

FINAL REPORT



Governor's

Flood Emergency

Action Team

May 10, 1997

The Resources Agency

Pete Wilson
Governor



Douglas P. Wheeler
Secretary

of California

California Conservation Corps • Department of Boating & Waterways • Department of Conservation
Department of Fish & Game • Department of Forestry & Fire Protection • Department of Parks & Recreation • Department of Water Resources

May 10, 1997

The Honorable Pete Wilson
Governor
State Capitol
Sacramento, CA 95814

Dear Governor Wilson,

Californians, particularly in the Central Valley region, welcomed the early end of our rainy season. The record rainfall of December and January has been followed by the driest spring of record in some parts of northern California, allowing prompt levee repairs and other flood recovery efforts.

Your Flood Emergency Action Team (FEAT) convened additional citizen advisory meetings during this period, hearing from hundreds of Californians who were most directly affected by the January Floods. This Report (1) summarizes the actions taken as a result of recommendations in FEAT's 30-day report; (2) offers further recommendations for improved flood response and recovery; and (3) suggests a more thorough evaluation of flood management options, including new emphasis on non-structural solutions.

Specifically, you will find in this 120-day report more than fifty individual recommendations which reflect FEAT's consideration of longer-term issues than were addressed in the 30-day report. These include our findings concerning *improved emergency response capabilities*; short-term improvements in *flood plain management, expedited repair, restoration, and improvement of the flood control system*; and *comprehensive, basin-wide planning for flood control*, which we believe necessary to guide both structural and nonstructural flood management so as to protect citizens, save prime agricultural land, and protect and enhance the environment.

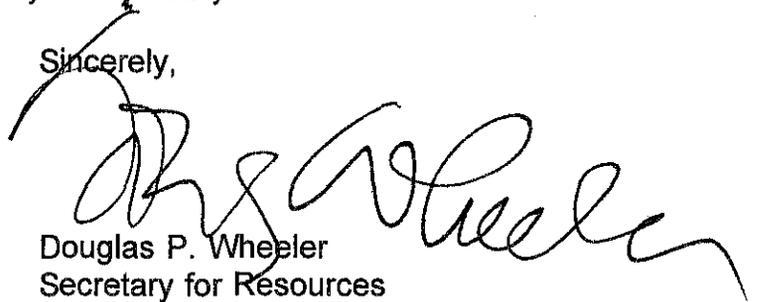
The Resources Building Sacramento, CA 95814 (916) 653-5656 FAX (916) 653-8102

California Coastal Commission • California Tahoe Conservancy • Colorado River Board of California
Energy Resources, Conservation & Development Commission • San Francisco Bay Conservation & Development Commission
State Coastal Conservancy • State Lands Commission • State Reclamation Board

The Honorable Pete Wilson
May 10, 1997
Page 2

FEAT very much appreciates the immediate and full cooperation offered by our Federal colleagues. Pursuant to your Executive Order of January 10, FEAT has completed its task with delivery of this report. Although the floods have long ago receded, and California's skies are once again cloudless, it is not too soon to plan for yet another rainy season. If the lessons learned from the January Floods can be put to use in reducing the threat of another such catastrophe, then some good will have come of the losses endured by so many earlier this year.

Sincerely,

A handwritten signature in black ink, appearing to read "Douglas P. Wheeler". The signature is fluid and cursive, with a large initial "D" and "W".

Douglas P. Wheeler
Secretary for Resources

Table of Contents

I. Foreword	1
II. Status of FEAT Actions from 30-Day Report	4
State Agency Actions Already Taken	4
Accelerate Payments of State Funds to Affected Counties	4
Pump-Out Program	4
OES Coordination with FEMA for Acceleration of Reimbursements	4
Telemetry for Stream Gaging Stations	4
Levee Rehabilitation Unit	8
OES Workshops	8
DWR/OES Technical Assistance for Emergency Repair of Private Levees	8
Trade and Commerce Tourism Campaign	8
State Requests for Federal Action	9
Urge Congress to Pass a Supplemental Appropriations Bill	9
Urge the Corps to Restore Critical Levees to Their Full Height and Section	9
Urge U. S. Fish and Wildlife Service to Use Its Authority	9
Urge Congress and the Corps to Accelerate the Phased Sacramento Flood Control Project Rehabilitation Program	9
Urge Congress To Re-authorize and Fund the Tree and Vine Assistance Program	9
III. Final FEAT Recommendations to the Governor	11
Emergency Response Recommendations	11
Improve Local Maintaining Agency Emergency Response Coordination and Operations	11
Local Maintaining Agency Emergency Plans	11
Model Emergency Procedures	11
Alerting and Warning Exercises	12
Improve Evacuation Procedures for Mobile Home Parks in Floodways	12
Livestock and Pet Evacuation	12
Sacramento-San Joaquin Delta Waterways—Emergency Response	12
Response Information Management System	12
DWR Emergency Management	12
Disaster Assistance Funding Guidance	12
Flood Center Event Tracking and Computer Mapping	13
Multi-Party Agreement on Payment	13
Authority to Fund Capital Outlay	13
Expand and Adequately Fund Long-Term Stream Gage Database	13
Uniform Flood Frequency Determination and Single Elevation Datum	13

Floodplain Management Recommendations	13
Additional FEMA Mapping for NFIP	13
Improve Floodplain Mapping	14
Outreach to Local Government	14
Lower Tuolumne River Floodplain Restoration	14
Floodplain Management Task Force	14
Flood Control System Restoration and Improvements	15
Acquisition of Flood Prone Lands in Stanislaus County	16
West Bear Creek Floodplain Restoration Project, San Luis National Wildlife Refuge	16
Provide Federal Assurances	16
Levee, Channel, and Streambed Maintenance	16
Mitigation for Ongoing Channel Maintenance	16
Enforcement of Maintenance Agreements	16
Ensure Integrity of the Sacramento River Flood Control System	16
Project Inspection Services	17
Increase Dam Safety Inspections	17
Anchoring Marinas	17
Fully Utilize Existing Corps' Authorities for Flood Repairs	17
Systemwide Benefit Approach for Levee Reconstruction	17
Sacramento River Bank Protection	17
Congressional Authorization for Third Phase, Sacramento River Bank Protection Project	18
Federal Adoption of Butte Basin Plan of Flood Control	18
Cache Creek Settling Basin	18
West Sacramento Project	18
Mid-Valley Levee Reconstruction Project	18
Mallott Road Bridge; Goose Lake FRS; Chester Project	18
Private Levees	19
Colusa Bypass Sediment Removal	19
Lower Sacramento Area Levee Reconstruction Project	19
Tisdale Bridge Replacement	19
American River FCP—Common Elements (Phase I)	19
Eastside Bypass on Lower San Joaquin River	19
Recommendations for Further Studies and Investigations	20
Yuba River Feasibility Study	20
Tuolumne River Reconnaissance Study	20
American River FCP—Long-Term Improvements	20
Sacramento River and San Joaquin River Comprehensive Watershed Management Studies	20
Evaluate Debris Commission Projects	20

Ditch and Canal Setbacks	21
Evaluate Effects of Vegetation on Levees	21
State Participation in Feasibility Studies	21
Needed University Research	21
Inventory Flood Control Agencies	21
IV. January 1997 Floods	25
A. Hydrologic Summary	25
1. Needed University Research	28
B. Damage Assessments	29
1. Overall Damage	29
2. Agriculture	29
3. Public Works and Infrastructure	29
4. Residential Property	32
5. Business	32
6. Travel and Tourism	32
7. Miscellaneous Damage	32
C. Description of Damage to Flood Control Systems	33
1. Federal Project Levees, Sacramento River Basin	33
2. Federal Project Levees, San Joaquin River Basin	41
3. Nonfederal Delta Levees: Response Through AB 360	48
4. Other Areas	48
a. Cosumnes River, Sacramento County	48
b. Ring Dikes, Sutter and Fresno Counties	49
c. Walker River, Mono County	49
d. Topaz Lake, Mono County	50
e. Truckee River	50
f. Napa and Russian Rivers	50
g. Coffee Creek, Trinity County	51
D. U.S. Army Corps of Engineer's Role	53
1. Water Management	53
2. Public Law 84-99 Authority	53
a. Emergency Flood Fight (Phase I)	53
b. Rehabilitation - Phase II and Phase III	54
3. Levee Repair Plan	59
4. Status and Schedule of Levee Repairs	67
E. Natural Resources Conservation Service Role	77
F. State Reclamation Board Role	79
G. Performance of State Jurisdictional Dams	79
V. Emergency Management System Response to Floods	81
A. Background	81

B. Description of SEMS	81
1. Emergency Response Organization	81
2. Maintenance System	83
3. Response Information Management System	84
C. Initiatives	84
1. Operations	85
a. Field/Emergency Operations Center/Department Operations Center Coordination	85
b. Emergency Planning and Operations at Local Maintaining Agencies	85
c. Evacuation	86
d. Livestock and Pet Evacuation	86
2. Training	87
a. Alerting and Warning	87
b. EOC Training	87
3. Information Management	87
a. RIMS	87
b. More Comprehensive Data Acquisition	88
c. Geographic River, Levee, Stream, and Reservoir Information	88
4. Disaster Assistance Program Funding	89
a. Eligibility Guidance	89
b. Multi-Party Agreement for Rapid Payment	89
D. Coordination of Emergency Response in Delta Waterways	90
VI. Floodplain Management Issues	93
A. Putting Risk into Context	93
B. Federal Floodplain Policy	95
1. Federal Floodplain Management Activities	95
a. U.S. Army Corps of Engineer's Role	97
b. FEMA Role	98
c. Other Federal Agencies' Role	100
2. Review of Nonstructural Alternatives	101
a. Interagency Levee Task Force	102
C. Statewide Floodplain Management Activities	106
1. State Agency Floodplain Management	107
2. State Reclamation Board Floodways	107
3. Establish State Floodplain Mapping Program	108
4. Revise the Safety Element of State's General Plan Guidelines to Include Floodplain Management on a Watershed Basis	111
5. Establish State Standards for Elevating Structures in Floodplains	111
6. Develop Appropriate Risk Management Program	111
7. Provide Technical Assistance to Communities on Evaluating Impacts of Development in Floodways/Floodplains	112

8. Continue Training Workshops for Local Officials	112
9. Assist Communities in Preparing Floodplain Management/Flood Hazard Mitigation Plans	112
10. Expand Public Outreach Program	112
D. Local Floodplain Management Issues	113
E. State Support of Local Flood Control	113
F. Other Proactive Actions for Floodplain Management	115
VII. Flood Control System Improvements	117
A. Planning Activities	117
1. Sacramento River Watershed	117
a. Yuba River Basin Feasibility Study	117
b. Middle Creek Ecosystem Restoration Project	118
2. San Joaquin River Watershed	119
a. Tuolumne River Reconnaissance Study	119
b. Acquire Flood Prone Land in Stanislaus County	119
c. West Bear Creek Floodplain Restoration Project, San Luis National Wildlife Refuge	120
d. Other San Joaquin River Projects	120
e. Increase Capacity of the Lower San Joaquin River	121
3. Nonstructural Planning Coordination	121
a. San Joaquin River Management Program	122
b. CALFED Ecosystem Restoration Program	123
c. CVPIA and OES General Recommendations for Nonstructural Alternatives	124
4. State Participation in Feasibility Studies	125
B. Design and Construction Activities	126
1. Sacramento River Watershed	126
a. Sacramento River Flood Control System Evaluation	126
b. Sacramento River Bank Protection Project	131
c. West Sacramento Levee Improvement Project	131
d. Butte Basin Plan of Flood Control	131
e. American River Flood Control Project (Common Elements)	132
f. Cache Creek Settling Basin	133
g. Colusa Bypass Sediment Removal	133
h. Tisdale Bridge Replacement	133
i. Mallott Road Bridge; Goose Lake FRS; Chester Project	134
j. Other Small Flood Control Projects	135
2. San Joaquin River Watershed	135
a. Lower Tuolumne River Floodplain Restoration	135
b. Other Projects	136

C. Comprehensive Studies for Flood Control	137
1. Sacramento River Flood Control Project	138
a. Needs Assessment	138
b. Alternatives	142
2. San Joaquin River Flood Control System	145
a. Needs Assessment	146
b. Alternatives	150
3. Sacramento–San Joaquin Delta	153
a. Needs Assessment	155
b. Alternatives	156
c. Other Significant Delta Issues	157
D. Evaluation of Maintenance	158
1. Preflood Maintenance Practices and Environmental Requirements	158
2. Channel Maintenance	158
3. Environmental Concerns for Channel and Streambed Maintenance	159
4. Sediment and Gravel Management	160
5. Levee Maintenance and Inspection	160
6. Bank Protection	162
7. Ditch and Canal Setbacks	162
E. Evaluate Debris Commission Projects	163
VIII. Funding Issues	165
A. Immediate Response and Recovery Costs	165
B. Subsequent Recovery Costs	166
C. Prevention/Long Range Planning	169
D. Federal Funding Issues	170
E. Estimated Costs	171
F. Overview of Disaster Assistance Programs and Issues	171
1. Public Assistance	171
2. Hazard Mitigation Assistance	173
3. Individual Assistance	173
G. Unresolved Issues	173

Appendices

Appendix A: Milestones in Flood Control California's Central Valley	175
Appendix B: Hydrologic Summary	179
Background Event Recap	181
Figure B-1. Annual Peak Discharges at Selected Long-Term U.S. Geological Survey Gaging Stations	183
Figure B-2. Shasta Lake Operations	184
Figure B-3. Lake Oroville Operations	185
Figure B-4. New Bullards Bar Reservoir Operations	186
Figure B-5. Folsom Lake Operations	187
Figure B-6. New Melones Reservoir Operations	188
Figure B-7. Don Pedro Reservoir Operations	189
Figure B-8. Lake McClure Operations	190
Figure B-9. Millerton Lake Operations	191
Figure B-10. Isohyetal Map: Northern and Central California, New Year's Flood. December 26, 1996 to January 3, 1997	192
Figure B-11. Isohyetal Map: Northern and Central California, Late January Flood. January 20-29, 1997	193
Figure B-12. Peak Flood Stages—Upper and Middle Sacramento River	194
Figure B-13. Peak Flood Stages—Feather, American and Lower Sacramento Rivers	195
Figure B-14. Peak Flood Stages—Cosumnes and Mokelumne Rivers	196
Figure B-15. Peak Flood Stages—Tuolumne and San Joaquin Rivers	197
Appendix C: Levee Failure Modes and Options for Repair	199
Levee Failure Modes	201
Figure C-1. Toe Drain and Levee Berm	202
Options for Levee Repair	203
Figure C-2. Slurry cut-off wall	204
Appendix D: State Requests for Corps' Small Communities Flood Assessment Studies	205
Appendix E: List of letters	209
Letters Requesting Federal Assistance:	
Resources Secretary Douglas P. Wheeler	211
Resources Secretary Douglas P. Wheeler	213
Governor Pete Wilson	215
OES Director Richard Andrews and Resources Secretary Douglas P. Wheeler	219
OES Director Richard Andrews	221
Senator Dianne Feinstein	223
Federal Response:	
Lacy E. Suiter, FEMA	225
Lacy E. Suiter, FEMA	227

Dorothy M. Lacy, FEMA	229
Letters to FEAT:	
Sacramento Valley Local Citizens' Advisory Team	231
Modesto Irrigation District	235
Senator Jim Costa	237
Delta Protection Commission	241
River Parkway Trust	245
County of Sacramento	247
ACWA	249
SAFCA	253
Turlock Irrigation District	259
California State University, Fresno	261
Senator Jim Costa	263
CALFED	265
South Delta Water Agency	271
San Joaquin Valley Local Citizens' Advisory Team	275
Appendix F: Flood Response Executive Orders	279
Executive Order W-140-97	281
Executive Order W-141-97	283
Executive Order W-142-97	285
Executive Order W-143-97	287
Executive Order W-149-97	289

Figures

Figure II-1. Pump-Out Program Participants	5
Figure IV-1. Sacramento Valley Flood Control System	37
Figure IV-2. Delta and San Joaquin Valley Flood Control System	43
Figure IV-3. Basin Delineations	61
Figure IV-4. Sacramento River System January 1997 Levee Problems	69
Figure IV-5. San Joaquin River System January 1997 Levee Problems	73
Figure VI-1. Nonstructural Alternative RD 2099, RD 2100, RD 2102	103
Figure VII-1. Sacramento River Flood Control System Evaluation	128

Tables

Table II-1. Pump-Out Program	7
Table III-1. FEAT Recommendations for FY 1997-98	22
Table III-2. FEAT Recommendations for FY 1998-99	23
Table IV-1. Estimated Water Year 1997 Rainflood Frequency	27
Table IV-2. Floodflows on the Tuolumne River	28
Table IV-3. Public Facilities Damage Estimates	30
Table IV-4. Road, Infrastructure Damage Estimates	30
Table IV-5. Sacramento River Flood Control System Damage	36
Table IV-6. San Joaquin River Flood Control System Damage	42
Table IV-7. Nonfederal Levee Emergency Sites	48
Table IV-8. Requests for Emergency Levee Repairs	58
Table IV-9. Levee Repair Status Report—Sacramento River	71
Table IV-10. Levee Repair Status Report—San Joaquin River	75
Table IV-11. USDA-NRCS, Emergency Watershed Protection Program Flood Damage Repair Projects after January 1997 Floods	78
Table VII-1. Federal Flood Control Storage Major Central Valley Reservoirs	140
Table VII-2. Estimated Current Level of Flood Protection San Joaquin River and Tulare Basin	148
Table VIII-1. Estimate of Costs Resulting from 1997 Floods	172

List of Flood Emergency Action Team Members

Douglas P. Wheeler	Secretary for Resources	The Resources Agency
James Strock	Secretary	CA Environmental Protection Agency
Julie Wright	Secretary	Trade and Commerce Agency
Craig L. Brown	Director	Department of Finance
Ann Veneman	Secretary	Department of Food and Agriculture
Lee Grissom	Executive Director	Governor's Office of Planning and Research
Richard Andrews	Director	Governor's Office of Emergency Services
David N. Kennedy	Director	Department of Water Resources
Richard Wilson	Director	Department of Forestry and Fire Protection
Al Aramburu	Director	CA Conservation Corps
Jackee Schafer	Director	Department of Fish and Game
John Caffrey	Chairman	State Water Resources Control Board
James van Loben Sels	Director	Department of Transportation

The FEAT gratefully acknowledges the assistance of the following:

Major General Tandy K. Bozeman		CA National Guard
W.R. Gomes	Vice President, Division of Agriculture and Natural Resources	University of California
Robert N. Shelton	Vice Provost for Research	University of California
Lester Snow	Executive Director	CALFED Bay-Delta
Brigadier General J. Richard Capka		U.S. Army Corps of Engineers
Colonel David Peixotto		U.S. Army Corps of Engineers
Colonel Dorothy Klasse		U.S. Army Corps of Engineers
Helen Flach	Assistant State Conservationist	Natural Resource Conservation Service
Charles Davis	State Conservation Engineer	Natural Resource Conservation Service
Jon Kennedy	Assistant to Regional Forester	U.S. Forest Service
Shirley Mattingly	Regional Director	Federal Emergency Management Agency
Dottie Lacey	Federal Coordinating Officer	Federal Emergency Management Agency
Roger Patterson	Regional Director	Bureau of Reclamation
Keith Takata	Division Director	U.S. Environmental Protection Agency
Wayne White	Field Supervisor	U.S. Fish and Wildlife Service
Mike Shulters	District Chief	U.S. Geological Survey, Water Resources Division
Raymond D. Hart	Deputy Director	Department of Water Resources

I. Foreword

Californians found themselves confronted with the largest and most extensive flood disaster in the Golden State's history as January 1997 drew to a close. Rivers from the Oregon border to the southern Sierra reached flood stages; some rivers exceeded channel capacities by as much as seven times. In many major river systems, flood control dams reduced deadly floodflows by half or more, saving lives and significantly reducing property damage. However, in some areas, leveed flood control systems were totally overwhelmed, and damage amounts in those areas and the cost to replace, restore, and rehabilitate flood damage are nearing \$2 billion. Most importantly, this event left many of the State's citizens apprehensive about how much protection they can expect from the current leveed flood control system.

These floods not only tested the Sacramento-San Joaquin flood control systems, but they tested the stamina and resolve of its citizens. People not directly affected by the flood pitched in to help those who were not so fortunate. Citizens strained in the frantic rush to fill sandbags, build temporary levees, and pull people from floodwaters. Flood response crews no sooner stabilized one area before having to dash off to a new and potentially more hazardous situation. With little opportunity for rest, the crews forged on. In many cases, the flood fight crews won, but in others, the water claimed its victory.

Flood control conveyance facilities on the Sacramento River and its tributaries sustained two major levee breaks, and even where levees performed as designed, major damage from erosion occurred. Flood control facilities on the San Joaquin River suffered more than two dozen levee breaks, and extensive sedimentation was observed in the form of new sandbars in the river, as well as widespread deposition of sand and silt in fields and orchards where floodwaters poured through levee breaks.

In response to concerns raised by the flooding, the Governor formed the Flood Emergency Action Team, which held citizen advisory meetings in Yuba City, Modesto, Fresno, Santa Rosa, and Walnut Grove in order to hear from those that were most affected by the January floods. These meetings provided a forum for local officials, landowners, and business owners to let the government in Sacramento know what worked and what needed improvement in the State and federal flood response efforts. The FEAT responded to many questions, primarily regarding disaster response processes, and listened to recommendations for future flood response actions and needed flood control system improvements.

This report outlines the FEAT's findings after evaluating existing flood control facilities and emergency agency responses, and lists their recommendations to enhance our capability to reduce impacts to California's citizens from future flood events. The near-term improvements in flood management will help to reduce risk

as California focuses on longer-term solutions that will come from development of a new master plan for flood management in the Central Valley.

The time to prepare for a flood event is not when it begins to rain. Unlike most other natural disasters—such as earthquakes which usually strike without warning—proper planning and preparation may prevent flooding or greatly reduce flood damage, except for extremely rare events. Proactive floodplain management is an excellent example of how such planning can mitigate flood-related damage. If development is controlled in a floodplain, flooding generally will be a harmless and natural occurrence. If channel maintenance is properly performed, only a major or unprecedented event places surrounding areas at risk.

In some areas, such as the San Joaquin Valley, nonstructural solutions may be capable of providing flood relief at a reasonable cost; however, some nonstructural solutions, such as reoperating existing reservoirs to provide more flood control space, must be carefully evaluated to determine whether the benefits outweigh the potential cost. In some cases, reoperation to enhance flood control may reduce water supply for power generation, and urban, agricultural, environmental, and recreational use. A case in point is the reoperation of Folsom Dam and Reservoir to provide flood protection for the Sacramento area. This program provided significant benefits during the December–January flood; however, subsequent dry conditions in the American River watershed have prevented a complete recovery of the stored water, which was released to achieve these benefits. The Sacramento Area Flood Control Agency has agreed to mitigate any resulting impacts on water and power benefits. Preliminary estimates for this year indicate losses in power revenues of \$1.3 million, and water storage impacts obligate SAFCA to purchase up to 100,000 acre-feet for delivery this summer at an estimated cost of \$3 to \$5 million. Nevertheless, given the billions of dollars of damageable property at risk in the American River floodplain, the action was justified.

The following recommendations result from the FEAT's look at the flood events of early 1997 and the input received from local citizens through the FEAT advisory workshops. With the State Legislature's support, implementing these near-term recommendations will significantly increase California's ability to respond to future flood events through planning and activities such as developing structural and nonstructural protections, enforcing sound floodplain management practices, developing more real-time information sources, and providing adequate numbers of trained individuals for flood response.

*Opposite page:
DWR pumped floodwater
out of more than 80,000
acres in the Central
Valley as part of the
Pump-out Program.*



II. Status of FEAT Actions from 30-Day Report

In response to the Governor's Executive Order, the FEAT prepared a preliminary report on February 10, 1997. That report recommended the Governor take a number of actions to provide immediate relief to California's victims and local agencies affected by the flooding. The following paragraphs summarize the status of key FEAT Actions from the 30-day report.

State Agency Actions Already Taken

➤ ***Accelerate Payments of State Funds to Affected Counties***

The Governor's Office of Emergency Services negotiated a new procedure with the Federal Emergency Management Agency to expedite approval and reimbursement of local government costs for emergency protective measures and debris removal. The procedure was implemented for cities and counties. Payments were based on 50 percent of the emergency costs and \$18.8 million in claims have been paid to date.

➤ ***Pump-Out Program***

The Department of Water Resources carried out and completed a program to provide assistance in pumping out ponded floodwaters from behind broken Sacramento-San Joaquin River and Delta flood control system levees. The Department of Water Resources pumped over 80,000 acres, at a cost of nearly \$5.4 million (see Table II-1).

➤ ***OES Coordination with FEMA for Acceleration of Reimbursements***

At the onset of the flood disaster, OES and FEMA identified problems that delayed reimbursements in earlier disasters. As a result, OES and FEMA agreed to a streamlined cooperative process which provided for use of OES figures to determine whether assistance programs were required and merging of federal and State payment forms. These actions resulted in an extraordinary cooperative effort between OES and FEMA and promoted a more rapid pace of recovery than has been seen in prior flood disasters.

➤ ***Telemetry for Stream Gaging Stations***

To improve the reliability of real-time flood data, the Department of Water Resources has installed telemetry at 25 key stream gages in the Sacramento, San Joaquin, and Truckee river basins. An additional 20 sites in the Central Valley will be equipped by June 30, 1997. The Governor has recommended funding increases for flood forecasting, telemetry maintenance, and data collection to further improve the flood data network.

Pump Out Program Participants

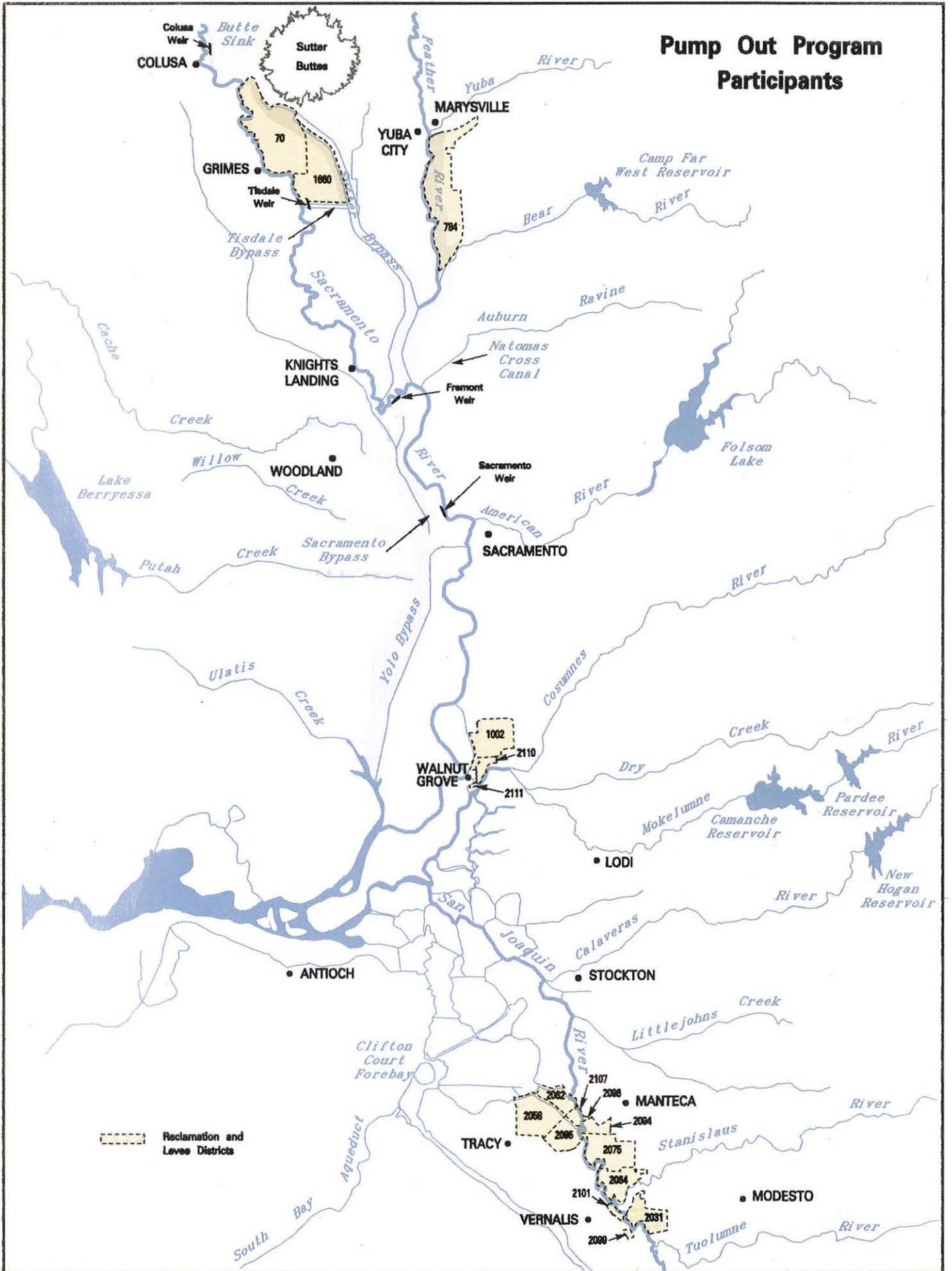




Table II-1. Pump-Out Program

Reclamation District Number	Participant Name	County	Initial Flooded Area (acres)	Estimated Pumping Cost (\$)
70/1660	Meridian Farms/Tisdale	Sutter	32,000	1,800,000
784	Plumas Lake	Yuba	4,000	500,000
1002	Glanville Tract	Sacramento	7,000	120,000
2031	Elliott	Stanislaus	5,030	175,000
2058	Pescadero Tract	San Joaquin	3,500	600,000
2062	Stewart Tract	San Joaquin	4,000	220,000
2064	River Junction	San Joaquin	2,000	240,000
2075	McMullin Ranch	San Joaquin	3,000	100,000
2094	Walthall	San Joaquin	2,000	180,000
2095	Paradise Junction	San Joaquin	2,000	250,000
2096	Wetherbee Lake	San Joaquin	3,840	192,000
2099	El Solyo Ranch	Stanislaus	265	5,000
2101	Blewett District	Stanislaus	800	83,000
2107	Mossdale	San Joaquin	600	125,000
2110	McCormack-Williamson Tract	Sacramento	1,654	150,000
2111	Dead Horse Island	Sacramento	211	70,000
Misc.	Private Lands	Madera	6,500	94,000
		Merced	32	3,000
		San Joaquin	1,260	241,000
		Stanislaus	900	248,000
Totals			80,592	5,396,000

Note: Pumping costs per acre of flooded area varied greatly among participants primarily due to depth of flooding, accessibility to pump sites, availability of pumps and power, and other site specific considerations.

➤ ***Levee Rehabilitation Unit***

To facilitate the U.S. Army Corps of Engineers' efforts in repairing damaged levees this year, the Department of Water Resources established a new Levee Rehabilitation Unit. In addition, the Governor recommended that the Legislature provide funds for the nonfederal share of the cost for repairing flood damage (see Chapter IV, Section D2b).

➤ ***OES Workshops***

OES conducted seven workshops throughout the flood-affected areas and also met with media representatives. Local, State, and federal agencies reviewed roles and procedures related to disseminating flood information and public warnings. The effort will continue with annual OES/DWR flood emergency workshops focusing on dissemination of emerging information.

➤ ***DWR/OES Technical Assistance for Emergency Repair of Private Levees***

The Governor requested the Legislature provide funds for interim repairs of private levee breaches to a five-year level of flood protection on the Cosumnes River. The County of Sacramento and Sloughhouse Resource Conservation District will perform this repair work. The newly formed Cosumnes River Task Force is developing permanent, long-term flood management solutions needed to provide flood protection for public safety and Highways 16 and 99 and Interstate 5.

➤ ***Trade and Commerce Tourism Campaign***

The Legislature is currently considering supplemental State appropriations for stimulating tourism for destinations whose economy has been impacted by the January 1997 floods.

State Requests for Federal Action

➤ ***Urge Congress to Pass a Supplemental Appropriations Bill***

The Governor is working with Congress to provide adequate federal funding in a supplemental appropriations bill to complete the levee and highway restoration work urgently needed.

➤ ***Urge the Corps to Restore Critical Levees to Their Full Height and Section***

At the request of the Reclamation Board, the Corps has restored the full height and section of the Feather River and Bear River levees and has expedited contracts for restoring full height and section for levees along the Sutter Bypass.

➤ ***Urge U. S. Fish and Wildlife Service to Use Its Authority to Implement Emergency Procedures with Respect to Mitigation for Emergency Levee Repair and Reconstruction***

The USFWS has responded in a manner showing flexibility, with field visits and office analysis. Levee repair work is proceeding well.

➤ ***Urge Congress and the Corps to Accelerate the Phased Sacramento Flood Control Project Rehabilitation Program***

The California Water Commission requested increasing the project funding proposed in the President's Budget for Federal Fiscal Year 1998 by \$8.7 million to accelerate the reconstruction project. DWR is providing the necessary support to the Corps to perform the phased levee reconstruction under the Corps' expedited schedule, which calls for construction completion in 1999.

➤ ***Urge Congress To Re-authorize And Fund The Tree And Vine Assistance Program***

Congress is currently considering a \$9 million appropriation in the supplemental appropriations bill.

Final

F.E.A.T.

Recommendations

III. Final FEAT Recommendations to the Governor

This report is not a statewide flood management report because the January 1997 floods primarily impacted the Central Valley region of the State, some localized streams on the east side of the Sierra Nevada, and the Napa and Russian rivers. Consequently, recommendations made in this report are not intended to address all statewide flood control issues.

The previous chapter detailed progress made as a result of actions taken in response to the FEAT's recommendations in the 30-day report. This final report affirms and builds on those initial recommendations and provides a framework for preparing for future flood events by presenting recommendations in four major areas: (1) needed improvements in emergency response capabilities; (2) floodplain management; (3) flood control system restoration and improvement; and (4) recommendations for further studies and investigations. Many of these can be accomplished administratively and some will require special legislation.

Emergency Response Recommendations

The following FEAT recommendations are actions that will improve flood emergency response capabilities and management of the flood control systems.

Improve Local Maintaining Agency Emergency Response Coordination and Operations

Directs the Governor's Office of Emergency Services to develop and test guidelines that clarify how federal, State, and local agencies will coordinate joint field emergency operations under its Standardized Emergency Management System. The guidelines should integrate local agencies that maintain levees and flood control structures into the overall emergency response organization. These guidelines must define fiscal responsibilities, emergency response, and statutory and regulatory authorities. (See Chapter V, Section C.)

Local Maintaining Agency Emergency Plans

Encourage local agencies responsible for maintaining levees and flood control structures to coordinate an emergency plan and response actions with the appropriate city and county emergency management agency. (See Chapter V, Section C.)

Model Emergency Procedures

Directs the Department of Water Resources, in coordination with OES, to develop model emergency procedures and training for use by local maintaining agencies in developing local plans. (See Chapter V, Section C.)

Alerting and Warning Exercises

Directs OES and DWR to jointly conduct flood emergency workshops annually, prior to the flood season. This effort will focus on the dissemination of critical information to decision makers and effectively using the tools available for conveying emergency information to the public in a timely manner. (See Chapter V, Section C.)

Improve Evacuation Procedures for Mobile Home Parks in Floodways

Directs OES to review the efficiency of mobile home and recreational vehicle park evacuations during the 1997 flood and take actions to necessary improve evacuation procedures for future flood events. (See Chapter VI, Section C.)

Livestock and Pet Evacuation

Directs OES, in cooperation with local animal control officers, the Department of Food and Agriculture, and UC Cooperative Extension, to review procedures for livestock and pet evacuation and develop animal safety and relocation procedures to be used in future emergencies. (See Chapter V, Section C.)

Sacramento–San Joaquin Delta Waterways—Emergency Response

Directs OES and the Department of Boating and Waterways, in cooperation with the U.S. Coast Guard and the Delta Protection Commission, to develop a plan of action for future emergency closures of the Sacramento–San Joaquin Delta waterways to nonessential vessel traffic during periods of extremely high water. (See Chapter V, Section D.)

Response Information Management System

Directs OES to explore the feasibility of developing RIMS for application to local governments which currently do not have access to it.. (See Chapter V, Section C.)

DWR Emergency Management

Directs the Department of Water Resources to establish a Department–wide emergency management function to better meet the requirements of the State's Emergency Services Act and the Standardized Emergency Management System. More emphasis should be placed on advance planning for all types of emergencies, and year–round coordination with OES and other local, State, and federal responding agencies. (See Chapter V, Section C.)

Disaster Assistance Funding Guidance

Directs OES to provide guidance about disaster assistance funding. This includes developing guidelines and training to clarify the responsibilities and benefits of emergency proclamations and declarations. To support this effort, OES will also develop a federal and State disaster assistance program matrix describing types of assistance provided, application requirements, time–frames, and restrictions. (See Chapter V, Section C.)

Flood Center Event Tracking and Computer Mapping

Directs DWR to assure that computer-based flood event tracking and reporting systems are completed, maintained, and staffed, including training of staff used only in emergencies. (See Chapter V, Section C.)

Multi-Party Agreement on Payment

Directs OES to coordinate, consistent with FEMA guidelines for reimbursable costs, a multi-party agreement among affected parties, at the local, State, and federal levels, addressing payment for flood emergencies and pre-emergency flood response. (See Chapter V, Section C.)

Authority to Fund Capital Outlay

Recommends that legislation be enacted authorizing the Department of Finance to use Section 8690.6 for allocation of funds for disaster related capital outlay projects needed to maintain essential State functions and to ensure public safety. (See Chapter VIII, Section A.)

Expand and Adequately Fund Long-Term Stream Gage Database

Urges the U.S. Geological Survey to expand its surface water data collection program and support long-term records of flows for gaging stations for more rivers and streams in California. This database is needed to define the watershed hydrology and provide statistics for critical water use decisions and more accurately define floods of a specific frequency, particularly the "100-year" event which is the basis of NFIP floodplain mapping. (See Chapter V, Section C.)

Uniform Flood Frequency Determination and Single Elevation Datum

Urges federal agencies to standardize the methodology for determining flood frequencies and to adopt a single elevation datum using English units rather than metric. (See Chapter V, Section C.)

Floodplain Management Recommendations

The January 1997 floods vividly pointed out the importance of floodplain management, particularly in the San Joaquin River basin where much of the floodplain is still relatively undeveloped. While a comprehensive watershed analysis is needed to develop a new master plan for flood management in the Central Valley, there are actions that governmental agencies can take now to minimize future flood impacts.

Additional FEMA Mapping for NFIP

Urges Congress to increase funding for FEMA's Region IX for its National Flood Insurance Program. These funds would be used to prepare and update Flood Insurance Rate Maps. (See Chapter VI, Section B.)

Improve Floodplain Mapping

Directs the Department of Water Resources to significantly improve its computer modeling and floodplain mapping capabilities to support the Reclamation Board's floodway program and FEMA's National Flood Insurance Program mapping efforts. (See Chapter VI, Section C.)

Outreach to Local Government

Directs the Department of Water Resources, in cooperation with the Reclamation Board, to implement critically needed proactive nonstructural floodplain management strategies and to strengthen its outreach to local government and landowners regarding allowable and appropriate land use within the Reclamation Board and FEMA floodways. (See Chapter VI, Section C.)

Lower Tuolumne River Floodplain Restoration

Recommends restoration of the Tuolumne River floodway width to safely convey floods twice the size of existing channel capacity by performing needed repairs and restoration. The FEAT recommends CALFED and DFG expedite funding and construction of this project. (See Chapter VI, Section F.)

Floodplain Management Task Force

Recommends the Governor appoint a ***Floodplain Management Task Force*** with broad membership from sectors of government and the affected community to examine specific issues related to State and local floodplain management and to make recommendations for improved statewide floodplain management policies by March 1, 1998 (See Chapter VI, Section C). In addition to broad management strategies, the Task Force should explicitly respond to the following recommendations:

- The FEAT recommends the Task Force, in consultation with Reclamation Board staff, review the **roles and responsibilities of the Reclamation Board** and recommend Legislative changes to be responsive to today's flood management needs in the Central Valley. (See Chapter IV, Section F and Chapter VI, Section C.)
- The FEAT recommends the Task Force review the situation that occurs when an LMA's **maintenance is deficient** and make recommendations for a course of action for the State to take to remedy the problem. (See Chapter VII, Section D.)
- The FEAT recommends that the Task Force **examine federal and State floodplain management regulations** and make recommendations for changes to the State's existing floodplain management procedures and policies that are implemented through Executive Order. (See Chapter VI, Section C.)

- The FEAT recommends the Task Force **review the Reclamation Board's Designated Floodways Program** and make recommendations as to how the program should be changed. (See Chapter VI, Section C.)
- The FEAT recommends the Task Force **develop specific multi-objective watershed planning elements that should be added to the Safety Element of the State's General Plan Guidelines** to encourage a regional/coordinated approach for land use planning decisions. (See Chapter VI, Section C.)
- The FEAT recommends the Task Force examine the option of requiring future urban developments to **exceed the minimum National Flood Insurance Program floodplain management elevation requirements** by imposing State standards in statute. (See Chapter VI, Section C.)
- The FEAT recommends that the Task Force examine the option of imposing **mandatory flood insurance** for structures protected at less than the 200-year level of protection in statute. (See Chapter VI, Section C.)
- The FEAT recommends the Task Force develop **proactive nonstructural floodplain management strategies** which can be implemented cooperatively with local government and landowners to reduce future flood loss and curtail the spiraling cost of State and federal disaster assistance. (See Chapter VI, Section C.)
- The FEAT recommends that the Task Force **evaluate land use policies** applicable to urban development in deep floodplains (generally defined as having flood depths greater than three feet) and other high flood risk areas and make recommendations as to methods of regulation, such as **requiring notice on title**—if the parcel is in a deep floodplain, to ensure that prospective buyers are noticed of potential hazards. (See Chapter VI, Section D.)
- The FEAT recommends that the Task Force examine the advisability of requesting the Legislature to amend the State's programs for **State participation in federal flood control projects** to provide funding only for those communities that adopt and implement local floodplain management, as an incentive. (See Chapter VI, Section D.)

Flood Control System Restoration and Improvements

The following recommendations will expedite repair, restoration, and planned improvements in the Sacramento–San Joaquin flood control system. In addition to the capital outlay required, these recommendations improve ongoing maintenance which is important to provide improved operation of the flood control system and thus, need to be completed soon.

Acquisition of Flood Prone Lands in Stanislaus County

Urges the U.S. Fish and Wildlife Service to acquire these lands, in a manner which supports and advances the CALFED ecosystem restoration goals, and in cooperation with the California Department of Transportation to assure protection of existing highways. (See Chapter VII, Section A.)

West Bear Creek Floodplain Restoration Project, San Luis National Wildlife Refuge

Recommends that the Reclamation Board and the Lower San Joaquin Levee District support USFWS efforts to direct a portion of peak flows through the levees, allowing historic floodplains and wetland areas to temporarily store peak floodflows and reduce downstream flooding impacts. (See Chapter VII, Section A.)

Provide Federal Assurances

Urges the federal government to provide assurances to levee maintaining agencies and landowners, that are seeking to participate in a nonstructural solution, that levee repairs under PL 84-99 and repair of further damages occurring due to floods—before agreement on a final long-term project—will be done under PL 84-99 if a decision is made to fix the levees, rather than pursue the nonstructural alternative. (See Chapter VII, Section A.)

Levee, Channel, and Streambed Maintenance

Directs the Department of Fish and Game to develop a process through regulation to facilitate levee and river channel maintenance and, using the federal Fish and Wildlife Coordination Act, assist private and public entities with biological information necessary to secure federal approvals for levee and streambed maintenance activities. (See Chapter VII, Section D.)

Mitigation for Ongoing Channel Maintenance

Recommends that once mitigation has been provided for restoring a channel to its design flood carrying capacity, no further mitigation should be required for work done in the future to maintain the channel to that capacity. (See Chapter VII, Section D.)

Enforcement of Maintenance Agreements

Recommends the Reclamation Board use its authority to enforce its agreements with local maintaining agencies; those agreements allocate responsibility for flood control maintenance to the LMAs. (See Chapter VII, Section D.)

Ensure Integrity of the Sacramento River Flood Control System

Directs the Department of Water Resources to ensure continued capability of the Sacramento River Flood Control System to safely pass design floodflows by directing maintenance activities to critical areas and accelerating flood control levee and structure repairs in State-maintained areas. (See Chapter VII, Section D.)

Project Inspection Services

Recommends the Reclamation Board help ensure appropriate levee maintenance practices are carried out by requesting the Department of Water Resources to increase its monitoring of local maintenance activities. These efforts will also help maintain control of encroachments. (See Chapter VII, Section D.)

Increase Dam Safety Inspections

Directs the Department of Water Resources to inspect all dams which made large spillway releases during the 1997 flood for damage that may impair the dam's ability to safely pass future floodflows. If necessary, require the owner to initiate repairs as soon as possible to assure downstream safety. (See Chapter IV, Section G.)

Anchoring Marinas

Directs the Department of Boating and Waterways, in cooperation with the Reclamation Board and other affected agencies, to develop engineering and construction guidelines to be applied in the design, permitting, construction and/or replacement of marinas and other in-water boating structures that are subjected to high velocity flows and flood stages. (See Chapter V, Section D.)

Fully Utilize Existing Corps' Authorities for Flood Repairs

Urges the U.S. Army Corps of Engineers to use PL 84-99 authority to repair levee damage caused by seepage and piping of levee and foundation materials through boils, and to use PL 84-99 authority, in addition to Sacramento River Bank Protection Project authority, to quickly repair eroded banks that threaten levees or other public infrastructure. (See Chapter IV, Section D.)

Systemwide Benefit Approach for Levee Reconstruction

Recommends federal legislation directing the Corps to repair, based on a systemwide benefit to cost ratio analysis, all project levees and other project features of the Sacramento River Flood Control Project. (See Chapter VII, Section B.)

Sacramento River Bank Protection

Recommends the State Reclamation Board be provided funds for the Sacramento River Bank Protection Project. This ongoing program will increase the Corps' capability to reduce damage to levees. The increased level of funding in 1997-98 is also needed in FY 1998-99 to continue support of this program. (See Chapter VII, Section B.)

Congressional Authorization for Third Phase, Sacramento River Bank Protection Project

Urges Congress to provide the Corps authorization to complete environmentally-sound bank protection, in a manner consistent with CALFED ecosystem restoration goals, for eroding banks for the Sacramento River Bank Protection Project. (See Chapter VII, Section B.)

Federal Adoption of Butte Basin Plan of Flood Control

Urges the Corps to formally recognize the importance of the Butte Basin Overflow Area by adopting the overflow and bank protection features into the Sacramento River Flood Control Project, extending the project limits north to Chico Landing to match the limits of the Sacramento River Bank Protection Project, and approving a plan of flood control for the Butte Basin Overflow Area reach of the river. (See Chapter VII, Section B.)

Cache Creek Settling Basin

Recommends the Reclamation Board support the Corps by acting as the nonfederal sponsor for constructing outlet improvements needed to complete the Cache Creek Settling Basin Enlargement Project. This additional work is necessary to correct conditions affecting drainage for the city of Woodland. (See Chapter VII, Section B.)

West Sacramento Project

Recommends the Reclamation Board continue to support the U.S. Army Corps of Engineers by acting as the nonfederal sponsor for funding additional repairs to the West Sacramento Project caused by flood damage to the Yolo Bypass east levee in West Sacramento and the Sacramento Bypass south levee during the 1997 floods. (See Chapter VII, Section B.)

Mid-Valley Levee Reconstruction Project

Recommends the Legislature fund the Reclamation Board to accelerate the Mid-Valley Area Levee Reconstruction Project. This will allow the Corps to proceed with damage repairs and improvements on levee sections along the Sacramento River Flood Control Project that do not currently meet federal design standards. (See Chapter VII, Section B.)

Mallott Road Bridge; Goose Lake FRS; Chester Project

Directs the Department of Water Resources to undertake the following minor capital outlay for flood control projects: constructing a concrete bridge at Mallott Road Crossing in Sutter County; improving escape flows at the Goose Lake Flood Relief Structure in Butte County; and providing State match for funding repairs and modifications to the diversion dam and fish ladder on the north fork of the Feather River near Chester in Plumas County. (See Chapter VII, Section B.)

Private Levees

Directs the Department of Water Resources, as it becomes aware of a private levee which provides some flood protection and for which there is no maintaining agency, to notify the appropriate local government entity regarding that levee. This is in response to the January 1997 floods, which highlighted the existence of such levees. This will allow residents who receive benefits from such levees to organize and decide as a group whether to take steps to improve the levees to meet Corps standards or to pursue nonstructural alternatives. (See Chapter VII, Section C.)

The following potential FY 1998–99 support and capital outlay projects need funding:

Colusa Bypass Sediment Removal

Recommends the Legislature provide Department of Water Resources funding to remove sediment build-up within the Colusa Bypass. Sediment deposits have reduced the flow capacity of the bypass and the efficiency of the flood control system by forcing flows to remain in the Sacramento River. (See Chapter VII, Section B.)

Lower Sacramento Area Levee Reconstruction Project

Recommends the Legislature provide the Reclamation Board funds to support the Corps construction of necessary levee repairs under Phase IV of the Sacramento River Flood Control System Evaluation. This project is continuing work begun and funded in FY 1997–98. (See Chapter VII, Section B.)

Tisdale Bridge Replacement

Recommends the Legislature provide funds for the Department of Water Resources in cooperation with Sutter County and the Department of Transportation to remove and replace the State-owned bridge at Tisdale Weir. This bridge collects debris and impedes flows into the Tisdale Bypass resulting in unnecessarily high Sacramento River flows. (See Chapter VII, Section B.)

American River FCP–Common Elements (Phase I)

Recommends the Legislature provide funds to the Reclamation Board for the State's share of the American River Flood Control Project. This work will construct levee stabilization measures common to all three alternatives formulated by the Corps for long-term flood control improvements, has been authorized by Congress, and is the first increment of a comprehensive flood control plan for the City of Sacramento. (See Chapter VII, Section B.)

Eastside Bypass on Lower San Joaquin River

Recommends the Legislature provide funding to restore subsided levees of the State-constructed Eastside Bypass to restore the bypass floodflow carrying capacity. (See Chapter VII, Section C.)

Recommendations for Further Studies and Investigations

Although this report makes a number of recommendations for immediate action, these are many outstanding statewide issues related to flood management for which more information and analysis are required before resolution can be reached. The following recommendations emphasize the ongoing need for such studies and investigations.

Yuba River Feasibility Study

Recommends the Legislature fund the Reclamation Board to support the Corps flood control feasibility study of the Yuba River Basin and the State's share of Preconstruction Engineering and Design work. A higher level of flood protection is needed for the urban areas of Linda/Olivehurst/Arboga. (See Chapter VII, Section A.)

Tuolumne River Reconnaissance Study

Urges Congress to provide funding to support the U.S. Army Corps of Engineers' preparation of a reconnaissance study to investigate long-term solutions to flooding problems along the Tuolumne River and Dry Creek. All potential structural and nonstructural solutions should be addressed in the investigation. (See Chapter VII, Section A.)

American River FCP—Long-Term Improvements

Recommends the Reclamation Board, the Corps, and the Sacramento Area Flood Control Agency should continue working to develop and implement long-term American River flood control improvements providing at least 1 in 200 year protection to the city of Sacramento. (See Chapter VII, Section B.)

Sacramento River and San Joaquin River Comprehensive Watershed Management Studies

Recommends the Legislature authorize the Reclamation Board to act as the nonfederal sponsor and support the U.S. Army Corps of Engineers, working collaboratively with the CALFED structure to complete comprehensive watershed management studies in the Sacramento and San Joaquin river basins, ensuring that the full range of structural and nonstructural flood damage reduction measures are considered in developing a new master plan for flood control in the Central Valley. These studies will take four years to complete and require continued funding beyond the current fiscal year. (See Chapter VII, Section C.)

Evaluate Debris Commission Projects

Directs DWR to cooperatively work with the Reclamation Board and the Corps to define responsibilities and authorities for maintaining projects constructed by the California Debris Commission. DWR should report on options and recommend repairs and improvements to be cost shared with the Corps, as appropriate, based upon the findings of the evaluations. (See Chapter VII, Section C.)

Ditch and Canal Setbacks

Directs DWR to work closely with the Corps and the Reclamation Board to evaluate the effect of ditches and canals near levees and, where necessary, to work with local agencies and property owners to set the ditches and canals back from the levee wherever levee integrity is threatened. (See Chapter VII, Section C.)

Evaluate Effects of Vegetation on Levees

Urges Congress to provide funding for the Corps to expedite evaluation of the effects of vegetation on levees and in bank protection. The Corps was directed in the Water Resources Development Act of 1996 to perform this evaluation and report on it within 270 days, but Congress has not provided specific funding for this activity. (See Chapter VII, Section D.)

State Participation in Feasibility Studies

Recommends the Legislature provide funding to DWR and CALFED to allow the State to fully participate in feasibility studies of flood damage reduction projects in the Central Valley, working collaboratively within the CALFED structure, to ensure that the full range of structural measures as well as nonstructural measures are considered. (See Chapter VII, Section A.)

Needed University Research

Recommends the University of California, to the extent federal funds are made available, increase its research efforts in the areas of climate prediction modeling and long-range weather forecasting, and floodplain management. (See Chapter IV, Section A.)

Inventory Flood Control Agencies

Directs the Department of Finance to develop an inventory of federal, State, and local agencies involved in flood control efforts and/or related environmental regulation. Such an inventory could be helpful in the coordination of the many agencies concerned with flood control. (See Chapter VIII, Section C.)

**Table III-1. FEAT Recommendations
for FY 1997-98
(in thousands of dollars)**

	General Fund	Personnel Years	
Support Proposals – Special Legislation			
Flood Center Event Tracking and Computer Mapping	450	3.8	
Ensure Integrity of the Sacramento River Flood Control System	950 ¹	8.5	
Proactive Floodplain Management	2,150	7.6	
Improvement of Inspection Services	340	2.8	
Increase Dam Safety Inspection	<u>475</u>	<u>2.8</u>	
Subtotal	4,365	25.5	
	General Fund	Reimbursable Authority	Federal Participation
Major Capital Outlay – Special Legislation			
Sacramento River Bank Protection Project	500 ²	—	Yes
Yuba River Feasibility Study	775	—	Yes
Sacramento River Watershed Management Study	500	—	Yes
San Joaquin River Watershed Management Study	500	—	Yes
Cache Creek Settling Basin	700	—	Yes
West Sacramento Project	140	60	Yes
Mid-Vailey Levee Reconstruction Project	<u>840</u>	<u>360</u>	Yes
Subtotal	3,955	420	
Minor Capital Outlay – Special Legislation			
Mallott Road Bridge Construction	250	—	No
Goose Lake Flood Relief Structure Reconstruction	250	—	No
North Fork Feather River Project near Chester	<u>250</u>	—	Yes
Subtotal	750		
Total for 1997-98	\$9,070		

¹ Supplements funding of \$450,000 already included in the 1997-98 Governor's Budget.

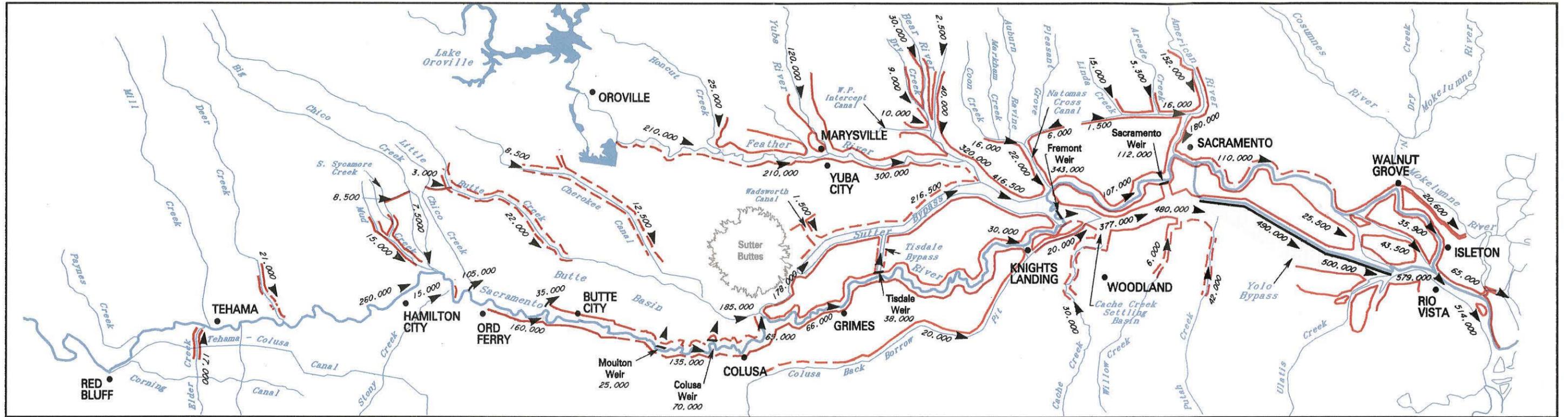
² Supplements funding of \$2,000,000 already included in the 1997-98 Governor's Budget.

**Table III-2. FEAT Recommendations
for FY 1998-99
(in thousands of dollars)**

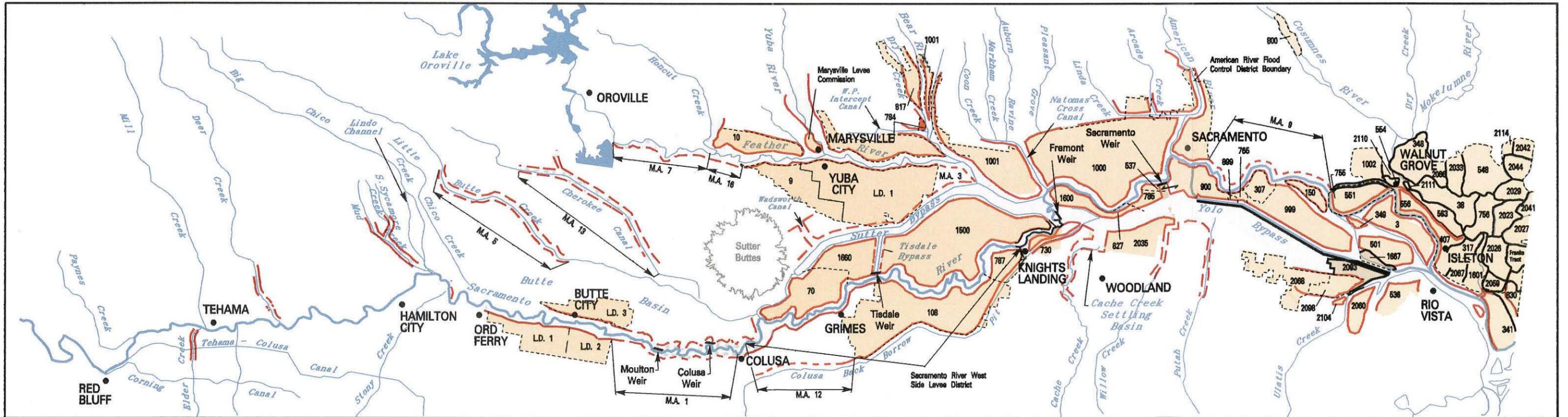
	Potential 1998-99 Amount Required		Estimated Future State Costs	Federal Participation
	General Fund	Reimbursable Authority		
New State Operations Proposal for 1998-99				
Colusa Bypass Sediment Removal	4,100	—	0	No
Subtotal	4,100	—		
New Major Capital Outlay for 1998-99				
Eastside Bypass, Lower San Joaquin River	2,000		0	No
Tisdale Bridge Replacement	<u>1,800</u>		0	Yes
Subtotal	3,800			
Continuation of 1997-98 Capital Outlay Programs				
Lower Sacramento Area Levee Reconstruction Project	700	300	0	Yes
American River FCP-Common Elements (Phase 1)	7,630	3,270	1,060	Yes
Sacramento River Bank Protection Project	2,500	—	Continuing	Yes
Yuba River-Preconstruction Engineering and Design	210	90	7,700	Yes
Sacramento River Watershed Management Study	1,400	—	2,100	Yes
San Joaquin River Watershed Management Study	<u>1,500</u>	—	2,500	Yes
Subtotal	13,940	3,660		
Total Potential 1998-99	21,840	3,660		



Sacramento Valley Flood Control System



Estimated Channel Capacity (in cubic feet per second)



Reclamation and Levee Districts

- Reclamation and Levee Districts
- Project Levees Maintained by Department of Water Resources
- Project Levees Maintained by Reclamation, Levee, and Drainage Districts and Municipalities
- Non-Project Levees

IV. January 1997 Floods

A. Hydrologic Summary

The New Year's Day Flood of 1997 was probably the largest in the 90-year northern California measured record which begins in 1906. It was notable in the sustained intensity of rainfall, the volume of floodwater, and the areal extent—from the Oregon border down to the southern end of the Sierra. New flood records were set on many of the major Central Valley rivers.

Over the 3-day period centered on New Year's Day, warm moist winds from the southwest blowing over the Sierra Nevada poured more than 30 inches of rain onto watersheds that were already saturated by one of the wettest Decembers on record. The sheer volume of runoff exceeded the flood control capacity of Don Pedro Reservoir on the Tuolumne River and Millerton Lake on the upper San Joaquin River. Most of the other large dams in northern California were full or nearly full within the first days in January.

Rain amounts at lower elevations in the Central Valley were not unusually high. Many valley residents could not understand why there was a flood problem because they were not seeing much rain. Meanwhile, the entire northern Sierra saw 20 inches, some 40 percent of average annual precipitation. Floods were produced on the Coast Range as well, but not to record levels. The Russian, Napa, and Pajaro rivers did not rise as high as the severe floods of 1995. Farther north, the Eel, Klamath and Smith rivers rose higher than in 1995, but did not set records.

On December 23, 1996, a very cold snowstorm produced heavy snows to low elevations (5 inches of water content at Blue Canyon). The big storm then dropped over 30 inches of rain in some locations, melting the existing snowpack at relatively low elevations. The middle and high elevation snowpack remained, the rain percolated through the pack, and little snow was lost. This contrasts with the public's impression that the melting snow caused the floods. Snowmelt from lower elevations only added about 15 percent to the runoff. The bulk of runoff was simply caused by too much rain, which in a normal year would have been snow and held in "cold storage" instead of flowing to the rivers.

Rainfall was relatively light after January 3, allowing the flood control system to drain and restoring reservoir flood control space in most Sacramento River system reservoirs. In late January, another siege of heavy rain occurred. This was not as heavy as the December-January storms (about two-thirds as much) and, although warmer than normal, snow levels were about 2,000 feet lower, which helped hold more water on the mountains. Even so, runoffs were large with high peaks on a few streams which caused considerable concern in areas where levees previously had been breached or damaged.

The Sacramento River region reservoir flood control space was restored before the second storm. Flood releases were kept lower (with the concurrence of

Opposite Page

Water flows through the Sutter Bypass levee break into Reclamation District 1660 and advances toward the town of Meridian.

the U.S. Army Corps of Engineers) than usual to avoid overtopping the partly completed levee repairs on the Sutter Bypass and along the Feather River south of Marysville.

The San Joaquin River region did not have enough time to restore full flood control space after several early December storms and before the late December and January storms. The channel capacities of the rivers below the major flood control dams in the San Joaquin region are much more constricted than in the Sacramento Valley, limiting downstream releases. At one point in late January, it appeared that a number of the foothill reservoirs would fill and spill, and emergency crews were put on alert. Fortunately, the next two days of rain were less than forecast and releases were controlled to channel capacity downstream.

The magnitude and duration of the 1997 floods will affect the calculation of return periods for all the affected basins. The Corps used previously computed statistics to estimate the return period frequencies of the 1997 flood. Some of the statistics are more than 15 years old, and incorporating data from the 1997 flood will change the statistics. The resulting new statistics will change the size of flood events at all return frequencies (including the 100-year frequency which is used as a flood insurance and zoning benchmark). Incorporating the 1997 data will also decrease the apparent frequency of the 1997 event. A comparison of the return period estimates is shown in Table IV-1, "Estimated Water Year 1997 Rainflood Frequency."

Table IV-1
Estimated Water Year 1997 Rainflood Frequency¹
Source: U.S. Army Corps of Engineers

River and Dam	Latest Update of Frequency Statistics	1997 Peak Flows (cfs) and Return Period (years)	
		One Day ²	Three Day ²
Sacramento River Region			
Sacramento - Shasta	1977	216,000 - 75 year	168,000 - 125 year
Feather - Oroville	1987	298,000 - 100 year	234,000 - 120 year
Yuba - New Bullards Bar	1991	88,000 - 75 year	67,000 - 120 year
American - Folsom	1987	249,000 - 70 year	164,000 - 65 year
Stony - Black Butte	1987	30,000 - 10 year	22,000 - 10 year
Cache - Indian Valley	1975	12,300 - 20 year	7,100 - 20 year
San Joaquin River Region			
Mokelumne - Pardee/Camanche	1980	76,000 - 275 year	39,000 - 165 year
Calaveras - New Hogan	1983	17,000 - 15 year	10,700 - 15 year
Littlejohns-- Farmington	1996	7,900 - 10 year	4,400 - 10 year
Stanislaus - New Melones	1979	73,000 - 80 year	50,000 - 90 year
Tuolumne - Don Pedro	1959	120,000 - 100 year	92,000 - 230 year
Merced - New Exchequer	1980	67,000 - 70 year	44,000 - 110 year
Chowchilla - Buchanan	1996	8,000 - 13 year	5,500 - 15 year
Fresno - Hidden	1996	7,700 - 20 year	5,500 - 30 year
San Joaquin - Friant	1979	77,500 - 100 year	52,600 - 140 year
Tulare Lake Basin			
Kings - Pine Flat	1979	50,000 - 35 year	36,000 - 60 year
Kaweah - Terminus	1990	18,000 - 15 year	13,500 - 25 year
Tule - Success	1990	9,700 - 15 year	6,500 - 15 year
Kern - Isabella	1996	18,800 - 30 year	11,900 - 33 year
Other Regions			
Russian - Coyote Valley	1986	6,800 - 10 year	4,500 - 10 year
Russian - Warm Springs	1984	12,600 - 10 year	10,400 - 15 year
Truckee at Reno	1985	37,000 - 180 year	25,000 - 160 year
Uncontrolled Rivers			
Cosumnes	N/A	est. 60,000 - 100 to 150 year ³	N/A
Walker	N/A	N/A - nearly 200 year	N/A

¹ Estimates are computed unimpaired runoff; they are preliminary and subject to change as the records from the storm are compiled and analyzed.

