

Chapter 1 Introduction

Contents

Chapter 1 Introduction	1-1
Geographic Scope of the Fish Passage Improvement Program	1-2
Historical Perspective of Fish Passage Improvement	1-3
Fish Passage Improvement Program.....	1-5
Priorities for Fish Passage Projects.....	1-7
Criteria for Prioritizing Projects	1-8
Coordination with Other Agencies and the Public	1-9
Stream Structures Inventory	1-9
Local Assistance	1-11
Literature Cited.....	1-12

Figure

Figure 1-1 Fish Passage Improvement Program geographic scope	1-13
--	------

Table

Table 1-1 Dams removed in California	1-14
--	------

Chapter 1 Introduction

Since the 1800s, salmon and steelhead spawning habitat in California has declined 95 percent. With this decline in habitat, there has been a decrease in salmon and steelhead fish populations (DFG 1993). There are fewer salmon and steelhead in the watersheds of California's Central Valley today than in the 1940s and 1950s. Federal and State resource agencies have listed several populations of Central Valley salmon and steelhead as threatened or endangered. In listing these fish, the resource agencies have cited the loss of historical spawning and rearing habitat that are upstream of large, impassable dams as a primary factor contributing to the fish decline and a threat to their continued existence. Other structures contributing to their decline include road crossings, bridges, culverts, flood control channels, erosion control structures, canal and pipeline crossings, unscreened water diversions, and gravel mining pits.

Recognizing the importance of saving and restoring the populations of salmon and steelhead, many government and private organizations have responded, working to reopen streams and rivers to anadromous fish¹.

Initiated by the State Legislature and the California Bay-Delta Program agencies in 1999, the Fish Passage Improvement Program (FPIP), an element of the Ecosystem Restoration Program² (ERP), is a partnership-building effort to improve and enhance fish passage in Central Valley rivers and streams. The program works with other local, State, and federal agencies and stakeholders to plan and implement projects to remove barriers that impede migration and spawning of anadromous fish. FPIP does not address screening diversions. The Anadromous Fish Screening Program, the California Department of Fish and Game (DFG) Fish Screening Program, and others address unscreened diversions.

FPIP was assigned to the California Department of Water Resources on behalf of ERP. DWR staff actively solicit input from ERP implementing agencies: US Fish and Wildlife Service (USFWS), NOAA's National Marine Fisheries Service (NMFS), and DFG. An interagency team made up of staff from ERP implementing agencies oversees the program.

DFG is the State agency that manages California's fish and the habitats upon which they depend. The mission of DFG is:

To manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

The mission of the USFWS is:

To work with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

¹ Anadromous fish are born in fresh water, migrate to salt water for a portion of their life cycle, and return to fresh waters to spawn.

² The Ecosystem Restoration Program is one of 11 programs initiated by a group of State and federal agencies to improve the quality and reliability of California's water supplies and revive the San Francisco Bay-Delta ecosystem. This cooperative effort is called the Bay-Delta Program.

The mission of the NMFS is:

Stewardship of living marine resources through science-based conservation and management and the promotion of healthy ecosystems.

The mission of the California Bay-Delta Program is:

To develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta System.

ERP is the CALFED program element responsible for implementing actions that contribute to the recovery of salmon and steelhead populations.

The Mission of DWR is:

To manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.

The FPIP, with its goal to improve and enhance anadromous fish passage in Central Valley rivers and streams, supports the mission of DWR.

Additionally, the FPIP supports USFWS, California Bay-Delta Program, NMFS, and DFG in regards to anadromous fish species recovery. Through coordinating resources and authorities, a comprehensive California fish passage program is vital to identifying, prioritizing, and treating migration barriers so that unimpeded migration of California's salmonid populations is achieved.

Bulletin 250, *Fish Passage Improvement*, will contribute significantly to our understanding of how California can help revitalize our salmon and steelhead fisheries. Bulletin 250 identifies man-made structures in the watersheds of the Sacramento and San Joaquin rivers and details how selected structures impede fish migration and what is being done about them. This bulletin is an important contribution to the protection and recovery of listed anadromous salmonid species in California.

