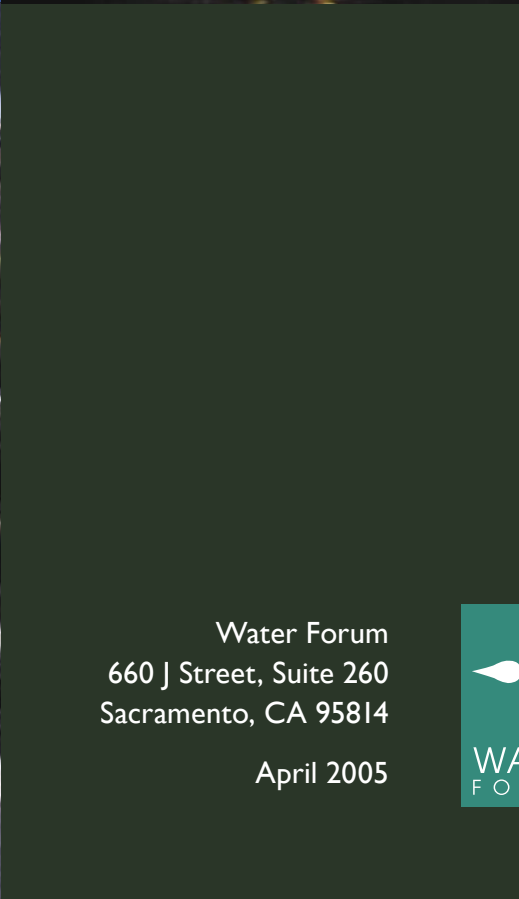




# Lower American River



# State of the River Report



Water Forum  
660 J Street, Suite 260  
Sacramento, CA 95814

April 2005



**The Water Forum is a diverse group** of business and agricultural leaders, citizens groups, environmentalists, water managers, and local governments in the Sacramento Region that have joined to fulfill two co-equal objectives:

- Provide a reliable and safe water supply for the region's economic health and planned development to the year 2030; and
- Preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

In 2000, Water Forum members approved a comprehensive Water Forum Agreement, consisting of integrated actions necessary to provide a regional solution to potential water shortages, environmental degradation, groundwater contamination, threats to groundwater reliability, and limits to economic prosperity. The Water Forum Agreement allows the region to meet its needs in a balanced way through implementation of seven elements. The seven elements of the Water Forum Agreement are: 1) increased surface water diversions, 2) actions to meet customers' needs while reducing diversion impacts in drier years, 3) an improved pattern of fishery flow releases from Folsom Reservoir, 4) lower American River Habitat Management Element, 5) water conservation, 6) groundwater management, and 7) the Water Forum Successor Effort (WFSE). The WFSE was created to implement the seven elements of the Water Forum Agreement over the next 30 years. Additional information can be found on the Water Forum's web site at: [www.waterforum.org](http://www.waterforum.org).

Water Forum  
660 J Street, Suite 260  
Sacramento, CA 95814

April 2005



Dear Reader,

This is the first lower American River State of the River Report. The purpose of this report is to review the health of the lower American River ecosystem as of 2004. It is meant to be an easy-to-read overview, and will be of use to anyone who is interested in learning more about and protecting the lower American River. This report summarizes information developed to support the Fisheries and In-Stream Habitat Management and Restoration Plan for the Lower American River (FISH Plan) as well as other reports and actions about the lower American River ecosystem. A complete list of information sources is at the end of this report.

The lower American River and the land adjacent to the river (much which is encompassed by the American River Parkway) are tremendous resources, managed by a number of different agencies and organizations, for a variety of purposes. In the last decade especially, we have learned that to protect these resources it is critical that those who have an interest in the lower American River come together to share information, work with resource managers, and creatively partner to plan, fund, and implement projects that benefit the lower American River.

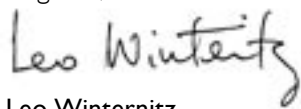
For this report, we decided to focus on the following elements of river management and consider “how are we doing?” in five areas:

- Managing the lower American River to protect fish and river habitat
- Maintaining and/or improving habitats adjacent to the lower American River
- Meeting water quality goals and achieving regulatory standards for the lower American River
- Implementing lower American River levee stabilization and erosion control measures
- Communicating among lower American River stakeholders to inform and improve current and future management

As you will see when you read this document, many actions and projects have been put in place that benefit the lower American River and its resources. You will also note that much still needs to be accomplished. It is important that stakeholders continue to work together to make informed decisions, improve dialogue, and implement actions to maintain or enhance the lower American River.

The Water Forum plans to provide a lower American River State of the River Report every five years. We hope that this report informs you, inspires you, and encourages you to enjoy and protect the lower American River.

Regards,



**Leo Winternitz**  
Executive Director  
Water Forum



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## List of Acronyms and Abbreviations

- AFRP** — Anadromous Fish Restoration Program
- ARFCD** — American River Flood Control District
- AROG** — American River Operations Work Group
- ARP** — American River Parkway
- ARP-IPMP** — American River Parkway Invasive Plant Management Plan
- CDFG** — California Department of Fish and Game
- City Parks** — City of Sacramento/Department of Parks and Recreation
- CMP** — Coordinated Monitoring Program
- Corps** — U.S. Army Corps of Engineers
- County Parks** — County of Sacramento/Department of Regional Parks, Recreation and Open Space
- County Planning** — County of Sacramento/Department of Planning and Community Development
- CSUS** — California State University, Sacramento
- CVP** — Central Valley Project
- CVPIA** — Central Valley Project Improvement Act
- DWR** — California Department of Water Resources
- ESA** — Endangered Species Act
- F** — Fahrenheit
- FEMA** — Federal Emergency Management Agency
- FISH Plan** — Fisheries and Instream Habitat Plan
- FMS** — Flow Management Standard
- HME** — Habitat Management Element
- LAR** — lower American River
- Nimbus Hatchery** — Nimbus Salmon and Steelhead Hatchery
- NOAA Fisheries** — National Oceanic and Atmospheric Administration's National Marine Fisheries Service
- OEHHA** — California Office of Environmental Health Hazard Assessment
- PHG** — Public health goal
- RCMP** — River Corridor Management Plan
- Reclamation** — U.S. Bureau of Reclamation
- RM** — River mile
- RMG** — River Management Group
- RWQCB** — Central Valley Regional Water Quality Control Board
- SAFCA** — Sacramento Area Flood Control Agency
- SRA** — Shaded riverine aquatic (habitat)
- SRCS** — Sacramento Regional County Sanitation District
- SRWP** — Sacramento River Watershed Program
- SWRCB** — State Water Resources Control Board
- TCD** — Temperature Control Device
- UC Davis** — University of California, Davis
- USFWS** — U.S. Fish and Wildlife Service
- USGS** — United States Geological Survey
- VELB** — Valley elderberry longhorn beetle
- WFSE** — Water Forum Successor Effort



# Summary of Key Findings – The State of the lower American

Each of the river management elements described in this report was assessed for an overall view of “how are we doing?” as of 2004. It is important to point out that the ratings provide a broad sense for the elements; there are many projects and activities at various stages of development underway or planned to benefit the lower American River (LAR) and its resources. The ratings used are:

- Some:** Starting or some progress on achieving this element.  
**Moderate:** Clear progress on achieving this element, although there is still work to do.  
**Full:** Major progress on achieving this element; full implementation completed or on the horizon (i.e. within the next year).



## **Managing the lower American River to protect fish and river habitat: Moderate**

### **Improvements related to water flow**

- The adoption of an updated and improved flow management standard (FMS) is a top priority for the LAR; it is anticipated that the FMS will be presented to the State Water Resources Control Board (SWRCB) in late 2005. Major challenges remain.
- The American River Operations Work Group (AROG) meets every two to four weeks, focusing on “real-time” management of the LAR, particularly water temperature and flow.
- Use of the CALFED Environmental Water Account makes it possible to increase releases and to bypass hydropower operations at Folsom Dam to better protect fish in the LAR.
- The U.S. Army Corps of Engineers (Corps) and U.S. Bureau of Reclamation (Reclamation) are studying potential modifications to operations of Folsom Dam and Folsom Reservoir, which may minimize the impact of flow fluctuations in the LAR.
- The SWRCB may modify the 1995 Bay-Delta Water Quality Control Plan that could result in benefits for biological resources of the LAR.

### **Improvements related to water temperatures**

- Temperature control devices (TCDs) allow water supply operators the flexibility to selectively draw water from varying depths in Folsom Reservoir, using or conserving the coldest water in Folsom Reservoir. A TCD allows Reclamation to conserve the coldwater in Folsom Reservoir so that it can be released when of the most benefit to fish in the LAR. A TCD for the Folsom Dam intake has been constructed and Reclamation began operation of the TCD in 2003.

- Physical modifications at Folsom Dam (such as the automation of temperature shutters) are planned by the Corps but will not be completed for several years.

## **Actions or projects to restore, maintain, and improve fish habitat**

- A floodplain habitat enhancement project in Discovery Park was constructed between November 2001 and January 2002, converting steep shoreline into a graded contoured segment of planted bank. The site is designed to seasonally flood with features that will develop into a successful riparian habitat to support wildlife, control erosion, and serve as floodplain habitat for Sacramento splittail and refuge/habitat for out-migrating salmon.
- Funding for habitat projects is limited, unstable, and large numbers of applicants compete for available funds. Demands for Central Valley Improvement Act (CVPIA) and California Bay-Delta Program restoration funds have created a complex array of issues and timelines that only can be resolved cooperatively, by involving the public and all stakeholders.
- Due to staffing constraints at resource agencies, it is difficult to implement new projects even if funding is secured.

## **Reducing the impact of surface water diversions**


- The Water Forum Agreement outlines agreed-to-diversions for each supplier and the facilities needed to divert, treat and distribute this water. In addition to extraordinary conservation in drier and driest years, the Water Forum Agreement includes three unique and significant alternative ways for purveyors to reduce surface water diversions from the American River:
  - Reducing additional water diversions from the American River in drier and driest years;
  - Allowing purveyors that choose to continue increased American River water diversions in drier or driest years to do so, if in the drier years there was a release of replacement water upstream of Folsom Reservoir; and
  - Diverting water from the Sacramento River instead of the American River.

## **Maintaining and/or improving habitats adjacent to the lower American River: Some**

- Non-native, invasive plants are a major concern in the LAR because they take over natural habitats along the river previously occupied by native species. These species are able to out compete native plants and do not provide similar habitat value for fish and wildlife. The first phase of the

American River Parkway Invasive Plant Management Plan was completed in early 2004, targeting five non-native invasive species for eradication: Giant reed (arundo), Chinese tallow tree, tamarisk, red sesbania, and Spanish broom. The second phase of the program began in late 2004, targeting five additional non-native species: pampas grass, pyracantha, French broom, Scotch broom, and oleander.

- The forest areas adjacent to the LAR (called riparian forests) are gradually changing, due to a variety of factors, to habitats dominated by more drought-tolerant upland species. Cottonwoods in particular are declining, as mature trees die of old age or fire damage and these trees are typically not replaced naturally. One species of concern in the LAR is the Valley Elderberry Longhorn Beetle (VELB) that depends on elderberry shrubs for survival. A collaborative effort is underway to integrate management and conservation to preserve the VELB and complete scientific studies to inform the development of a final VELB Habitat Management Plan.
- Creation of upland habitat on the Cal Expo floodplain in the vicinity of Bushy Lake was completed in July 2002. The Corps constructed 8.5 acres of habitat suitable for VELB, and in 2003, an additional two acres of habitat mitigation was designed and planted by County Parks to offset habitat loss due to the Jedediah Smith bicycle trail overlay project and the American River Parkway Invasive Plant Management Program.
- In 2003, the Corps worked with local, state, and federal agencies to develop a project that established approximately 650 linear feet of shaded riverine aquatic (SRA) habitat at RM 2.4L. The habitat is now under active maintenance by a landscaping contractor and this site will be monitored for 10–15 years after planting.
- Funding for projects to restore, maintain, or improve habitat is limited and unstable. LAR projects must compete for limited funds.
- Due to staffing constraints at resource agencies, it is difficult to implement new projects even if funding is secured.
- Because of ongoing monitoring and maintenance responsibilities, maintaining and/or improving habitat is a long-term effort.



### **Meeting water quality goals and achieving regulatory standards for the lower American River: Moderate**

- The LAR consistently meets water quality goals and objectives for drinking water, achieving its designated beneficial uses as sources of municipal, industrial and agricultural supply water and recreation.



- The LAR is on the state's list of impaired waterbodies due to mercury (from historic mining activity). Mercury contamination of sediments is a major issue in many northern California rivers, and addressing this issue is a long-term challenge.
- The LAR is on the state's list of impaired waterbodies due to toxicity (sources unknown). Monitoring conducted on test organisms such as algae indicates that significant toxicity to test organisms occurs in surface water monitored by the Sacramento River Watershed Program (SRWP) throughout the watershed, including the LAR. It is important to note that the testing program assumes that toxicity to test organisms is an indication of *potential* impairment to aquatic species and ecosystems. The Toxicity Focus Group of the SRWP has developed a strategy to address toxicity of unknown causes and is seeking funding to begin implementing this strategy.

### **Implementing lower American River levee stabilization work and erosion control measures: Moderate**

- The Corps and the Sacramento Area Flood Control Agency (SAFCA) are implementing erosion control measures needed before LAR levees can be certified as being in compliance with the Federal Emergency Management Agency's (FEMA's) standards.

### **Communication and collaboration among lower American River stakeholders to inform and improve current and future management: Moderate**

- The Water Forum Successor Effort was created to implement the seven elements of the Water Forum Agreement over the next 30 years.
- The Lower American River Task Force (LARTF) and its three technical working groups meet regularly to promote implementation of the LAR River Corridor Management Plan (RCMP) recommended actions and provide advice to program managers implementing studies and projects proposed for the LAR and the American River Parkway.
- The first Lower American River Science Conference was held in June 2003; a second is planned for April 2005.
- Numerous agencies have jurisdiction and responsibilities for management of natural resources, land use, recreation, water supply, and flood control in the LAR. Although a great deal of information has been generated by various entities about the LAR, its resources, and related management plans, this information is not in one place, nor always readily accessible. The RCMP recommends improvements to the availability and management of information about the LAR so that information is readily accessible to resource managers and the public.

# 1. A Resource of Local, Regional, and Statewide Importance\*



The LAR is the 23-mile section of the American River, extending from its mouth at the Sacramento River to Nimbus Dam (Figures 1 and 2). Confined by high ground along its upper reach, the LAR has levees along its north and south banks for about 13 miles from the Sacramento River to the easterly end of Arden Way in Carmichael on the north and to the Mayhew Drain on the south.