² One day and three day flows are the average flow for these periods.

³ Department of Water Resources preliminary estimate.

The Tuolumne River has one of the longest records, extending back 100 years to 1897. The 1997 flood was the biggest in history on that stream. The six largest unimpaired floods were:

Table IV-2. Floodflows on the Tuolumne River

Flood Event ¹		One Day	Three Day
January	1997	120,000 cfs	92,000 cfs
December	1955	118,000 cfs	71,000 cfs
December	1964	73,000 cfs	51,000 cfs
November	1950	67,000 cfs	53,000 cfs
February	1986	53,000 cfs	50,000 cfs
December	1937	74,000 cfs	39,000 cfs

¹ Six largest flood events, 1897-1997

Five of the six floods occurred in the second half of this century. As a result, return period calculations continue to be revised downward, reflecting the apparent frequency of large floods. What is also evident from the return period figures in Table IV-1 is that the relative impact of the storm was uneven as it moved from north to south along the Sierra.

1. Needed University Research

The floods of 1997 clearly indicated the need for more long-term research. The University of California can provide needed research in difficult water resource and floodplain management issues that require more science to make good public policy decisions and to further scientific capabilities. Of particular interest to FEAT is the need for more reliable information on future weather events and changes in the climate and their effects on California in terms of evaluating flood risks and providing early warning for major events. *The FEAT recommends, to the extent federal funds are made available, the University of California increase its research efforts in the areas of climate prediction modeling and long-range weather forecasting, and floodplain management.*

B. Damage Assessments

This section summarizes the damage and financial loss estimates for agriculture, public facilities and infrastructure, residential property, and businesses. Flooding forced more than 120,000 people from their homes. Over 55,000 people were housed in 107 shelters; it was the largest sheltering operation in California's history. An estimated 30,000 residential and 2,000 business properties were damaged or destroyed. Lost tax revenues due to reduced economic activity caused by flooding are not tallied, nor is the increased economic activity from construction, services, and sales associated with damage repair.

1. Overall Damage

The magnitude of total damages. Total flood damages are nearly \$2 billion, with estimated costs to public infrastructure exceeding \$1 billion. These infrastructure costs include \$206 million in damages to various public facilities, \$300 million in damage to flood control facilities, and nearly \$500 million in highway and other infrastructure damage. Nearly 300 square miles was flooded in January, of which 80,000 acres had to be pumped out with State assistance.

Almost 1,200 claims for disaster unemployment assistance were filed with and approved by the State's Employment Development Department. As of mid-April, \$690,000 in benefits had been issued.

2. Agriculture

Nearly 300 square miles of agricultural land were flooded, causing nearly \$300 million in damage to agriculture. While damage was widespread, affecting more than 30 counties and 30 agricultural commodities, the largest dollar loss, \$109 million, was to farm infrastructure: irrigation systems, roads, buildings, and fences. Crop losses totaled \$107 million, with the largest losses being walnuts, winegrapes, winter wheat, and alfalfa. Crop damage costs added another \$49 million, with peaches, plums/prunes, winegrapes, and walnuts incurring the largest damage. Damage to nurseries totaled \$16 million, and livestock costs were another \$12 million. The most severely affected counties were Butte, Yuba, Stanislaus, Nevada, Sacramento, San Joaquin, and Sutter.

Farm worker housing has been completely destroyed in some counties. The U.S. Department of Agriculture is heading a task force to look into methods to obtain short-term and long-term replacement farm worker housing. There have been no requests for participation in its Farm Disaster Loan Guarantee program. More activity may occur after the growing season is underway and farmers get a better idea of their losses.

3. Public Works and Infrastructure

Damage to public infrastructure. The Governor's Office of Emergency Services reported the following damages that may be eligible for 75 percent federal funding from FEMA as a result of the storms:

Table IV-3. Public Facilities Damage Estimates*

Description	Amount (in millions of dollars)
Debris removal	19.5
Protective measures	44.1
Roads and bridges	87.0**
Water control facilities	16.2
Buildings and equipment	7.4
Public utilities	21.2
Other	10.8
Total	206.2

Source: OES

* Figures are based on damage estimates as of April 1997.

** FEMA eligible damage costs

Damage to roads, highways and infrastructure. The California Department of Transportation has reported the following damages that could exceed \$500 million to State facilities.

Table IV-4. Road, Infrastructure Damage Estimates^d
(as of February 5, 1997)

Agency	Infrastructure	Estimate (in millions of dollars)
Department of Transportation	Highways, including interstates	347
Local Agencies	Streets and roads	70 ^a
Department of Water Resources - SWP	Levees, debris, trails, other	13 ^b
Department of Fish and Game	Levees, roads, hatcheries	3
Department of Forestry and Fire Protection	Roads, structures, driveways	2
US Forest Service	Roads, campgrounds, facilities	66 ^c

Source: California Department of Transportation

^a FHWA eligible damage costs not eligible under FEMA.

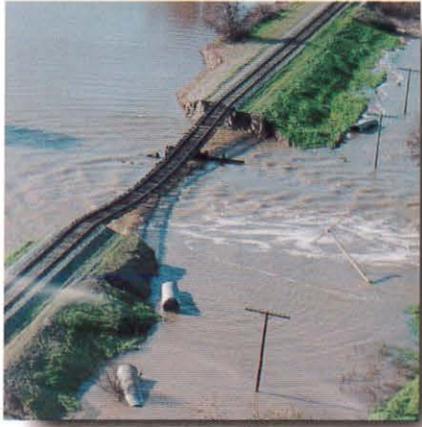
^b Not included is damage to the Sacramento-San Joaquin flood control systems; the federal share is estimated at nearly \$300 million. The federal government will likely be responsible for most of the cost of repairs with the exception of lands, easements, rights of ways, and relocations and other costs.

^c Not included is an estimated \$178 million damage to Yosemite National Park.

^d These estimates may vary from figures in Chapter VIII due to federal eligibility requirements and timing of estimates.

Opposite Page

Clockwise from top: railroad tracks are suspended in mid-air near Stewart Tract in Reclamation District 1660 near Sutter Bypass relief cut, natural gas bubbles up through the floodwater after a gas well connection is severed, Highway 70 in Yuba County is under water.



4. Residential Property

As of April 15, 1997, OES reported over 24,000 primary residences were damaged or destroyed in the floods. The cost of this damage is an estimated \$300 million. Only 6 percent of the damaged homes were covered by flood insurance. (See FEAT recommendations on mandatory flood insurance in Floodplain Management Section.)

FEMA's Disaster Housing Program has received almost 16,000 requests for housing assistance. More than 8,700 households have received funds totaling almost \$15 million for alternative housing or minimal repairs. Nearly 12,000 disaster victims have been referred to the state administered Individual and Family Grant Program for assistance. Over \$10.5 million in grant assistance has been awarded in State and federal funds.

5. Business

The Small Business Administration has issued over 10,000 applications for home and personal property loans. About 4,000 loan applications have been returned for consideration, with SBA approving 734 loans totaling over \$24.7 million.

6. Travel and Tourism

California's travel and tourism businesses tabulated damage in excess of \$360 million, including Yosemite National Park. The perception of lingering damage is a continuing problem for some smaller tourist-serving businesses, such as restaurants, motels, RV parks and campgrounds, gift shops, etc., because they do not have sufficient working capital to sustain prolonged periods of reduced sales volumes. The California Travel Parks Association estimates 30 percent Statewide tourism losses through September 1997 for RV parks and campgrounds.

7. Miscellaneous Damage

The Department of Toxic Substances Control provided support to several counties needing assistance with hazardous waste management and hazardous materials removal work. Staff in DTSC's emergency response center coordinated hazardous materials emergency response work with OES, U.S. Environmental Protection Agency, and other agencies to ensure that a well-organized effort occurred. Based on requests for assistance received through the OES Standardized Emergency Management System, DTSC's Site Mitigation Program sent emergency response staff to Yuba, Sutter, Colusa, San Joaquin, and Stanislaus counties. These staff provided support to local agency emergency operation centers in developing plans to assess the extent of flood-related hazardous materials problems in their areas and plans to remove the materials for proper handling and disposal. This effort involved coordinating actual field activities with U.S. EPA, Coast Guard, other State agencies, and local agency hazardous materials response personnel to maximize the efficiency of the assessment and removal operations and to

coordinate funding of the work. DTSC staff and emergency response contractors also directly participated with the other agencies in carrying out work to assess and remove hazardous materials and relocate them to common staging areas. Approximately \$300,000 was spent on these activities. U.S. EPA took the lead in analyzing the materials at these areas and for funding their shipment to appropriate facilities for handling or disposal.

Concurrent with these operations, DTSC's Hazardous Waste Management Program worked to provide emergency support to local agencies in the areas of household hazardous waste collection, issuance of emergency hazardous waste permits, and issuance of generator identification numbers.



C. Description of Damage to Flood Control Systems

Federal, local, and private flood control facilities were damaged throughout northern California from coastal areas to the eastern Sierra and from Madera County to Trinity County. Most of the damage occurred in the Central Valley on the Sacramento River and San Joaquin River systems, but there was also significant damage in other areas. Issues about federal assistance for fixing levees arose from the distinction drawn from (1) federal levees—those that are under a Corps program; (2) nonfederal—publicly maintained—those nonproject levees maintained by levee districts; and (3) private levees—those levees privately owned and maintained. The following sections describe the damage and assistance available.

1. Federal Project Levees, Sacramento River Basin

Levees of the federal Sacramento River Flood Control Project sustained moderate to heavy damage in the January 1997 floods. In addition to breaks and relief cuts, levees sustained various types of damage such as erosion on the landside due to overtopping and wavewash, which threatened levee stability; slope failures, sloughing, settlement, and sinkholes; and seepage damage from boils and seeps carrying levee and foundation soils. Table IV-5 describes notable failures and extensive levee damage areas. Figure IV-1 depicts major features of the Sacramento River Flood Control System as well as the boundaries of local maintaining agencies.

At the request of the local maintaining agencies and with DWR's concurrence, the Corps waged emergency flood fights under authority of PL 84-99 at several locations in the Sacramento River system. Those flood fights are discussed later under "U.S. Army Corps of Engineers Role."

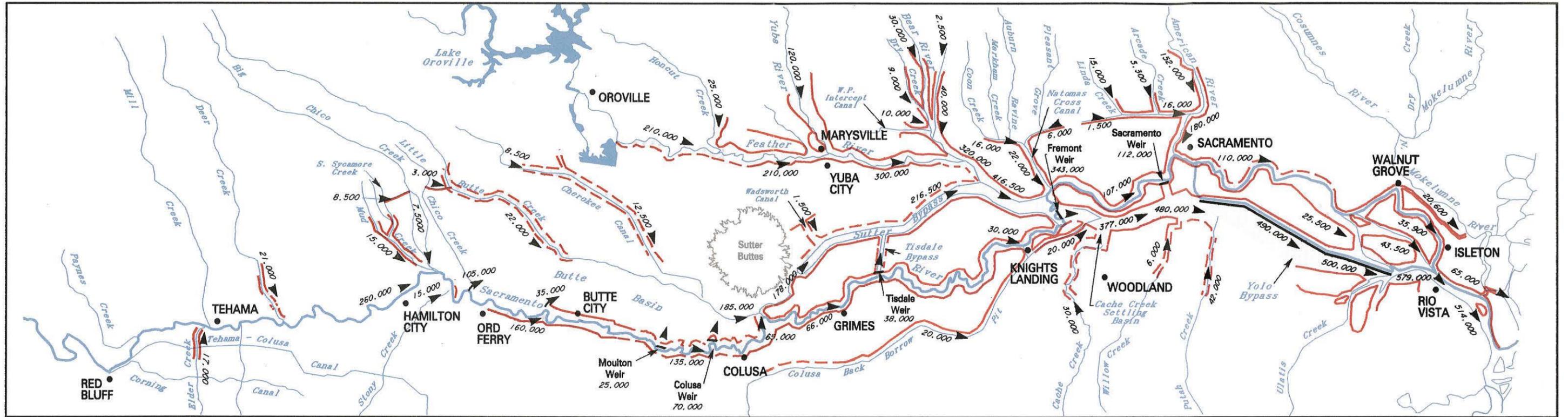
Opposite Page

Clockwise from top left: Deer try to escape the Feather River flood by wading through an orchard; the country club area in Yuba County is inundated; the Feather River levee break in Yuba County the day after the break.

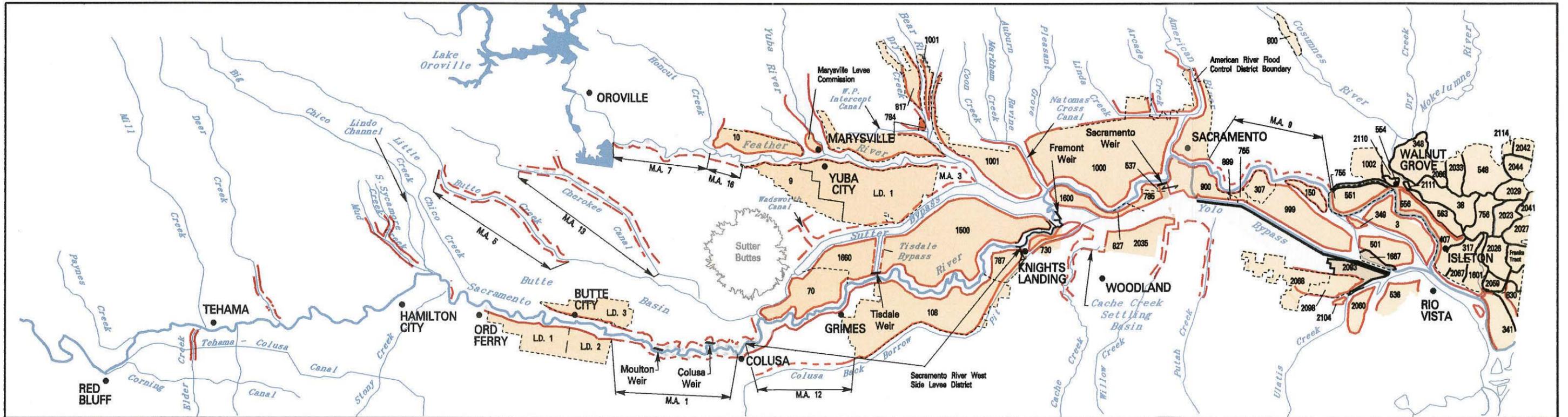
**Table IV-5. Sacramento River Flood Control System Damage
January 1997 Flood Damage**

Location	Description of Damage
East levee of Feather River and north levee of Bear River in Reclamation District No. 784	<ul style="list-style-type: none"> -- Feather River levee failed near town of Arboga, flooding the District -- Bear River levee failed in two places due to overtopping flow from the flooded area. -- Feather River levee damaged by attempt to make a relief cut -- Bear River and Feather River levees damaged by landside wavewash erosion -- Feather River levee damaged by cuts made for pump-out lines
West levee of Sutter Bypass in Reclamation District No. 1660; Reclamation District No. 70; town of Meridian	<ul style="list-style-type: none"> -- West levee of Sutter Bypass failed, flooding much of RD 1660 and RD 70 -- Floodwaters threatened Meridian, but were contained by a ring dike -- Sutter Bypass levee damaged by a relief cut to allow outflow -- Sutter Bypass, Sacramento River, and Tisdale Eypass levees damaged by landside wavewash -- Landside of Sacramento River and Sutter Bypass levees sloughed
Butte Creek levees (State Maintenance Area 5)	<ul style="list-style-type: none"> -- East levee failed -- Both levees damaged by overtopping -- Damage to bridges, roads, and railroad -- Severe bank and levee erosion
Location	Other Damage
Left bank of Sacramento River at Mile 208 in Butte County	-- Several major washouts of rock bank protection
Right bank of Sacramento River at Mile 221 in Tehama County	-- Severe erosion to rock bank protection over a 0.8 mile reach
Numerous additional sites in Butte, Glenn, and Tehama counties	-- Rock bank protection damaged
RD 3 (Grand Island)	-- Waterside sloughing of Steamboat Slough east levee and Sacramento River west levee
RD 70 (Meridian Farms)	<ul style="list-style-type: none"> -- Waterside toe of Butte Slough levee sloughed -- Boils and a sinkhole
RD 108 (River Farms)	-- Waterside sloughing of Colusa Basin Drain levee
RD 150 (Merritt Island)	-- Wavewash, erosion and sloughing on the east levee of the Sacramento River
RD 563 (Tyler Island)	-- Sloughing and erosion of the waterside of the Georgiana Slough east levee
RD 755 (Randall Island)	-- Waterside sloughing on the east levee of the Sacramento River
RD 784 (Plumas Lake)	-- Waterside erosion, boils, and sinkholes
RD 900 (West Sacramento)	-- Waterside sloughing on the west levee of the Sacramento River
RD 1001 (Nicolaus)	<ul style="list-style-type: none"> -- Roadway damage on both levees of Yankee Slough and the south levee of the Bear River -- Waterside berm erosion on the south levee of the Bear River, east levee of the Feather River, and north levee of the Natomas Cross Canal
RD 1601 (Twitchell Island)	-- Subsidence of the east levee crown on Three Mile Slough
Location	Other Damage
RD 2103 (Wheatland)	-- Waterside and landside erosion
Brannan Andrus Levee Maintenance District	-- Landside sloughing and subsidence on the west levee of Georgiana Slough
Levee District 9 (Sutter County)	-- Landside sloughing into adjacent irrigation canal on the west levee of the Feather River
Lake County Flood Control and Water Conservation District	-- Wavewash damage, erosion, and seepage on the west levee of Middle Creek
LOFC&WCD: Tehama County	<ul style="list-style-type: none"> -- Gravel deposit causing bank erosion, and other waterside erosion, south levee of Clover Creek Bypass -- Four levee breaks and erosion on the west levee of Deer Creek -- Levee break and scouring on the south levee of Elder Creek
State Maintenance Area #3	-- Waterside slope erosion on the west levee of the Feather River, boils
State Maintained East Levee of Sacramento River in Colusa County	-- Large scour hole in the Colusa Bypass Channel near the levee
Sacramento Bypass	-- Heavy seepage and boils in parallel irrigation ditch, causing failure of levee slope
Tisdale Bypass	-- Heavy seepage, causing progressive sloughing of landside slope into parallel irrigation canal

Sacramento Valley Flood Control System



Estimated Channel Capacity (in cubic feet per second)



Reclamation and Levee Districts

- Reclamation and Levee Districts
- Project Levees Maintained by Department of Water Resources
- Project Levees Maintained by Reclamation, Levee, and Drainage Districts and Municipalities
- Non-Project Levees





2. Federal Project Levees, San Joaquin River Basin

The San Joaquin River Flood Control Project was hard hit by the floods of January 1997. Thirty-six levee failures occurred on the San Joaquin River system, along with extensive damage such as wavewash and sloughing related to the high flows and inundation. Table IV-6 describes notable failures and extensive levee damage work. Figure IV-2 depicts major features of the San Joaquin River Flood Control System, as well as boundaries of local maintaining agencies.

At the request of the local maintaining agencies and with DWR's concurrence, the Corps waged emergency flood fights under authority of PL 84-99 at several locations in the San Joaquin River system. Those flood fights are discussed later under "U.S. Army Corps of Engineers Role."

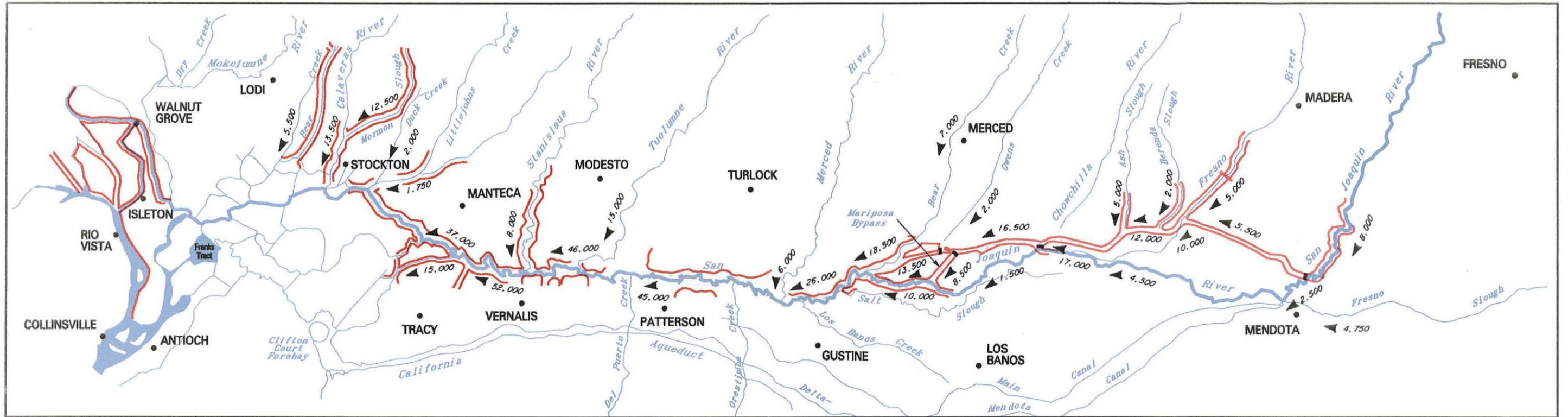
Opposite Page

Top to bottom: a close-up view of a flooded diary near Manteca; an overview of the San Joaquin River flooding near Manteca, showing the flooded Highway 132.

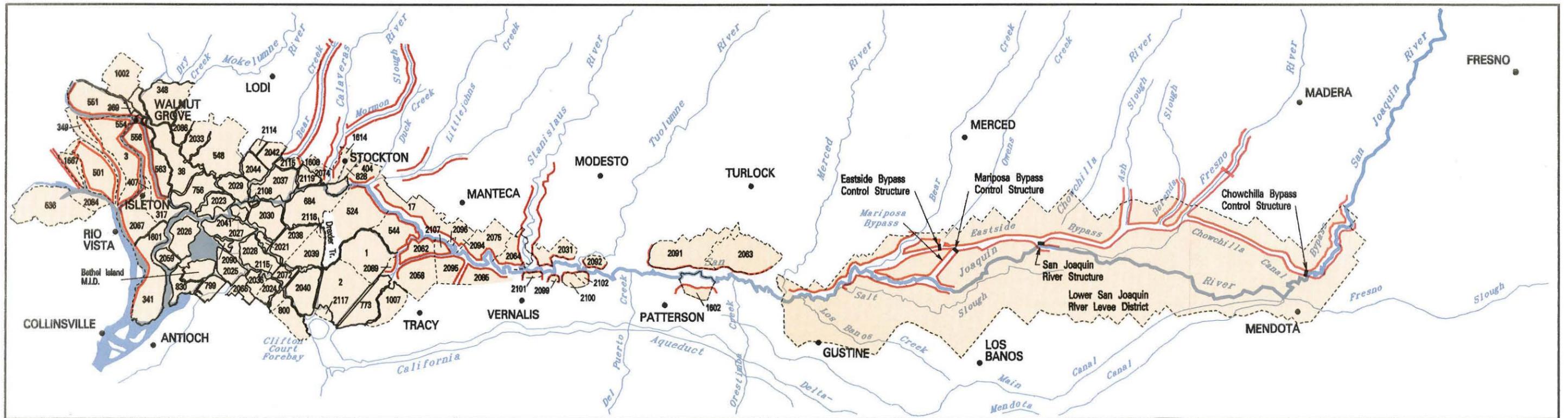
**Table IV-6. San Joaquin River Flood Control System Damage
January 1997 Flood Damage**

Location	Description of Damage
Lower San Joaquin Levee District, Madera and Fresno counties	<ul style="list-style-type: none"> - Levee overtopped above the Chowchilla Canal Bypass and damaged both levees - North levee failed in seven places in Madera County - South levee failed in four places, threatening the city of Firebaugh in Fresno County
RD 2031 (Ellott), Stanislaus County, east levee of San Joaquin River	<ul style="list-style-type: none"> - Levee failed in five places - Extensive landside wavewash damage - Serious waterside erosion
RD 2064 (River Junction), San Joaquin County, east levee of San Joaquin River	<ul style="list-style-type: none"> - Levee failed in two places; one relief cut - Extensive landside wavewash damage
RD 2075 (McMullin Ranch), San Joaquin County, east levee of San Joaquin River	<ul style="list-style-type: none"> - Levee failed in three places - Extensive landside wavewash damage
RD 2094 (Walthall), RD 2096 (Wetherbee Lake), San Joaquin County, east levee of San Joaquin River	<ul style="list-style-type: none"> - Levee failed in two places - Water from RD 2094 break also flooded RD 2096 - Levees further damaged by overtopping from the landside - Extensive landside wavewash damage
RD 2099, RD 2100 (White Lake Ranch), RD 2101 (Blewett), RD 2102, Stanislaus County, west levee of San Joaquin River	<ul style="list-style-type: none"> - Levees failed, inundating all four districts - Extensive landside wavewash damage
RD 2095 (Paradise Junction), San Joaquin County	<ul style="list-style-type: none"> - Partially inundated when Paradise Cut west levee failed - Cracks and holes in levee
RD 2058 (Pescadero), San Joaquin County	<ul style="list-style-type: none"> - Partially flooded by overflow of unleveed Tom Paine Slough - Slough received water from RD 2095 levee failure
RD 2107 (Mossdale), RD 2062 (Stewart Tract), San Joaquin County	<ul style="list-style-type: none"> - Inundated when Paradise Cut east levee failed - RD 2062 levee further damaged by relief cut - Extensive landside wavewash damage in both districts
Location	Other Damage
San Joaquin and Stanislaus counties	<ul style="list-style-type: none"> - Widespread boils, sinkholes, erosion, sloughing, and seepage
RD 404 (Boggs)	<ul style="list-style-type: none"> - Waterside slope erosion on the east levee of the San Joaquin River
RD 544 (Upper Roberts Island)	<ul style="list-style-type: none"> - Extensive erosion on west levee of San Joaquin River - Extensive erosion on north levee of Old River - North levee of Old River sloughed in four places - Numerous boils, much shallow inundation from seepage
RD 2062	<ul style="list-style-type: none"> - Serious waterside erosion on east levee of Paradise Cut
RD 2062 and RD 2107	<ul style="list-style-type: none"> - Serious waterside erosion on west levee San Joaquin River
RD 2091 (Stanislaus County)	<ul style="list-style-type: none"> - Almost 2.5 miles of crown roadway damaged
Fresno River, Madera County	<ul style="list-style-type: none"> - Three erosion sites on south levee

Delta and San Joaquin Valley Flood Control System



Estimated Channel Capacity (in cubic feet per second)



Reclamation and Levee Districts

-  Reclamation and Levee Districts
-  Project Levees Maintained by Reclamation, Levee, and Drainage Districts and Municipalities
-  Non-Project Levees

Page 46

Clockwise, from top left floodwater encroaches onto farmland in the San Joaquin Valley; a crane places large rocks and boulders into a levee break along the San Joaquin River; a levee break had just occurred on the San Joaquin River, while another break begins to its right.

Page 47

Top to bottom: The Paradise Trailer Park is under water. Many trailer and recreational vehicle parks build near rivers; houses built next to a San Joaquin River levee sustained substantial damage as floodwater from an upstream break overtopped a levee from the landside.





3. Nonfederal Delta Levees: Response Through AB 360

The emergency response provisions of the Delta Protection Act (newly reauthorized January 1997) were used during the January 1997 floods. The law provides for spending up to \$200,000 per fiscal year on emergency levee work, with a limit of \$50,000 per emergency levee site. The \$200,000 was used to provide the resources for an initial response to the threatening incident, giving the reclamation districts time to secure the additional resources to stabilize the emerging event. The emergency sites and response are tabulated below:

Table IV-7. Nonfederal Levee Emergency Sites

<i>Site</i>	<i>Response</i>
Twitchell Island	Trouble spots consisted of cracking and movement of the landside levee slope. Funds were used to initiate construction of a stabilizing berm on the landside of the levee. The emergency repair was completed by the Corps of Engineers under PL 84-99, emergency flood fight.
Quimby Island	Trouble spots consisted of severe cracking and movement of the landside levee slope. Funds were used to assist in the construction of a stabilizing berm on the landside of the levee.
Bouldin Island	Trouble spots consisted of cracking and movement of the landside levee slope. Funds were used to assist in the construction of a stabilizing berm on the landside of the levee.
Upper Roberts Island	Numerous seepage sites appeared from the extended period of high water in the channels adjacent to Upper Roberts Island. Funds were used to assist in the mobilization of heavy equipment and materials to construct a chimney encircling a 10-foot diameter boil. The chimney was lined with filter fabric and imported fill was placed in the chimney to seal the boil.

4. Other Areas

The following sections describe other areas damaged, and also protective measures taken at the town of Meridian and the city of Firebaugh when nearby flood control facilities were damaged in early January.

a. Cosumnes River, Sacramento County

Of particular concern are levees (such as most of the levees along the Cosumnes River) for which there is no regular maintenance support as there is no obvious entity with the authority or financial wherewithal to undertake the repair and continuing maintenance of these levees.

One of the major issues identified in the 30-day FEAT report was the failure of private levees on the Cosumnes River and the need to define a long-term solution to protect life and property and public infrastructure from future flood events. Further, the failure of FEMA to step in under its authority, as defined in the federal Stafford Act, left the area totally unprotected from future flood events. The Governor is sponsoring legislation to support Sacramento County and the Sloughhouse Resource Conservation District in providing interim repairs to the levee system to bring it to a 5-year level of protection while a long-term solution

is developed. The FEAT recommended, and the county has established, a Cosumnes River Task Force made up of federal, State, county, local, and environmental interests to look at options and develop a long-term plan for flood control—that will include structural and nonstructural elements—for the Cosumnes River. The Governor requested the Legislature to provide funds for interim repairs of private levee breaches to a 5-year level of flood protection on the Cosumnes River. The County of Sacramento and Sloughhouse Resource Conservation District will perform this repair work. The newly formed Cosumnes River Task Force is developing permanent, long-term flood management solutions needed to provide flood protection for public safety and Highways 16 and 99 and Interstate 5.

b. Ring Dikes, Sutter and Fresno Counties

Two ring dikes were constructed around developed communities to prevent damage from rising or potentially rising waters. First, the Corps contracted for equipment to “push up” an earthen ring dike around the town of Meridian, Sutter County. The north part of the dike was built by RD 1660 and RD 70. When the uncompacted outside ring started leaking, it was backed up by another ring, inside the first, also built by local and inmate crews. The Meridian dike prevented extensive flooding of the town of Meridian.

A second ring dike was constructed under DWR leadership by CDF inmate crews at Firebaugh, Fresno County, against the possibility of flooding resulting from levee breaks on the San Joaquin River in the Lower San Joaquin Levee District. Although floodwaters did not reach the dike, additional levee breaks could easily have threatened the town during the extended period of high water.

c. Walker River, Mono County

The early January 1997 storm, combined with snowmelt from up to 9,000 feet elevation, caused record flows in the West Walker River in Mono County. Stream gages above and below the town of Walker were washed out after recording near-100-year flows. The eventual peak flow rate was estimated around a 200-year flood. The runoff removed much of the earth and rock from the narrow floodplain in the Walker Canyon, above the town. Of ten miles of Highway 395 in the canyon, six miles were severely damaged and impassable.

As the record flows reached Walker, sediment filled the channel and caused the river to carve multiple channels through the town. The west approach fill of the Eastside Lane bridge on Highway 395 at the upper end of the community was washed away and allowed the river to bypass the bridge. Extensive damage was sustained downstream. Thirty-four houses were destroyed as the stream undercut many of them, and 69 others were damaged, some left hanging over one of the new channels. Damage extended to a mobile home park a mile downstream, destroying six homes and damaging ten more.

The Corps, under emergency flood fight provisions of PL 84-99, DWR, and the federal Bureau of Land Management contributed to the three-week effort to

rechannel and stabilize the river from the canyon mouth through Walker to the mobile home park. By January 29, the channel was restored to its previous capacity.

d. Topaz Lake, Mono County

Topaz Lake is a scenic off-stream storage reservoir for the Walker River Irrigation District. Water is diverted from the West Walker River about 14 miles downstream of the town of Walker to serve agriculture in Smith Valley, Nevada. Diverted water enters the lake from the south and can be routed northeasterly back to the river. In 1997, the high flows deposited large quantities of sediment in the river channel below the diversion structures which had been damaged by previous floods and never repaired. River flows bypassed an existing dike and entered the diversion channel, and flooding occurred downstream in the city of Yerington, Nevada. There is no federal flood control project on this river, and as there was no immediately threatened life or property, the Corps did not respond under their PL-84-99 authorities.

The Walker River Irrigation District is planning to deal with the situation by reconstructing the dike to prevent the overflowing river from returning to the diversion canal, and eventually by constructing new diversion structures. The proposed dike would be in California, and, if constructed, the State of California would have responsibility for safety inspection of the dam. The area below the diversion structure, in the State of Nevada, would continue to flood.

e. Truckee River

The Truckee River experienced the worst flooding in more than 30 years. Lake Tahoe experienced its highest level in 70 years, and in the town of Truckee, several homes and businesses were damaged and a section of the bank of the Truckee River along West River Street was washed out. Broken sewer and power lines forced the closure of two upper mountain ski resorts. Private damage on the Truckee River included seven washed-out bridges and twelve others that were damaged from overtopping. Several streamflow gaging stations were destroyed.

f. Napa and Russian Rivers

Napa and Sonoma counties are among five communities nationwide with the most repetitive losses from flooding, according to National Flood Insurance Program records.

In Napa County, the Napa River overtopped its banks and destroyed one home and damaged several homes and businesses at an estimated cost of \$1.4 million. Approximately 10,000 of the 35,000 acres of vineyards were flooded with an estimated \$4 million in agricultural damage. Napa County is reformulating a flood control project with the Corps that will eventually require a vote of the people. Napa County, the city of Napa, and the town of Yountville have also applied for FEMA Hazard Mitigation Grant Funding to raise existing structures.

Flooding from the Russian River, primarily in the Guerneville area, destroyed 80 homes and 28 mobile homes. Over 800 homes, businesses and other structures sustained damage in the fifth flood in ten years. The peak river level was the fifth highest of historical record.

Sonoma County will raise 90 homes with funding from a post-1995 flood \$4.7 million grant from FEMA's Hazard Mitigation Grant Program. The FEMA grant will reimburse 75 percent of the cost to perform the work. Sonoma County will pursue funding from the 1997 program to raise additional homes, acquire flood prone properties, and improve drainage culverts.

g. Coffee Creek, Trinity County

Local levees along the south side of Coffee Creek and the west side of the Trinity River failed, endangering lives and property in the mountain resort community of Coffee Creek. The Corps responded under PL 84-99 and performed emergency repairs on the levees. Two alternatives are currently being considered for PL 84-99 rehabilitation, estimated costs are \$860,000 and \$1.1 million, respectively.



D. U.S. Army Corps of Engineer's Role

The U.S. Army Corps of Engineers has nationwide responsibility for flood control. In California, flood control on the Sacramento River system, the San Joaquin River system, and other rivers are Corps projects. The Corps has emergency authority under PL 84-99 to fight any flood to protect life and property, and to rehabilitate federal flood control facilities which are maintained by State and local entities. These programs and their application to the January 1997 floods are described below.

1. Water Management

The Corps' Water Management Section monitors the status of all reservoirs for which the Corps has issued a Water Control Plan for regulation of seasonally reserved flood storage purchased by the Corps. Initial coordination with project operators generally occurs in August or September, prior to the flood season. Anticipated project operation during the flood season and compliance with the water control plan are discussed, and any factors which might cause operations to deviate from the water control plan are identified. These factors may include channel and/or levee conditions downstream, release limitations for fish and wildlife, and other operational constraints. Periodically during the flood season, the Corps may consult with the operating agency on project operation as a result of monitoring of dam operations, or at the request of the operating agency. However, the Corps' authority is limited to serving notice to the operating agency of any noncompliance to the water control plan.

As the storms approached the State in late December 1996, the frequency of monitoring projects and discussions with project operators increased. The Corps' personnel were involved daily in numerous conference calls with operators and other agencies to coordinate operation of reservoirs or systems of reservoirs. A systematic flood operation, which moved floodwaters through the systems as efficiently as possible, was initiated and coordinated with all State, local, and private interests.

2. Public Law 84-99 Authority

The following two sections describe the U.S. Army Corps of Engineers' PL 84-99 program as it was applied to the January 1997 floods.

a. Emergency Flood Fight (Phase 1)

The Corps' emergency flood fight assistance can be extended to any situation, as long as the Corps determines that an immediate danger to life or property exists. Assistance may be extended as long as the danger exists, but must end when the situation is stabilized, even if facilities remain in disrepair. Local agencies are responsible for providing appropriate property rights and for cleaning up debris afterwards. The PL 84-99 flood fight response is accomplished by the Corps

Opposite Page

From top to bottom: An aerial view of levee seepage as illustrated by the sand boils within sandbag rings along the levee toe on the right bank of the San Joaquin River in Reclamation District 17; a close-up view of a sandbag ring at the same site.

assumption of control of the situation. Cost of the response is paid by the federal government, and reimbursement is not an issue.

Emergency response under PL 84-99 is extended by request of the Governor, who must determine and certify that local forces cannot meet the emergency physically or financially, and that State assistance is not available. Corps response can include technical assistance, supply of materials otherwise unobtainable, or actual Corps flood fighting including heavy construction if necessary.

In the early stages of the January 1997 floods, the Corps' Sacramento District recognized the potential need for repeated emergency response, and took two actions that greatly facilitated coordination of effort, handling of requests, and promptness of response. First, a management-level Corps representative was stationed at the DWR Flood Center on a 24-hour basis, solely to provide liaison for PL 84-99 requests. Second, the Corps suggested and the Governor made a broad request for technical assistance in assessing the status of federal levees throughout the Central Valley. This action was taken because of the near certainty that assessment of flood problems in the coming large-scale event would be beyond the capabilities of local and State resources. Throughout the event, the Corps' geotechnical engineers and geologists were dispatched at State request to investigate levee problems. The State cooperated by sending DWR flood fight specialists and geotechnical engineers to accompany and assist the Corps' personnel.

The Corps responded to 29 specific written requests for direct assistance including one request for technical assistance at the town of Walker, when the West Walker River went out of its banks.

b. Rehabilitation – Phase II and Phase III

As the State sponsor of most federal flood control projects in the Central Valley, the Reclamation Board, with DWR staff support, is cooperating with the Corps in performing levee repairs under PL 84-99. To facilitate the Corps' efforts in repairing damaged levees this year, a new Levee Rehabilitation Unit was established in the DWR. This unit will be providing relocations needed for flood repairs, acquiring levee rights of way, providing haul roads and staging areas, and acquiring construction easements, borrow sites, and mitigation lands.

In addition, the Governor has recommended the Legislature provide funds for the States share of the cost for repairing the flood damage. The funds are for the nonfederal costs of restoring and rehabilitating of federally or State constructed or owned flood, erosion, and sediment control projects damaged by the January 1997 floods, and includes design, construction, lands, easements, rights of way, relocations, and mitigation. Costs for deferred maintenance are to be fully reimbursed to the State by local maintaining agencies. Finally, the Governor has recommended funding to repair damage to other critical flood project features

identified subsequent to the initial damage surveys. The State has the flexibility to use its funding for its share of structural repairs at a particular site or for nonstructural alternatives at that site.

Phase II repairs, which closed breached levees and corrected immediate problems to regain a moderate level of flood protection, are now complete.

Phase III repairs are performed under preexisting Project Cooperation Agreements between the Corps and the Reclamation Board for each federal project. These agreements require the Reclamation Board to provide the lands; hold and save the Government harmless; and maintain the flood control works. State law requires a local agency to provide similar assurances to the State and to carry out project maintenance.

The FEAT urges the Corps to use PL 84-99 authority to repair damage to levees caused by seepage and piping of levee and foundation materials through boils, and to use PL 84-99 authority, in addition to Sacramento River Bank Protection Project authority, to quickly repair eroded banks that threaten levees or other public infrastructure.

Page 56

Clockwise from top left: The Sutter Bypass as it looked on January 5, 1997, one day after the break; repair work in progress after the main break is closed, the Corps used new flood fighting technology by setting up the temporary bladder (to the left of the photo) to protect the repair work and prevent additional flooding from rising water levels in the bypass; a view of the partially repaired levee, approximately three weeks after the levee break.

Page 57

Top to bottom: Work began on the Sutter Bypass relief cut the morning after the break and was completed in two days; three weeks later, water is still steadily draining from Reclamation District 1660. The benefits of the relief cut included protection of Meridian, savings in cost to pump, and a faster draining time.





Table IV-8. Requests for Emergency Levee Repairs

Location	Site	Damage
RD 784 (Plumas Lake)	East levee of the Feather River	- Break - Two relief cuts
	North levee of the Bear River	- Two breaks
RD 1660 (Tisdale) Near Meridian	West levee of Sutter Bypass	- Break - Relief cut (near Tisdale Bypass)
RD 2095 (Paradise Junction)	West levee of Paradise Cut	- Break
RD 2107 (Mossdale)	East levee of Paradise Cut	- Break
RD 2064 (River Junction)	East levee of San Joaquin River	- Two breaks
RD 2075 (McMullin Ranch)	East levee of the San Joaquin River	- Break
Lower San Joaquin Levee District	South levee of the San Joaquin River	- Four breaks - Repair two miles of severe erosion and more than 50 major boils
town of Walker	West Walker River	- Restore river channel
town of Coffee Creek	South levee of Coffee Creek and west levee of the Trinity River	- Two breaks
Emergency Flood Fight		
	Town of Meridian	- Construct ring dike
	West levee of Butte Creek	- Erosion
State Maintenance Area 3	West levee of the Feather River	- Slumping and boils
	South levee of the Sacramento By- pass	- Seepage and slumping
RD 501 (Ryer Island)	West levee of Sutter Slough	- Waterside slough
RD 556 (Upper Andrus Island)	East levee of the Sacramento River	- Numerous boils
Brannan-Andrus Levee Mainte- nance District	West levee of Georgiana Slough	- High rate of seepage - Renewed seepage and slumping
	West levee of the Mokelumne River at Georgiana Slough	- Cracking and slumping
RD 1601 (Twitchell Island)	San Joaquin River at Seven Mile Slough	- Cracking and slumping
	East levee of Three Mile Slough	- Seepage and boils
RD 544 (Upper Roberts Island)	West levee of the San Joaquin River	- Seepage and boils
RD 17	East levee of the San Joaquin River	- Seepage and boils
	Walthall Slough (Woodward) Levee	- Wavewash erosion
RD 2107 (Mossdale)	West levee of the San Joaquin River	- Seepage and boils
RD 2075 (McMullin Ranch)	Trahern Levee	- 2.5 miles with plastic sheeting armor - Sandbags
RD 2063 (Crows Landing)	East levee of the San Joaquin River	- Cracking, slumping, and sloughing

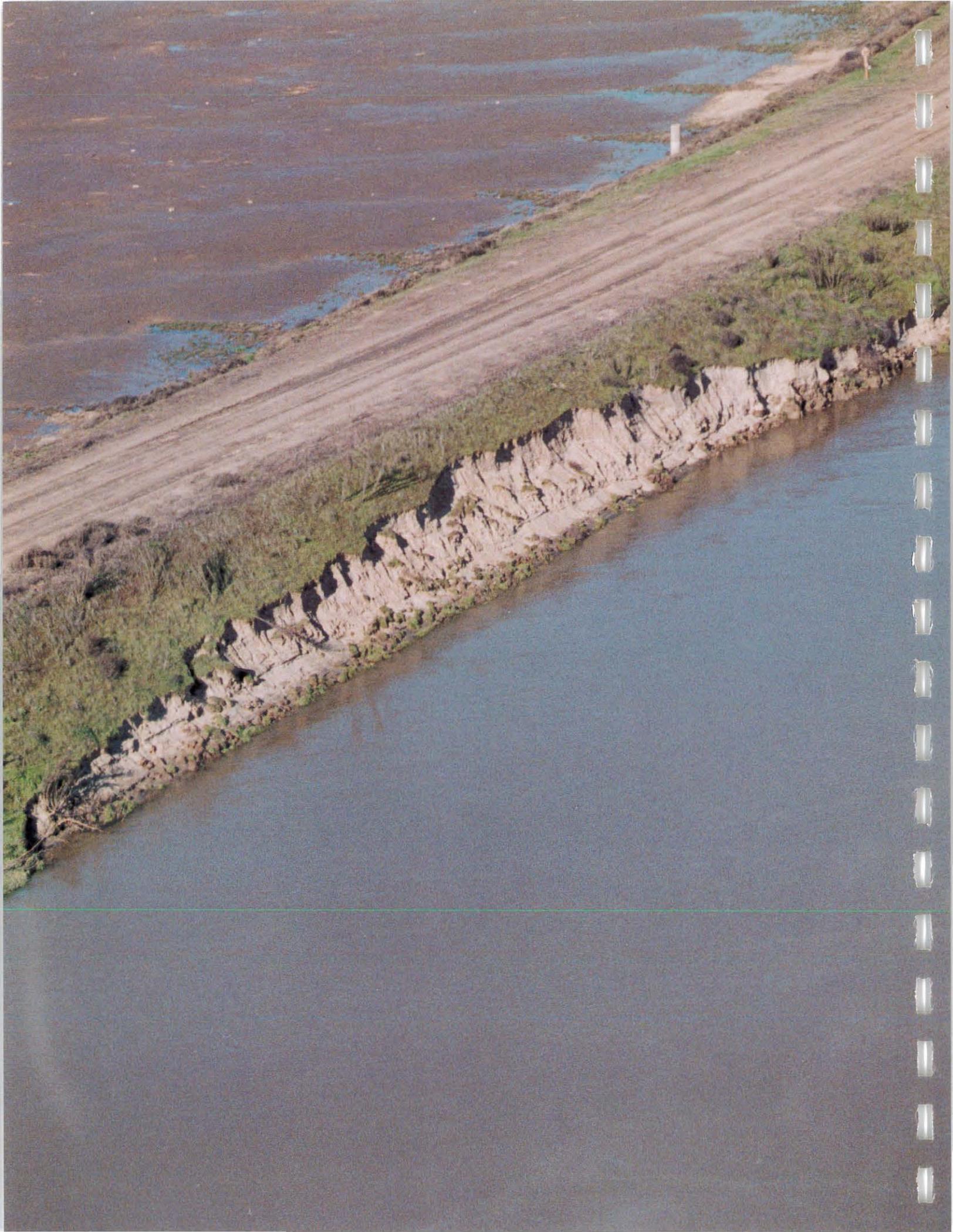
3. Levee Repair Plan

Under PL 84-99, the Corps is authorized to perform immediate and long-term repairs to damaged project levees in partnership with local sponsors. The Reclamation Board is the local sponsor for the Sacramento River and San Joaquin River flood control systems. The Corps is preparing detailed Project Information Reports which will assess damages and include recommendations for restoration and mitigation within distinct hydrologically separable basins for long-term repairs. The reports must justify the cost of repairs against flood damages averted and document all environmental impacts. Upon approval of the reports, plans and specifications will be prepared and the repair contracts awarded. Figure IV-3 identifies which separable basins have applied for PL 84-99 assistance.

As an alternative to levee reconstruction, the Corps is encouraging proposals for nonstructural solutions whenever appropriate. Nonstructural approaches include actions such as purchase of flowage easements and/or construction of setback levees. These options are currently being considered in RDs 2099, 2100, 2102, 2124, and 2031. As repair plans progress, nonstructural alternatives will be closely examined in other areas. However, nonstructural alternatives involving land acquisition are only being pursued if there are willing sellers.

Page 60

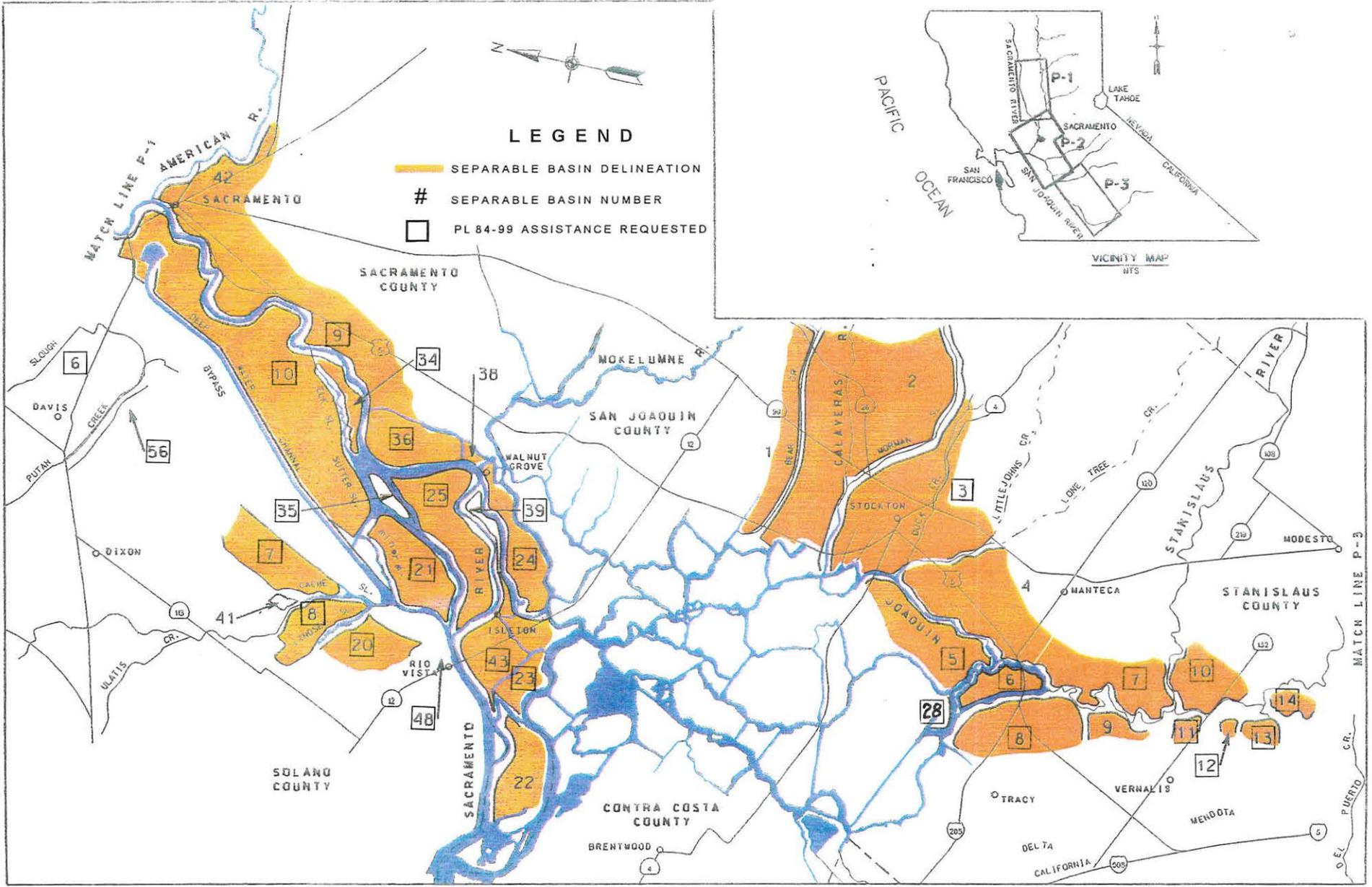
A levee along the lower San Joaquin River shows the effects of erosion. Much of the Corps PL 84-99 restoration work involves repairing areas such as this.



SACRAMENTO AND SAN JOAQUIN RIVERS, DELTA, AND TRIBUTARIES

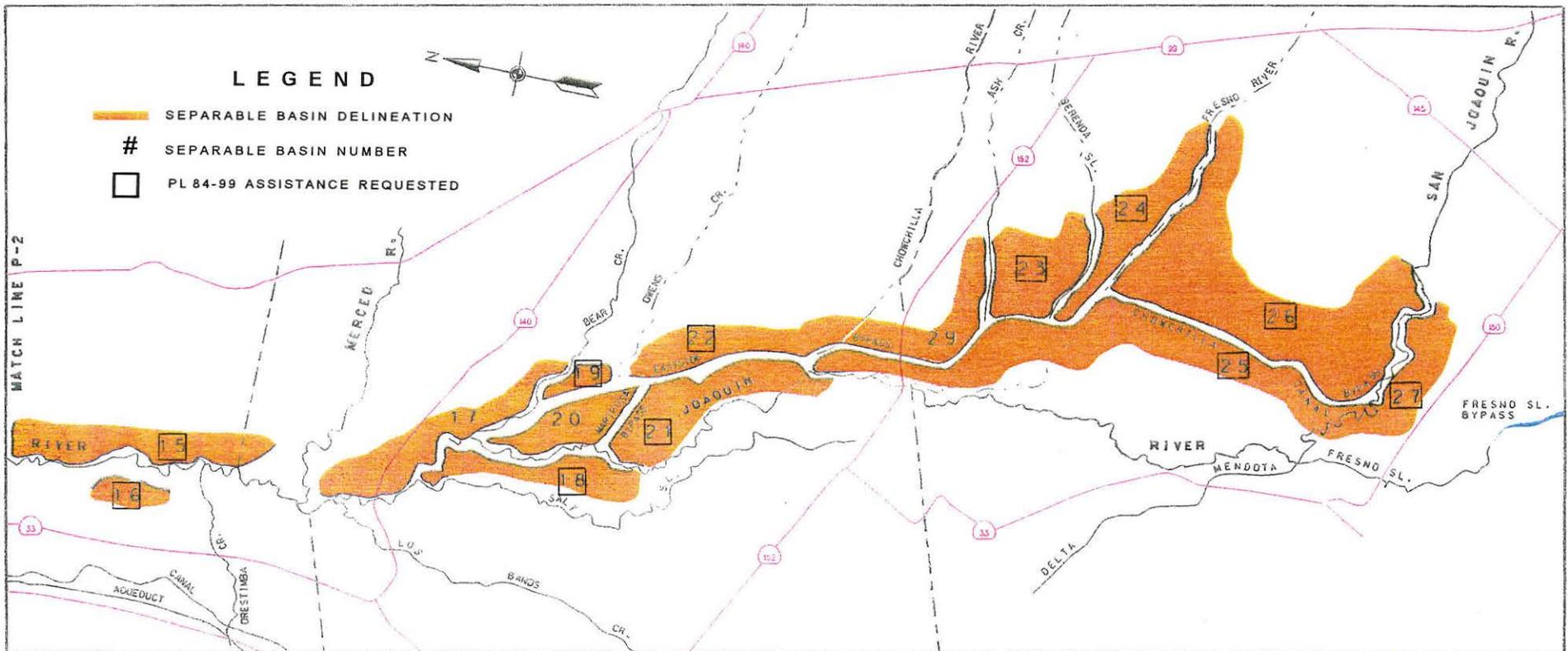
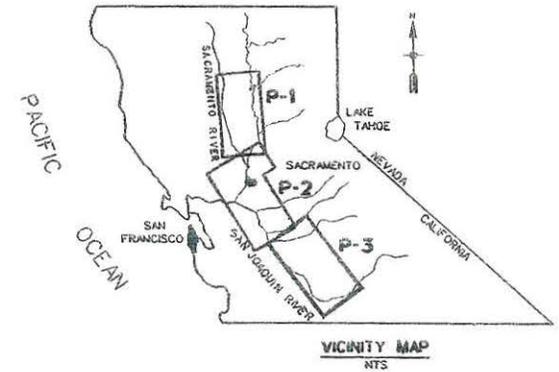
BASIN DELINEATIONS

SACRAMENTO DISTRICT
US ARMY CORPS OF ENGINEERS



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

SACRAMENTO DISTRICT
US ARMY CORPS OF ENGINEERS
SACRAMENTO AND SAN JOAQUIN RIVERS,
DELTA, AND TRIBUTARIES
BASIN DELINEATIONS



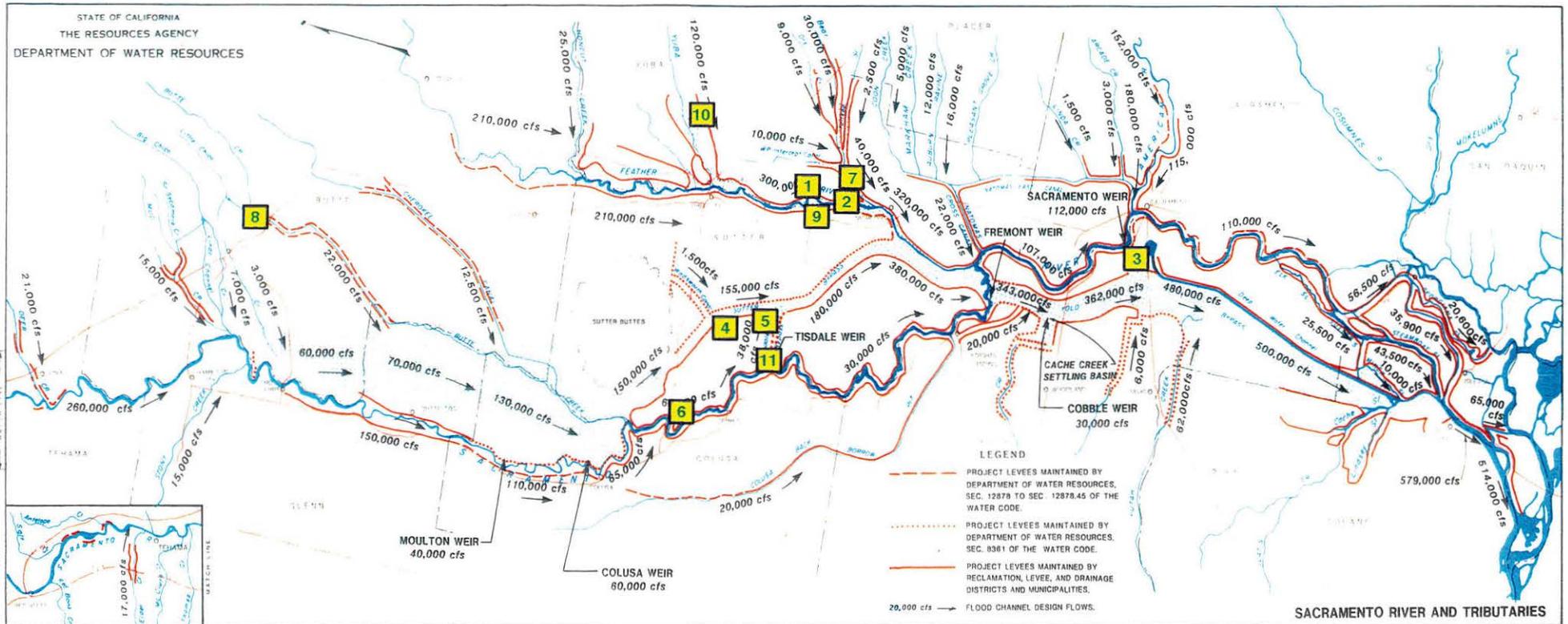
4. Status and Schedule of Levee Repairs

PL 84-99 repairs are being performed in three phases. Phase I involved emergency flood fight activities and is essentially complete. Phase II work solved the immediate need to close levee breaches and provide a moderate level of protection for the remainder of the flood season. Phase III restores damaged levees to their full preflood integrity. The Corps' goal is to complete the Phase III repairs by November 1997.

More than 90 letters were written by local maintaining agencies to the State Reclamation Board requesting PL 84-99 Levee Rehabilitation assistance for the January flood damages. These letters were forwarded to the Corps for action. In response, the Corps has begun detailed Project Information Reports scheduled to be completed in May and June. After preparing plans and specifications and securing necessary agreements and rights of way, construction should start in July and August for most basins and be completed in October. Although some of the reports such as the Feather and Bear rivers and Sutter Bypass have already been completed, most of the basin reports will be completed in May and June.

The following maps of the Sacramento River and San Joaquin River systems and corresponding "Levee Repair Status" tables (Tables 9 and 10) show the Corps' current contract status including comments on issues associated with construction activity. The maps are the same ones used for the 30-day FEAT report; updated channel capacity information is shown on the 11-inch-by-17-inch foldout maps under Section C, "Description of Damage to Flood Control Systems," earlier in this chapter.

Sacramento River System January 1997 Levee Problems



1 Feather River Levee Break (Left Bank)

2 Feather River Levee Relief Cuts (Left Bank)

3 Sacramento Bypass Levee Repair (Left Bank)

4 Sutter Bypass Levee Break (Right Bank)

5 Sutter Bypass Levee Relief Cuts (Right Bank)

6 Meridian Emergency Dike

7 Bear River Levee Overtopping And Breaks (Right Bank)

8 Butte Creek Levee Restoration (Both Banks)

9 Feather River Levee Repair (Right Bank)

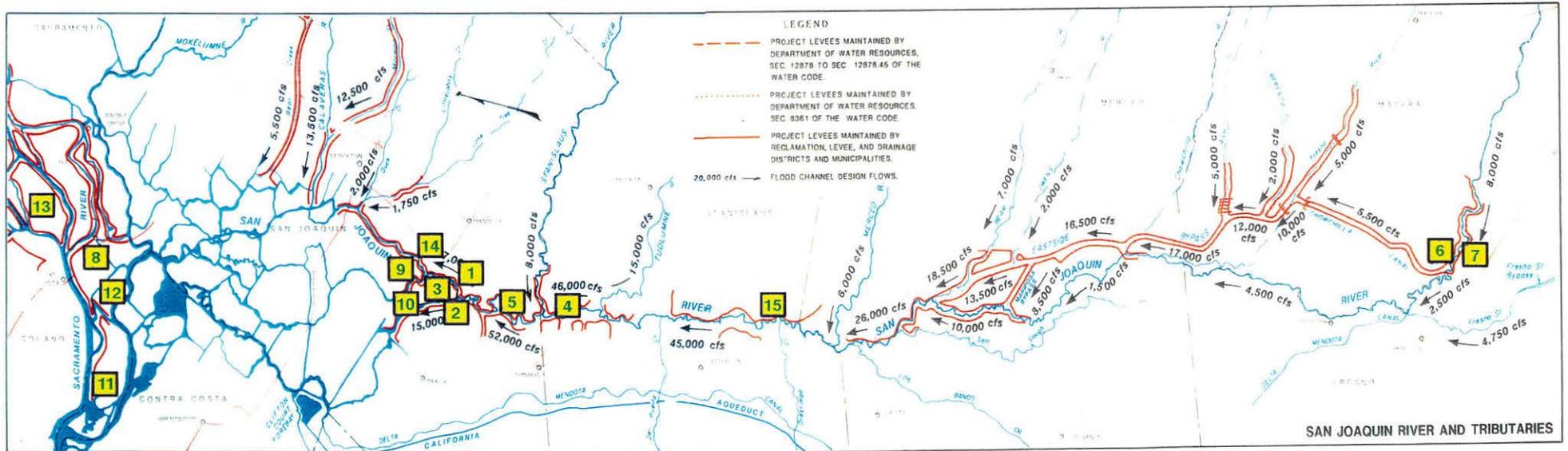
10 Yuba River Mining Debris Dike Repair

11 Tisdale Bypass Levee Repair (Right Bank)

Table IV-9. Levee Repair Status Report — Sacramento River System

FEAT Map Reference	Stream	Location	County	Type	Local Agency	Contract Status	Completion Date	Comments
1	Feather River	Near Arboga	Yuba	Levee breach	RD 784	Bid Opening 3-21-97		Phase III Project Information Report has been approved.
2	Feather River	1 1/2 miles north of confluence Feather and Bear Rivers	Yuba	Levee relief cuts	RD 784	See above		Feather River relief cuts will be repaired as part of the Phase III Project mentioned above. State searching for clay borrow site.
3	Sacramento Bypass Levee	Near Sacramento	Yolo	Seepage, slough	DWR Per Water Code	Awarded 1-3-97	1-6-97	
4	Sutter Bypass	6 miles north of Tisdale Weir	Sutter	Bypass levee break	RD 1660	Awarded 1-5-97	2-6-97	Phase II Contract to provide 25-year protection is complete. Conditional approval of Project Information Report and funding by Corps South Pacific Division was received March 18. This work is expected to start soon after the Feather/Bear contracts are underway.
5	Sutter Bypass	500 feet north of Tisdale Weir	Sutter	Bypass levee relief cuts	RD 1660			The Phase III Contract for repair of the relief cuts will be done as part of the contract mentioned above.
6	Meridian Emergency Dike	Meridian	Sutter	Construct ring dike	RD 70	Awarded 1-5-97	1-6-97	The Corps has completed work here. The State is currently conducting site evaluations. The ring dike constructed to prevent the inundation of Meridian is being removed.
7	Bear River	1 1/2 miles above confluence Bear and Feather rivers	Yuba	Levee breach	RD 784	See FEAT Map, Reference No. 1	Expected 4-23-97	Phase III Project contract let as part of the Feather River Project. Import rock completed April 8 on east side. Shaping and sloping east bank completed. Hauling levee fill material for the deep scour areas.
8	Butte Creek	Durham near Durham Road	Butte	Levee restoration (severe erosion)	State MA5	Awarded 1-24-97	1-28-97	Preparation of Project Information Report in progress. Phase II site evaluation determined Phase III action is necessary, i.e., Phase II repair will be bypassed. No detail map available.
9	Feather River	South of Yuba City near Laurel Road	Sutter	Levee sloughing (right bank) 1-2-97	LD1	Awarded 1-25-97	Expected 4-23-97	Contract for Phase III repair awarded March 21. Excavation is complete. Levee is approximately 20% complete. Contract is approximately 25% complete.
10	Yuba River	East of Marysville 4 miles upstream of Simpson Lane Bridge	Yuba	Mining debris dike erosion 1-24-97	None	Awarded 1-23-97	1-28-97	Work done under California Debris Commission authority (50/50 cost share).