Geographic Scope of the Fish Passage Improvement Program

The primary geographic scope of the ERP is “the Sacramento-San Joaquin Delta, Suisun Bay, the Sacramento River below Shasta Dam, the San Joaquin River below the confluence with the Merced River, and their major tributary watersheds directly connected to the Bay-Delta system below major dams and reservoirs” (CALFED 2000). At a broader, programmatic level the ERP addresses the central and south San Francisco Bay and their watersheds (CALFED 2000). Because of the geographic scope of ERP, the FPIP only addresses fish passage goals described in CALFED 2000 and in areas downstream of “rim dams.” Because there are no fish passage goals for the Bay Area, its watersheds are not within FPIP's geographic scope³.

³ Appendix E contains information on a portion of the San Francisco Bay area and Delta anadromous fish bearing streams with fish passage issues.

Many of the principal waterways in California's Central Valley and the San Joaquin Valley contain rim dams that prevent fish passage to formerly used habitat. It has been previously noted and is well documented that rim dams, such as Shasta, Oroville, Folsom, etc. have been major factors contributing to population declines of salmonids. Between 80 and 90 percent of historical anadromous fish habitat has been lost due to construction of rim dams resulting in significant population declines and subsequent State and federal listings of several Salmonid populations.

In order to recover these salmon and steelhead populations to the point where they no longer require the protective measures provided by the Endangered Species Act, it is likely that fish passage will need to be re-established to historical habitats that are outside the existing scope of the FPIP. There are well documented methods for fish passage upstream of rim dams in the Pacific Northwest, and some of these methods could be utilized in California. If the geographic scope of the FPIP expands upstream of rim dams in the future, and funding is available, FPIP's geographic scope could include watersheds within the scope of the CALFED Watershed Program.

Besides FPIP there are many public and private efforts to solve the problem of fish passage (some are described in Appendix B). A short history of fish passage improvement in California helps put FPIP in context.

Appendix B

Historical Perspective of Fish Passage Improvement

There are many public and private efforts to solve the problem of fish passage. Fish passage improvement has included removal of dams and other obstructions, building fish ladders over and around dams or other man-made or natural obstructions, replacing or retrofitting culverts where roads cross streams, screening diversions, and reclaiming gravel-mining pits.

DFG has broad jurisdiction over man-made and natural fish barriers, fishways, dam modifications and other barriers. Since the early 1900s, DFG's regional offices and fish-screen shops, have installed hundreds of fish screens at water diversions and has built many fish ladders at dams or other man-made or natural obstructions to fulfill its mandate to ensure fish passage in streams. Since 1991, DFG's Statewide Fish Screen and Fish Passage Program, has been performing the following activities:

- 1) inventory of water diversion and fish passage problems;
- 2) evaluation and prioritization of fish screening and fish passage problems;
- 3) implementation and coordination of fish protection activities;
- 4) evaluation of existing and proposed fish protective installations; and
- 5) review of fish screening and fish passage literature.

To date, at least 614 dams have been removed nationwide for reasons including fish passage, safety, erosion control, and habitat restoration (American Rivers 2004). Another 60 dams were projected to be removed during 2004 (American Rivers 2004). In California, at least 77 dams have been removed since 1922. (Because there are no centralized records, that number may be low). From 1990 to 1999, 10 dams were removed, and in 2000 at least 18 dams were removed, including Saeltzer Dam on Clear Creek

and several small check and diversion dams. Since 1993, at least 13 dams have been removed within the geographic scope of the FPIP. Table 1-1 lists dams that have been removed in California for which documentation could be obtained.

Appendix B describes other federal and State programs addressing fish passage. For instance, the US Forest Service conducted fish passage inventories throughout the Mill, Deer, and Antelope Creek watersheds in 2002. This inventory includes fish passage evaluations at cement slab crossings along the main stem and North Fork of Antelope Creek, a recognized steelhead stream.

Examples of recent or current fish passage improvement projects—some already completed, some in progress—are summarized in Appendix C. Dams that have been removed or are in progress include Saeltzer Dam on Clear Creek; Point Four, Western Canal, McGowan, and McPherrin Dams on Butte Creek; and Matilija Dam on Matilija Creek. Woodbridge Dam on the Mokelumne River is an example of a modified dam, and the Ratzlaff gravel pit on the Merced River is an example of gravel-pit pond isolation. At least partially as a result of removing dams on Butte Creek, the number of adult spring-run Chinook salmon spawners went from 14 in 1987 to 20,000 in 1998 (Harvey Arrison 2004). Since the removal of Saeltzer Dam from Clear Creek in 2000, State biologists have documented spring-run and fall-run Chinook salmon and steelhead spawning in the 12 miles of creek previously inaccessible and upstream of the old dam site. Also, spawning riffles have formed in the creek where the dam and reservoir were located.

