos P.P.(Fed. and Other)
560,076	432,044	271,902	224,656	198,257	184,543	3,731,722	Total Inflow, Dos Amigos P.P.
0	0	0	0	0	0	0	Flow into Aqueduct
1	0	1	1	0	1	7	Deliveries to Dept. of Fish and Game (State)
0	1	0	0	1	0	56	Deliveries to Dept. of Fish and Game (Fed.)
0	0	3	0	22	10	43	Miscellaneous Outflow (Phase 1)
13,151	19,781	0	0	0	0	43,432	Deliveries, Transfers to Fed. Customers
185,599	101,790	34,111	45,088	28,050	31,377	1,012,937	Deliveries to Fed. Customers
370,464	325,423	228,466	185,630	171,303	159,450	2,733,001	Outflow, Check 21 (State)
8,377	1,096	14,323	5,756	4,656	1,569	44,187	Outflow, Check 21 (Fed.)
720	-1,450	-408	-392	188	-1,445	-909	Change in Storage
18,236	14,597	4,594	11,427	5,963	6,419	101,032	Computed Losses (-), Gains (+)
							<b>SAN JOAQUIN FIELD DIVISION</b>
							California Aqueduct, Check 21 to Buena Vista Pumping Plant
370,464	325,423	228,466	185,630	171,303	159,450	2,733,001	Inflow, Check 21 (State)
8,377	1,096	14,323	5,756	4,656	1,569	44,187	Inflow, Check 21 (Fed.)
378,841	326,519	242,789	191,386	175,959	161,019	2,777,188	Total Inflow, Check 21
0	0	0	0	0	0	0	Kern River Intertie (Inflow)
0	0	0	0	0	0	0	Kern River Intertie (Outflow)
131,646	118,002	37,010	36,807	10,067	14,551	712,237	Deliveries to Contracting State Agencies
8,377	1,096	14,323	5,756	4,656	1,569	44,187	Deliveries to Fed. Customers
0	0	0	0	5,645	4,300	36,799	Friant CVP Inflow
206,816	180,133	169,439	132,328	157,349	139,632	1,851,775	Outflow, Buena Vista P.P.
15,582	13,587	9,430	7,275	3,802	3,857	100,421	Coastal Br. Diversion
-447	339	-112	357	-894	514	-233	Change in Storage
-16,867	-13,362	-12,699	-8,863	-6,624	-5,196	-105,600	Computed Losses (-), Gains (+)
							California Aqueduct, Buena Vista P.P. to Teerink Pumping Plant
206,816	180,133	169,439	132,328	157,349	139,632	1,851,775	Inflow, Buena Vista P.P.
16,845	13,363	6,482	3,746	1,608	1,077	91,061	Deliveries to Contracting State Agencies
						0	W.R.M.W.S.D. Pumpback
197,466	173,476	169,664	133,194	160,518	143,840	1,827,459	Outflow, Teerink Pumping Plant
-236	232	-211	133	-11	-57	2	Change in Storage
7,259	6,938	6,496	4,745	4,766	5,228	66,747	Computed Losses (-), Gains (+)
							California Aqueduct, Teerink Pumping Plant to Chrisman Pumping Plant
197,466	173,476	169,664	133,194	160,518	143,840	1,827,459	Inflow, Teerink Pumping Plant
7,157	4,530	3,155	2,628	475	255	41,552	Deliveries to Contracting State Agencies
184,344	165,125	162,998	127,406	157,077	140,449	1,747,041	Outflow, Chrisman Pumping Plant
66	3	-49	8	11	14	-22	Change in Storage
-5,899	-3,818	-3,560	-3,152	-2,955	-3,122	-38,888	Computed Losses (-), Gains (+)
							California Aqueduct, Chrisman Pumping Plant to Edmonston Pumping Plant
184,344	165,125	162,998	127,406	157,077	140,449	1,747,041	Inflow, Chrisman Pumping Plant
3,326	2,829	1,748	1,405	32	42	18,747	Deliveries to Contracting State Agencies
181,434	161,873	160,932	125,746	156,915	139,498	1,718,888	Outflow, Edmonston Pumping Plant
-99	35	74	-56	24	16	-51	Change in Storage
317	-388	-244	-311	-106	-893	-9,457	Computed Losses (-), Gains (+)
							Coastal Branch, California Aqueduct
15,582	13,587	9,430	7,275	3,802	3,857	100,421	Inflow, Las Perillas P.P.
0	0	0	0	0	0	0	B.M.W.S.D. Pumpback
15,445	13,283	9,612	7,466	3,780	3,962	99,783	Deliveries to Contracting State Agencies
0	0	0	0	0	0	0	Deliveries to Fed. Customers
-6	1	13	-53	54	-19	-15	Change in Storage
-143	-303	195	138	32	86	-653	Computed Losses (-), Gains (+)