San Joaquin River System January 1997 Levee Problems



- | | |
|---|---|
| 1 San Joaquin River Trahern & Walthall Levees (Flood Fights) | 9 Upper Roberts Island Levee Seepage (Flood Fight) |
| 2 Paradise Cut Levee Break "A" | 10 Stewart Tract (Flood Fight) |
| 3 Paradise Cut Levee Break "B" | 11 Sherman Island Levee Slumping |
| 4 & 5 Lower San Joaquin River Multiple Levee Breaks | 12 Twitchell Island Levee Sloughing (2 Sites) |
| 6 Upper San Joaquin River Multiple Levee Breaks (Right Bank) | 13 Ryer Island Levee Sloughing |
| 7 Upper San Joaquin River Multiple Levee Breaks (Left Bank) | 14 San Joaquin River Levee Seepage At RD17 (Right Bank) |
| 8 Brannan-Andrus Island Boils And Levee Sloughing (3 Sites) | 15 San Joaquin River Levee Slumping At RD2063 (Right Bank) |

Table IV-10. Levee Repair Status Report San Joaquin River System

FEAT Map Reference	Stream	Location	County	Type	Local Agency	Contract Status	Completion Date	Comments
1	San Joaquin River	Near Manteca at Airport Road and Peach Avenue	San Joaquin	Erosion 1-5-97 (Trahern) 1-22-97 (Walthall)	RD 17	Awarded 1-5-97 Awarded 1-26-97	1-7-97 1-30-97	Constructed temporary levee to protect Manteca.
2	Paradise Cut	Near Mossdale 0.3 miles downstream of confluence San Joaquin River and Paradise Cut	San Joaquin	Break "A" 1-5-97	RD 2095	Awarded 1-6-97	1-16-97	
3	Paradise Cut	Near Mossdale 1/2 mile downstream of Paradise Dam	San Joaquin	Break "B" 1-10-97	RD 2107	Awarded 1-11-97	1-18-97	
4A Multiple Sites	San Joaquin River	Near Vernalis. Breaks 1 to 3 miles south of Maze Blvd.	Stanislaus	Multiple levee breaks 1-4-97 (2099 & 2100)	RD 2099 RD 2100	Awarded 3-5-97	4-5-97	The archaeological site found in the T1/T2 area has caused work to stop in this area. Design of a ring levee around the site is underway. Work at sites S & U completed. Base rock row now being placed on top of levee. Dredging of Site T2 halted due to disturbing of burial site. Meeting to be held to determine course of action. Contract approximately 50% complete.
4B Multiple Sites	San Joaquin River	Near Vernalis. Breaks near Maze Blvd.	Stanislaus	Multiple levee breaks 1-5-97	RD 2031	Awarded 2-4-97	2-28-97	Sites O, P, Q, V, and N are complete. Contract completed. Evaluating site for Phase III report.
4C	San Joaquin River	Near Vernalis. 1/2 mile north of Maze Rd.	Stanislaus	Levee break Levee erosion and sloughing	RD 2101	Awarded 3-4-97	3-31-97	Levee breach repair finish work completed March 31. Contract 100% complete.
5A	San Joaquin River	South of Manteca near Perrin Road. A-Right bank San Joaquin River 1/2 mile south of Airport Way B-At confluence of San Joaquin and Stanislaus rivers	San Joaquin	Levee breaks 1-6-97 (Site F) 1-5-97 (Site A & B)	RD 2075 RD 2064	Site F Contract Awarded 2-1-97 Sites A & B Contract Awarded 1-18-97	3-7-97 2-25-97	Site F contract complete. Sites A & B contract completed 2-25-97.
5B	San Joaquin River	West of Ripon and south of Manteca near River Junction Avenue	San Joaquin	Levee breaks 1-6-97 Relief cut 1-5-97	RD 2075 RD 2064	Contract awarded 1-31-97 (10 days base; 60-day option for Site C)	2-28-97	Sites D & E (RD 2075 levee breaks) completed. Site C (RD 2064 Relief Cut) completed. Contract completed.
5C Multiple Sites	San Joaquin River	Southwest of Manteca near Weatherbee Lake	San Joaquin	Levee break, overtopping, and relief cut 1-6-97	RD 2094	Awarded 1-29-97	3-21-97	Sites G & H contract completed.
6 Multiple Sites	San Joaquin River	In the area 6 to 10 miles east of Mendota	Madera	Multiple breaks 1-4-97	Lower San Joaquin Levee District	Awarded 1-19-97	2-6-97	Site evaluation underway for Phase III Report preparation.
7 Multiple Sites	San Joaquin River	In the area 6 to 10 miles east of Mendota	Fresno	Multiple breaks 1-4-97	Lower San Joaquin Levee District	Awarded 1-15-97	2-6-97	

FEAT Map Reference	Stream	Location	County	Type	Local Agency	Contract Status	Completion Date	Comments
8A	Sacramento River	Upper Andrus Island, south of Walnut Grove on Highway 160	Sacramento	Seepage, boils 1-4-97	Brannan-Andrus Levee Maintenance District (BALMD)	Awarded 1-4-97	1-17-97	
8B	Georgiana Slough	Brannan-Andrus Island, near Oxbow Marina	Sacramento	Seepage 1-7-97	BALMD	Awarded 1-9-97	1-27-97	
8C	Mokelumne River	Brannan-Andrus Island 1/2 mile upstream from confluence Mokelumne and San Joaquin rivers	Sacramento	Cracks, slumping 1-11-97	BALMD	Awarded 1-12-97	1-21-97	
9	San Joaquin River	Upper Roberts Island 2 miles west of Lathrop and 1 mile downstream of bifurcation, San Joaquin River and Old River	San Joaquin	Seepage, numerous boils 1-11-97	RD 544	Awarded 1-12-97	1-18-97	
10A	San Joaquin River	Near Mossdale 1/2 mile southeast of Interstate 5	San Joaquin	Seepage, boils 1-8-97	RD 2062 RD 2107	Awarded 1-28-97	2-7-97	Contract was ready to bid on 1-10-97, when Paradise Cut "Break B" occurred. This work was held up until break was closed and water drained down sufficiently. Scope was broader than original, due to additional damage while inundated.
10B	Paradise Cut	North of Tracy 1/2 mile east of confluence Old River and Paradise Cut	San Joaquin	Relief cut 1-11-97	RD 2062	Awarded 2-5-97	2-16-97	Relief cut made 1-11-97 to drain Stewart Tract, after "Break B" on 1-10-97 at Paradise Cut in RD 2107.
11	San Joaquin River	Sherman Island 2 miles south of confluence Sacramento River and Three Mile Slough	Sacramento	Cracks, slumping 1-27-97	RD 341	Monitoring		Corps determined situation was not urgent, and not appropriate for PL 84-99 rehabilitation. The local district's engineer is monitoring to detect any further movement.
12	Three Mile Slough	Twitchell Island 1/2 mile upstream of confluence Sacramento River and Three Mile Slough	Sacramento	Seepage, boils, slumping, sinkhole 1-22-97	RD 1601	Awarded 1-24-97	1-30-97	Stability/seepage/berm
13	Sutter Slough	Ryer Island near junction of Ryer Road and East Ryer Road	Solano	Slough 1-11-97	RD 501	Awarded 1-11-97	1-18-97	Stability/seepage/berm
14	San Joaquin River	Southwest of Lathrop near bifurcation of Old River and San Joaquin River	San Joaquin	Seepage, boils 1-10-97	RD 17	Awarded 1-12-97	1-18-97	Stability/seepage/berm
15	San Joaquin River	West of Turlock (Crows Landing) 4 miles north of Crows Landing Bridge	Stanislaus	Cracks, slumping 1-29-97	RD 2063	Awarded 1-29-97	2-1-97	Stability/seepage/berm

E. Natural Resources Conservation Service Role

The United States Department of Agriculture Natural Resources Conservation Service provided technical and financial assistance to communities for restoring watersheds impaired by natural disasters following the 1997 floods. Through the Emergency Watershed Protection program, the NRCS helps safeguard people and property after natural disasters, such as floods, fires, wind storms, earthquakes, and drought. The NRCS helps repair overtopped levees, dikes, and other flood retarding structures. Assistance was provided to help clear water courses clogged by sediment and debris to prevent future flooding.

The 1996 Farm Bill gave USDA the authority to purchase floodplain easements as an emergency measure under the EWP program. This new authority provides an opportunity to purchase easements when the long-term economic, social, and environmental benefits of purchasing the easement is greater than repeated repairs to the same land. Where willing sellers are available, land retirement provides a more permanent solution from damages associated with flooding or products of erosion, giving the landowner fair value for the land, and providing an opportunity to enhance the environmental functions of the riparian corridor. In many cases, some agricultural production will still be possible by purchase of an easement, leaving residual value such as the ability to crop the land when it is not flooded. This authority gives NRCS the flexibility to provide long-term, environmentally-responsible flood protection while respecting private property rights.

Local sponsors of EWP projects (cities, counties, resource conservation districts) were responsible for obtaining the necessary permits, providing 25 percent cost-share, and providing for the operation and maintenance of completed emergency measures. The sponsors determined priorities for emergency assistance and coordinated work with other federal and local agencies. Local sponsors provided their share of construction costs in the form of cash and in-kind services, such as labor or equipment.

Following the 1997 floods, NRCS provided assistance in 22 counties to prevent damage from future flooding, runoff and erosion; reducing the threat to life and property. Measures included repairing existing levees; removing debris and sediment from channels; and protecting streambanks. This assistance protects homes, businesses, and other properties from further damage in the event of subsequent storms.

**Table IV-11. USDA-NRCS, Emergency Watershed Protection Program
Flood Damage Repair Projects after January 1997 Floods**

County	Total Number of DSRs ¹	Number of Approved DSRs	Cost Estimate for Approved DSRs (in dollars)	Number of Projects Completed ²
Amador	1	1	35,000	0
Butte	8	8	2,027,000	0
Colusa	1	1	220,000	0
Humboldt	3	2	110,000	0
Kern	2	1	25,000	0
Lake	1	1	20,000	0
Lassen	3	2	100,000	2
Mariposa	2	2	80,000	0
Modoc	16	14	256,700	10
Napa	4	4	579,931	2
Nevada	3	3	581,080	0
Placer	8	7	356,354	2
Plumas	23	14	612,500	7
San Luis Obispo	1	1	35,000	0
Santa Cruz	1	1	600,000	0
Shasta	2	2	82,000	0
Sierra	9	6	638,000	2
Siskiyou	1	1	15,000	0
Sutter	1	1	60,000	1
Tehama	7	4	954,181	1
Trinity	5	2	55,000	2
Yuba	1	1	20,000	1
Totals	103	79	7,462,746	30

Source: National Resources Conservation Service

¹ Damage Survey Report

² NRCS has received \$2,085,000 in funding. Other projects will be completed after request for supplemental appropriation is approved by Congress.

F. State Reclamation Board Role

The State Reclamation Board was established by the Legislature in 1911 to oversee the construction of flood control levees and help Californians reclaim lands of the Central Valley, primarily for agriculture. The Reclamation Board is the primary State agency which cooperates with the Corps in flood control projects along the Sacramento and San Joaquin rivers and their tributaries. The Reclamation Board has acted as liaison between the State of California, the Corps, and residents, property owners and local agencies within the Central Valley on flood control issues.

As part of the PL 84-99 levee rehabilitation efforts, the Board is continuing its longtime role of providing all the lands, easements, and rights-of-way and relocations for the Corps' work. In addition, the Reclamation Board has regulatory authority over projects carried out along or near the Sacramento and San Joaquin rivers and their tributaries. The Board also administers the Designated Floodway Program, a nonstructural flood management approach which is intended to ensure the safe passage of floodflows through flood-prone areas.

The Reclamation Board's authorities are sometimes confused with the functions and authorities of local reclamation districts and the U.S. Bureau of Reclamation. The January floods pointed out that emergency response authorities are not well understood between local reclamation districts, Department of Water Resources, and the Reclamation Board. Many of the statutes that govern the Reclamation Board are archaic and there is a need to review and modernize the role of the Reclamation Board. There is as much need now as there was in 1911 for a State agency, like the Reclamation Board, to provide regional leadership in flood control within the Central Valley. (See FEAT recommendation in Chapter VI, Section C.)

G. Performance of State Jurisdictional Dams

In addition to the large flood control dams, the State monitors performance of more than 1,200 dams. These smaller dams, referred to as "state jurisdictional dams," performed well; however, spillways at many of these dams passed large flows capable of damaging the structures. The Division of Safety of Dams must inspect these dams and follow-up by requiring owners to perform necessary repairs as soon as possible in order to ensure the combined safe operation of these dams. This extra effort is expected to take two years.

The FEAT recommends that the Department of Water Resources inspect all dams which made large spillway releases during the 1997 flood for damage that may impair the dam's ability to safely pass future floodflows. If necessary, require the owner to initiate repairs as soon as possible to assure downstream safety.



V. Emergency Management System Response to Floods

A. Background

December 1996 was a major milestone in the continuing development of California's emergency management system. The initial training, exercises, and planning necessary to implement the Standardized Emergency Management System were essentially complete, and the system was ready for its first major test. Further, steps to improve automated information management were underway through the use of the Response Information Management System.

The floods of January 1997 provided a test that showed the strength and weaknesses of these emergency systems and helped to identify areas where improvement is needed. When the floods hit, the information management system was being implemented in all the Operational Areas and in some local and State agencies. However, implementation was not complete.

B. Description of SEMS

The Standardized Emergency Management System incorporates a broad range of emergency management practices to effectively respond to disasters. Between disasters, SEMS builds connections to integrate management, communications, and resources at the local, regional, and statewide levels to maximize the responsiveness of emergency personnel.

1. Emergency Response Organization

The Standardized System is multi-level and designed to manage disasters anytime and anywhere in the State. It is intended to facilitate priority setting, inter-agency cooperation, and the efficient flow of resources and information, but does not alter statutory authorities or responsibilities of emergency responders.

SEMS provides the framework for coordinating state and local government emergency response in California using the existing incident command system and mutual aid agreements. It consists of five organizational levels, five main functions, mutual aid, the Incident Command System, multi/inter-agency coordination, and the operational area concept.

The five organizational levels are:

1. Field level, which includes those entities which manage and coordinate response at the emergency scene.
2. Local level, which manages and coordinates county, city, or special districts (which in turn manage and coordinate the field levels).

Opposite Page:

Clockwise from upper left: a daring helicopter rescue by the U.S. Coast Guard; CCC crews place sandbags on levee; trucks dump rock on levee; OES search and rescue teams look for flood victims; crews work to repair levee damage.



3. Operational areas, which manage and coordinate at the local level (essentially all local governments within the geographic boundary of a county).
4. Regional levels, which manage and coordinate information and resources among operational areas.
5. State level, which provides statewide regional level resource coordination integrated with federal resource coordination.

The five main functions of the SEMS structure are:

1. Management, which provides the overall direction and sets priorities for an emergency, limited by the jurisdiction roles and responsibilities.
2. Operations, which implements priorities established by the management function.
3. Planning/Intelligence, which gathers and assesses information.
4. Logistics, which obtains the resources to support the operations.
5. Finance/Administration, which tracks all costs related to the operations.

Most local jurisdictions have “mutual aid” agreements. These agreements provide a means for a community, that has fully committed all of its available resources to a local emergency, to obtain additional resources from surrounding communities and counties. Mutual aid agreements are used daily and during disasters by fire, law enforcement, health care, and other disciplines. SEMS incorporates existing, and newly developed mutual aid systems.

The Incident Command System provides standardized procedures and terminology, a unified command structure, a manageable span of control, and an action planning process that identifies overall incident response strategies. Within SEMS, the general concepts of the ICS are translated to each level of the statewide response system—from a local field incident to statewide coordination. This allows seamless communication among all responding agencies and levels of government.

2. Maintenance System

The SEMS Advisory Committee, under the chairmanship of OES, developed the SEMS system and regulations, an Approved Course of Instruction, guidance materials, a “maintenance system,” and other information to implement the system.

The maintenance system is designed to ensure that SEMS incorporates new knowledge gained through emergency response experience, regulatory changes and/or technological developments. With each application of SEMS, new ideas arise to improve the system.

The components of the maintenance system are:

- SEMS Advisory Board. This is the executive level of the SEMS maintenance system. It approves recommendations of the SEMS Technical Group. It is

*Opposite Page:
Volunteer firefighters
from Williams fill
sandbags in Colusa
County.*

chaired by the OES Director, and its membership consists of state agency directors and others.

- Mutual Aid Regional Advisory Committees. For the purpose of coordinating mutual aid, the state is divided into six mutual aid regions. Membership is composed of local emergency managers and other emergency response agencies in each region. The committees provide a method for the local and field users of SEMS to assess and make recommendations for improvements to the system. The committees meet quarterly to exchange information and advise the SEMS Technical Group of issues that need to be addressed.
- SEMS Technical Group. This group consists of representatives of state agencies, and a representative from each mutual aid region. It is chaired by an OES Deputy Director. It assigns issues to committees for resolution and makes recommendations to the SEMS Advisory Board.
- SEMS Specialist Committees. These committees are created to address specific issues. As a result of the floods of January 1997 the Flood Issues Specialist Committee was established to make recommendations regarding flood problems.

3. Response Information Management System

Effective operation of SEMS is critically dependent upon timely, clear and accurate information flow between all components of the system. The Governor's Office of Emergency Services recently instituted the Response Information Management System. RIMS is a network that allows for the rapid sharing of critical information and resource management data between the various organizational levels during a disaster. When a local government resource need is identified, RIMS is designed to identify a source for the required assistance. It is also designed to provide access to all the requests and their status. The intent is to provide responding agencies a clearer picture of emergency activities and committed resources. Eventually, RIMS will help the transition from response to recovery by allowing local jurisdiction damage estimates to be put online for computer access.

Not all State agencies and Operational Areas had been equipped with RIMS at the time of the floods. However the power of using RIMS in conjunction with SEMS was abundantly clear. OES is proceeding as rapidly as possible with a program to distribute RIMS technology to all concerned parties.

C. Initiatives

The January 1997 flood was the first major disaster which used SEMS. As in any disaster, problems arose which can become lessons learned to improve future response. Application of SEMS principles and understanding of the system was not satisfactory in some cases. The SEMS maintenance system will be utilized to address problems associated with the emergency response. What follows is a brief

description of the issues and the initiatives to address it. The lessons learned from this disaster will be used to develop better procedures that can be applicable to all types of disasters.

1. Operations

a. Field/Emergency Operations Center/Department Operations Center Coordination

Coordination between the field response forces and emergency operations centers and department operations centers needs to be improved. Problems with numerous field command posts and information flow through the different levels decreased the effective prioritization of resources. In some instances, state field forces acted independently of local jurisdictions. Occasionally, resources ordered were duplicated. Some requests were canceled without a clear reason. Coordination with federal agencies was duplicated resulting in lost time for emergency work and cancellation of resource requests. Some of these problems may be attributed to the geographical extent of the emergency response and the severity of the disaster which exceeded recent past flood events.

The FEAT recommends OES develop and test guidelines that clarify how federal, State, and local agencies will coordinate joint field emergency operations under SEMS. The guidelines should integrate local agencies that maintain levees and flood control structures into the overall emergency response organization. These guidelines must define fiscal responsibilities, emergency response, and statutory and regulatory authorities.

The SEMS Flood Issues Specialist Committee was formed to address this area. Committee representation includes local government, special districts, state agencies, and OES as the lead. This Committee will develop guidelines to clarify the roles, responsibilities, and means of facilitating coordination of field forces with EOCs and DOCs, the incorporation of federal and State forces in the field operations, protocols for information exchange, and resource ordering and tracking. The main focus of this effort will ensure that coordination with the local jurisdictions will occur in a timely manner to avoid both omissions and duplication and to improve emergency operations. The guidelines will be tested through exercises prior to the flood season to help ensure effectiveness.

b. Emergency Planning and Operations at Local Maintaining Agencies

SEMS regulations require all local governments, including special districts, to use SEMS in multi-agency or multi-jurisdictional emergency responses in order to receive reimbursement for personnel costs. Local maintaining agencies such as reclamation districts, levee districts, and flood control districts have rarely been involved in emergency planning and training exercises, except for the larger, better-staffed LMAs in urban areas or those directly associated with county governments.

Initiative—To improve emergency planning and response by LMAs, SEMS Flood Issues Specialist Committee will develop and test guidelines for integration of LMAs into the overall emergency organization. The guidelines will address fiscal responsibility, emergency planning, emergency response, and statutory and regulatory authorities.

The FEAT encourages local agencies responsible for maintenance of levees, and flood control structures, to coordinate an emergency plan and response actions with the appropriate city and county emergency management agency. The FEAT also recommends DWR, in coordination with OES, develop model emergency procedures and training for use by local maintaining agencies in development of local plans.

c. Evacuation

The floods caused one of the largest evacuations in California's history. The overall evacuation appears to have been successful, but there is need for improvement. Evacuation terms were unclear, the authority to order an evacuation was not fully understood, and all methods of disseminating the warning were not utilized. There were instances of individuals not willing to evacuate without their pets, and some pets were abandoned. Evacuation warnings were not directed toward persons with disabilities and shelter facilities were not designed to accommodate their needs.

Initiative—DWR will continue to work with the National Weather Service to help clarify warnings by providing clear, useful information to state and local governments. OES will coordinate with the Department of Justice to provide clarification of the legal authorities and terms for evacuation orders.

Initiative—OES, in cooperation with DOJ, DWR, Department of Rehabilitation, and members of the newly formed SEMS Flood Issues Specialist Committee, will develop evacuation guidelines for distribution to emergency response agencies. These guidelines will address the needs of persons with disabilities. If statutory impediments to safe and efficient evacuation exist, OES will work to develop legislation to address the problem.

d. Livestock and Pet Evacuation

Emergency managers are primarily concerned with protection of human lives and property. During the floods, vast tracts of agricultural land were flooded, livestock was in danger, and the evacuation of livestock and their care was not consistently provided. Most emergency plans do not include procedures for protection or evacuation of livestock or pets.

The FEAT recommends OES in cooperation with local animal control officers, the Department of Food and Agriculture, and U.C. Cooperative Extension, to review procedures for livestock and pet evacuation and develop animal safety and relocation procedures to be used in future emergencies.

2. Training

a. Alerting and Warning

Public notifications of impending danger or flooding were not clearly understood by the public or the media. Terms such as "voluntary" and "mandatory" evacuations were not clearly defined. Evacuations ranged from very smooth, timely operations to panic. Mixed messages were sent by public officials, adding confusion to a difficult situation.

The FEAT recommends OES and DWR jointly conduct flood emergency workshops annually, prior to the flood season. This effort will focus on the dissemination of critical information to decision-makers, and the effective use of tools to convey emergency information to the public in a timely manner. These workshops will coincide with public flood awareness campaigns prior to the flood season.

b. EOC Training

In preparation for the flood season, several DWR personnel were trained in the SEMS EOC course. The magnitude of the January 1997 event highlighted the need for additional trained personnel to implement and maintain a SEMS organization in the Flood Center.

Initiative—OES will provide EOC training to DWR to improve DWR's ability to organize the Flood Center according to SEMS in flood emergencies. The training will be tailored to meet the specific needs of DWR. DWR will require this training for all levels of personnel beginning with executive management. The training will include exercises to illustrate aspects of EOC organization. DWR will update its ICS training materials and provide ICS training to sufficient personnel to staff all SEMS functions adequately on an ongoing basis. *The FEAT recommends the Department of Water Resources establish a Department-wide emergency management function to better meet the requirements of the State's Emergency Services Act and the Standardized Emergency Management System. More emphasis should be placed on advanced planning for all types of emergencies, and year-round coordination with OES and other local, State, and federal responding agencies.*

3. Information Management

a. RIMS

The floods of January 1997 were the first major use of RIMS during a large disaster event. The system was useful to those who had access to it. Increasing its accessibility will provide improved overall coordination of response resources and activities.

The FEAT recommends OES explore the feasibility of developing RIMS for expanded distribution. The State will continue to research and develop methods for increasing the use of RIMS and for expanding its application to local governments which currently do not have access to it.

In order to expand, RIMS will have to be customized to meet the needs of operational areas and local government. The hardware necessary to run the application and link it to the State network will need to be provided to counties, cities, and special districts. This will include training in the use of RIMS and state-wide exercises. All of these costs will need to be part of the analysis related to expansion. OES will work with California's post-secondary system to access high speed networks and computing resources Statewide.

b. More Comprehensive Data Acquisition

During the flood operations, DWR and the National Weather Service, utilizing information from stream gages, weather analysis, and reservoir telemetry provided river forecasts using computer modeling. These forecasts enabled DWR and NWS to provide flood warnings, which enabled reservoir operators to manage reservoir flood operations better. Forecasts can be improved by gathering and using more reservoir and streamgage information.

Initiative—DWR will work with reservoir operators to obtain more comprehensive inflow, outflow and other operational information during flood operations. DWR will work with the Corps, USGS, and others to increase the number of telemetered gaging stations for streamflow and precipitation in the Sacramento-San Joaquin River system and other streams. Twenty-five have been added and 20 more are planned by the end of June. In addition, *the FEAT recommends urging the U.S. Geological Survey to expand its surface water data collection program and support long-term records of flows for gaging stations for more rivers and streams in California. This database is needed to define the hydrology and provide statistics for critical water use decisions and to more accurately define floods of a specific frequency, particularly the "100-year event" which is the basis of NFIP floodplain mapping.*

The FEAT recommends urging federal agencies to standardize the methodology for determining flood frequencies and to adopt a single elevation datum using English units rather than metric. The Corps, USGS, and FEMA use different methods for determining flood frequency, leading to confusion about levels of protection for various communities. Use of more than one datum, and metric units, leads to unnecessary confusion and conversion errors, especially during emergencies. Federal agencies should continue to use English units until State and local agencies adopt and implement metric units.

c. Geographic River, Levee, Stream, and Reservoir Information

During the disaster, flood fight operations were conducted over a large geographic area. Geographic information was obtained mostly from fixed, paper-based map sources. Coordination, information flow, and effectiveness of response could be improved by providing a flexible mapping system based on digital information.

The FEAT recommends DWR develop, maintain, and staff a computer-based mapping system that can be used for tracking levee problems, field operations, and potential impacts on persons and property. This effort should include training staff used only in emergencies. The system should be coordinated with OES and use standardized reporting forms for tracking flood-fighting activities. RIMS will disseminate this information.

4. Disaster Assistance Program Funding

a. Eligibility Guidance

Emergency response actions were driven by the disaster events, with life and property safety as primary concerns. Resources were ordered according to the immediate need, regardless of secured reimbursement. Many entities, however, lacked a clear understanding of what activities and resources were reimbursable under the various State and federal programs. Although most agencies do not condition their response based upon the availability of reimbursement, this programmatic uncertainty may have confused the decision-making process at the expense of emergency actions.

The FEAT recommends OES use the Standardized Emergency Management System's maintenance system to provide guidance on disaster assistance funding. OES will develop guidelines and training that clarify the responsibilities and benefits of emergency proclamations and declarations. To support this effort, OES will also develop a federal and State disaster assistance program matrix describing types of assistance provided, application requirements, time-frames, and restrictions.

DWR will work with the Corps and other State agencies to provide a convenient reference summary of financial support under the Corps programs based on Public Law 84-99 and its amendments.

b. Multi-Party Agreement for Rapid Payment

Emergency actions on failing levees were constrained by shortage of personnel and other resources, and the overwhelming number of problems over a vast geographical area. Understanding responsibilities and roles is critical. Agreements on payments need to be addressed prior to an incident.

The FEAT recommends OES, in cooperation with interested parties, to facilitate the development of a Multi-Party Agreement among Local Maintaining Agencies, local governments, DWR, the Reclamation Board, and the Corps, addressing payment for flood emergencies and pre-emergency response. OES will coordinate the effort to ensure consistency with FEMA guidelines for reimbursable costs.

Initiative—Use the Department of Finance authority under Gov. Code Section 8690.6, to finance emergency response operations to State agencies for response to flood, earthquake, fire, and other disasters. In addition, funds should be made available to make expedited payments to local agencies for the cost of emergency response operations.

D. Coordination of Emergency Response in Delta Waterways

The Sacramento–San Joaquin Delta levee system is particularly susceptible to the eroding forces of wave action for boat wakes during high tides combined with large floodflows from the Sacramento and San Joaquin rivers. During the January 1997 floods, boating had to be curtailed to minimize damage to severely stressed levees and to allow for emergency vessel traffic, i.e., repair barges and evacuation craft. However, a process for requesting and authority for implementing such curtailments were unclear during the January event. *The FEAT recommends OES and the Department of Boating and Waterways, in cooperation with the U.S. Coast Guard and the Delta Protection Commission, develop a plan of action for future emergency closures of the Sacramento–San Joaquin Delta waterways to non-essential vessel traffic during periods of extremely high water.*

During the flooding, marinas were pulled from their foundations into Delta waterways. Boats and wreckage floated downstream catching on bridges, which impeded flows and increased upstream water levels. This created a hazard both for the levees and downstream structures.

The FEAT recommends the Department of Boating and Waterways, in cooperation with the Reclamation Board and other affected agencies, to develop engineering and construction guidelines to be applied in the design, permitting, construction, and/or replacement of marinas and other in-water boating structures that are subjected to high velocity flows and flood stages.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100



VI. Floodplain Management Issues

Historical accounts of the Central Valley during flood season describe it as an inland sea, and impassible from January to May. More than 100 years ago, settlers began to channel and control the rivers and creeks that ran into the valley. Eventually, the flood control system as we know it was constructed.

Urbanization of California's floodplains contributed to the spiraling costs of flood disasters. Many levee projects, originally built to provide a specific level of protection, now provide less than their design due to a variety of changed conditions—presenting a dilemma for communities which have developed behind them. To compound the problem, federal and State agencies do not always implement floodplain management practices when siting their facilities. Finally, development in floodplains occurs simply as a result of economic pressures. In the end, the public continues to put itself at risk by purchasing homes in these floodplains and not mitigating that risk with flood insurance.

A. Putting Risk into Context

The “Webster definition” of risk is: “A chance of encountering harm or loss; hazard; danger.” When individuals and public entities make decisions about recognizing and dealing with risk, opinions diverge on levels of acceptable risk.

In 1995 the National Academy of Sciences published a report on the American River Basin alternatives titled, “Flood Risk Management and the American River Basin.” This report contains valuable insight into a variety of engineering, environmental, and social issues revolving around the project alternatives being evaluated, but the committee's key conclusions relate to risk:

“This report discusses the uncertainties that confront flood managers and offers suggestions in many areas, including the need for additional research. But decision makers, agency officials, and interest groups reading this report should not use calls for additional research as an excuse for not taking action. It is time to select and implement flood risk reduction strategies for the American River Basin.”

The NAS committee was clearly acknowledging that decision makers will never have all the information they would like, but cannot shrink from their responsibility to make a decision when the time comes. Thus, there is even an inherent element of risk in the decision-making process for risk management issues.

Certainly, those on the front lines during the peak of the event— making operational decisions for flood control projects, logistical decisions on deployment of flood fight crews, evacuation decisions for local communities, and decisions by individuals to ensure their family's personal safety — weighed the risks and did what they thought best based on information available to them at the time. They acknowledge the risk and know they must deal with it immediately.

Opposite Page:

Houses and farmland are under water as the Cosumnes River reached its peak flow on January 2, 1997. Even before the flood, the area was the topic of much discussion about appropriate land use within the river's floodplain.

A key point concerning “residual risk” and relating to some of the policy recommendations in this report is: Regardless of the level of flood protection (or protection from any natural hazard), there will always be an event “out there” that is bigger than what has been anticipated and prepared for. All that can be done is to mitigate the consequences of failure — in terms of life, property, and economic and social disruption— and make decisions based on the information available at the time. Often, however, particularly if decisions regarding flood risk are made during 100 degree weather in the middle of a dry period, it is easy to minimize the potential hazard and rationalize that “this level of protection is probably good enough.” The economic benefits of continued development in high risk areas, without mandatory flood insurance requirements to address residual risk, will need to be balanced with the risk to public safety. The mandatory purchase of flood insurance would address the residual risk for development behind levees, and could be waived if the levee system provided a 200-year level of protection or higher.

The “consequence of failure” concept is the discerning factor between urban and rural decision making. Rural areas traditionally have less flood protection than urban areas because the economic impacts are less, and generally, fewer people are at risk. However, a disturbing trend in California is for once-rural areas to transition to residential/urban areas, with the people moving into these areas unaware of the potential flood risk. This concern relates to other policy recommendations for more awareness and appropriate land use decision-making by local entities, and for more floodplain mapping of formerly rural areas where this transition is either in progress or is anticipated.

Another excerpt from the NAS “Flood Risk Management” report provides more insight into residual risk:

“It is important to understand that even if a community achieves a stated goal of a specific level of flood protection, that community will still face a significant residual flood risk. Moreover, estimation of the residual risk of flooding alone does not provide owners and occupants of facilities in the floodplain with a complete picture of the consequences and damages that are likely to result from flooding. Estimates of flood risk should be augmented by estimates of likely loss of life and property damages, which are affected by evacuation opportunities, warning times, and the likely depth and character of flooding. Such vulnerabilities can be communicated by realistic scenarios that illustrate how a flood event would look and what losses are likely to occur.

“Perhaps the worst thing that might be done is to create a false sense of security or to encourage people to think that any proposed project provides complete protection from flooding. Therefore, flood risk management needs to be an ongoing part of urban planning for any community to reduce residual vulnerability to disastrous flood losses. One element of such

management is improved flood risk communication, which would give investors and residents in the area a better understanding of the risks and vulnerabilities they face.”

Finally, some excerpts from “Sharing the Challenge: Floodplain Management Into the 21st Century”—commonly referred to as the “Galloway Report”—suggest how flood risk should be addressed for the long-term future:

“Human activity in the floodplain will continue, but with the clear understanding that any activity is subject to the residual risk of flooding and that the costs of this risk are to be borne by the sponsors of the activity. All new activity will be evaluated for its economic, social, and environmental impacts and its effects on other activities in the floodplain.

“There are no silver bullets in the floodplain management business, no single actions that will suddenly reduce the vulnerability of those who are currently at risk or stave off placing others in the same position.

“If the nation is to move ahead, it must do so in a manner that recognizes the many stakeholders in the floodplain management effort and appropriately divides the responsibilities among them. . . . Operating together with common goals, governments, businesses, and private citizens can make sound floodplain management a reality throughout the nation.”

B. Federal Floodplain Policy

As a result of repeated and expensive flooding, national flood policy has emphasized reducing disaster assistance costs by more effective floodplain management, both on a watershed basis and through protection of natural floodplain functions, rather than dependence on structural flood control projects. National policy continues to encourage states to assume the primary role for floodplain management. However, the federal government is involved in floodplain management to a certain extent.

1. Federal Floodplain Management Activities

In addition to the role the U.S. Army Corps of Engineers has in planning, construction, and emergency response to flooding, they provide other services to local governments through their Floodplain Management Services and Planning Assistance to States Programs. The Federal Emergency Management Agency provides subsidized flood insurance, and maps of flood depths, through the National Flood Insurance Program and provides technical assistance and grants through the Hazard Mitigation Grant program. In addition to this broad support there are other federal agencies that provide more specialized support.



a. U.S. Army Corps of Engineer's Role

The Corps has two programs that provide assistance to State and local governments. These programs are specifically identified as Floodplain Management Services and Planning Assistance to States and are closely coordinated with DWR.

Floodplain Management Services Program. The Corps' Division and District offices provide General Technical Services, General Planning Guidance, and Guides, Pamphlets, and Supporting Studies. Upon request, the program provides the following services—without charge—to State, regional, and local governments, and to other nonfederal public agencies:

- *General Technical Services* – develops or interprets site-specific data on obstructions to floodflows; flood routing and timing; flood depths or stages; floodwater velocities; and the extent, duration, and frequency of flooding. Information on natural and cultural floodplain resources and flood loss potentials before and after the use of floodplain management measures can also be provided.
- *General Planning Guidance* – provides assistance and guidance in the form of “Special Studies” on all aspects of floodplain management planning including the possible impacts of off-floodplain land use changes on the physical, socio-economic, and environmental conditions of the floodplain. This can range from helping the State or a community identify present or future floodplain areas and related problems, to a broad assessment of which of the various remedial measures may be effectively used. Guidance and assistance for conducting workshops and seminars on nonstructural floodplain management measures, such as floodproofing, can also be provided.
- *Guides, Pamphlets, and Supporting Studies* – guides and pamphlets are prepared on floodproofing techniques, floodplain regulations, floodplain occupancy, natural floodplain resources, and other related aspects of floodplain management. Supporting Studies are conducted to improve the methods and procedures for mitigating flood damages.

Planning Assistance to States Program. The Corps' Division and District offices provide assistance to states and local governments in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. This program is funded annually by Congress and any study conducted must be cost-shared on a 50 percent federal – 50 percent nonfederal basis.

The program can encompass studies dealing with water resources issues such as: water supply and demand, water quality, environmental conservation/restoration, wetland evaluations, dam safety/failure, flood damage reduction, floodplain management, coastal zone management/protection, flood warning/evacuation, etc. These studies are only at a planning level, and do not include design for project

Opposite Page:

Top to bottom: a flooded residential area along the Feather River near Arboga; flooding from the Feather River in Yuba County

construction. Most of these studies become the basis for State and local planning decisions.

The planning assistance needs are determined by the State and a list of proposed studies are provided to the Corps each year. The Corps accommodates as many studies as possible within their funding allotment. In 1997, DWR identified 14 community studies and 3 area-wide studies to be undertaken by the Corps. (See Appendix D for a complete list.) The Corps estimates \$575,000 will be needed for the California Small Community Flood Assessment studies started in March 1997 and scheduled to be completed by October 1997.

b. FEMA Role

National Flood Insurance Program (NFIP). The NFIP has two main components. One is Floodplain Management assistance, and the other is Flood Insurance assistance. The purpose of flood insurance is to enable persons and State and local governments to purchase insurance against losses from physical damage or the loss of buildings and their contents caused by floods, or flood related mud-slides, or erosion. Insurance is provided at a reasonable rate, backed by the federal Government, to communities that are participating in the NFIP, and is administered by the Federal Insurance Administration (FIA) under FEMA. As part of the National Flood Insurance Program, FEMA provides Flood Insurance Rate Maps (FIRMs). These maps provide information on the depth of flooding during a 100-year event. While in many cases the maps are outdated, there are numerous instances where a floodplain has never been mapped at all. When this occurs, the local agency assumes that there is no flood danger and the homeowner is not required to buy flood insurance. This can result in tragedy if a flood event does occur. *The FEAT urges Congress to increase funding for FEMA's Region IX for its National Flood Insurance Program. These funds would be used to prepare and update Flood Insurance Rate Maps.* Many communities and counties are using maps that have not been updated in 10-15 years. Development has occurred in many areas where no detailed floodplain data is available.

Opposite Page:

In the San Joaquin Valley, one resident benefited from a hastily constructed dike while another was not able to fend off the floodwater.



The purpose of floodplain management is to reduce potential flood losses and the costs of disaster assistance and flood insurance claims payments by providing technical assistance and advisory services to communities and States in developing and administering floodplain management programs as part of their participation in the NFIP. Assistance includes solving nonstructural floodplain management problems; improving and administering community floodplain management ordinances; interpretation of technical information; and related planning assistance and guidance on the use of floodplains. This part of the NFIP is administered both by FEMA and DWR under a partnership contract.

Hazard Mitigation Grant Program (HMGP). FEMA provides technical assistance and grants for hazard mitigation projects and activities under the HMGP. Hazard mitigation involves the identification and implementation of measures to reduce the severity of disasters. The HMGP provides funding for mitigation measures which substantially reduce the risk of future damage. The HMGP can fund up to 75 percent of the cost of FEMA-approved projects. The measures funded must be cost-effective and environmentally compatible, and should be identified among the hazard mitigation categories contained in the *State Hazard Mitigation Plan*. Total federal funds available for the HMGP are limited to 15 percent of the federal share of grant assistance provided through the Stafford Act (less administrative costs) for a Presidentially declared disaster. OES serves as the grantee for the HMGP with overall financial and program responsibilities. Grant applicants are limited to State agencies, local units of government, and eligible private nonprofit organizations.

The State also has specific policies on nonstructural measures and these are included in the State Flood Hazard Mitigation Plan. The plan directs the State to emphasize nonstructural hazard mitigation when feasible. For example, the plan recommends enactment of codes and standards requiring structures to be raised above the 100-year flood level rather than allowing construction of new diversion channels or levees.

The primary purpose of this plan is to provide the basis for funding priorities for the Hazard Mitigation Grant Program, with the overriding goal of eliminating or reducing the long-term risk to human life and property from disasters. See Chapter VII Section A for a discussion of nonstructural planning coordination and the section about HMGP.

c. Other Federal Agencies' Role

Other federal agencies have programs which are related to floodplain management activities. Most prominent are the U.S. Geological Survey (USGS), the Natural Resources Conservation Service (NRCS), the National Park Service (NPS), and the Environmental Protection Agency (EPA).

The USGS, in cooperation with the Department of Water Resources, has responsibility to collect surface water data, which becomes the essential database

used to develop the hydrology required for defining the floodplain, and which is then depicted on the Flood Insurance Rate Maps (FIRMs). The USGS is also doing detailed studies for FEMA to define the "100-year" and "500-year" floodplains for the FIRMs.

The NRCS is involved in watershed planning, and has programs which can provide assistance to local governments and the State in constructing flood relief facilities. The NPS also gets involved in using the watershed approach to facilitate solutions to reducing flood damage.

The EPA will teach groups how to build consensus and use a team approach to Multi-Objective-Management. EPA will work with State and local governments to provide advice and training in water supply planning. EPA has a limited regulatory function in floodplain management due to its role relating to water quality and storm runoff.

2. Review of Nonstructural Alternatives

The devastating impacts to the levee system due to the January floods, the anticipated high cost of repairs, and concern that engineered structures may not be the most effective long-term approach to flood management led to a number of efforts to investigate the use of nonstructural alternatives. These included the formation of an ad hoc committee to review a range of alternatives in the San Joaquin Valley as the flood event was still underway—with an emphasis on nonstructural measures. In mid-February, a formal Interagency Levee Task Force was created and chaired by the Corps. Members invited to participate and identify funding sources included the Corps, the Department of the Interior, Department of Commerce, the Federal Emergency Management Agency, Department of Agriculture, EPA, HUD, Department of Transportation, Small Business Administration, DWR, The Resources Agency and CALFED.

The importance of these committees to review nonstructural options was in part defined by the high estimated cost to repair parts of the San Joaquin River levee system, including the need for extensive improvements to levee foundations. The repair and upgrading of 85 miles of levee system from the Merced River to the Delta was estimated to cost several hundred million dollars. While the cost of a nonstructural solution is more expensive than a one-time levee repair, such an approach provides future savings from avoiding repetitive levee repair and increased transitory storage in the system.

a. Interagency Levee Task Force

The objective of the Interagency Levee Task Force is to assist in the rapid and effective recovery of the damaged California flood control system before the next flood season in a way that will minimize risk to life and property while ensuring a cost-effective approach to flood damage mitigation and floodplain management, and the protection of important environmental and natural values.

An important policy which directly relates to the role of the Interagency Levee Task Force is the PL 84-99 Nonstructural Alternatives Project, (NSAP), whereby the Chief of Engineers is authorized, when requested by a nonfederal sponsor, to implement nonstructural alternatives. The option of implementing a NSAP in lieu of a structural repair or restoration is available only to nonfederal sponsors meeting certain conditions and only upon the request of the nonfederal sponsors.

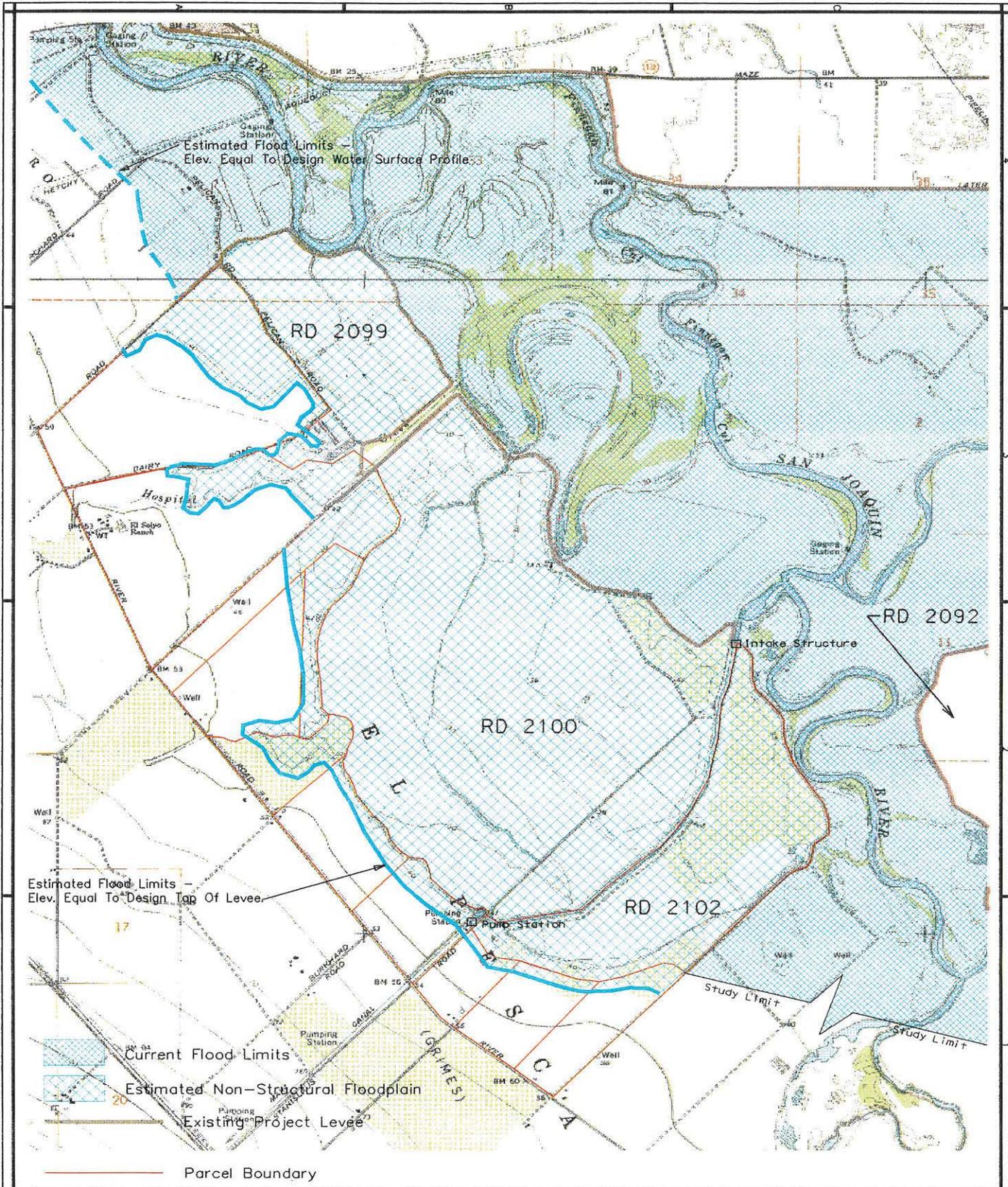
On February 18, 1997, the federal Office of Management and Budget and the Council on Environment Quality released a guidance memorandum entitled "Floodplain Management and Procedures for Evaluation and Review of Levee and Associated Restoration Projects." Part of this guidance required Task Force identification of potential nonstructural alternatives. The Corps project reports for proposed levee repairs are being routed to task force members for review to ensure that any appropriate nonstructural alternatives are identified.

The agency participants on the ad hoc committee generated alternatives and recommendations to correct the flood problems of the San Joaquin Valley. In many cases it became apparent that a combination of structural and nonstructural measures would have to be considered for a meaningful planning effort. In certain cases, setback levees and elevated highways were necessary.

Various landowners in the San Joaquin Valley indicated a willingness to participate in nonstructural alternatives specifically with respect to the sale of their property for flood purposes. This circumstance precipitated particularly prompt attention to nonstructural alternatives in the San Joaquin basin.

Accordingly, the ad hoc group decided to focus on formulating alternatives for the San Joaquin River basin from the Merced River to Interstate 5 (Paradise Cut). These two reaches had several levee breaks along the San Joaquin River from the January 1997 storm. The FEMA 100-year floodplain for this reach is about 88 square miles, and the 1997 flooded area on February 5 was similar, not including the Stewart Tract. The evaluation included limited hydraulic modeling. The group understood that action on this study reach could not be considered separately from the Sacramento-San Joaquin Delta and further consideration was necessary, including review of proposals being formulated by other groups.

Figure VI-1. Nonstructural Alternative RD 2099, RD 2100, RD 2102



Sheet
17
of
20

NON-STRUCTURAL ALTERNATIVE
RD 2099, RD2100, RD 2102
PLAN -
NON-STRUCTURAL FLOODPLAIN

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

Designed by: [blank]
Date: 4/22/97
Reviewed by: [blank]
Date: [blank]
Submitted by: [blank]
Date: [blank]

Revised	Description	Date	Approved	Checked	Date	Approved



To develop alternatives, various elements were considered that included: (1) increasing the river system's flood-carrying capacity with less reliance on levees; (2) promoting floodplain management measures to reduce future losses; (3) identifying flood bypass opportunities; (4) identifying fish and wildlife habitat restoration opportunities, including the identification of baseline conditions and habitat values for future enhancement or mitigation credit; (5) comparing cost estimates for repairs to the existing flood system versus new nonstructural/structural alternatives; (6) evaluating new levee alignments with consideration of topographic and geologic conditions to reduce levee geometry and increase foundation strength; (7) considering recreation opportunities, including proposals identified by the San Joaquin River Management Study and CALFED planning; and (8) considering a phased approach for implementation that may require a hold harmless (or assurances by the Corps to keep parties whole) provision as an intermediate step.

Three alternatives were formulated that focused on nonstructural measures; however, there were certain considerations of structural activity, such as levee setbacks.

Alternative 1: Acquire flood-prone land in Stanislaus County. This project involves land acquisition of 3,000 acres adjoining the federal refuge and San Joaquin River. The landowners have indicated a willingness to initiate a land acquisition process. These areas were flooded because of numerous levee breaks. This plan would effectively eliminate three reclamation districts—RD 2099, RD 2100, and RD 2102—resulting in deauthorization of approximately 5 miles of project levees. The land is located just south of Highway 132. This alternative is considered to be a pilot project or a first step in advancing a nonstructural action. The estimated cost is \$15 million.

This alternative required special consideration of adjoining landowners that may be impacted. If no other hydraulic improvements were implemented to reduce peak design water elevation, then secondary levees would be required. The cost of these secondary levees would be approximately \$3 million and would require the involvement of the State Reclamation Board. If these levees were not constructed, it may be possible to protect the interest of the adjoining landowners by in-fee purchases or the purchase of flowage easements. If this alternative were implemented with any other alternative, then water level reductions and topographic conditions may remove the adjoining properties from any new flood threat. The estimated flood limit shown Figure VI-1 represents the flood level equivalent to that confined by the existing top of levee.

Another aspect related to this alternative is the use of a phased implementation process. If the time required to advance a valley-wide plan puts landowners at risk (i.e., PL 84-99 work is put on hold), then the federal government must provide compensation for damages that may occur during the

period of implementation. This project is supported by FEAT—See Chapter VII, Section A.

Alternative 2: Land Acquisition. This project involves land acquisition for a 100-year floodplain with riparian benefits, and benefits to lowering floodflow elevations. Costs include improvement to the Highway 132 bridge. The acquisition would approximately include FEMA's 100-year floodplain which is 90 square miles from the Merced River to Paradise Cut. An integrated program of habitat and managed agriculture would be implemented. It was assumed that the design of this program would provide for significant resolution of ESA and HCP issues for the San Joaquin Valley. The estimated cost is \$250 million.

Alternative 3: Setback Levees. This project involves construction of setback levees at locations of good ground foundations reducing land acquisition to approximately 60 square miles. This alternative would also increase riparian habitat for fish and wildlife and would improve flood protection by lowering peak water elevations. Correspondingly, lower levees could be constructed. Improvements to Highway 132 would still be required. The area required within the bypass/setback levees is about 60.5 square miles. The estimated cost is \$250 million.

An ongoing activity discussed by the ad hoc group was the West Bear Creek Floodplain Restoration Project (See Section VII 2.d.). This demonstration project involves deauthorizing a 10-mile section of levee along the San Joaquin River to restore the historic floodplain, wetland and riparian areas on the 4,000-acre West Bear Creek unit of the San Luis National Wildlife Refuge. The project is a joint effort by the USFWS and DWR using a North American Wetlands Conservation Act Grant and San Joaquin River Management Program funding. See Chapter VII, Section A(2c) for more discussion and the FEAT recommendations.

C. Statewide Floodplain Management Activities

For California, effective floodplain management will require cooperation among all levels of government and the public to share in the responsibility of managing flood risk. Clearly, agencies at the federal level need to strengthen their programs with adequate funding in those areas where the federal government continues to have a role. However, the State must formulate a consistent floodplain policy which provides adequate protection from unchecked development in floodplains, but which also respects private property rights and local land use control. There are existing regulatory mechanisms to accomplish much; however, these mechanisms are not structured in any manner which provides a cohesive policy. Accordingly, given the many different interests that will be affected by floodplain management, and given the complexity of the matrix of decisions and options for regulation that exist, *the FEAT recommends that the Governor appoint a Floodplain Management Task Force with broad membership from sectors of govern-*

ment and the affected community to examine specific issues related to state and local floodplain management and to make recommendations for improved state-wide floodplain management policies by March 1, 1998.

As part of its examination, the FEAT recommends that the Task Force, in consultation with Reclamation Board staff, review the roles and responsibilities of the Reclamation Board and recommend Legislative changes to be responsive to today's flood management need in the Central Valley.

1. State Agency Floodplain Management

The Governor, through Executive Order, directs State policy with respect to floodplain management. The existing Executive Order is more than 20 years old, and does not reflect changes in federal law, FEMA regulation, and policy. Currently, many State agencies do not follow floodplain management practices. For example, the State often permits mobile homes to be sited near rivers and in harms way should a large flood occur. During the floods of 1997, several mobile home parks could not be evacuated quickly enough to avoid destruction.

The FEAT recommends that the Task Force examine federal and State floodplain management regulations and make recommendations for changes to the State's existing floodplain management procedures and policies that are implemented through Executive Order.

2. State Reclamation Board Floodways

The California Water Code gives the Reclamation Board authority for the designation of floodways in the Central Valley. Since it began in 1970, the Reclamation Board has adopted over 1,300 miles of floodways along all or portions of 54 streams. The purpose of the designated floodway program is to control encroachments and development within the floodways and to preserve the floodways to protect lives and property. The Reclamation Board adopts floodway boundaries and approves uses within the designated floodways that conform to the Board's adopted regulations. These floodways are inspected annually by the Department of Water Resources on behalf of the Reclamation Board. The last designated floodway was adopted in 1988 and there is currently no active program to map and adopt new floodways or update existing floodway maps.

Some uses permitted within designated floodways are: agriculture, canals, low dikes and berms, parks and parkways, golf courses, sand and gravel mining, structures that will not be used for human habitation, and other facilities and activities that will not be significantly damaged by the base flood event and will not cause an adverse hydraulic impact that will raise the water surface in the floodway.

Designated floodways provide an official plan of management that generally provide for the safe passage of floodwaters for a particular flood discharge (generally the 100-year event) for a particular reach of a stream. The maps show the boundaries of the floodplain for the given frequency flood event. The designated

floodway maps are developed by conducting hydrologic studies to determine the discharge associated with the flood event and to determine the geographic boundary of the flooding that would result from the flood event. In some cases, the floodway boundaries were developed based on engineering judgement and the review of historical floods.

The Reclamation Board encourages local communities to participate in the designated floodway program, to incorporate designated floodway maps as part of their zoning ordinances, and to develop sound floodplain management practices. A permit from the Reclamation Board is required for most activities other than normal agricultural practices within the boundaries of designated floodways. The designated floodway program is considered an effective means of "nonstructural" flood management by preventing obstruction of the natural floodway by major structural development. However, with staff adequate to provide only intermittent inspections and follow-up contact with landowners, encroachment into the floodways is occurring.

The FEAT recommends the Task Force review the Reclamation Board's Designated Floodways Program and make recommendations as to how the program should be changed.

In addition, pre-existing mobile home and recreational vehicle parks have been permitted to remain in designated floodways (and project floodways). They are required to evacuate during high water according to a preapproved evacuation plan. Unfortunately, many parks did not evacuate successfully during the January 1997 flood. Under the conditions of their permits, the Board may revoke or revise the permit to ensure successful evacuations.

The FEAT recommends Governor's Office of Emergency Services review the efficiency of mobile home and recreational vehicle park evacuations during the 1997 flood and take actions necessary to improve evacuation procedures for future flood events.

3. Establish State Floodplain Mapping Program

Local community officials need access to more accurate floodplain maps. While the Federal Emergency Management Agency's National Flood Insurance Program (NFIP) does prepare and distribute maps showing the areas subject to certain frequency floods, their program tends to concentrate on publishing floodplain maps for areas already densely populated. In addition, funding for such maps has been inadequate for years, resulting in significant gaps in mapping. These maps quickly become outdated and sometimes are not revised. Maps for rural areas, if they exist, only show an approximate flood boundary. In many cases, local residents who want to build cannot accurately determine how high to elevate their structures to avoid flooding or even whether their properties are subject to flooding.

As California continues to increase in population, more and more development is going to take place in rural areas where either substandard floodplain maps exist or no map exists at all. Counties need information defining floodplains and water depths so they can inform residents of flood hazard potentials and how to ensure their safety.

A separate area of concern is the continuing urban development on alluvial fans. An alluvial fan is a conical or fan-shaped deposit of sediments at the base of a mountain range where the mountain stream flows onto the flatter slope of the valley floor (the apex of the cone or fan points upstream). Behavior of water entering these fans is extremely unpredictable and floodwaters encountering the fan are subject to constant redirection, making urban planning and protection very difficult. FEMA's methodology for mapping and regulating development on alluvial fans in arid and semi-arid regions of the State does not always work well. As part of the State floodplain mapping program, a statewide inventory will be done initially to characterize the nature and flooding risk of the identified fans. This inventory is intended to help prioritize alluvial fan mapping needs, assist communities on land use planning, and improve FEMA's methodology for managing risk and rating flood insurance.

The FEAT recommends the Department of Water Resources significantly upgrade its computer modeling and floodplain mapping capabilities to support the work of the Reclamation Board's floodway program and FEMA's National Flood Insurance Program mapping efforts.

The proposed proactive floodplain management mapping program would support and complement the work of the Task Force, the Reclamation Board, and FEMA/NFIP programs. Mapping priorities include rural areas that are forecast to have a large increase in population from 1995 to the year 2020, areas where maps need to be updated, and floodplains newly identified from recent floods.

The mapping activities would be coordinated with the Corps, federal agencies, counties, and local communities to help ensure that there is no duplication of effort.



4. Revise the Safety Element of State's General Plan Guidelines to Include Floodplain Management on a Watershed Basis

The State's General Plan Guidelines contain mandatory elements which local governments are required to address in their planning efforts and land-use decisions. An earlier recommendation in the Interagency Hazard Mitigation Team (IHMT) Report, issued by FEMA after the 1983 Presidentially declared flood disaster, was to include floodplain management requirements and standards of the NFIP in the Safety element of the State's General Plan. Intermittent efforts have taken place since the 1983 IHMT Report, working with the State Office of Planning and Research to get appropriate material into the General Plan Guidelines. Changes in federal regulations, and format changes to the General Plan Guidelines have contributed to the delay of a successful inclusion.

The FEAT recommends the Task Force develop specific multi-objective watershed planning elements that should be added to the Public Safety Element of the State's General Plan Guidelines to encourage a regional/coordinated approach for land use planning decisions.

5. Establish State Standards for Elevating Structures in Floodplains

The FEAT recommends the Task Force examine the option of requiring future urban developments to exceed the minimum National Flood Insurance Program floodplain management elevation requirements by imposing State standards in statute.

Higher State elevation requirements are needed because FEMA's minimum elevation criteria under its NFIP does not take into account the effects of future development on the 100-year flood elevation. Also, the minimum criteria does not provide any safety factor to accommodate inaccurate floodplain maps or future changes in hydrology.

6. Develop Appropriate Risk Management Program

In urban areas, a need exists for a higher level of levee protection than the minimum 100-year provided under the NFIP, such as 200-year or even 500-year in some areas. The 1997 flood event emphasizes that many levees (even those certified by FEMA or the Corps) did not provide the expected 100-year protection. This was particularly evident when private levees were involved. Many private levees failed due to unstable conditions, such as building the levee over old river bed, poor foundations built to unknown standards at time of construction, and poor maintenance. This allowed subsequent seepage problems and eventual levee breakthroughs. When development takes place in areas which are protected by levees, it must be understood that no levee is 100 percent safe, and not all levees provide 100-year or more protection.

The FEAT recommends that the Task Force examine the option of imposing mandatory flood insurance for structures protected at less than the 200-year level of protection in statute.

Opposite Page:

From top to bottom: The H Street Bridge over the American River in Sacramento is almost submerged as the lower American River reaches its peak flow of 115,000 cfs on January 2, 1997. The north levee was built in the 1950s, consequently narrowing the floodway in that river reach.

7. Provide Technical Assistance to Communities on Evaluating Impacts of Development in Floodways/Floodplains

Communities that develop on floodplain fringes are required under FEMA's NFIP regulations to track the impacts of their developments to the base flood elevation to assure that the allowable increase of 1-foot is not exceeded after full development has occurred. They are also required to evaluate the upstream and downstream impacts of their proposed developments to adjacent communities so as to minimize any effects and not to place them out of compliance with NFIP regulation. Often, communities do not have the technical staff to accomplish these required tasks and one of the purposes of this proactive program is to make DWR technical assistance available.

The FEAT recommends the Department of Water Resources, in cooperation with the Reclamation Board, implement critically needed proactive nonstructural floodplain management strategies and strengthen its outreach to local government and landowners regarding allowable and appropriate land use within the Reclamation Board and FEMA floodways. This recommendation also applies to actions discussed in numbers 8, 9, and 10 below.

8. Continue Training Workshops for Local Officials

The need to train local floodplain management staff continues due to staff turnover in the 500 plus communities with regulated floodplains. Some community officials continue to allow unwise developments in floodplains and areas protected by levees. DWR presents a one-day basic floodplain management workshop which is very effective. Workshop evaluations from attendees have indicated the need for additional educational modules which concentrate on specific topics or audiences, such as substantial damage/improvement, approximated floodplains (A zones), multi-objective floodplain management on a watershed basis, and floodplain construction requirements for building officials and developers.

9. Assist Communities in Preparing Floodplain Management/Flood Hazard Mitigation Plans

Local communities are required to prepare flood hazard mitigation plans as a requisite for grants under the Hazard Mitigation Grant Program (HMGP). This requirement was initiated in 1980, and funding became available in the mid-1980s. A community HM Plan can become detailed and comprehensive, and the community may need some assistance from the State. That assistance is available from the Department of Water Resources, and from the State Office of Emergency Services.

10. Expand Public Outreach Program

The need to inform the public about the risks of purchasing homes in floodplains and in areas protected by levees was evident during this year's floods. Frequently, residents in communities subject to flooding are unaware of the risk. Each year, DWR's floodplain management staff displays a physical floodplain mod-

el at the California State Fair and also loans the model out for community fairs and other events. The response from the public has shown that such outreach activities are very effective. In addition, the Executive Summary of the California State Flood Hazard Mitigation Plan, prepared by OES, states, "Ensure that citizens receive information on storm-related hazards affecting their community, and the practices necessary to diminish their vulnerability through public education."

In addition, the FEAT recommends the Task Force develop proactive nonstructural floodplain management strategies which can be implemented cooperatively with local government and landowners to reduce future flood loss and curtail the spiraling cost of State and federal disaster assistance.

D. Local Floodplain Management Issues

Local governments traditionally make their own land use decisions and therefore have the direct responsibility for floodplain management. Ideally such decisions reflect a balance between the need for economic development against the safety risk to the public. Unfortunately, in the case of development in flood-prone areas, the ideal balance does not always occur. In many cases this is because communities make land use decisions based on the FIRM, not realizing that the FIRM may not be accurate as they are based on cursory mapping studies that were based on limited data and stream gaging records, and do not take into account changes in hydrology.

The FEAT recommends that the Task Force evaluate land use policies applicable to urban development in deep floodplains (generally defined as having flood depths greater than three feet) and other high flood risk areas and make recommendations as to methods of regulation, such as requiring notice on title—if the parcel is in a deep floodplain, to ensure that prospective buyers are noticed of potential hazards.

The State can provide guidance for local communities to assist them in making prudent floodplain management decisions through the general plan guidelines as recommended earlier. Those communities that do follow the guidelines for floodplain management may, in the short-term, be penalized economically. However, the cost of prudent management will be dwarfed in the long run by the cost of reconstruction after catastrophic events like the January 1997 flood.

The FEAT recommends that the Task Force examine the advisability of requesting the Legislature to amend the State's programs for State participation in federal flood control projects to provide funding only for those communities that adopt and implement local floodplain management, as an incentive.

E. State Support of Local Flood Control

Most of the State's major urban areas are receiving protection from State and federally financed flood control projects. In California, local government or the Reclamation Board serves as the nonfederal sponsor for these projects.

The Flood Control Subventions Program provides State financial assistance to local agencies cooperating as nonfederal sponsors in the construction of federal flood control projects. There are three types of federal flood control projects: (1) major Corps projects; (2) small Corps projects; and (3) Natural Resources Conservation Service watershed protection projects.

All types of flood control projects are federally authorized on the basis of a report prepared by the federal agency. The reports include an Environmental Impact Report/Environmental Impact Statement and are extensively reviewed prior to authorization. Major Corps projects are specifically authorized by Congress. This is generally done in a federal Water Resources Development Act. Small Corps projects are authorized by the U.S. Army Chief of Engineers. Watershed protection projects are authorized by the Administrator of the NRCS after the reports are reviewed by the Agriculture Committees of Congress. The definition of project size is based on cost.

Local flood control agencies have authority to participate in the projects under their enabling acts. They do not require a State authorization to enter into an agreement with a federal agency. If, however, they wish to receive State financial assistance, they must arrange for State authorization of the project.