Flows on the LAR are controlled by operation of Folsom Dam and Folsom Lake (also called Folsom Reservoir), located about 30 miles east of Sacramento. Folsom Reservoir, Folsom Dam,

Lake Natoma, and Nimbus Dam are a unit of the Central Valley Project<sup>1</sup> (CVP) constructed by the Corps and operated by the U.S. Bureau of Reclamation (Reclamation). Folsom Reservoir provides flood protection for the Sacramento area; water supplies for irrigation, domestic, municipal, and industrial uses; hydropower; extensive water-related recreational opportunities; water quality control in the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary (Delta); and maintenance of flows stipulated to protect fish, wildlife, and recreational considerations (both

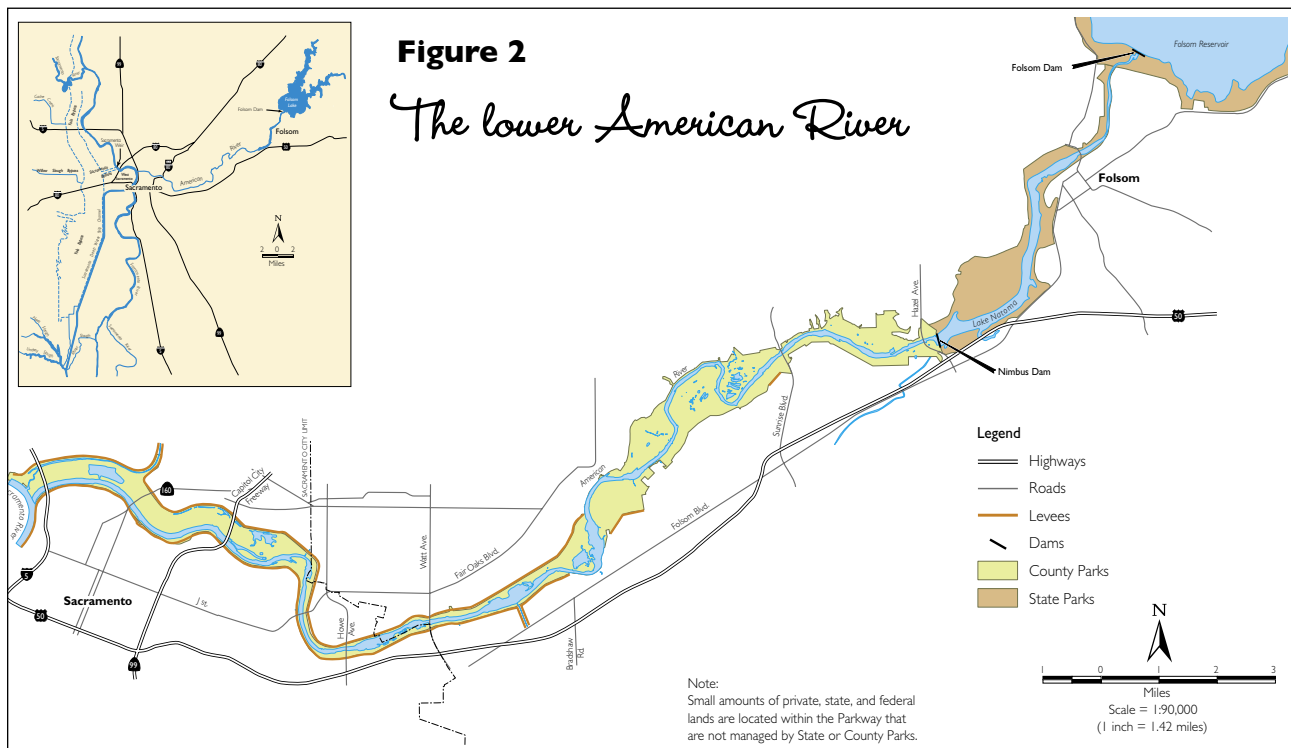
\* Information in this section is derived from the lower American River RCMP (RCMP) and the Aquatic Resources of the Lower American River Baseline Report (Baseline Report).

<sup>1</sup> The CVP network includes dams, reservoirs, canals, power plants, aqueducts, and pumping plants. The project extends from the Shasta and Trinity Reservoirs in the north 500 miles southward, and stretches 100 miles from the foothills of the Sierra to the coastal mountain ranges. The CVP is the largest surface water storage and delivery system in California, with a geographic scope covering 35 of the state's 58 counties.

downstream of Folsom Dam on the river and at adjacent areas such as the American River Parkway and the Folsom Lake State Recreation Area).

Lake Natoma serves as an afterbay to Folsom Reservoir, regulating fluctuating discharges and allowing dam operators to coordinate power generation and flows in the LAR channel during normal reservoir operations. Lake Natoma has a surface area of 500 acres and its elevation fluctuates between three to four feet daily. Nimbus Dam is located about seven miles downstream of Folsom Dam. The Folsom South Canal extends from Lake Natoma southward about 27 miles towards the Cosumnes River.

The American River is the second largest tributary to the Sacramento River, with an average annual runoff (rain, snow melt, or other water that flows off the land) coming into Folsom Reservoir of 2.7 million acre-feet from about 1,875 square miles of drainage area. An acre-foot is the volume of water needed to cover an acre of land to a depth of one foot, equivalent to about 326,000 gallons. The Corps specifies flood control



Source: RCMP

**Table 1***Fish species occurring in the American River watershed.*

	Common Name	Status
	Pacific lamprey	N
	White sturgeon	N
	American shad	I
	Threadfin shad	I
	Goldfish	I
	Common carp	I
	Thicktail chub	NE
<b>KEY</b>	California roach	N
<b>N nativespecies</b>	Hitch	N
	Hardhead	N
<b>NE nativespecies now extinct</b>	Golden shiner	I
	Sacramento blackfish	N
<b>NL native species but locally extirpated</b>	Fathead minnow	I
	Splittail	N
	Sacramento pikeminnow	N
	Speckled dace	N
<b>I alien species</b>	Sacramento sucker	N
	White catfish	I
	Brown bullhead	I
	Black bullhead	I
	Channel catfish	I
	Wakasagi	I
	Pink salmon	N
	Chum salmon	N
	Coho salmon	N
	Steelhead rainbow trout	N
	Kokanee	I
	Chinook salmon	N
	Brown trout	I
	Inland silverside	I
	Western mosquitofish	I
	Threespine stickleback	N
	Prickly sculpin	N
	Riffle sculpin	N
	Striped bass	I
	Sacramento perch	NL
	Green sunfish	I
	Bluegill	I
	Redear sunfish	I
	Smallmouth bass	I
	Largemouth bass	I
	White crappie	I
	Tule perch	N

requirements and regulating criteria, depending on the time of year. Reclamation, under an agreement with SAFCA, is presently following a more conservative flood control operation to provide increased flood control space in Folsom Reservoir.

The LAR is a tremendous asset to the Sacramento region and beyond, with more than 40 species of native and nonnative fish documented in the LAR, including native fish that migrate up rivers from the ocean to breed in fresh water, such as fall-run Chinook (King) salmon and steelhead. Several of these species are of primary management concern because of their declining numbers, or their importance to recreational/commercial fisheries. Recreationally and/or commercially important species include fall-run Chinook salmon (a federal species of concern), steelhead (listed as a federal threatened species under the Endangered Species Act), and non-native striped bass and American shad (Table 1).

The LAR has been designated a “Recreational River” under both the California Wild and Scenic Rivers Act and the National Wild and Scenic Rivers Act. These designations provide state and national recognition, and additional protection of the river’s outstanding scenic, wildlife, historic, cultural, and recreational values. The trail system of the American River Parkway has been designated a “National Recreational Trail” (see sidebars next page).

Numerous influences (man-made and natural) impact the LAR corridor and the LAR ecosystem (see Figure 3 on pages 14 and 15). Before 1800 and the advent of European settlement, the Nisenan, Southern Maidu, and Patwin were the human inhabitants of the LAR floodplain. Vegetation adjacent to the river formed extensive, continuous forests in the LAR’s floodplain. The area supported an abundance of native vegetation and wildlife and the LAR historically supported numerous fish species, including spring- and fall-run Chinook salmon and summer-, fall-, and winter-run steelhead. These species had access to more than 125 miles of habitat in the upper reaches of the

## *American River Parkway*

In 1960, the American River Parkway was created to provide protection to the greenbelt and trails along the LAR. The Parkway includes more than 4,700 acres of parkland with multi-trail uses, picnic areas, boating access sites, swimming areas, golf courses, a group camping area, and a nature center. The American River Parkway remains a valued stretch of open space reaching across the community and is considered to be one of the finest urban public parks of its kind in the nation. The County of Sacramento, Department of Regional Parks, Recreation and Open Space (County Parks) manages the Parkway. In addition, access to the American River is provided at a number of facilities administered by the City of Sacramento, Department of Parks and Recreation (City Parks). Lake Natoma (the area between Folsom Dam and Nimbus Dam) is formally managed in compliance with the Folsom Lake State Recreation Area General Plan. Recreation at Folsom Reservoir is managed by the California Department of Parks and Recreation under an agreement with Reclamation.



## *American River Parkway Plan*

In 1985, the California Legislature acknowledged the Parkway's statewide significance by adopting the American River Parkway Plan through the passage of the Urban American River Parkway Preservation Act. The current version of the American River Parkway Plan, written in 1985, is a policy document guiding land use decisions to preserve the Parkway's unique natural environment while facilitating human enjoyment of the Parkway. It includes goals and policies primarily for recreation, land use and public safety within the Parkway and is an element of the general plans of both the City and the County of Sacramento. While the geographic scope of the 1985 Parkway Plan includes Lake Natoma (the area between Folsom and Nimbus Dams), this area is formally managed in compliance with the Folsom Lake State Recreation Area General Plan. The Parkway Plan incorporates by reference the Folsom Lake State Recreation Area General Plan, acknowledging its validity as the land use plan for the Lake Natoma area.

The process to update the 1985 American River Parkway Plan was initiated in fall 2003 and is being led by these local co-sponsoring agencies: the Sacramento County Department of Planning and Community Development (County Planning, the project manager for the Update), working in close coordination with County Parks, City Parks, the City of Sacramento Department of Planning and Building, SAFCA, the Water Forum, and the California Exposition and State Fair. Other agencies, such as Reclamation and the California Department of Parks and Recreation are also participating in the process. An Update Citizens' Advisory Committee, with representatives of environmental, recreation, and community groups and individuals appointed by the City and County of Sacramento is working with the co-sponsoring agencies throughout the Update process.

Source: RCMP and County Planning web site.



**Figure 3**

## Significant Events in the History of the lower American River





1990

**1990:** Judge Richard A. Hodge rules in *Environmental Defense Fund v. East Bay Municipal Utility District*. EBMUD contracted with Reclamation in 1970 for water that would be diverted from the LAR into the Folsom South Canal at Nimbus, which is upstream of the LAR. Complainants sued over concern about how increased diversions would impact the LAR fishery. Judge Hodge came up with a physical solution to the case that attempted to balance in-stream values and water as a contracted resource. Judge Hodge reasoned that EBMUD could only divert when certain specified flows would remain in the river. These flows have come to be known as the Hodge Flows.

**1990:** SWRCB concludes existing flow criteria not protective of beneficial uses of the LAR.

**1992:** Central Valley Improvement Act passed by Congress and signed into law.

**1995:** CALFED Program initiated to develop a long-term strategy to restore environmental health and resolve water management problems in the Bay-Delta and its watersheds.

**1998:** Floodway Management Plan for the LAR developed by SAFCA and a diverse group of stakeholders.

**1999:** The Water Forum, with Reclamation, U.S. Fish & Wildlife Service (USFWS), California Department of Fish and Game (CDFG), the National Marine Fisheries Service, and other agencies, begins work on an improved and updated FMS for the river.

2000

**2002:** The Lower American River - River Corridor Management Plan (RCMP) is endorsed by representatives of more than 40 local, state, federal, community, environmental, flood control and neighborhood agencies/organizations as the basis for continued multi-agency collaboration and coordinated resource management for the LAR.

**2003:** American River Parkway Plan Update process begins.

### Ongoing Activities

**1990 – Present:** Many studies and actions undertaken to compensate for historical changes, improve natural resources, protect against floods, and sustain beneficial uses.

**1996 – Present:** AROG brings together those that have a legislated or resources-specific interest in the operations of Folsom Dam and Reservoir, and the LAR.

**2002 – Present:** Lower American River Task Force and its technical working groups working to implement RCMP recommended actions.

**2004 – Present:** American River Parkway Plan Update Citizens' Advisory Committee working with Update co-sponsoring agencies.

Sources: RCMP, Baseline Report, web sites of County Planning, CDFG, NOAA Fisheries.

## Impacts of Gold Mining

Between 1849 and 1909, hydraulic gold mining in the watershed of the North and Middle forks of the American River caused an estimated 257 million cubic yards of sand, silt, and fine gravels to be deposited in the river. From 5-30 feet of these materials were deposited on the bed of the LAR as a result of hydraulic mining and dredging. The deposition of these sediments resulted in extensive sand and gravel bars in the LAR, an overall rise of the channel and surrounding floodplain, and the covering of fish spawning gravels. From the late 1800s to the mid-1900s, large-scale dredge gold mining was conducted



*Early gold mining operation in Placer County*

south of the river, downstream of Folsom. In addition, miners began scraping gravel bars in the river to obtain rock material for concrete production, from Folsom to as far downstream as Watt Avenue, raising the river channel bed. Excavation of shoreline gravel material in dredge mining operations drastically altered the surface features of the floodplain, resulting in tracts of land being swept away, deposits left in other areas, and accumulation of mining debris forming new channels.

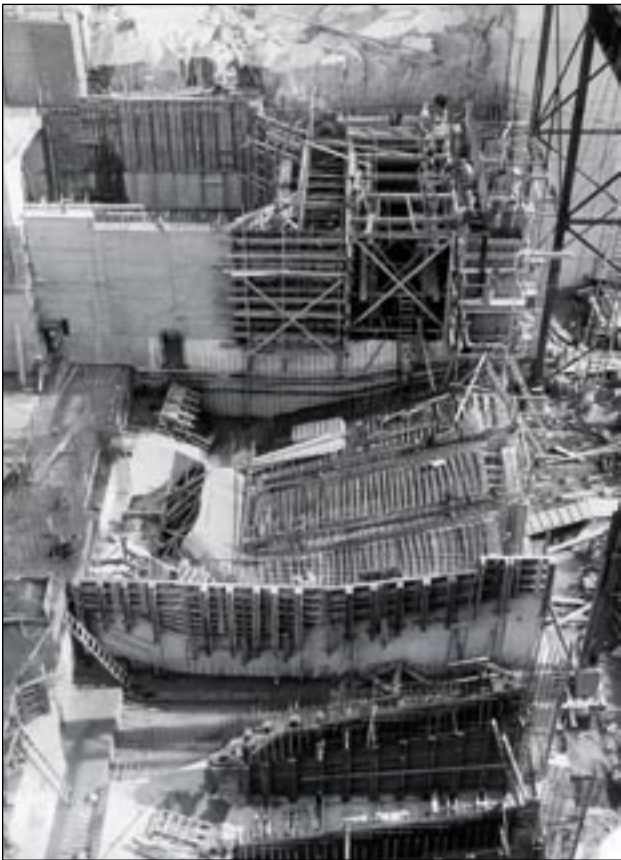
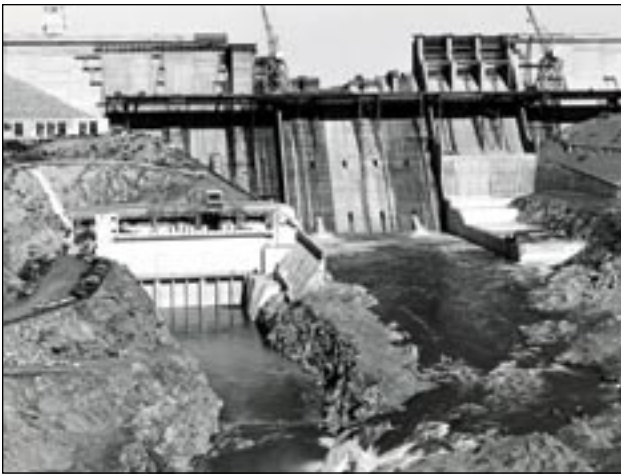
Source: RCMP

American River Basin.

Following the discovery of gold, widespread hydraulic mining began to substantially impact the American River and its watershed (see sidebar above). Since 1850, when California became a state, settlement of the LAR floodplain by European settlers affected the physical processes shaping the river and its floodplain, causing drastic alterations to the LAR and its adjacent habitats.