**Table 22. Summary of California Aqueduct Operation**

**2002**  
(in acre-feet)

Description	Jan	Feb	Mar	Apr	May	Jun
<b>SOUTHERN FIELD DIVISION</b>						
<b>California Aqueduct, Edmonston Pumping Plant to Junction of West Branch</b>						
Inflow, Edmonston Pumping Plant	98,424	100,922	124,218	138,202	169,524	161,200
Outflow, West Branch	37,435	40,576	68,352	76,157	89,844	78,652
Outflow, East Branch	60,987	60,342	55,875	62,049	79,666	82,537
Change in Storage	-2	2	5	-7	2	3
Computed Losses (-), Gains (+)	-4	-2	14	-3	-12	-8
<b>California Aqueduct, Junction of West Branch to Pearblossom P.P.</b>						
Inflow (Aqueduct)	60,987	60,342	55,875	62,049	79,666	82,537
Inflow (L.A.D.W.P.)	0	0	0	0	0	0
Deliveries to Contracting State Agencies	2,702	2,665	4,172	5,842	7,517	9,666
Outflow, Pearblossom P.P.	58,195	57,532	52,402	56,505	71,205	72,259
Change in Storage	-209	-12	344	-502	72	-26
Computed Losses (-), Gains (+)	-299	-157	1,043	-204	-872	-638
<b>California Aqueduct, Pearblossom P.P. to Silverwood Lake</b>						
Inflow, Pearblossom P.P.	58,195	57,532	52,402	56,505	71,205	72,259
Deliveries (Exchange of Natural Inflow)	320	145	143	139	360	195
Exchange of Natural Inflow (Los Flores T.O.)	0	14	121	79	37	28
Outflow to Silverwood Lake	58,757	57,431	52,044	56,131	70,993	72,116
Change in Storage	-497	-145	181	46	-2	264
Computed Losses (-), Gains (+)	385	-87	87	-110	183	344
<b>Silverwood Lake Operation</b>						
Inflow, Project	58,757	57,431	52,044	56,131	70,993	72,116
Inflow, Natural	54	57	69	54	27	0
Deliveries to Contracting State Agencies	113	115	95	117	170	236
Recreation Deliveries	2	1	2	5	8	9
Outflow, Natural Inflow Released	11	10	11	11	12	11
Outflow, At San Bernardino Tunnel	61,444	55,500	51,821	55,064	71,744	71,491
Change in storage	-2,414	1,956	314	1,035	-958	584
Computed Losses (-), Gains (+)	345	94	130	47	-44	215
<b>California Aqueduct, Silverwood Lake to Lake Perris</b>						
Inflow, SBMWD Reverse Flow	0	0	0	0	0	0
Inflow, San Bernardino Tunnel	61,444	55,500	51,821	55,064	71,744	71,491
Inflow, From 28J	0	0	0	0	0	0
Deliveries to Contracting State Agencies	50,598	47,022	43,733	54,504	70,734	68,343
Outflow to Lake Perris	12,510	8,882	8,973	1,209	1,528	3,814
Change in Storage	-1,034	564	124	-43	-115	203
Operational Losses (-), Gains (+)	630	968	1,009	606	403	869
<b>Lake Perris Operation</b>						
Inflow	12,510	8,882	8,973	1,209	1,528	3,814
Deliveries to Contracting State Agencies	12,910	6,901	321	4,652	1,294	1,218
Recreation Deliveries	23	23	25	34	41	40
Outflow (Reverse Flow)	0	0	0	0	0	0
Change in Storage	-2,568	221	6,981	-4,745	-1,065	301
Computed Losses (-), Gains (+)	-2,145	-1,737	-1,646	-1,268	-1,258	-2,255