Major Corps projects must be specifically authorized by the State Legislature. Small Corps projects and watershed protection projects are authorized by DWR. Once a project has State authorization, the local agency may file claims with DWR for reimbursement of the State share of the nonfederal costs of a project. DWR performs an engineering review of all claims to determine whether they include only eligible costs. State payments are subject to the availability of funds. After all claims are paid, they are audited by the State Controller's Office.

This process provides no incentive to local governments to proactively manage flooding through prudent land use decision. Under the current statutes, local communities bear little or none of the costs of their land use decisions that result in the need for floodworks. Accordingly the FEAT recommends this Task Force review the existing program and make recommendations as to whether it should be restructured to provide an incentive to local government for floodplain management.

As stated in Section D above, the FEAT recommends that the Task Force examine the advisability of using the flood control subventions program as an incentive by providing funding only for those communities that adopt and implement local floodplain management.

F. Other Proactive Actions for Floodplain Management

Chapter VII, Flood Control System Improvements, suggests several nonstructural actions that can be implemented to help minimize or mitigate future flood damages in some areas of the San Joaquin Valley. In addition, there has been considerable work done to identify nonstructural measures for restoring the Lower Tuolumne River floodplain just below Don Pedro Reservoir. This program has been proposed by the Tuolumne River Stakeholders Group and the Tuolumne River Technical Advisory Committee to restore the floodplain and habitat on a 5-mile reach of the Tuolumne River that was severely damaged during the January 1997 flooding. Levees were breached and surrounding land and gravel operations were engulfed by what has become a new channel for the Tuolumne River. (See FEAT recommendation, Chapter VII, Section B(2a).)



VII. Flood Control System Improvements

The Reclamation Board is the State sponsor for most federal flood control projects in the Central Valley. The Reclamation Board, with technical staff support provided by DWR, works closely with the U.S. Army Corps of Engineers to plan, design and construct flood control projects and improvements to existing projects. In addition, since 1969, the Reclamation Board has been promoting nonstructural flood management through its designated floodway program.

A. Planning Activities

In planning for flood control system improvements, the Corps, the Reclamation Board, and the local flood control entities jointly identify or respond to problems and opportunities to improve flood management. The planning process consists of several steps which lead to a recommendation to implement a plan.

Usually, the planning activities are divided into two phases. The first phase is the reconnaissance phase, which is fully funded by the federal government. The second phase is the feasibility phase, which is funded by the federal, State, and local interests. The following sections describe the current flood control planning activities in the Sacramento River and San Joaquin River watersheds.

1. Sacramento River Watershed

a. Yuba River Basin Feasibility Study

Frequent floods have devastated the Yuba River basin, claiming lives and damaging property along the Yuba and Feather rivers. To prevent further loss of life and reduce property damage from floods, the Corps initiated a feasibility study of the basin in 1991.

The purpose of the study was to (1) evaluate the need for additional flood protection in the Yuba River basin, (2) identify alternatives to increase the level of flood protection, and (3) identify the federal interest based on cost, benefits, environmental effects, and local interest and support. Preliminary results indicate that strengthening levees along the two rivers would provide a higher level of flood protection, and is probably the most economically feasible alternative.

The feasibility study will be finished in April of 1998, and the most desirable alternative will be considered by Congress for federal authorization in the Water Resources Development Act of 1998.

The FEAT recommends the Legislature fund the Reclamation Board to support the U.S. Army Corps of Engineers in a flood control feasibility study of the Yuba River Basin. A higher level of flood protection is needed for the urban areas of Linda/Olivehurst/Arboga. Completion (scheduled for April 1998) of this study is the first step needed to obtain federal project authorization to increase flood protection. This project will require the same amount of funding in FY 1998-99.

Opposite Page

Moulton Weir is one of several diversion structures on the Sacramento River Flood Control Project that channels Sacramento River overflows into the bypass system. Other opportunities for bypass systems in the Central Valley should be explored as a means of flood control.

b. Middle Creek Ecosystem Restoration Project

The Middle Creek flood control project was constructed by the Corps in 1966. Due to soft foundation soils, the levees have subsided, leaving some of the protected lands and homes with less than a 50-year level of flood protection.

The project identified by the Corps' March 1997 reconnaissance study entitled *Report for Middle Creek, California, Ecosystem Restoration* would restore the floodplain of Middle Creek into the historic Robinson Lake wetland area. This would be accomplished by relocating existing homes out of the floodplain and breaching the existing levee system to create inlets that divert flows into the historic floodplain. The project would maintain some existing levees; restore almost 800 acres of open water, marsh and riparian habitat; enhance upland habitat; and acquire 841 acres of land and easements.

The Reclamation Board and Lake County expressed support and intend to sponsor the project. The Middle Creek Ecosystem Restoration includes section alternatives that vary in extent of restoration. The alternatives include restoration from a maximum of 1,218 acres to a minimum of 633 acres. These alternatives also designate acreage for agriculture, residential, and other uses. The Corps has proposed implementation of this project.

Alternative 4 in the Corps' 1997 report is favored by both the Corps and the local sponsor. This alternative includes 914 acres to be restored as habitat and 1,040 acres that would remain designated for agriculture, residential, and other uses. The least favored alternative is "No Action," because the Middle Creek flood control levees require ongoing repair and maintenance, especially on levees subject to slumpage, settlement, or overtopping.

The Corps could proceed to construction of the recommended alternative under Section 1135 of PL 99-662, or proceed with a feasibility study. The PL 99-662, Section 1135, has a maximum of \$5 million funding limit and any cost above that would have to be funded by the local sponsor. If the "1135" approach is not implemented, the Corps would proceed with a feasibility study for a project and would need to seek federal authorization upon completion of the study. It is premature for FEAT to make a specific recommendation on this project. This project is not currently authorized by the State and any level of State funding has yet to be determined.

2. San Joaquin River Watershed

a. Tuolumne River Reconnaissance Study

In January 1997 the Tuolumne River flow peaked at over 120,000 cfs which was the largest flood since 1862. While flood releases from Don Pedro Dam peaked at less than half the peak inflow, nearly 60,000 cfs, it was more than 6 times the downstream channel design capacity of 9,000 cfs. The flood caused extensive damages in low-lying developed areas.

The FEAT recommends Congress fund the U.S. Army Corps of Engineers to initiate a reconnaissance study to investigate the following potential long-term solutions to flooding problems along the Tuolumne River and Dry Creek.

- Increasing authorization to maintain flows up to 20,000 cfs in the Tuolumne River at the Ninth Street Bridge in Modesto.
- Restricting development into the floodplain.
- Constructing an impound structure on unregulated Dry Creek.
- Developing additional off-stream flood storage, integrated with water supply storage.
- Constructing levees to protect the Modesto Waste Water Treatment Plant, the airport, and La Loma Carpenter Road and Hatch Road Districts.

b. Acquire Flood Prone Land in Stanislaus County

This planning activity is discussed in more detail in Chapter VI, Section A.

The U.S. Fish and Wildlife Service has proposed purchasing land and flood easements, and modifying existing flood control levees to allow periodic flooding of specific units of the San Joaquin National Wildlife Refuge near Modesto. The proposal would not only restore flood prone lands to the river as floodplains, but would provide downstream flood protection by providing temporary storage of peak flows. This area experienced significant flooding during the high flows of 1997.

Currently, the federal government owns about 2,000 acres, approximately one-fifth of the refuge's proposed total acreage. The Corps is doing hydrologic studies on the restoration of the river's floodplain that include breaching levees in the refuge area and establishing setback levees in nearby areas with flood easements. The land would be included in the USFWS National Wildlife Refuge System. The Reclamation Board would need to act to deauthorize the project features. The property purchase, from willing sellers, would also result in long-term cost savings by eliminating federal disaster assistance to private landowners. *The FEAT recommends support of the Fish and Wildlife Service efforts to acquire these lands, in a manner which supports and advances the CALFED ecosystem restoration goals, and in cooperation with the California Department of Transportation to assure protec-*

Interagency Levee Task Force (discussed in Chapter VI, Section B) was also reviewed for consistency with the San Joaquin River Management Program, CALFED, the Central Valley Improvement Act, and State Office of Emergency Services. In general, nonstructural planning will require a higher level of participation by affected interests with the State. Despite the obvious benefits to flood control and to the environment, there are other less obvious effects. Of particular importance is potential loss of prime agricultural land and its effects on the agricultural economy and the State's economy. These effects must be considered as part of any analysis of a nonstructural alternative.

a. San Joaquin River Management Program

The consensus building undertaken by the San Joaquin River Management Program over the past seven years has resulted in a package of projects that are consistent with the nonstructural emphasis being applied in the San Joaquin Basin.

The San Joaquin River Management Program was established in 1989 to develop consensus-based solutions to water-use problems within the San Joaquin River system and to stem deterioration of the system. The San Joaquin River system has significant social, environmental, and economic value to the people of California and provides flood protection; agricultural, municipal, and industrial uses; hydroelectric power; fish and wildlife values; recreation; and navigation.

The San Joaquin River Management Plan, completed in February 1995, was prepared by an advisory council and action team consisting of people representing a wide range of federal, State and local agencies and private interests concerned with protecting the health of the San Joaquin River system. The plan identified and refined specific projects, studies, and acquisitions to help restore the San Joaquin River to a healthy state. Potential benefits, conflicts, and resolutions, estimated costs and possible funding sources, required legislation, and environmental documentation have been identified for each of the proposed action items.

The San Joaquin River Management Program Advisory Council has concluded that implementation of one or more of the identified action items will improve current conditions in the San Joaquin River basin. The Council strongly recommends the implementation of as many action items as feasible in the foreseeable future to stop the degradation that is occurring in many reaches of the system.

Coordination with agencies that have legislative mandates to implement improvements in the system is paramount to success. This will ultimately avoid duplication of effort and will provide the greatest efficiency for implementation of action items. Working together to implement the measures identified in these programs will most effectively set the stage for restoration of the San Joaquin River basin.

Considerations in determining the feasibility of recommended actions included: the degree of consensus, the amount of information available, the signifi-

cance of potential benefits, the ability to minimize conflicts, permits required, urgency, the potential for implementation, and costs and available funding.

All of the recommended flood protection projects included in the Plan are nonstructural and are consistent with Nonstructural Planning Alternatives. These projects are at various stages of development from conceptual to ready for implementation. Projects include:

- Coordination of flood releases among San Joaquin River system reservoirs;
- Correction of main stem levee design deficiencies where the design has proven inadequate for design flow stages;
- Demonstration project for control of in-channel aggradation;
- Development and implementation of a comprehensive restoration program for the riparian corridor, compatible with flood protection goals, along the San Joaquin River and its tributaries;
- Dual-purpose floodway proposal;
- Management of urban runoff;
- Overflow of San Joaquin River flows onto adjacent riparian and wetland areas;
- Removal of exotic vegetation that is encroaching into the floodway;
- Possible revision of Friant Dam (Millerton Lake) release schedule;
- Sale of ongoing sediment aggradations from the river channel along the valley floor; and
- Watershed and watercourse management for sediment control.

As stated earlier, the FEAT recommends the federal government provide assurances to levee maintaining agencies seeking to participate in a nonstructural solution. Such assurances should provide that levee delayed repairs and further damages occurring due to floods—before agreement on the final long-term project—will be done under PL 84-99 at such time a decision is made to fix the levees, rather than pursue the nonstructural alternative.

b. CALFED Ecosystem Restoration Program

The nonstructural concepts reviewed for the San Joaquin River were also evaluated for consistency with the CALFED “Ecosystem Restoration Program Plan.” This plan established the framework and ecological philosophy on ecological functions, processes, habitats, species, and stressors applicable to the study area. CALFED has visions for five classes of ecosystem elements: (1) physical processes; (2) ecosystem functions; (3) habitats; (4) species and species groups; and (5) stressors. Physical processes are the natural forces such as stream flows, gravel and sediment supply, landscape shapes and patterns influenced by water and hydraulic processes. Ecosystem functions are the habitat building aspects of the eco-

system and dictate which species might colonize the habitats. Included in these functions are gravel recruitment, stream temperatures and floodplain processes. These can all be accommodated by the nonstructural concepts for flood control developed for the San Joaquin River.

c. CVPIA and OES General Recommendations for Nonstructural Alternatives

Ongoing investigations corroborated the high level of interest in nonstructural concepts. Gen. Russell Fuhrman, director of the Corps' civil works division, told the House Water Resources and Environment Subcommittee on a recent visit that in many cases, the wisest use may be not to rebuild what was there, but to move developments out of the floodplain or purchase easements as the best way to reduce future damage. In Washington, the Corps' Fuhrman told the subcommittee that in many cases rebuilding levees to their original condition is the wisest choice. But the agency will consider other alternatives, he said, including leaving damaged areas alone. The Sierra Club and representatives of 15 different environmental organizations, presented a statement of principles for floodplain management and restoration that proposed:

- More restrictions on future residential building in flood plains.
- Setting back levees to widen floodways during high flows.
- Elimination of incentives or subsidies for development in dangerous parts of the floodplain.
- Reforming floodplain mapping programs to accurately portray flood risks.
- Relocation of the most threatened communities to safer places.
- Making State and local governments pay a larger share of flood-recovery efforts in floodplains.

The statement also urged an increase in wetland habitats, more prudent use of reservoir space for flood control, and a strengthening of levees that protect structures which cannot easily be relocated.

The nonstructural alternatives identified for the San Joaquin River are judged to complement the Central Valley Project Improvement Act of 1992. Implementation of environmental restoration measures is a major goal of the act, which specifically reauthorizes the CVP to establish fish and wildlife mitigation, protection, and restoration on a par with domestic and irrigation uses of water, and additionally place fish and wildlife enhancement on a par with hydropower generation. The act requires that 800,000 acre-feet annually of project yield be dedicated to general fish and wildlife, and habitat purposes. It establishes a goal of doubling the natural production of anadromous fish in Central Valley rivers and streams (except for part of the San Joaquin River, which is treated separately) by 2002. The act further requires dedication of additional water for Trinity River instream flows, and for wetlands habitat areas in the Sacramento and San Joaquin valleys.

The Office of Emergency Services general recommendations for nonstructural actions are consistent with the State's long-term flood mitigation strategy. Listed below are the nonstructural actions developed cooperatively by the Department of Water Resources and OES as required by FEMA.

- Promote a cause-and-effect approach to streams and watersheds in developing flood hazard mitigation measures.
- Control future development in floodplains and flood-prone areas by promoting the establishment and enforcement of zoning regulations, codes and standards, permitting regulations, and effective planning at the State and local level. This includes development of bluffs, hillsides and in coastal zones.
- Promote the acquisition or elevation of existing properties located in the floodplain which are vulnerable to repetitive damage.
- Where acquisitions, elevations, or other nonstructural measures are not feasible, other flood control measures should be implemented. This includes the improvement or installation of levees, culverts, and channels.
- Ensure that citizens receive information on storm-related hazards affecting their community, and the practices necessary to diminish their vulnerability through public education.
- Assist local governments by endorsing effective regulation and maintenance practices for private flood control facilities.
- Work with local floodplain managers to promote participation in, and ensure compliance with, the National Flood Insurance Program and to update Flood Insurance Rate Maps for their community.
- Work with the Department of Water Resources, regional and local entities to document historic flood patterns across the State's watersheds.
- Ensure OES participation in existing interagency groups (or establish such groups as necessary) to improve the awareness and adequate implementation of effective mitigation actions.
- Create an inventory/data base on flood vulnerability and risk, and the status of floodplain management, and mitigation practices at the State and local level.

Fully implementing and achieving these recommendations will require constant and determined monitoring effort. As indicated within, changes in the emphasis of mitigation for future flood disasters will of necessity be made. However, the focus for OES post-disaster flood mitigation programs is a firm necessity.

4. State Participation in Feasibility Studies

The floods of 1997 focused attention on the need to provide additional flood protection in the Central Valley, particularly in the San Joaquin Valley where

preliminary DWR studies have shown that nonstructural approaches incorporating floodways can produce multiple benefits when melded with river restoration programs such as the San Joaquin River Management Plan and the CALFED ecosystem restoration program.

The FEAT recommends the Legislature provide funding to DWR and CALFED to allow the State to fully participate in feasibility studies of flood damage reduction projects in the Central Valley, working collaboratively within the CALFED structure, to ensure that the full range of structural measures as well as nonstructural measures are considered.

B. Design and Construction Activities

Following completion of the State and federal (Corps) planning process, the sponsors seek authorization and funding to implement the recommended plan. Upon securing authorization, the plans and specifications are prepared to bid the project. All land rights for the construction, operation, and maintenance are acquired in advance of the bidding by the Reclamation Board. Most construction activities are contracted and controlled by the Corps.

The federal government funds 50 to 70 percent of the total project costs and the State cost shares the remaining costs with the local interests. The extent of federal participation is governed by federal laws; State contributions are guided by State law. The following sections describe the current flood control design and construction activities in the Sacramento and San Joaquin river watersheds.

1. Sacramento River Watershed

a. Sacramento River Flood Control System Evaluation

After the 1986 flooding, Congress authorized the U.S. Army Corps of Engineers to evaluate the condition of the Sacramento River Flood Control System. Specifically, the Corps was tasked to determine the extent and nature of the remedial work needed to bring the Sacramento River Flood Control Project up to its design standards.

The Corps completed the evaluation in five phases; each phase represented a different geographical region. The two urban areas, Sacramento and Marysville/Yuba City, received the highest priority. Construction was scheduled in five phases.

Phase I—Sacramento Urban Area Levee Reconstruction Project

Phase II—Marysville/Yuba City Area Levee Reconstruction Project

Phase III—Mid-Valley Area Levee Reconstruction Project

Phase IV—Lower Sacramento Area Levee Reconstruction Project

Phase V—Upper Sacramento Area Levee Reconstruction Project

Critical areas damaged by floods within the project area, that are not eligible under PL 84-99 authority, are expected to be repaired under the appropriate phase of the reconstruction project.

Phase I – Sacramento Urban Area Levee Reconstruction Project. The Sacramento Urban Area Levee Reconstruction Project repaired deficient levees in the Sacramento Area, including repair of a flood wall along the Sacramento River. This phase is essentially complete.

Phase II – Marysville/Yuba City Area Levee Reconstruction Project. The Marysville/Yuba City Levee Reconstruction Project repairs levees along the Feather and Yuba Rivers and their tributaries; Sutter Bypass; the cities of Marysville and Yuba City; and the communities of Linda, Gridley, Live Oak and Olivehurst. The Corps, in cooperation with the Reclamation Board and the local maintaining agencies, and identified a total length of about 22 miles of levees that need repair.

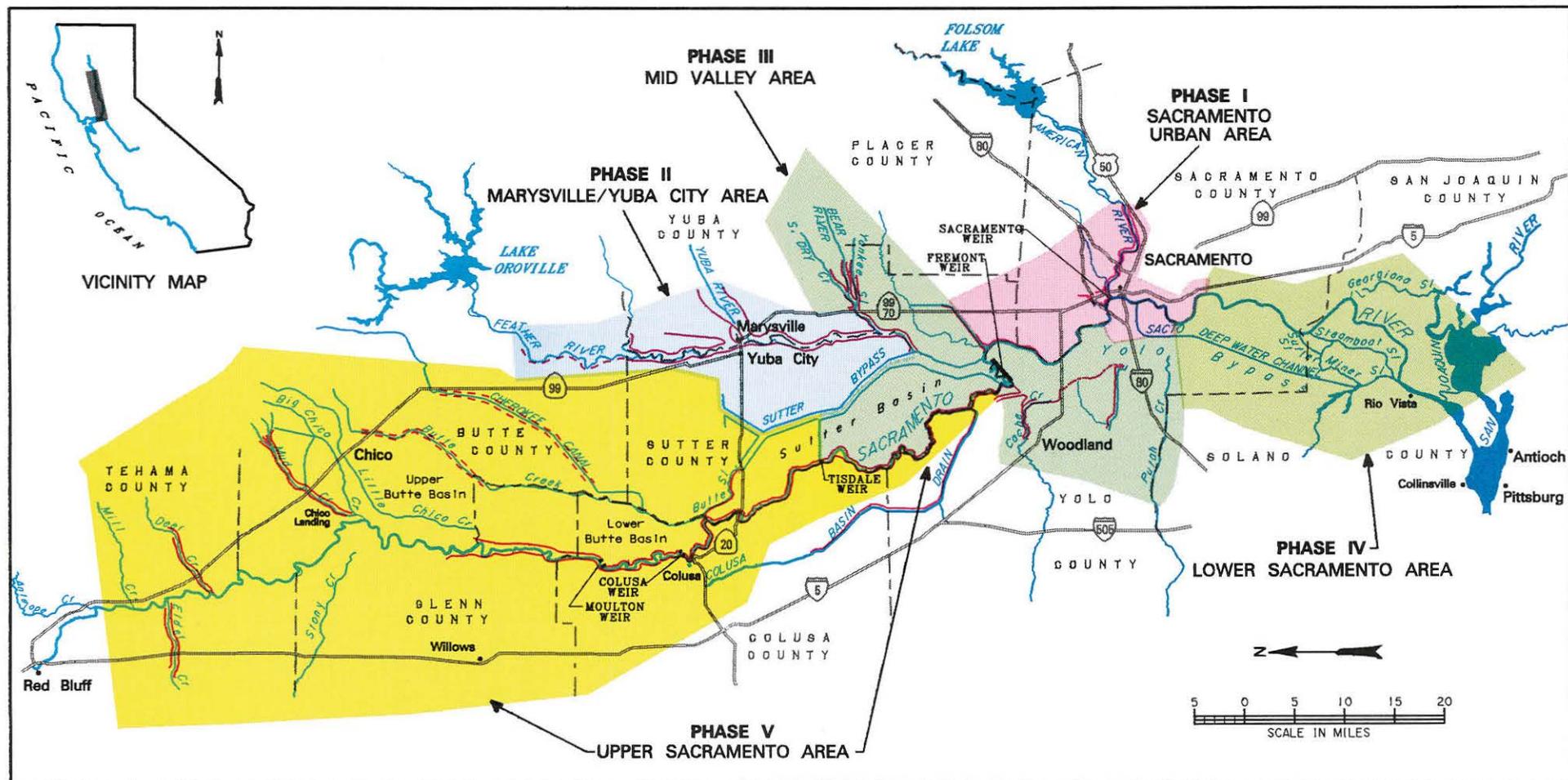
The proposed repair work includes new toe drain facilities and slurry cutoff walls to minimize seepage, restoration of levee height, and backfill of drainage ditches. In addition, a 76-acre mitigation area will be provided.

The first contract, north of Marysville, was finished in 1996; the final two contracts are either under construction or will be awarded this year.

Phase III – Mid-Valley Area Levee Reconstruction. The project will restore Sacramento River Flood Control Project levees north of Sacramento along the Sacramento and Feather rivers and their tributaries to original design standards. The Corps' Design Memorandum was completed in June 1996. About 18.3 miles of levees are susceptible to seepage, subsidence, instability and partial collapse. Reconstruction of these levees around the Robbins, Verona, Knights Landing, and Elkhorn areas is economically justified. The work is divided into four construction contracts.

Contracts 1A and 1B are composed of 6.28 miles of levee reconstruction in Reclamation District 1500, and includes construction of seepage interceptor trench drains, landside ditch relocations, landside seepage/stability berms, and landside toe restoration and landside ditch filling. Contract 1A is scheduled for completion in September 1997, and Contract 1B for November 1998.

SACRAMENTO RIVER FLOOD CONTROL SYSTEM EVALUATION CALIFORNIA



Contract 2 is composed of 1.05 miles of Feather River levees in Reclamation District 1001 and includes construction of landside seepage/stability berms.

Contract 3 is composed of 4.1 miles of levee in the Knights Landing Area and includes construction of landside seepage/stability berms and ditch relocations.

Contract 4 is composed of 6.84 miles of Sacramento River right bank levees and Yolo Bypass west bank levees in Reclamation Districts 1600, 827, 785, and 537, and includes construction of landside seepage/stability berm and ditch relocations.

Contracts 2, 3, and 4 are scheduled for award in May 1998 and scheduled to be completed in September 1998. *The FEAT recommends the Legislature fund the Reclamation Board to accelerate the Mid-Valley Area Levee Reconstruction Project. This will allow the Corps to proceed with damage repairs and improvements on levee sections along the Sacramento River Flood Control Project that do not currently meet federal design standards.*

Phase IV – Lower Sacramento Area Levee Reconstruction Project. The project will restore Sacramento River Flood Control Project levees south of Sacramento along the Sacramento River, its tributaries and distributary sloughs, and the Yolo Bypass to original design standards. The Corps' October 1993 report has identified a total of 43 miles of levees susceptible to seepage, subsidence, instability and partial collapse. Repairs to four of the fourteen identified flood hazard areas are economically justifiable based on the Corps' incremental economic analysis criteria.

The economically feasible work consists of stabilizing and raising levees along Miner, Elk, Steamboat, and Sutter Sloughs. The work includes backfilling ditches along the toe of levees and/or construction of landside seepage/stability berms, or installation of a bentonite-cement slurry wall where right of way is not available for construction of the berm. Construction work is contingent upon execution of cost sharing agreements and funding. *The FEAT recommends the Legislature provide the Reclamation Board funds to support the Corps construction of necessary levee repairs under Phase IV of the Sacramento River Flood Control System Evaluation. This project is continuing work begun and funded in FY 1997-98.*

The remaining work at the other nine flood hazard areas including Hastings Tract, Peters Pocket, Moore Tract, Sherman Island, Twitchell Island, Brannan-Andrus Island, Ryer Island, Tyler Island, and south Lindsey Slough, is not economically feasible under current Corps criteria (as separable elements of the system) and is therefore not proposed for repair by the Corps. However, flooding of these areas due to levee failure or damage may impact Highways 12, 84, 160, and 220. This is a critical issue that must be resolved as the system will not operate as designed if portions of it are left out (see Unresolved Issues).

Phase V – Upper Sacramento Area Levee Reconstruction Project. The project will restore Sacramento River Flood Control Project levees northwest of Sacramento along the Sacramento River and Colusa Basin Drainage Canal to original design standards. The Corps' May 1995 Initial Appraisal Report identified a total of 13 miles of levees susceptible to seepage, subsidence, instability and partial collapse. Repairs to two of the five identified sites are economically justifiable based on the Corps' criteria. Construction work is contingent upon execution of cost sharing agreements and funding.

Work proposed at the two feasible sites along the Sacramento River includes construction of 19,400 linear feet of landside seepage/stability berm or installation of bentonite-cement slurry wall where right of way is not available for construction of the berm. The remaining work at Sites A, B, and C is not economically feasible per Corps criteria and is therefore not proposed for repair by the Corps, (see Unresolved Issues).

Unresolved Issues. The Corps is unwilling to fund work on several sites based on an incremental economic analysis. However, a systemwide benefit analysis clearly supports reconstruction of the levees. In the Lower Sacramento Area phase of the System Evaluation, 10 of the 14 flood hazard areas are not economically justified based on an incremental analysis as separable elements. In the Upper Sacramento Area phase of the System Evaluation two of the three flood hazard areas are not economically justified based on an incremental analysis as separable elements.

Federal interest should be based on a system-wide approach. The project was designed and constructed to function as a total system and it is not possible to separate individual components and still have a fully functioning system. Accordingly, any component of the project should be evaluated in the context of its role within the system.

Congress recognized the relationship between the entire system and its components and in PL 102-377 directed the Corps of Engineers to perform a system-wide economic analysis for restoring project features. The Corps completed a Limited Reevaluation Report for a total system evaluation which indicated that repairs to the system are economically feasible. However, the Corps' implementation of the Congressional directive was only to calculate the benefits but not apply them when determining federal interest for each flood hazard area. The Corps' position is that their policies only allow those areas that are incrementally justified to be recommended for federal interest.

The FEAT recommends federal legislation directing the Corps to repair, based on a systemwide benefit to cost ratio analysis, all project levees and other project features of the Sacramento River Flood Control Project.

b. Sacramento River Bank Protection Project

Erosion presents a serious on-going threat to the Sacramento River Flood Control Project levee system. The Sacramento River Bank Protection Project is a continuing construction project of the U.S. Army Corps of Engineers and the Reclamation Board. The First Phase was authorized in 1960 to preserve the integrity of the levee system of the Sacramento River Flood Control Project's levee system. The levee system protects over 1 million acres, 2 million people, and \$26.3 billion of property.

Project sites are located along the Sacramento River, its tributaries, and distributaries. Construction of the First Phase began in June 1965. The Second Phase of construction was authorized in 1974 and the remaining bank protection sites are located on the American River, Sacramento River, and in the Delta. Congressional authorization is needed for the Third Phase.

The FEAT recommends the State Reclamation Board be provided additional funds for the Sacramento River Bank Protection Project. This ongoing program will increase the Corps' capability to reduce damage to levees. The increased level of funding in FY 1997-98 is also needed in FY 1998-99 to continue support of this program.

In addition, the FEAT recommends Congress provide the Corps authorization to complete environmentally-sound bank protection, in a manner consistent with CALFED ecosystem restoration goals, for eroding banks for the Third Phase of the Sacramento River Bank Protection Project.

c. West Sacramento Levee Improvement Project

After the near disastrous floods in 1986, the Corps determined West Sacramento had approximately a 70-year level of flood protection based on the analysis of current hydrologic data. The Corps recognized that a 70-year level of flood protection is a safety risk based upon the population and the level of development of the area (30,000 people, \$1.2 billion in damageable property).

The project consists of raising 5 miles of levees to a maximum of 5 feet. The project includes minor utility relocations and development of an approximately 60-acre environmental mitigation site. The total approximate cost is \$17 million, with the State's share being \$3 million and the locals' share \$1.25 million.

The FEAT recommends the Reclamation Board continue to support the U.S. Army Corps of Engineers by acting as the nonfederal sponsor for funding additional repairs to the West Sacramento Project caused by flood damage to the Yolo Bypass east levee in West Sacramento and the Sacramento Bypass south levee during the 1997 floods.

d. Butte Basin Plan of Flood Control

The FEAT urges the Corps to formally recognize the importance of the Butte Basin Overflow Area by adopting the overflow and bank protection features into the

Sacramento River Flood Control Project, extending the project limits north to Chico Landing to match the limits of the Sacramento River Bank Protection Project, and approving a plan of flood control for the Butte Basin Overflow Area reach of the river.

e. American River Flood Control Project (Common Elements)

The February 1986 storm demonstrated that Sacramento had inadequate flood protection and prompted local, State, and federal agencies to identify ways of solving the area's flood control problems. In December 1991, the American River Watershed Investigation Feasibility Report and EIS/EIR were completed and identified alternative measures. It also recommended a flood control detention dam near Auburn. In 1992 Congress directed the Corps to do specific follow-up activities regarding their flood control studies.

After completion of the studies in June 1996, the Corps recommended the deferral of a decision regarding long-term solutions and recommended proceeding with the elements common to the final array of candidate plans.

In October 1996, Congress authorized the \$57 million project, and under the Water Resources Development Act authorized construction of the common elements only. The common elements consist of stabilizing 24 miles of existing levees along the lower American River, raising and strengthening about 12 miles of levees along the east side of the Sacramento River, and implementing the telemetered inflow gage system and emergency flood warning system. Construction of the slurry wall in the American River levee system is scheduled to begin in 1998.

This work is the first increment of the comprehensive flood control plan for the city of Sacramento. Unfortunately, the January 1997 floods have shown that reoperation of Folsom Dam and the common elements will provide less than 100-year protection for Sacramento.

The FEAT recommends the Legislature provide funds to the Reclamation Board for the State's share of the American River Flood Control Project. This work will construct levee stabilization measures common to all three alternatives formulated by the Corps for long-term flood control improvements, has been authorized by Congress, and is the first increment of a comprehensive flood control plan for the City of Sacramento.

Inflow into Folsom Lake on the American River during the January 1997 flood was almost equal to that of 1986. As a result of having another large flood event, the statistical analysis for determining return periods for various flood events will lower flood return periods for specific events (the 1986 and 1997 floods are now estimated at 1-in-65 year for 3-day volumes) and will change the expected level of protection from reoperation of Folsom Dam. The reoperation of Folsom Dam is now only expected to improve protection of the Sacramento Metropolitan Area to an estimated 1-in-85 year return period. Now that reoperation of Folsom Dam and

the common elements to reinforce the levees will no longer provide 1-in-100 year protection, FEMA flood insurance issues will not be resolved until a higher level of protection (1-in-100 year or greater) is provided.

The FEAT recommends the Reclamation Board, the Corps, and the Sacramento Area Flood Control Agency should continue working to develop and implement long-term American River flood control improvements providing at least 1 in 200 year protection to the city of Sacramento.

f. Cache Creek Settling Basin

The Cache Creek Settling Basin traps sediment from Cache Creek that would otherwise settle in the Yolo Bypass and restrict its capacity. The CCSB was recently enlarged by the Corps and The Reclamation Board. However, several unforeseen problem areas have developed subsequent to the enlargement which result in damage during each high water event and prevent adequate maintenance of the facility. *The FEAT recommends the Reclamation Board support the U.S. Army Corps of Engineers by acting as the nonfederal sponsor for constructing outlet improvements needed to complete the Cache Creek Settling Basin Enlargement Project. This additional work is necessary to correct conditions affecting drainage for the city of Woodland.*

g. Colusa Bypass Sediment Removal

The Colusa Bypass is an integral part of the Sacramento River Flood Control Project and its proper operation is essential to ensure the design level of flood protection. Above-normal flows during the past several years have increased the sediment deposits in the bypass. currently the flood-carrying capacity of the Colusa Bypass is inadequate. The Department of Water Resources is responsible for maintenance of the Colusa Weir and Bypass and extensive sediment removal is necessary in order to restore its flood carrying capacity and to ensure proper operation of the flood control system. *The FEAT recommends the Legislature provide Department of Water Resources funding to remove sediment build-up within the Colusa Bypass. Sediment deposits have reduced the flow capacity of the bypass and the efficiency of the flood control system by forcing flows to remain in the Sacramento River.*

h. Tisdale Bridge Replacement

The bridge over the Tisdale weir is an important transportation facility for the Department of Water Resources and Sutter County. However, the existing bridge is an outdated single-lane, pier-supported concrete structure which restricted the passage of debris during the January 1997 flood and previous high water events. This restriction can prevent proper relief of flood flows from the Sacramento River and jeopardize the safety of heavy equipment operators who work from the bridge deck to remove the debris. To ensure proper operation of the Sacramento River flood control system, *the FEAT recommends the Legislature provide funds for the*

Department of Water Resources in cooperation with Sutter County and the Department of Transportation to remove and replace the State-owned bridge at Tisdale Weir. This bridge collects debris and impedes flows into the Tisdale Bypass resulting in unnecessarily high Sacramento River flows.

I. Mallott Road Bridge; Goose Lake FRS; Chester Project

The floodflow capacity of the culverts at Mallott Road is less than the design capacity of the West Interceptor Canal. During the 1997 storms, the Mallott Road crossing flooded, forcing a road closure for several days. Also, the pooled water eroded the bank adjacent to the crossing. The Department of Water Resources' Sutter Yard performed emergency repairs to protect the integrity of the canal. *The FEAT recommends the Legislature to direct the Department of Water Resources to construct a concrete bridge at Mallott Road Crossing in Sutter County.*

Diversion of the appropriate amount of floodflows from the Sacramento River into the Butte Basin Overflow Area through the Goose Lake Flood Relief Structure is essential to keep the flow rate at or below the downstream floodflow capacity of the leveed Sacramento River. The 1997 floodflows have degraded the Goose Lake FRS. The Department of Water Resources is responsible for maintenance of the FRS and in order to ensure its proper function and to avoid repeated repairs, a nondegradable weir crest is necessary at this location. *The FEAT recommends the Legislature to direct the Department of Water Resources to improve escape flows at the Goose Lake Flood Relief Structure in Butte County.*

The North Fork Feather River dam near Chester is a flood control structure providing flood protection for the town of Chester. The dam was built in 1976 by the Corps with provisions for fish passage. Fish passage through the dam has been impaired by debris accumulating in the fish ladder during high flows. The January 1997 floods created difficulties in operating the North Fork Feather River diversion dam. The storms created debris removal and fish passage problems and increased flows down the bypass. Fish and Game Code Section 5935 requires that the fish passage be kept open and free of obstruction at all times. In addition, a portion of the project was damaged because funds were not available to complete the necessary work. *The FEAT recommends the Legislature to provide the State match for funding repairs and modifications to the diversion dam and fish ladder on the north fork of the Feather River near Chester in Plumas County.*

J. Other Small Flood Control Projects

The following are smaller tributary projects that cause localized flooding.

Magpie Creek Small Flood Control Project. In recent years, reported flooding in the Magpie Creek Area has become a problem. The Corps, and the city of Sacramento and American River Flood Control District acting as nonfederal sponsors, have released a draft Detailed Project Report and draft Environmental Impact Statement/Environmental Impact Report for the proposed Magpie Creek Small Flood Control Project. The existing Magpie Creek Diversion Channel was constructed in the 1950s as part of the Sacramento River Flood Control Project by the Corps, with the Reclamation Board acting as nonfederal sponsor.

The tentatively recommended plan consists of improving the existing Magpie Creek Diversion Channel to a 50-foot base width trapezoidal channel from Magpie Creek Diversion Channel/Robla Creek confluence to the McClellan AFB boundary. As originally proposed, this project tied into a proposed channel improvement project with McClellan Air Force Base. Due to the current plans for base closure and restructuring of the McClellan AFB, funding limitations prohibit immediate financial participation in the upstream project by the Air Force. Therefore, minor modifications have been made to the project's upstream end to assure it functions as intended. The revised tentatively selected plan is described in a supplement to the Detailed Project Report and environmental documentation prepared by the Corps in January 1997.

Nonfederal funding is needed, prior to Corps project construction, to provide lands, easements, rights-of-way, and relocations. It is anticipated these costs will total more than 50 percent of the total project cost; thus the Corps is expected to refund to the State the amount in excess of 50 percent, now estimated to be \$1.6 million. This project is not currently authorized by the State and any level of State funding has yet to be determined.

American River Flood Control Project-Natomas Features. The Sacramento Area Flood Control Agency constructed the North Area Local Project, which consists primarily of levee improvements and pumping facility improvements. SAFCA funded the north area project with the expectation that the State would eventually fund its cost share under current cost-sharing formulas for State authorized projects. This project was constructed based on the federally authorized Natomas Project Features described in the 1991 American River Watershed Feasibility Report. This project is not currently authorized by the State and any level of State funding has yet to be determined.

2. San Joaquin River Watershed

a. Lower Tuolumne River Floodplain Restoration

As previously discussed in Section IV the January 1997 releases on the Tuolumne River from Don Pedro Dam peaked at nearly 60,000 cfs. Damages on the

upper 5-mile reach, where aggregate extraction is currently taking place, were extensive. Levees separating the channel from mining operations were breached, bridges were damaged, and the stockpiled aggregates and important chinook salmon habitat were lost. An emergency repair and long-term restoration plan has been proposed by the Tuolumne River Stakeholders group and the Tuolumne River Technical Advisory Committee who strongly support restoration of this reach of the Tuolumne River.

Repair of this reach will require reconstruction of the levee system. This proposal is to acquire lands, rights of way, and retire the existing levees and build setback levees to create a floodway and riparian zone with a minimum width of 500 to 600 feet. This width would safely convey floods up to 20,000 cfs.

This is a cooperative effort between gravel operators, water districts, land owners and state and local agencies. Costs for this work are estimated to be \$15 million; the work is proposed to be constructed in two phases, with Phase I of the construction scheduled to begin this summer.

The FEAT recommends CALFED and DFG expedite funding and construction of the Tuolumne River floodway emergency repair and long-term restoration project. The proposal is to restore the floodway width to safely convey floods twice the size of existing channel capacity.

b. Other Projects

There are two major flood control proposals that could be constructed in the near-term if adequate funding is identified. FEAT does not have a specific recommendation for those projects.

Merced County Streams Group. The project is located near the city of Merced, on the streams draining from the Mariposa County foothills of the Sierra Nevada into Merced County. These streams drain into the San Joaquin River between the Chowchilla River on the south and the Merced River on the north. The proposed improvement would increase flood protection to existing residential, public and agricultural developments in and adjacent to the city of Merced and Castle Air Force Base.

The two-phased project was approved for construction by Congress in 1985 (PL 99-88). *Phase I* which included construction of Castle Dam and upstream diversion structures on the Merced Irrigation District Canal was completed in 1994. The dam is a single purpose flood control structure that is part of a larger project for flood control for the city of Merced and adjacent county area. In April 1995, responsibility for operation and maintenance of the project was transferred to Merced County, the local sponsor.

Phase II consists of Haystack Mountain Dam, enlargement of Bear Dam, and channel improvements on Fahrens Creek. Over the years, due to increased costs, the benefit-to-cost ratio for the original Phase II plan has dropped to less than

unity. The Corps is modifying the project based upon current economic and environmental considerations, dropping those features with high mitigation costs or minimal benefits. The reformulated project is feasible and is scheduled for construction in 1999. It is premature for FEAT to have a specific recommendation for this project. This project is not currently authorized by the State and any level of State funding has yet to be determined.

Kaweab Reservoir Enlargement. Terminus Dam and Lake Kaweah, on the Kaweah River, are located in the Tulare Lake Basin, in the southern half of the San Joaquin Valley, east of the city of Visalia. The dam was constructed in 1962 for flood protection and water supply. The project was constructed for 150,000 acre-feet of storage, with 142,000 acre-feet authorized for flood control and 8,000 acre-feet for sedimentation. However, the rate of sediment accumulation has been much greater than anticipated and now the available storage for sediment is only 1,000 acre-feet. The total reservoir now has a capacity of 143,000 acre-feet. The reduced storage has resulted in increased flooding downstream in Visalia, rural areas, and the Tulare Lakebed.

The Corps' feasibility study, completed in 1996, determined that raising the spillway elevation of the dam by approximately 21 feet would increase the level of flood protection downstream from 45 to 70 years and provide greater operational flexibility in the Tulare Lake tributary flood control system. Storage would be increased by 43,000 acre-feet to nearly 186,000 acre-feet. The total project costs are estimated to be \$36 million. The total land required for the project is approximately 1,420 acres, of which 830 acres would be mitigation and 590 acres for flowage easement. This project is scheduled for construction pending identification of funding sources and upon completion of the plan and specifications in 1998. This project is not currently authorized by the State and any level of State funding has yet to be determined.

C. Comprehensive Studies for Flood Control

Flood protection can be developed in many ways. Nonstructural methods basically keep people away from areas subject to floods by floodplain zoning, floodway regulation, floodproofing structures (normally raising them) and warnings in advance of high water. Structural measures include levees, floodway and overflow channels, and temporarily storing floodwaters in reservoirs to confine and direct floodflows away from people and property.

With so many areas subject to the threat of flooding, it is infeasible to provide total flood control protection for all possible storms. Therefore society as a whole has to arrive at a consensus on the level of flood risk it can tolerate with some thought on what evacuation and shelter options to provide in those rare events which exceed the provided local protection levels. The hydrologic record in California is relatively short to precisely define rare flood events. The shift from

predominantly agricultural to increasing urban development in the Central Valley has increased the damage when disastrous floods occur, warranting a higher degree of structural flood protection for already-developed areas.

1. Sacramento River Flood Control Project

One might expect that a comprehensive look at the Sacramento Valley flood control system would have been made periodically—perhaps every 20 or 30 years, but at least after major flood events. The fact is, it has been nearly 90 years since the last (and only) such plan was developed.

The Jackson Report was prepared in 1910 by the California Debris Commission following many decades of debate on how to control the Sacramento River and its tributaries. The fundamental design was based on a composite of the 1907 and 1909 floods in the Sacramento River system, and served as the basis for authorization of the Sacramento River Flood Control Project in 1917. This report is found in the federal Senate Document No. 23 in Congress.

As indicated in the initial FEAT 30-day report, a comprehensive evaluation of flood control systems in the Sacramento Valley is needed. The study should be cost shared between the State, through the Reclamation Board, and the U.S. Army Corps of Engineers and result in a master plan of flood control for the valley. Development of this master plan will be a substantial undertaking that lays the groundwork, at a programmatic level, for follow-on projects and programs to improve flood protection and restore or enhance the environment in the valley.

The concept set forth in the Jackson report was to confine the river in a narrow corridor between levees and provide relief through weirs and bypasses into some of the natural overflow basins when the river gets high. The reason for this narrow corridor approach was to keep the hydraulic mining debris, a major sedimentation and flood problem, entrained in swiftly moving water until it reached the San Francisco Bay. With a few isolated exceptions, the hydraulic mining debris has now been flushed from the system. Along with changes to the physical system, society's values have also changed over the years, highlighting the need to evaluate other configurations for the system including setting back some levees and potentially changing the role of weirs and bypasses. Among the many benefits of replacing the narrow corridor approach would be the ability to eliminate or drastically reduce the need for bank protection of levees.

a. Needs Assessment

The design flow capacity of the Sacramento River Flood Control Project is very large with total design flow into the Delta of 500,000 cfs in the Yolo Bypass (south of Putah Creek), plus 110,000 cfs in the Sacramento River below Sacramento.

Generally, depending on location within the system, the estimated level of flood projection is in the 50 to 100 year return period range. Some smaller por-

tions of the system may have a lower degree of protection. Some cities may have more protection because of wider levees or higher levee freeboard than the standard 3 feet.

In the middle of this century the levee and channel system was augmented by flood control space in foothill multipurpose reservoirs. Maximum federal flood control storage totals nearly 2.8 million acre-feet in 6 reservoirs. (See Table VII-1).

Anticipated urbanization is an issue which is related to a judgment on the degree of flood protection to provide — or whether to pursue more aggressive land use policies in presently undeveloped areas. The population of the Central Valley is expected to more than double during the next 25 years. A continuation of historical trends would place more people at risk.

Structural improvements to the existing levees are being performed under the levee reconstruction projects associated with the Sacramento River Flood Control System Evaluation. However, the authority of the levee reconstruction project is limited to restoring authorized design integrity to existing project levees. Many residents of the Sacramento Valley are relying on project levees which, even after reconstruction, will not provide the high level of protection they need. Further, people rely upon many nonproject and private levees in the valley to protect homes and other infrastructure. These project and nonproject levees need to be evaluated and, where appropriate, flood damage reduction measures (both structural and nonstructural) should be identified and implemented using federal, State, and local funds. *In the case of private levees, the FEAT recommends DWR notify the appropriate local government entity regarding private levees they became aware of which are currently providing flood protection and for which there is no maintaining agency. This will allow residents who receive benefits from such levees to organize as a group and decide whether to take steps to improve the levees to meet Corps standards or to pursue nonstructural alternatives.*

**Table VII-1. Federal Flood Control Storage
Major Central Valley Reservoirs**

Project Name	Stream	Storage (1,000 AF)	Maximum Flood Control Space (1,000 AF)	Owner
Shasta Lake	Sacramento River	4,552	1,300	USBR
Lake Oroville	Feather River	3,538	750	DWR
Black Butte Lake	Stony Creek	144	*137	COE
New Bullards Bar Res.	Yuba River	966	170	YCWA
Indian Valley Res.	Cache Creek	301	40	YCFCWCD
Folsom Lake	American River	977	400	USBR
Camanche Res.	Mokelumne River	417	*200	EBMUD
New Hogan Lake	Calaveras River	317	165	COE
Farmington Dam	Littlejohns Creek	52	52	COE
New Melones Lake	Stanislaus River	2,420	450	USBR
Don Pedro Reservoir	Tuolumne River	2,030	340	TID/MID
New Exchequer Dam (Lake McClure)	Merced River	1,025	*350	Merced ID
Buchanan Dam (Eastman Lake)	Chowchilla River	150	45	COE
Hidden Dam (Hensley Lake)	Fresno River	90	65	COE
Friant Dam (Millerton Lake)	San Joaquin River	521	*170	USBR
Pine Flat Lake	Kings River	1,000	*475	COE
Terminus Dam (Lake Kaweah)	Kaweah River	143	136	COE
Success Lake	Tule River	82	75	COE
Isabella Lake	Kern River	568	*400	COE

Note: * — Maximum flood control space may vary depending on upstream storage and/or snow pack

Project Owners:

USBR: U. S. Bureau of Reclamation
DWR: California Department of Water Resources
COE: U.S. Army Corps of Engineers
YCWA: Yuba County Water Agency

YCFCWCD: Yolo County Flood Control and
Water Conservation District
EBMUD: East Bay Municipal Utility District
TID: Turlock Irrigation District
MID: Modesto Irrigation District

The following paragraphs identify the need for comprehensive watershed studies and potential alternatives that should be investigated to determine options for a comprehensive master plan for flood control in the Central Valley. *The FEAT recommends the Legislature authorize the Reclamation Board to act as the nonfederal sponsor and support the U.S. Army Corps of Engineers, working collaboratively with the CALFED structure, to complete comprehensive watershed management studies in the Sacramento and San Joaquin river basins, ensuring that the full range of structural and nonstructural flood damage reduction measures are considered in developing a new master plan for flood control in the Central Valley. These studies will take four years to complete and require continued funding beyond the current fiscal year.*

The proposed new comprehensive study is likely to find that the existing project lacks the degree of flood protection for which most people expect and are willing to pay. It would also be prudent in a new analysis to assume a rise in sea level of around one foot at the lower end of the Yolo Bypass near Rio Vista to accommodate a potential gradual rise in ocean level over the next 100 years.

The comprehensive study should evaluate conditions as they exist today—and will exist in the future—if no action is taken. A phase 1 report on these “without project” conditions, including hydrology, hydraulics, geomorphology, structural integrity, urban development projections, levels of flood protection, annual flood damages, and ecology should be presented within two years. This report will be the foundation for evaluating all alternatives for improved flood protection, water supply, water quality, and fish and wildlife habitat considered in development of the master plan. In addition, this report should present the results of the plan formulation process by clearly describing various alternative master plans that will be evaluated through the remainder of the comprehensive study.

Much can be learned from analyzing, with hydraulic models, the results from DWR high water surveys of the 1997 and previous large floods. With the recent years of data including the 1997 flood, channel capacity and flood frequencies should be updated. This gives the design flow once a decision has been made on the degree of protection to provide. The process is iterative: initially a design is proposed, then cost estimates are developed and the process is repeated at different levels of protection.

As potentially feasible alternatives are identified through the course of the study, they may be broken out and pursued on their own merits in concert with the comprehensive study. Simultaneous with the phase 1 work, the study needs to develop the hydrologic and hydraulic models necessary to fully evaluate the without project condition and the various alternative plans.

The final product of the comprehensive study should be a programmatic EIS/EIR for a preferred master plan. Specific projects identified in the plan would have follow-on feasibility studies and environmental documents. As mentioned earlier,

some of these specific studies may be broken out earlier and studied concurrently with the development of the master plan. These projects would be constructed after completion of their respective feasibility reports and environmental documents and legislative authorization. Finally, the comprehensive study must be closely coordinated with other ongoing planning efforts in the valley including the *California Water Plan* update (Bulletin 160-98), CALFED, and SB 1086.

b. Alternatives

The Sacramento River flood control project already makes use of extensive floodways and bypasses. Alternatives to handling more flow in this system are complex, but more desirable if they do not raise design flood stage; lower flood stages would reduce the catastrophic effect of potential levee breaks. (The higher the stage above adjoining protected land, the greater catastrophe potential if and when a break does occur.) Potential alternatives are described in the following paragraphs.

Additional Seasonal Reservoir Flood Control Space. Additional reservoir flood space has already been successfully employed as a temporary option by Sacramento urban interests, purchasing up to 270,000 af of winter flood space to improve protection to the areas subject to flood threat from the American River. However, that space comes at a price of reductions in power, water supply, recreation, and fishing at Folsom Lake in some years. As California's population grows and water supply needs increase, this option will have to be carefully considered and balanced among competing interests. (See Table VI-2 for a complete listing of federal flood control storage in major Central Valley reservoirs.)

New Reservoir Storage. New reservoir flood control storage can be on-stream and, to some extent, off-stream. On-stream storage, such as the long-debated multipurpose proposed Auburn Dam on the American River, has a direct flood protection benefit. The primary merit of the off-stream storage option would be to replace water supply lost by increasing existing on-stream reservoir storage space during the winter. However, storing peak floodflows off-stream requires large diversion capabilities that have their own set of problems. Many northern California communities depend on lake recreation during the summer for their local economy. To the extent greater flood control reservations reduce reservoir levels during the prime recreation season, this will be a large drawback to the local economy.

New or Enlarged Flood Bypasses. There may be possibilities of creating new or enlarged flood bypasses on portions of the Sacramento system. Any comprehensive study of the system should investigate such possibilities. However, because the present system of bypasses already takes advantage of most of the pre-existing natural overflow basins along the Sacramento River, enlarging existing bypasses, rather than creating new ones, is more likely to be economically, financially, and politically feasible.

Levee Setbacks. There are probably a number of selected areas along the Sacramento River and tributaries where levee setbacks would be feasible to increase the flow area. These need to be examined in a systematic way. Sometimes reduced levee length (by straightening a curved section) could reduce maintenance costs with a relatively small amount of land sacrificed.

Levee setbacks have other advantages too. They increase the meander zone available for the low-flow channel of the river, reducing the need for bank protection to protect the levees from being undermined by erosion. Through both planting activities and natural processes, this wider meander zone provides opportunities for improving riparian habitat along river corridors. Finally, the setbacks provide opportunity to construct new levees according to modern day standards of design and construction. Many existing levees were constructed more than a hundred years ago, over a period of decades, using poorly compacted dredge fill and little, if any, foundation improvement.

In spite of the advantages of setback levees, they are not a panacea. The primary drawback to setback levees is their prohibitively high cost. The costs include removal of the existing levee, construction of the new levee, purchase of new levee easements, purchase of new flood easements, and relocation of infrastructure. In some areas, setback levees would have to be built higher than the existing levees located on higher ground adjacent to the river channel. Even in the most appropriate locations, productive farmland would be impacted or eliminated by frequent flooding once located between the newly setback levees. Of particular importance is potential impacts to agricultural growers from the perspective of permanent loss of prime agricultural land and its economic contribution. Purchase of agricultural lands must be on a willing seller basis.

Improved Channel Clearing Practices, Maintenance, and Sediment Removal. For federally constructed flood control projects, channel maintenance, including vegetation thinning and clearing and sediment removal, is a nonfederal responsibility. Maintenance of the project channels (including bypasses) of the Sacramento River Flood Control Project is the responsibility of the Department of Water Resources. While some channels require very little maintenance, others require continual clearing and thinning. Environmental restrictions on such activities in recent decades have affected the ability of DWR to perform such maintenance in a cost effective manner. For instance, some project channels are slowly becoming choked with protected plant species which are prohibitively expensive to remove due to the high mitigation cost. Obviously, this can impact the ability of channels to safely convey floodwaters. A comprehensive study of the system needs to evaluate long-term channel capacities, needed vegetation clearing, opportunities for improved vegetation management, and opportunities for increasing vegetation without impacting flood carrying capacity.

The FEAT recommends that once mitigation has been provided for restoring a channel to its design flood-carrying capacity, no further mitigation should be required for work done in the future to maintain the channel to that capacity.

Many channels and bypasses continue to accumulate large sediment deposits. The worst cases, such as Cherokee Canal and the Yuba River, are associated with hydraulic mining debris from the last century. In some cases, the sediment load provides a system benefit by reducing bank and levee erosion. And in some cases, the sediment deposits may be the result of bank erosion in upstream reaches. Many times it is not obvious whether sediment deposits are new material from distant upstream sources or actually just locally rearranged deposits that adjust with each flood event. A primary concern associated with sediment deposits is whether they impact the flood carrying capacity of the stream. Any comprehensive investigation of the flood control system should be based on an up-to-date hydrographic survey of the system's channels. Using this information, a basic understanding of the system's sediment transport characteristics and needs should be developed through geomorphologic studies and modeling. With this basic understanding in place, decision-makers will be in a better position to evaluate all options for system improvement, and to consider many of the long-term ramifications of their decisions.

Other Nonstructural Measures. A comprehensive study of the system should closely evaluate nonstructural alternatives on an equal level with structural approaches. Nonstructural measures encompass a variety of approaches including construction of new structures such as setback levees and ring levees. Some of these nonstructural approaches have already been discussed. Others, such as floodplain zoning, floodway regulation, and flood proofing have made a real difference in the Sacramento system. An ideal nonstructural approach is to identify floodplains and implement zoning and floodway regulation prior to urban encroachment. This is the most cost effective approach to flood management. It also has the advantages of leaving valuable farmland in production and leaving river corridors with their riparian habitat relatively undisturbed. Although this approach has been used in many areas of the Sacramento River and its tributaries, it has been most effective along the upper reaches of the Sacramento River above the project levees. For instance, the Reclamation Board's Designated Floodway Program may well have prevented the flooding of Hamilton City, in both 1995 and 1997, by preserving historic overflow areas through control of levee elevations on the east side of the Sacramento River.

A well-balanced blend of both structural and nonstructural approaches in almost any area will lead to optimal flood protection. However, in general, structural approaches are more feasible for urban areas and nonstructural are more feasible in agricultural areas. See Section VI for a more detailed discussion on nonstructural measures.

Acquisition/Relocation of Structures. Another nonstructural approach to flood management that involves some construction is structure relocation. In areas with few structures and a low level of flood protection it may be the most cost effective alternative for improving flood protection.

As stated earlier in Section C, the FEAT recommends that a full range of structural and nonstructural flood damage reduction measures be considered in the comprehensive water management studies.

2. San Joaquin River Flood Control System

As recommended previously in the Sacramento River basin section, the FEAT recommends a comprehensive watershed management study for the San Joaquin River basin. The following paragraphs outline the needs and alternatives that must be investigated for a comprehensive master plan for Central Valley flood control.

The San Joaquin Basin is located in the central portion of the Central Valley of California. The principal stream in the basin is the San Joaquin River, with its major tributaries: Cosumnes River, Dry Creek, Mokelumne, and Calaveras rivers, Littlejohns Creek; Stanislaus, Tuolumne, and Merced rivers; Bear, Owens, and Mariposa creeks; Chowchilla and Fresno rivers; at times the Kings River overflows; and Los Banos, San Luis, Orestimba, and Marsh creeks. All these streams eventually drain into the Sacramento-San Joaquin Delta, and to a common mouth with the Sacramento River at the upper end of Suisun Bay.

As indicated in the initial 30-day FEAT report, a comprehensive evaluation of flood control systems in the San Joaquin Valley is needed. The study should be cost shared between the Reclamation Board and the U.S. Army Corps of Engineers with substantial coordination with local agencies.

The needs assessment is similar to that of the Sacramento River system. Each river needs to have flood statistics updated (a process that is partly underway by the Corps' Sacramento District with FEMA funds). Again a decision on the desirable level of flood protection would establish design flows. Every effort should be made to develop a solution which does not further raise design flood stages.

A comprehensive study of the San Joaquin River watershed is needed to improve flood protection and environmental resources. Like the study for the Sacramento system, this study needs to have an initial phase which fully describes "without project" conditions and identifies alternative "master plans" for further evaluation. Because the San Joaquin does not have an ongoing System Evaluation like the Sacramento system, the initial phase should also identify the levees common to all potential master plans and authorize reconstruction to meet original design standards. The comprehensive study needs to be closely coordinated with other ongoing related efforts such as the *California Water Plan* update (Bulletin 160-98), CALFED, CVPIA, and the San Joaquin River Management Program.

a. Needs Assessment

Many of the same considerations that apply toward the possible solution elements for the Sacramento River system apply to the San Joaquin as well. Differences are emphasized in the following discussion.

The San Joaquin River Flood Control System is newer than the Sacramento system and had different guiding principles in its design. Three of the major design considerations for the Sacramento River Flood Control Project were thought to not apply to the San Joaquin: (1) hydraulic mining debris, (2) major urban centers such as the city of Sacramento, and (3) large rainfloods. Of these three considerations, only the first is irrelevant to the San Joaquin system (and, for the most part, is becoming irrelevant for the Sacramento system too). Though hydraulic mining debris is not a problem for the San Joaquin, erosion in the upstream reaches of the flood control system and sediment deposition in the lower reaches is a larger problem than originally anticipated.

Major urban areas are now developing along the San Joaquin River, primarily to the east. Consequently, the low level of protection afforded by many of the project levees should be reevaluated. The subtropical storms of early January 1997 produced concurrently high reservoir releases along the mainstem and its tributaries that simply overwhelmed the system, raising further concerns about the level of protection provided by the project levees.

On the San Joaquin River system, channel maintenance responsibilities rest with local agencies. In some areas, vegetation clearing necessary to maintain channel capacity has been difficult due to various environmental restrictions and permitting requirements. At the lower end of the system sediment deposition continues to raise the river bed, lowering flood protection by reducing channel cross sectional area and by promoting growth of willows and other plants that increase channel roughness and further impede flows. Several approaches to removing these sediments have been proposed, but for various reasons have not been successfully implemented. A primary difficulty is finding nearby markets for the sand in an attempt to offset the costs of excavation and dredging operations.

Flood Carrying Capacity of the San Joaquin River. From the Delta upstream on the San Joaquin River to the mouth of the Merced River and along several of the San Joaquin River tributaries, the federally authorized and constructed portion of the project consists of about 100 miles of intermittent levees along the San Joaquin River, Paradise Cut, Old River, and the lower reaches of the Stanislaus and Tuolumne rivers. The levees vary in height from about 15 feet at the downstream end to an average of 6 to 8 feet over much of the project.

The project also provides flood protection along the San Joaquin River above the mouth of the Merced River through a bypass system consisting of levees and channel improvements. The bypass system consists primarily of manmade chan-

nels (Eastside, Chowchilla, and Mariposa bypasses), which divert and carry floodflows from the San Joaquin River at Gravelly Ford along with inflows from other eastside tributaries, downstream to the mainstem just above the Merced River.

The San Joaquin River flood situation is different from that of the Sacramento River. In general, channel capacity is around one tenth that of the Sacramento system. Rainfloods are smaller but there is also a greater threat of snowmelt floods in years of heavy snowpack. Soils and levee foundations tend to be of sandier material which increases seepage and sand boil problems during high water.

The Corps has established objective design release flows for the San Joaquin River and its tributaries for use in flood control operation of the reservoirs on these streams (Table VII-2). These flows are generally considered to be safe carrying capacities. These flows were used to establish project levee elevations for the lower San Joaquin River. The objective release flow is 8,000 cfs from Millerton Lake, 6,000 cfs from Lake McClure, 9,000 cfs from Don Pedro Reservoir, and 8,000 cfs for New Melones Lake. San Joaquin River main stem channel capacities vary from 45,000 cfs downstream of the confluence with the Merced River (100-year flood protection) to 52,000 cfs downstream of the Stanislaus River (60-year flood protection).

Current Level of Flood Protection. The primary problem is lack of capacity, especially in the lower San Joaquin River below the Merced River. Generally channels are designed for 50-year flood protection, although some tributaries have more protection locally. Because of the degree of urbanization downstream, a priority would be to increase the degree of protection on these four streams. To some extent more downstream channel capacity would help (for example increasing Tuolumne River objective flows from the current 9,000 cfs at Modesto to 13,000 cfs), but the lower San Joaquin River cannot take the additional water if all tributaries release objective flows. The 1997 flood was eased in the Eastside Bypass reach south of Merced by holding back on Hidden and Buchanan releases where the inflows were not unusually high. (See Table IV-1 for flood frequencies of the 1997 flood). However, the flood carrying capacity of the Bypass has been substantially reduced due to area-wide subsidence. In addition to correcting Bypass subsidence problems, a solution to increase conveyance in the lower river must reach all the way into the larger channels of the central Delta. It is likely that levee breaks south of Mossdale (near Manteca) prevented further levee breaks in the south Delta from occurring by relieving water levels. (See "Increased Capacity of the San Joaquin River" earlier in this chapter.)

The FEAT recommends the Legislature provide funding to restore subsided levees of the State-constructed Eastside Bypass to restore the bypass floodflow carrying capacity.

With a few exceptions, the degree of protection varies from 1-in-100-year or greater in most urban areas to 1-in-10-year to 1-in-50-year protection in agricultural areas. In addition to the principal levee and channel systems, local interests have constructed numerous secondary levees and improved channels. These secondary improvements provide flood protection of varying levels, primarily to agricultural areas. In general, the protection afforded ranges from a 1-in-2-year flood to a 1-in-25-year flood.

Table VII-2
Estimated Current Level of Flood Protection
San Joaquin River and Tulare Basin

River	Dam	Downstream Objective Flow (cfs)	Level of Protection
Mokelumne	Camanche	5,000	50 year
Calaveras	New Hogan	12,500	150 year
Littlejohns Cr.	Farmington	2,000	100 year
Stanislaus	New Melones	8,000	180 year
Tuolumne	Don Pedro	9,000	55 year
Merced	New Exchequer	6,000	100 year
Chowchilla	Buchanan	7,000	200 year
Fresno	Hidden	5,000	200 year
San Joaquin	Friant	8,000	50 year
Kings	Pine Flat	7,950	125 year
Kaweah	Terminus	5,500	45 year
Tule	Success	3,200	36 year
Kern	Isabella	4,600	333 year

Note: The level of protection estimates are based on the periods of record shown in Table 1: "Estimated Water Year 1997 Rainflood Frequency". The calculated "protection" figures may change when statistics are updated.

Reservoir Storage Capacities. Many reservoirs on streams tributary to the San Joaquin River provide significant contributions to flood protection. Each of the main tributaries, as well as the San Joaquin River, has a large dam and reservoir that includes storage space for control of rainfloods or snowmelt. The Corps prescribes the rules for the use of the federal flood control space. Each dam is operated to control floodflows on its downstream tributary river. Coordination efforts among reservoir operators, the Corps, and DWR have pursued a secondary objective of reducing floodflows along the lower San Joaquin River. Projects associated with the building of several dams also included levee and channel improvements along downstream reaches of tributary rivers. A key feature of the system evaluation would be to enhance coordinated flood control operations.

Pine Flat Dam and Lake – The dam, on the Kings River 25 miles east of Fresno, was completed by the Corps in 1954. The lake has a capacity of one million acre-feet, and up to 475,000 acre-feet of storage space is reserved for control of rainfloods. The reservoir also is operated to control snowmelt floods.

Floodflows are routed so that the first 4,750 cfs or channel capacity goes north to the San Joaquin River via Fresno Slough and James Bypass, the next 3,200 cfs of channel capacity goes south to Tulare lakebed; then additional floodflows are divided equally between the southerly routing to Tulare lakebed and northerly to the San Joaquin River.