Finally, State and federal agencies have funded studies detailing anadromous fish population recovery and stream restoration. Restorations include screening diversions, augmenting spawning gravel, installing fish ladders, increasing flows, controlling water temperatures, restoring riparian vegetation, rehabilitating stream channels, and eliminating instream gravel pits and gravel mining (DFG 1990, 1993, 1996; USFWS 1995, 1998).

In addition, many municipal and agricultural water agencies are trying to improve the way they use streams. They know that further declines in biodiversity and fish populations and delays in recovery of threatened or endangered species will further hamper their ability to deliver or use water. The Santa Clara Valley Water District is attempting to ensure its ability to deliver and use water by incorporating stream stewardship practices to help protect and restore fish habitat, introducing new approaches in flood control, and incorporating new water delivery operations. The SCVWD has constructed several fish ladders and fish screens at dams and a drop structure, and removed two barriers on streams in its watershed, opening miles of river for migrating Chinook salmon and steelhead for the first time in perhaps six decades. The Stockton East Water District, in largely agricultural San Joaquin County, is cooperating in fish passage and salmon and steelhead life history studies on the Calaveras River. SEWD hopes the studies will help it better manage, protect, and enhance the river's salmon and steelhead fishery while continuing to serve its customers.

Table 1-1 Dams removed in California

Appendix C

Fish Passage Improvement Program

FPIP was started by DWR in 1999 and is an element of the ERP within the Bay-Delta Program. FPIP's primary objective is to identify and support projects that resolve fish migration problems at man-made structures in support of the ERP's fish passage goals. These structures can include dams, road crossings, bridges, culverts, flood control channels, erosion control structures, canal and pipeline crossings, and gravel mining pits. The program does not address screening water diversions.

FPIP identifies and inventories structures that may impede anadromous and other fish during emigration or immigration to native watersheds, and participates in projects that modify or remove those barriers. These inventories provide a critical first step toward improving riverine habitat and ultimately increasing native fish populations. The inventory of potential barriers (Appendix A) is based on data compiled from 395 sources, including 326 reports or surveys, 69 databases of other agencies or groups, and surveys conducted by program staff. (See Appendix H for data sources.) The program can help implement projects that alter or remove structures that impede migration by developing partnerships with local individuals and agencies. Chapter 4 provides a description of projects that the program has been or is involved in. Priority watershed basins include those where stream restoration projects are already funded and coordinated. The program focuses on identifying passage improvements that have mutual benefits for fish and people who depend on the stream.

FPIP is assisting DWR and the Bay-Delta Program implementing agencies meet ecosystem restoration and water management goals by identifying barriers that might be modified or removed. DWR's mission includes protecting, restoring, and enhancing the natural environment. Inclusion of the FPIP within DWR helps DWR implement its mission and meet its local assistance goals. Working with local water agencies to improve fish passage may result in increased flexibility in managing State water supplies.

The Bay-Delta Program, with 23 State and federal participating agencies, was established to solve the problems in ecosystem, water quality, water supply reliability, and levee and channel integrity. The Bay-Delta plan for restoring the health of the Delta will be done in stages over a 30-year period that began with the signing of the Record of Decision in 2000.

Restoring access to critical spawning habitat for anadromous fish is an integral part of the ERP, a component of the Bay-Delta Program. The ERP is designed to maintain, improve, and increase aquatic and terrestrial habitats and improve ecological functions in the San Francisco Bay and Sacramento-San Joaquin Delta (CALFED 2001). ERP has several goals. Goal number one seeks to "Recover Endangered and Other At-Risk Species and Native Biotic Communities". Identifying fish passage needs and opportunities supports this goal. Dams and other structures are identified as stressors in several of CALFED's regions, including the Sacramento Valley and San Joaquin Valley Regions, and the eastside tributary streams of the Delta region. The Environmental Water Program (EWP), another component of ERP, works to acquire water from willing sellers on streams tributary to the

Appendix A

Appendix H

and known barriers within California is included in the Fish Passage Decision Support System.