**Table 22. Summary of California Aqueduct Operations**

**2002**  
(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
							<b>SOUTHERN FIELD DIVISION</b>
							California Aqueduct, Edmonston Pumping Plant to Junction of West Branch
181,434	161,873	160,932	125,746	156,915	139,498	1,718,888	Inflow, Edmonston Pumping Plant
88,077	61,296	59,911	41,454	78,752	81,832	802,338	Outflow, West Branch
93,327	100,535	100,987	84,260	78,158	57,672	916,395	Outflow, East Branch
-2	-3	1	4	3	-7	-1	Change in Storage
-32	-45	-33	-28	-2	-1	-156	Computed Losses (-), Gains (+)
							California Aqueduct, Junction of West Branch to Pearblossom P.P.
93,327	100,535	100,987	84,260	78,158	57,672	916,395	Inflow (Aqueduct)
0	0	0	0	0	0	0	Inflow (L.A.D.W.P.)
11,275	10,777	9,243	6,511	4,136	3,034	77,540	Deliveries to Contracting State Agencies
79,953	85,849	89,619	75,744	73,317	54,895	827,475	Outflow, Pearblossom P.P.
-266	575	-307	-65	598	-276	-74	Change in Storage
-2,365	-3,334	-2,432	-2,070	-107	-19	-11,454	Computed Losses (-), Gains (+)
							California Aqueduct, Pearblossom P.P. to Silverwood Lake
79,953	85,849	89,619	75,744	73,317	54,895	827,475	Inflow, Pearblossom P.P.
242	515	452	481	273	208	3,473	Deliveries (Exchange of Natural Inflow)
0	0	0	0	0	0	279	Exchange of Natural Inflow (Los Flores T.O.)
80,635	87,474	89,434	75,900	73,437	54,861	829,213	Outflow to Silverwood Lake
-16	-461	229	-29	-106	-76	-612	Change in Storage
908	1,679	496	608	287	98	4,878	Computed Losses (-), Gains (+)
							Silverwood Lake Operation
80,635	87,474	89,434	75,900	73,437	54,861	829,213	Inflow, Project
0	0	0	0	10	59	330	Inflow, Natural
296	296	249	202	159	141	2,189	Deliveries to Contracting State Agencies
12	12	11	9	4	2	77	Recreation Deliveries
11	11	11	11	10	11	131	Outflow, Natural Inflow Released
80,012	87,255	89,960	77,173	71,595	56,187	829,246	Outflow, At San Bernardino Tunnel
-240	-172	-639	-1,090	1,395	-856	-1,085	Change in storage
-544	-72	158	405	-284	565	1,015	Computed Losses (-), Gains (+)
							California Aqueduct, Silverwood Lake to Lake Perris
0	0	0	0	0	0	0	Inflow, SBMWD Reverse Flow
80,012	87,255	89,960	77,173	71,595	56,187	829,246	Inflow, San Bernardino Tunnel
0	0	0	0	0	0	0	Inflow, From 28J
77,700	85,785	87,861	73,632	61,736	54,828	776,476	Deliveries to Contracting State Agencies
3,362	2,291	2,505	3,987	11,679	2,026	62,766	Outflow to Lake Perris
-141	92	61	21	-137	-2	-407	Change in Storage
909	913	467	467	1,683	665	9,589	Operational Losses (-), Gains (+)
							Lake Perris Operation
3,362	2,291	2,505	3,987	11,679	2,026	62,766	Inflow
1,212	284	816	495	437	320	30,860	Deliveries to Contracting State Agencies
50	52	47	35	23	20	413	Recreation Deliveries
0	0	0	0	0	0	0	Outflow (Reverse Flow)
-124	-133	-376	1,863	8,709	618	9,682	Change in Storage
-2,224	-2,088	-2,018	-1,594	-2,510	-1,068	-21,811	Computed Losses (-), Gains (+)