Friant Dam (Millerton Lake) – The dam, on the San Joaquin River about 10 miles north of Fresno, was completed in 1949 by the USBR. The lake has a capacity of 520,000 acre-feet, which is primarily used for conservation. Up to 170,000 acre-feet can be reserved for rainflood control during the flood season, and 390,000 is available for snowmelt.

Mendota Dam – The dam, on the San Joaquin River at its confluence with Kings River North via James Bypass and Fresno Slough, is used for irrigation water supply diversion. It is a diversion dam and provides few, if any, direct flood damage reduction benefits downstream.

Combined design capacity of the Chowchilla Bypass (5,500 cfs) and the San Joaquin River below Mendota (4,500 cfs) is 10,000 cfs. This is less than the combined San Joaquin River objective flow below Friant Dam (8,000 cfs) and the Kings River overflow (4,750 cfs).

Hidden Dam (Hensley Lake) – The dam, on the Fresno River 15 miles northeast of Madera, was completed by the Corps in 1975. The lake has a capacity of 90,000 acre-feet, of which 65,000 acre-feet is reserved for flood control.

Buchanan Dam (H.V. Eastman Lake) – The dam, on the Chowchilla River 16 miles northeast of the town of Chowchilla, was completed by the Corps in 1975. The lake has a capacity of 150,000 acre-feet, of which 45,000 acre-feet is reserved for rainflood control.

New Exchequer Dam (Lake McClure) – The dam, on the Merced River about 25 miles northeast of Merced, was completed by the Merced Irrigation District in 1967. The lake has storage capacity of just over one million acre-feet, of which 350,000 acre-feet is reserved for rainflood control. About 400,000 acre-feet is available for snowmelt. The Merced River control point is downstream near Cressey below its confluence with Dry Creek.

Don Pedro Dam and Reservoir – The dam, on the Tuolumne River about 35 miles east of Modesto, was completed in 1971 under a cooperative agreement between the federal government, city and county of San Francisco, and the Turlock and Modesto irrigation districts. The reservoir has a capacity of just over two mil-

lion acre-feet, of which 340,000 acre-feet of storage space is for flood control or snowmelt. The objective Tuolumne River control point is in Modesto which includes the runoff of Dry Creek. There are no federal project levees on the Tuolumne River except for a south flow directing levee near the confluence with the San Joaquin River.

New Melones Dam and Lake - The dam, on the Stanislaus River about 30 miles northeast of Modesto, was completed by the Corps in 1979. The lake has a storage capacity of 2.4 million acre-feet, of which 450,000 acre-feet is reserved for rainflood control or snowmelt. The Stanislaus River downstream flow target is not to exceed 13 feet at Orange Blossom Bridge near Oakdale.

Developing Areas-Land Use. Land use in the area includes rural, agricultural and urbanized areas. Mining, lumbering, livestock production and recreation are significant in the mountainous areas. The valley area supports intensively irrigated agricultural development with related manufacturing and industrial activities.

Agriculture is the economic base of the area, and over 50 percent of the land in all five counties is currently used for agriculture. A number of crops are grown, including tree orchards, vineyards, row crops and grains. Typical agricultural products are almonds, walnuts, peaches, plums, grapes, tomatoes, corn, sugar beets, cotton, wheat, oats, and barley.

Urban development is increasing due to the low cost of land, housing, and the proximity to the job markets in Sacramento, San Jose and the Bay areas. All five counties are trying to accommodate new urban development and planned industrial growth. Most of the growth is planned for areas in the incorporated cities located adjacent to Highway 99 and Interstate 5.

Agricultural land uses within the area are not expected to change significantly in the near future. The relative percentages of lands in various types of uses should remain fairly constant.

b. Alternatives

Additional Reservoir Storage (Reoperation). The limited channel capacity of this system and our new appreciation of rain caused floods (vs. that of snowmelt) in the San Joaquin system, point to the continuing need to closely coordinate reservoir releases from Friant Dam and San Joaquin tributaries to meet flood control and environmental needs. Generally the Corps, in consultation with DWR and the reservoir operators, has quite effectively coordinated these releases.

As mentioned earlier, the primary flood operation of each reservoir is to provide control of flooding on each tributary as well as water rights and water needs of the individual owners and districts for their service. A secondary goal of reducing floodflows in the lower river also has been carried out this year by coordinating efforts among reservoir operators.

With respect to reoperation of existing reservoirs for increased flood storage, it is important to consider that competition for water supply is even greater here than in the Sacramento Valley; alternatives which cause loss in water supply yield will be more controversial and expensive for a basin already in water deficit.

In connection with the work of the State and federal ad hoc committee on Floodplain Management and Nonstructural Alternatives, a preliminary review of flood control reservoirs was conducted. It was determined that three of the seven principal flood control reservoirs of the San Joaquin River basin exceeded their objective releases during the January 1997 floods. These were Millerton Lake, Lake McClure, and Don Pedro Reservoir. The committee also recognized that further investigation was needed to review the relationships between channel capacities and objective flows. It was also noted that poor foundation conditions could exist under much of the 84 miles of "federal-state" levees on the San Joaquin River from the Merced River to the bifurcation at Paradise Cut. There could still be levee breaks in the San Joaquin River even if floodflows were held to design levels.

Reservoir reoperation in the San Joaquin River basin to increase winter flood space could be further reviewed as a possible interim step to be taken while a long-term solution is developed. However, reservoir reoperation will not resolve the problem of levees that cannot withstand channel design flows due to structural deficiencies in the area near the San Joaquin River confluence with the Stanislaus River and downstream.

New Reservoir Storage. New reservoir storage, either directly instream or offstream, to replace water supply lost by increasing flood storage in the major reservoirs is an option. Reservoir enlargement to improve operational flexibility during large flood events may be an economical possibility on several San Joaquin River and Tulare Lake region foothill reservoirs. These projects would also improve water supply availability.

New Off-stream Storage. This alternative includes a series of temporary storage areas or off-stream storage for floodwater on lands adjacent to the San Joaquin River. Diversion of water to these areas would reduce downstream peak flows. Adjacent areas could be operated and managed in coordination with one another, creating a single system with numerous cells working together to divert, distribute, and direct the floodflows. These areas include federal and State wildlife refuges, agricultural lands, and other privately owned properties.

New or Enlarged Flood Bypasses. This alternative creates new flood bypasses along the narrow reaches on the San Joaquin River to convey some of the floodflows and avoid the congestion in the river.

The system of bypasses upstream of the Merced River can be improved to control larger events. New bypasses downstream of the Merced may be feasible. The most likely location for new bypasses would be on the low lying areas on ei-

ther river where housing density is low, although there would be significant challenges presented by existing infrastructure.

Setback levees and purchase of flowage easements for wider floodways, new or enlarged bypasses, or full recovery of the historic floodplain are more feasible on the San Joaquin because of the limited development along the river. The purchase of low lying adjacent property for overflow and carryover may be more practical than structural alternatives. Estimated costs for structural strengthening of existing levee foundations may be high (on the order of \$500,000 to \$700,000 per mile) and may not be justified. However, there are no side flow basins along the San Joaquin River as there are along the Sacramento River.

A related alternative is to increase the flow capacity of the river channel itself. The work involves sediment and vegetation removal in the river channels.

Levee Setbacks. This alternative includes constructing setback levees, at a location with good foundation for levees, to enlarge the floodway. This alternative may be combined with reoperation of reservoirs to provide more flood control storage. The viability of increasing the flood control reservation on a long-term or short-term basis would require extensive analysis to ascertain the impacts of such a decision. Such a concept would have to be fully analyzed with the cooperation and involvement of many parties. Important factors would include the sustainable yield of existing Central Valley reservoirs, water rights, CVP contracted supplies, and water quality and fishery flow requirements and needs downstream. Of particular importance are potential operational impacts to agricultural producers from the perspective of permanent loss of prime agricultural land and its economic contribution. Purchase of agricultural production lands must be on a willing seller basis and should not be due to regulatory actions.

Improved Channel Clearing Practices, Maintenance. Excess vegetation exists along some reaches of the San Joaquin River. This vegetation consists mainly of grasses and scrub that have colonized the areas. Willows and alders are interspersed with some elderberry bushes and cottonwood trees. Excess vegetation can result from lack of adequate channel maintenance and the lack of winter flows due to the prolonged drought. The vegetation causes problems by capturing flood debris, restricting passages of floodflows, and consequently increasing water surface elevation in the channels.

It is necessary to carry out a channel maintenance program, but institutional constraints related to carrying out the Operations and Maintenance will continue to hamper maintaining channel capacity. It is likely that mitigation will be required to offset the impacts to federal and/or State endangered species resulting from vegetation removal. In particular, losses related to riparian and shaded riverine aquatic habitat will likely result in significant and costly mitigation requirements.

As stated earlier (under the Sacramento River section of this chapter), the FEAT recommends that once mitigation has been provided for restoring a channel to its design flood carrying capacity, no further mitigation should be required to maintain the channel to that capacity.

Other Nonstructural Measures. The purpose of nonstructural measures is to reduce flood damages rather than controlling floodwaters. Nonstructural measures may include such physical activities as relocating, elevating, flood proofing, or constructing floodwalls or levees to protect individual or small groups of structures. They can also include regulations or policies such as floodplain zoning in the National Flood Insurance Program, and flood warning and preparedness planning. See Chapter VI for a more detailed discussion on nonstructural measures.

In addition, a basin-wide nonstructural measure would involve optimizing the operation of all existing reservoirs in the basin to improve flood protection to downstream areas consistent with other authorized purposes.

Acquisition/Relocation of Structures. This alternative is to acquire or relocate the structures or land located in the flood-prone area to establish a long-term solution for the floodplain management. FEMA's 100-year floodplain guidelines may be used for this alternative. An integrated program of habitat and managed agriculture may be implemented. The major benefits of this alternative are as follows:

- Reduce the risk of property damage and resulting exposure to liability
- Habitat development to advance programs such as the CALFED and CVPIA efforts
- Potential rental income on acquired agricultural ground to offset management and other maintenance costs
- Potential to integrate agricultural and wildlife plans
- High recreational potential

However, the January 1997 flood on the lower San Joaquin River likely exceeded the 100-year flood.

As stated earlier in Section C, the FEAT recommends that a full range of structural and nonstructural flood damage reduction measures be considered in the comprehensive water management studies.

3. Sacramento-San Joaquin Delta

The Sacramento-San Joaquin Delta is the hub of water supply infrastructure and provides valuable resources and without adequate levees, the Delta as we know it today will be lost. The levees serve many diverse needs. They protect valuable wildlife habitat, farms, homes, urban areas, recreational developments,

highways and railroads, natural gas fields, utility lines, major aqueducts, and other public developments. The levees are also critical to protecting Delta water quality and serve a significant function in the State's water transfer system. In the Delta Flood Protection Act of 1988 (SB 34), the Legislature declared "...that the delta is endowed with many invaluable and unique resources and that these resources are of major statewide significance."

Since reclamation of the Delta began in the 1800s, the levees have increased from under 5 feet to over 25 feet in height. Due to subsidence of the island interiors, it has been necessary to continually add material to hold back the adjoining rivers and sloughs. Since many of the levees were built piecemeal over many decades with little understanding of the engineering challenges posed by the Delta's geology and the impacts of long-term subsidence, there has been an ongoing concern over the performance of these levees.

Levee conditions in the Delta are quite different from those in many other locations, where land elevations are above normal water levels. In these other locations, water forces act on levees only during periods of high water or flooding. In the Delta, land elevations are generally much lower than waterway elevations. Because of this difference, the levees function more as earthen dams which act as continuous water barriers. This difference between many Delta levees and levees in other areas has important implications regarding levee design and reconstruction. For example, most of the Delta levees have to remain fully functional during any improvements or rehabilitation.

Levee failures continue to be one of the Delta's primary problems. Levee failures in the Delta are due to several factors which include instability, overtopping, and seepage. To gain a better understanding of the problems facing the Delta, DWR has undertaken engineering investigations such as a recently completed seismic analysis of the Delta levees. These investigations along with levee improvement projects performed under SB 34 have demonstrated that many difficult Delta levee problems are solvable. SB 34 has provided the necessary focus for coordinated levee engineering investigations and funds for improvement projects that have advanced the state of the art of levee design. These efforts have demonstrated that levees can be engineered to alleviate the unfavorable conditions which continue to threaten this water hub of unique economic and natural value. SB 34 programs have also significantly advanced the understanding of Delta subsidence, its causes, and the importance of integrating subsidence control with levee improvements.

Maintenance and improvement work is vital to the protection of the island itself and the habitat existing on the island. The importance of the Delta as habitat can be seen in its increased use by waterfowl. With the dwindling wetland habitat throughout the State, the winter use by Delta waterfowl has increased from 0.5 million birds 20 years ago to about 1.5 million today.

Improvements being made on extremely fragile levees in the western Delta have been completed using an innovative design. Even after accounting for recreation and maintenance, these costs are significantly less than the estimates made over 10 years ago to repair the same levees to essentially the same standards. Use of new designs, extensive monitoring, economical borrow sources, and the beneficial reuse of dredge material are all factors which need to be considered in developing realistic future costs.

However, rehabilitation costs exceed the financial resources of most Delta landowners. Funding through Senate Bill 34, enacted in 1988, has provided for significant levee improvements, but is insufficient to properly rehabilitate all Delta levees. Therefore, a comprehensive cost sharing arrangement needs to be established which will address benefits and equitable cost sharing among all the beneficiaries. Cost sharing arrangements similar to those being forged with the Long Term Management Strategy program to provide economical sources of levee material will help to meet this objective.

Significant DWR activities focus on protecting the Delta both through emergency work and long-term planning. Senate Bill 34 allows the Department to mobilize forces to take necessary immediate action for threatened levee sites as well as provide long term improvement projects. The long term improvement projects that DWR has sponsored address the specific problems of each levee system in a flexible manner.

a. Needs Assessment

River Channel and Levee Capacities. Upstream development with flood control improvements continue to increase flows entering the Delta. The combination of increased inflows into the Delta from the Cosumnes, Mokelumne, Sacramento, and San Joaquin rivers, and reduced channel capacities from sedimentation increase the risk of flooding in the north and south Delta.

Current Level of Flood Protection. Nearly all of the levee work in the Delta is performed through the cooperative efforts of the local reclamation districts and the Senate Bill 34 program. The SB34 projects are compatible with the plan for improvement set forth in Bulletin 192-82. The high participation in the program by reclamation districts has resulted in funding to the minimum FEMA Hazard Mitigation Plan standard (one foot above the hundred year flood event), a standard that resulted from the floods of the 1980s and one that is required to receive federal disaster assistance. Nearly all Delta reclamation districts meet the HMP standard.

Developing Areas—Land Use. Cities such as Stockton, Lathrop, Tracy, Byron, and Antioch follow the overall trend of growth in California and are now encroaching into the Delta. The Delta Protection Act of 1992 was passed by the Legislature and signed by the Governor to protect the Delta Primary Zone, an area of approximately 500,000 acres.

The goals identified in the Act are to "protect, maintain, and where possible, enhance and restore the overall quality of the Delta environment, including but not limited to agriculture, wildlife habitat, and recreational activities; assure orderly, balanced conservation and development of Delta land resources and improve flood protection by structural and nonstructural means to ensure an increased level of public health and safety." To meet these goals, the Delta Protection Commission has adopted a "Land Use and Resource Management Plan for the Primary Zone of the Delta." The findings of the Plan are meant to be used by the Delta local governments to adopt into their general plans so local governments throughout the primary zone provide consistent and harmonious land use policies.

Seismic Risk. Delta levee seismic susceptibility is being explored by continuing research that began with the Department of Water Resources' Phase I Delta Seismic investigation. Since there are many unknowns regarding the dynamic properties of the peaty foundation layers which commonly exist beneath the Delta levee system, the continued research will attempt to reduce the major uncertainties by installing strong-motion accelerometers at three to four levee sites in the Delta; creating a geologic model for deeper soil deposits; undertaking field and laboratory testing to better determine the static and dynamic properties of organic soils; undertaking field and laboratory testing to better determine liquefaction potential; and investigating the potential activity of the Coast Range-Sierra /Nevada Boundary Zone. These efforts will be closely coordinated with the CALFED Bay Delta Program, USGS, UCD, and interested stakeholders. DWR, in coordination with CALFED, is investigating emergency preparedness for earthquake damage and multiple island failures.

b. Alternatives

New or Enlarged Floodways. To improve the flood carrying capacities of floodways, impediments to the flow need to be removed and/or the channel geometry needs to be enlarged. With the shortage of shaded riverine aquatic habitat (overhanging riparian vegetation such as trees and large shrubs), removing these impediments is not a viable alternative. Therefore, either increasing the channel capacity by dredging or setting back levees to allow vegetated benches that can overflow when floodflows are present are the reasonable alternatives that will not adversely impact the estuary.

Dredging channels has historically been performed as needed by reclamation districts to provide a source of material for levee construction and additional flow capacity adjacent to the island. Declines in the populations of native aquatic species such as Delta smelt and winter run salmon have resulted in Endangered Species Act listings of these species and increased regulation on activities that may have impacts on the survival of these species. Cautiously, regulatory agencies have limited dredging to a 1 1/2 month window (August 1 to Sept 14). However, the pertinent State and federal agencies that regulate dredging are formulating criteria

for dredging outside the dredging window to allow for in-water work when it is evident that the project will have not threaten endangered aquatic species.

Flexibility in regulating Delta maintenance dredging will allow more levee rehabilitation to take place, but not enough to alleviate the north and south Delta channel capacities problem.

Levee Setbacks. Setback levees are the most costly alternative for increasing channel capacity but provide the biggest benefits to the estuary. A program that would setback levees along flood prone channels would result in large riparian corridors that would benefit both aquatic and terrestrial species. The impact of these corridors would be a reduction of Delta agricultural production and terrestrial habitat such as Swainson Hawk habitat for foraging.

Acquisition/Relocation of Structures. Most western and central Delta (Primary Zone) lands are sparsely populated with most structures associated directly or indirectly with the agricultural industry. The surface of these lands lies below the adjacent water surface elevation at all times of the year. Therefore, relocating these structures within the same islands is not an acceptable alternative. A more reasonable approach to decrease the risk to Delta residents and lower disaster assistance costs would be to floodproof structures meant for habitation to National Flood Insurance Program standards. Improvements such as raising living areas out of the floodplain and leaving uninhabited structures such as garages below the living area are efficient ways of floodproofing. However, the lower structural members need to be sturdy or debris and logs will batter the dwelling to pieces.

c. Other Significant Delta Issues

Subsidence of Delta lands and the lack of suitable borrow material for levee raising and reconstruction is a significant issue in the Delta. Delta lands continue to subside requiring high levels of maintenance to provide adequate flood protection. Material to raise and stabilize these larger levees is not available within the Delta. Therefore, beneficial reuse of dredge material is a significant resource for Delta levee rehabilitation.

Subsidence control research is being performed through the coordinated efforts of DWR, USGS, and CALFED. The results of the research will be used to develop subsidence control guidelines that will be based on research into "capping" and techniques which maximize accretion through shallow water flooding. Utilizing GIS technology, parameters that have been found through ongoing research to affect subsidence (depth of peat soil, historical subsidence rates, percent organic matter and, land use), will be mapped to aid land use planning decisions for subsidence control.

D. Evaluation of Maintenance

1. Preflood Maintenance Practices and Environmental Requirements

Maintenance of federal flood control facilities of the Sacramento River Flood Control Project and related projects on tributaries, and maintenance of federal flood control facilities of the San Joaquin River Flood Control System is assured by the State of California through the Reclamation Board and performed by State maintenance yards or local maintaining agencies.

DWR inspects maintenance performed by local maintaining agencies and State maintenance yards and rates its quality. In the case of State-maintained, State-inspected areas, the inspectors are organizationally remote enough from the maintenance yards that they may produce an objective inspection report. DWR inspections occur four times a year. The spring inspection is a thorough look at maintenance practices as evidenced by the condition of the levees. The spring joint inspection is conducted with the local maintaining agency, and is a field conference with an LMA representative to look at actual problems identified in the spring inspection and discuss them face to face. The fall inspection is like the spring inspection, and also looks for progress on the problems identified in the spring. The fall joint inspection, another field conference with an LMA representative, is to discuss progress through the summer and to assess preparedness for the coming flood season. Two inspection reports are produced for each LMA as products of the joint inspections.

Most local levee maintaining agencies (DWR yards, reclamation districts, levee districts, flood control districts, and other local entities) do an adequate job of meeting these maintenance requirements. Of 112 agencies rated by DWR in 1995, 95 rated outstanding or good, while 17 rated fair or poor. The lower rated agencies tend to be the same ones year after year.

The FEAT recommends that the Reclamation Board use its authority to enforce its agreements with local maintaining agencies, these agreements allocate responsibility for flood control maintenance to the LMAs.

In addition, the FEAT recommends the Task Force (see Chapter VI, Section C) review the situation that occurs when an LMA's maintenance is deficient and make recommendations for a course of action for the State to take to remedy the problem.

2. Channel Maintenance

Channels are leveed or unleveed watercourses, constructed or improved by the U.S. Army Corps of Engineers or the State of California to carry specific flows. In a few cases, existing watercourses have simply been incorporated into a project as an "unimproved project channel." The object of channel maintenance is to perpetuate the channel's ability to carry the design flow.

Unimproved channels are amenable to development of wildlife habitat and are more susceptible to being mistaken for natural streams. If a channel is maintained to the condition that existed after completion of the initial construction, its floodflow characteristics will be preserved. However, if a channel develops vegetation that then becomes habitat for wildlife, maintenance to initial conditions becomes more difficult and control of vegetative growth may be subject to environmental constraints. In these cases, it is important to develop maintenance practices that allow controlled growth of desirable habitat without unduly compromising channel capacity.

Channels of the Sacramento River Flood Control Project are maintained by DWR under Water Code Section 8361. Other channels are maintained by Local Maintaining Agencies. All are inspected annually by DWR in order to identify and report any condition which may diminish channel capacity. The initial standard of comparison for the inspection is the condition immediately after construction. However, after development of satisfactory habitat management practices that do not compromise the channel capacity, the standard of comparison may incorporate the agreed-upon practices.

3. Environmental Concerns for Channel and Streambed Maintenance

Public expectation for multiple benefits associated with streambeds, flood control levees, and channels has increased significantly. In many instances, the flood channels and streambeds represent habitat corridors, public parkways, recreational opportunities, agricultural lands, gravel extraction, and water conveyance facilities values far in excess of the original design or intent. These diverse and often competing public values increase the cost of maintenance and repair for both public and private interests whose principal responsibility and authority is focused on flood control. The solution to this paradox must include two principal objectives: (1) actively manage current facilities, and (2) design future flood control facilities recognizing the multiple public values they will be required to accommodate.

Under Sections of the Fish and Game Code, a public entity or an individual entity desiring to engage in an activity which will substantially alter the bed, bank, or channel of a river, stream, or lake must first notify Department of Fish and Game of the proposed project. DFG must determine whether the project will have a significant adverse effect on fish or wildlife resources in the water course, and if so, DFG must propose alternatives or measures to avoid that effect. DFG and the applicant must agree on the mitigation measures. If there is no agreement, the matter may be taken to binding arbitration. A project cannot proceed in the absence of an agreement (except to protect life and property during an emergency), unless DFG has failed to respond within the statutory time limits (within 30 days of receipt of plans, which can be extended by mutual agreement). DFG cannot condition a Lake or Streambed Alteration Agreement on approval of another State

or federal permit. However, DFG can deem the application incomplete if no proof of compliance with the requirements of the California Environmental Quality Act are provided with the application.

DFG may enter into long-term (5-years) Lake or Streambed Alteration Agreements for maintenance. The maintenance agreements renew automatically at expiration (with payment of renewal fee), unless DFG determines there has been a substantial change in conditions. The maintenance agreements are an effective tool in addressing the issues raised by flood control interests. However, in many instances, maintenance deferred over many years has allowed substantial habitat to become established within the bed, bank, or channel. Substantial alteration to reestablish base capacity is then required, which then can be maintained through a maintenance agreement. This underscores the conflict in definition of maintenance that exists between DFG and agencies responsible for flood channel and streambed maintenance, as well as the competing public values associated with streambeds and associated flood control channels.

The FEAT encourages local maintaining agencies to establish, with DFG, Lake or Streambed Alteration Master Agreements that would provide for routine maintenance activities conducted by either the applicant or private landowners within the applicants jurisdiction that agree to meet the conditions of the agreement.

4. Sediment and Gravel Management

Sedimentation of natural channels reduces their flow-carrying capacity. Historically, hydraulic mining released great quantities of sediment into some foothill streams, which was carried into the valley and deposited wherever the gradient and flow rate no longer would support the bed load. Even though hydraulic mining is now outlawed, its sediment remains in valley streams. Natural sedimentation, too, deposits large quantities of silt, sand, gravel, and rock where steep foothill streams become flat valley watercourses.

Removal of sediment is a continual maintenance process. Because of the pervasive nature and universal presence of sediment, its removal has been easy to overlook and difficult to fund. However, maintenance of channel cross-section and removal of sediment is fundamental to preservation of floodflow capacity in channels.

5. Levee Maintenance and Inspection

Levee maintenance is performed in three different patterns:

1. Local maintaining agencies maintain approximately 1,500 miles of levees within the Central Valley under specific agreement with the Reclamation Board or under the provisions of statute.
2. The Department of Water Resources is responsible for maintenance on certain specific levee sections described by statute (Water Code Section 8361).

3. The Department of Water Resources maintains levees for the Reclamation Board in some areas where there is no local maintaining agency in existence, or none capable of accomplishing the required maintenance. These are called "State Maintenance Areas."

Proper levee maintenance practices are widely accepted. Maintenance must meet the Corps' standards contained in Title 33, Code of Federal Regulations, as interpreted in the Standard Operation and Maintenance manual produced by the Sacramento District, U.S. Army Corps of Engineers. Levee maintenance includes the following:

- Maintaining the levee to adequate cross section and grade
- Preventing and removing unauthorized encroachments
- Controlling certain wild vegetative growth and rodents
- Repairing cracks, bank erosion, caving, or other surface problems
- Keeping access gates operable and in good condition
- Repairing occurrences of scour, wash, settlement, or failure or rock revetments
- Keeping crown roadways shaped, graded and gravelled to facilitate drainage and travel
- Controlling livestock grazing to minimize damage to the slope
- Keeping pipes and other structures on the levee in sound, reliable, working condition

Maintenance practices are constrained to some extent by environmental laws and regulations. LMAs must meet the requirements of the State and federal Endangered Species Acts, NEPA, CEQA, and other environmental statutes. In most cases, this means that certain kinds of maintenance can only be done at certain times of year, and some former maintenance practices have been abandoned. The LMAs exhibiting good maintenance practices have learned to meet these requirements and to schedule maintenance work to fit environmental objectives.

The State inspects and reports only on the status of maintenance practices and on observable levee conditions resulting from those practices; the State does not conduct field studies to assess the internal structural integrity of the levees or their foundations. Although maintenance is one of the keys to adequate flood protection, maintenance alone cannot compensate for structurally deficient levees. Improvement of levees is a separate process from levee maintenance, involving lengthy planning cycles and area-wide studies leading to development and execution of improvement projects. While levee maintenance inspection covers all levees on a regular basis, levee improvement is a selective process designed to place limited funds where they will be most effective. Only the Sacramento River Flood Control Project has an active levee improvement program.

The FEAT recommends the Department of Water Resources ensure continued capability of the Sacramento River Flood Control System to safely pass design floodflows by directing maintenance activities to critical areas and accelerating flood control levee and structure repairs in State-maintained areas.

The FEAT recommends the Reclamation Board help ensure appropriate levee maintenance practices are carried out by requesting the Department of Water Resources to increase its monitoring of local maintenance activities. These efforts will also help maintain control of encroachments.

In addition to providing adequate maintenance to State facilities and monitoring of local maintaining agencies practices, *the FEAT recommends the Department of Fish and Game develop a process through regulation to facilitate levee and river channel maintenance and, using the federal Fish and Wildlife Coordination Act, assist private and public entities with biological information necessary to secure federal approvals for levee and streambed maintenance activities. Finally, the FEAT recommends Congress provide funding for the Corps to expedite evaluation of the effects of vegetation on levees and in bank protection. The Corps was directed in the Water Resources Development Act of 1996 to perform this evaluation and report on it within 270 days, but Congress has not provided funding for this activity.*

6. Bank Protection

Rock rip-rap is a customary way of protecting riverbanks from erosion. It has been used extensively in the Sacramento-San Joaquin basins. It is relatively inexpensive and effective. However, it may not provide suitable habitat for certain fish and wildlife species. For that reason, it is not favored by the environmental community.

Many variations of rock rip-rap have been tried, most of which encourage growth of vegetation in the rock prism. This kind of installation has become prevalent, and has changed the approach of rip-rap maintenance from the clean-rock appearance to one of encouraging growth of shade producing plants on riverbanks.

Institutional means must now be found to allow new installations of rock rip-rap where warranted to protect levees and river banks. Stone protection on levees, as distinguished from riverbanks, must remain clear of vegetation to ensure levee integrity and the ability to inspect and flood fight.

7. Ditch and Canal Setbacks

Drainage ditches and irrigation canals are located near the land side levee toe of many federal project levees in the Central Valley. In some cases, they were the borrow source for construction of the levee. Many of these ditches and canals are located too close to the levee and can threaten levee integrity. During high water, seepage through the levee foundation can emerge in these ditches, carrying foundation soils and/or causing progressive failure of the ditch bank. If left un-

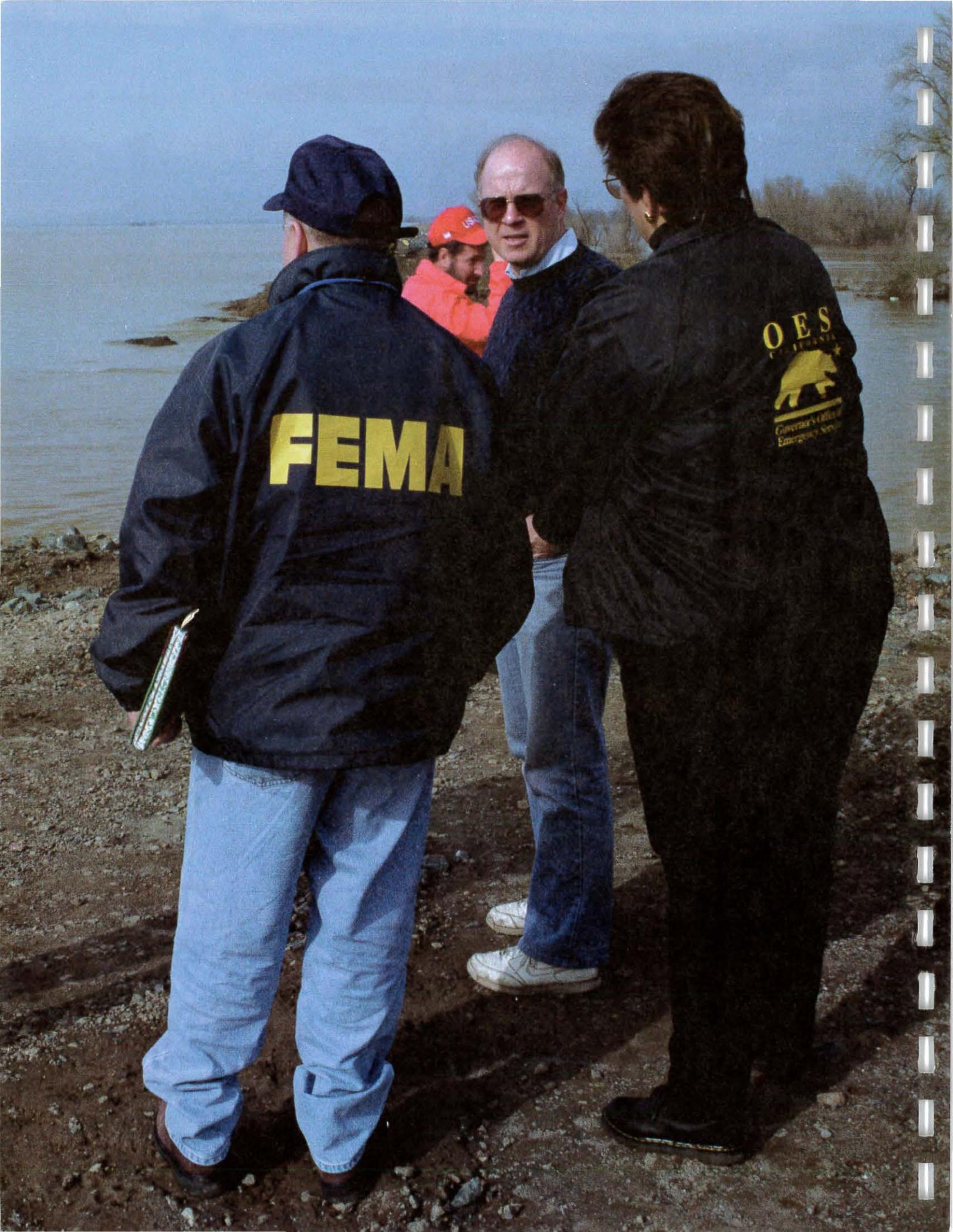
checked, the levee will eventually fail from loss of foundation material or from progressive land side levee slope failure. This problem was especially prevalent during the January 1997 floods. Some of these ditches and canals had exhibited problems in previous flood events, but many had not; past performance did not necessarily indicate future performance.

The FEAT directs DWR to work closely with the Corps and the Reclamation Board to evaluate the effect of ditches and canals near levees and where necessary to work with local agencies and property owners to set them back from the levee wherever levee integrity is threatened.

E. Evaluate Debris Commission Projects

To address the downstream impacts of hydraulic mining in the Sierra Nevada during the latter half of the nineteenth century, the California Debris Commission was established in 1893. Over the next 40 years, numerous structures were built to trap, entrain, and control mining debris. The primary purpose of the structures was to maintain navigation capability on streams subjected to heavy mining debris loads. Many of these structures on the Yuba River were damaged during record flows in January 1997. Furthermore, the bed of the Yuba River was impacted with newly deposited materials which, to some extent, originated from upstream sources. By agreement, the Corps and DWR share maintenance responsibilities for Debris Commission projects on the Yuba River.

The FEAT directs DWR to cooperatively work with the Corps the Reclamation Board and to define responsibilities and authorities for maintaining projects constructed by the California Debris Commission. DWR should report on options and recommend repairs and improvements to be cost shared with the Corps, as appropriate based upon the findings of the evaluations.



VIII. Funding Issues

The January 1997 floods resulted in costs to the State as well as to local governments and the federal government. These costs include expenditures for efforts to limit the deleterious effects of the floods and assist victims during the period of high water as well as subsequent repair of damage caused by the floods. There are also costs to implement measures deemed necessary in light of experience gained as a result of the floods. Costs incurred during the current fiscal year (1996-97) are largely determined at this point and 1997-98 costs have been estimated with some confidence. However, estimates of the significant costs which will be incurred over the next several years are somewhat less precise. We have estimated costs incurred by government programs in which the State participates in some way, but have not attempted estimates of costs incurred by the private sector. Nor have we included costs incurred by federal or local programs in which the State has no role.

A. Immediate Response and Recovery Costs

The primary method used to fund response costs has been through the process authorized in Section 8690.6 of the Government Code. The Legislature was notified, as required in this section, and a subsequent Executive Order was signed by the Governor which provided \$29.7 million from the General Fund to various State agencies for flood related efforts. These costs are included in Table VIII-1 at the end of this section and the more significant allocations are described here:

- The Office of Emergency Services was provided \$3 million for various programs. Over \$964,000 was for the cost of adding staff to process flood claims from local governments for the repair/replacement of flood damaged public facilities under the Public Assistance Program operated in conjunction with the Federal Emergency Management Agency. An additional \$692,000 was required for a community relations effort to ensure that flood victims were aware of available benefits. These efforts included both public presentations and individual contacts. OES also received \$463,000 for implementation of the Hazard Mitigation Program in conjunction with FEMA. The Hazard Mitigation Program provides federal funding (which the State and local agencies must match) for preventive measures to lessen the impact of future disasters through mitigation measures involving undamaged facilities. The remainder of the allocation was primarily for coordination efforts during the floods, mobilization of State and local fire and rescue teams, and necessary administrative expenses.
- The Department of Social Services was allocated \$15.7 million for grants to flood victims provided through the Individual Family Grant Program as well as related administrative expenses. This funding includes the State's share of a joint state/federal program which provides assistance to those who are not

Opposite page:

Cooperation among all levels of government—local, State, and federal—was evident during the January 1997 floods. Representatives of FEMA, OES, Sutter County, and the U.S. Army Corps of Engineers view the work at the site of the Sutter Bypass relief cut.

eligible for other government programs or when these programs do not provide adequate assistance. This funding also includes \$8.9 million in State supplemental payments.

- The Department of Forestry and Fire Protection, the California Conservation Corps, the California Youth Authority, and the Department of Corrections were allocated a total of \$2.9 million for emergency response activities such as sandbagging crews, rescues and reconnaissance, and debris removal.
- The Department of Water Resources is being allocated \$7.7 million. Of this amount, \$1.4 million was for operation of the flood operations center, patrolling and inspecting levees, shoring up levees, responding to flood warning calls, collecting flood situation data and other immediate response efforts. An additional \$5.9 million was allocated to DWR for pumping of standing water to remove it from orchards and other agricultural land as well as establishing of a Levee Rehabilitation Unit, plus additional stream gauging and telemetry. In addition to the \$7.3 million already allocated, we anticipate \$400,000 will be needed for pumping costs during the 1996-97 fiscal year.

Section 8690.6 includes a requirement that allocations of funds be "in accordance with Section 27.00 the Budget Act" and Section 27.00 the 1996 Budget Act includes a provision that "No deficiency authorization may be made under this section for any expenditure for capital outlay." These requirements precluded the use of Section 8690.6 to fund land acquisitions, relocations, and related environmental mitigation and debris removal necessary for the repair of flood damaged levees. The cost of these activities is estimated to be up to \$13.4 million. *The FEAT recommends that legislation be enacted authorizing the Department of Finance to use Section 8690.6 for allocation of funds for disaster related capital projects needed to maintain essential State functions and/or to ensure public safety.* Specifically, Section 8690.6 (c) of the Government Code should be amended to add the following language:

Notwithstanding subdivision (a) of Section 27.00 of the Budget Act, authorizations for acquisitions, relocations and environmental mitigations related to response and recovery activities, as defined in subsection (a), shall be allowed under this code section, but only for needs that are a direct consequence of the declared emergency, where failure to undertake the project will interrupt essential state services or jeopardize public health and safety.

B. Subsequent Recovery Costs

While the initial response to the 1997 floods is largely completed, repair of the damage caused will continue into fiscal year 1997-98 and, in some cases, subsequent years. The major expenditure areas appear to be repair of the levee system, repair of damaged State highways, and the repair or replacement of damaged faci-

lities owned by local governments. However, there were a number of other state facilities which sustained some flood damage.

Within The Resources Agency, the Administration has already acknowledged \$6.5 million in recovery activities that have been funded or have been proposed for funding. The majority of these costs fall within the Department of Water Resources with: \$3.5 million in support related costs, particularly for the flood management program and \$2.4 million in local assistance costs for the Cosumnes River.

Other departments within The Resources Agency that have incurred costs to repair and restore State facilities are: Department of Forestry and Fire Protection, Department of Parks and Recreation, Department of Fish and Game, and three of the State's conservancies: the California Tahoe Conservancy, the San Joaquin River Conservancy, and the State Coastal Conservancy.

Of the \$46.6 million in previously proposed funding for activities within The Resources Agency, the Administration has proposed to fund: \$29.4 million General Fund, \$0.9 million Special Funds, \$15.7 million in FEMA reimbursements and \$0.6 million to be absorbed within existing budgets. Authorization for this funding has already been sought through Department of Finance Letters, proposing amendments to the 1997 Budget Bill, and special legislation.

Recommendations in this report are estimated to result in an additional \$38.7 million in costs for the Department of Water Resources (\$34.7 million General Fund, \$4.0 million reimbursement). Funding for these costs would be pursued through special legislation or redirection of existing resources within the Department.

California Department of Transportation (Caltrans) has slightly revised their previous estimates of 1996-97 flood damage to roads to a total of \$554 million including \$50 million damage to roads on federal property and \$504 million to State and local government roads and highways. It is possible that Caltrans will do some of the work on federal property under contract. Expenditures on State and local roads are eligible for funding as follows:

- State Emergency Operating—\$139 million Federal Highway Administration (FHWA)
- State Restoration Projects—\$180 million (FHWA), \$26 million State Highway Account (SHA)
- State FEMA eligible—\$1 million (FEMA), \$1 million (SHA)
- State ineligible—\$7 million (SHA)
- Local FHWA eligible—\$62 million (FHWA), \$8 million (local)
- Local FEMA eligible—\$60 million (FEMA), \$20 million (local)

Letters requesting legislative approval of appropriations for both State and federal funds were sent by the Department of Finance at the beginning of April for

the 1997-98 fiscal year and 1996-97 fiscal year respectively. Additionally, standby authority was requested to use State funds in place of any federal funds that are not forthcoming. This will require urgency State legislation in 1996-97, if significant amounts of federal funds are not received by year end.

Special budget control language was requested for 1997-98 to provide this authority. Without such authority Caltrans would be forced to hold back funds from regular State capital projects in order to avoid any possibility of incurring an unauthorized deficiency in its State Highway Account capital outlay and support appropriations. Work is proceeding as quickly as practical using state cash.

As noted above, the Department of Social Services administers the IFGP as well as a state supplemental program. The IFGP awards money to individuals and families for serious unmet needs resulting from a disaster when other disaster related assistance is either unavailable or inadequate. While the cost of this program is largely accruing in 1996-97, \$4.3 million has been proposed for anticipated 1997-98 costs.

The Governor's Office of Emergency Services administers the Public Assistance program which funds the repair of damaged public facilities. Current estimates are that the cost of this program will be \$206 million, of which FEMA would fund \$154.5 million, the State would fund \$38.6 million, and local governments would fund \$12.9 million. These amounts include \$6.3 million in expedited payments to local agencies for response and debris removal costs. Generally, existing law provides that local agencies fund 25 percent of the 25 percent nonfederal share (6.25 percent) of the cost of repairing/replacing public facilities. However, when a case has been made that local agencies could not provide this share, the Governor has signed legislation authorizing the state to fund the entire nonfederal share. No such legislation has yet reached the point in the legislative process at which the Administration normally takes a formal position.

The Employment Development Department (EDD) is administering a federal grant of \$25 million under the Job Training Partnership Act which is expected to provide approximately 2,200 temporary jobs in the public sector to assist communities in clean-up and repairs after the flood as well as flood prevention efforts. EDD is also responsible for the Disaster Unemployment Assistance Program, under which an estimated 4,000 workers not entitled to regular unemployment insurance benefits will receive an estimated \$15.9 million. These benefits, plus approximately \$2.4 million in administrative costs are being funded by the federal government.

Current income tax law and bank and corporation tax law allow non-business casualty losses over \$100, not reimbursed by insurance, to be deducted if the loss for the year exceeds 10 percent of adjusted gross income. Casualty losses on business property are not subject to the \$100 and 10 percent of adjusted gross income limitations that apply to non-business property. Fifty percent of unused losses may be carried forward for up to 15 years as a net operating loss. Casualty losses that

occur in a federally declared disaster area may be claimed in the year that the disaster occurred, or the preceding year, which allows disaster victims to immediately take advantage of these provisions. If authorizing legislation is enacted, flood victims would also be able to carry forward 100 percent of any unclaimed losses for up to five years, with 50 percent of any remaining losses carried forward for an additional 10 years. Estimated General Fund revenue losses resulting from the provisions in existing law are \$36 million. If legislation regarding the special loss provisions is enacted, these revenue losses would increase by \$17 million.

Current law provides that a county board of supervisors may adopt an ordinance authorizing an assessee to apply for the re-assessment (for property tax purposes) of property damaged in a disaster, and that the property owner may apply to the county for deferral of the property tax until the next installment due following the disaster. The county may apply to the State for a "bridge loan" to cover cash flow losses during the period of deferment. If legislation authorizing such a program is enacted, counties would be required to repay the State for only that portion of the loan which exceeds their actual property tax loss. Such legislation would result in estimated costs of approximately \$500,000. Property tax revenue losses to schools which would be funded by the state under the Proposition 98 guarantee is estimated to be approximately \$1 million.

C. Prevention/Long Range Planning

In addition to the repair of damage caused by the floods, this report discusses measures that may need to be taken to minimize the impacts of future floods. As with other natural disasters, some of these efforts will proceed through the Hazard Mitigation Program which is jointly operated by OES and FEMA. However, planning related to floods also involves a substantial effort by DWR.

As an initial step to address the long-range, broad policy concerns, this report recommends broadening the DWR's floodplain management program to be more pro-active by: (a) providing assistance to State agencies to comply with the Governor's Executive Order regarding avoiding flood hazards when siting new state facilities, and (b) working with local agencies to develop floodplain management and flood hazard mitigation plans.

In addition, this report recommends three major planning projects to be undertaken by DWR. The Sacramento River Watershed Management Study would require \$500,000 in State funds the first year and a total of \$4.0 million State funds, leveraging a 50 percent federal match. The San Joaquin River Watershed Management Study would require \$500,000 in State funds the first year and a total of \$4.5 million state funds with a 50 percent federal match. The Yuba River Feasibility Study would require \$775,000 in state funds, all in the first year, with a 75 percent match from federal and local agencies. Yuba River Project design costs would be-

gin in 1998-99. As stated previously, the FEAT recommends the Administration propose legislation which would fund first year costs of these projects in 1997-98.

Based on information provided to the FEAT, there seem to be a large number of federal, state and local agencies that are involved in flood control issues. In addition to those agencies directly involved in issues such as levee maintenance, there are a number of others concerned with the environmental impacts of flood control projects and/or alternatives to traditional flood control measures. *The FEAT recommends Department of Finance to develop an inventory of federal, State, and local agencies involved in flood control efforts and/or related environmental regulation. Such an inventory could be helpful in the coordination of the many agencies concerned with flood control.*

These planning projects could result in recommendations to significantly change the current flood control system. Any such changes would likely require significant funding from both the state and the federal government.

D. Federal Funding Issues

Under existing law, the federal government has a very significant role in the repair of flood related damage as well as planning to limit the frequency and extent of future floods. Unfortunately, additional funding for federal agencies is necessary if the federal government is to meet these obligations. The primary needs for additional federal funding are to repair damaged levees and highways.

The federal share of levee repair costs is estimated at \$300 million. However, the President has only proposed \$202 million for the U.S. Army Corps of Engineers to perform the needed work. It is essential that the federal government share in the cost of repairing levees which have been breached as well as the cost of strengthening levees which were weakened by the floods as necessary to ensure public safety.

Although the Federal Highway Administration had indicated that \$50 million was available for California State and local government losses of the \$100 million annual appropriation for disasters, these funds have not yet been released pending Congressional action on a supplemental appropriations bill. We understand that the Clinton Administration supports supplemental appropriations for Federal Fiscal Year (FFY) 97 of \$208 million for State and local roads in California and \$50 million for federal roads. Added to the \$50 million previously promised, this would provide \$308 million of \$432 million needed within California. Assuming level expenditures in State Fiscal Year 1997-98, this would provide sufficient funds to cover expenditures until FFY 98 begins in October. At a minimum, California would need to have \$124 million appropriated in the FFY 98 Budget above the usual \$100 million. However, this level does not deal with any damages in recent months in the rest of the United States or any of the approximately \$237 million unfunded federal share of cost from previous disasters.

E. Estimated Costs

The discussion above has included the most significant costs which are estimated to result from the January 1997 floods. A more extensive listing is included in the table which follows this page.

The table indicates that the cost of flood related programs in which the State participates is currently estimated to be \$864.9 million. The federal share of this cost is estimated at \$620.6 million, not including \$300 million anticipated to be expended directly by the Corps. The State share is estimated to be \$219.2 million, \$183.2 million GF, \$36 million Special Fund (SF). The local share is estimated to be \$25.1 million. Based on the information available at this time, it appears that 1996-97 costs will be \$85.2 million (\$73.3 million GF, \$11.9 million SF) and 1997-98 costs are estimated at \$64.6 million (\$40.8 million GF, \$23.8 million SF).

F. Overview of Disaster Assistance Programs and Issues

FEMA and other federal, State, local, and volunteer agencies offer disaster assistance in several forms. Basic disaster assistance from the State or federal government falls into three categories: public assistance, hazard mitigation assistance, and assistance to individuals and businesses.

1. Public Assistance

Public assistance refers to federal and State programs that provide funding to State and local governments, and to certain nonprofit organizations to assist them in recovering from a disaster. The federal program is administered by FEMA, and the State program is administered by OES. The public assistance program reimburses eligible expenditures to repair or replace facilities such as roads, bridges, utilities, buildings, schools, recreational areas, and similar publicly-owned property, which were damaged in a disaster. The programs also fund some measures taken to protect life and property during the response phase of the disaster, as well as debris removal. The federal Public Assistance Program funds up to 75 percent of eligible costs. The remaining 25 percent costs are split between the State and local entity (18.75 percent State, 6.25 percent local). Other federal agencies, such as the Corps, the Natural Resource Conservation Service, and the Federal Highway Administration, also fund certain disaster recovery projects, in accordance with their own authority.

Table VIII-1. Estimate of Costs Resulting from 1997 Floods
(in millions of dollars)

Dept. or Program	Estimated Cost				Estimated State Cost by Fiscal Year		
	Total Costs	Federal Share	State Share	Local Share	1996-97	1997-98	Future Years
OES-Local Assistance	206.0	154.5	38.6 GF	12.9	6.3 GF	10.0 GF	22.3 GF
Operations	4.2	1.2	3.0 GF	-	3.0 GF	-	-
Trade & Commerce Agency—Small Business Loan Program	0.6	-	0.6 GF	-	0.6 GF	-	-
Tourism Advertising	1.0	-	1.0 GF	-	1.0 GF	-	-
Dept. of Transportation	424.0	382.0	34.0 SHA	8.0	11.0 SHA	23.0 SHA	-
California Highway Patrol	1.6	1.2	0.4 MVA	-	0.4 MVA	-	-
Calif. Tahoe Conservancy	0.3	0.2	0.1 GF	-	-	0.1 GF	-
Calif. Cons. Corps (SO)	1.2	0.9	0.2 GF	0.1	0.2 GF	-	-
Dept. of Water Resources State Operations	27.6	4.2	23.4 GF	-	7.8 GF	6.5 GF	9.1
Local Assistance	2.4	-	2.4 GF	-	2.4 GF	-	-(3)
Capital Outlay	39.9 (1)	-(1)	35.8 GF	4.1	13.4 GF	4.7 GF	17.7 (3)
Dept. of Forestry	6.3	4.6	1.7 GF	-	1.7 GF	-	-
Dept. of Fish and Game	3.6	2.7	0.9 SF	-	0.4 SF	0.4 SF	0.1 SF
State Coastal Conservancy	0.13	0.1	0.03 SF	-	-	0.03 SF	-
Dept. of Parks and Recreation	3.8	2.9	0.9 (2)	-	0.2 (2)	0.5 (2)	0.2 (2)
San Joaquin River Conserv.	0.13	0.1	0.03 SF	-	0.01 SF	0.02 SF	-
Mental Health (Counseling Services)	0.5	0.5	-	-	-	-	-
Social Services: IFGP	23.1	17.3	5.8 GF	-	4.6 GF	1.2 GF	-
State Supplemental	11.0	-	11.0 GF	-	8.9 GF	2.1 GF	-
Administration	3.2	-	3.2 GF	-	2.2 GF	1.0 GF	-
Employment Development Department	43.3	43.3	-	-	-	-	-
Youth Authority	0.4	0.3	0.1 GF	-	0.1 GF	-	-
Corrections	3.6	2.7	0.9 GF	-	0.9 GF	-	-
Military Dept.	2.5	1.9	0.6 GF	-	0.6 GF	-	-
Prop. Tax Relief	1.5	-	1.5 GF	-	0.5 GF	1.0 GF	-
Casualty Losses:							
Current law	36.0	-	36.0 GF	-	19.0 GF	9.0 GF	8.0 GF
Legislation	17.0	-	17.0 GF	-	-	5.0 GF	12.0 GF
Totals	864.9	620.6	219.2	25.1	85.2	64.6	69.4
General Fund State Costs			183.2 GF		73.3 GF	40.8 GF	69.2 GF
Special Fund Costs			36.0 SF		11.9 SF	23.8 SF	0.2 SF

(1) The Corps anticipates spending up to \$300 million for levee repair. However, this amount is not included in these totals, since those funds will be spent directly by the federal agency and will not be received by the State.

(2) Comprised of \$590,000 State Park Recreation Fund (SPRF) and \$360,000 GF. Same ratio assumed for 1996-97, 1997-98, and future years. The SPRF costs will be absorbed within the DPR's existing budget.

(3) Does not include potential future bond funded projects.

2. Hazard Mitigation Assistance

Hazard mitigation assistance provides aid in support of measures that will permanently eliminate or reduce an area's long-term vulnerability to the loss of human life and property from a particular hazard. It is made available to all State and local government agencies, special districts, and eligible private nonprofit organizations located in a declared disaster area, to implement measures that will reduce loss of life and property damage in future events. Grants are awarded through a competitive proposal process and require a 25 percent local fund match. The total amount of funds available for the program is calculated based on the total of federal assistance provided for the disaster.

3. Individual Assistance

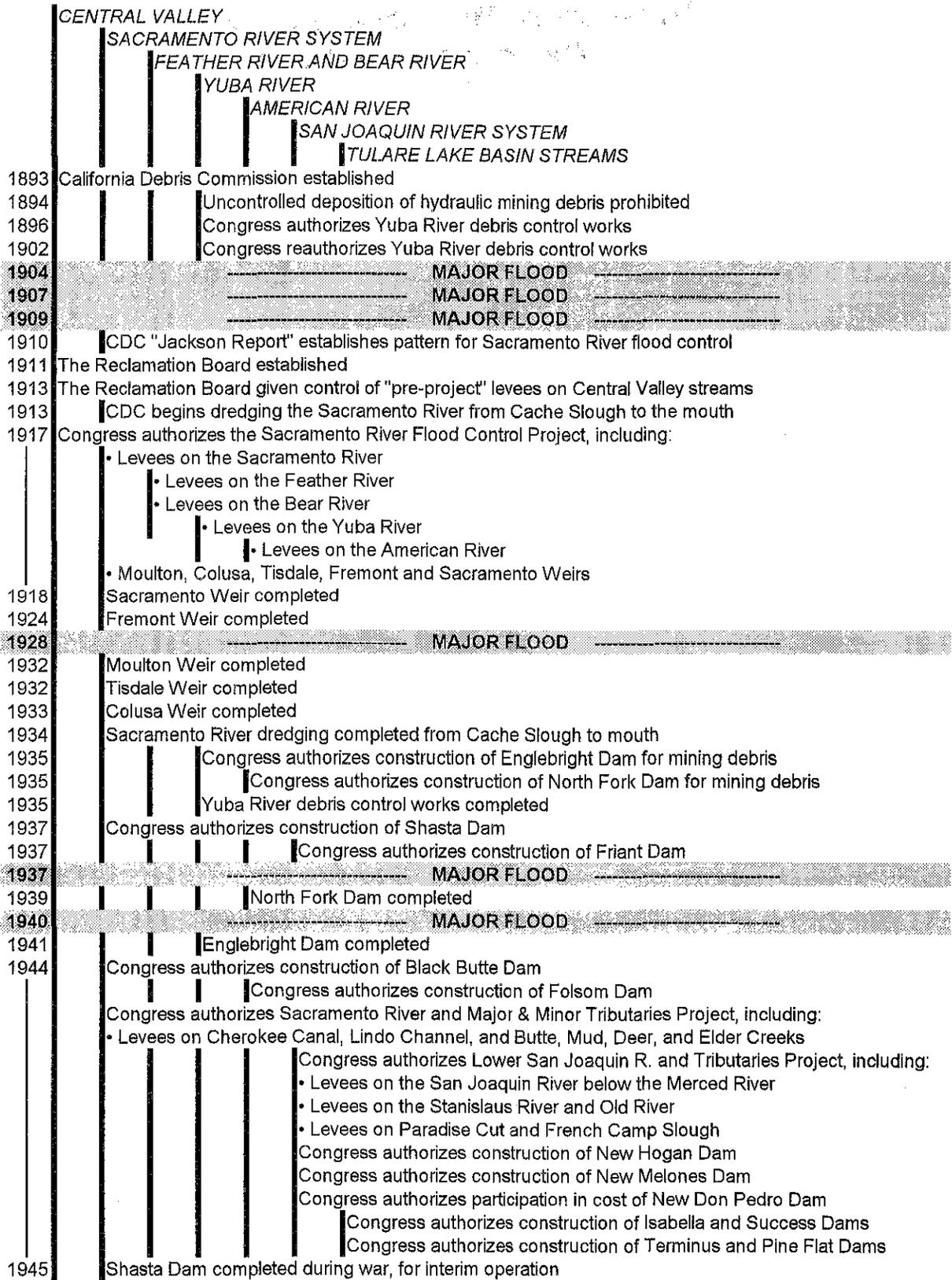
Individual assistance provides resources to individuals, families, and businesses (including nonprofit) and can include the following assistance: mass care, shelter, feeding, insurance recovery, crisis counseling, disaster housing assistance, disaster loans and grants, and unemployment assistance. Most federal assistance is in the form of low interest loans. These loans pay expenses not covered by State or local programs, or private insurance. Low interest loans are available for eligible individuals, businesses, and farms from the Small Business Administration and Farmers Home Administration to repair or replace damaged property and personal belongings not covered by insurance, and to provide working capital for businesses.

G. Unresolved Issues

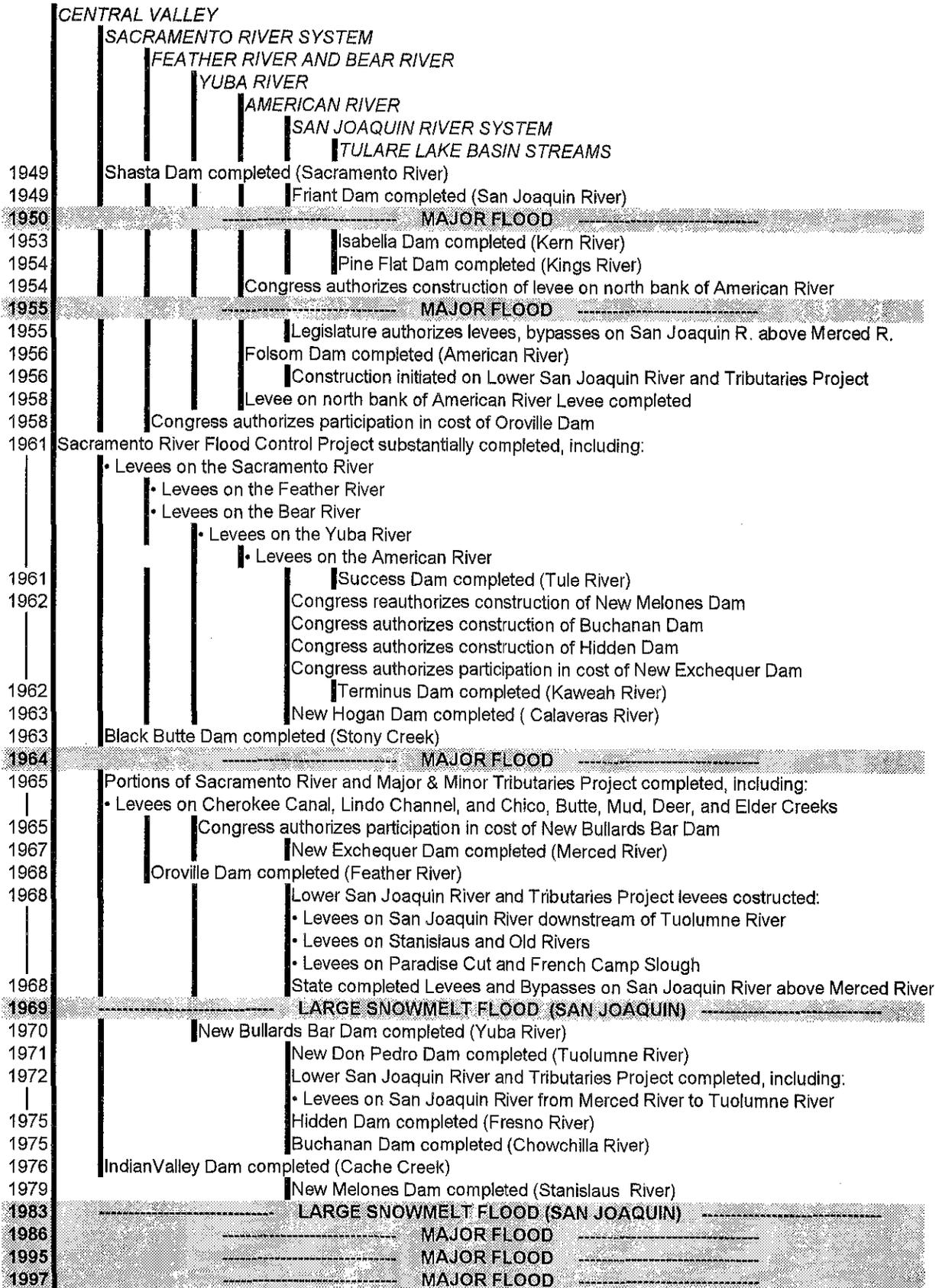
FEMA policy changes resulting from the 1993 midwest floods and the 1995 California floods resulted in a reduction of federal disaster assistance eligibility for State and local government for making levee repairs which had direct impact on the safety of individuals and protection of property. It is the experience of the State and local governments that some FEMA eligibility determinations are being made retroactively and in some cases in conflict with federal regulations and the Stafford Act. An example is levee repairs. The *Stafford Act* specifically mentions the repair of levees as an *authorized activity*. FEMA's failure to recognize and fund 5-year level of repairs to the Cosumnes River levees protecting State and federal highways needs to be addressed. Further, the State had to provide funds to pump-out lands flooded by levee failures that FEMA should have recognized as threats to public health and safety. These flooded areas also threatened public infrastructure. (See Appendix E.)

Appendix A: Milestones in Flood Control California's Central Valley

MILESTONES IN FLOOD CONTROL -- CALIFORNIA'S CENTRAL VALLEY



MILESTONES IN FLOOD CONTROL -- CALIFORNIA'S CENTRAL VALLEY



Appendix B: Hydrologic Summary

This appendix consists of a “Background Event Recap”—which provides a narrative summary of hydrologic information on the 1997 floods—as well as a number of data display charts. Figures B-1 through B-15, listed below, include peak flows, water operations during the flood period on eight major Central Valley reservoirs, and some peak stage comparisons with recent floods at a number of river stations in the Sacramento and San Joaquin River system. Two isohyetal maps (contours of rainfall depths) are also presented for the two major periods of rain. Although the data is the best currently available, technical analyses are continuing and final published figures may change upon further review by hydrologists and engineers.

Background Event Recap	181
Figure B-1. Annual Peak Discharges at Selected Long-Term U.S. Geological Survey Gaging Stations	183
Figure B-2. Shasta Lake Operations	184
Figure B-3. Lake Oroville Operations	185
Figure B-4. New Bullards Bar Reservoir Operations	186
Figure B-5. Folsom Lake Operations	187
Figure B-6. New Melones Reservoir Operations	188
Figure B-7. Don Pedro Reservoir Operations	189
Figure B-8. Lake McClure Operations	190
Figure B-9. Millerton Lake Operations	191
Figure B-10. Isohyetal Map: Northern and Central California, New Year's Flood. December 26, 1996 to January 3, 1997	192
Figure B-11. Isohyetal Map: Northern and Central California, Late January Flood. January 20-29, 1997	193
Figure B-12. Peak Flood Stages—Upper and Middle Sacramento River ...	194
Figure B-13. Peak Flood Stages—Feather, American and Lower Sacramento Rivers	195
Figure B-14. Peak Flood Stages—Cosumnes and Mokelumne Rivers	196
Figure B-15. Peak Flood Stages—Tuolumne and San Joaquin Rivers	197

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

Background Event Recap

The New Year's Day Flood of 1997 was one of the largest storms in northern California this century.

This was a classic orographic event with warm moist winds from the southwest blowing over the Sierra Nevada and dropping astounding amounts of rain at the middle and high elevations centering on New Year's Day. The volume of runoff exceeded the flood control capacity of Don Pedro Reservoir on the Tuolumne River and Millerton Reservoir on the upper San Joaquin River with large spills of excess water. Most of the other large dams in northern California were full or nearly full at the end of the storm.

In contrast to the torrential downpours in the upper watersheds, rain at lower elevations was not unusual. For example, downtown Sacramento had 3.7 inches from December 26, 1996 through January 2, 1997. But Blue Canyon, at the one-mile elevation between Sacramento and Reno, had over 30 inches, an orographic ratio of over 8, far more than the usual 3 to 4 for most storms. Residents could not understand that there was a problem because they were not seeing a lot of rain. Yet, the northern Sierra residents saw 20 inches, some 40 percent of average annual precipitation.

Flooding occurred on the Coast Range, but not to record levels. The Russian, Napa, and Pajaro rivers did not rise as high as the floods of 1995. Further north, the Eel, Klamath and Smith rivers rose higher than 1995, but did not set records.

Most of the flood-producing storms in the past started with drier watersheds, particularly in December 1955 and to a lesser extent in December 1964 and February 1986, respectively.

But a few days before Christmas, the big storm was followed by a cold snowstorm which blanketed snow at low elevations. After this snowstorm the mile-high Blue Canyon station had a snowpack of 5 inches of water content. The storm pelted over 30 inches of rain on Blue Canyon from December 26 to January 2 melting the existing snowpack there, and at other low elevations. But the middle and high elevation snowpack remained with the rain percolating through the pack. Not much loss was observed on the snow sensors over 6,000 feet in elevation in the northern Sierra, despite snow levels up to 9,000 feet at times.

Most people had the impression that melting snow caused the floods. Snowmelt, partly from lower elevations added to the runoff, perhaps 15 percent. But the bulk of runoff was from too much rain.

The amount of precipitation at Blue Canyon for the December through January period was a record 75 inches, about 43 inches during December and 32 inches in January. The station's annual total averages about 63 inches. The December amount was second wettest for that month, after 1955.