Dams and the levee system built primarily along the lower portion of the LAR were constructed, in part, to provide flood protection to the Sacramento area, which is built largely in the river

floodplain. Dam construction has had severe and unintended consequences to the vegetation, wildlife, fish, and habitat of the river. Beginning in the mid-1800s, upstream access for migrating fish was impeded by dams constructed for mining debris containment, flood control, and diversions. Many of the dams constructed had inadequate or no passage systems (e.g., fish ladders) that would have allowed fish to migrate upstream. In 1950, floods destroyed the fish ladder at the Old Folsom Dam, restricting fish to the lower 25 miles of the American River. Construction of Folsom and Nimbus Dams in 1955 permanently blocked



*Folsom Dam during construction and today*

upstream migration of fish above the lower 23 miles of the American River (the portion of the river now referred to as the LAR), blocking about 70 percent of the spawning habitat (areas of the river where fish lay eggs) historically used by Chinook salmon and 100 percent of the spawning habitat historically used by steelhead. The Nimbus Salmon and Steelhead Hatchery was constructed to replace the salmon and steelhead runs blocked by Nimbus and Folsom dams.

Dam construction effectively cut off the supply of upstream sediments to the LAR, resulting in a deepening of the river channel since the 1950s. In several locations, the channel has degraded to its previous bed elevation, and it is thought that the mining debris that once filled the channel of the LAR has been completely removed by river flows and gravels mining. However, the surrounding floodplain remains at its post-mining elevation. Sediment supply is now derived from the surrounding river banks which increases erosion and leads to accelerated loss of valuable shaded riverine aquatic habitat (SRA), loss of soft bank and disrupts/changes the natural recruitment process of large woody debris. Large woody debris accumulates naturally in rivers and plays an important role in stream mechanics and fish habitat. SRA habitat provides multiple benefits to both fish and wildlife. In particular, it provides shade along the river to moderate water temperatures in the summer. These impacts coupled with reduced frequency of seasonal flooding and a deeper water table on the high floodplain has altered the vegetation communities



*Nimbus Dam and Lake Natoma.*

along the river to habitats that provide less value to wildlife and fish.

Today, the LAR remains a diverse river ecosystem and factors that impact management of this ecosystem include water temperature, river flow, upstream hydropower production, habitat for fish reproduction and rearing, water quality, water diversions, predation, fish migration barriers, flood control, non-native plants and animals, bank erosion, and river channel characteristics.

Operation of Folsom and Nimbus dams has dramatically altered the LAR and its adjacent habitats by causing an overall decline in extremes of flow and temperature compared with historical conditions. Current LAR flows and temperatures are different than pre-dam conditions because river flows are managed by Reclamation to meet multiple objectives. The timing of peak river flows has shifted from spring to early winter and summer water temperatures have declined significantly as summer flows increased.

The Central Valley Improvement Act (CVPIA)

signed into law in 1992 mandated changes in management of the Central Valley Project, particularly for the protection, restoration, and enhancement of fish and wildlife. The CVPIA made significant changes in the policies and administration of the project and redefined the purposes of the CVP to include the protection, restoration, and enhancement of fish, wildlife, and associated habitats; and to contribute to California's interim and long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin River Delta Estuary.

The CVPIA directed the development and implementation of a program that makes all reasonable efforts to at least double natural production of anadromous fish in California's Central Valley streams on a long-term, sustainable basis. This program is known as the Anadromous Fish Restoration Program (AFRP) and it is co-implemented by the U.S. Fish and Wildlife Service (USFWS) and Reclamation.<sup>2</sup> The baseline for the LAR for Chinook salmon is 80,000 adults either returning to spawn naturally in the LAR or caught in ocean and inland fisheries, so the AFRP doubling goal is 160,000 fish. In recent years, (1992–2003) an increasing trend in fall-run Chinook salmon returning to the LAR can be observed. Resource agencies have estimated that the population of LAR Chinook salmon accounts for nearly 20 percent of the total annual number of salmon spawning in the Central Valley.

This SOR Report summarizes information developed to support the *Fisheries and In-Stream Habitat Management and Restoration Plan for the Lower American River* (FISH Plan) as well as other reports about the LAR ecosystem. The FISH Plan constitutes a blueprint for improving conditions of five priority LAR fish species: Chinook salmon, steelhead, Sacramento splittail, American shad, and striped bass. Improvement of conditions for these

<sup>2</sup> Additional information about the AFRP is available on the program's web site [www.delta.dfg.ca.gov/afrp](http://www.delta.dfg.ca.gov/afrp). Since 1995, the AFRP has helped implement over 195 projects in the Central Valley to restore natural production of five anadromous fish species: steelhead, Chinook salmon, non-native American shad, non-native striped bass, and sturgeon.



species will likely protect or enhance conditions for other LAR fish, including native resident species.

The FISH Plan is one element of the River Corridor Management Plan (RCMP) for the LAR developed by the Lower American River Task Force (LARTF). The LARTF, with support from SAFCA, the Water Forum, and Sacramento County, guided the development of the RCMP to institute a cooperative approach to managing and enhancing the LAR. In January 2002, representatives of more than 40 local, state, federal, community, environmental, flood control and neighborhood agencies/organizations endorsed the RCMP as the basis for continued multi-agency collaboration and coordinated resource management for the LAR. The RCMP includes goals, objectives, and recommended actions in the areas of fisheries and in-stream habitat, vegetation and wildlife management, flood management, and recreation (see sidebar to right).

Currently, the LARTF and its three technical working groups (fisheries and instream habitat, bank protection, and floodway management) are focused on implementing the recommended actions of the RCMP. Significant progress has occurred on RCMP implementation since its endorsement: as of mid-2003, of the 112 actions in the RCMP's three-year action plan, 52 actions were either completed or underway, 22 actions were in the plan development stage (i.e. designs or studies to implement the action were being conducted), and 38 actions were not started or on hold, primarily due to staffing and funding constraints.<sup>3</sup> A list of agencies and organizations that endorsed the RCMP as well as a summary of RCMP accomplishments can be found in Appendix 2.

## River Corridor Management Plan

The goals of the four elements of the River Corridor Management Plan for the lower American River are:

### **Fisheries and In-Stream Habitat Management**

- Increase and maintain viable populations of naturally spawning fall-run Chinook salmon and steelhead;
- Achieve and maintain a viable population of splittail;
- Restore or maintain an appropriate distribution and abundance of other native fish species; and
- Maintain American shad and striped bass populations of sufficient abundance to sustain these fisheries, consistent with restoring native species.

### **Vegetation and Wildlife Management**

- Achieve and maintain healthy aquatic, riparian (habitats along the river), and terrestrial habitats that support targeted species.

### **Flood Management**

- Improve the reliability of the existing flood-control system along the LAR.

### **Recreation Management**

- Provide appropriate access and facilities for recreational pursuits within the American River Parkway, compatible with the unique natural environment that other recreational facilities in Sacramento County do not normally provide.

Source: RCMP

<sup>3</sup> Additional information about the Lower American River Task Force and RCMP implementation is available on the SAFCA web site [www.safca.org](http://www.safca.org).

## 2. Key Findings – The State of the lower American River



### **Managing the lower American River to protect fish and river habitat**

#### **Background\***

More than 40 species of native and nonnative fish have been documented in the LAR (see Table 1 page 12), including native fish that migrate up rivers from the ocean to lay and fertilize eggs in fresh water, such as fall-run Chinook salmon and steelhead. These species are called anadromous fish and several are of primary concern because of their declining numbers, and/or their importance to recreational/commercial fisheries. Steelhead are listed as “threatened” under the federal Endangered Species Act (ESA). Recreationally and/or commercially important species include fall-run Chinook salmon (a federal species of concern), steelhead, and non-native striped bass and non-native American shad.

The LAR supports rich fish diversity, but the abundance of some individual species appears to be low. Of the 43 species that do or did occupy

the river, 19 are considered numerous or common in certain portions of the LAR, nine are considered present or occasional, 14 are considered as few, uncommon, or rare, and one is now extinct. Twenty-two are believed to be non-anadromous species native to the LAR. In addition to Chinook salmon and steelhead, a few native species have been most abundant in surveys conducted in recent years, including Sacramento sucker, Sacramento pikeminnow, sculpins (prickly and riffle), tule perch, hardhead, and Pacific lamprey.

In the 1920s, gravel bars were scraped to obtain aggregate for concrete production, and by 1940 gravel bars as far downstream as Watt Avenue were affected. These operations caused repeated destruction of the channel from 1900 to 1955. In the 1950s and early 1960s, gravel extraction activities were located immediately adjacent to the river upstream of the Interstate-80, Howe Avenue, and Watt Avenue bridges and at Arden Bar. Gravel extraction from elevated terraces at Sacramento Bar and Arden Bar caused the formation of ponds and debris mounds. These ponds are connected to the river, and may trap fish at high flows, resulting in fish isolation, stranding and mortality.

Non-native aquatic species are a concern for the LAR. Water hyacinths are found in tributaries to and in Lake Natoma. Reclamation funds physical removal of water hyacinth to help prevent its spread in Lake Natoma and to the LAR.

There is also concern that the New Zealand Mud Snail could invade the LAR (see sidebar next page).

#### **Chinook Salmon**

Fall-run Chinook salmon has been the dominant run of Chinook salmon since the 1940s and since 1955, Chinook salmon populations have been supplemented by the operation of the Nimbus

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\* Information in this section is derived from the Baseline Report, RCMP, information from the Water Forum, and web sites of CDFG, Reclamation, SAFCA, and the Corps.



## New Zealand Mud Snail

The New Zealand Mud Snail was first found in the United States in Idaho about seven years ago; since that time it has quickly spread to other locations in the western United States. The first specimens found west of the Sierras in California occurred in October 2003 in Putah Creek (Yolo County), at an access area used by fly fishers. In December 2003, the snails were discovered in the Mokelumne River, on equipment downstream from Camanche Reservoir, east of Lodi.

The snail is small, brownish gray and about  $\frac{1}{8}$  inch in size, but may be as small as a grain of sand. Immature mud snails often look like sprinkled black pepper; mature mud snails have a light to dark brown shell.

The snails reproduce without a mate allowing one female to colonize an area and snail densities as high as 750,000 per square meter have been recorded. The mud snail can live up to 25 days with little moisture; resource managers believe that they are primarily spread in damp fishing gear, shoes, ballast water, and boats.

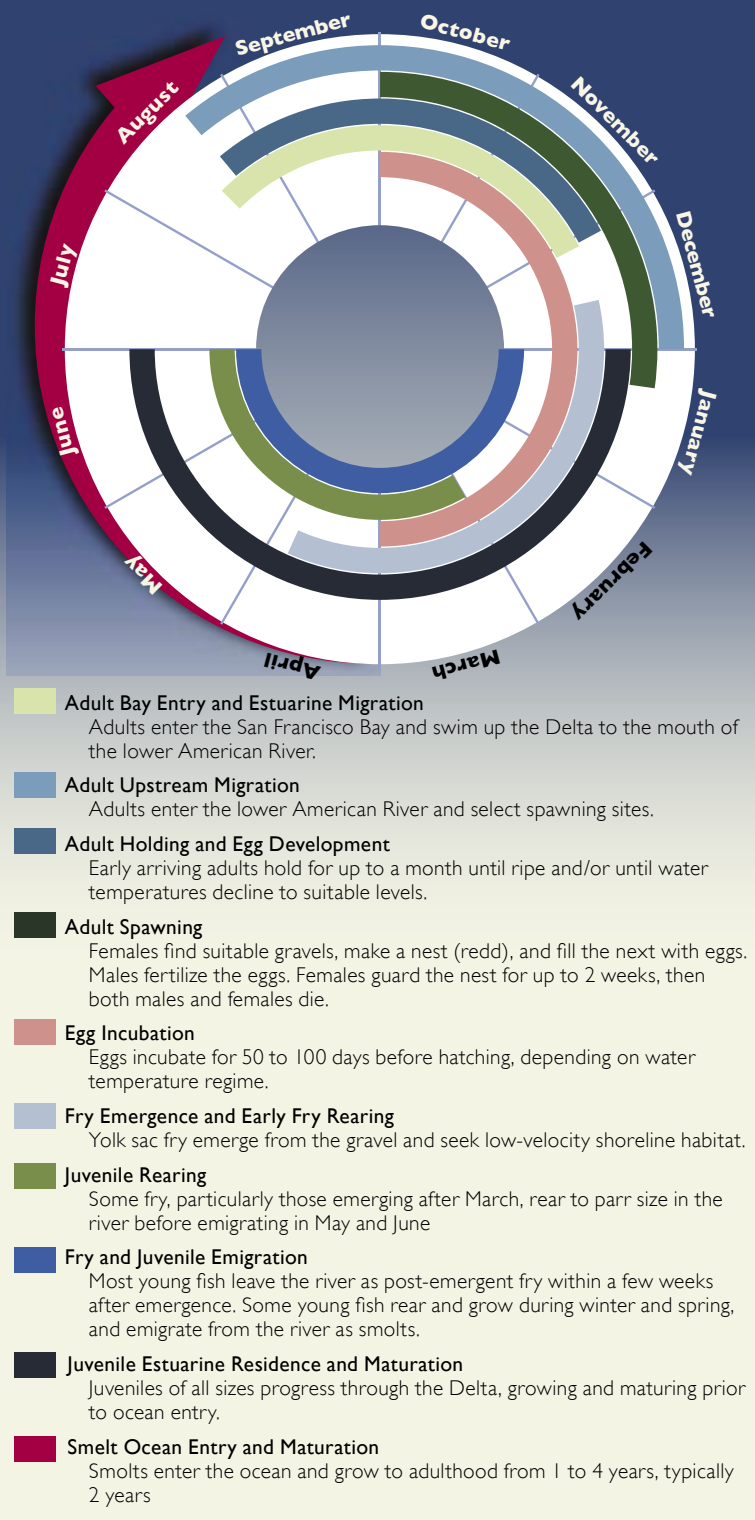
Mud snails have been found up to 40 feet from the water so they also can be spread on clothing, shoes, and animal fur. The mud snail is a concern because if large colonies of exotic snails establish, they could successfully compete with native snails and aquatic insects for food, impacting an important part of the aquatic food chain. In addition, because the mud snails pass through a fish's intestinal tract undigested, they are not considered a food source for native trout, salmon, steelhead, or other fish species.

If you fish, recreate, or swim in locations other than the American River, please do your part to making sure that this species is kept out of the American River. Resource agencies are conducting outreach to increase the public's awareness about this important issue and information and guidelines are available on the California Department of Fish and Game's web site: [www.dfg.ca.gov](http://www.dfg.ca.gov). Cleaning all boating and fishing equipment is crucial to reducing impacts from non-native species.



**Figure 4**

## Fall-Run Chinook Salmon Life Cycle



Salmon and Steelhead Hatchery (Nimbus Hatchery). The Nimbus Hatchery was constructed to mitigate for lost habitat blocked by Nimbus and Folsom Dams. In cooperation with the California Department of Fish and Game (CDFG) and the USFWS, Reclamation designed and built the Nimbus Hatchery, and currently pays CDFG to operate and maintain it (see sidebar page x).

Figure 4 is a generalized fall-run Chinook salmon lifecycle for the LAR. As illustrated, fall-run Chinook salmon use the LAR during nearly every month of the year for the various stages of their lifecycle. The timing of adult Chinook salmon spawning is strongly influenced by water temperature. When decreasing water temperature approaches 60 degrees Fahrenheit (F), female Chinook salmon begin to construct redds (egg nests), into which their eggs are eventually released and fertilized. This activity in the LAR is concentrated in the upper seven-mile portion of the river, although some redds have been documented below this river section. Natural spawning can be observed at several locations along the American River Parkway. Salmon fry emerge from the gravel and fry and juvenile salmon emigrate from the LAR to the ocean where they live the majority of their lives. The small salmon can often be seen along the shore as they make their way downstream to the Sacramento River. Most of the fall-run Chinook salmon returning to the LAR are three years old. Chinook salmon naturally die soon after they spawn. The river below the hatchery to Ancil Hoffman Park is closed to fishing during the spawning season to protect spawning fish and eggs.