**Table 22. Summary of California Aqueduct Operation  
2002  
(in acre-feet)**

Description	Jan	Feb	Mar	Apr	May	Jun
<b>SOUTHERN FIELD DIVISION (Cont.)</b>						
<b>West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.</b>						
Inflow	37,435	40,576	68,352	76,157	89,844	78,652
Outflow, Oso Pumping Plant	37,429	40,563	68,379	76,166	89,804	78,615
Change in Storage	-6	7	16	-17	4	10
Computed Losses (-), Gains (+)	-12	-6	43	-8	-36	-27
<b>West Branch California Aqueduct Oso P.P. to Pyramid Lake</b>						
Inflow, Oso P.P.	37,429	40,563	68,379	76,166	89,804	78,615
Deliveries to Contracting State Agencies	0	0	0	0	0	0
Outflow Through Warne to Pyramid Lake	37,756	38,841	68,880	74,543	88,880	77,277
Change in Storage	-732	885	-1,199	-449	179	344
Operational Losses (-), Gains (+)	-405	-837	-698	-2,072	-745	-994
<b>Pyramid Lake Operation</b>						
Inflow, Project	37,756	38,841	68,880	74,543	88,880	77,277
Inflow, Natural	996	787	918	733	522	289
Inflow, Pumpback from Elderberry Forebay Deliveries (Fish Enhancement)	45,799	21,402	11,585	54,689	80,580	108,701
Deliveries to Contracting State Agencies	0	0	0	0	0	0
Deliveries to Dept. of Parks and Rec. (State)	1	1	1	2	2	2
Outflow, Pyramid Diversion	382	463	756	1,565	1,661	1,586
Outflow, Angeles Tunnel	82,857	58,024	75,868	130,842	170,957	179,585
Change in Storage	-1,234	1,108	3,161	-4,231	-4,986	2,288
Computed Losses (-), Gains (+)	-2,545	-1,434	-1,597	-1,787	-2,348	-2,806
<b>Elderberry Forebay Operation</b>						
Inflow, Project through Castaic P-G Plant	82,857	58,024	75,868	130,842	170,957	179,585
Inflow, Natural	43	55	49	21	2	0
Outflow, Pumpback to Pyramid Lake	45,799	21,402	11,585	54,689	80,580	108,701
Outflow, Released to Castaic Lake /1	36,722	39,599	63,235	71,750	89,900	71,170
Change in Storage	552	-2,938	292	4,283	526	-231
Computed Losses (-), Gains (+)	173	-16	-805	-141	47	55
<b>Castaic Lake Operation</b>						
Inflow, 1/ Inflow, Natural	36,722	39,599	63,235	71,750	89,900	71,170
Deliveries to Contracting State Agencies	121	118	117	58	24	2
Deliveries to Recreation	43,021	45,623	68,138	72,312	59,502	57,887
Outflow, (streamflow release)	15	3	19	32	35	45
Outflow, Project to Castaic Lagoon	592	58	282	83	603	412
Change in Storage	0	0	0	0	0	0
Computed Losses (-), Gains (+)	-6,582	-5,749	-4,597	-1,073	28,382	12,434
Computed Losses (-), Gains (+)	203	218	490	-454	-1,402	-394
<b>Castaic Lagoon Operation</b>						
Inflow (Recreation Deliveries)	0	0	0	0	582	410
Inflow, Project	592	58	282	83	21	2
Inflow, Non-project	0	0	0	0	0	0
Outflow	184	116	151	160	230	200
Deliveries to Recreation (State)	0	0	0	0	0	0
Change in Storage	362	-102	58	-153	265	70
Computed Losses (-), Gains (+)	-46	-44	-73	-76	-108	-142

**Table 22. Summary of California Aqueduct Operations**

**2002**

(in acre-feet)