In 2002, FPIP agreed to assist the California Coastal Conservancy with barrier inventory within and outside the original CALFED geographic scope. FPIP assistance included reviewing Division of Safety of Dams water right application files, obtaining jurisdictional and nonjurisdictional dam data, soliciting data on behalf of the conservancy, participating in the development of a barrier datasheet, sharing all data compiled in FPIP's barrier database, and reviewing the conservancy's draft barrier report. The conservancy, with \$750,000 provided by State legislation, developed a comprehensive assessment of barriers to fish passage in coastal watersheds. The assessment compiled and standardized existing data into an Internet-accessible GIS database.

FPIP is also assisting Caltrans, through an interagency agreement, with a statewide fish passage assessment of State highway culverts. In 2000, Caltrans began implementing a Statewide Passage Barrier Assessment and Correction Program in each of its districts. The assessment started on the Northern California coast (District 1) and is progressing to the northeast and Central Coast (Districts 2, 4, 5). Humboldt State University is doing the field assessment and analysis of State highways in coastal Northern California. FPIP staff and other contractors will assess culverts along other portions of the State's highways.

Priorities for Fish Passage Projects

The Environmental Coordination, Assessment, and Review Team⁴ aided FPIP in developing criteria—defined by ERP goals and objectives (CALFED 1997)—that could be used by the program to decide the priority of structures or projects it will support. The team recommended the following be considered in setting priorities (in no particular order):

- Geographic scope
- The biological basis for selection
- Endangered species concerns
- Flood control issues
- Water supply issues
- Habitat conditions
- Natural versus man-made barriers
- Definition of barriers to migration (upstream and downstream)
- Implemented or ongoing restoration activities
- Any existing fish passage facilities
- Public safety issues related to structural barriers to fish migration

Inventory of Barriers to Fish Passage in California's Coastal Watersheds is available at <http://www.calfish.org/DesktopDefault.aspx?tabId=69>.

⁴ Members of the Environmental Coordination, Assessment, and Review Team include DFG, DWR, USFWS, NMFS, California Bay-Delta Authority, USBR, South Yuba River Citizens League, Friends of the River, Northern California Water Association, Yuba County Water Agency, and others.

Criteria for Prioritizing Projects

Following discussions and feedback on program goals, the criteria for project prioritization were further refined. Criteria for prioritizing projects were divided into two levels identified as Level I and Level II

Level I (First Priority)

1. Central Valley/Bay Area within CALFED solution area.
2. Downstream of rim dams (major flood control, water, power supply facilities)
3. Benefits native salmonids
4. Located within Critical Habitat
5. First downstream impediment
6. Established program or stakeholder supported

Level II (Supporting Considerations)

1. Barrier has existing non-functional passage facility
2. Will not impact flood protection
3. Water supply impacts can be mitigated
4. Benefits Endangered Species Act-listed salmonids
5. Historical habitat for listed species
6. Identified interagency priority action
7. Existing good quality habitat upstream barrier
8. Significant habitat gain within historical/Critical Habitat

Level I criteria considers FPIP objectives and scope. These are the first program criteria used to set project priorities. Projects must meet Level I criteria to be included in the FPIP. Level I criteria are designed to provide a broader list of projects for consideration. Level I criteria also include identifying benefits to Endangered Species Act-listed salmonids and actions within designated critical habitat as set forth by State and federal regulatory agencies. In addition, there must be no significant impacts to flood control and it must be possible to mitigate water supply issues. It is important to note that lack of critical habitat is not a reason to screen out a viable project, but if there are two or more projects that are similar in the other criteria and considerations, the project containing critical habitat will be given preference.

Level II criteria can be used to narrow the broad list of potential projects developed using Level I criteria. Level II criteria provide additional prioritization standards for a project based on supporting objectives and goals of the program. Level II criteria, like Level I, also take into account habitat conditions, structural or physical features, as well as program support and coordination activities that assist in achieving program objectives. The Level II criteria consider in more detail project benefits to be gained by implementing an action to improve fish passage. Any one or all of the criteria may be met by any specific project; however, the more criteria that are met, the higher priority that is assigned.

As a result of the Bulletin 250 review process, certain elements of the Level I criteria and Level II criteria will be revised before project prioritization begins. NMFS has requested that the priority criteria include

endangered species recovery planning, and that Level II criteria include Endangered Species Act recovery goals. Levels I and II criteria will be revisited prior to any structure prioritizations.