Both naturally and hatchery produced Chinook salmon spawn in the LAR. Annual estimates of Chinook salmon that return to the LAR have been made by the CDFG since 1952. The estimates appear to be highly variable and no consistent trend is readily apparent over the entire period. However, in recent years, returns of fall-run Chinook salmon to the LAR have increased (see Figure 5, page 24).

## Nimbus Salmon and Steelhead Hatchery



*Juvenile salmonid*

CDFG operates the Nimbus Hatchery immediately downstream from Nimbus Dam, receiving its water supply directly from Lake Natoma. In about the middle of September, a fish diversion rack (also called a weir) is installed in the river to stop the upstream migration of fish because of the limited spawning area between the hatchery and Nimbus Dam. The rack guides Chinook salmon and steelhead to the ladder entrance of the hatchery.

The hatchery's fish ladder is open to fall-run Chinook salmon annually when the average daily river temperature declines to approximately 60 degrees F., generally in October or early November. Steelhead spawning occurs after salmon, usually December through March. Salmon and steelhead jump over steps to the top of the fish ladder and then swim into a holding pond. Fish are sorted and spawned at the hatchery. In the case of salmon, fish ready for spawning are killed (Chinook salmon naturally die after spawning, so killing the fish is not wasteful). The eggs taken are fertilized with sperm squeezed from male salmon, placed into egg hatching jars to incubate, and hatch after 50 to 60 days, depending on water temperature. The newly hatched salmon fry

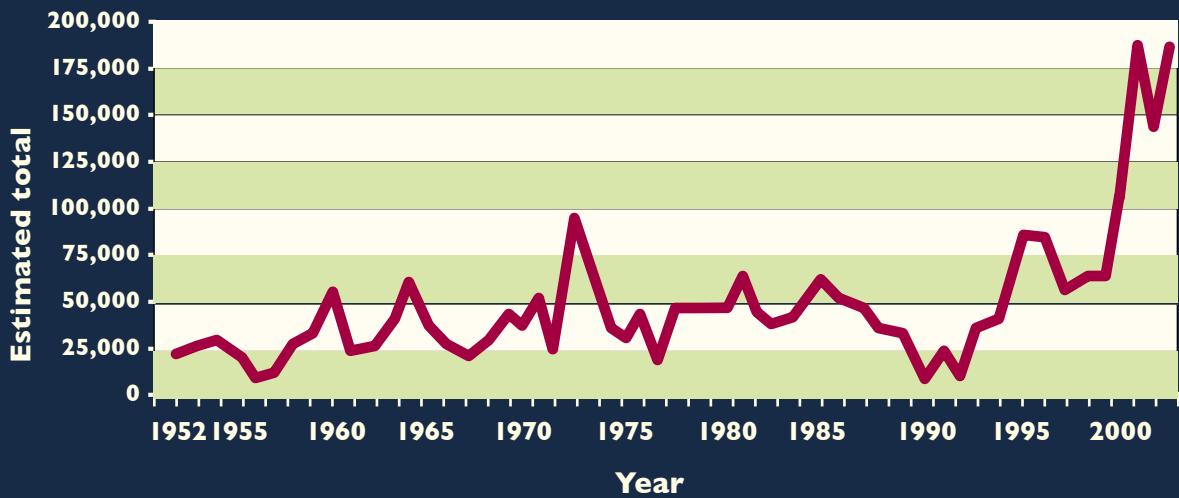
nourish for about a month by absorbing a yolk sac that is attached to them. The fry are then placed in rearing troughs and fed until they are four to six inches long. After being raised in the hatchery, about four million salmon of this size are trucked and released in the Sacramento -San Joaquin Delta Estuary, where they swim to the ocean.

Steelhead seek out and climb the hatchery's fish ladder, jumping from pool to pool up the ladder into a holding pond. After the sorting and artificial spawning process, steelhead are returned to the river alive. Steelhead eggs incubate for about a month and the young develop similar to salmon. Juveniles spawned at the hatchery remain in holding ponds about a year until they are 8-12 inches in length. Then, they are released in the Sacramento River near Rio Vista in January and February.

Reclamation is in the process of evaluating alternatives to replace the fish weir at the Nimbus Hatchery because it has deteriorated. Reclamation held two public meetings in December 2003 to receive input from stakeholders and is now evaluating six alternatives including no action. Two alternatives involve replacing the existing fish diversion structure with a new structure. Three alternatives involve extending the fish ladder to the Nimbus stilling basin (the pooling area just downstream of Nimbus Dam) and removing the existing structure. One alternative is to site the new fish ladder in a location that would not preclude the future construction of a whitewater boating course near this location. A decision on which alternative will be proposed is anticipated in 2005.

**Figure 5**

## Fall Run Chinook Salmon Escapement Estimates in the lower American River 1952 - 2003



Based on CDFG data since 1952, the population of LAR Chinook salmon on average has accounted for nearly 17 percent of the estimated total annual number of salmon spawning in the Central Valley.

Source: California Department of Fish and Game; estimates for 2001–2003 are preliminary.

### Steelhead

Historically, nearly all steelhead spawning occurred upstream of what is now the Nimbus Dam. By 1955, it is believed that summer-run steelhead were extinct from the American River and only remnant populations of the fall-run and winter-run steelhead remained.

Figure 6 is a generalized winter-run steelhead lifecycle for the LAR. Adult steelhead migrate into the LAR to spawn, and juvenile steelhead typically rear in the LAR for one year before emigrating to the Pacific Ocean. Not all steelhead die after spawning, unlike Chinook salmon. Those that do not die return to the ocean, and may return to the LAR to spawn again in future years. As with fall-run Chinook salmon, the entire LAR is used by steelhead for one or more portions of their lifecycle. The peak of the upstream migration and

spawning period occurs from December to March.

There are no comprehensive estimates available for run size of LAR steelhead. Since the Nimbus Fish Hatchery began operation in 1955, it has provided the best available measure of steelhead run size. Figure 7 depicts the total number of steelhead entering the Nimbus Hatchery from 1955–2002, with most of these fish originating from the hatchery.

Estimates of naturally spawning steelhead in the LAR were made in the early 1990s. Run sizes of 305, 1,462 and 255 adults were estimated for the 1990-1991, 1991-1992 and 1992-1993 spawning seasons, respectively, based on counts at the hatchery that were corrected for harvest. More recently, biologists with Reclamation and CDFG conducted surveys of steelhead redds (nest sites) in the LAR. In 2002, they found 159 steelhead redds and their 2002 estimate of in-river spawning

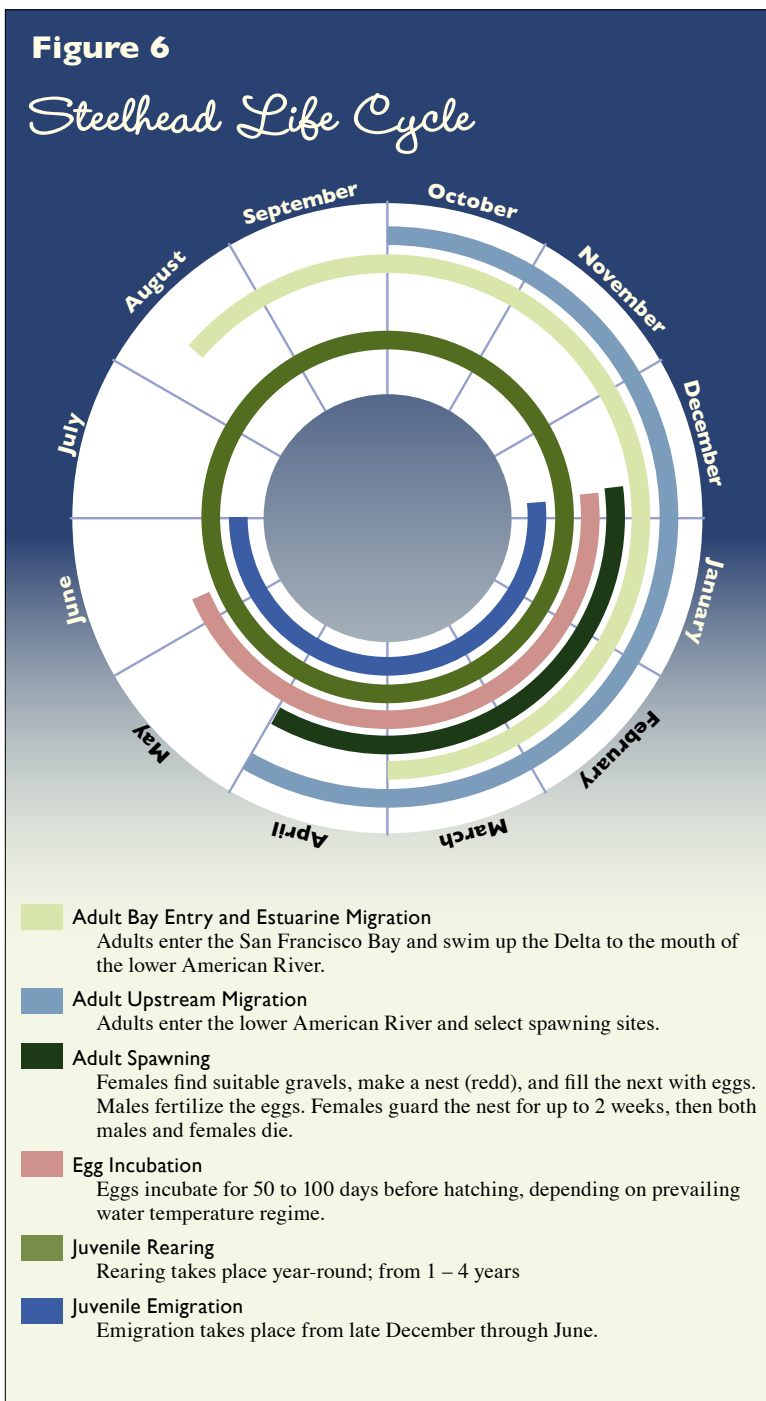
steelhead was 200 to 401 fish. In 2003, they found 215 steelhead redds and their 2003 estimate of in-river spawning steelhead was 240 to 479 fish. In 2004, they found 197 redds and their 2004 estimate of in-river spawning steelhead was 221 to 441 fish.

### Sacramento Splittail

Historically, splittail inhabited Central Valley lowland rivers and lakes. Presently, adult splittail primarily inhabit the Delta, Suisun Bay, Suisun Marsh, and other parts of the Sacramento-San Joaquin estuary. Splittail are also known to inhabit the Sacramento River below Red Bluff Diversion Dam and the lower sections of its tributaries, including the Feather and American rivers. Little information regarding Sacramento splittail occurrence, abundance, or habitat utilization is available specifically for the LAR.

Prior to spawning, adult splittail apparently migrate upstream into freshwater areas. Changes in the timing, magnitude, and duration of high river flows and flooded areas are believed to affect when and where adults migrate, forage, and lay eggs. It is likely that the reproductive success of this species is tied to the timing and duration of flooding of the Yolo and Sutter bypasses and to flooding of areas along the major rivers of the Central Valley. Splittail larvae are believed to develop and grow in shallow, highly vegetated areas close to spawning areas, but move into deeper water as they mature. It appears that their downstream migration occurs during the spring and summer months, however, some juvenile splittail apparently rear in upstream habitats for up to a year before migrating downstream. It is believed that if splittail spawn in the LAR, they do so in relatively low numbers and at downstream locations. Splittail are not harvested commercially, but support a small recreational fishery.

In 1999, the USFWS listed splittail as threatened under the federal Endangered Species Act. In September 2003, the USFWS published a “notice



of removal” determination to remove the splittail as threatened under the Endangered Species Act based on its analysis of population information, threats to the species, and habitat-restoration and water-management actions being implemented to benefit Central Valley fish.



**Figure 7**

*Total Number of Steelhead Entering Nimbus Hatchery from 1955 - 2002*



Source: CDFG

### American Shad

American shad, a non-native species, was first introduced into California in 1871. American shad is another anadromous species, migrating from the ocean to freshwater to spawn. The introduced American shad rapidly became abundant, and by 1879 a commercial fishery had developed in California. Legislative action in 1957 terminated the commercial fishery in favor of a rapidly developing sport fishery. In recent years (1994–1999), American shad have been captured in the LAR during the CDFG’s surveys. No specific estimates are available regarding the annual run size of American shad in the LAR.

Water temperature is apparently the most important factor influencing the timing of shad spawning. Optimum water temperatures for American shad spawning have not been determined for the LAR; however, optimum water temperatures for American shad spawning in the Feather River have been reported to range from 60 to 70 degrees F. Most of the eggs spawned in the LAR probably do not hatch until they have

drifted downriver and entered the Sacramento River. Recent collections of juvenile American shad by CDFG suggest that juvenile American shad may rear in the LAR for relatively extended periods, at least as far upstream as Watt Avenue.

The relative volume of river flow influences the size and location of American shad runs in the Sacramento River and its tributaries. Not all American shad die after spawning, unlike Chinook salmon. The number of American shad spawning in the LAR would be expected to vary as flows in the LAR change relative to the flows in the Sacramento River.

### Striped Bass

Striped bass were introduced into California in 1879 and 1882, when shipments were released in the Sacramento-San Joaquin Estuary. The species rapidly became abundant and provided the basis for a commercial fishery by 1888. Striped bass remains an important sport fish with high recreational value and it also plays an important role as a top predator in the Bay-Delta ecosystem



and its watershed. Limited information is available on striped bass presence and distribution in the LAR based on previous surveys conducted by the USFWS. The AFRP has set a target for striped bass in the Central Valley as 2.5 million adults, approximately double the 1967–1991 average estimated abundance of striped bass in the Central Valley. Goals specific to the LAR have not been established by the AFRP.

Adult striped bass are present in the LAR throughout the year, with peak abundance occurring in the summer months. It is unknown whether striped bass spawn in the LAR, however, available information indicates that minimal, if any, spawning occurs in the LAR and that adult fish that enter the LAR probably spawned elsewhere, or not at all. The LAR apparently is a nursery area for young striped bass, with numerous schools of five-inch to eight-inch long fish reported in the river during the summer months. In addition, juvenile and sub-adult fish have been reported to be abundant in the LAR during the summer and fall.

Optimal water temperatures for juvenile striped bass rearing range from about 61 to 71 degrees F. The number of striped bass entering the LAR during the summer is believed to vary with river flows, water temperature, and food production. In any given year, the population of striped bass in the Delta is probably the greatest factor determining the number of striped bass in the LAR.

## Key Issues

There are three key areas to managing the river to protect priority fish species, particularly Chinook salmon and steelhead, and river habitat:

- Improvements related to water temperatures and flow;
- Actions or projects to restore, maintain, and improve fish habitat;
- Reducing the impact of water supply diversions.