Rainfall was light after January 3, allowing the flood control system to drain and restoring reservoir flood control space. After January 20, another siege of heavy rain occurred. This was not as heavy as the year end storms (about two thirds as much) but had snow levels about 2,000 feet lower, helping hold more water on the mountains as snow. But runoffs were large with higher peaks on a few streams.

Sacramento River region reservoir flood control space was restored before the second storm and it handled the second storm easily. Flood releases were kept lower to avoid overtopping the partially completed levee break repairs on the Sutter Bypass and along the Feather River south of Marysville. This time lower elevation stations caught heavy rain with some local creek flooding.

In the San Joaquin region there had not been enough time to restore full flood control space. The channel capacity of the rivers is more constricted than in the Sacramento Valley, limiting downstream releases. Amounts were heavy with over 11 inches in the Stanislaus and San Joaquin (above Friant) basins during seven days ending on January 27. On January 24, it appeared that a number of the foothill reservoirs would fill and spill. Fortunately, the next two days of rain were less than forecast, and releases were controlled to channel capacity downstream.

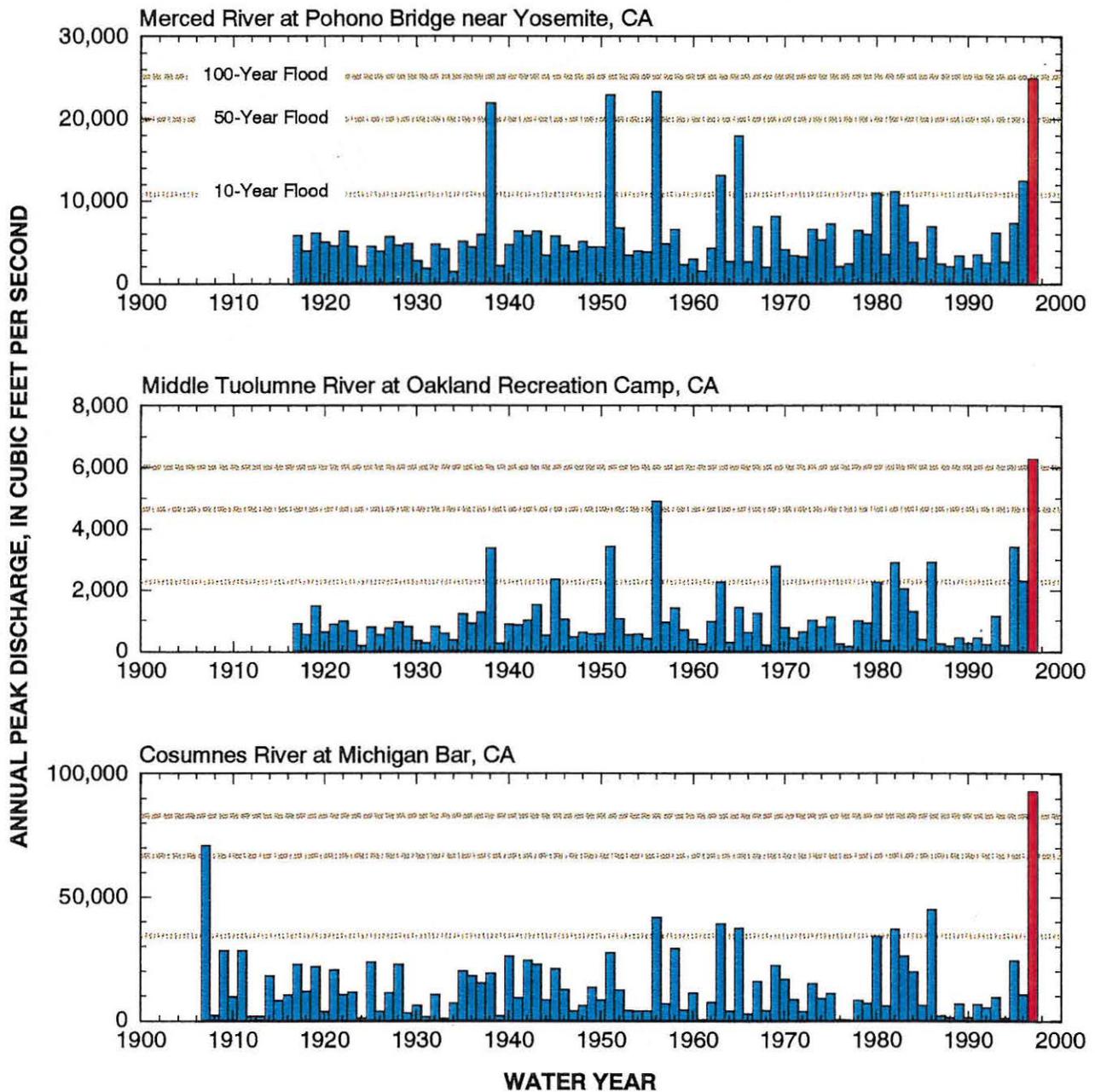
The northern three basins, upper Sacramento, Feather and Yuba rivers, were hard hit, with less impact than on the American River (primarily on the North and Middle forks), then heavier surge on the South Fork of the American and the Cosumnes and Mokelumne rivers with heavier impacts on the Tuolumne and San Joaquin rivers again. The Cosumnes River southeast of Sacramento exceeded the previous flood peak at the Michigan Bar gaging station by a wide margin. The estimated recurrence interval for the 1997 flood on the Cosumnes River is about 100 years. The peak stage of 18.3 feet also exceeded the previous reported peak of 16.3 feet in the March 1907 flood. The following figures are provided:

- B-1: Annual Peak Discharges at Long-Term USGS Gaging Stations
- B-2 through B-9: Reservoir Operations Charts
- B-10 through B-11: Isohyetal Charts
- B-12 through B-15: Peak Flood Stage Charts¹

¹ "Flood Stage" and "Warning Stage" gage readings are indicated on each bar chart. This provides points of comparison for the peak stages shown:

- For non-leveed streams, warning stage is the water level which may cause minor flooding of low-lying lands; flood stage is the level which causes considerable inundation of land and poses a threat of significant hazard to life and property.
- For leveed streams, warning stage is the level at which patrol of flood control project levees becomes mandatory; flood stage is the level at which flow in a flood control project is at maximum design capacity with a minimum freeboard of 3 feet to the top of the levee.

Annual Peak Discharges at Selected Long-Term U.S. Geological Survey Gaging Stations

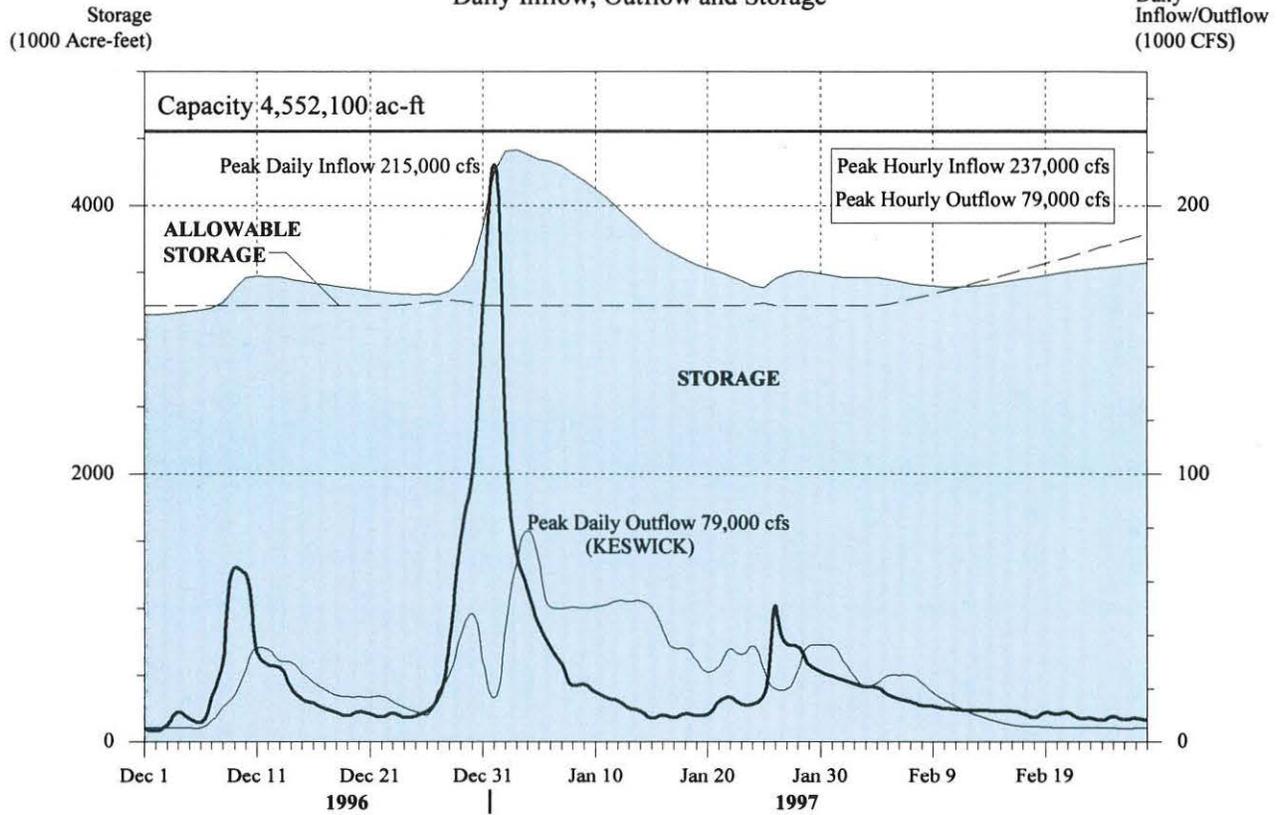


The recurrence intervals of floods are determined from the history of peak flows at specific locations. In addition to the valuable warning that streamflow gaging stations provide during floods, the long-term record that is collected year after year provides the information necessary to put the floods into proper perspective. (Peak discharge data for the January 1997 flood is provisional, subject to revision. For additional information contact District Chief, U.S. Geological Survey, Placer Hall, 6000 J Street, Sacramento, CA 95819-6129. Phone: (916) 278-3026. E-mail: dc_ca@usgs.gov. World Wide Web: <http://water.wr.usgs.gov/>)

SHASTA LAKE OPERATIONS

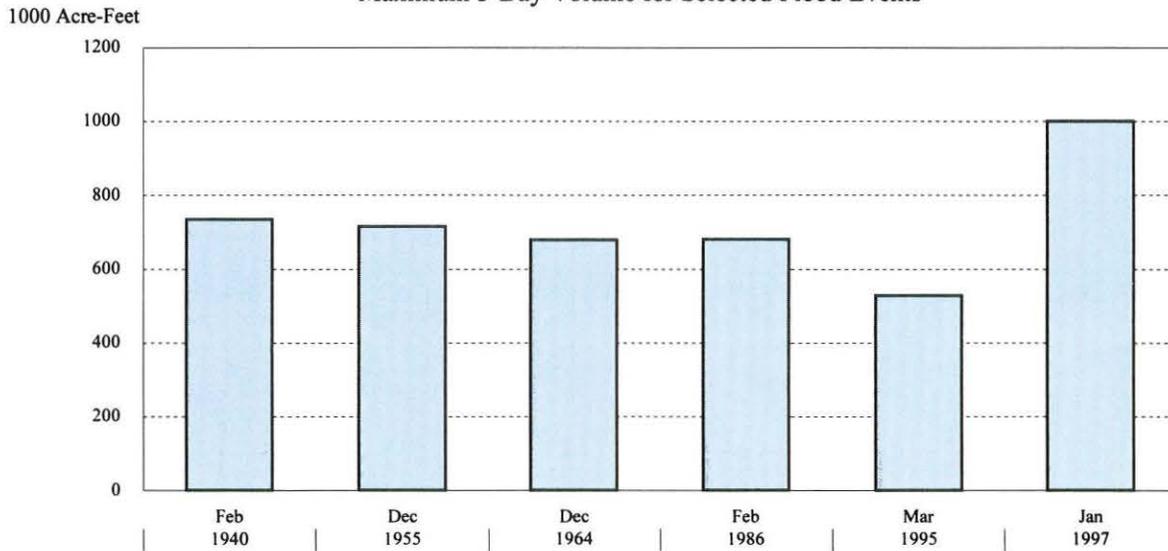
Sacramento River

Daily Inflow, Outflow and Storage



SACRAMENTO RIVER RUNOFF at Shasta Lake

Maximum 3-Day Volume for Selected Flood Events

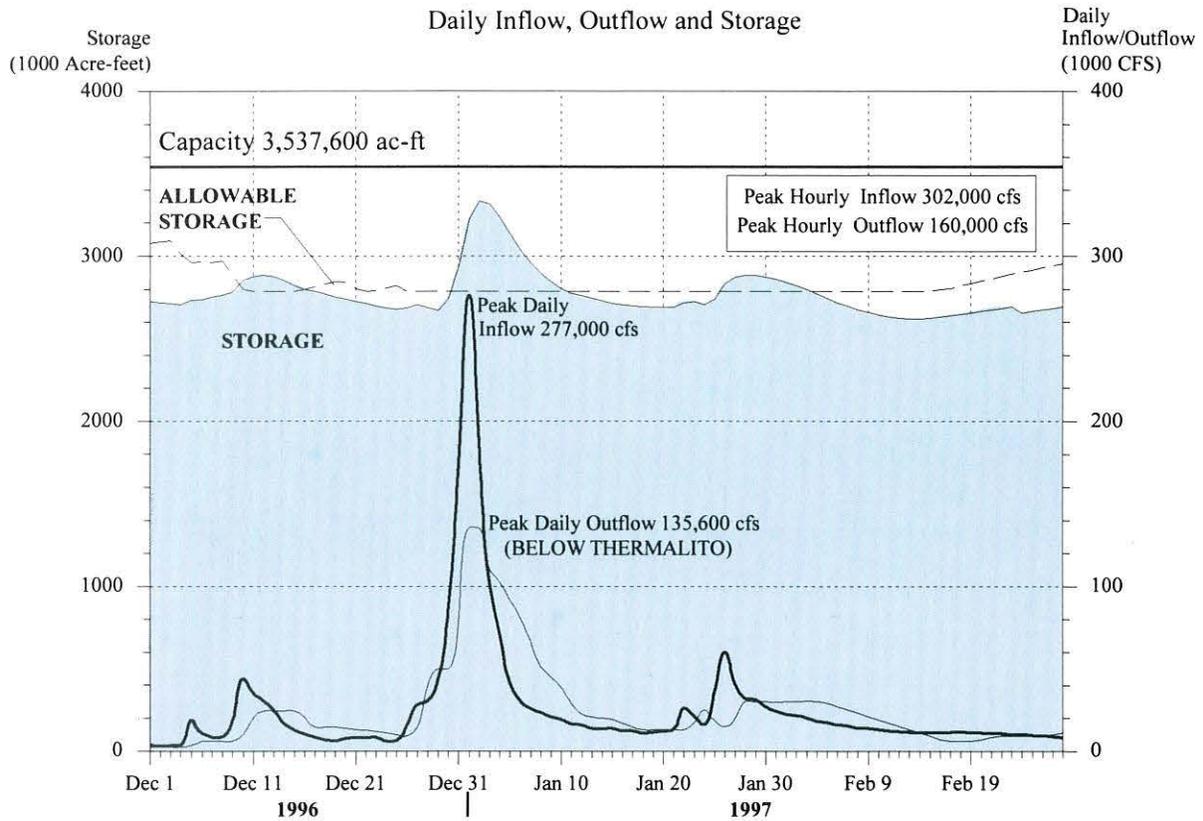




LAKE OROVILLE OPERATIONS

Feather River

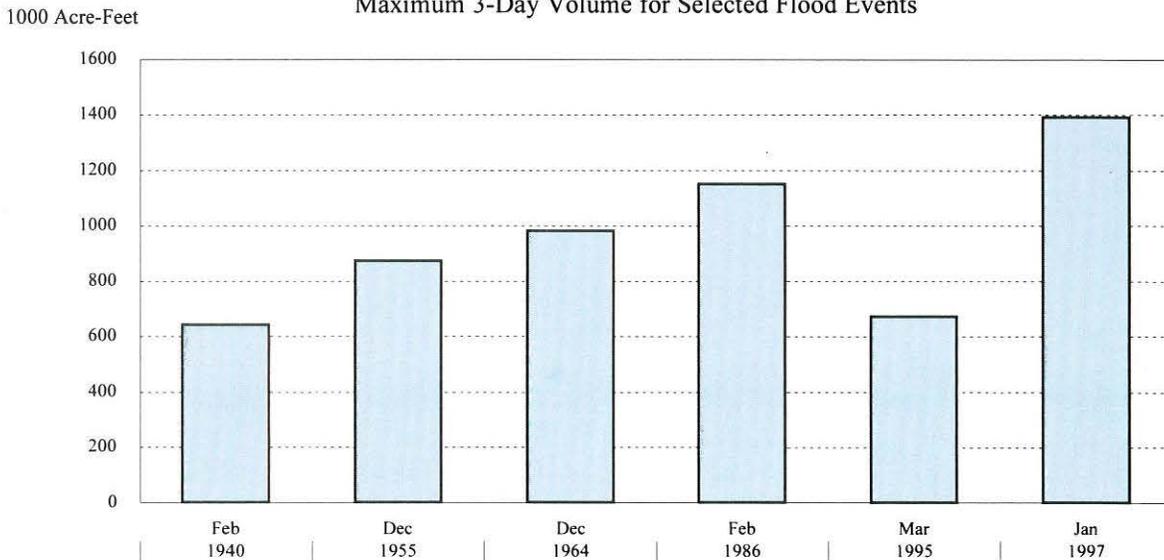
Daily Inflow, Outflow and Storage



FEATHER RIVER RUNOFF

at Lake Oroville

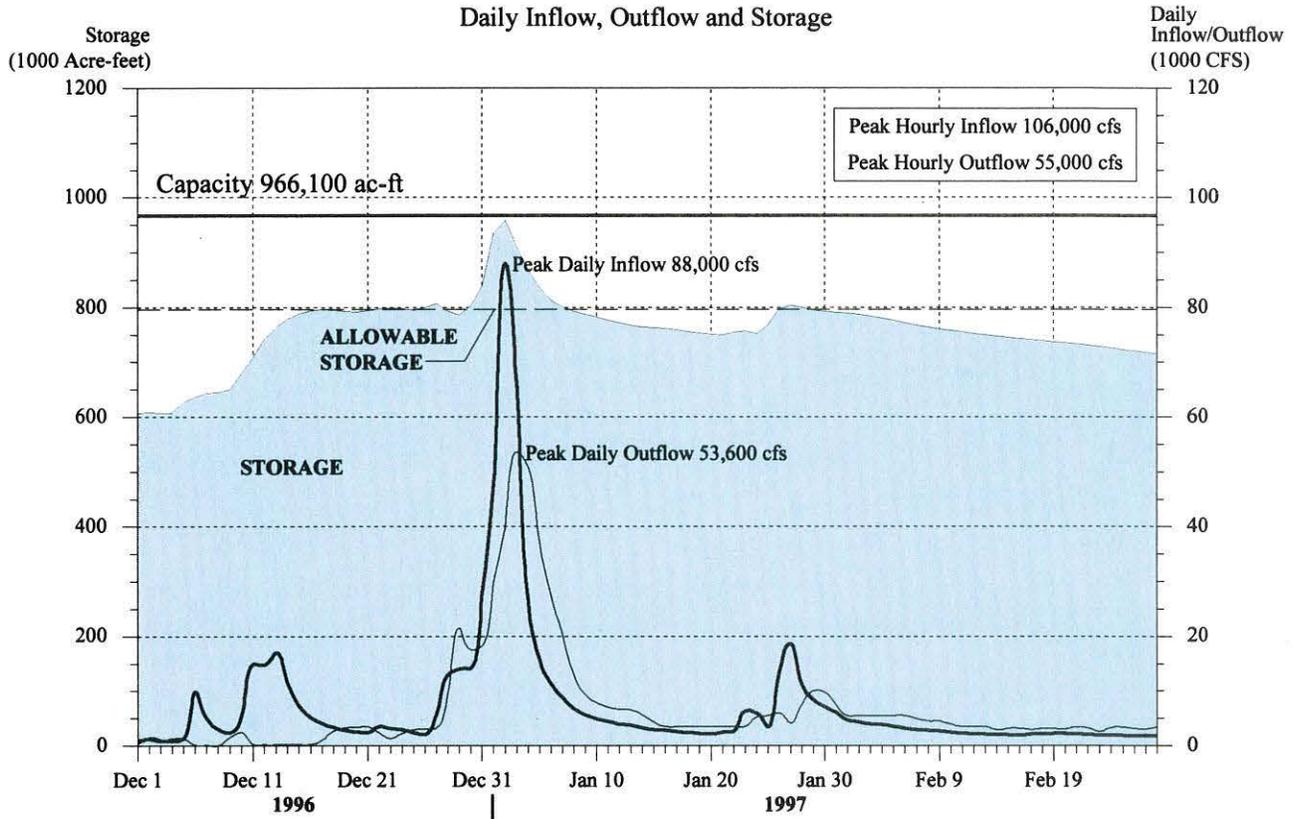
Maximum 3-Day Volume for Selected Flood Events



NEW BULLARDS BAR RESERVOIR OPERATIONS

Yuba River

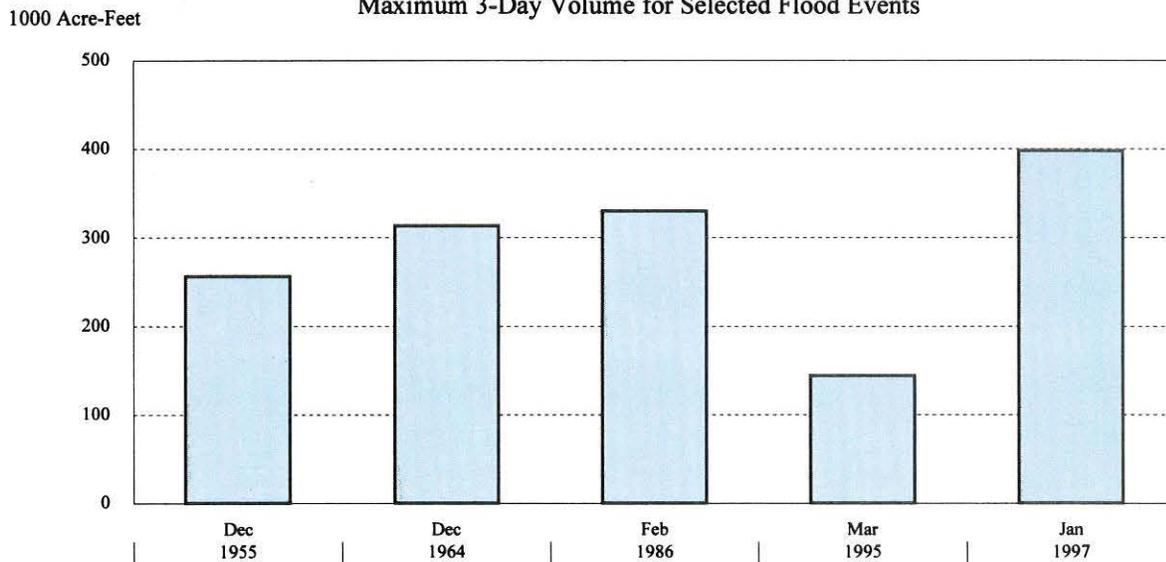
Daily Inflow, Outflow and Storage



YUBA RIVER RUNOFF

at New Bullards Bar Reservoir

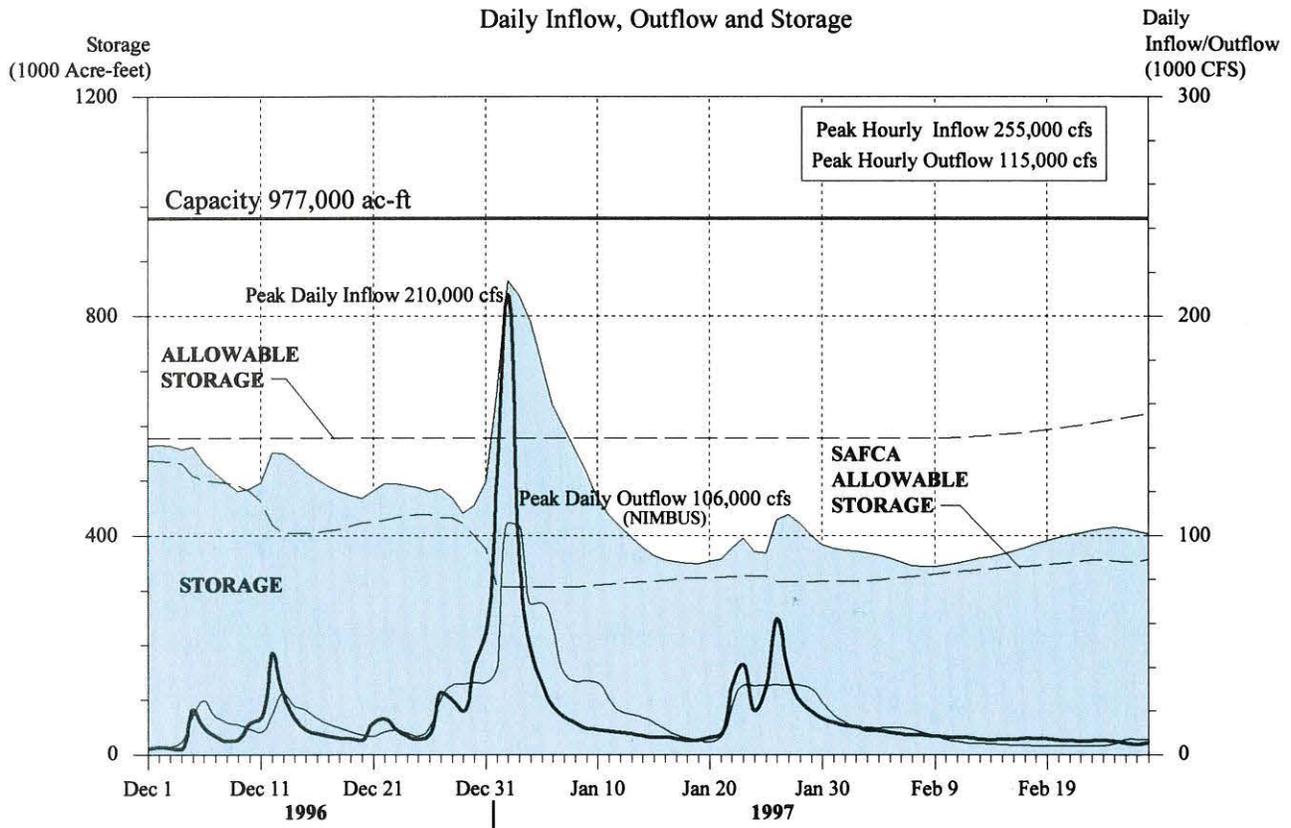
Maximum 3-Day Volume for Selected Flood Events



FOLSOM LAKE OPERATIONS

American River

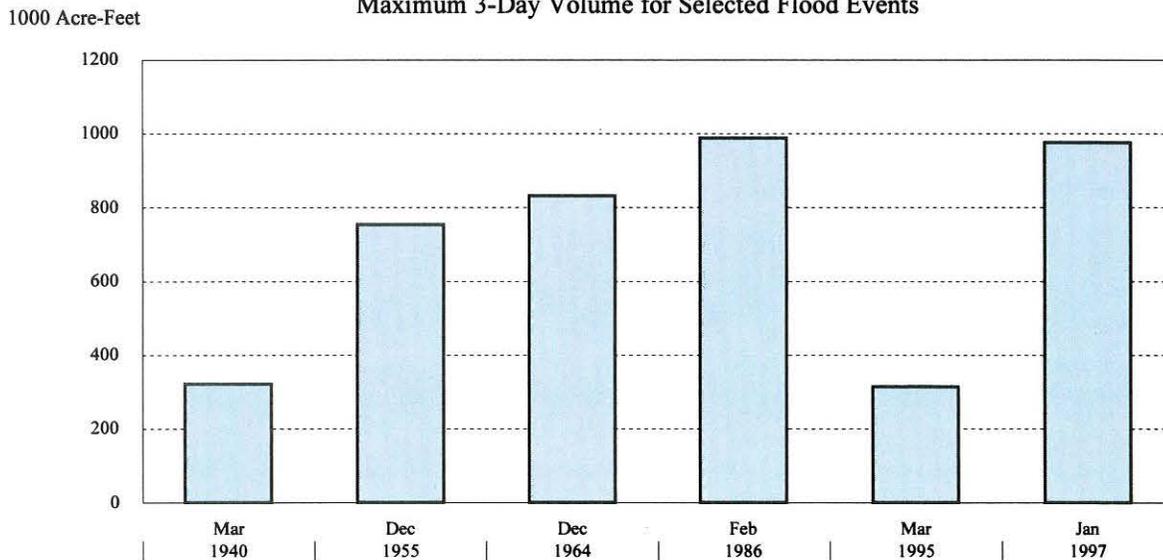
Daily Inflow, Outflow and Storage



AMERICAN RIVER RUNOFF

at Folsom Lake

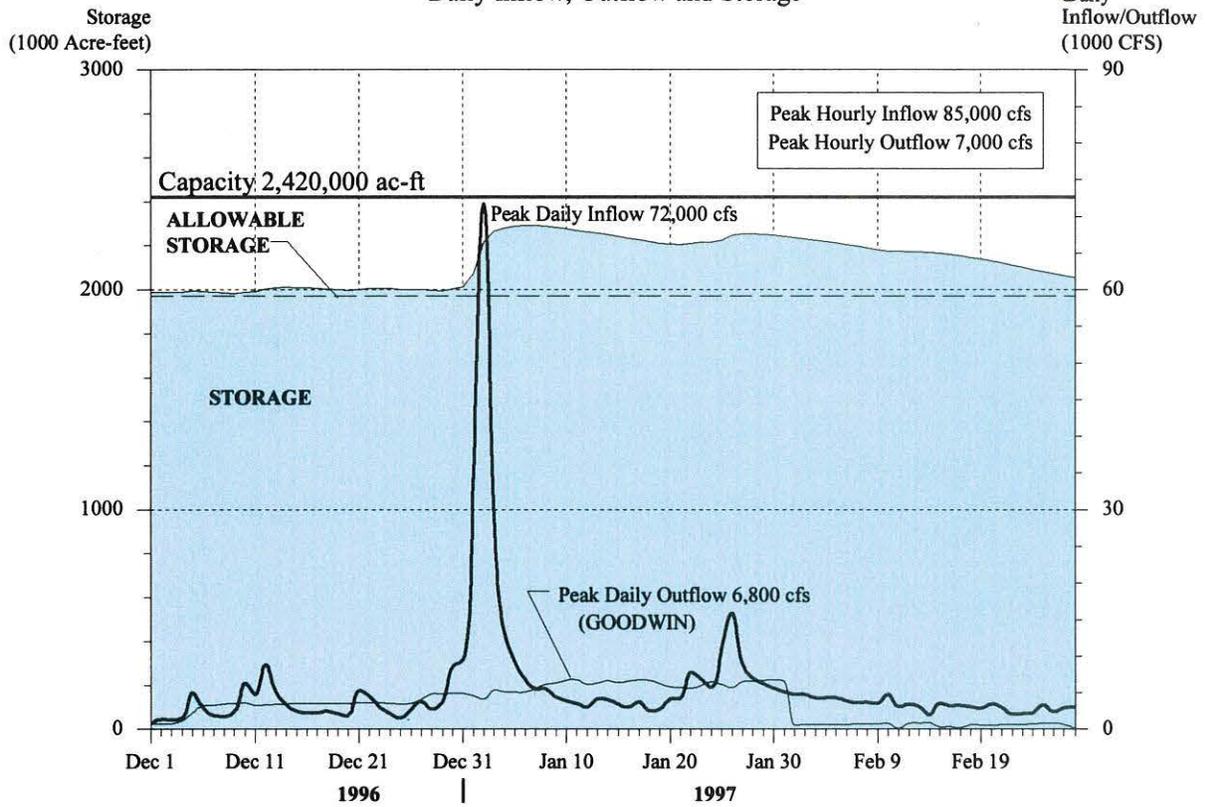
Maximum 3-Day Volume for Selected Flood Events



NEW MELONES RESERVOIR OPERATIONS

Stanislaus River

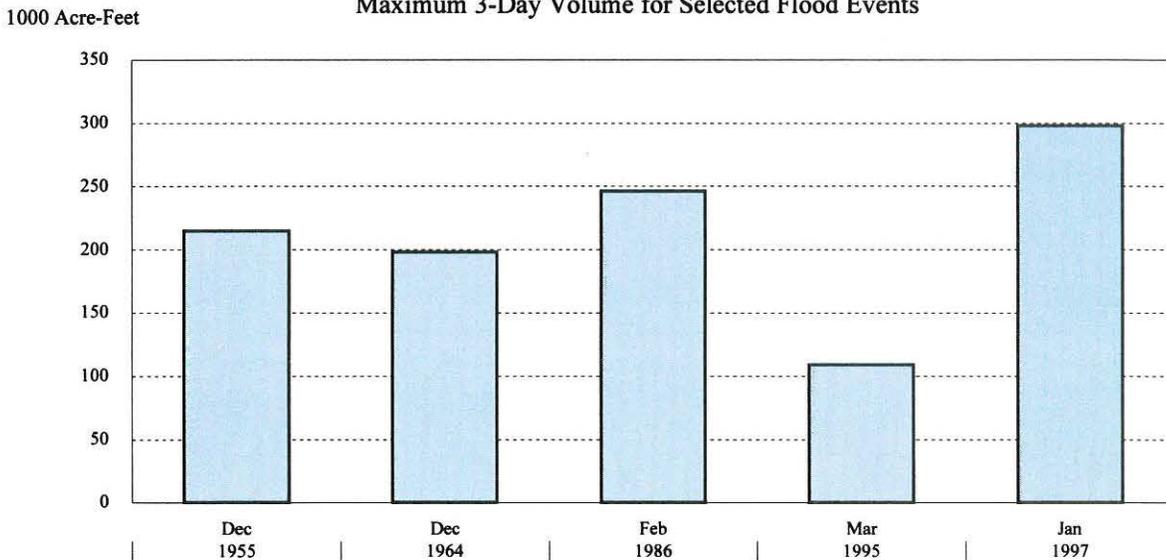
Daily Inflow, Outflow and Storage



STANISLAUS RIVER RUNOFF

at New Melones Reservoir

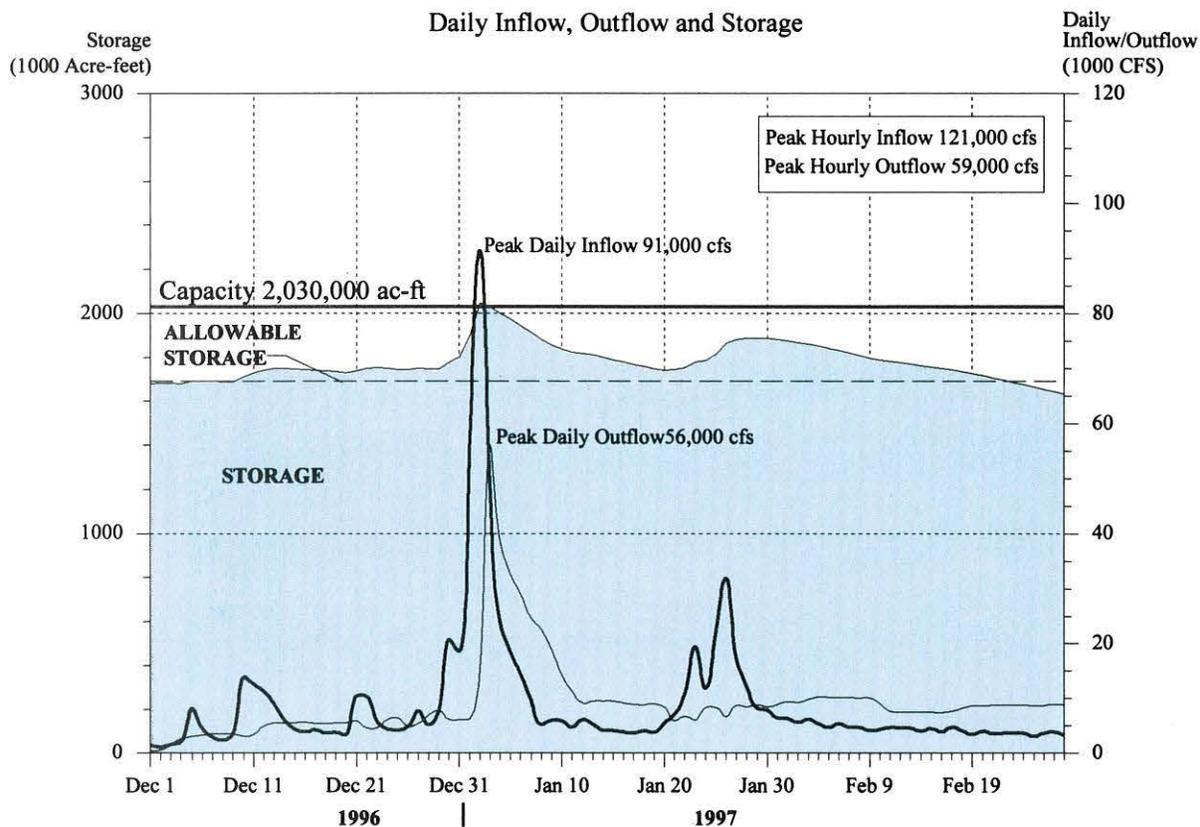
Maximum 3-Day Volume for Selected Flood Events



DON PEDRO RESERVOIR OPERATIONS

Tuolumne River

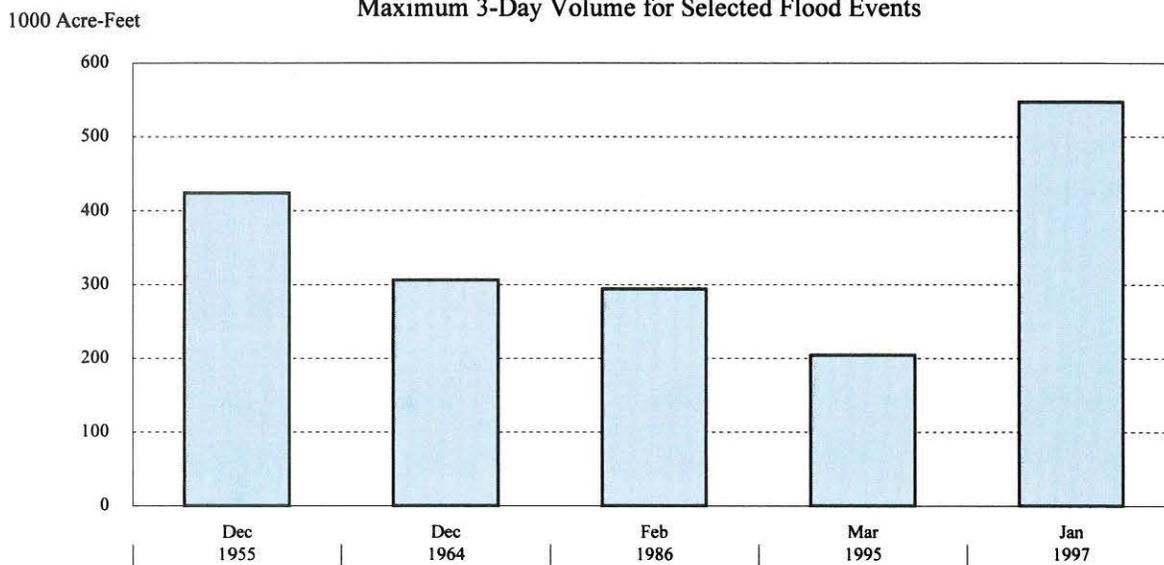
Daily Inflow, Outflow and Storage



TUOLUMNE RIVER RUNOFF

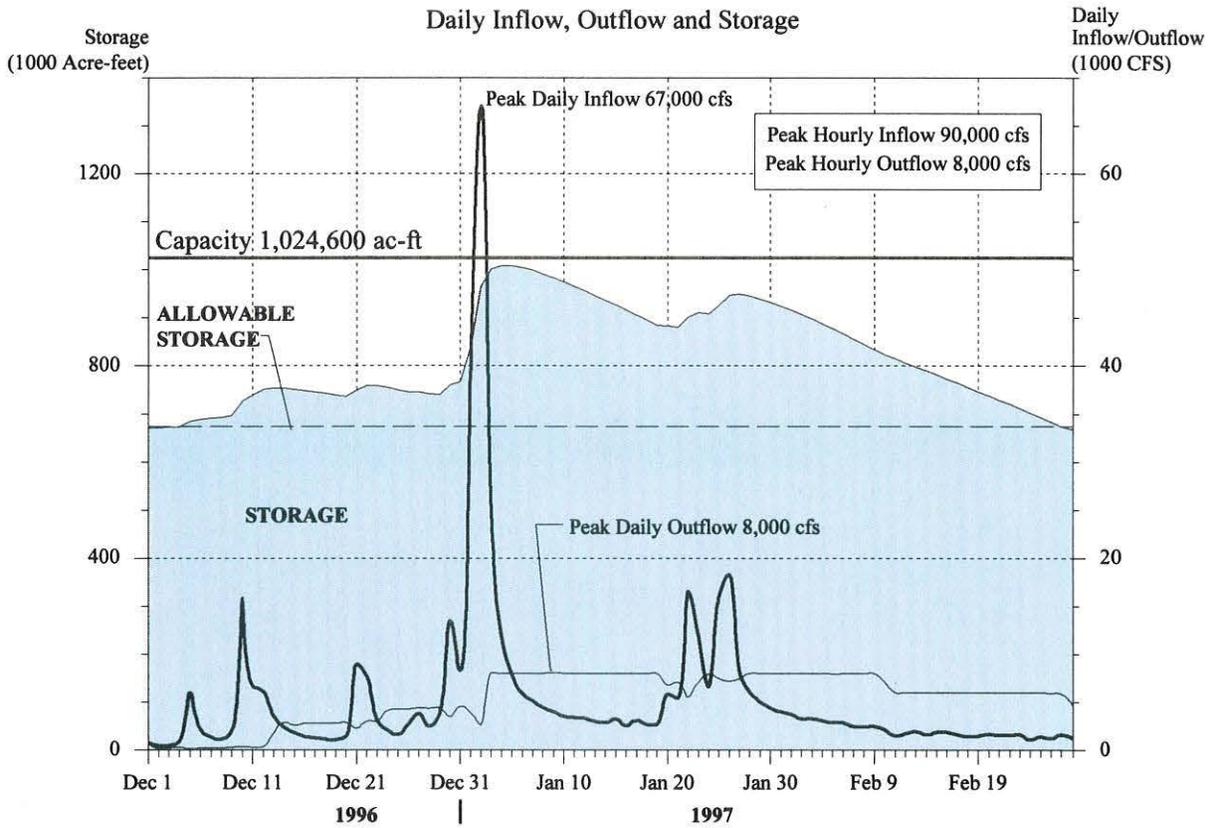
at Don Pedro Reservoir

Maximum 3-Day Volume for Selected Flood Events



LAKE McCLURE OPERATIONS

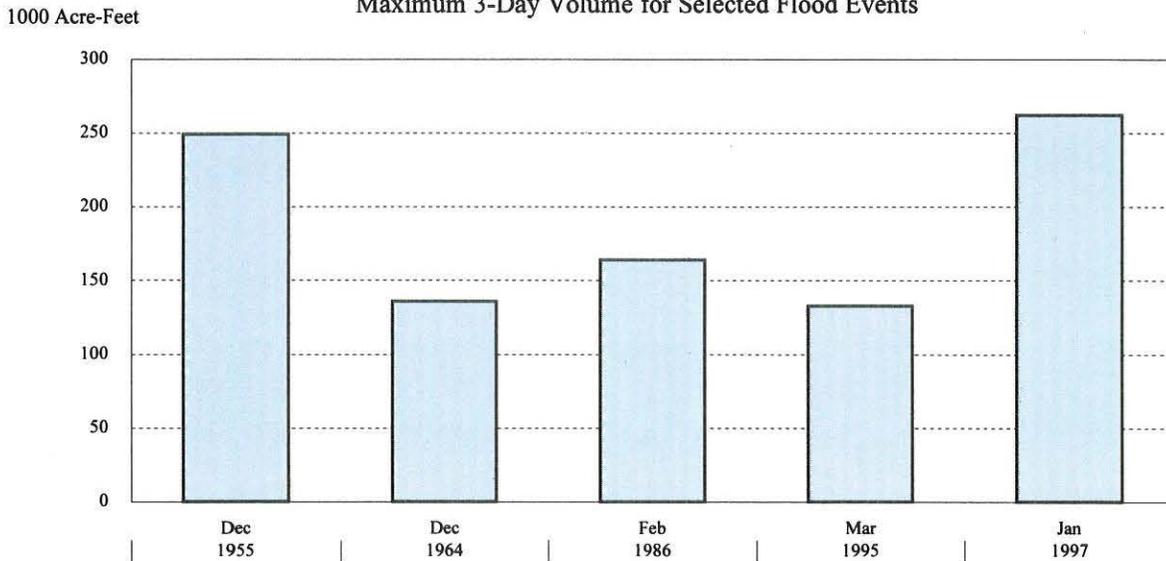
Merced River



MERCED RIVER RUNOFF

at Lake McClure

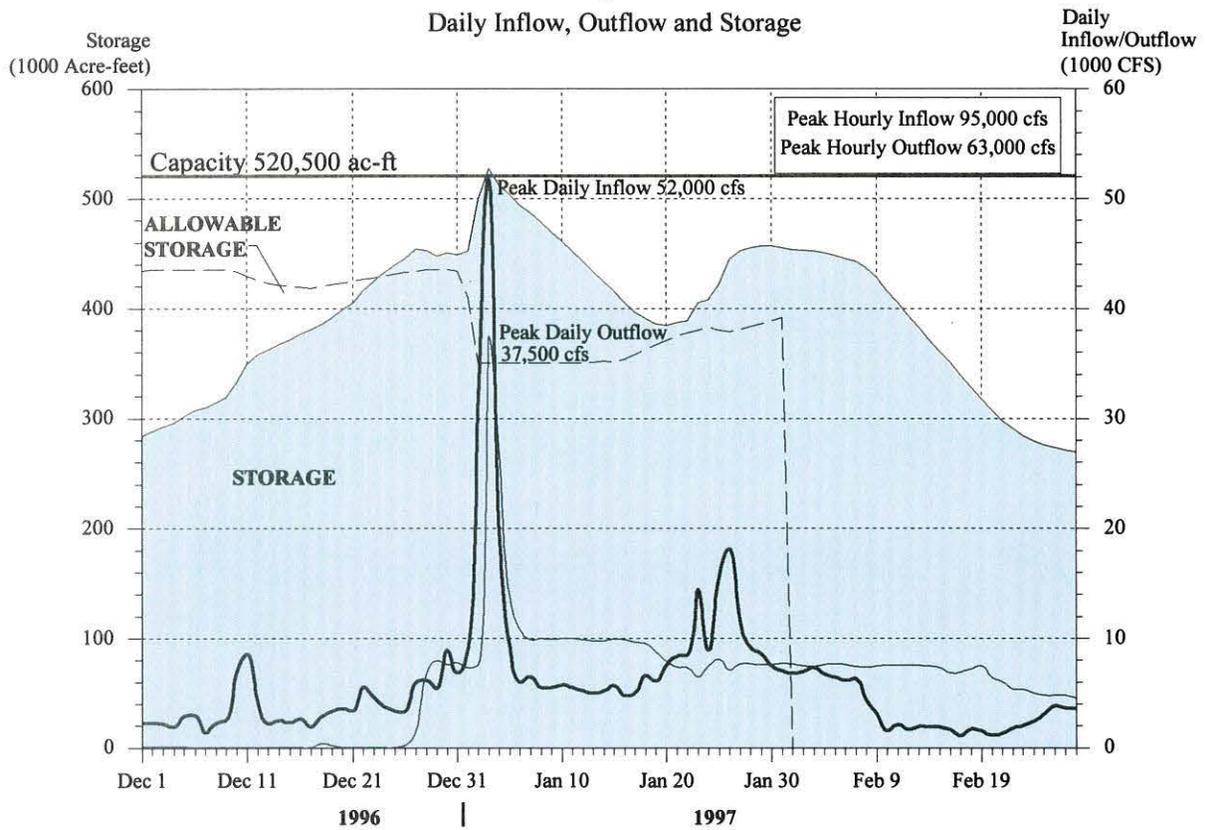
Maximum 3-Day Volume for Selected Flood Events



MILLERTON LAKE OPERATIONS

San Joaquin River

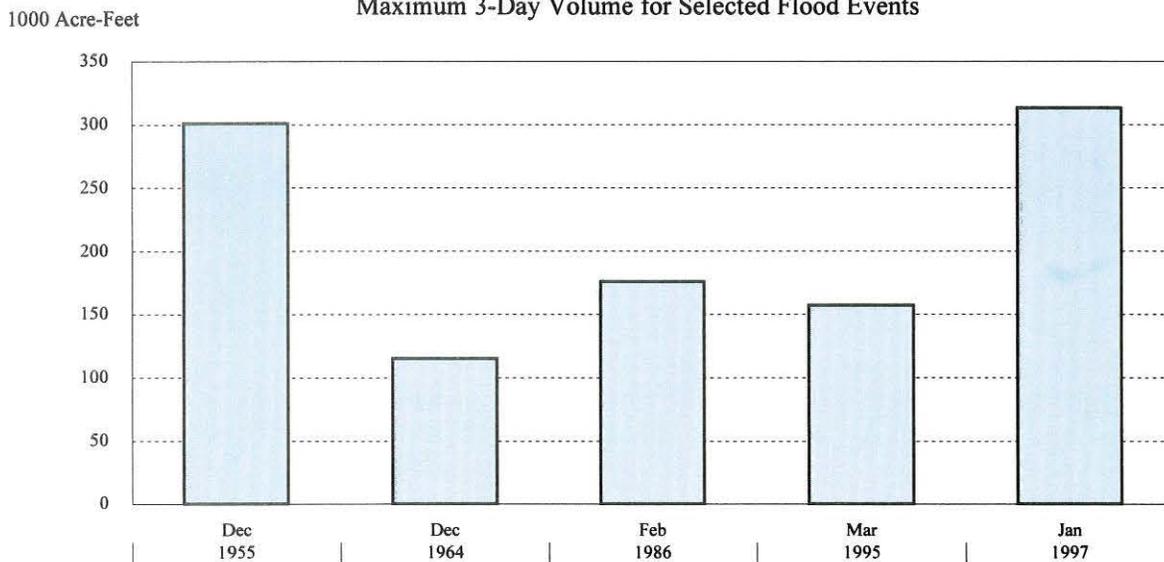
Daily Inflow, Outflow and Storage

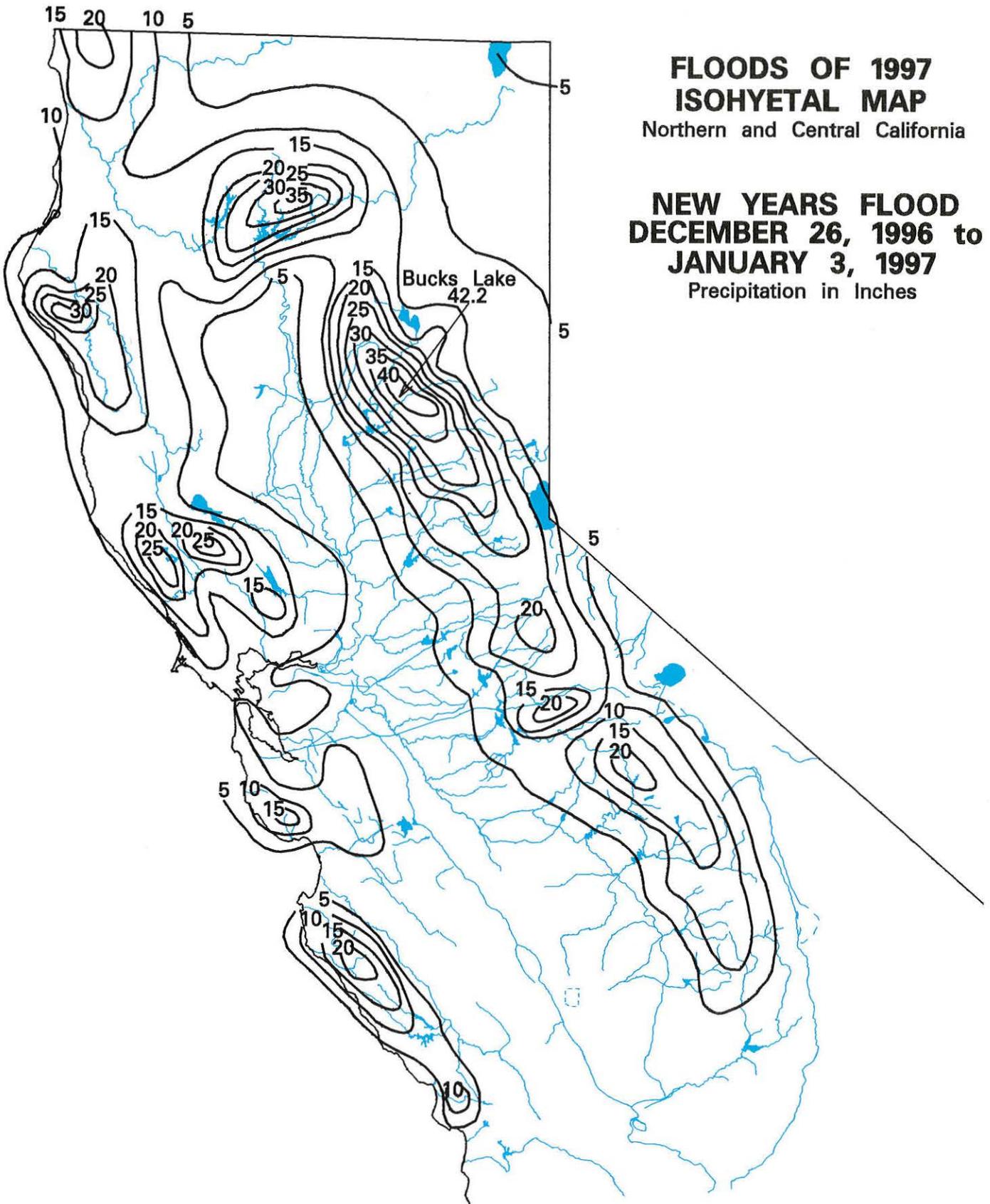


SAN JOAQUIN RIVER RUNOFF

at Millerton Lake

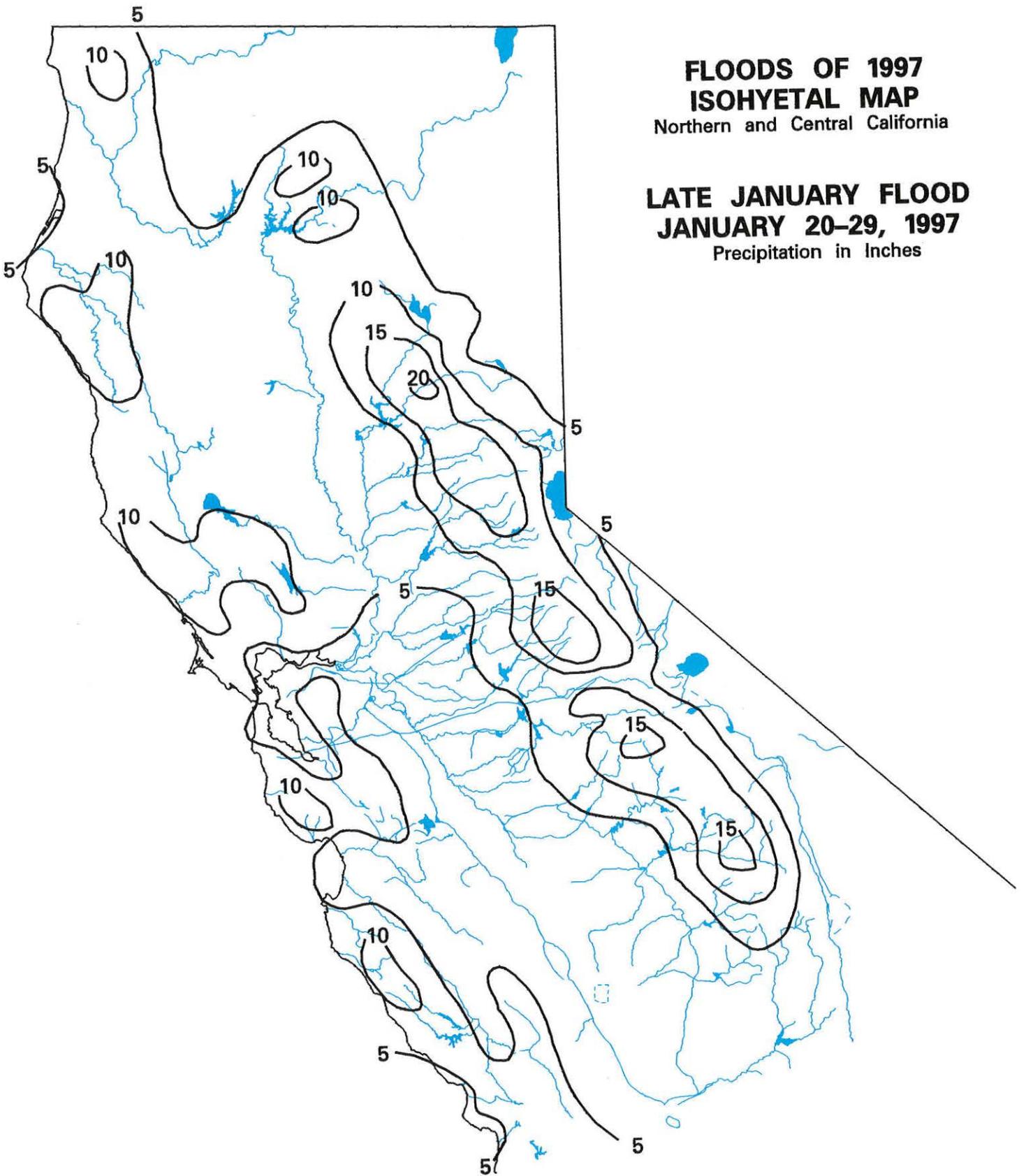
Maximum 3-Day Volume for Selected Flood Events



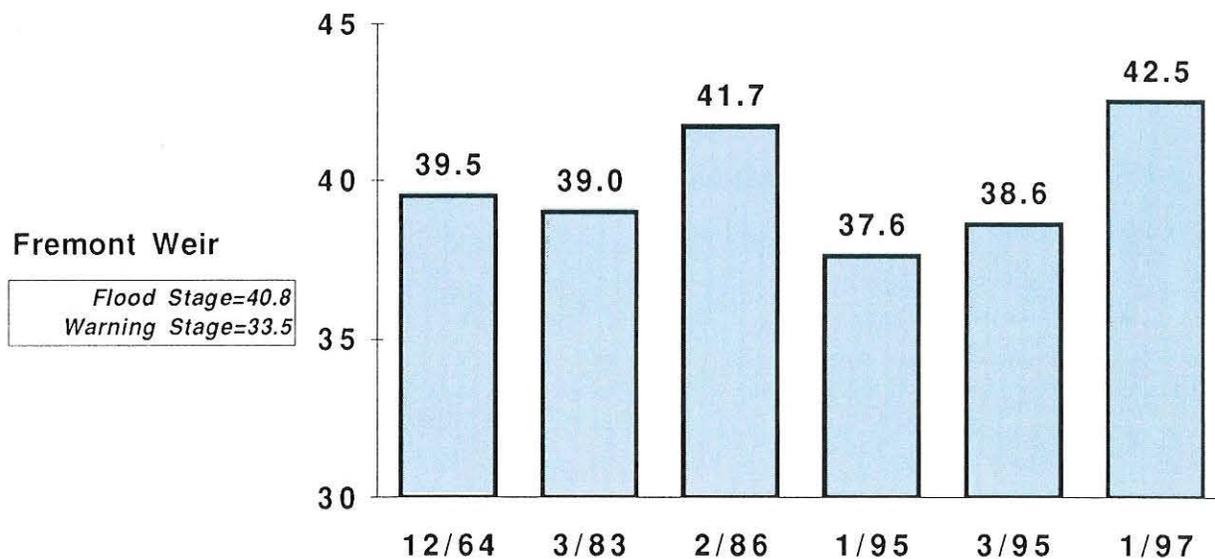
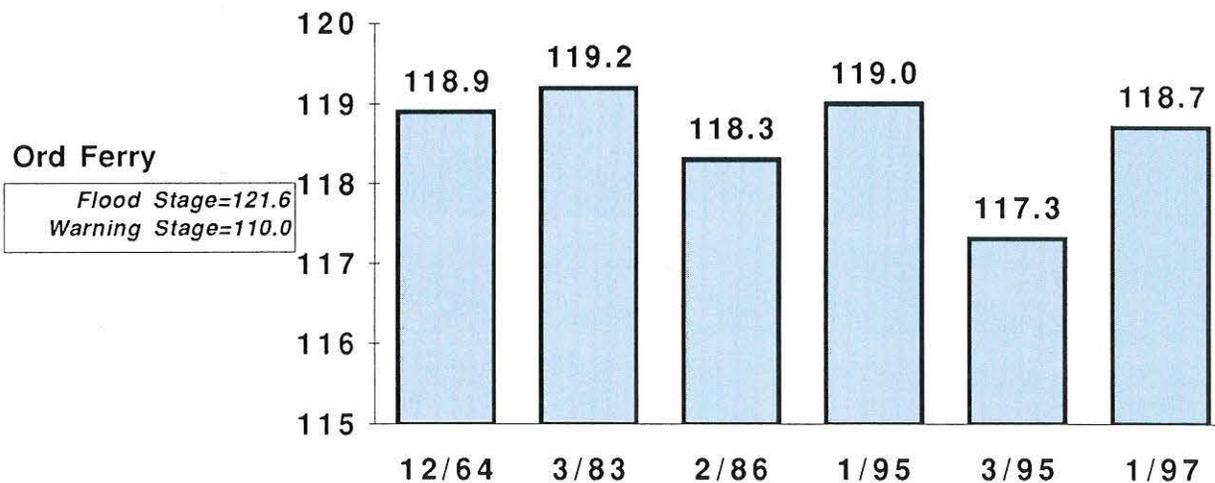
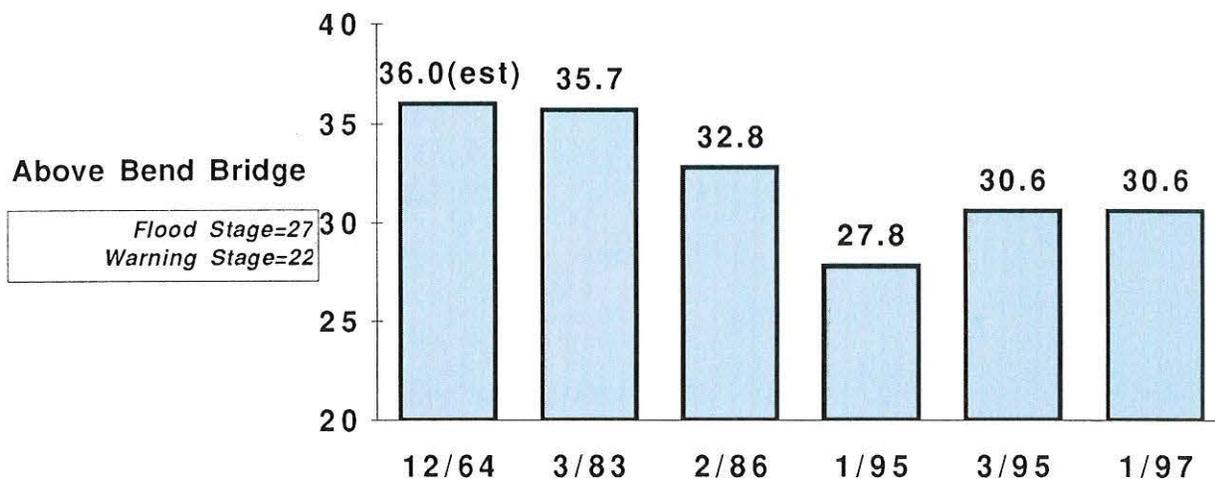


FLOODS OF 1997
ISOHYETAL MAP
Northern and Central California

LATE JANUARY FLOOD
JANUARY 20-29, 1997
Precipitation in Inches



Peak Flood Stages, in Feet Upper and Middle Sacramento River

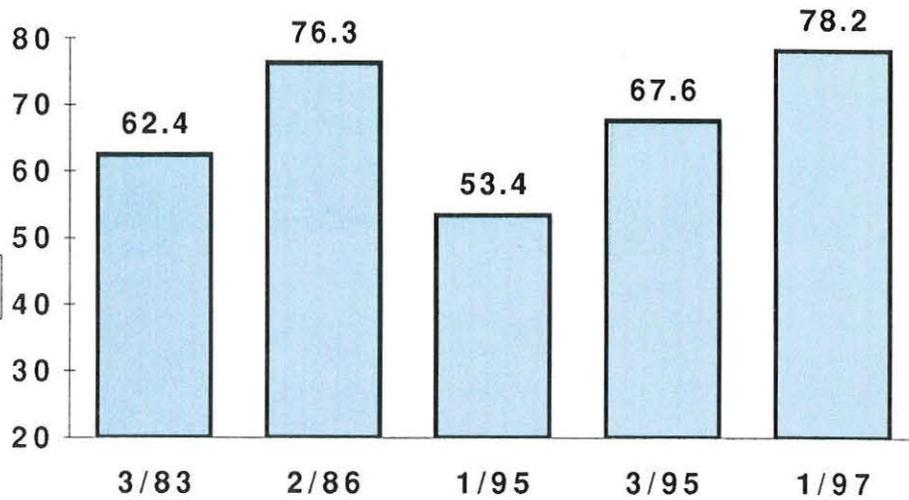


Peak Flood Stages, in Feet

Feather, American, and Lower Sacramento Rivers

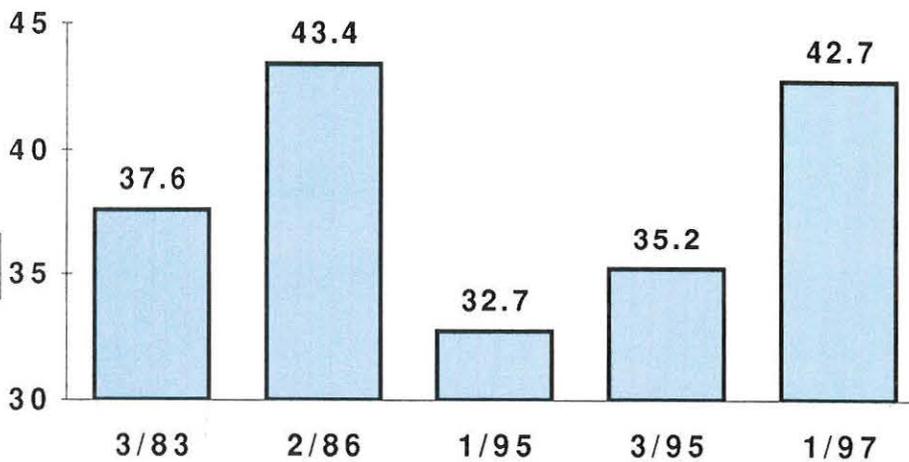
Yuba City
(Feather River)