Coordination with Other Agencies and the Public

FPIP mirrors the Bay-Delta Program principles. For example, FPIP relies on local leadership and community participation in selecting and implementing fish passage projects or studies; participates in opportunities to increase public knowledge of fish passage problems and proposed projects by holding general workshops and project specific public meetings; and encourages diverse stakeholder involvement in project decision making. FPIP coordinates closely with Bay-Delta agencies such as the USFWS, DFG, NMFS, US Bureau of Reclamation (USBR), and US Army Corps of Engineers. FPIP and the EWP also coordinate to ensure that the EWP is not working to overcome a barrier by increasing flow that the FPIP is trying to eliminate altogether.

An Environmental Coordination, Assessment, and Review Team provides broader stakeholder guidance to FPIP. Members of the team come from the DFG, DWR, USFWS, NMFS, California Bay-Delta Authority, USBR, South Yuba River Citizens League, and Friends of the River, Northern California Water Association and the Yuba County Water Agency. In the early stages of the program, the team assisted in refining FPIP goals and approach; identifying overlaps with other government programs; providing coordination of efforts; and developing criteria for determining which structures in streams should be modified or removed. The interagency coordination team will continue to provide stakeholder guidance to the program, including prioritizing streams, structures and projects.

FPIP also involves the public through forums such as the Coordinated Resource Management Planning⁵ programs, public workshops, and cooperative meetings with water users and agency representatives. In addition, the program will participate in or help identify basin workgroups of landowners and water users to coordinate with DFG and other aquatic resources groups such as the Fish Passage Forum⁶ to define and develop projects. The program can do project planning, environmental documentation, engineering design, feasibility studies, proposal development, proposal submission, surveys, and barrier evaluations.

Stream Structures Inventory

FPIP will inventory potential fish migration barriers in historical anadromous fish drainages of the Central Valley and the Bay Area and Delta. The program's first phase of the inventory began in early 2000. The inventory database, see Appendix A, will provide a tool that public agencies, watershed groups, and others can use to guide resources to where they will do the most good. Data for the inventory were collected using existing State and federal agency or private data files and published reports. Pertinent documents generated by local, State, and federal agencies were reviewed. Additionally, DFG files were reviewed for unpublished data, and program staff conducted interviews with regional biologists from State, federal and local water agencies, established watershed Coordinated Resource Management

⁵ Coordinated Resource Management Planning is a process by which natural resource owners, managers, and users work together as a team to formulate plans for the management of major resources within a specific area, and/or seek to identify and resolve specific conflicts concerning management activities

⁶ The Fish Passage Forum is an interagency group created to coordinate fish passage improvement efforts in coastal California. Members include DFG, Caltrans, NMFS, DWR, California Coastal Conservancy, Trinity County, Five Counties, CalTrout, Humboldt County Department of Power and Water, Pacific States Marine Fisheries Commission, and others.

Planning groups, local environmental or stream advocacy groups, and consultants. For a list of documents reviewed and agencies that contributed data, see Appendix H.

Inventory data consist of the structure's name or identifying descriptor; river mile; latitude and longitude; physical description and present use; stream name; and condition of fish passage facilities. Appendix A describes more than 500 structures in streams in the Central Valley and Bay Area. Other reports have already identified some of these structures as partial or complete barriers to migrating anadromous fish, and some structures remain to be evaluated. The inventory provides information that public agencies, watershed groups, and others can use in watershed management strategies to recover declining salmonid populations. This information will be screened and prioritized using the CALFED Milestone Assessment and the FPIP criteria to aid stakeholders in identifying future projects.

The inventory can be used to:

- 1) Identify potential barriers to fish migration.
- 2) Consider watershed basins for assessment of barrier remediation or removal and prioritization based on restoration programs and potential benefits to migratory salmonid populations.
- 3) Prioritize barriers in each watershed for future modification or removal based on criteria developed by stakeholders, watershed groups and others.

Barriers to fish migration occur in many ways. Fish migration and instream movement can be impeded by lack of water, poor water quality, poor habitat, natural occurrences such as landslides, waterfalls, boulder cascades, and man-made structures. Identifying natural and man-made conditions that create potential and obvious fish migration barriers was crucial in developing program objectives.

FPIP's primary objective is to identify and support projects that resolve fish migration problems at man-made structures, which can include dams, road crossings, shipping channels, bridges, culverts, flood control channels, salinity control gates, boat lock structures, erosion control structures, canal and pipeline crossings, and gravel mining pits. Screening of water diversions is addressed by the Anadromous Fish Screen Program, DFG's Fish Screen Program, and others.