*Salmonid eggs and alevin*

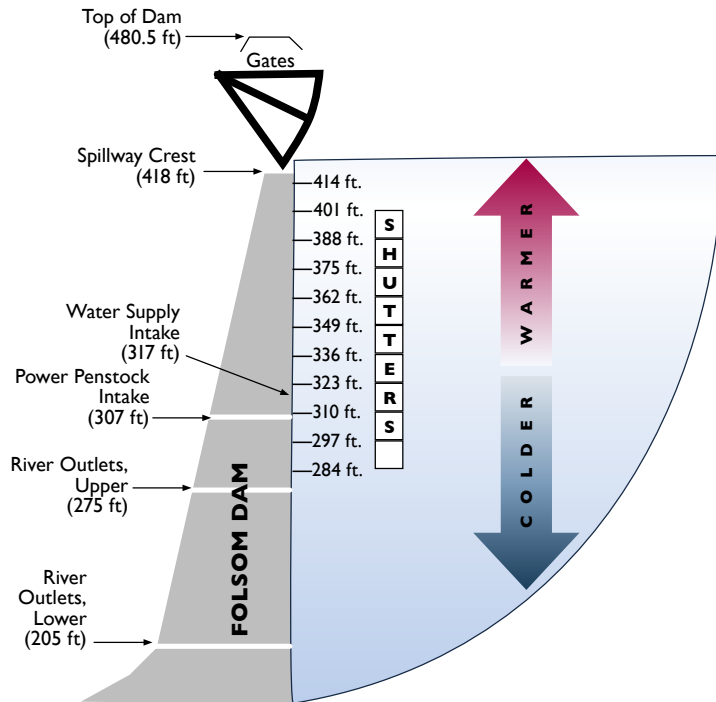
In the LAR, improvements related to flow and water temperatures are believed to have the greatest potential for improving the health of Chinook salmon, steelhead, and habitats. In addition, actions or projects that restore, maintain, and improve LAR habitats for fish and that reduce the impact of water diversions also are important to the overall health of the LAR.

## Improvements Related to Water Temperature and Flow

Water temperature, which is linked closely to the temperature of the water released from Nimbus Dam, and flows, are critical factors related to the production and condition of LAR fish species, particularly the priority species Chinook salmon and steelhead. Manipulating the timing, temperature and rate of water released from Folsom and Nimbus dams is likely to provide the most immediate and effective results for Chinook salmon and steelhead, and their habitat. Water

**Figure 8**

## Schematic Diagram of Folsom Coldwater Pool



Warmer or cooler water can be withdrawn from the reservoir by raising or lowering the control gate.

temperature influences the health and behavior of fish as well as overall ability of some species to successfully spawn and rear in the river. The environmental factor probably most limiting to natural production of steelhead in the LAR is high water temperatures during the summer and fall. The critical period for water temperature control to benefit steelhead is July through September, when juvenile steelhead are rearing in the river. The critical period for fall-run Chinook salmon is October and November when peak spawning occurs. Most Chinook salmon juveniles leave the river by the end of June and, therefore, are not present during the July through September period.

Because Folsom Reservoir has a limited quantity of cold water, managing release temperatures for the sole benefit of steelhead in the summer could adversely affect fall-run Chinook salmon spawning

in the fall. Conversely, conserving cold water throughout the summer and releasing it in the fall could benefit Chinook salmon, but would result in adverse high summer temperatures for steelhead.

CDFG estimated that in excess of 130,000 fall-run Chinook salmon returned to the LAR in 2001. Elevated water temperatures in 2001, resulting in part from draw down of the coldwater pool in Folsom Reservoir to meet CVP obligations, including fish and Delta water quality standards, depleted the cold water resulting in inappropriate Chinook salmon spawning water temperatures in the LAR. CDFG believes that because water temperatures were likely too high, approximately two-thirds of the Chinook salmon died before they could spawn.

Currently, the configuration of the temperature control shutters at Folsom Dam provides important but limited operational flexibility for access to cold water in Folsom Reservoir to release to the LAR (Figure 8). Automating the system would allow the shutters to be adjusted in multiple configurations, on a frequent, as-needed basis, to provide increased operational flexibility and an opportunity to access and release target water temperatures for the benefit of fish in the LAR.

The amount of water in the river, and its flow rate and pattern, is another important factor related to LAR fish species, and is influenced by human activities such as diversions to provide water supplies, hydropower operations, and adjacent land uses. Reclamation, through the operation of the Folsom and Nimbus dams, regulates the flow of water in the LAR, and the flow pattern and temperature, as well as the frequency and extent of flow fluctuations. Flow rates, flow patterns, and water temperatures affect LAR fish populations, particularly Chinook salmon and steelhead, by determining how much habitat is available for events such as fish spawning or by altering the timing of the various life stages of the fish lifecycle.

Changes in flow during the Chinook salmon

spawning and embryo incubation season flood or expose riverbank and/or gravel bar areas and determine the actual space available for spawning. Reductions in flow can expose salmon redds that were previously underwater, drying them out and preventing the eggs from hatching. Crowded spawning conditions resulting from excessive numbers of spawning salmon relative to the amount of suitable spawning habitat can cause redds to be constructed on top of already active redds. This can destroy redds and increase embryo mortality, reducing overall Chinook salmon spawning success. Flow fluctuations result in the stranding of juvenile steelhead and salmon that are rearing in the river. When flows increase, juveniles not ready to leave the river will move to the sides of the river to avoid the high and fast water in the main river channel and to take advantage of newly available habitat. When flows decrease, many of these fish become trapped in isolated pools and backwaters.

Since the construction of Folsom Dam and Reservoir, Reclamation regulates the instream flow of the LAR. In 1958, the SWRCB adopted flow criteria meant to protect the aquatic resources of the American River. The SWRCB prescribes a minimum daily flow of 500 cubic feet per second (cfs) at the mouth of the American River between September 15 and December 31, and a minimum daily flow of 250 cfs at all other times (Figure 9). (A flow of one cubic foot per second equals about two acre-feet of water a day.) Although the current regulatory flow standard for the LAR needs to be updated, Reclamation routinely operates to flows well above the standard.

However, these standards do not appropriately address requirements of the CVPIA, the San Francisco Bay-San Joaquin Delta Water Quality Plan, or provisions to protect Chinook salmon and steelhead. In 1990, the SWRCB concluded that the existing criteria were not protective of beneficial uses in the American River. The AFRP is a key program intended to protect and restore the anadromous fish resources of the Central

Valley. However, the AFRP does not provide the long-term assurance of protection for LAR aquatic resources that an improved SWRCB prescribed flow standard would provide.

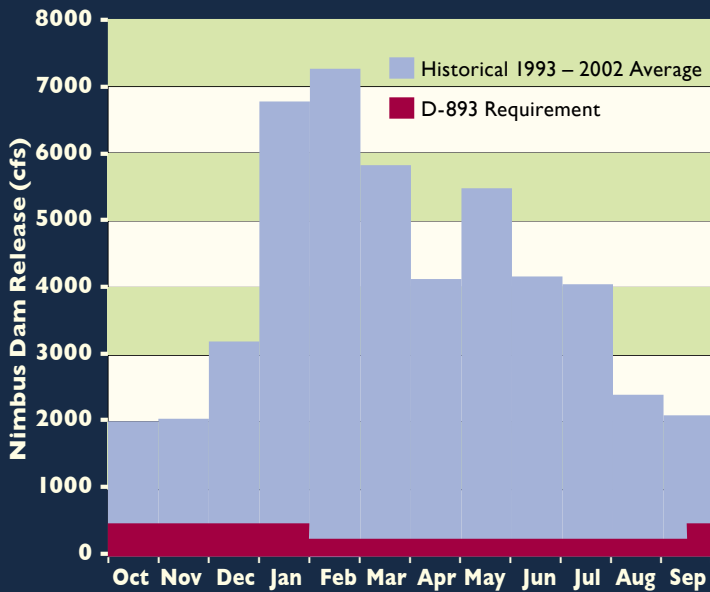
In addition, because of the close proximity of Folsom Dam and Reservoir to the Delta, and the relatively short period of time for water flows from the LAR to reach the Delta, releases from Folsom Reservoir are commonly relied on to help meet standards of the Bay-Delta Water Quality Plan. Reclamation attempts to minimize flow fluctuations because of these releases, however, fluctuations still occur, as well as the accompanying reduction of storage and coldwater supply in Folsom Reservoir. So, depending on the time of year and other factors, water releases to meet one objective (Delta standards) may make it more difficult to reach another objective (conserving the Folsom Reservoir coldwater pool), and these tradeoffs can have an adverse impact on the fish resources of the LAR (e.g., not enough cold water left in Folsom Reservoir to release into the river during key spawning and rearing periods).

## **What's being done?**

**American River Operations Work Group (AROG).** The AROG is an informal group of professionals from various federal, state, local, and private sector agencies, and environmental/recreation organizations. Reclamation started this group in 1996, following a flood control operation in the spring that resulted in a high number of fish being stranded. Reclamation convened the group to receive biological input in order to modify operations that might result in excessive stranding of fish. Since that time, the group has provided input on other aspects of water management that affect fish, including flow and water temperature. Reclamation acts as the lead coordinator of the effort, bringing together those who have either a legislated or resources-specific interest in the operations of Folsom Dam, Folsom Reservoir, and the LAR.

**Figure 9**

## *Lower American Flow Averages and Existing D-893 Requirements*



Source: USBR

The AROG is primarily interested in the management of the releases from Nimbus Dam in a way that will be protective and beneficial to fall-run Chinook salmon and steelhead in the LAR, while meeting other project objectives. At each meeting, representatives of CDFG and the National Marine Fisheries Services (NOAA Fisheries) update the group on the status of steelhead and fall-run Chinook salmon inhabiting

the LAR. Reclamation provides information regarding reservoir storage, the volume of cold water in Folsom Reservoir; short and long-term runoff forecasts, and tentative plans for Folsom Dam water releases. The group also considers other factors, such as short-term weather forecasts, water availability and release plans for fishery use in accordance with the CVPIA, the Environmental Water Account managed by the California Bay-Delta Program,<sup>4</sup> Bay-Delta Water Quality Plan requirements, and additional demands on the Central Valley Project and State Water Project.

The AROG generally meets every two to four weeks, depending on the urgency of the current issues. These meetings are open to anyone wishing to attend; however, most participants represent the following agencies and organizations: U.S. Bureau of Reclamation, California Department of Fish and Game, U.S. Fish and Wildlife Service, NOAA Fisheries, Western Area Power Administration, Sacramento Municipal Utilities District, City of Sacramento, Water Forum, Save the American River Association, Northern California Council—Federation of Fly Fishers, and Granite Bay Flycasters.

The AROG evaluates all information and discusses how to manage both water quantity and temperature to protect the fish within the constraints of available resources. The Group provides its conclusions regarding the most favorable operations for fish (within other constraints) to management in Reclamation and the USFWS. Reclamation considers this

<sup>4</sup> The California Bay-Delta Program (Program) is a cooperative effort of state and federal agencies working with local communities to improve the quality and reliability of California's water supplies and revive the San Francisco Bay/Sacramento-San Joaquin River Delta ecosystem. In 2003, the California Legislature created the California Bay-Delta Authority to oversee implementation of the Program, formerly known as CALFED. In late 2004, President George W. Bush signed the Calfed Bay-Delta Authorization Act, reauthorizing federal participation in the Program. The Program is implementing a long-term plan designed to restore the ecological health of the Bay-Delta and improve water management practices for its many beneficial uses. Additional information about the California Bay-Delta Program is available on the program's web site [www.calwater.ca.gov](http://www.calwater.ca.gov). The purpose of the Environmental Water Account is to better protect fish by making it possible to modify water project operations in the Bay-Delta and still meet the needs of water users. The LAR and its watershed have been recognized as important components in the pursuit of the Program's vision and objectives for ecosystem restoration.

information along with information from other groups in its overall operational decision making process.

Reclamation is responsible for the operation of Folsom Dam and Reservoir, and aims to achieve a reasonable balance among competing demands for use of CVP water. This requires balancing competing demands between fishery needs and agricultural, municipal and industrial water supplies, while contributing to California's interim and long-term efforts to protect the Delta. If Reclamation determines a need to operate outside of the limits discussed at the previous group's meeting, Reclamation will either conduct a conference call with representatives from NOAA Fisheries, CDFG, and the USFWS, or a special meeting of the group is held.

### **Updated and Improved Flow Management**

**Standard.** Since 1999, the Water Forum, in conjunction with Reclamation, the USFWS, NOAA Fisheries, CDFG, and other agencies, has been working toward an updated and improved FMS for the LAR to be presented to the SWRCB in late 2005 (see sidebar page x). The Water Forum sponsored a two-day monitoring workshop in 2003 to address monitoring issues related to the LAR that may be a part of the updated FMS.

**LAR Flow Fluctuations Workshop.** In 2002, the LAR Flow Fluctuation Function Analysis Workshop (sponsored by Reclamation, the Water Forum, and SAFCA) was held to identify measures and opportunities to minimize substantial flow fluctuation occurrences on the LAR. Thirty members of the LARTF and FISH Working Group and additional technical experts closely examined flow fluctuations and stranding issues on the LAR. The workshop resulted in 23 proposals, many of which affirmed existing FISH Plan recommendations, including 12 recommended "jump start" actions designed to provide a springboard for near-term implementation. Recommendations focused on dam operation

criteria, physical changes to minimize fry stranding and juvenile isolation, and weather forecast-based decision-making. The report from the LAR Flow Fluctuation Function Analysis Workshop provides detailed rationales and descriptions for several of the FISH Plan's recommended actions including identification of opportunities to: improve the complexity and diversity of fish habitat, create shallow inundated floodplain habitat for multispecies benefits, and enhance or construct mainstem and side channel areas that provide salmon and steelhead spawning and rearing habitat.

### **Folsom Dam Temperature Control Shutter System.**

The Corps has received approval by Congress through the Water Resources Development Act to fully automate the temperature control shutter system at Folsom Dam. This will provide increased flexibility for managing the coldwater pool of Folsom Reservoir to benefit fish species and minimize planning and logistics concerns that now occur when the shutter configuration is manually changed.

### **Temperature Control Devices on Urban Water Supply Intakes.**

Temperature control devices (TCDs) allow water supply operators the flexibility to selectively draw water from varying depths in Folsom Reservoir, using or conserving the coldest water in Folsom Reservoir. This allows Reclamation to conserve the coldwater in Folsom Reservoir so that it can be released when it can be of the most benefit to fish species downstream in the LAR. A TCD for the Folsom Dam intake has been constructed and Reclamation began operating it in 2003. The El Dorado Irrigation District water supply intake in the South Fork arm of Folsom Reservoir withdraws water from the coldwater pool and does not have a TCD; the FISH Plan recommends installing and operating a TCD on this intake. Reclamation and the El Dorado Irrigation District plan to complete the design and specifications of the TCD by fall 2005.



### **Structural Modifications in Lake**

**Natoma.** In January 2001, Reclamation, with financial support from SAFCA, conducted a workshop to identify, evaluate, and recommend solutions to provide optimum water temperatures in the LAR. Several structural modifications in Lake Natoma were identified including placing temperature curtains in the lake, modifying/removing the debris wall at Nimbus Dam, and excavating a channel through the lake. The Water Forum successfully submitted a grant proposal to CALFED to develop the necessary computer models to evaluate these proposals. In 2003, the Water Forum contracted with Reclamation's Technical Service Center to conduct this three-year project.

### **Modifications to Folsom Dam and Flood Management Planning.**

In 1986, when major storms in northern California caused record flood flows in the American River basin, outflows from Folsom Reservoir, together with high flows in the Sacramento River, caused water levels to rise above the safety margin on levees protecting the Sacramento area. This led to investigations into the need to develop a comprehensive flood protection management program for the Sacramento area. As part of this program in 1999, Congress authorized modifications to Folsom Dam by the Corps in the Water Resources Development Act. The modifications consist of enlarging Folsom Dam's eight existing river outlets, constructing two additional river outlets and modifying the use of flood storage at Folsom Dam.<sup>5</sup>

In addition to these improvements, Congress has directed the Corps to conduct studies on the feasibility of incorporating changes in its operations for Folsom Dam and Reservoir to provide additional flood control space in Folsom Reservoir based on a specific "forecasted" storm or series of storms that may be issued up to 72 hours prior

to a storm actually occurring in the watershed. This strategy would be initiated under rare, severe, flood conditions, and may possibly avoid later higher releases of water from Folsom Reservoir that could potentially stress the LAR levee system. The Corps agreed to a "planned deviation" from the flood control plan in 2004 to conserve storage in Folsom Reservoir in the spring when no storms were expected. This strategy of forecast-based flood operations is not currently used in reservoir operations, and there is international interest in these studies.