Jul	Aug	Sep	Oct	Nov	Dec	Total	Description
							<b>SOUTHERN FIELD DIVISION (Cont.)</b>
							West Branch California Aqueduct Tehachapi Afterbay to Oso P.P.
88,077	61,296	59,911	41,454	78,752	81,832	802,338	Inflow
87,985	61,167	59,809	41,357	78,739	81,852	801,865	Outflow, Oso Pumping Plant
-6	-9	2	11	9	-20	1	Change in Storage
-98	-138	-100	-86	-4	0	-472	Computed Losses (-), Gains (+)
							West Branch California Aqueduct Oso P.P. to Pyramid Lake
87,985	61,167	59,809	41,357	78,739	81,852	801,865	Inflow, Oso P.P.
0	0	0	0	0	0	0	Deliveries to Contracting State Agencies
87,554	60,987	58,401	41,382	77,574	80,629	792,704	Outflow Through Wame to Pyramid Lake
-315	-568	919	-648	-178	462	-1,300	Change in Storage
-746	-748	-489	-623	-1,343	-761	-10,461	Operational Losses (-), Gains (+)
							<b>Pyramid Lake Operation</b>
87,554	60,987	58,401	41,382	77,574	80,629	792,704	Inflow, Project
213	253	309	408	507	693	6,628	Inflow, Natural
97,504	82,180	64,378	50,423	33,900	34,298	685,439	Inflow, Pumpback from Elderberry Forebay
149	618	1,048	1,264	69	0	3,148	Deliveries (Fish Enhancement)
						0	Deliveries to Contracting State Agencies
3	2	2	1	1	0	18	Deliveries to Dept. of Parks and Rec. (State)
1,537	1,534	1,029	353	378	376	11,620	Outflow, Pyramid Diversion
181,558	137,760	113,674	90,898	110,740	110,906	1,443,669	Outflow, Angeles Tunnel
-1,450	1,164	4,938	-2,055	-802	3,428	1,329	Change in Storage
-3,474	-2,342	-2,397	-1,752	-1,595	-910	-24,987	Computed Losses (-), Gains (+)
							<b>Elderberry Forebay Operation</b>
181,558	137,760	113,674	90,898	110,740	110,906	1,443,669	Inflow, Project through Castaic P-G Plant
0	0	0	0	0	1	171	Inflow, Natural
97,504	82,180	64,378	50,423	33,900	34,298	685,439	Outflow, Pumpback to Pyramid Lake
							Outflow, Released to Castaic Lake /1
82,803	58,272	50,613	40,554	75,873	76,224	756,715	Change in Storage
1,235	-2,328	-1,350	-728	670	-377	-394	Computed Losses (-), Gains (+)
-16	364	-33	-649	-297	-762	-2,080	
							<b>Castaic Lake Operation</b>
82,803	58,272	50,613	40,554	75,873	76,224	756,715	Inflow, 1/
0	0	0	0	4	60	504	Inflow, Natural
69,164	56,963	54,263	74,166	60,894	50,298	712,231	Deliveries to Contracting State Agencies
45	31	30	25	9	16	305	Deliveries to Recreation
501	291	0	0	397	0	3,219	Outflow, (streamflow release)
0	0	0	0	0	0	0	Outflow, Project to Castaic Lagoon
11,325	-946	-4,944	-32,614	13,548	25,396	34,580	Change in Storage
-1,768	-1,933	-1,264	1,023	-1,029	-574	-6,884	Computed Losses (-), Gains (+)
							<b>Castaic Lagoon Operation</b>
501	291	0	0	397	0	2,181	Inflow (Recreation Deliveries)
0	0	0	0	0	0	1,038	Inflow, Project
0	0	0	0	0	0	0	Inflow, Non-project
279	215	153	182	94	113	2,077	Outflow
0	0	0	0	0	0	0	Deliveries to Recreation (State)
115	-57	-302	-262	190	-149	35	Change in Storage
-107	-133	-149	-80	-113	-36	-1,107	Computed Losses (-), Gains (+)

## Glossary

**accretion** - the water accumulated and retained within a service area.

**acre-foot (AF)** - a quantity or volume of water covering one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.

**active storage capacity** - the total usable reservoir capacity available for seasonal or cyclic water storage. It is gross reservoir capacity minus inactive storage capacity.