Flood Stage=80.2
Warning Stage=65.0



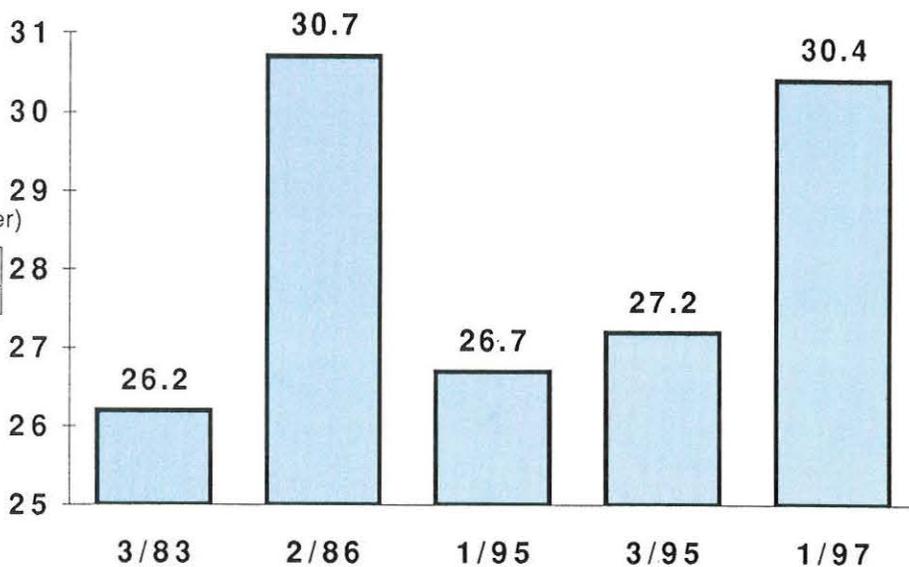
H Street
(American River)

Flood Stage=42.8
Warning Stage=40.0



I Street
(Lower Sacramento River)

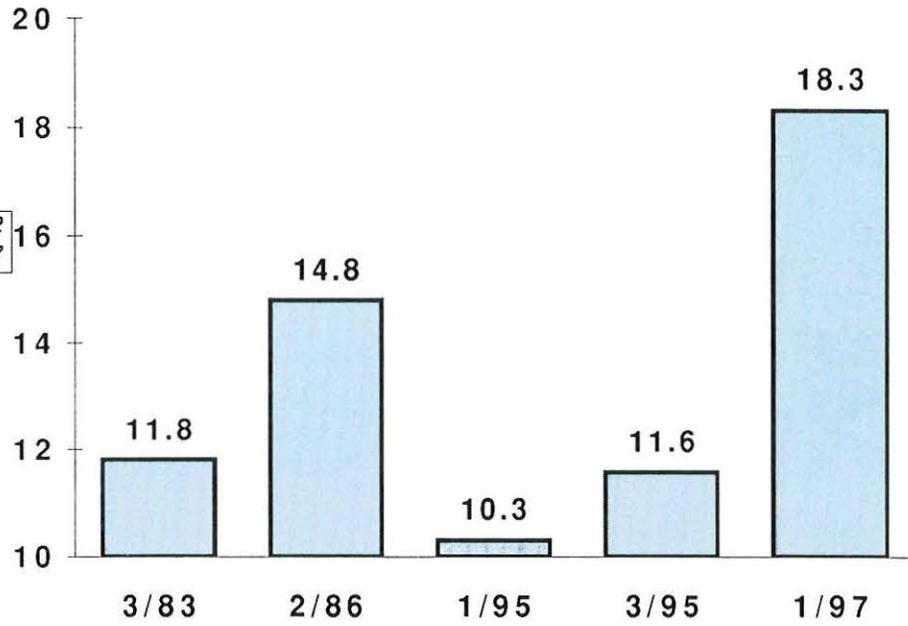
Flood Stage=31
Warning Stage=25



Peak Flood Stages, in Feet Cosumnes and Mokelumne Rivers

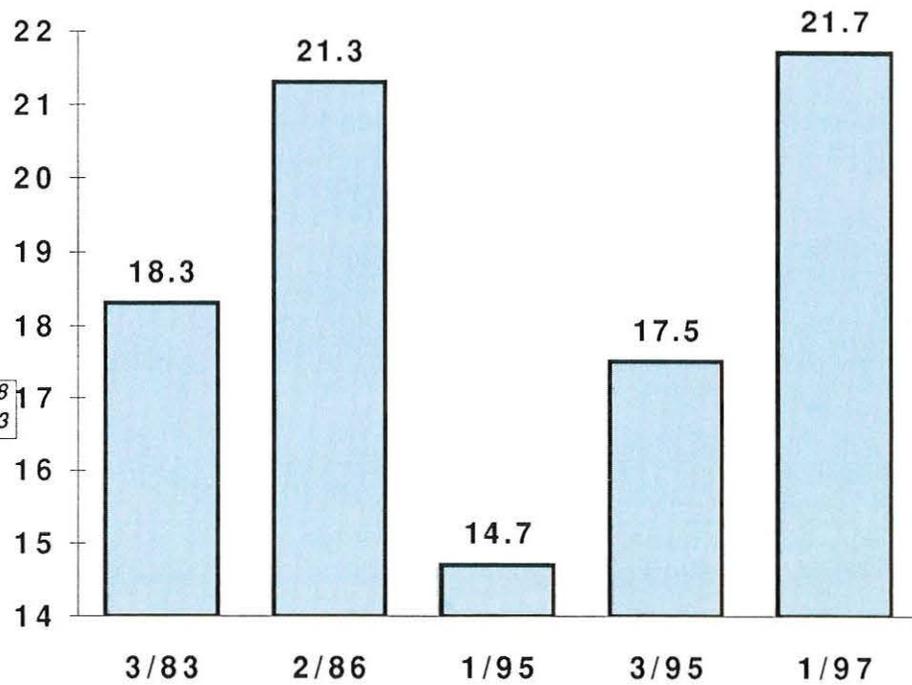
Michigan Bar
(Cosumnes River)

Flood Stage=12
Warning Stage=7



Benson Ferry
(Mokelumne River)

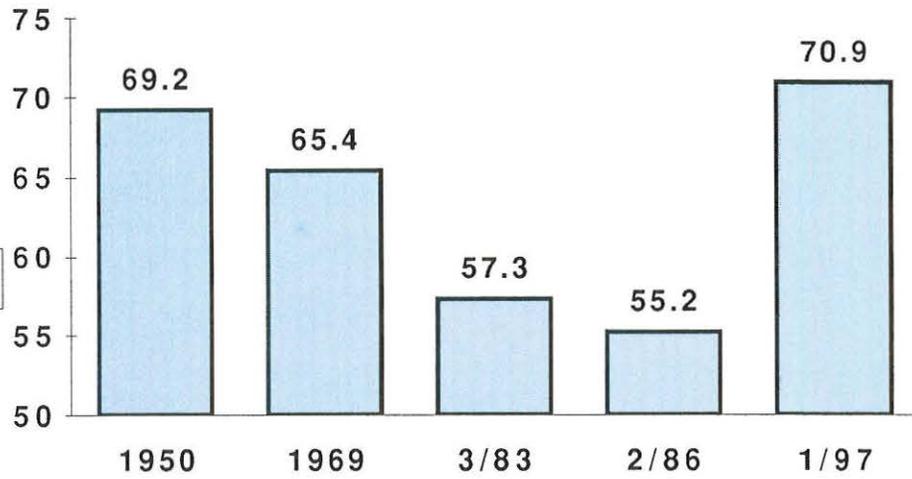
Flood Stage=18
Warning Stage=13



Peak Flood Stages, in Feet Tuolumne and San Joaquin Rivers

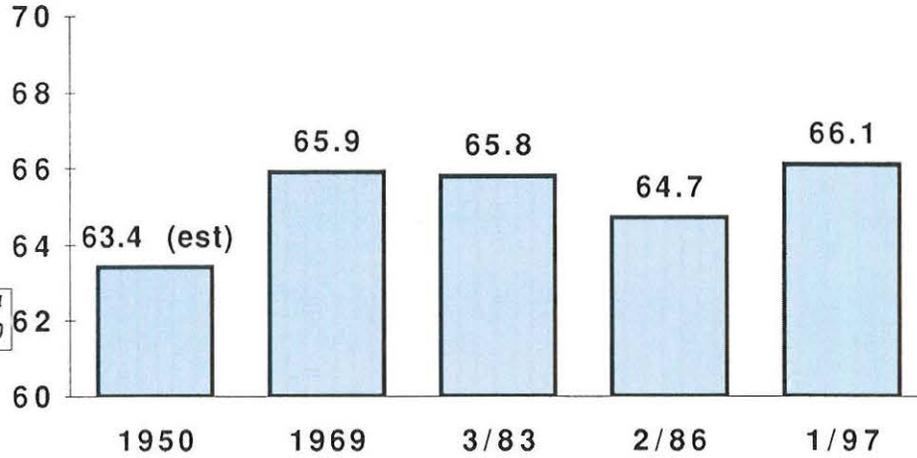
Modesto (Tuolumne River)

Flood Stage=55.0
Warning Stage=50.5



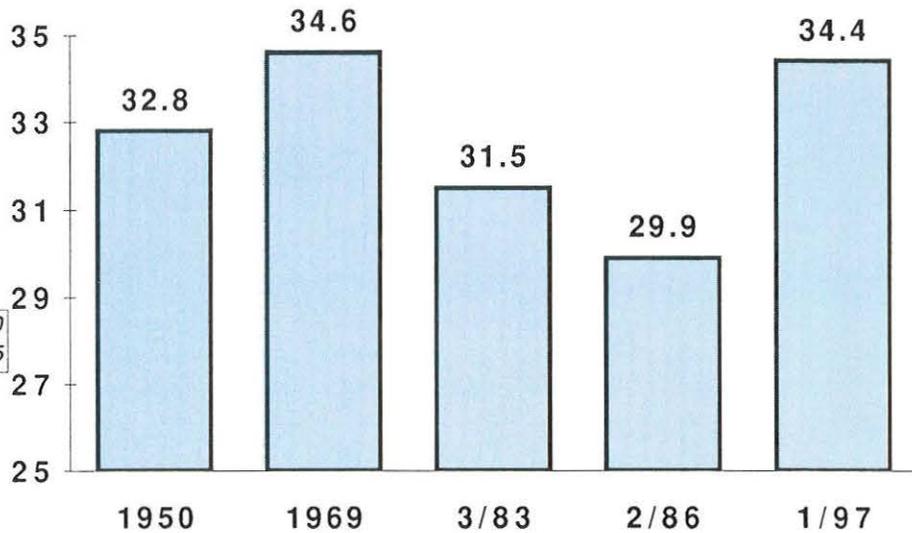
Newman (San Joaquin River)

Flood Stage=69.4
Warning Stage=63.0



Vernalis (San Joaquin River)

Flood Stage=29.0
Warning Stage=24.5



Appendix C: Levee Failure Modes and Options for Repair

Figure C-1. Toe Drain and Levee Berm	202
Figure C-2. Slurry cut-off wall	204

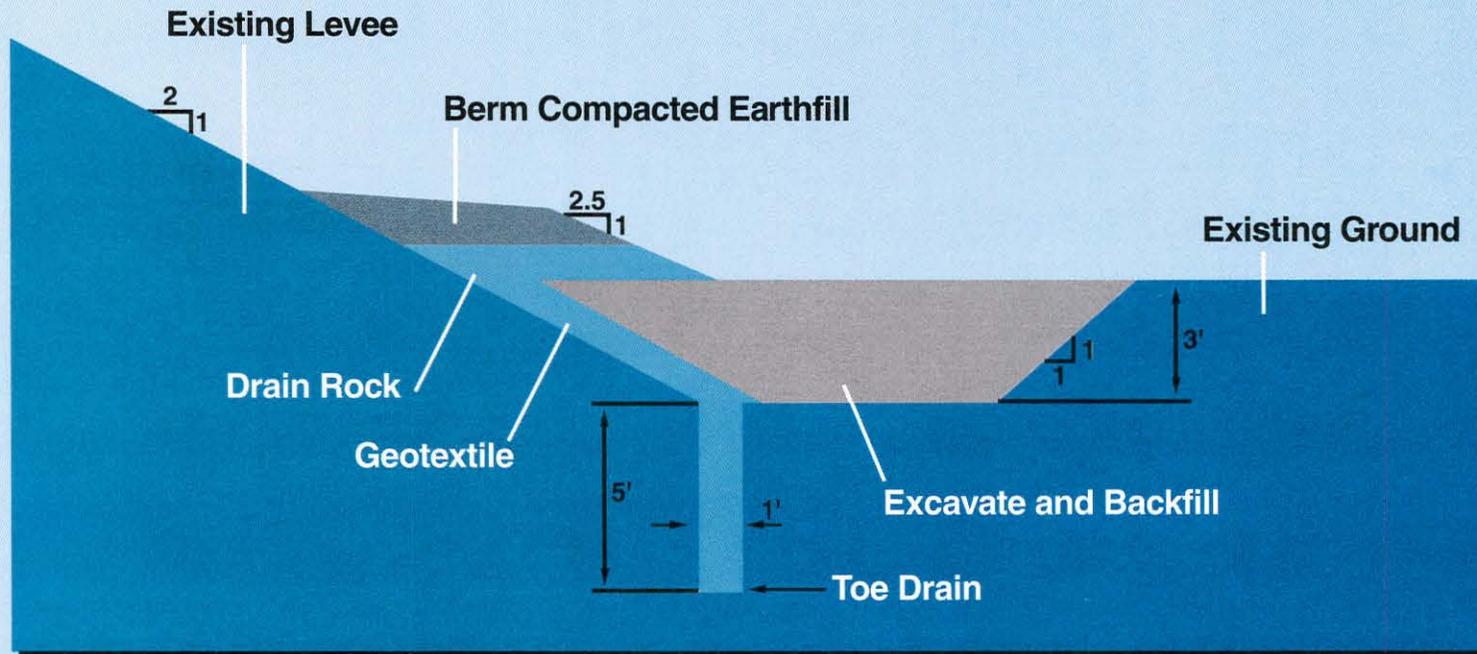
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

Levee Failure Modes

Generally levees fail by one of the following mechanisms:

- **Overtopping**, where the quantity of floodwater entering the channel is greater than its capacity, and water pours over the top of the levee. Levee failure results from erosion on the back (land) side of the levee caused by water cascading over the crown and gradually washing soil away until the full cross section is breached. Levees constructed of clay soil can withstand significantly more overtopping than levees constructed of silty or sandy soil.
- **Seepage and Piping**, where floodwater seeps through or under a levee and carries levee or foundation material with it. Some seepage through an earthen levee is relatively common, but when the seepage finds or creates a drainage path, or “pipe,” through erodible material, such as a sand strata, material is gradually washed out through a “boil” on the landside of the levee. If unchecked, sufficient material can exit the levee through the boil to create a large void inside the levee, resulting in a depression or “slump” in the crown of the levee. If the crown slumps below the water surface elevation, overtopping will occur through the depression and lead to failure.
- **Erosion**, where high water velocity or wave action removes material from the levee or the streambank adjacent to the levee, leading to slope instability and increased seepage.
- **Sliding (Rotational Slip)**, where seepage through the levee, or even thorough saturation caused by extensive duration of high water, weakens the levee and/or foundation material to the point where the weight of soil exceeds its internal strength. The levee slope then slides. This type of sliding is a characteristic problem for levees built of clay soil.
- **Sloughing**, where seepage through the levee causes the outermost soil on the levee slope to slide down. Progressive sloughing shortens the seepage path through the levee, causing increasingly heavy seepage until the levee gives way. Sloughing is a characteristic problem of silty and sandy levees.

Toe Drain and Levee Berm



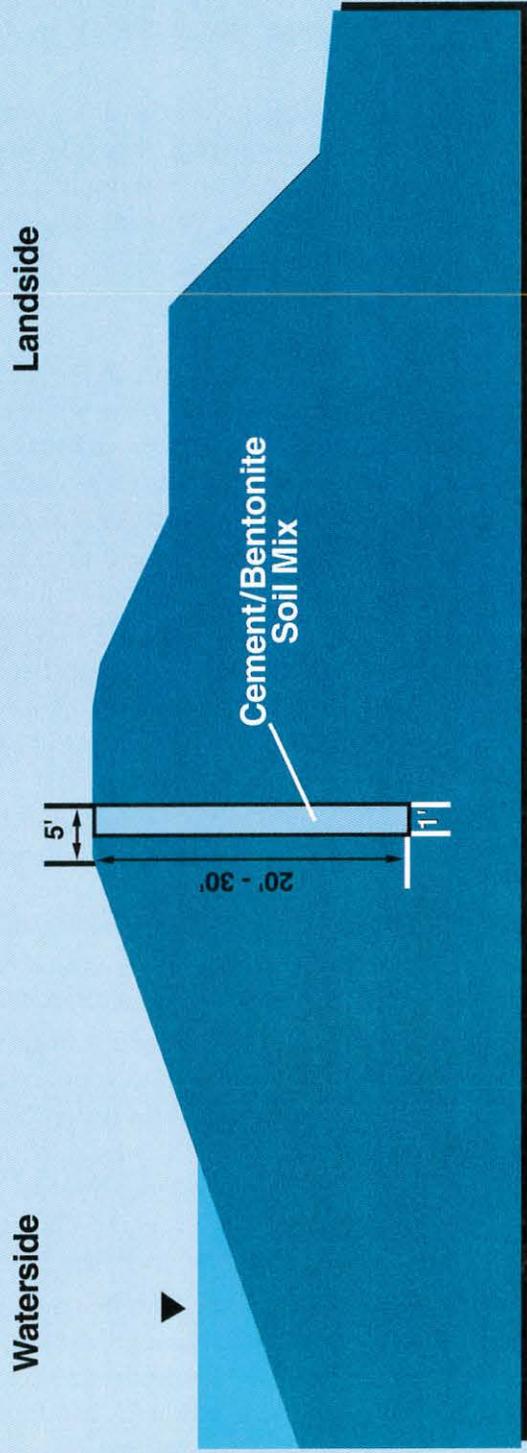
Typical Levee Embankment Section

Options for Levee Repair

The options most frequently used to repair levees and/or to prevent failure are:

- **Levee Raising.** This involves increasing the “footprint” and height of the levee to provide adequate levee clearance above the water and reduce the risk of overtopping. Levees are usually raised by adding earthfill to the crown and sides of the levee.
- **Slurry Cutoff Wall.** This is a relatively expensive repair method commonly used where there is no room to make adjustments to the levee toe to stabilize it. The slurry wall is usually constructed by excavating a trench down the center of the levee, sufficiently deep to cut off any seepage paths under the levee and “anchoring” the wall into a relatively impermeable clay material. Where this is not possible, the slurry wall is constructed to a depth that lengthens the seepage path sufficiently to render it harmless. A combination of soil, cement and Bentonite (a clay material) is mixed with water to form a slurry inside the trench. When the slurry mixture “sets up,” the slurry wall cuts off seepage through the levee.
- **Drainage Blanket and Stability Berm.** This is the most common (and generally least expensive) method to address seepage and stability problems in a levee—both for emergency flood fight and permanent repair. The drainage blanket consists of crushed rock encapsulated in geotechnical fabric (filter) placed on the slope and along the landside toe. The blanket allows seepage to pass without allowing levee material to escape. The stability berm is constructed of earth fill on top of the blanket and against the levee slope. The stability berm is constructed a sufficient distance and height to act as a counterweight, preventing rotational slides.
- **Toe Drain.** Can be used with or without a landside stability berm to control seepage and prevent boils. The toe drain is constructed by placing crushed rock in a trench at the landside toe of the levee. The rock is encapsulated in filter fabric that prevents levee and foundation soils from migrating into the rock. The toe drain reduces the saturation of the levee and eliminates boils. A berm can be placed above the toe drain to further enhance levee stability.
- **Slope Protection.** Can be used to address erosion problems on the levee and streambank adjacent to the levee. Steep slopes are more susceptible to erosion than flatter slopes, particularly when material at the levee toe is erodible (causing “toe failure”—undercutting the slope and having material cave in from the top). Various types of revetment placed at the toe (anchored by a “toe trench”), in combination with laying back the bank or levee slope to a flatter angle can prevent erosion.

Slurry Cut-Off Wall



Typical Levee Embankment Section

Appendix D: State Requests for Corps' Small Communities Flood Assessment Studies

DEPARTMENT OF WATER RESOURCES

1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791



April 8, 1997

Mr. Clark Frentzen
FPMS Manager
U.S. Army Corps of Engineers
South Pacific Division
333 Market Street, Room 923
San Francisco, California 94105-2195

Dear Mr. Frentzen:

We have been contacted by Mr. Thomas Christensen, Sacramento District, and Mr. Gary Flickinger, San Francisco District, concerning the Small Communities Flood Assessment studies you plan to initiate under the Corps' Flood Plain Management Services program.

Your Districts requested that we prioritize a list of communities and/or area wide studies that we believe should be studied. Our prioritized list of studies for each of the two Districts are as follows:

SACRAMENTO DISTRICT

Sacramento River Basin

Community Studies

Arboga	Feather River
Quincy	Spanish Creek
Madison	Willow Slough
Esparto	Willow Slough

Area-Wide Study

Sacramento River Basin

San Joaquin River Basin

Community Studies

Wilton	Cosumnes River
Modesto	Tuolumne River
Manteca	San Joaquin River
Lathrop	San Joaquin River
Ripon	Stanislaus River

Area-Wide Study

San Joaquin River Basin

Mr. Clark Frentzen
April 8, 1997
Page Two

Eastern Sierra River Basin
Community Study
Walker West Walker River

SAN FRANCISCO DISTRICT

Community Studies
Napa River Communities: (St. Helena, Calistoga, and Yountville)
Russian River Communities: (Cloverdale, Healdsburg, and Guerneville)
Weaverville East Weaver Creek
Castroville Tembladera South

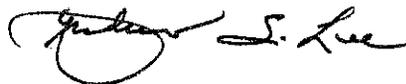
Area-Wide Study
North Coast Area

It is our understanding that you have the necessary funds and capabilities to prepare a report for each area identified and that all reports will be completed by September 30, 1997.

The Department of Water Resources totally supports such an effort and we will cooperate with personnel from your two District offices to the maximum extent possible.

If you have any questions or need to contact this office concerning any of these studies, please call John Sibilsky at (916) 327-1574.

Sincerely,



Andrew Lee, Chief
Floodplain Management Branch

cc: Mr. Thomas Christensen, Acting Chief Mr. Gary Flickinger, FPMS Manager
Regional Planning Branch Corps of Engineers
Corps of Engineers 333 Market Street, Room 717-M
1325 J Street San Francisco, California 94105-2195
Sacramento, California 95814-2922

Appendix E: List of letters

Letters Requesting Federal Assistance:

- *Resources Secretary Douglas P. Wheeler* February 27, 1997
- *Resources Secretary Douglas P. Wheeler* February 25, 1997
- *Governor Pete Wilson* February 13, 1997
- *OES Director Richard Andrews and Resources Secretary Douglas P. Wheeler* January 17, 1997
- *OES Director Richard Andrews* January 7, 1997
- *Senator Dianne Feinstein* October 21, 1996

Federal Response:

- *Lacy E. Suiter, FEMA* April 3, 1997
- *Lacy E. Suiter, FEMA* March 28, 1997
- *Dorothy M. Lacey, FEMA* March 8, 1997

Letters to FEAT:

- *Sacramento Valley Local Citizens' Advisory Team* April 29, 1997
- *Modesto Irrigation District* April 11, 1997
- *Senator Jim Costa* April 2, 1997
- *Delta Protection Commission* April 1, 1997
- *River Parkway Trust* March 12, 1997
- *County of Sacramento* March 7, 1997
- *ACWA* March 5, 1997
- *SAFCA* March 5, 1997
- *Turlock Irrigation District* February 27, 1997
- *California State University, Fresno* February 21, 1997
- *Senator Jim Costa* February 21, 1997
- *CALFED* February 6, 1997
- *South Delta Water Agency* Undated
- *San Joaquin Valley Local Citizens' Advisory Team* Undated

The Resources Agency

Pete Wilson
Governor



Douglas P. Wheeler
Secretary

of California

California Conservation Corps • Department of Boating & Waterways • Department of Conservation
Department of Fish & Game • Department of Forestry • Department of Parks & Recreation • Department of Water Resources

February 27, 1997

Mr. James Lee Witt, Director
Federal Emergency Management Agency
Federal Center Plaza
500 "C" Street, Southwest
Washington, DC 20472

Dear Mr. Witt:

It was very discouraging to learn that the Federal Emergency Management Agency (FEMA) had denied Sacramento County's application for funding emergency levee repairs along the Cosumnes River. We had understood, through meetings with FEMA staff, that the County would be eligible for emergency funding to repair the levee breaks for a five-year level of protection, provided it could be documented that there is an immediate imminent danger to life and property.

It was with this understanding that the staff of the Department of Water Resources provided technical assistance to the County in preparing its application to FEMA. The technical review also involved staffs from FEMA, Office of Emergency Services, and the U.S. Army Corps of Engineers in a coordinated effort to assist the County in its application to FEMA. FEMA's subsequent decision to deny the County's request for assistance seems inconsistent with the initial direction given by FEMA staff.

The current flood season is not over yet and there is great potential for further flood damage to the Cosumnes River watershed if these breaks are not repaired. We strongly urge FEMA to reconsider its decision and approve the County's request for assistance. I would also remind you that we still await FEMA's response to our request of January 17, 1997 for reimbursement of pumping costs, resulting from failed levees,

The Resources Building Sacramento, CA 95814 (916) 653-5656 FAX (916) 653-8102

California Coastal Commission • California Tahoe Conservancy • Colorado River Board of California
Energy Resources, Conservation & Development Commission • San Francisco Bay Conservation & Development Commission
State Coastal Conservancy • State Lands Commission • State Reclamation Board

Mr. James Lee Witt, Director
February 27, 1997
Page Two

as you and I discussed on February 7, 1997. For ready reference, I attach copies of my letter of January 17, 1997 concerning pumping costs and our February 25, 1997 endorsement of Sacramento County's request for assistance in rebuilding levees within the Cosumnes River Watershed.

Sincerely,



Douglas P. Wheeler
Secretary for Resources

The Resources Agency

Pete Wilson
Governor



Douglas P. Wheeler
Secretary

of California

California Conservation Corps • Department of Boating & Waterways • Department of Conservation
Department of Fish & Game • Department of Forestry & Fire Protection • Department of Parks & Recreation • Department of Water Resources

February 25, 1997

The Honorable Shirley Mattingly
Regional Administrator
FEMA
Bldg. 105, PO Box 29998
Presidio
San Francisco, CA 94129-1250

Dear Shirley,

There is now pending a request of FEMA from the County of Sacramento for financial assistance in making emergency repairs to the flood-damaged Consumnes River levees. In its letter to FEMA of February 7, "Request of Emergency Assistance for Repairing Consumnes River Levee Breaks", the County estimates that repairs at ten sites would cost \$2.6 million.

The County's proposal was prepared with technical assistance from our Department of Water Resources and the Army Corps of Engineers. It is intended to provide immediate protection for the areas which were most directly impacted by the New Years Floods, and will not, in our judgment, prejudice the development of a longer-term solution which embodies the kinds of mitigation strategies which are being discussed for the Cosumnes watershed. In fact, we have scheduled a discussion of those strategies for the next meeting of the Flood Emergency Action Team, on March 5.

The Resources Building Sacramento, CA 95814 (916) 653-5656 FAX (916) 653-8102

California Coastal Commission • California Tahoe Conservancy • Colorado River Board of California
Energy Resources, Conservation & Development Commission • San Francisco Bay Conservation & Development Commission
State Coastal Conservancy • State Lands Commission • State Reclamation Board

Ms. Shirley Mattingly
February 25, 1997
Page 2

As you know, Governor Wilson has endorsed FEAT's recommendation that the Consumnes situation be given high priority by FEMA, and we urge your approval of the County's request for assistance. Thank you for your prompt attention to this request, and for FEMA's continuing support of flood recovery in California.

Sincerely,

A handwritten signature in black ink, appearing to read "Doug Wheeler", written over a faint circular stamp.

Douglas P. Wheeler
Chair
Flood Emergency Action Team



GOVERNOR PETE WILSON

February 13, 1997

The President
The White House
Washington, DC 20500

Dear President Clinton:

As you know, California continues to work to recover from the devastating flooding caused by the January storms. In the past month, we have been grateful for the quick response of such federal agencies as the Federal Emergency Management Agency and the U.S. Army Corps of Engineers and their invaluable help.

However, as we move from the immediate response phase, several issues have arisen that make clear the need for additional federal action to ensure the fullest possible recovery and restoration of our flood control system to a level sufficient to provide full protection during the remainder of the 1997 rainy season. This includes the need for a federal supplemental appropriations bill, which I understand is now being discussed within your Administration.

Through Executive Order, I created a Flood Emergency Action Team of state agencies to work with their counterpart federal agencies, affected local governments, and citizens to review the January floods. The Team has completed their interim 30-day report on actions needed now to speed recovery efforts and ensure the flood control and emergency response systems perform as needed during the remainder of the flood season. I have enclosed a copy of this report, which includes several recommendations for federal action. Pursuant to my Executive Order, the Team is also preparing a more comprehensive report within the next 90 days; this report will identify longer term improvements and recommend state and federal actions needed for flood control within California.

Administrative Actions

I request your assistance in implementing the following recommendations, which do not require congressional approval, as quickly as possible to ensure a full recovery effort and safeguard public health and safety as we continue to be at risk to additional flooding this year.

Army Corps of Engineers. Direct the U.S. Army Corps of Engineers to restore damaged flood control facilities to pre-flood full capacity, using the Corps' emergency authorities. The Corps is currently repairing levees to a 25-year capacity regardless of the original design capacity. This approach limits protection for those relying on the levee system during the remainder of the flood season in two ways. First, if there is another significant storm, there will be insufficient channel capacity to carry the water. Second, because of insufficient channel capacity, reservoirs will be unable to empty quickly enough to provide adequate flood storage. In addition, the current approach will also mean that repairs will have to be made twice on the same levee, increasing the cost of total levee repair. This issue is of particular importance along the Sacramento and Feather Rivers.

Fish and Wildlife Service. Direct the U.S. Fish and Wildlife Service to exercise its authority to implement emergency procedures with respect to mitigating emergency and reconstructive levee repair. In addition, it is critical that the Service make it clear that where mitigation is required, it will be to the post-flood level of habitat. Finally, the Service should be providing any mitigation requirements on repair projects at the time of the initial consultation.

These federal procedures would conform with the process already implemented by the California Department of Fish and Game for emergency repairs. The Department is providing on-site consultation with immediate determination of mitigation requirements to speed the repair process, without neglecting the important mitigation that may be required. However, our approach provides certainty with respect to the total costs associated with repairs. The Fish and Wildlife Service's current practice of deferring mitigation requirements leaves considerable uncertainty as to the total cost, and could lead to incomplete repairs should their mitigation requirements, as determined later, exceed the amounts to be available from both federal and state sources.

FEMA. Direct the Federal Emergency Management Agency (FEMA) to provide federal funds for pumping of floodwaters that are endangering levees that have not yet failed. The State has written to FEMA twice to emphasize the hazard that ponded water is causing for the levees. In the past, FEMA has recognized that ponded water threatens the continued integrity of the levee infrastructure, and has funded pumping efforts. Failure to do so now risks the needed integrity of this infrastructure for the remainder of the current flood season and, in the case of Delta levees, also presents risks to a major portion of the State's water supply infrastructure. This issue is sufficiently critical that I have already directed State agencies to advance funds and begin the pumping on their own.

FEMA. Direct FEMA to expedite reimbursement to counties that have had to respond to flooding. Many members of your Cabinet and administration have witnessed firsthand the dramatic loss of infrastructure and tax base in many counties as a result of the flooding. Some of these counties are the same ones that experienced losses in the 1995 flooding, yet they are still awaiting FEMA reimbursements for those previous events. Again, because of the importance of this issue to those local governments, I have already directed state agencies to advance a portion of the funds needed for recovery. I request that the federal agencies join with us.

Parks and Tourism. Repairs to the roads and infrastructure of Yosemite National Park and other important tourism areas are urgently needed. Many of the counties affected by flooding and the storms, such as Mariposa County, are experiencing severe economic hardship because of the closure of Yosemite. I have directed our Department of Transportation to expedite repairs on all damaged roads that fall under the responsibility of the State, and have issued an Executive Order waiving any procedural requirements as appropriate for the Department to do this work as quickly as possible. These efforts are showing extraordinary results, and I am offering the services of Caltrans on a contractual basis to the National Park Service and the U.S. Forestry Service to expedite repairs to roads within Yosemite and other tourism destinations as well.

Supplemental Appropriations

In addition to the administrative measures outlined above, I understand your administration is preparing a supplemental appropriations request to address the costs of recent natural disasters nationwide. I request that any proposal presented to the Congress include funding for the following flood-related costs. I would only caution that these cost estimates are necessarily preliminary as recovery work is still continuing and access to many areas and levees remains limited due to high waters.

Levee Repair. Repair to our damaged levee system is urgently needed to protect the lives, property, and water supply for millions of Californians. The Corps of Engineers has primary responsibility for these repairs, and it is currently estimated the Corps will need over \$300 million to repair damages directly attributable to the January floods. However, it is impossible to accurately estimate the full amount of the damages to the flood control systems at this point, as repairs continue to be made and access to many areas is limited by continued high waters. This number may increase as more information is available.

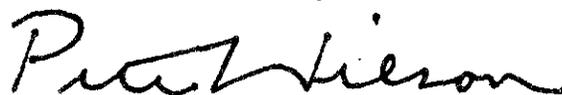
Transportation. California's transportation system has been devastated in some parts of the State, and it is imperative that the Federal Highway Administration have sufficient funding available to provide assistance as they have in previous disasters. Current estimates are that \$381 million will be required to fund the federal share of these needed repairs to eligible roadways. However, as you know, the existing federal appropriation for the Emergency Relief program is \$100 million for all states and the federal government combined. Moreover, the amount that can be spent per disaster is capped at \$100 million. I am requesting this cap be waived, as the federal government has done in previous disasters, to accommodate transportation repair needs.

FEMA Public Assistance. Under current law, the Federal Emergency Management Agency (FEMA) pays 75 percent of certain costs of repairing damaged public facilities and providing assistance to flood victims. Demands on existing FEMA appropriations are unclear. However, our current estimates are that at least \$200 million will be needed to fund the federal share of eligible costs arising from the recent floods. This current estimate includes damages to non-federal roads, public facilities, schools, emergency response, debris removal, the individual family grant program, and the costs of pumping standing water to preserve the levee infrastructure and portions of the state's water supply system.

Agriculture. Hundreds of acres of orchards may be destroyed as a result of the flooding. These are permanent crops that will require years to restore, with resulting losses to our agriculture industry and local economies. Funding for the Tree Assistance Program under the U.S. Department of Agriculture would provide much needed assistance to growers and farm dependent communities who have lost a significant portion of their agricultural infrastructure. No cost estimates are available at this on the total amount of damage.

On behalf of all Californians, I want to thank you for your assistance and the attention your Cabinet and others in the Administration have given the flood victims. As we both recognize, much work remains in the recovery phase of the floods. I urge your continued assistance as Californians continue this massive recovery effort.

Sincerely,



The Resources Agency

Pete Wilson
Governor



Douglas P. Wheeler
Secretary

of California

California Conservation Corps • Department of Boating & Waterways • Department of Conservation
Department of Fish & Game • Department of Forestry & Fire Protection • Department of Parks & Recreation • Department of Water Resources

January 17, 1997

Mr. James Lee Witt
Director
Federal Emergency Management Agency
Federal Center Plaza
500 C Street S.W.
Washington, D.C. 20472

Dear Mr. Witt:

We are writing to request your intervention in obtaining federal assistance for pumping flood waters out of inundated islands in the San Francisco Bay Delta and other catastrophically flooded areas within the Central Valley of California.

We are concerned that the Federal Emergency Management Agency may uncritically apply policies established following the 1993 midwest flood thereby overlooking the precedent set in connection with the 1983 and 1986 floods in northern California and disallowing the pumping of these flooded areas. Failure to pump flooded areas promptly will result in continued destabilization and potential loss of significant portions of the levee system, further endangering human life and property.

As we write this letter, wave wash erosion and continued saturation is damaging levees in the Delta and other flooded areas. Refusal to fund the pumping, could further compromise the Sacramento-San Joaquin flood control system and threaten the integrity of other Delta islands. Failure of additional delta levees would severely damage the ecosystem, seriously jeopardizing the range of options available to the State and federal governments under the Bay Delta Accord. Finally, failure to act could severely disrupt the water supply of millions of Californians.

As you are aware from your recent visit, the State of California continuing to work very closely with FEMA and other federal officials in response to the floods. An essential aspect of this work is the removal of residual flood waters which remain after emergency

The Resources Building Sacramento, CA 95814 (916) 653-5656 FAX (916) 653-8102

California Coastal Commission • California Tahoe Conservancy • Colorado River Board of California
Energy Resources Conservation & Development Commission • San Francisco Bay Conservation & Development Commission
State Coastal Conservancy • State Lands Commission • State Reclamation Board



Printed on recycled paper

James Lee Witt
January 17, 1997
Page 2

levee repairs. These residual flood waters pose severe threats to human health, safety, and property. One of the most significant risks is further damage to flood control levees on the Sacramento River and San Joaquin River. Wave wash erosion can further deteriorate already stressed levees and lead to additional levee failures. Further, residual flood waters will keep the levees saturated, which can lead to additional levee failures.

The federal government has broad authorities to deal with the threats to lives and property resulting from major flood disasters (see e.g. 42 U.S.C. Sections 5170b, 5170c, 5172, and 5192). Specifically, these authorities include reduction of immediate threats to life, property, public health and safety. There can be no doubt that these residual flood waters pose such a risk and that pumping is the best solution available to us.

Federal law provides sufficient authority to assist California and impacted local governments in removing residual floodwater by pumping and we urge your support. Your assistance in securing federal assistance in these efforts in order to avert the threat of more damage is appreciated.

Sincerely,



Douglas P. Wheeler
Secretary for Resources
Chair, Governor's Flood Emergency
Action Team



Richard Andrews, Director
Office of Emergency Services



OFFICE OF THE DIRECTOR
GOVERNOR'S OFFICE OF EMERGENCY SERVICES
2800 MEADOWVIEW ROAD
SACRAMENTO, CALIFORNIA 95832
(916) 262-1816
FAX: 262-2837



January 7, 1997

Mr. John Swanson
Federal Coordinating Officer
Federal Emergency Management Agency
Region IX, Building 105
Presidio of San Francisco, California 94129

Dear Mr. Swanson:

I am writing to outline serious concerns that the state of California has over federal policies that could impact the critical levee repair/restoration efforts that are currently underway throughout the counties in DR 1155.

As was discussed by local officials as well as representatives from the Department of Water Resources and the Corps of Engineers during briefings on Monday, January 6, over the coming days and weeks repair of damaged levee systems is not only vital to recovery from the current flooding, but essential if the risk of additional flooding over the coming months is to be reduced.

As you know, reservoirs throughout northern California are all but full, and efforts to reduce levels in the reservoirs to accommodate runoff from future storms or the spring snow melt in the Sierras will be compromised by the many breaches in levees throughout northern and central California.

With this critical scenario, I am concerned that federal policies will hamper levee restoration efforts.

Specifically, I am concerned about:

1. FEMA's definition of emergency work. Almost all work is designated permanent by FEMA, and the Corps cannot fund permanent repair or emergency work if an applicant has begun work. Our concern is that FEMA applies this policy in such a way as to exclude reasonable shoring in anticipation of flooding that does not eventually occur and that the policy does not allow a meaningful level of emergency repair and restoration. We would recommend that FEMA use the definitions of emergency work as spelled out in PL -288 and 44 CFR, regardless of whether it relates to a levee or flood channel.
2. FEMA's policy of funding repairs only to a "5 year" flood level, regardless of the design or capacity of the facility. We are unable to find justification for this benchmark in PL-2988 or 44 CFR and do not understand why levee repairs should be treated differently from other damaged public facilities.

3. FEMA's inconsistencies in accepting the Corps of Engineers's written determination as to whether a facility is a Corps regulated Flood Control Work, thereby excluding such projects from funding under Public Assistance. We recommend that FEMA honor the Corps determinations in such matters and fund repairs of flood control works that are not regulated by the Corps.
4. FEMA needs to ensure active participation and coordination by other federal agencies that have statutory disaster recovery programs. In the past FEMA has denied eligibility to a subgrantee on the basis that some other federal program has responsibility or jurisdiction, regardless of whether the other federal program can or will fund the project. It would be helpful if FEMA could proactively coordinate assistance programs provided by other federal agencies and inform the state and local applicants in a timely, consistent manner of restrictions and criteria for all federal programs.

Because of the urgency of these issues to the recovery efforts from the on-going floods in California, I seek your early response to these concerns.

I am available to discuss these issues at your convenience.

Sincerely

A handwritten signature in black ink, appearing to read "Richard Andrews", written in a cursive style.

RICHARD ANDREWS
Director

United States Senate

WASHINGTON, DC 20510-0504

March 27, 1997

James Lee Witt
Director
Federal Emergency Management Agency
500 C Street, S.W.
Washington, DC 20472

Dear James Lee,

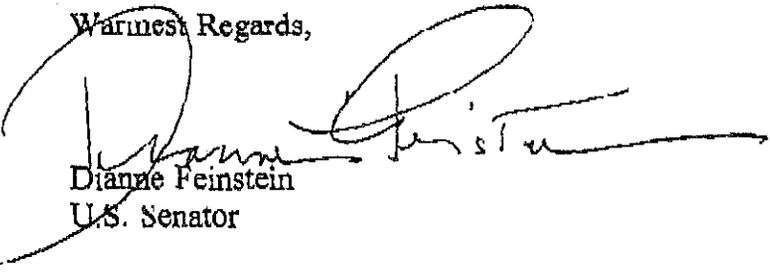
As you know, I deeply appreciate FEMA's quick response in helping California to recover from the 1997 floods. Unfortunately, a number of California counties still have not received reimbursement for damages related to flooding in 1993 and 1995. FEMA's landslide policy--which many counties consider confusing and unfair--has been a major cause of these delays.

On October 21, I sent you the attached letter, which outlined my objections to FEMA's landslide policy. However, I have not received a response to this letter. In the meantime, counties throughout California continue to experience difficulties with the landslide policy. For example, FEMA recently cited the policy in denying Sierra County's \$63,435 supplemental disaster claim for repairs to Lavezzola Road.

I urge you once again to re-examine the landslide policy, and address each of the concerns I raised five months ago. If you have any questions on this issue, please feel free to have your staff contact Chris Kierig at (202) 224-3841 or Kathleen Reich at (415) 536-6868.

Once again, I would like to thank you for all of your hard work in resolving problems from previous disasters--and for your extraordinary efforts during the 1997 disaster. Keep up the good work!

Warmest Regards,



Dianne Feinstein
U.S. Senator



Federal Emergency Management Agency

Washington, D.C. 20472

Mr. Douglas P. Wheeler
Secretary for Resources
The Resources Agency of California
The Resources Building
Sacramento, California 95814

APR 3 1997

Dear Mr. Wheeler:

This is in response to your February 27, 1997, facsimile to James L. Witt, Director of the Federal Emergency Management Agency (FEMA), regarding repair of privately owned levees along the Cosumnes River in Sacramento County. Director Witt asked me to respond to your concerns because they fall under the purview of my office. I sincerely regret the delay in responding.

FEMA operates in accordance with the rules and implementing regulations of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act). The Stafford Act limits FEMA to providing Public Assistance funds to specific eligible applicants which include State agencies, local governments, specific private nonprofit agencies, and Indian and Alaskan tribes and villages. Privately owned levees, such as those along the Cosumnes River, do not fall under any of those eligible groups of applicants. For this reason, levee repair along the Cosumnes River is not eligible for funding through FEMA.

Even if the levees were not privately owned, FEMA has limited authority to provide funding for the repair of flood control works. Such funding is generally limited to providing one-time funding for emergency repairs, and requires the applicant to join the U.S. Army Corps of Engineers' Levee Rehabilitation Program. In this case, there is no eligible applicant, and this requirement cannot be satisfied.

Emergency repairs to flood control works are only eligible if they are necessary to save lives, to protect public health and safety, or to protect improved property. A review of information provided by Sacramento County indicates that the primary purpose of the levees along the Cosumnes River is for the protection of agricultural property. Most of the benefits from emergency repairs would be to agricultural property. According to our regulations, land used for agricultural purposes does not constitute improved property. Repairs to levees that primarily protect agricultural property are generally ineligible for FEMA funding.

If you have additional questions, please contact the California Office of Emergency Services at the following address and telephone number:

Dr. Richard Andrews
Director
California Office of Emergency Services
2800 Meadowview Road
Sacramento, California 95832
Telephone: 916-262-1816

I hope that this response explains FEMA's position with regard to levee repair along the Cosumnes River. Thank you for allowing us the opportunity to respond to your concerns.

Sincerely,

A handwritten signature in black ink, appearing to read "Lacy Suiter". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

Lacy E. Suiter
Executive Associate Director
Response and Recovery Directorate



Federal Emergency Management Agency

Washington, D.C. 20472

MAR 28 1997

Mr. Douglas P. Wheeler
Secretary for Resources
Chair, Governor's Flood Emergency Action Team
The Resources Agency of California
The Resources Building
Sacramento, California 95814

Dear Mr. Wheeler:

This is in response to your January 17, 1997, letter to James L. Witt, Director of the Federal Emergency Management Agency (FEMA). You wrote regarding your desire to obtain Federal disaster assistance for pumping flood waters out of inundated islands in the San Francisco Bay Delta and other areas in California. I regret the delay in our response.

As you know, FEMA has been actively participating in the Interagency Levee Task Force (ILTF) which includes other agencies such as the U.S. Department of the Interior (lead agency), the U.S. Army Corps of Engineers (USACE), Environmental Protection Agency (EPA), U.S. Department of Commerce, U.S. Housing and Urban Development, U.S. Department of Transportation, U.S. Department of Agriculture, U.S. Small Business Administration, representatives of Native American Tribes as appropriate, and the State of California Resources Agency. The purpose of this task force is to assist in the rapid and effective recovery of flood control systems before November 1, 1997, to minimize risk to life and property, to ensure a cost-effective approach to flood damage mitigation and flood-plain management and to protect important environmental and natural resource values. On March 3, 1997, the first meeting of the ILTF was held. The task force will continue to call meetings as necessary.

FEMA stands ready to provide any all assistance authorized by the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Pumping of floodwaters resulting from a declared disaster may be eligible a emergency protective measures under Section 403 of the Act. Pumping of impounded water could be a way of reducing or eliminating threats to public health or safety or to improved property if such threats exist. Property which can be considered for protection would be levees, public infrastructure such as roads, and home and other buildings. However, we have received no specific evidence of threats to improved property in the fourteen flooded areas identified by the State at this time. It should be noted that FEMA regulations specifically exclude agricultural land from the definition of improved property. Thus, there is no basis for dewatering any land used for agriculture purposes.

Two of the flooded tracts in the San Joaquin/Sacramento Delta are have already been pumped out with assistance from the State and the State is to be commended for moving out quickly in these and other areas without waiting for funding issues to be settled. FEMA will review information to be provided on the extent of threats to improved property in order to determine eligibility for FEMA assistance.

Concerning assistance which FEMA has provided in the past for the pumping of the Delta islands, the circumstances in 1980, 1982, 1983, and 1986 were quite different than today. The islands involved in the 1980s were in the central Delta region and thus would have a greater impact on the transport of fresh water to the pumping plants in the South Delta. The flooded areas in this disaster are not in this high impact region. The high flows of water through the Delta towards the San Francisco bay which are occurring now and which should continue for some time will also lessen the impact which flooded tracts will have on the transport of fresh water to the South.

I am certain that you understand FEMA is also anxious to resolve any flood-related issues and is working expeditiously to help the State and communities recover from this disaster. If you have any specific questions about the disaster recovery efforts, please call or write:

Dr. Richard Andrews
Director
California Office of Emergency Services
2800 Meadowview Drive
Sacramento, California 95832
916-262-1816

I appreciate your correspondence and thank you for writing to Director Witt.

Sincerely,



Lacy E. Suiter
Executive Associate Director
Response and Recovery Directorate



Federal Emergency Management Agency

Region IX

FEMA-1155-DR-CA

Disaster Field Office

3695 BLECKELY

MATHER, CA 95655

(916) 364-3000 FAX: (916) 364-3200

March 8, 1997

Mr. Douglas P. Wheeler
Chair, Flood Emergency Action Team
The Resources Agency of California
The Resources Building
Sacramento, CA 95814

Dear Mr. Wheeler:

This is in response to your letter of February 25, 1997 regarding the County of Sacramento's request for emergency funding of levee repairs at ten sites along the Consumnes River. The request was reviewed by FEMA personnel familiar with current federal levee policy.

Public Law 93-288, as amended, (the Stafford Act), limits FEMA to providing emergency funds for specific eligible applicants (i.e., State agencies, local governments, specific private non-profit agencies, and Indian/Alaskan tribes and villages). Privately owned levees, as in the case of the Consumnes River, do not qualify under any of these eligibility groups.

In order for the Consumnes River levee system to receive emergency assistance it would have to be the responsibility of an eligible applicant. Previous discussions with representatives of the Sacramento County Water Resource Division confirmed that the County has neither the responsibility for the Consumnes Levee System nor are County officials aware of any known eligible entity having operational/maintenance responsibility.

Additionally, FEMA's limited authority for qualifying levee systems, provides one-time funding for emergency repairs and, requires the applicant to join the U.S. Army Corps of Engineers' Levee Rehabilitation Program.

Emergency repairs are defined as those actions that will save lives, protect public health and safety, and provide protection of improved property. The information provided to FEMA by Sacramento County defines the primary purpose of the Consumnes River Levee System as the

protection of agricultural property. Consequently, subject emergency repairs would be to agricultural property which is not considered improved property.

Under current federal law, FEMA has no jurisdiction in the Levee System of the Consumnes River. Therefore, by law, FEMA is not able to provide federal assistance to repair the Levee System of the Consumnes River.

Dorothy M. Lacey
Dorothy M. Lacey
Federal Coordinating Officer

Sacramento Valley Local Citizens' Advisory Team Recommendations to Governor Wilson's Flood Emergency Action Team

Brief Status of Current Flood Recovery Actions:

1. Status of Levee Repairs

The January 1997 Feather and Bear River levee breaches have been fully repaired. Flood related damage to primary levees on the Bear, and secondary levees on the Yuba, however have not been repaired. Apparently, the U.S. Army Corps of Engineers and Department of Water Resources are in discussions regarding which agency has ultimate responsibility for the secondary Yuba River levees and which agency will fund and undertake the necessary repairs.

The Sutter Bypass levee breaks near the town of Meridian have been repaired to only a twenty-five year level, not to the 100-year level. Moreover, Sutter County and local Reclamation District officials are unaware of a plan or schedule for full repair to the 100-year level.

Recommendation: State and federal agencies should resolve responsibility for secondary Yuba River levees and initiate repair efforts. The Corps should immediately begin repair work on the Sutter Bypass levee break to the 100-year level.

2. Status of Flood Assistance

Local counties continue to receive individual applications for flood relief. Unfortunately, the Federal Emergency Management Agency (FEMA) has denied a request to extend the filing deadline. A great deal of effort has been made to assure that FEMA DSR filings are proper, fully documented and approved by FEMA field inspectors. In spite of these efforts, a number of FEMA claims are being denied or delayed. Additionally, farm worker housing remains a critical issue for Yuba County. Though commitments have been made to resolve the problem, the funding mechanism is still unresolved.

Recommendation: FEMA should extend the filing deadline so individuals affected by the January floods may submit necessary paperwork for disaster assistance. Agencies should also expedite their efforts to secure farm worker housing.

3. Yuba River Channel Capacity Loss

The Yuba River Channel capacity downstream of Daguerra Point Dam has been substantially reduced due to residual hydraulic mining debris distributed by floodwaters. Hundreds of thousands of cubic yards of sand and gravel were stripped from training walls, originally established by the California Debris Commission, and washed into the downstream Yuba River channel.

Until about 10 years ago, aggregate companies and adjacent landowners each summer harvested sand and gravel from the accumulated river bars. Regulatory agencies either prohibited, or made the process cumbersome, and this practice has ceased while channel capacity continues to degrade. Today, at least three federal and three state permits are required to harvest accumulated material from within the

floodway. What was previously accomplished at minimal cost to the federal government will probably now require the expenditure of several million dollars for its obligations under the Federal California Debris Commission Act, just to correct the loss of channel capacity from the sediment deposited during the January high river flows.

The problem is compounded by the Corps' lack of funding for the Yuba River channel capacity work. The Corps is counting on aggregate companies to harvest the material on a royalty basis. However, the companies are unwilling to pay to remove the channel material due to the uncertainties of working under the numerous regulatory agencies.

Recommendation: State and federal agencies should streamline the process to allow immediate removal of flood-deposited gravel by public agencies or private companies. Adequate funding should be allocated for the necessary work.

4. Communication

Immediately after the flood, communications between state and federal agencies, and local entities improved substantially. However, the flow of information regarding the status, plans and schedules for levee and channel repair and restoration is limited. Additionally, minimal consultation with local officials as to the location and prioritization for rehabilitation of weakened levees has occurred.

Recommendation: State and federal agencies should work with local agencies to improve multi-jurisdictional communication and coordination. These efforts should include such measures as post-emergency contracts, repair and maintenance plans and funding priorities.

Necessary Long-Term Actions:

1. Adequate Funding for Flood Control Structure Repair and Maintenance

Although State and Federal agencies are repairing levees and flood control structures damaged from the January flood event, many levees and other facilities throughout the Sacramento Valley are in a weakened condition and present a threat to public safety.

Congressional consideration of the emergency supplemental appropriations bill will provide limited funds for emergency repairs. However, it is unclear if these funds will be available for long-term repair and maintenance needs. This situation has been exacerbated by a new law, developed after the 1993 Mid-West floods, that shifts federal reimbursement responsibility for levee repairs from the Federal Emergency Management Agency (FEMA) to the U.S. Army Corps of Engineers (Corps) (for drainage areas larger than 400 square miles) and to the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) (for drainage areas smaller than 400 square miles). FEMA will no longer fund permanent repairs to flood control facilities, including levees.

Recommendation: Increase state and federal funding levels for long-term levee repair and maintenance of publicly and privately maintained levees. Expedite allocation of funds for repairs and maintenance on priority projects and initiate an adequately

funded, comprehensive assessment program to determine the integrity of the levee system throughout the Central Valley. Prioritization for funding levee repairs and maintenance should be made on a basin-wide determination.

2. Flood Prevention and Habitat Improvement Integration

Since the January 1997 floods, state and federal agencies, particularly those participating in the CALFED program, have devoted increasing attention to flood recovery activities and flood prevention projects, and the potential relationship between these issues and the CALFED Bay-Delta program.

Protection of life and property from flooding should be an unquestioned priority for state and federal agencies, however, opportunities may be examined to integrate repair and maintenance programs and increased flood protection measures with ongoing or proposed programs that deal with levee or land management and habitat improvements. The Northern California Water Association has submitted specific recommendations to CALFED regarding their proposed levee setback and meander belt program and its relationship with flood protection projects (attached NCWA April 9, 1997 letter).

Recommendation: State and federal agencies should consider coordination and, where appropriate, integration with programs such as the CALFED Bay-Delta program in order to realize multiple goals of improved flood protection and habitat management. Although integration of flood protection and habitat management may not be possible in all cases, where coordination and integration is feasible, state and federal agencies must manage flood protection as the priority goal for flood control repairs, maintenance and improvements.

A comprehensive feasibility study should also be completed to evaluate the financial costs, scope and benefits, and cumulative impacts, of the proposed project. Based on the analysis provided in the comprehensive feasibility study, pilot or demonstration projects should be initiated to fully evaluate potential hydrological and biological impacts to water users, for flood control and environmental management. The feasibility study and demonstration projects should be completed prior to funding or initiation of any levee set-back or meander program, or purchasing easements or property in fee title.

State and federal agencies should also implement guidelines and regulations that establish a one-time mitigation requirement on levee projects. This will ensure that necessary repairs and maintenance are not delayed by additional mitigation requirements. Restoration activities such as levee setbacks, meander belt programs and others, should serve as mitigation for levee and flood control project repair and maintenance. Proposed habitat restoration programs or activities must not impair current or future actions necessary to fully repair and maintain all flood control structures, including levees, weirs and bypasses.

3. Development of New Flood Control Projects

Despite appropriate management of state and federal projects, Northern California reservoirs were unable to fully contain the record inflows during the January flood event. For example, Shasta Dam filled to 97% of capacity, while the Sacramento Valley's eastside reservoirs made large releases into the American, Feather and Yuba rivers. If additional storms had arrived shortly after the first storm, or if high inflows occur anytime when reservoir levels are near capacity, existing reservoirs do not have sufficient capacity to fully protect Sacramento Valley residents.

Recommendation: California and the U.S. should develop new flood control storage projects for the primary purpose of flood control protection. State and federal agencies should also support private efforts to develop flood control projects consistent with current state and federal laws and regulations. Projects on the Yuba River, Bear River, and Cottonwood Creek and the Sites Reservoir project would provide greater flood control flexibility for flood operation of the State Water Project and the Central Valley Project, ensuring greater flood protection for the region and Sacramento.



**Modesto
Irrigation
District**

1231 Eleventh St.
P.O. Box 4060
Modesto, CA 95352
(209) 526-7373

April 11, 1997

Ms. Julie McDonald
Deputy Secretary for Legislative Affairs
The Resources Agency
1416 Ninth Street
Sacramento, CA 95814

Dear Ms. McDonald:

As you well know, California experienced some of the worst flooding in state history during the December 26, 1996, and January 5, 1997, storms. In the San Joaquin Valley, levee failures on the San Joaquin River caused extensive flooding in residential and agricultural areas.

The Modesto Irrigation District (MID) was a participant in the Local Citizen Advisory Team Meeting in Modesto, California, on February 4, 1997. The majority of the District's comments were assembled in the team briefing booklet which was distributed at this meeting. However, MID would like to take this opportunity to re-emphasize the most prudent recommendations of increased flood protection on the Tuolumne River.

1. Clear channels - This is clearing of debris and material which accumulates over time and hinders the flow of water to the Delta
2. Increasing the channel capacity at Ninth Street to maintain flows up to 20,000 cubic feet per second in the Tuolumne River
3. Improve levees to increase protection both within the city limits and rural areas of Modesto
4. Develop off-stream storage facilities
5. Purchase additional land within the flood plain
6. Restrict development in flood plain

These options require federal, state and local participation. Thus, funding will be the key to the success of increasing the level of flood protection in the San Joaquin Valley.

If Modesto Irrigation District can be of assistance, please contact me at (209) 526-7405.

Sincerely,

ALLEN SHORT
General Manager

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

MEMBERS:

RUBÉN S. AYALA
VICE CHAIRMAN

WILLIAM A. CRAVEN
K. MAURICE JOHANNESSEN
PATRICK JOHNSTON
DAVID G. KELLEY
QUENTIN L. KOPP
DICK MONTEITH
STEVE PEACE
MIKE THOMPSON
CATHIE WRIGHT

California Legislature
Senate Committee
on

Agriculture and Water Resources

CONSULTANTS:

LINDA ADAMS
DANIEL WEBB

COMMITTEE
ASSISTANT:
PAMELA OTO

STATE CAPITOL
ROOM 2031
SACRAMENTO, CA 95814
(916) 445-2206
FAX: (916) 327-8290

April 2, 1997

JIM COSTA
CHAIRMAN

Mr. Douglas P. Wheeler, Chairman
Governor's Flood Emergency Action Team
c/o California Resources Agency
1416 9th Street, Suite 1311
Sacramento, CA 95814

Dear Mr. Wheeler:

Jim

I would like to take this opportunity to thank you for bringing the Flood Emergency Action Team (FEAT) to Fresno on March 12, 1997. I appreciate the Administration's responsiveness to the San Joaquin Valley's flood problems.

The meeting resulted in a constructive exchange of ideas and an improved understanding of the extent of damage suffered in the San Joaquin Valley. The Valley needs insightful efforts to deal with existing flood damage, flood protection in future years, and the capture of surplus water for use in the Valley.

I have proposed a number of short-term and long-term approaches to deal with the flood problems in the Valley. The purpose of this letter is to formally transmit my recommendations for short-term and long-term actions for inclusion in the final FEAT report to be submitted to the Governor.

Please give serious consideration to the enclosed proposals, which incorporate many of the suggestions received from the San Joaquin Citizens Group. I would appreciate the inclusion of these recommendations in the final FEAT report to be submitted to the Governor.

Sincerely,



JIM COSTA
Chairman

JC:st

Enclosures

COSTA PROPOSALS TO GOVERNOR'S FLOOD EMERGENCY ACTION TEAM

March 12, 1997

SHORT-TERM ACTIONS:

- The Legislature should enact and the Governor should support urgency legislation to pay local agency costs of rebuilding and repairing local public facilities (e.g., roads and bridges) not covered by federal disaster assistance.
- The Legislature should enact and the Governor should support urgency legislation to provide tax relief to owners of private property and businesses damaged by the floods, including tax breaks for the repair of private levees.
- State and federal agencies should cooperate in levee repairs and emergency channel clearing on the San Joaquin River and its existing bypass between Gravelly Ford and the confluence of the Merced River, in order to return these channels back to original design capacities.
- Local agencies should identify opportunities for nontraditional flood prevention projects that can be undertaken prior to next flood season, such as levee setbacks and voluntary acquisition of land or easements.
- State and federal funding should be identified for levee repairs, channel clearing, and nontraditional projects that can be undertaken this year. Consideration should be given to using the State's Reserve for Economic Uncertainties.
- Streamline process for formation of local special assessment districts (local levee districts, etc.) should this continue to be necessary for reimbursement in the event of future disasters.

LONG-TERM ACTIONS:

- State and local public policy needs to make clear that flood control projects and disaster relief programs are no substitute for sound land use planning. Even highly controlled rivers will flood. Land uses compatible with flood plains include multi-purpose conservation projects and agricultural production. The State should use financial and other incentives to encourage local agencies to do better flood plain management and land use planning.
- The Administration should support feasible projects for increased storage on the San Joaquin River, Success Reservoir Enlargement Project on the Tule River, and the Terminus Dam Project on the Kaweah River.

- Federal, state, and local agencies should cooperate in the design, financing, and construction of a system of weirs, bypasses, and voluntary easements on the lower San Joaquin River in order to protect downstream communities from future floods.
- State and local agencies should identify opportunities for non-structural flood prevention projects such as levee setbacks and voluntary acquisition of land or easements that will provide multi-purpose benefits such as flood prevention, agricultural production, habitat, recreation, and groundwater recharge.
- The Administration should support a long-term, significant source of state funding to pay the state's share of flood prevention and control projects, such as a general obligation bond.
- Reservoir operations and operating manuals should be regularly examined and updated to reflect new information and to take into account development downstream.
- Develop a means of identifying ownership and responsibility for specific levees. Availability of global positioning satellite technology, with inexpensive ground locating receivers, allows us new opportunities here.
- Federal flood relief reimbursement policies should be based on common sense. Costs incurred during flood fight periods, such as private efforts to control breaks in a public levee, should not require months to determine compensability. Also, levee ownership arrangements should not provide the sole means of determining compensability.

Finally, we must evaluate federal and state criteria as to what constitutes an economic loss to those involved in agriculture. For example, flood waters that prevent planting (during what is usually a very narrow window of proper climate and moisture conditions) can cause farmers to lose an entire year of income. Damage to livestock (reduced milk production or weight gain) is difficult to quantify. Water damage to permanent crops (such as trees) may not show up for some time. Many farm workers will not feel the impact of our January floods until the summer season, when smaller harvests will restrict employment opportunities in a manner difficult to quantify. These are all very direct losses, but those affected may not qualify under current relief programs.

Because agricultural flood impacts are not always readily known, we need to analyze how well our recovery efforts meet the needs of this industry in particular.

MEMBERS.

RUBÉN S. AYALA
VICE CHAIRMAN

WILLIAM A. CRAVEN
K. MAURICE JOHANNESSEN
PATRICK JOHNSTON
DAVID G. KELLEY
QUENTIN L. KOPP
DICK MONTEITH
STEVE PEACE
MIKE THOMPSON
CATHIE WRIGHT

California Legislature

Senate Committee

on

Agriculture and Water Resources

JIM COSTA
CHAIRMAN

CONSULTANTS:
LINDA ADAMS
DANIEL WEBB

COMMITTEE
ASSISTANT:
PAMELA OTO

STATE CAPITOL
ROOM 2031
SACRAMENTO, CA 95814
(916) 445-2206
FAX: (916) 327-8290

Senator Costa - Flood Actions

SB 310 (Costa) - Lake Kaweah Flood Control - Authorizes state financial participation in the raising of Terminus Dam on the Kaweah River for purposes of flood control and water supply. This project will increase Lake Kaweah's capacity about 30% or 42,600 acre feet and would provide improved flood protection downstream in Tulare and Kings counties, including the City of Visalia and other nearby communities.