### **Meeting Delta Water Quality Standards.**

The SWRCB is in the process of a review of the 1995 Bay-Delta Water Quality Plan to incorporate better modeling and information (including tributaries information), changes in beneficial uses, and special status species. Several parties, including DWR and Reclamation, have identified meeting Bay-Delta water quality standards (particularly the salinity standard commonly referred to as "X2") as an issue to be considered in the review process. The SWRCB staff anticipates this issue will likely be reviewed. The Water Forum was asked to provide assistance and input to quantify impacts to the LAR on meeting the "X2" standard, and to suggest options for developing solutions to mitigate these impacts. Water Forum consultants prepared a report for the SWRCB outlining these impacts that is available on the Water Forum web site, [www.waterforum.org](http://www.waterforum.org).

### **Actions or Projects to Restore, Maintain, or Improve Fish Habitat**

Particularly in the last 10–15 years, significant work has been done by CDFG and others to study and document important fish habitat areas in the LAR. The FISH Plan and the RCMP contain recommended actions to build upon this work

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<sup>5</sup> Additional information on the Folsom Dam Modifications Project is available on the Internet at: [www.spk.usace.army.mil/projects/civil/folsom](http://www.spk.usace.army.mil/projects/civil/folsom).



# Updated and Improved Flow Management Standard

The overall objective of an updated and improved FMS is to improve the pattern of fishery flow releases from Folsom Reservoir for the LAR, consistent with the Water Forum Agreement and CVPIA provisions. This section summarizes the three elements of the FMS from policy and technical documents being developed for the FMS:

- **Prescriptive Element:** Improve the regulatory baseline for the LAR to account for appropriate minimum flow, water temperature, ramping rate, and flow fluctuation criteria. Objectives of the regulatory baseline are to:

- Sustain increased habitat availability, while concurrently minimizing flow fluctuations and reductions, within the context of water availability;
- Maximize the occurrence of target Chinook salmon and steelhead spawning flows;
- Reduce flow fluctuations during the Chinook salmon and steelhead egg incubation periods;
- Reduce month-to-month flow reductions to minimize juvenile salmonid stranding



*Adult Chinook salmon*

and isolation; and

- Manage flow releases and reservoir storage to effectively utilize coldwater pool availability.
- **River Management Element:** Establish a River Management Group (RMG) and process for Folsom Reservoir and LAR operations to implement the FMS, document management decisions made and the results of those decisions. Objectives of the River Management Element are to:
  - Evaluate fishery, habitat, hydrologic conditions and other variables; and
  - Provide operational recommendations and adjustments related to flow and water temperatures for specific weekly, monthly, water-year type, and ecosystem conditions.
- **Monitoring and Reporting Element:** Collect, organize, and report data and information on LAR hydrologic and biologic conditions to resource managers. Objectives of the Monitoring and Reporting Element are to:
  - Assist the RMG operational considerations and recommendations;
  - Provide early warning of potential problems, allowing corrective actions before adverse impacts to LAR aquatic resources occur;
  - Evaluate the effects of implementation of the FMS on LAR environmental conditions and biologic resources; and
  - Improve the potential to effectively manage the LAR.

**Table 2**

## *American River Agreed Upon Surface Water Diversion Amounts and 2002 – 2003 Diversion Amounts*

Purveyor	1995 Baseline	2030 Diversion (wet/av. yrs)	2030 Diversion (drier years)	2030 Diversion (driest years)	2002 Diversion (actual)	2003 Diversion (actual)
<b>American River Diversions</b>						
Folsom	20,000	34,000	34,000–22,000	20,000	21,351	23,404
Roseville	19,800	54,900	54,900–39,800	39,800	29,852	29,967
San Juan Consortium	54,200	82,200	82,200-54,200	54,200	69,727	69,037
Arden-Cordova (Southern California Water Company)	5,000	5,000	5,000	5,000	5,765	7,027
Sacramento Suburban North- ridge Service Area	0	29,000	0	0	16,283	~14,504
Sacramento Suburban Arcade Service Area	3,500	26,040	0	0	796	~710
South County Ag	0	35,000	0	0	0	0
SMUD	15,000	30,000	30,000-15,000	15,000	14,194	19,731 (includes 5,000 sold to Arden Cordova)
Placer County Water Agency	8,500	35,500	35,500	35,500	22,846	22,866
Carmichael W D	12,000	12,000	12,000	12,000	8,507	9,308
City of Sacramento	50,000	310 cfs	90,000	50,000	61,809	~60,463

~ indicates approximate amount

to update, identify, and evaluate potential sites for habitat restoration, and implement measures where suitable opportunities exist.

The LAR has benefited from funding provided by the CVPIA restoration programs. Several factors are considered in establishing priorities for implementing CVPIA actions. These include the importance of the action to achieving CVPIA program goals and coordination with other ongoing programs and funding. In order to prioritize activities and the expenditure of CVPIA funds, the Department of Interior has focused on integration of three biological factors: 1) the

species of greatest concern, 2) factors most influencing those species populations, and 3) the geographic areas or habitats critical to those populations. Priorities are set by resource agencies to establish where fish and wildlife restoration is needed.

### **What's being done?**

Between 1996 and 1998, CDFG monitored fall-run Chinook salmon spawning activity and in 1999, implemented restoration projects of gravel sites used for spawning. This project has been evaluated by a team from California State University,

Sacramento (CSUS) working in partnership with CDFG and Reclamation. Results show that Chinook salmon spawning has occurred at the edges of the manipulated gravel areas and also identified other adjacent areas where spawning has taken place.

CDFG and its partners are developing an AFRP funding proposal for a project to restore fish habitat on the LAR in the vicinity of the lower Sunrise area. The purpose of the proposed project is to improve an existing stranding and isolation area along the gravel bar, which is worsened by flow fluctuations on the LAR. Presently, the gravel bar includes a side channel at high river flows. Studies have shown that redd dewatering and juvenile fish stranding and isolation occurred within the side channel and adjacent bar during 2003 and 2004 as a result of flow fluctuations on the LAR. The proposed project will deepen the entrance to the channel bar and stabilize the entrance so that redds would not be dewatered and the incidence of stranding and isolation would be reduced when flows are dropped from a higher flow event. Planting vegetation and placement of large woody materials and boulders would be used to stabilize the side channel during high flow events, increase the habitat value within the side channel, and reduce erosion. Non-native plants will be removed and the design will maximize rearing habitat for juvenile salmon and steelhead and provide shelter for juveniles from predators.

The Energy and Water Appropriations Act of 2004 approved by Congress will provide funding to implement environmental and habitat restoration projects at the Woodlake and Bushy Lake areas (in addition to funding a raise of Folsom Dam by seven feet, a new bridge over the American River below Folsom Dam, and automation of the temperature shutters at Folsom Dam).

## **Reducing the Impact of Surface Water Diversions**

The LAR is an important source of drinking water. Each year, water suppliers divert water from Folsom Reservoir, Lake Natoma, and the LAR for municipal and industrial uses. The increased surface water diversions element of the Water Forum Agreement recognizes that diversions from the LAR (including Folsom Reservoir) will increase in the future to support economic development and planned urban growth through the year 2030, even with active conservation programs and the sustainable use of groundwater. It is envisioned that American River diversions by purveyors in the region in average and wetter years will increase from the current level of 216,500 acre-feet annually to about 481,000 acre feet annually by the year 2030. With appropriate mitigation, including an updated FMS, it is anticipated that diversions at these levels could be accomplished without adversely affecting the fishery, wildlife, recreational, and aesthetic values of the LAR.

### **What's being done?**

The Water Forum Agreement outlines agreed-to-diversions for each supplier and the facilities needed to divert, treat and distribute this water. Table 2 (page 34) shows the historic maximum amount of water diverted from the American River, using 1995 as the "baseline"; the amount of water that will be annually diverted by the year 2030, depending on the type of water year; and the amount of water diverted in 2002 – 2003.

Considerable effort has been taken to identify how purveyors diverting from the American River can implement specific actions to meet their customers' needs in drier and driest years with reduced diversions. In addition to extraordinary conservation in drier and driest years, the Water Forum Agreement includes three unique and significant alternative ways for purveyors to reduce

surface water diversions from the American River:

- Reducing additional water diversions from the American River in drier and driest years;
- Allowing purveyors that choose to continue increased American River water diversions in drier or driest years to do so, if in the drier years there was a release of replacement water upstream of Folsom Reservoir; and
- Diverting water from the Sacramento River instead of the American River.

The Habitat Management Element (HME) of the Water Forum Agreement will help mitigate, along with other Agreement components, the impacts of increased surface diversions on the American River. The HME includes projects that will avoid and/or offset potential impacts to the river's fishery and riparian resources. The HME will be implemented through two major plans: the FISH Plan and the Recreation Plan, which are incorporated into the RCMP for the LAR. The updated and improved FMS will also help to reduce the impact on the LAR of surface water diversions, while ensuring adequate flows in the river for fish and other aquatic resources. Sidebar, page X, is a summary of the objectives and elements of the FMS.

## Maintaining and/or improving habitat areas adjacent to the river

### Background\*

The floodplain and associated riparian habitats along the LAR serve an important function in river ecosystems, benefiting a large number of aquatic and terrestrial species. Prior to 1849, the riparian vegetation along the river formed extensive, continuous forests in the floodplain, reaching widths of up to four miles.

Settlement of the LAR floodplain by non-indigenous peoples and the resulting modifications of the physical processes shaping the river and its floodplain have drastically altered the habitats along the LAR. Early settlers removed trees and converted riparian areas to agricultural fields. Hydraulic gold mining in the watershed caused deposits of 5-30 feet of sand, silt, and fine gravels on the riverbed of the LAR. These deposits resulted in extensive sand and gravel bars in the lower river and an overall raising of the river channel and surrounding floodplain. This was later exacerbated by gravel extraction activities. As a result, the floodplain's water table has dropped, reducing the growth and regeneration of the riparian forest (Figure 10).

Additional habitat impacts resulted from the construction of Folsom and Nimbus Dams. These structures have blocked the main upstream sediment supply to the LAR. This sediment deficit reduces the amount of material that can deposit into bars in the lower reaches, resulting in less substrate for growth of cottonwoods and other riparian vegetation. Modification of river flows resulting from the operation of Folsom Dam and Reservoir has likely affected the potential for regeneration of cottonwood. Flows that had historically occurred during the seed dispersal period for cottonwood shifted from the late spring/early summer to late summer or no longer occur. Also, artificial flow fluctuations can cause the stranding of fish in ponds and depressions on the floodplain when high flows recede.



Since the 1970s, bank erosion, channel degradation and creation of riprap revetments have contributed to the decline of riparian vegetation along the river's edge, loss of soft bank and channel complexity, and reduced amounts of large woody debris in the river that are used by fish and other species. In particular, there has been a decrease in overhanging bank vegetation called shaded riverine aquatic (SRA) habitat. SRA habitat provides multiple benefits to both fish and wildlife. In particular, it provides shade along the river to moderate water temperatures in the summer. Overhanging vegetation also provides cover to aquatic species, creating areas where they can feed and rest while being sheltered from predators. Living and dead vegetation provides habitat and food for many species of insects and other organisms, which can then be eaten by fish species including salmonids. Flooded vegetation adjacent to the river is also believed to be a key component of Sacramento splittail spawning habitat.

### Key Issues

In the American River Parkway, it has been estimated that the riparian area is just over 1,110 acres, with distribution and abundance of

\* Information in this section is derived from the RCMP.



**Table 10**

# Historical Changes to the LAR Channel

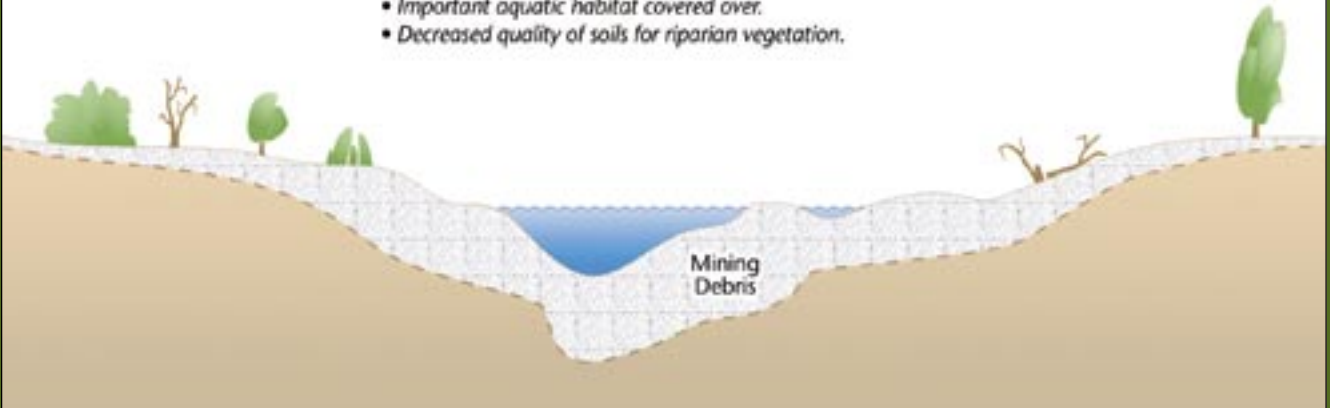
## Before Hydraulic Mining (Pre-1850)

- Relatively undisturbed floodplain and channel.
- Diverse range of aquatic, near-shore, and riparian floodplain habitats.
- Floodplain frequently inundated under the natural hydrologic cycle.



## Mining Period (1850 to early 1900s)

- Mining sediments deposited, raising the channel and floodplain elevation (aggradation).
- Important aquatic habitat covered over.
- Decreased quality of soils for riparian vegetation.



## Present Conditions

- Additional sediment eliminated by upstream dams.
- Flows concentrated by levees, resulting in the removal of soil from the channel bed (incision).
- Combination of floodplain height and management of flows has resulted in decreased habitat values.



Source: RCMP

vegetation differing among river reaches. The USFWS has predicted that approximately 50% of existing forested area along the LAR will be lost over the next 100 years due to changes in hydrologic conditions, the deepening river channel, and drier conditions at the higher bank elevations. All these factors contribute to a gradual conversion of riparian forest to habitats dominated by more drought-tolerant upland species. Cottonwoods in particular are declining, as mature trees die of old age or fire damage and these trees are typically not replaced naturally.

With reduced frequency of seasonal flooding, the riparian forest is slower to regenerate, and some vegetation communities along the river have gradually changed to habitats that provide less value to wildlife and fish. One particular species of concern in the LAR is the Valley Elderberry Longhorn Beetle (VELB) that depends on elderberry shrubs for survival. In 1984, the VELB was listed as threatened under the Endangered Species Act with habitat loss cited as the reason for its decline. The USFWS called for the preservation of remaining VELB habitat and, if habitat loss is unavoidable, the replacement of lost habitat with mitigation.

Non-native, invasive plants also are a major concern in the LAR because they take over natural habitats along the river previously occupied by native species. In particular, red sesbania, Chinese tallow tree, giant reed (arundo), Spanish broom, tamarisk, and black locust are rapidly spreading in parts of the LAR. These species are able to out compete native plants such as willow and cottonwood and do not provide similar habitat value for fish and wildlife.

### **What's being done?**

As part of the development of the RCMP, riparian vegetation communities have been mapped throughout the American River Parkway. Mapping was based on floodplain elevation and the dominant tree or shrub species present, including:



*Elderberry flower*

alder, black walnut, box elder, cottonwood, valley oak, willow, and mixed riparian. In addition, three upland woodland types have been mapped for the Parkway: 1) blue oak woodland, 2) live oak woodland, and 3) foothill pine.