**afterbay** - a reservoir that regulates fluctuating discharges from a hydroelectric power plant or a pumping plant.

**alluvium** - a stratified bed of sand, gravel, silt, and clay deposited by flowing water.

**aquifer** - a geologic formation that stores and transmits water and yields significant quantities of water to wells and springs.

**average annual runoff** - the average value of annual runoff amounts for a specified area calculated for a selected period of record that represents average hydrologic conditions.

**balanced water conditions** - exist when upstream reservoir storage releases, plus other inflows, approximately equal the water supply needed to (1) satisfy Sacramento Valley and Sacramento-San Joaquin Delta in-basin needs, including Delta water quality requirements, and (2) meet export needs.

**benthic invertebrates** - aquatic animals without backbones that dwell on or in the bottom sediments of fresh or salt water. Examples: clams, crayfish, and a wide variety of worms.

**biota** - all living organisms of a region, as in a stream or other body of water.

**brackish water** - water containing dissolved minerals in amounts that exceed normally acceptable standards for municipal, domestic, and irrigation uses. Considerably less saline than sea water.

**carriage water** - the amount of water needed above an increased export so as to not increase salinity in the Delta.

**conjunctive use** - the operation of a ground water basin in combination with a surface water storage and conveyance system. Water is stored in the ground water basin for later use by intentionally recharging the basin during years of above-average water supply.

**Decision 1485 operating criteria** - standards for operating water project facilities under Water Rights Decision 1485 regarding the Sacramento-San Joaquin Delta and Suisun Marsh, adopted by the State Water Resources Control Board, August 1978.

**Delta consumptive use** - the sum of evapotranspiration and changes in soil moisture of Delta lands and evaporation from Delta channels.

**Delta outflow index** - a calculated approximation of this seaward freshwater outflow as it passes Chipps Island near Pittsburg, beyond the confluence of the Sacramento and San Joaquin Rivers.

**depletion** - the water consumed within a service area and no longer available as a source of supply.

**dissolved organic compounds** - carbon substances dissolved in water.

**drainage basin** - the area of land from which water drains into a river; for example, the Sacramento River Basin, in which all land area drains into the Sacramento River. Also called, "catchment area," "watershed," or "river basin."

**drought condition** - hydrologic conditions during a defined drought period during which rainfall and runoff are much less than average.

**ecology** - the study of the interrelationships of living organisms to one another and to their surroundings.

**ecosystem** - recognizable, relatively homogeneous units, including the organisms they contain, their environment, and all the interactions among them.

**effluent** - waste water or other liquid, partially or completely treated or in its natural state, flowing from a treatment plant.

**environment** - the sum of all external influences and conditions affecting the life and development of an organism or ecological community; the total social and cultural conditions.

**estuary** - the lower course of a river entering the sea influenced by tidal action where the tide meets the river current.

**evapotranspiration (ET)** - the quantity of water transpired (given off), retained in plant tissues, and evaporated from plant tissues and surrounding soil surfaces. Quantitatively, it is usually expressed in terms of depth of water per unit area during a specified period of time.

**evapotranspiration of applied water (ETAW)** - the portion of the total evapotranspiration which is provided by irrigation.

**forebay** - a reservoir or pond situated at the intake of a pumping plant or power plant to stabilize water levels; also a storage basin for regulating water for percolation into ground water basins.

**fry** - a recently hatched fish.

**gross reservoir capacity** - the total storage capacity available in a reservoir for all purposes, from the streambed to the normal maximum operating level. Includes dead (or inactive) storage, but excludes surcharge (water temporarily stored above the elevation of the top of the spillway).

**ground water** - water that occurs beneath the land surface and completely fills all pore spaces of the alluvium, soil or rock formation in which it is situated.

**ground water basin** - a ground water reservoir, defined by an overlying land surface and the underlying aquifers that contain water stored in the reservoir.

**ground water overdraft** - the condition of a ground water basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average.