FPIP does not have the authority to initiate water acquisitions as a primary objective. Therefore, directly acquiring water for streams and rivers where there is little or no water over most water years due to over-allocation is outside the purview of FPIP. Water acquisitions are within the purview of EWP. FPIP supports finding solutions to limited surface water supplies and will participate in forums to discuss and implement workable water supply alternatives in coordination with EWP. The program will treat water quality issues the same way. Other State and federal agency programs exist that address surface water quality issues.

For information on the CALFED Milestone Assessment, go to <http://calwater.ca.gov/>

Local Assistance

FPIP is already supporting several priority fish passage improvement projects with identified benefits to listed anadromous species. These priority projects are detailed in Chapter 4. Chapter 3 presents descriptions of riverine habitat conditions, the status of Chinook salmon and steelhead populations, and current restoration projects on streams and rivers in the program area.

Fish passage improvement options at a structure can include removal, partial removal, new or improved fish ladders, or major structural redesign. Examples of some of these include removing Saeltzer Dam on Clear Creek or eliminating gravel pits on the Merced River (see Chapter 3). Decisions to remove barriers or modify structures, such as improving fish ladders, will be made using the best available data and science. While ultimately, the decision regarding remediation will be addressed during environmental reviews of each project, FPIP will base its support on:

- Quantified estimates and comparisons of fish numbers and habitat utilization between removal alternatives and structural improvement alternatives.
- Identification of environmental impacts and mitigation measures between removal and structural improvement alternatives.
- Impacts to flood control, water use, or power under removal or structural improvement alternatives.
- Long-term maintenance and repair costs associated with structural improvement alternatives, and identification of who will be responsible for long-term maintenance.
- Comparison of costs between removal and structural improvement alternatives.
- Monitoring to determine if structural improvements have been effective and to provide subsequent remediation through removal if they prove to be ineffective.

In order to identify the most critical barriers, the FPIP will overlay Level I and Level II criteria and the goals from the CALFED Milestone Assessment to the potential barriers listed in Appendix A using GIS. It is hoped that other stakeholders may also use these data for planning restoration projects. However, we recognize that projects can only be successful with local support.

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Figure 1-1 Fish Passage Improvement Program geographic scope



Table 1-1 Dams removed in California

Year removed	Dam	River	Reason	Owner
1922	Russell (Hinkley) Dam	Hayfork Creek		
1925	Hessellwood Dam	Hayfork Creek		
1927	Henry Danninbrink Dam	Canyon Creek		
1936	Anderline Dam	Rush Creek		
1946	D.B. Fields / Johnson Dam	Indian Creek		
1946	Bonally Mining Co. Dam	Salmon River		
1946	Dam	Trinity River		Trinity City Water and Power Co.
1947	D.B. Fields Dam	Indian Creek		
1947	Altoona Dam	Kidder Creek		
1949	Three C. Picket Dam	Beaver Creek		USDA Forest Service
1949	Big Nugget Mine Dam	Horse Creek		
1949	Moser Dam	Swillup Creek		
1949	Todd Dam	Trinity River		
1949	Smith Dam	Whites Gulch		
1950	Clarissa V. Mining Dam	Redding Creek		
1950	Bennet-Smith Dam	Salmon River		
1950	Barton Dam	Scott River		
1950	North Fork Placers Dam	Trinity River		
1951	Red Hill Mining Co. Dam	Canyon Creek		
1951	Quinn Dam	Trinity River		
1970	Sweasey Dam	Mad River		City of Eureka
1985	Diversion dam	Oristimba Creek drainage (Henry Coe State Park)	Erosion/ failure	California State Parks
1985	Rock Creek dam	Rock Creek		Pacific Gas and Electric Co.
1986	Diversion dam (3 total)	Coyote Creek drainage (Henry Coe State Park)	Erosion/ failure	California State Parks
1987	Happy Isles Dam	Merced River (Yosemite National Park)		National Parks Service
1987	Diversion dam (2)	Pacheco Creek drainage (Henry Coe State Park)	Erosion/ failure	California State Parks
1989	Lake Christopher Dam (breached)	Cold Creek	Safety hazard	City of South Lake Tahoe
1989	Arco Pond Dam	Lost Man Creek	Fish passage	National Park Service
1992	Unnamed dam #1	Wildcat Creek		
1992	Unnamed dam #2	Wildcat Creek		