The RCMP contains recommendations related to the improvement of habitat along the river. One example is a low floodplain habitat enhancement project in Discovery Park at river mile 0.9 (RM 0.9L) constructed between November 2001 and January 2002, converting steep shoreline into a graded contoured segment of planted bank. The site is designed to seasonally flood with features that include a reshaped shoreline edge with two created islands, three planted terraces each with separate plant species that will develop into a successful riparian habitat to support wildlife, and willow cuttings/matting along the sloped contours to control erosion. The site also serves as floodplain habitat for Sacramento splittail and refuge for out-migrating salmon.

Creation of upland habitat on the Cal Expo floodplain in the vicinity of Bushy Lake was completed in July 2002. The Corps constructed 8.5 acres of habitat suitable for VELB, and in 2003, an additional two acres of habitat mitigation was designed and planted by County Parks to offset habitat loss due to the Jedediah Smith bicycle trail overlay project and the American River Parkway



*Valley Elderberry Longhorn Beetle mating.*

(ARP) Invasive Plant Management Plan.

The Corps constructed additional SRA habitat mitigation in 2003 to offset impacts to salmonids associated with a slurry leak that occurred during slurry wall

construction in 2001. Approximately 650 linear feet of SRA was established at RM 2.4L and is now under active maintenance by a landscaping contractor. The Corps has worked closely with representatives of the DWR, SAFCA, USFWS, NOAA Fisheries, and County Parks in project development. This site will be monitored for 10–15 years after planting.

A collaborative is underway to integrate management and conservation to preserve the threatened VELB. The collaborative has evolved based on the recognition that better science leads to improved policy and regulation. A number of scientific studies are underway which include a detailed determination of the VELB and elderberry population structure and environmental controls, an assessment of the effects of management



*Channel infested with red sesbania.*

practices (pruning and topping) on VELB presence and abundance, and assessing the role of natural enemies (e.g. Argentine ant) in the presence and abundance of the VELB. Once threats to the VELB are defined, guidelines, policies and activities will be altered to minimize the threats to the species and a final VELB Habitat Management Plan will be developed and implemented.

The collaborative began initially with County Parks, SAFCA, and UC Davis following the implementation of the ARP Jedediah Smith bike trail overlay project. Additional agencies (American River Flood Control District, Pacific Gas and Electric, Sacramento Municipal Utility District, Western Area Power Administration, and the Sacramento Regional County Sanitation District, the state Reclamation Board/DWR, Sacramento County Department of Environmental Review) joined the collaborative for its second year. Now in its third year of information gathering the collaborative has evolved further with recent participation from Cal Trans, Federal Highways Administration and the City of Sacramento (Departments of Parks and Recreation and Utilities). Funding has been received from the National Fish and Wildlife Foundation for three successive years as well as contributions from most participating agencies.

In 1997, the California Native Plant Society, County Parks, SAFCA and local weed scientists partnered to develop the American River Parkway Invasive Plant Management Plan (ARP IPMP). The goal of this plan is to restore major riparian and upland habitat areas within the 4,700-acre Parkway to native vegetation. The planning phase, completed in May 2000, identified and mapped the locations and coverage of over 140 species of non-native plants. Pilot weed management projects were also carried out in partnership with agencies and community groups providing an opportunity to test both eradication and restoration strategies. These efforts yielded a feasible strategy for removing, restoring and managing the most egregious species in a phased



*Spanish broom along the LAR Parkway*

approach.

In the fall of 2001, Phase I of the eradication efforts began and was completed in April 2004. This effort removed approximately 650 acres of five targeted non-native invasive plants<sup>6</sup> from the ARP, and relied on a combination of active restoration and the self-propagation of existing native plants as the primary means of restoration. Phase 2 commencing in Fall 2004 with completion by Spring 2007 involves removal and follow-up treatment of approximately 850 acres and expands the number of targeted non-native weeds by five<sup>7</sup> to the ten most aggressive non-native plants in the ARP. The project will essentially clear all targeted weeds from the Parkway and establish a 40-acre pilot project for the restoration of habitat currently infested with yellow star thistle.

After 2007, ensuring successful establishment of native plant habitats and keeping the Parkway free of weed re-infestations will become the responsibility of Sacramento County Parks working in partnership with the Sacramento Weed Warriors (SWW), a volunteer stewardship program being implemented under the leadership of the California Native Plant Society—Sacramento Valley Chapter in cooperation with

a number of partners. The SWW began their support of the program in May 2001 and since that time, more than 150 work groups have assisted in eradication efforts, totaling over 13,000 hours of volunteer support. The SWW, working in conjunction with the American River Parkway Foundation, will patrol the ARP for re-infestations and undertake the necessary follow-up removal treatments.

Funding for Phase I of the eradication effort was provided by grants from the State Department of Transportation's 2001-2002 Environmental Enhancement and Mitigation Program, the Wildlife Conservation Board's 2001 California Riparian Habitat Conservation Program, and SAFCA. Funds for the eradication and restoration portion of Phase 2 have been secured from the Wildlife Conservation Board and SAFCA.

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<sup>6</sup> Giant reed (arundo), Chinese tallow tree, tamarisk, red sesbania, and Spanish broom.

<sup>7</sup> Pampas grass, pyracantha, French broom, Scotch broom, and oleander.



## Meeting water quality goals and achieving regulatory standards

### Background\*

Historically, water quality conditions in the LAR were typically well within acceptable limits for water quality objectives and beneficial uses identified for the LAR, despite and other contaminants from urban runoff and stormwater discharges. However, the LAR's water quality has reflected the influence of the same historical activities that have affected the river's physical features, such as mining, dam and levee construction, agricultural development, and urbanization.

The impact of gold mining, particularly hydraulic mining, on the physical features of LAR is discussed earlier in this report. Gold mining also introduced mercury to the watershed. During the 19th century, mercury was transported from mines along California's coastal range to the Sierra Nevadas for use in gold processing. Widespread mercury contamination of the sediments at the bottom of rivers and lakes occurred, and continues to occur in many Northern California rivers that drain the areas where gold fields and mercury processing operations were located. Overall, the Sacramento River watershed drainage is a major source of mercury to the Delta, contributing approximately 90% of the total mercury loads to the Delta.

Since 1992, the Sacramento Coordinated Monitoring Program (CMP), a partnership of the Sacramento Regional County Sanitation District with the City and County of Sacramento has conducted water quality monitoring to characterize water quality conditions in the LAR and Sacramento River. Before 1990, water quality monitoring was not conducted in the LAR in a consistent or comprehensive manner. The CMP coordinates with and participates in other regional monitoring programs, including those managed by the Sacramento River Watershed Program (SRWP), the U.S. Geological Survey (USGS), and the Central Valley

Regional Water Quality Control Board (CRWQCB). Since 1992, the CMP has collected water samples from sites within the greater Sacramento County area to provide water quality data, including two sites on the LAR: one at Nimbus Dam and one at Discovery Park near the LAR's confluence with the Sacramento River. The SRWP water quality-monitoring program includes three sites on the LAR: at the Fairbairn water treatment plant, at J Street, and at Discovery Park. Water and other environmental samples are collected on a regular basis throughout the year and analyzed from these locations by the SRWP as well as by its coordinating partners, such as the CMP.

There are a number of federal and state laws, regulations, and regional plans that have established water quality standards applicable to the LAR or that could expand the role of resource agencies in water quality standards and permitting of facilities that discharge into surface waters, including the LAR. These include the federal Clean Water Act, the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, the California Toxics Rule, Biological Opinions by NOAA Fisheries and the USFWS, California SWRCB water quality plans, policies and regulations, the Bay-Delta Water Quality Plan, and the state's Porter-Cologne Water Quality Control Act.

In 1998, the Water Quality Control Plan for the Sacramento-San Joaquin River Basins (Basin Plan) was approved by the SWRCB, defining water quality objectives and standards for the waters of the Sacramento and San Joaquin river basins (including the LAR). The LAR has numerous beneficial uses, defined by state law as uses that may be protected against quality degradation. The Central Valley Regional Water Quality Control Board has defined the following existing and potential beneficial uses for the LAR:

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\* Information in this section is derived from the RCMP, Baseline Report, and web sites of SRWP, USGS, CMP partners, and RWQCB.



- *Municipal and domestic water supply;*
- *Industrial service water supply;*
- *Irrigation;*
- *Power;*
- *Water contact, canoeing and rafting, and other non-contact recreation;*
- *Warm and cold freshwater habitat;*
- *Migration of aquatic organisms (includes striped bass, sturgeon, shad, salmon, steelhead);*
- *Spawning, reproduction, and/or early development of fish; and*
- *Wildlife habitat.*

### Key Issues

Under the federal Clean Water Act, states are required to develop a list of water quality limited segments. The waters on this list do not meet water quality standards and the law requires that states develop plans to address water quality limited segments. The LAR appears on California's list of water quality limited segments for mercury and toxicity; additional information appears below.

In its latest Annual Monitoring Report, the SRWP provides a review of the SRWP monitoring and the data generated by the SRWP and its coordinating partners. A summary of key findings for the LAR locations from the SRWP Annual Monitoring Report is presented below.<sup>8</sup>

**Mercury.** Erosion and leaching from inactive mercury mining sites and historic gold mining sites have contributed to the release of large amounts of mercury into California's surface waters. Mercury also can be released into the environment from industrial sources, including the burning of fossil fuels and solid wastes, disposal of mercury-containing products, permitted discharges of treated wastewater, urban runoff, and discharges from naturally occurring mineral springs. Once mercury gets into lakes, rivers, or streams, much

of it settles to the bottom where bacteria in the mud or sand convert it to the form of methylmercury. Fish absorb methylmercury when they eat smaller aquatic organisms. Larger and older fish absorb more methylmercury as they eat other fish. In this way, the amount of methylmercury builds up as it passes through the food chain. Fish

eliminate methylmercury slowly, and so it builds up in fish in much greater concentrations than in the surrounding water. Methylmercury generally reaches the highest levels in predatory fish at the top of the aquatic food chain (Figure 11). Humans and wildlife can be exposed to mercury when they consume fish that have accumulated methylmercury in their tissue.

The LAR does not appear to be a major source of total mercury in the larger Sacramento River watershed; however, the LAR is on the state's list of impaired waterbodies for mercury based on elevated concentrations in fish tissue, with mining activity (resource extraction) cited as the major source of mercury.

### What's being done?

In early 2004, the California Office of Environmental Health Hazard Assessment (OEHHA) evaluated findings on mercury in fish from Lake Natoma and the LAR (collected by the USGS) and, in April 2004, released a report providing health guidelines for consumption of fish from these water bodies. A copy of the OEHHA fact sheet summarizing these finding and guidelines



<sup>8</sup> The full Annual Monitoring Report is available at the Sacramento River Watershed Program web site: [www.sacriver.org](http://www.sacriver.org).

can be found at the end of this report (Appendix 2).<sup>9</sup>

The Delta Tributaries Mercury Council of the SRWP is currently evaluating measures to control additional mercury sources within the Sacramento River watershed as part of its Strategic Plan, which was released in 2002. The goal of the Strategic Plan is to reduce the risk of mercury bioaccumulation through implementation of actions within specific areas of the Sacramento River watershed. The Council is cooperating with OEHHA on public information, outreach and education and development of a Sacramento River watershed fish consumption study.

County Sanitation is working to educate Sacramento County residents about the sources and effects of mercury and how to reduce the amount of mercury entering the Sacramento River watershed. County Sanitation's outreach education program, "Be Mercury Free" is a comprehensive effort to eliminate common sources of mercury pollution.<sup>10</sup> The District also is exploring the feasibility of a pilot project that would reduce the amount of mercury entering the Sacramento River watershed from abandoned mine sites.

**Drinking Water.** The LAR consistently meets water quality goals and objectives for drinking water, achieving its designated beneficial uses as sources of municipal, industrial and agricultural supply water and recreation. One concern has been that infrequently, LAR water samples exceeded the maximum limit for single samples for fecal coliform organisms (as indicators of potential pathogens such as *Cryptosporidium* and *Giardia* and viruses). There are many potential sources for increasing levels of coliform organisms detected, including septic systems, domestic animals, and wildlife.

## What's being done?

Reclamation is conducting monitoring in Lake Natoma for fecal coliform organisms, and is working to identify the source(s).

The parameters of greatest concern for drinking water quality are still largely unregulated by the Regional Water Quality Control Board and the Basin Plan. The combination of existing and future land use changes, and the resulting increases in point source and nonpoint source discharges in the Sacramento River watershed, has the potential to increase loadings of these parameters of concern to waterbodies such as the LAR. The Regional Water Quality Control Board is currently implementing a work plan to specifically address these parameters and establish drinking water quality objectives for eventual inclusion in the Basin Plan.

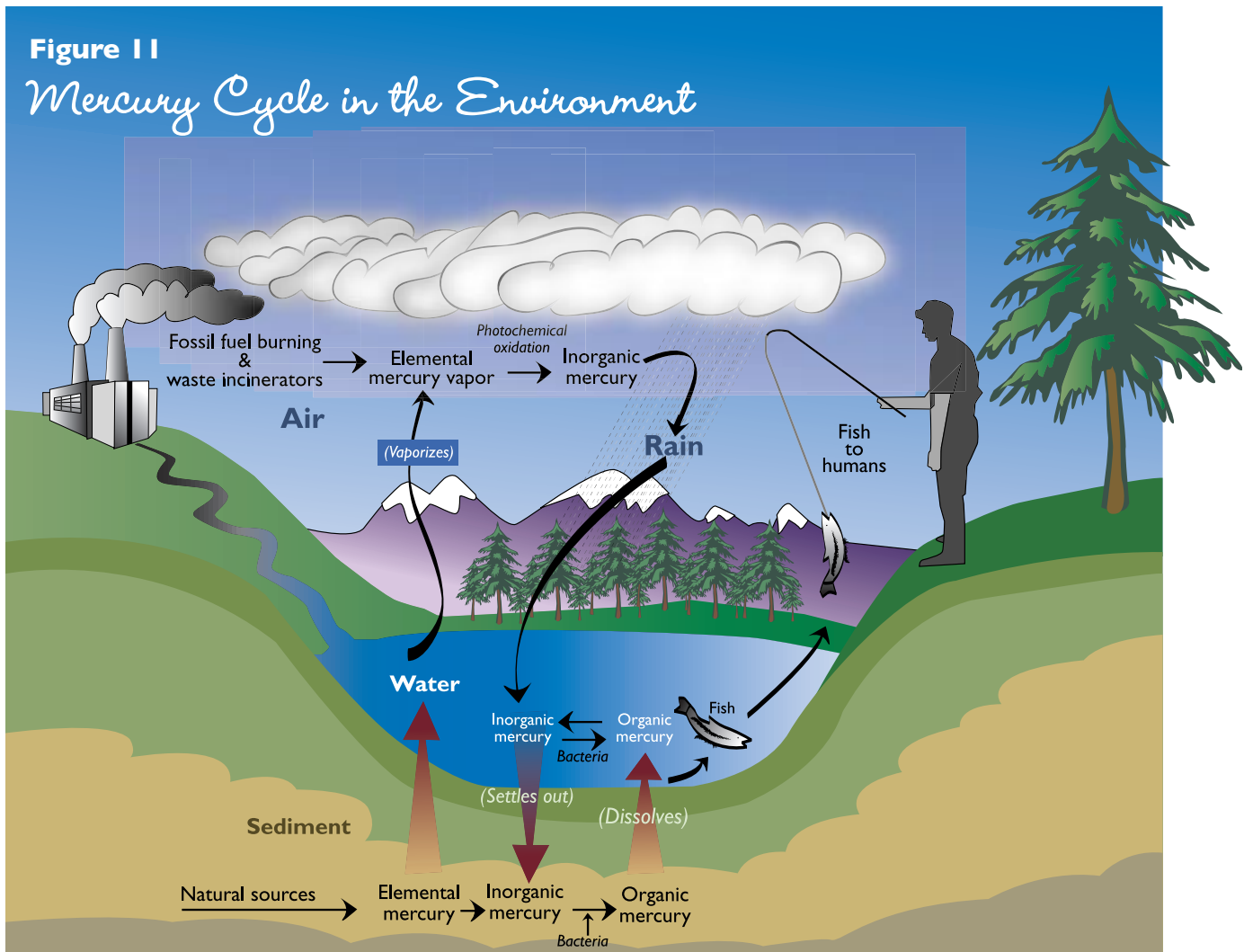
**Toxicity.** Samples of water and sediment can be tested in the laboratory for toxicity to provide an indication of the conditions that exist in the natural environment. Toxicity is deemed to occur when test species (such as fish larvae and algae) are significantly affected by exposure to water or sediment. These effects may include reduced growth or reproduction, increased abnormalities, or increased mortality of test species. Effects may occur rapidly over a period of hours (acute toxicity) or may occur over a longer period of days or weeks (chronic toxicity).