**ground water recharge** - increases in ground water storage by natural conditions or by human activity.

**ground water table** - the upper surface of the zone of saturation, except where the surface is formed by an impermeable body.

**hydraulic barrier** - a barrier developed in the estuary by release of fresh water from upstream reservoirs to prevent intrusion of sea water into the body of fresh water.

**hydrologic balance** - an accounting of all water inflow to, water outflow from, and changes in water storage within a hydrologic unit over a specified period of time.

**hydrologic basin** - the complete drainage area upstream from a given point on a stream.

**hydrologic region** - a study area, consisting of one or more planning subareas.

**joint-use facilities** - specific pumping plants, power plants, canals, and reservoirs in which both State and federal agencies participated in the construction, use, and maintenance.

**land subsidence** - the lowering of the natural land surface in response to earth movements; lowering of fluid pressure (or lowering of ground water level); removal of underlying supporting materials by mining or solution of solids, either artificially or from natural causes; compaction caused by wetting (hydrocompaction); oxidation of organic matter in soils; or added load on the land surface.

**megawatt** - one million watts.

**milligrams per liter (mg/L)** - the weight in milligrams of any substance dissolved in one liter of liquid; nearly the same as parts per million.

**natural flow** - the flow past a specified point on a natural stream that is unaffected by stream diversion, storage, import, export, return flow, or change in use caused by modification in land use.

**percolation** - the downward movement of water throughout the soil or alluvium to a ground water table.

**permeability** - the capability of soil or other geologic formations to transmit water.

**phytoplankton** - minute plants, usually algae, that live suspended in bodies of water and that drift about because they cannot move by themselves or because they are too small or too weak to swim effectively against a current.

**pollution (of water)** - the alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water.

**prior water right** - a water designation used for water delivered based on its use prior to SWP construction.

**pumping-generating plant** - a plant at which the turbine-driven generators can also be used as motor-driven pumps.

**recharge basin** - a surface facility, often a large pond, used to increase the percolation of surface water into a ground water basin.

**riparian vegetation** - vegetation growing on the banks of a stream or other body of water.

**runoff** - the total volume of surface flow from an area during a specified time.

**Sacramento River index** - the sum of the Sacramento Valley's unimpaired runoff at the following four locations: Sacramento River near Red Bluff; total Feather River inflow to Lake Oroville; Yuba River at Smartville; and total American River inflow to Folsom Lake.

**salinity** - generally, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids), electrical conductivity, or osmotic pressure. See **total dissolved solids**.

**salinity intrusion** - the movement of salt water into a body of fresh water. It can occur in either surface water or ground water bodies.

**salt-water barrier** - a physical facility or method of operation designed to prevent the intrusion of salt water into a body of fresh water.

**sediment** - soil or mineral material transported by water and deposited in streams or other bodies of water.

**seepage** - the gradual movement of a fluid into, through, or from a porous medium.

**service area** - the geographical land area served by a distribution system of a water agency.

**snow water content** - a calculated or measured amount of water contained in packed snow based on its depth and density.

**spawning** - the depositing and fertilizing of eggs (roe) by fish and other aquatic life.

**streamflow** - the rate of water flow past a specified point in a channel.

**surplus water** - developed water supplies in excess of contract entitlement or apportioned water.

**total dissolved solids (TDS)** - a quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter. See **salinity**.

**transpiration** - an essential physiological process in which plant tissues give off water vapor to the atmosphere.

**unimpaired runoff** - represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds.

**waste water** - the water, liquid waste, or drainage from a community, industry, or institution.

**water conservation** - reduction in applied water due to more efficient water use.

**water quality** - used to describe the chemical, physical, and biological characteristics of water, usually in regard to its suitability for a particular purpose or use.

**water right** - a legally protected right to take possession of water occurring in a natural waterway and to divert that water for beneficial use.

**water table** - see **ground water table**.

**water year** - a continuous 12-month period for which hydrologic records are compiled and summarized. In California, it begins on October 1 and ends September 30 of the following year.

**watershed** - see **drainage basin**.