Table 1-1 continued on next page

Year removed	Dam	River	Reason	Owner
<i>Table 1-1 (continued)</i>				
1993	C-Line Dam #1	Tributary to MacDonald Creek	Habitat improvement	National Parks Service Redwood National Park
1993	Point Four Dam	Butte Creek	Fish passage	Western Canal Water District
1993	Diversion dam	Ritchie Creek (Bothe-Napa Valley State Park)	Fish passage	California State Parks
1998	McGowan Dam	Butte Creek	Fish passage	
1998	McPherrin Dam	Butte Creek	Fish passage	McPherrin Family
1998	Western Canal East Channel Dam	Butte Creek	Fish passage	Western Canal Water District
1998	Western Canal Main Dam	Butte Creek	Fish passage	Western Canal Water District
1998	Unnamed small dam #1 (weir)	Guadalupe River		
1998	Unnamed small dam #2 (weir)	Guadalupe River		
2000	Diversion dam	(Bothe-Napa Valley State Park)	Habitat improvement	California State Parks
2000	McCormick – Saeltzer Dam	Clear Creek	Fish passage	Townsend Flat Water – Ditch Company
2000	Concrete check dams (13 total)	Fife Creek (Armstrong Redwoods State Reserve)	Sedimentation, erosion	California State Parks
2000	Diversion dam	Mill Creek (San Mateo County)	Erosion, habitat improvement	California State Parks
2000	Concrete check dam	Sausal Creek (Alameda County)	Habitat improvement	City of Oakland
2000	Wilder Creek Dam	Wilder Creek (Wilder Ranch State Park)	Erosion, habitat improvement	California State Parks
2001	Summer dams (several)	Austin Creek	Habitat improvement	Local participants
2001	Swim dams (2)	Alameda Creek	Fish Passage	East Bay Regional Park
2002	Crocker Creek Dam	Crocker Creek (Sonoma County)	Erosion/failure, fish passage	Sonoma Co. Water Agency

Table 1-1 continued on next page

Year removed	Dam	River	Reason	Owner
<i>Table 1-1 (continued)</i>				
2002	Haypress Pond Dam	Unnamed tributary (Golden Gate National Recreation Area)	Safety, habitat improvement	National Park Service
2002	Horseshoe Pond Dam	Unnamed tributary (Point Reyes National Seashore)	Safety, habitat improvement	National Park Service
2002	North Debris Dam	Unnamed tributary to the Los Angeles River	Safety, habitat improvement	Santa Monica Mountain
2002	Trancas Debris Dam	Unnamed tributary to Trancas Canyon Creek	Safety, habitat improvement	Santa Monica Mountain
2002	Unnamed road crossing	Solstice Creek	Fish passage	National Park Service
2002	Unnamed dam	Ferrari Creek (Santa Cruz County)	Habitat improvement fish passage	Trust for Public Land
2002	St. Helena diversion	York Creek (Napa County)	Fish passage	City of St. Helena
2003	A-Frame Dam	Brandy Creek	Habitat improvement	National Parks Service
2003	Cascade Diversion Dam	Merced River	Fish Passage	National Parks Service
2003	Unnamed Dam	Murphy Creek	Habitat Improvement	
2003	Mumford Dam	Russian River	Habitat Improvement	Sonoma County
2003	East Panther Creek Dam	East Panther Creek	Habitat Improvement	Pacific Gas & Electric
2003	West Panther Creek Dam	West Panther Creek	Habitat Improvement	Pacific Gas & Electric
2004	John Muir #1 Dam	Alhambra Creek Tributary	Safety	National Parks Service, John Muir National Historic Site
Unknown	Big Creek Mfg. Dam	Big Creek		
Unknown	Trout Haven Dam	Monkey Creek		
Unknown	Merry Mountain Guzzler Dam	Unnamed	Safety	Whiskeytown-Shasta-Trinity-National Recreational Area

Table 1-1 continued on next page

Year removed	Dam	River	Reason	Owner
<i>Table 1-1 (continued)</i>				
Unknown	Arco Pond Dam	Lost Man Creek	Fish passage	National Parks Service Redwood National Park
Unknown	Small diversion dam	Green Valley Creek (Sonoma County)		
Unknown	Minnie Reeves Dam	Indian Creek		
Unknown	Salt Creek Dam	Salt Creek		
Unknown	Dam	San Luis Obispo Creek		
Unknown	Lone Jack Dam	Trinity River		