Request to Governor: Success Reservoir Enlargement, Tule River - Senator Costa has formally requested that the Governor include in the Budget Act of 1997 an appropriation of \$150,000 to the State Department of Water Resources for the state's share of funding to update feasibility studies for the enlargement of the Success Reservoir on the Tule River.

SB 312 (COSTA) - Flood Prevention Bond Act of 1998 - Proposes to place on the statewide ballot in 1998 a general obligation bond measure in the range of \$400-\$500 million to finance flood prevention projects statewide, including: Upgrading existing levees to meet minimum standards developed by the U.S. Army Corps of Engineers; to pay the state's share of the flood control subventions program (for projects authorized by Congress and the state); to develop a system of weirs, bypasses, and easements on the lower San Joaquin River; for projects in the Arroyo Pasajero watershed; and to acquire flood easements in flood-prone areas of the state.

SB 4X (COSTA) - Disaster relief - Pays the cost of rebuilding and repairing local public facilities (e.g., roads and bridges) not covered by federal disaster assistance.

Taxation: Disaster Relief - Senator Costa is supporting a package of legislative proposals that will provide tax relief to owners of private property and businesses damaged by the floods and reimburse counties for lost property tax revenues as the result of reassessment of flood-damaged property.

DELTA PROTECTION COMMISSION

14115 RIVER ROAD
P.O. BOX 530
WALNUT GROVE, CA 95690
PHONE: (916) 776-2290
FAX: (916) 776-2293



April 1, 1997

Honorable Douglas Wheeler
Secretary of Resources
1416 Ninth Street, 13th Floor
Sacramento, CA 95814

Subject: Delta Protection Commission Comments on the Governor's Flood Emergency
Action Team (FEAT) 30 Day Report

Dear Secretary Wheeler:

I am writing to comment on the FEAT 30 Day Report. The Delta Protection Commission is concerned about floods and flooding due to its location at the confluence of the Sacramento and San Joaquin Rivers, and its land surface elevations near and below sea level. Protection and maintenance of the levees, which define land forms in the Delta, are the keys to flood control in this region.

Comments on the 30 Day Report:

The report directs Department of Water Resources to install new stream gauging stations and telemetry to provide real time data for areas found to be deficient in the January event.

The Sacramento and San Joaquin Rivers and the east side waterways, particularly the Cosumnes and the Mokelumne Rivers, should be evaluated for additional gauging stations. Additional gauging stations will allow Reclamation Districts and public officials additional information to use in preparing for high flows. No data on the flows of the Cosumnes and the Mokelumne Rivers is included in the 30 Day report (see maps following page 10), even though these waterways caused flooding in the January event.

The report directs Office of Emergency Services to conduct workshops with State, local and federal agencies in areas at risk during this flood season, to review roles and procedures related to dissemination of flood information and public warnings.

Mr. D. A. Christian
March 7, 1997
Page 2

months. It is important to note that one of the largest storms of record in Sacramento occurred at the end of April (April 20-21, 1880). 8.3 inches of rainfall fell on these dates, including 7.24 inches in a 24-hour period. Should such an event be repeated in the Cosumnes River watershed this Spring, flooding would certainly occur through the existing levee breaks.

We are looking to the State of California and the federal government to provide the necessary leadership and resources to reduce the continued flood threat to our citizen's safety and properties. Our citizens live in constant fear that another storm event may occur on top of this spring's snow melt that would again inundate their homes, properties, and roadways.

Should you require further information or have any questions please contact me at 440-6581.

Sincerely,



Warren H. Harada, Administrator
Public Works Agency

DATE: March 5, 1997
RE: Mike Hardesty - Comments to Governor's Flood Emergency Action Team

Introduction

- Member of the Board of Directors of ACWA, The Association of California Water Agencies.
- Manager of Reclamation District No. 2068.
- President of the California Central Valley Flood Control Association
- Appointed alternate to the Board of Directors of the Solano County Water Agency

I am here today to represent the interests of ACWA, but I will also address more specific areas of concern of the flood control community.

ACWA represents over 400 public water agencies in addition to numerous private water purveyors in the State of California. The Central Valley Flood Control Association represents some eighty reclamation districts, levee districts, cities and counties in the Sacramento Valley, Delta and Northern San Joaquin Valley who are responsible for flood control system maintenance along the Sacramento and San Joaquin Rivers, their tributaries and the Delta. Both of these entities have been in existence for more than 70 years.

ACWA expresses its strong desire to protect the necessary components of the Central Valley's and Delta's flood control system of levees, channels and bypasses. ACWA recognizes the value effective flood control provides in protecting lives and property as well as protecting vital transportation, water conveyance and habitat resources.

ACWA is committed to the CALFED process and supports and encourages the recognition of a comprehensive systemwide flood control solution as a vital and necessary component of the larger resolution of California's resource issues.

ACWA General Policy

As a general policy ACWA believes that multipurpose projects are preferable to single-purpose projects. Such projects better utilize scarce physical resources and limited public funds and have the added benefit of potential water supply, power generation, fish and wildlife mitigation, water quality enhancement and recreation.

It is ACWA's position that the federal government has a major responsibility for funding flood control projects with reasonable participation by State and local interests.

ACWA supports the continuing development and management of necessary flood control projects for the protection of lives and property. We recognize that taking no action is in fact acceptance of a continuing and accelerating reduction in the

level of protection provided by the existing flood control system. In addition, ACWA supports responsible land use planning policies and regulation by cities and counties as one of the elements of effective flood protection efforts.

Flood Control Agency Concerns

Within the flood control community, our immediate concern is the need to expedite levee repair and to ensure that required maintenance is undertaken. When the Flood Control Association asked its members agencies what their most pressing problems were, the answers were not particularly surprising:

1. State funding for non federal cost sharing,
2. Federal funding for levee rehabilitation,
3. Federal emergency repair funding,
4. Corps of Engineers 404 permitting,
5. DFG 1601/1603 permits,
6. Post Proposition 218 local funding.

Funding, funding, funding, permits, permits & funding. Do you see a pattern here? These are all items that will require substantial attention in order to continue providing an effective flood control program.

Role of Flood Control Components

Both ACWA and the flood control community understand that effective flood control is achieved through a balanced mix of facilities and policy. No one component will effectively, or safely, provide the necessary flood protection required in California. It is our belief that reliance on any one component, such as levees, channel improvements, storage, policy or regulation is short-sighted and a certain invitation to continued damage as we have seen this year. Each of these components must be pursued in determining an appropriate flood control plan. There can be no components left "off the table".

Recognition of Benefits

There is a great need to recognize that while the very nature of the flood control system is to provide for the safety of life and property. It must also be recognized that this protection also extends to the habitat and the wildlife in the areas protected by these facilities. The habitat acreage protected by these facilities is substantially larger than that affected by repair and maintenance activities.

The State's environmental resources are beneficiaries of the flood control system, and this protection should be recognized and credited to the projects in lieu of any mitigation requirement for necessary repairs and maintenance to the original design specifications. The current environment where such benefits are not recognized has created the situation where many maintaining agencies have adopted a "scorched earth" maintenance policy out of the fear that allowing habitat development will lead to habitat mitigation requirements for routine repair and maintenance. This condition serves no benefit to either of the interests involved, flood control or environmental.

Legal and Regulatory Constraints

It is essential to reconsider the state and federal constraints on flood control activities. Environmental law, regulation and regulators have served to delay, discourage and sometimes prevent essential flood control work, and in almost all cases they reduce significantly the funds available for flood protection.

We believe that it is necessary to remove unreasonable and unwarranted regulatory constraints to the maintenance and repair of the flood control components, including for example, unduly restrictive limitations contained in Corps of Engineers Nationwide Permits 3, 13 and the previously proposed Permit D (Maintenance, Bank Protection and Maintenance of Existing Flood Control Projects).

It is our position that, as public agencies responsible for the flood control, system we must put system integrity and "SAFETY FIRST".

System Deficiencies

Many of the problems during the recent and previous floods were a result of deficiencies in design, not maintenance. As a result of the 1986 floods the Sacramento River Flood Control System Evaluation was undertaken by the Corps of Engineers. Numerous system deficiencies were identified. Unfortunately, under current Corps guidelines only those individual sites meeting a positive cost/benefit analysis will be considered for restoration, despite the fact that a systemwide economic analysis shows such a positive ratio. It is disingenuous to tout the "system" when in fact federal policy so clearly signals a disinterest in maintaining the "system" in favor of a fragmented, "incrementally justified" flood control patchwork.

This must change. Incremental justification is inappropriate hydraulically and represents poor public policy. Congress, if it can not be done elsewhere, needs direct the evaluation of the federal system of levees, bypasses, channel improvements and dams be completed and the repairs implemented as a whole system and not subject to justification on an incremental basis.

Funding Repairs and Maintenance

Over time, the costs for repair of the flood control system have shifted from the federal government to state and local interests. Original maintenance agreements provided that local reclamation and levee districts would provide for the maintenance of federal facilities.

With the advent of local cost sharing requirements, many agencies found themselves saddled with not only with those maintenance costs but also substantial restoration and improvement costs to protect themselves from waters delivered to the system from activities and system benefits conferred upon upstream lands that are not assessable for these locally increased costs. Many local agencies are no longer able to fund this work, and with the recently enacted Proposition 218 local funding may be increasing difficult to generate.

The state and federal interests need to consider increased participation in funding levee and channel rehab and maintenance. We would suggest programs patterned after the state Delta Flood Protection Act of 1988 (SB34) as amended in 1996 through AB 360. This program has proved valuable to the Delta and we feel its expansion to the entire flood control system on both the federal and state levels could provide cost effective and rapid implementation of needed repairs and improvements and at the same time provide significant reductions in cost.

It is our experience that local agencies are able to achieve significant cost reductions when they are permitted to undertake repair and improvement work when compared to state or federal contracted work. There is very limited opportunity for this transfer of work to willing local agencies to occur at the current time. The ability of local agencies to contract with or otherwise undertake such flood control system work on a reimbursement basis from both the state and federal governments needs to be implemented.

State Reclamation Board

The State Reclamation Board performs an essential role in flood control activities within the entire Central Valley. The Board was created to provide for an orderly system of flood protection and has unquestionably filled that role. In addition to its role as the official State agency which approves federal levee and other flood control projects and provides the state assurances to match federal funding, the Board monitors encroachments in flood plains and provides maintenance oversight to local agencies.

Additionally, the Board performs the very important role of establishing and policing "designated floodways". These are areas as yet unreclaimed which are identified as subject to periodic flooding. This program has been of great value in reducing potential flood damages.

These responsibilities will become ever more important as the potential redesign of the San Joaquin portion of the flood control project is undertaken to accommodate the kind of rainfall driven flood that during January and which greatly exceeded the capacity of the San Joaquin River.

For all of these reasons, the State Reclamation Board budget must be substantially increased, even to levels above what it was before the substantial reductions of the past several budget years. This agency of the State should not be required to limp along at the level which has resulted from the cuts that the Legislature has required in recent years.



Sacramento
Area Flood
Control
Agency

**TESTIMONY BEFORE THE FLOOD EMERGENCY ACTION TEAM
SUBMITTED BY SACRAMENTO AREA FLOOD CONTROL AGENCY**

March 5, 1997

The Sacramento Area Flood Control Agency (SAFCA) appreciates this opportunity to brief members of the Flood Emergency Action Team (FEAT) on the flood control situation facing Sacramento. We believe it is of critical importance that the FEAT report recognize the immediate need for significant near-term flood control improvements in the Sacramento region, where 400,000 residents, 150,000 homes, 5,000 businesses, the State Capitol, and 1,300 government facilities face almost one chance in three of experiencing a devastating flood over the next thirty years. While the region suffered significant flood damage in the New Year's event, we are thankful that the storm path did not focus its peak power in the American River watershed. This random act of nature, coupled with the improvements to Sacramento's flood control system, which SAFCA, the State and the Corps have implemented since 1986, allowed Sacramento to again escape the type of devastating flooding experienced by our northern and southern neighbors.

FLOODING FROM THE JANUARY STORM

Sacramento's most severe flooding occurred along the Cosumnes River. Flows at the Michigan Bar gauge north and east of Rancho Murieta peaked at nearly 100,000 cfs, more than twice the previous historic highs. Flood waters streamed over the top of private agricultural levees, inundating nearly 100 homes in the Wilton and Point Pleasant communities, flooding nearly 50,000 acres, and causing damages in excess of \$30 million. Nineteen open breaks in these levees pose an ongoing immediate threat to public infrastructure and private property. Efforts are underway to secure emergency assistance in repair of these levees and to place them in the jurisdiction of a public agency. If these efforts are successful, prospects for repair, maintenance, and long-term improvements may be substantially improved.

Dry Creek and its tributaries originating in the Placer County foothills overflowed on two occasions flooding homes in Roseville, Granite Bay, and Rio Linda. After the 1995 floods, Placer and Sacramento counties and the City of Roseville submitted a grant application to the Office of Emergency Services for a coordinated flood hazard reduction program along Dry Creek. After the 1995 floods, FEMA made hazard mitigation funds available for the OES grant program and similar funding will be available in 1997. SAFCA, Sacramento and Placer County flood control agencies will submit to OES a suggestion which would allow future hazard mitigation grants to be awarded in coordination with flood insurance payments so that qualifying flood-prone structures can be raised at the same time they are reconstructed. Significant flooding of homes and apartments also occurred in the Arden Arcade community due to the coincident occurrence of intense rain and high levels in the American River.

Office 916-440-7606
FAX 916-440-8289

1007 - 7th Street, 5th Floor
Sacramento, CA 95811-3107

DEVASTATING FLOODING AVOIDED

As earlier noted, the full power of the New Year's storms was not centered over the American River. Nevertheless, peak inflows to Folsom Reservoir were higher than in 1986 as was the three-day runoff volume. 1986 was the previous storm of record, and nearly \$150 million has been spent on improved flood protection for Sacramento since that event. Accomplishments include strengthening 30 miles of Sacramento River levees, erosion protection along the lower American River, SAFCA's purchase of additional flood space in Folsom Reservoir, and SAFCA's locally funded North Area Levee Project which resulted in \$60 million in improvements to levees protecting the Natomas and North Sacramento areas. These improvements played an important role in avoiding the devastating type of flooding that was experienced by our northern and southern neighbors. Our levees held and with the additional flood control space in Folsom Reservoir the Bureau of Reclamation was able to limit releases to the safe carrying capacity of the levees which convey the lower American River through the urbanized area.

Equally important was the January storm path. On December 31 and January 1, the National Weather Service was projecting American River runoff far in excess of that which subsequently occurred. Fortunately, the storm released its full power over the Feather River. With a slightly different storm track, the actual precipitation which fell on the Feather River could have instead produced American River runoff which would have necessitated Folsom Reservoir releases of 155,000 cfs, nearly 50 percent more than the 115,000 cfs design capacity of the lower American River levees. The Corps has estimated that the minimum damage from an American River levee breach would be \$7 billion, with 150,000 homes flooded. Sacramento was spared this devastation by a random act of nature. With the above explanation, we feel certain FEAT will understand the importance of including further flood control improvements for the Sacramento region in its recommendations to the Governor. The near-term improvements described below are necessary to complete SAFCA's and The Reclamation Board's efforts to shore up the levees protecting the Sacramento urban area.

NEAR-TERM LEVEE IMPROVEMENTS

Common Elements - Last September, Congress authorized additional levee improvements around Sacramento, including 26 miles of levee stabilization along the lower American River, raising and strengthening 12 miles of the east levee of the Sacramento River south from the Natomas Cross Canal, and three new telemetered gauges and other early flood warning improvements along the American River. The Clinton Administration has proposed to begin construction on these improvements immediately and is seeking a 1998 appropriation of \$44.7 million to fund the entire Federal share of this \$63.3 million project. The Governor has included \$3.5 million to fund the State's share of the initial phase of this project in his proposed budget. Total State funding of \$13 million is needed over the next three years.

Honorable Members of FEAT

March 5, 1997

Page 3

American River Bank Protection Project - SAFCA, The Reclamation Board and the Corps have found that bank protection improvements are needed to stop erosion which threatens urban levees along the lower American River. Over the last two years, SAFCA has led a collaborative process through which flood control, environmental, and neighborhood interests have reached agreement on how to complete this work in a manner which protects the sensitive environmental and aesthetic values of the American River. As a result, construction of a project to correct erosion which occurred in 1995 was rapidly initiated last summer avoiding a potential levee failure in the most recent storm. Additional improvements costing approximately \$9.7 million are needed over the next four years to prevent levee-threatening erosion at three other American River sites. This work is already authorized under the Sacramento River Bank Protection project, which is used to fund erosion control projects throughout the Sacramento River system. The Clinton Administration has requested a 1998 appropriation of \$5.5 million, which includes \$4.0 million for the next phase of work on the American River. The Governor has included a \$1.8 million State match for next year in his proposed budget. This work is critical both for Sacramento and the State and should be included in FEAT's recommendations. Over the next three years total State funding for American River work will be approximately \$2.4 million.

Magpie Creek - Congress has already appropriated \$4 million for improvements to Reclamation Board project levees along Magpie Creek west of McClellan Air Force Base and we will be seeking \$3 million in State matching funds this year. These improvements are necessary to protect existing homes and Interstate 80 from flooding and to provide a portion of the improvements which are necessary for the successful conversion of McClellan Air Force Base to a civilian employment center. Total need for State funds is \$3 million over the next year.

North Area Levee Improvements - In 1993, Congress authorized Federal reimbursement for certain locally constructed levee improvements needed to protect urbanized portions of North Sacramento and Natomas from flooding from the American River. By borrowing heavily, SAFCA has rapidly completed \$60 million in improvements which helped to prevent flooding last January. This borrowing, coupled with additional future flood control obligations of about \$30 million, has severely strained SAFCA's financing capability and SAFCA now seeks State and Federal reimbursement for this work. The Assistant Secretary of the Army has directed the Corps to negotiate and execute a crediting/reimbursement agreement with the non-Federal sponsors. This agreement, which will be ready for execution later this year, will allow SAFCA to obtain approximately \$47 million in Federal reimbursement and \$11 million from The Reclamation Board. These funds can be used to stabilize SAFCA's financing capability so that additional flood control improvements can be constructed.

Additionally, the cost-sharing agreement will make these improvements part of the Central Valley flood control project and provide local assurances of long-term maintenance. SAFCA will seek State authorization and Reclamation Board participation in this project and State funding totaling approximately \$11 million over the next three years.

Honorable Members of FEAT

March 5, 1997

Page 4

South Sacramento Streams Group Project - In order to complete work on the urban levees surrounding Sacramento, improvements to the levees protecting South Sacramento from the effects of high water in the Cosumnes and Mokelumne Rivers and the Delta are also needed. SAFCA and the Corps have undertaken a feasibility study to identify and seek authorization of a Federal project to improve levees along Morrison Creek and its tributaries. In anticipation of future Federal project authorization, SAFCA will seek State authorization of this project. Appropriations will not be sought before a Federal project is authorized, perhaps in 1998. If a Federal project is authorized the State's share is currently estimated to be approximately \$10 million.

The New Year's storm drove home the importance of ensuring that urban levees are reliable. SAFCA and The Reclamation Board, working with the Corps, have identified the above near-term levee improvements as being necessary to provide such reliability in the levees ringing Sacramento. SAFCA and The Reclamation Board need to continue their partnership and, working with the Corps, complete these near-term levee improvements. SAFCA respectfully requests FEAT's support of these projects in your final report to the Governor.

LONG-TERM NEEDS

Your report should also recognize that levee improvements alone will not provide even the minimum 100-year flood protection mandated by State and Federal standards. This is because the American River has demonstrated, on five separate occasions since 1950, its ability to produce higher flood flows than were anticipated in the design of Folsom Reservoir. While the best technical solution to controlling the American River is to construct a flood control facility at Auburn, there are other options which involve modifications to Folsom Dam. In 1996, SAFCA and The Reclamation Board, with the support of the Wilson Administration and the region's bipartisan congressional delegation, sought but did not receive authorization for an Auburn facility. However, because there was widespread agreement by all interests that Sacramento faced unacceptable flood risk, the Common Elements were authorized.

SAFCA has decided that its first priority is to obtain the authorizations and funding necessary to complete the near-term improvements described above. SAFCA will then turn its attention to the matter of additional flood control improvements along the American River. FEAT may wish to consider the following points in its report to the Governor.

Even with the near-term levee improvements described above, Folsom Dam as currently configured is not capable of controlling the American River. Uncontrolled American River flows jeopardize Sacramento, the Capitol, and the center of State government. 160,000 acres were flooded in Sutter and Yuba counties. Approximately one month after the flood about half the area had been drained and pumping was started to drain the remaining area. Now, two months later, some of the area is still flooded. Had Sacramento flooded a similar restoration period would be required. During that time, the operations of State and local governments would be severely impacted. In short, the most

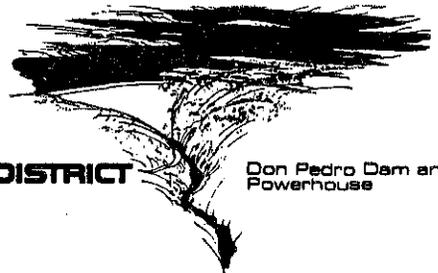
Honorable Members of FEAT

March 5, 1997

Page 5

basic operations of the governing structure of the world's seventh largest economy would be devastated. We cannot afford to do anything but fully protect the capital city.

Additionally, uncontrolled American River flows jeopardize the integrity of the Central Valley flood control project below the confluence of the American River. Uncontrolled flows threaten levees along the lower Sacramento River, the Yolo Bypass, and in the Delta. Over the next thirty years there is a one in three chance of uncontrolled American River flows. In supporting these essential near-term levee improvements, the State must not forget its long-term interests. Additional long-term flood protection measures are needed along the American River.



TURLOCK IRRIGATION DISTRICT

333 EAST CANAL DRIVE
POST OFFICE BOX 949
TURLOCK, CALIFORNIA 95381
(209) 883-8300

Don Pedro Dam and
Powerhouse

February 27, 1997

Ms Julie McDonald
Deputy Secretary for Legislative Affairs
The Resources Building
Sacramento, CA 95814

RE: Local Citizen Advisory Team Meeting - Modesto, CA - February 4, 1997

Dear Ms McDonald:

This letter is in response to Mr. Wheeler's invitation at the referenced meeting to provide recommendations on additional flood protection measures in the San Joaquin/Delta region.

The Turlock Irrigation District has given careful consideration to the events surrounding the January flood, and measures that could be implemented to further enhance flood control operations and minimize the possibility of a recurrence of extreme high flows in the lower Tuolumne River. The following are viewed as the most practical and prudent steps to take to reach that goal.

1. **Increase authorization to maintain flows greater than 9,000 cubic feet per second in the Tuolumne River at the Ninth Street Bridge in Modesto.** Presently, the Army Corps of Engineers requires that flows not exceed 9,000 cfs. Substantially increasing the maximum flow would provide the additional release capability to accommodate another major runoff.
2. **Restrict developmental encroachment into the flood plain.** The Ninth Street Trailer Park should be relocated and no new development allowed within the defined flood plain.
3. **Construct an impound structure on Dry Creek.** Flow from the Dry Creek drainage must be regulated so that discharge into the Tuolumne River can be coordinated with upstream reservoir operations. At a minimum, Dry Creek storm runoff needs to be retained up to 48 hours.



February 27, 1997
McDonald
Page 2

4. **Construct a bulwark to protect the City of Modesto Wastewater Treatment Plant from higher river flows.**
5. **Construct, as necessary, levees to protect the Airport, La Loma, Carpenter Road, and Hatch Road districts from flows up to 20,000 cfs.**
6. **Reinforce Tuolumne River levee system downstream of Modesto.**

The majority of these steps will take federal, state, local and stakeholder participation to analyze, evaluate and conclude what is the best option to take considering all ramifications. All can be accomplished with a unified approach of the interested parties.

At the same time, off-stream flood control facilities need to be evaluated. A number of potential sites have previously been identified. All should be reevaluated in light of present-day value. Parties with interests beyond flood control should be invited to participate in the evaluation to determine the potential for a multiple use project which could provide flood control, water supply, recreation or power production benefits.

Sincerely,

TURLOCK IRRIGATION DISTRICT



Paul D. Elias
General Manager

Feb. 21, 1997



CALIFORNIA
STATE
UNIVERSITY,
FRESNO

Mr. Ray Hart
Deputy Director
California Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

Dear Mr. Hart:

Pursuant to our telephone conversation of 14 Feb., I am sending this letter to express my concern regarding the safety of a pending housing development planned to be constructed entirely within the floodway of the San Joaquin River, in Fresno County. The site is on Scout Island, on the south side of a meander loop in Sect. 25, T.12S., R. 19E., Fresno North 7.5 minute quadrangle. Grading permits have been issued, several pads have been constructed, and building permits for up-scale houses are in review and will probably soon be approved by the City of Fresno.

The property is presently owned by Mr. Jon Thomason and the Scout Island Investment Company. The area was entirely inundated by flowing floodwaters during the Jan. 2-4 event as seen by the video recording made by the Fresno Metropolitan Flood Control District (FMFCD). This video, shot after the peak flow had subsided, shows the pads barely emergent; for several days, they remained islands cut off from all infrastructure.

According to Mr. Doug Harrison of the FMFCD, the pads were engineered (and approved) based on a design "250-year event" of 51,000 cfs. The January flow of nearly 60,000 cfs clearly indicates that the pads are under engineered. On this basis, I question two things: #1 the developer's assumption that the pads "grandfather" in and cannot be required to be re-engineered based on higher and more realistic flows, and #2 the prudence of granting building permits in area that has demonstrably suffered catastrophic flooding.

As was pointed out during a recent City Council meeting, the argument in favor of permitting is based solely on "rights of the individual proper owner". But there is a much larger issue at stake--that of the safety of the inhabitants, and the rights of the public who will undoubtedly be asked to bear the expense of future flood damages to these properties.

I request that you place this item on the agenda when the Flood Emergency Action Team comes to Fresno. Thank you for your consideration in this matter.

Sincerely,

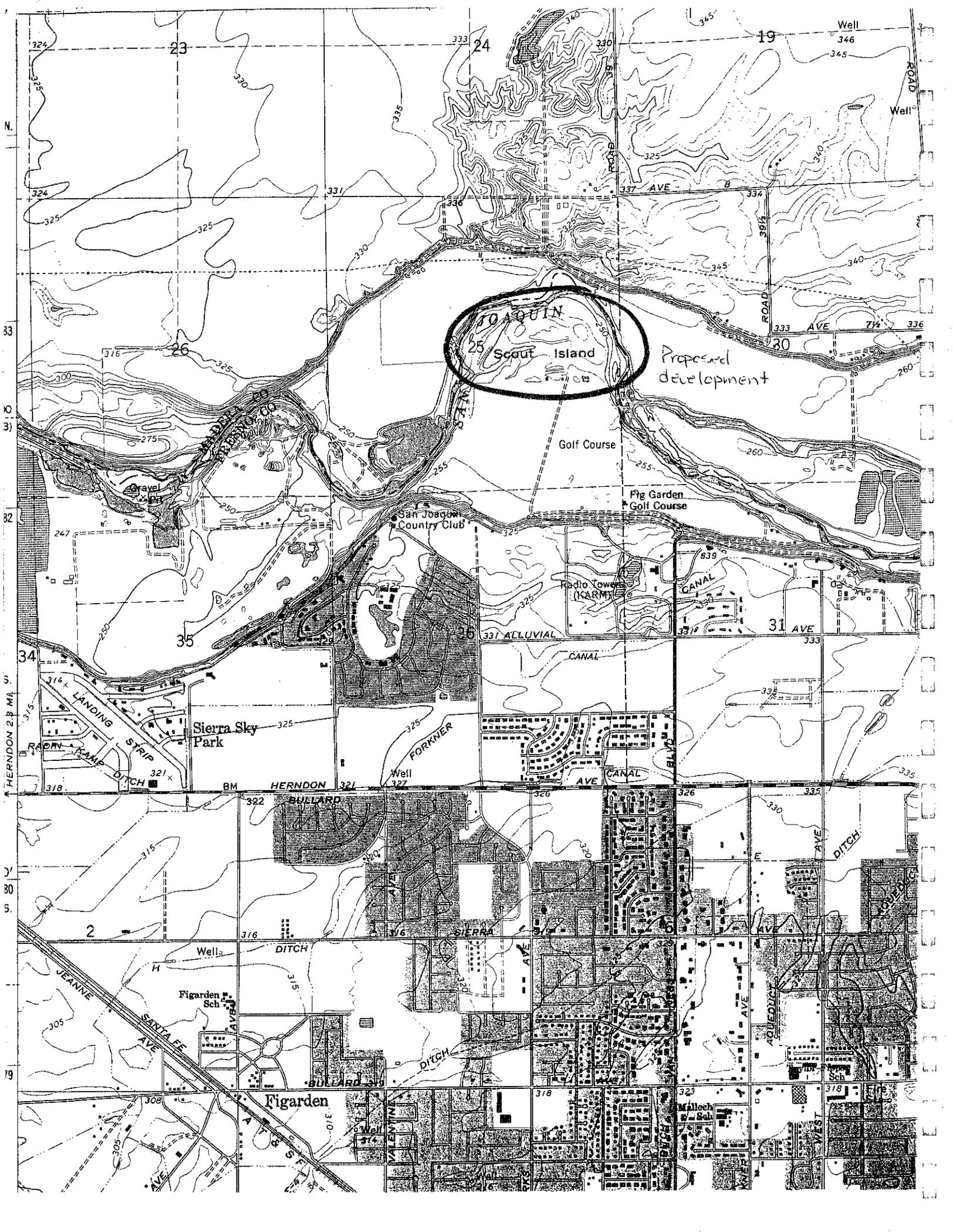
A handwritten signature in cursive script that reads "Roland H. Brady III".

Dr. Roland H. Brady III
Professor of Geology

School of
Natural Sciences
Department of Geology
2345 East San Ramon Avenue
Fresno, CA 93740-0024

209. 278-3086
Fax 209. 278-5980

encl. map



MEMBERS

RIBEN S. AYALA
VICE CHAIRMAN

WILLIAM A. CRAVEN
K. MAURICE JOHANNESSEN
PATRICK JOHNSTON
DAVID G. KELLEY
QUENTIN L. KOPP
DICK MONTEITH
STEVE PEACE
MIKE THOMPSON
CATHIE WRIGHT

California Legislature
Senate Committee

on

Agriculture and Water Resources

CONSULTANTS
LINDA ADAMS
DANIEL WEBB

COMMITTEE
ASSISTANT
PAMELA OTO

STATE CAPITOL
ROOM 2031
SACRAMENTO, CA 95814
916/445-2206
FAX 916/327-8290

JIM COSTA
CHAIRMAN

February 21, 1997

The Honorable Pete Wilson
Governor of California
State Capitol Building
Sacramento, CA 95814

Re: State Funding for Tule River, Success Reservoir Enlargement Project

Dear Governor Wilson:

This is to request your support for inclusion in the Budget Act of 1997 an appropriation of \$150,000 to the Department of Water Resources for a state share of funding to update feasibility studies and completion of the EIR/EIS for the enlargement of the Success Reservoir on the Tule River.

The local sponsor and the U.S. Army Corps of Engineers entered a Feasibility Cost Sharing Agreement in 1988 for the Tule River Basin Investigation, Success Reservoir Enlargement Project. The parties recently negotiated an amendment for updating the feasibility study and for completion of the EIR/EIS for the selected National Economic Development plan. The selected plan involves raising the spillway 10 feet and lengthening the spillway 100 feet, thereby providing 28,000 acre feet of additional flood control space in Success Reservoir.

This important project will increase the flood protection for the City of Porterville and downstream agricultural lands from an event occurring once in 55 years (the existing project) to an event occurring once in 100 years (the proposed project). The recent flooding that has occurred in California has been a harsh and costly reminder of the damage that can occur in areas without adequate flood protection.

Under the amended cost-sharing agreement, the federal government has committed to \$400,000 of the cost, and the Tule River Association, the County of Kings, and the County of Tulare have committed \$100,000 each. It is critical that state funding in the amount of \$150,000 be appropriated to the Department of Water Resources for in-kind services for the update of the feasibility study and completion of the EIR/EIS.

Honorable Pete Wilson
Page 2
February 21, 1997

I also intend to request that this project be included in the final recommendations of your Flood Emergency Action Team (FEAT). The inclusion of the Success Reservoir Enlargement Project in the final FEAT report would be in keeping with the state's need to develop long-term solutions to California's flood control problems.

Your serious consideration of this project is greatly appreciated. I look forward to working with you on this and other critical flood control efforts.

Sincerely,



JIM COSTA
Chairman

JC:lsa



CALFED
BAY-DELTA
PROGRAM

1416 Ninth Street, Suite 1155
Sacramento, California 95814

(916) 657-2666
FAX (916) 654-9780

Memorandum

Date: February 6, 1997

To: Ray Hart

From: Lester A. Snow *by Steve Yarger*

Subject: Issues for the 120-Day Report on the 1997 Flood

Attached is a list of issues we believe should be examined in the 120-day report. These issues generally explore the linkages between the flood control system and the water supply and ecosystem restoration elements of the CALFED Bay-Delta Program draft alternatives.

cc: Julie MacDonald

CALFED Agencies

California

The Resources Agency
Department of Fish and Game
Department of Water Resources
California Environmental Protection Agency
State Water Resources Control Board

Federal

Environmental Protection Agency
Department of the Interior
Fish and Wildlife Service
Bureau of Reclamation
Department of Commerce
National Marine Fisheries Service

Overview

CALFED Flood Protection Opportunities

The CALFED Bay-Delta Program is developing a long-term comprehensive plan that will restore ecological health and improve water management and protection of beneficial uses of the Bay-Delta system. Specific actions will address Bay-Delta problems in ecosystem quality, water quality, levee system vulnerability, and water supply reliability. Many of these can also improve flood protection in the system.

The attached map shows some of the Program elements which promote flood protection while also meeting other Program objectives. Following are brief descriptions of these elements.

Delta Levee/Channel Improvements - The majority of the land within the Delta is below sea level. Approximately 1100 miles of existing levees encircle different tracts of lands to form "islands" used for agriculture, habitat for important terrestrial species, towns, and infrastructure. These levees also provide a significant link in protecting the water supply reliability for 2/3 of California's water users. Many of these levees do not meet high standards for flood protection and the Bay-Delta system faces an unacceptably high risk of inundation of Delta islands due to potential levee failure. Improving levees by building them higher and stronger will significantly improve flood protection and provide new opportunities for habitat restoration and protection. Channel improvements, in conjunction with the levee improvements, allow for carrying larger floods. The **North Delta Program** is one example of levee and channel improvements that has been under study for several years.

Setback Levees - Many existing levees are located at the edge of river channels. Constructing new levees farther away from the channel provides for a wider area to carry flood waters. This wider flood plain will temporarily store some flood waters and lower flood flows to downstream areas. The wider flood plain also creates new opportunities for habitat restoration.

Bypass - Existing bypass channels were constructed years ago along portions of the Sacramento and San Joaquin Rivers to divert some of the flood flows out of the rivers and thus relieving pressure on the main channel. The combination of the rivers and the bypasses can carry more water than the rivers alone. Improvements to the existing San Joaquin Bypass by construction of new **setback levees** would allow for carrying even more flow and new opportunities for habitat restoration. An extension of this bypass to the Delta could reduce flood risk along the lower San Joaquin River.

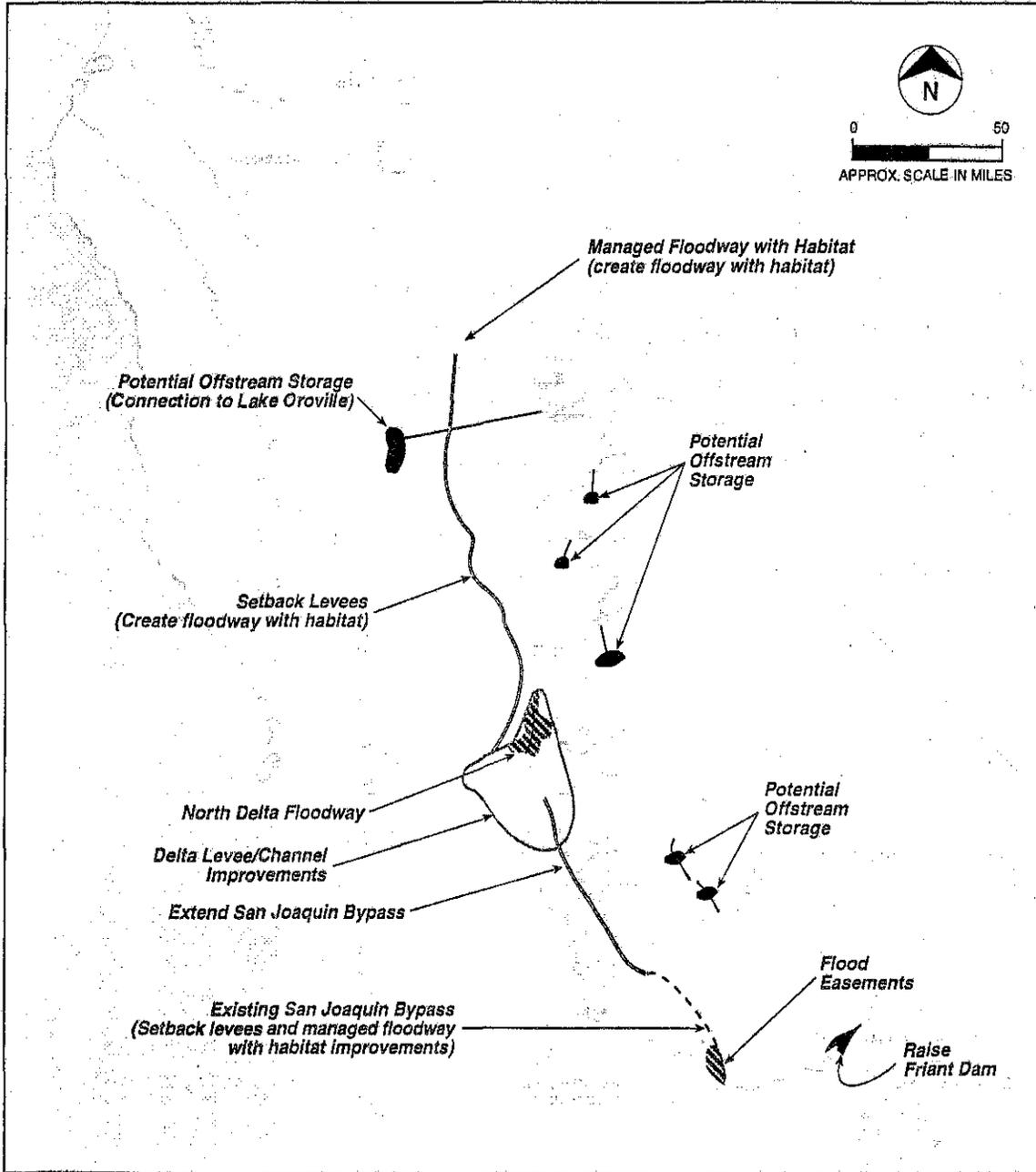
Managed Floodways - Rather than constraining rivers to flow within a strict corridor width, the river can be allowed to meander throughout the floodway. This use of the full natural floodway results in better temporary flood storage and reduced flood flows to downstream areas. The floodway also creates new opportunities for habitat restoration.

Flood Easements - The Program could purchase the rights to periodically flood some areas and thereby eliminate the need for expensive levees or other improvements to protect the areas from flooding. The flooding of designated areas would temporarily store flood waters and lessen the flooding treat to downstream areas. The areas covered by flood easements would continue with their traditional land use during non-flooding times.

Flood Control Storage - Major storage reservoirs on the Sacramento and San Joaquin Rivers and tributaries currently have storage dedicated for flood control. Raising key dams, such as Friant Dam, could provide new water for water users and the environment and additional storage for flood control. Storing water at times of high inflow can reduce flows to downstream areas subject to flooding.

Offstream Storage - Potential offstream storage reservoirs would be filled by diverting water from the main rivers at times of high flow resulting in some reduction in downstream flood risk. These reservoirs would primarily store water for multiple water uses including environmental flows. Depending on how the offstream reservoirs are designed to operate in conjunction with existing reservoirs, some new system-wide flood storage could be developed. For instance, due to the increase in offstream storage for beneficial uses, other reservoirs on the rivers could be held lower (more flood storage available) in the winter without jeopardizing overall water deliveries. In addition, there will be opportunities to move water from onstream reservoirs (e.g. Oroville) at the start of the flood season into offstream storage; improving flood storage while saving water.

Calfed Bay Delta Program



Program Elements Which Promote Flood Protection Along With Other Program Objectives

**Potential Flood Control Linkages
for the CALFED Bay-Delta Program**

1. What should be the relative roles of offstream storage versus onstream flood storage in the system?
2. Can a combination of flood management actions, such as set back levees with wide, managed floodways which incorporate habitat enhancements and accommodate agriculture, flood bypasses and additional offstream storage keyed to increased flood reservations on existing reservoirs, provide fuller, more integrated flood protection?
3. Can designated floodways and low set back levees be used on the Cosumnes river to increase flood protection?
4. Can set back levees be used on the Mokelumne River to increase flood protection?
5. Can set back levees and tidal wetlands be used at McCormick Williamson Tract, New Hope Tract, Canal Ranch and Bract Tract to increase flood protection?
6. Should a weir and designated floodway at Bouldin Island be incorporated in the flood protection plan?
7. Should a designated floodway adjacent to the Lower San Joaquin River down to Middle River, followed by dredging of a low flow channel be used in the flood protection plan?
8. Can a set back levee along one side or the other of the Sacramento River from Chico Landing to Verona provide additional flood protection along with enhanced habitat values?
9. Should a set back levee along Steamboat Slough and Miner Slough be part of the flood protection plan?
10. Can flood easements and riparian easements on the Sacramento River from Red Bluff to Chico Landing be included in the flood protection plan?

11. Can set back levees along the west bank of the Sacramento River from Freeport to Rio Vista be included in the flood protection plan?
12. Can offstream storage near the Tuolumne River provide additional flood protection as well as fishery enhancement flows?
13. Can offstream storage off the Sacramento River (such as the Sites Reservoir or the Tomes Newville Reservoir), combined with an enlarged Shasta Dam, provide additional flood protection as well as fishery enhancement flows?
14. Can offstream storage off the Yuba River be incorporated in the flood protection plan to provide flood protection as well as fishery enhancement flows?
15. Can an enlarged Friant Dam be incorporated in the flood protection plan to provide flood protection as well as fishery enhancement flows?
16. Should environmentally beneficial reconstruction of diversion on Butte and Mill Creeks be incorporated in the flood protection plan?
17. How can the long-term flood protection plan mitigate the loss of spawning gravels caused by the flood?

Secretary of Resources Douglas Wheeler,
Chair of Flood Emergency Analysis Team
Senator Dianne Feinstein
Congressman Richard Pombo
State Senator Jim Costa
State Senator Pat Johnston
Assemblyman Mike Machado

The undersigned parties urge that you work with us and other appropriate parties, including CAL FED, to develop plans and legislation that will lead to measures which would upgrade flood protection in the San Joaquin River System, including the south Delta. We believe the river system can be improved to significantly reduce the incidence of levee breaks that occurred in January of this year. Engineering studies will be needed to develop details, but we describe below the basic approaches that we believe should be pursued unless hydraulic and cost analyses demonstrate that other approaches are preferable.

BACKGROUND

Most of the levees that failed (or whose failure broke other levees) downstream of the mouth of the Merced River are Corps "Project Levees" that failed because the levees were structurally inadequate and not because they were overtopped. The structural inadequacy appears to be related to insufficiency of the cross-section to withstand the experienced rate of flow and consequent river stage. This results in seepage, boils, sloughs, and blow-outs.

The flow capacity of the river channel along the valley floor has been reduced by lack of channel maintenance. The riverbed in long reaches of channel has been filled with sediment (as much as eight feet in places) which then is sometimes partially covered with brush. There is now no agency north of the Merced River with the authority and responsibility to maintain the river channel. Furthermore, environmental agencies typically oppose and prevent the granting of Corps, Fish and Game, and Regional Water Quality Control Board permits needed to perform channel maintenance in a feasible manner.

There are a few places where flow is restricted by inadequate road bridges or inadequate floodway width between levees. In most cases, however, the problem is not inadequate width of floodway.

BASIC APPROACHES TO REDUCING FLOOD STAGES

There are two basic approaches to reducing flood stages. One is to increase the flow capacity of the system and the other is to increase the ability to store water during high flows.

FLOW CAPACITY

(1) The Delta. Increased flow capacity must be provided first at the lower end of the system. Little will be accomplished if upstream improvements simply dump more water into the Delta and aggravate flooding problems there. Recalculating incremental flood stages from upstream channel capacity improvements, revising Delta levee standards, and strengthening Delta levees to the new standards must precede increasing the capability of the tributaries to convey flood waters to the Delta which otherwise are delayed by upstream levee failures. Once this task has been addressed, the improvements should proceed up the river.

(2) The Lower San Joaquin. The terrain and the existing land uses in the Lower San Joaquin where it enters the Delta are such that new bypasses would be difficult. However, they may not be necessary. The river stages both below and upstream of Mossdale at a given river flow can be reduced by the following.

(a) Dredge Middle River Downstream of Old River

The upper few miles of Middle River are severely choked with sediment and bamboo, and the levees in some portions may be too close together. The channel should be dredged and cleaned to the capacity of downstream Middle River reaches. Levee setbacks should be considered at choke points. Dredge spoils should be used to strengthen the levees from the head of Old River down past the dredged portion of Middle River.

(b) Increase the Bypass Capacity of Paradise Cut

Paradise Cut has a rock weir to avenge overflow from the river into the Cut. The capacity of the weir can be increased by widening and/or lowering. The Paradise Cut channel can be dredged for increased capacity, and the dredge spoil used to strengthen the levees along the Cut.

(c) Dredge and Maintain the San Joaquin River Channel

Start a program of dredging and maintaining the main channel of the San Joaquin River and of Old River and Granite Canal. This channel restoration should start at the lower end and extend upstream past the city of Grayson. Many miles of channel have been aggraded in recent decades by as much as eight feet of sediment. The sediment should be used to substantially increase levee cross sections and reduce the slope of levee banks.

(d) Eliminate Chokes in the River System

It is alleged that bridges such as at Highway 132 are restricting flow capacity. There may also be some locations where the width of the floodway is inadequate to handle flows that are

within the capacity of most of the river reach in question. If so, these chokes should be removed.

Again, it is imperative that the capacity of the downstream system must be sufficient to avoid an increased downstream flood threat.

RETENTION DOWNSTREAM OF DAMS

Major rainstorms often result in substantial peak flows that typically last only a few days. These flows include runoff that originates below the dams. Prior to land development and levee construction these peak flows were absorbed by overflow onto wetlands and then flowed back to the river as river stages fell. The U.S. Army Corps of Engineers made a reconnaissance study in the early 1980's that indicated that this overflow could be restored in a controlled manner on currently established wetlands and could absorb more than 100,000 acre feet of peak flow. This concept was adopted in the San Joaquin River Management Plan and is included in its February 1995 report. It should be implemented.

It is important not to confuse these measures of transient impoundment with bypasses which can increase upstream flow capacity above downstream flow capacity.

NEW ONSTREAM DAM CAPACITY

A significant opportunity to increase reservoir storage in the San Joaquin river system is to raise Friant Dam. The watershed above Friant generates about the same runoff as the watershed above New Don Pedro Dam on the Tuolumne. Yet Friant (Millerton Lake) can impound only about one quarter as much water as Don Pedro. The DMR determined in 1982 that the reservoir capacity could be more than doubled. During the twenty-six years starting in 1970, records show that Friant flood control releases came to about seven and one-half million acre feet. It appears that more than half of these releases could have been avoided with the enlarged dam if it was operated in the manner proposed by the South Delta Water Agency. This saving in flood releases would provide about four million acre feet of yield for controlled release for instream uses, water quality improvement in the river, increased power generation, and high quality increased water supply south of the Delta. The proposal was endorsed by the San Joaquin River Management Plan in 1995.

INCREASED FLOOD CONTROL WITH EXISTING DAMS

In the design and operation of multipurpose dams there is necessarily a somewhat arbitrary balance between the use of reservoir capacity for dry season water supply versus reserving reservoir capacity for flood control. Any change in that balance would be very controversial. It may be reasonable, however, to pay

those who depend on water supply to take a somewhat greater risk of modest water loss in order to reduce flood risks, pending implementation of the measures previously discussed. This might involve a greater reservoir flood reservation for rain floods through January, and/or a greater reservoir flood reservation for snow melt in years of heavy snow pack.

A similar consideration could be applied to the power dams above Triant. Those dams have the incidental effect of increasing water supply yield, but they do relatively little for flood protection.

LEVEE DESIGN, CONSTRUCTION AND MAINTENANCE

The design of the San Joaquin River levee system should be reanalyzed and levee structures strengthened where necessary to sustain flood stages with recent and anticipated flood flows. These anticipated flood stages can be reduced if and when the measures above are implemented. In the meantime, all damage to the levees caused by the current flood should be repaired as soon as possible.

The primary purpose for levees should be flood control. The structural section necessary to sustain the anticipated flood stages with an adequate factor of safety and the waterfalls and landside slope areas necessary for floodfight should not be compromised or obstructed with vegetation or other encroachments. If retention of vegetation is mandated the levee structure must be further strengthened to provide the same safety factor.

CONCLUSION

If all of these measures were implemented we believe that the San Joaquin River System could handle a flood event such as happened this year with substantially reduced risk of levee failures all the way through the Delta.

Thank you for your consideration.


Alex Wildbrand for South Delta Water Agency


Judy Muesy for Central Delta Water Agency

**SAN JOAQUIN VALLEY LOCAL CITIZENS' ADVISORY TEAM
RECOMMENDATIONS TO GOVERNOR WILSON'S FLOOD EMERGENCY ACTION
TEAM**

1. Issue: Damaged Levees

Throughout the San Joaquin Valley, numerous levees and flood control facilities are in a weakened condition and present a real threat to public safety. In addition, excessive siltation has raised the river beds on rivers including the Tuolumne, Merced, and Stanislaus Rivers, increasing the chances of more serious flooding in the near future.

Recommendation: Complete full levee repairs immediately to prevent further flooding, clear debris from flood areas and creeks tributary to the San Joaquin River and dredge flood deposits in rivers and flood control channels.

2. Issue: Levee Integrity and Funding

State and federal agencies have not provided sufficient funding for adequate repair and maintenance of levees. This has been exacerbated by a new law, developed after the 1993 Mid-West floods, that shifts federal reimbursement responsibility for levee repairs from the Federal Emergency Management Agency (FEMA) to the U.S. Army Corps of Engineers (Corps) for drainage's larger than 400 square miles and to the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) for drainage's smaller than 400 square miles. FEMA will no longer fund permanent repairs to flood control facilities, including levees.

The Corps and reclamation district does not have adequate funding for all needed levee maintenance and NRCS has only \$2 million available to fund permanent levee repairs in small watersheds for the entire state. As a result, numerous levees remain a threat to tens of thousands of Valley residents.

In addition, maintaining certain private levees free of trees and growth is prohibited and reasonable maintenance is impossible. Stream channel improvements to improve flow capacities are virtually impossible by private landowners due to onerous permit process and regulations.

Recommendation: Increase state and federal funding levels for long-term levee repair, stabilization and maintenance for publicly and privately maintained levees. Expedite repairs and maintenance on priority projects and initiate an adequately funded, comprehensive assessment program to determine the integrity of levees throughout the Central Valley. Prioritization for funding levee repairs and maintenance should be made on a basin-wide basis.

Permit the same standards of maintenance of project and private levees especially where private levees are contiguous to riparian areas. For requested permission for channel improvements, there is a need for one lead agency to walk the process and be recognized as the approving or disapproving agency. More than a dozen departments or agencies hamstring each other and the landowners permit entry for more than 5 months per year for simple projects.

3. Issue: Assistance for Flood Victims and Local Governments

Although state and local officials are still calculating economic damages, total losses from the worst flooding recorded in California history could exceed \$2 billion. Many residents in the flooded areas may not fully recover from catastrophic losses caused by the floods. Local governments have already incurred substantial costs related to the floods. For example, San Joaquin and Stanislaus counties have expended in excess of \$199 million on flood activities.

Recommendation: State and federal officials should consider a variety of funding mechanisms to ensure that funding is available to compensate local governments and individuals for losses caused by the flooding. The federal and state government should provide counties with cash advances equal to each county's estimated disaster expenditure. The State of California could also serve as a guarantor for local governments with agencies such as FEMA.

4. Issue: FEMA Reimbursement

Many flood victims await reimbursements from the 1996 floods.

Recommendation: FEMA should reimburse flood victims within a reasonable time period.

5. Issue: Tax Revenues

Due to extensive flood damage, there will be a real decrease in the assessed value of land in many counties, and a corresponding decrease in property tax revenues caused by decreased farm productivity.

Recommendation: State and federal agencies should assist counties, schools, cities and special districts with short-term assistance for vital public services.

6. Issue: Storage Operations During Flood Events

State and federal agencies should be commended for responding to the challenges presented by one of the worst storms in California history. Record precipitation fell in the Sierra Nevada, resulting in unprecedented inflows to all Northern California Reservoirs. For example, approximately 600,000 acre-feet of storm event runoff, *one-third of the total average annual runoff from the watershed*, flowed into New Don Pedro in a four day period.

Recommendation: Channel capacity in several tributaries is limited and needs to be addressed. Operate reservoirs to reduce possibility of downstream flooding due to weakened levees in the San Joaquin Valley and the Delta and dredge channels to improve capacity.

7. Issue: New Storage

New Don Pedro, Friant, and New Exchequer had difficulty handling record inflows. For example, New Don Pedro filled to capacity, while the other reservoirs made large releases. If additional major storms had arrived shortly after the first storm, or if high inflows occur anytime when reservoir levels are near capacity, existing reservoirs do not have sufficient capacity to effectively protect San Joaquin Valley residents.

Recommendation: Develop new water storage projects (off-stream) for the purpose of flood control. Projects on Dry Creek, etc., would provide greater flood control flexibility.

Relief From Environmental Laws and Regulations

8. Issue: Conflicts Between Flood Control and Habitat Priorities

Local flood officials are increasingly constrained by state and federal environmental laws and regulations in their efforts to operate flood control facilities and implement releases, and obtain permits to properly maintain levees and flood control channels. Fish and Game and/or Fish and Wildlife were able to veto increased downstream water releases suggested by certain dam operators even as the further encroachment of flood control space was occurring and flood control criteria was compromised.

Recommendation: Permit the dam operators to operate the reservoirs within the flood control criteria (which is established by Congress, hydrologists and the Corps of Engineers) without interference. Withdraw the assumed powers.

Appendix F: Flood Response Executive Orders

<i>Executive Order W-140-97</i>	<i>January 9, 1997</i>
<i>Executive Order W-141-97</i>	<i>January 10, 1997</i>
<i>Executive Order W-142-97</i>	<i>January 10, 1997</i>
<i>Executive Order W-143-97</i>	<i>January 10, 1997</i>
<i>Executive Order W-149-97</i>	<i>February 13, 1997</i>

PAGE TWO

3. The Team shall complete its work in consultation with relevant federal agencies, including but not limited to the Federal Emergency Management Agency, Army Corps of Engineers, Bureau of Reclamation, and Department of Agriculture.
4. The Team shall complete a report addressing the following issues:
 - a. Assess Central Valley levees and other flood control facilities affected by the recent floods, and develop a plan for the repair and stabilization of damaged facilities.
 - b. Recommend a long-term repair and general maintenance plan, consistent with related state and federal activities including the CALFED Bay-Delta program.
 - c. Evaluate agency responses during the recent floods related to flood control facility operations and repairs, and develop recommendations for improvements to response procedures.
 - d. Develop short-term strategies related to levee and flood control facility maintenance and operation for response to additional storms during the remainder of the 1997 rain season.

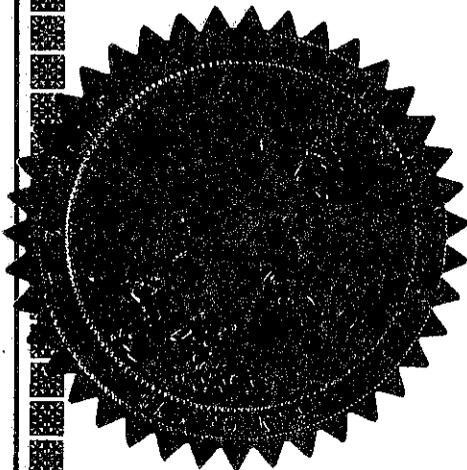
A preliminary report shall be submitted to the Governor within 30 days of this Order, and a final report within 120 days.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 10th day of January 1997.


Governor of California

ATTEST:


Secretary of State



EXECUTIVE DEPARTMENT
STATE OF CALIFORNIA



EXECUTIVE ORDER W-142-97

WHEREAS, I, PETE WILSON, Governor of the State of California, having declared a State of Emergency in numerous counties based on conditions of extreme peril to the safety of persons and property because of flooding that occurred in January 1997; and

WHEREAS, the destruction of key transportation arteries into the affected counties, the destruction of numerous homes and businesses, the destruction of and inundation of large areas of land adjacent to numerous rivers and streams, and the damage to existing dams, levees and weirs will have a continuing devastating effect on transportation, employment, the provision of potable drinking water, the restoration of private and public lands, and traffic within and through affected areas, and constitute a threat to the health and safety of those citizens of California living in the affected counties, and these effects are likely to be beyond the control of the services, personnel, equipment, and facilities of any single county; and

WHEREAS, the requirement of overtime costs for work beyond eight (8) hours a day will hinder efforts to rearrange schedules of facilitate the restoration of homes, lands and business in the affected areas, to allow employees to devote time to relief efforts for victims, assist in preventative efforts, and to work around areas of traffic congestion and interruption;

NOW, THEREFORE, I, PETE WILSON, hereby order the immediate suspension of requirements under the Labor Code and/or the orders of the Industrial Welfare Commission that require California private sector employers to pay overtime after eight (8) hours worked in any twenty-four (24) hour period.

This Order shall not affect requirements that overtime be paid for hours in excess of forty (40) per week, the requirements under Labor Code Sections 1810-1815 that overtime wages be paid on public works projects, or requirements imposed by a private contract or collective bargaining agreement.

This Order shall apply to California private employers, with respect to employees whose places of employment are in counties that are on the list of affected counties maintained by the Office of Emergency Services.

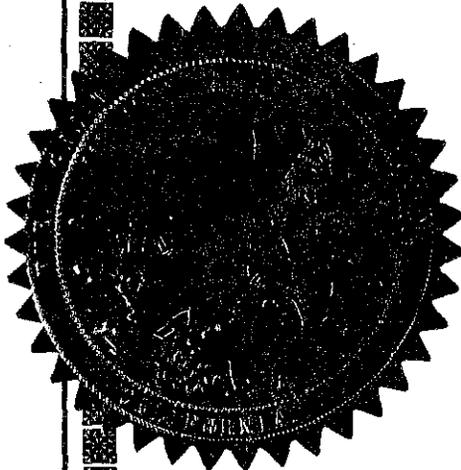
This order shall remain in effect until further executive order terminating the state of emergency.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 10th day of January 1997.


Governor of California

ATTEST:


Secretary of State



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

EXECUTIVE DEPARTMENT
STATE OF CALIFORNIA



EXECUTIVE ORDER W-143-97

WHEREAS, the Emergency Services Act provides for the suspension of any regulation or statute prescribing the conduct of state business, or the orders, rules or regulations of any state agency where the Governor determines and declares that strict compliance with any statute, order, rule or regulation would in any way prevent, hinder or delay the mitigation of the effects of the emergency; and

WHEREAS, the Governor has found that the recent floods pose an immediate danger to the health and welfare of the state, and immediate recovery actions are necessary to respond to this emergency;

NOW, THEREFORE, I, PETE WILSON, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this order to become effective immediately:

1. The application of Section 41800 of the Health and Safety Code related to nonagricultural burning may inhibit activities necessary to recover from the recent floods, and this provision is suspended to allow the burning of nonagricultural flood debris on days where otherwise no such burning would be allowed in those counties where a Proclamation of a State of Emergency exists due to flooding in December 1996 and January 1997.
2. Agricultural related flood debris may need to be burned to prevent an eminent and substantial economic loss, and therefore local air districts are authorized to use their authority under Section 41862 of the Health and Safety Code to allow burning on days where otherwise no such burning would be allowed in those counties where a Proclamation of a State of Emergency exists due to flooding in December 1996 and January 1997.

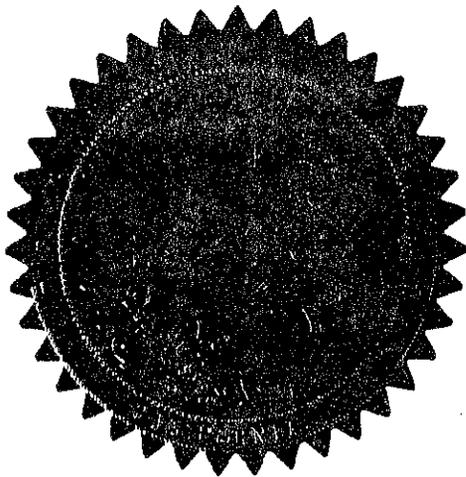
IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 10th day of January 1997.

Pete Wilson
Governor of California

ATTEST:

Bill Jones

Secretary of State



EXECUTIVE DEPARTMENT
STATE OF CALIFORNIA



EXECUTIVE ORDER W-149-97

WHEREAS, California has experienced catastrophic flooding in 48 counties, with devastation and displacement of enormous proportions, leaving hundreds of our fellow citizens displaced from their homes, and leaving the State and our local governments with seriously damaged infrastructure and support systems; and

WHEREAS, on January 2 through 31, 1997, I issued declarations of disaster for those counties, followed on January 4 through 24, 1997 by federal declarations of those counties as a major disaster; and

WHEREAS, Executive Order W-141-97 established a Flood Emergency Action Team under the Water Policy Council, to work with federal and local agencies and citizens in the flooded areas to identify actions needed to provide continued flood protection during the remainder of the 1997 flood season and to evaluate further recommendations to improve the flood control and emergency response systems on a long term basis; and

WHEREAS, the Flood Emergency Action Team has completed its Preliminary Report, dated February 10, 1997, on immediate actions to be taken to speed recovery from the December/January 1997 floods and protect the public health and safety from additional flooding in the 1997 flood season; and

WHEREAS, it is imperative to bring every resource to bear in addressing the individual, social, and economic impacts of this catastrophic event and to remove bureaucratic barriers to recovery and to California's citizens in need of services.

NOW, THEREFORE, I, PETE WILSON, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this order to become effective immediately:

1. The Department of Water Resources shall install additional stream gauging stations and telemetry to provide data for areas found to be deficient during the early January flooding.
2. The Department of Water Resources shall establish a Levee Rehabilitation Unit to assist in efforts of the U.S. Army Corps of Engineers to restore the levee system to its pre-flood condition.
3. The Department of Water Resources, in cooperation with affected counties and landowners, shall provide assistance in the development of local plans for emergency repair of privately-maintained levees so that counties may submit those plans to the federal government for purposes of qualifying for federal funding of repairs.

4. The California Department of Transportation shall offer, on a contractual basis and to the extent permitted by law, State assistance, whether equipment, services, or otherwise to the National Park Service and the U.S. Forest Service for repairs to National Park and Forest Service facilities damaged by the January floods, in order to expedite road repairs and reopen parks and other recreational facilities as quickly as possible.
5. The Office of Emergency Services shall conduct workshops with State, local, and federal agencies and the media in areas at risk during the remainder of the 1997 flood season, to review roles and procedures related to the emergency response system and the dissemination of flood information and public warnings.
6. Upon appropriation of funds therefore, the Secretary of the Trade and Commerce Agency shall implement a tourism promotion campaign to publicize the availability of recreational facilities including those in formerly flooded areas, and, where appropriate, alternate routes open to tourism destinations. The Secretary shall seek to leverage any appropriated funds through cooperative promotional efforts with the private sector.

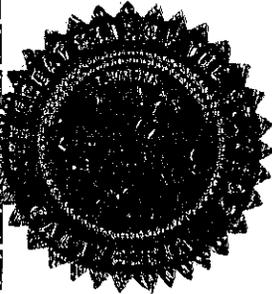
IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 13th day of February, 1997.

Pete Wilson

Governor of California

ATTEST:

Bill Jones
Secretary of State



The FEAT acknowledges the assistance of the following:

Editorial Assistance and Report Preparation: Nikki Blomquist, Liz Kanter, Therese Tynan, and Nancy Ullrey,

Reports Administration Unit, Department of Water Resources

Graphic Design and Production: Mike Miller, Graphic Services Unit, Department of Water Resources;

Marcella Davis, Chuck Lano, Joanne Pierce, and Judith Santillian,

Drafting Unit, Department of Water Resources

Paula Styler, Department of Water Resources, for her assistance with the FEAT workshops

Printing: Reprographics Unit, Department of Water Resources

Photographs: Photography Unit, Department of Water Resources; Photography Unit, Governor's Office of

Emergency Services; and The Sacramento Bee

LIST OF STATE, FEDERAL, AND OTHER RESPONDING AGENCIES

STATE OF CALIFORNIA: Department of Mental Health
Department of Social Services
Department of Health Services
Department of Toxic Substances Control
Department of Transportation
Emergency Medical Services Authority
California Department of Highway Patrol
State Water Resources Control Board
California National Guard
California Integrated Waste Management Board
State of California Public Utilities Commission
Department of Food and Agriculture
Department of Boating and Waterways
Department of Parks and Recreation
Department of Forestry and Fire Protection
Office of Emergency Services
Department of Water Resources
Department of the Youth Authority
Department of Fish and Game
California Conservation Corps
Department of Corrections
Department of Housing and Community Development

FEDERAL: United States Department of Defense
United States Natural Resources Conservation Service
General Services Administration
United States Public Health Service
United States Army Corps of Engineers
Environmental Protection Agency
United States Bureau of Reclamation
Federal Emergency Management Agency
National Weather Service
United States Coast Guard
United States National Park Service
United States Geological Survey

OTHER RESPONDING AGENCIES: American Red Cross
The Salvation Army