The latest and previous aquatic toxicity monitoring have confirmed that significant toxicity (to test organisms) occurs in surface water monitored by the SRWP throughout the watershed, including the LAR. The magnitude of effects observed on test organisms ranged from small decreases in growth or reproduction to mortality of test organisms. In the SRWP's evaluation, it is assumed that toxicity to test

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<sup>9</sup> Additional information specific to Lake Natoma and the LAR can be found on the OEHHA web site ([www.oehha.org](http://www.oehha.org)) in addition to consumption advisories for other California waterbodies.

<sup>10</sup> Additional information is available on the program's web site: [www.bemercuryfree.net](http://www.bemercuryfree.net).



organisms is an indication of potential impairment to aquatic species and ecosystems. The Basin Plan described above prohibits toxicity in surface waters and violations of this prohibition have resulted in waterbodies being included on the state's list of impaired waterbodies. The LAR is included on this list for toxicity; although the source of the toxicity is unknown at this time.

### What's being done?

The Toxicity Focus Group of the SRWP has developed a strategy to address toxicity of unknown causes, and is seeking funding to begin implementing the strategy.

**Pesticides and Stormwater Runoff.** In 1998, the LAR had been on the state's list of impaired waterbodies due to pesticides and PCBs in fish tissue. Results of more recent monitoring supported the Regional Water Quality Control Board's recommendation to remove the LAR from the state's impaired waterbodies list for pesticides and PCBs in fish tissue.

The CMP has found levels of concern in tributary creeks to the Sacramento River of common lawn chemicals, primarily pesticides that are washed down stormwater drains and into local rivers.

Garbage is also a concern for the LAR. Trash thrown on the street washes down storm drains and into the river; illegal dumping of items such as

## Great American River Cleanup

Each year, the American River Parkway Foundation sponsors the Great American River Cleanup, a community event where volunteers collect garbage along the American River Parkway and in the LAR. In September 2004, the 26th Great American River Cleanup was held, when more than 900 volunteers collected 1,500 bags of garbage weighing more than 13,000 pounds.



Source: American River Parkway Foundation and Sacramento Bee web sites.

Additional information can be found on the American River Parkway Foundation's web site: [www.arpf.org](http://www.arpf.org).

tires, computer monitors, car batteries, bicycles, and other debris pollutes the LAR and can be dangerous to aquatic species as well as recreational users (see sidebar previous page).

### What's being done?

Water quality of the LAR can be affected by contaminants from urban runoff. Both the FISH Plan and the Vegetation and Wildlife Management Element of the RCMP recommend identification and evaluation of suitable locations to establish and provide wetland filtration habitat to reduce the impact of urban runoff. A potential project site at Bushy Lake in the Cal Expo area has been identified that will provide wetland filtration habitat, and the plan development for implementation is underway.

Public education and awareness is considered one of the most critical tools for achieving the changes in behavior necessary for significant stormwater pollution reductions. Sacramento's stormwater management program focuses on a community oriented approach to education and outreach. Elements of the programs include the Clean Water Business Partner Program, a community grant program, the volunteer stenciling program, The Sacramento Bee design-an-ad contest participation, radio and television media campaigns, multiethnic outreach, partnerships with other agencies and businesses, and participation in community events using an interactive storm water model and exhibit. Emphasis is placed on coordination with neighborhood associations and local environmental groups.

**Perchlorate.** Perchlorate originates as a contaminant in the environment from the solid salts of ammonium, potassium, or sodium perchlorate. The perchlorate part of these salts is soluble in water and mobile in ground and surface waters. Perchlorate can persist for many decades under typical groundwater and surface water conditions, and is difficult to remove with standard

water treatment technologies. Ammonium perchlorate is manufactured for use as the oxidizer component, for more efficient combustion, and primary ingredient in solid propellant for rockets, missiles, and fireworks.

Perchlorate is one of the groundwater contaminants beneath the Aerojet facility (a former weapons manufacturing facility) located south of Highway 50 in Rancho Cordova. The California Department of Health Services has monitored for perchlorate a few times on the LAR below Folsom Dam; it was not found above the detection limit (i.e. the level at which current testing methods can detect the presence of a chemical). In 1998, the groundwater extraction and treatment systems at the Aerojet facility began discharging treated water into Buffalo Creek, which flows into the LAR. There have been no exceedances of the permitted limits for perchlorate as regulated by the Regional Water Quality Control Board.

### **What's being done?**

In March 2004, the OEHHA announced the publication of a public health goal (PHG) for perchlorate. The PHG identifies 6 parts per billion as a level of perchlorate in drinking water that does not pose a significant human health risk. State law next requires the California Department of Health Services to set a regulatory drinking water standard for perchlorate that is as close to the PHG as is economically and technically feasible. OEHHA develops PHGs for all regulated drinking water contaminants.

In 2003, new groundwater contamination was discovered north of the American River and further sampling by Aerojet showed that the contamination extends northwest under the American River and below the southern edge of Carmichael. See sidebar for additional information.

## *Groundwater Contamination*

In 1979, industrial solvents were discovered in drinking water wells near the Aerojet facility (a former weapons manufacturing facility) located south of Highway 50 in Rancho Cordova. Aerojet installed and operates several systems to pump out and treat contaminated groundwater. In 2003, new groundwater contamination was discovered north of the American River and further sampling showed that the contamination extends from the south, northwest under the American River, and below the southern edge of Carmichael. To date the groundwater contamination has *not* reached drinking water supply wells in Carmichael. The extent of the contamination, movement rate and direction are not yet completely defined.

The potential extent of contamination in the groundwater basin underlying the LAR may adversely affect the usable yield of groundwater, which could undermine the accomplishments of the Water Forum Agreement. As part of the Water Forum Agreement, water purveyors adjacent to areas where groundwater contamination had been identified committed to reduce surface water diversions from the American River in drier years to provide increased protection for aquatic resources while protecting the aesthetic and recreational values of the river. They agreed to rely more heavily on groundwater resources to meet water demand in those years. If the groundwater basin is not reliable or is inaccessible as a result of contamination, then water purveyors in the region will have to increase their surface water diversions from the LAR to the detriment of aquatic resources and other beneficial uses. In addition, existing water-system infrastructure and planned capital improvements throughout the region depend on continued access to the high-quality groundwater resources.



## Implementing levee stabilization and erosion control measures

### Background\*

Several key activities have occurred over the years that have affected the physical features of the LAR including upstream hydraulic gold mining, aggregate mining and associated dredging of the LAR, land use changes in and around the river as a result of urbanization, construction of the levee system, and the changes to historic river flow and volumes resulting from the construction and operations of Folsom and Nimbus Dams.

Dredge mining in the LAR began in the mid-1800s, with some of the most extensive and productive dredge mining occurring on the LAR near and below the City of Folsom. Dredge mining for gold occurred as far downstream on the LAR as Goethe Park. Past sand and gravel mining in the river and its floodplain resulted in the development of numerous split flow reaches and new channels within the river. The tailings from most gold mining operations along the LAR were dumped into the riverbed, filling the channel an estimated 5–30 feet.

Bluffs naturally confine the upstream reach of the LAR. Below Goethe Park, the river flows through areas with little natural confinement. In this portion of the LAR to the confluence with the Sacramento River, the river is confined by levees. The levees join at the mouth of the LAR with those of the Sacramento River levee and flood bypass system. Together with the lower levees that are part of the Sacramento River Flood Control Project, this system of levees protects the greater Sacramento area from large-scale flooding. The construction of the levee system directed all river flows through a confined channel, effectively eliminating the natural frequency with which river flows would inundate the natural floodplain, profoundly altering the LAR. The cores of today's levees are often the levees built by farmers and settlers as much as 150 years ago. Early levees did not have the advantage of modern

day equipment and construction techniques and are not as structurally sound as modern levees. These remnants of the past make today's levees susceptible to seepage, erosion, and other problems if not properly addressed.

Construction of Folsom and Nimbus dams essentially cut off the supply of sediment to the river from upstream sources. Studies indicate that 90–100 percent of sediment is retained upstream of the dam. As a result, deposits that accumulated in the channel from historic mining activity have been washed away resulting in the lowering of the river channel with the surrounding floodplain still at its post-mining elevation (Figure 10 on page 38). Today, most of the river's sediment supply is derived from the erosion of the banks in the upper and mid reaches of the LAR. This, in addition to river flows concentrated by the levees, has increased bank erosion and channel degradation. Such channel degradation has resulted in the need to reinforce numerous bridge piers along the LAR, especially in the lower reaches where the oldest bridges are located.

Locations near the confluence of the LAR and the Sacramento River generally have a lower potential for erosion (due to the backwater influence of the Sacramento River) than locations in the middle reach of the river, although there are locations with erosion issues. Most of the locations in the middle reach of the river have existing bank protection features, although additional sites that will require bank protection have been identified. Most of the locations in the upper reaches of the river (between the upstream end of the south bank levee and Nimbus Dam) have erosion-resistant material in the riverbank.

### Key Issues

Sacramento's vulnerability to catastrophic

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\* Information in this section is derived from the RCMP and information from SAFCA staff.

flooding was exposed during the record storms of February 1986 when Folsom Dam exceeded its normal flood control storage capacity and several area levees were in danger of failing or nearly collapsing. SAFCA was formed in 1989 by the City of Sacramento, the County of Sacramento, the County of Sutter, the American River Flood Control District (ARFCD), and Reclamation District 1000 to provide the Sacramento area with increased flood protection along the American and Sacramento rivers. SAFCA's mission is to provide the region with at least a 100-year level of flood protection as quickly as possible while seeking a 200-year or greater level of protection over time. Areas with 100-year protection as certified by the Federal Emergency Management Administration (FEMA) are eligible for lower cost flood insurance, or may opt not to carry any insurance.

### **What's being done?**

Improvements to strengthen the levees and make them less susceptible to failures are a major part of SAFCA's efforts to reduce the risk of flooding in Sacramento. Bank protection methods presently used in the LAR include rock revetment (retaining wall), concrete walls, and other materials. The extent of revetment is greatest where the levees are relatively close to the river channel or are subject to high velocities as a result of channel constrictions such as adjacent to CSUS. Some of the rock revetment adjacent to CSUS was constructed in 1986 under emergency status. Bank protection performance on the LAR has, in general, been satisfactory, although locations of damaged bank protection along the river have been identified. The primary levee failure problem on the LAR is not riverbank erosion into the levee sections, but levee failure due to under seepage.

In the 1990s, the Corps and SAFCA identified five sites on the LAR as critical bank erosion sites, where ongoing bank erosion threatened to undermine levees. If left unchecked, these sites could have eroded during periods of high

water, resulting in flooding of the Sacramento metropolitan area.

The Corps was authorized to provide bank protection under the Sacramento River Bank Protection Project. The Corps constructed bank protection sites and on-site and off-site mitigation features between 1996 and 2001. The Reclamation Board served as the state local sponsor and was responsible for accepting the maintenance responsibilities for the five sites once construction was complete. The Reclamation Board transferred responsibility for site maintenance to the ARFCD and SAFCA. SAFCA provides vegetation maintenance, performs annual vegetation monitoring, and prepares annual monitoring reports for the bank protection sites and mitigation features. The sites are adaptively managed based on the unique conditions that occur at each site and on varying environmental factors that may occur throughout the year or from year to year. Beavers have affected some of the vegetation at the sites, primarily cottonwood and willows. SAFCA is actively managing these sites, using fencing and other measures, to control beaver predation.

The Flood Management Element of the RCMP contains recommendations to maintain the structural integrity and capacity of the American River levees, control erosion to protect the flood-control system while conserving diversity of riparian habitats, and increase flood safety for the Sacramento region.

The FISH Plan recommends conducting a survey of existing bank protection sites (often constructed from riprap) and evaluation of opportunities to modify existing sites to incorporate habitat features in continuing and future projects that would: 1) protect aquatic and terrestrial species and their habitat along the LAR; and 2) enhance habitat along the banks of the river to provide shade over the water to keep water temperatures low, and 3) provide habitat for other wildlife. Locations where existing sites could be modified to increase habitat values have been identified.

**Table 3***Summary of Remaining Erosion Control Work on the LAR for FEMA Certification*

<b>Site and Location</b>	<b>Work to be implemented</b>	<b>Lead Agency</b>
Immediately downstream of Highway 160 bridge on south bank at RM 1.8L.	Rock at levee toe. Completed.	SAFCA
Immediately upstream of Business 80 freeway bridge on south bank at RM 4.2L.	Revegetation with erosion resistant grass.	SAFCA
Near River Park, approximately 1/4 mile downstream of H Street bridge on south bank at RM 6.4L.	Rock blanket covered with soil and revegetated with grass.	Corps
Near CSUS, immediately upstream of H Street on south bank at RM 6.9L.	Rock blanket covered with soil and revegetated with grass.	Corps
Between Guy West and Howe Avenue bridges on north bank at RM 7.0R.	Rock trench covered with soil and revegetated with grass.	Corps
Near Waterton Way, approximately 3,000 feet upstream of Watt Avenue bridge on south bank at RM 10.0L.	Log boxes revegetated with grass and woody plants.	SAFCA
Near Estates Drive, approximately 3/4 mile upstream of Watt Avenue bridge on north bank at RM 10.2 R.	Rock trench covered with soil, woody thicket and revegetated with grass and other woody plants.	Corps

In recent years, habitat attributes have been measured at several locations on the LAR to establish a baseline for evaluating impacts of proposed bank protection projects. A wide range of habitat values exist along the LAR depending on a number of factors, including the presence of existing revetment, the degree of levee maintenance activities, types of shoreline vegetation, and orientation of the shoreline (i.e., inside or outside the river bends).

The Corps has recently identified seven sites along the LAR where erosion control measures will need to be implemented before the levees can be certified as in compliance with the FEMA's standards. The Corps and SAFCA are responsible

for the design and construction of the projects to complete the work summarized in the table above. In addition to the construction effort, a LAR Erosion Monitoring Plan is being developed that would identify and monitor potential erosion sites relative to flood control concerns.

# Communicating among lower American River stakeholders to inform and improve current and future management

## Background\*

*In the last decade especially, the LAR has benefited from several forums, including the Water Forum, the Lower American River Task Force and its technical working groups, the Lake Natoma Working Group, the AROG, project-specific committees and work groups, outreach, volunteer work groups, and education activities provided by local organizations such as the American River Parkway Foundation, Save the American River Association, the Sacramento Weed Warriors, the American River Natural History Association, and others.*

*These forums have provided a framework for those that have an interest in the LAR to develop a shared understanding of the best way to manage the river, learn from each other, work with resource managers, and creatively partner to plan, fund, and implement projects and actions that benefit the LAR. Products of these forums include: the Water Forum Agreement, the previously mentioned RCMP, and the LAR Floodway Management Plan. The documents are a “blueprint for action” used by resource managers and stakeholders to manage the LAR.*

*In June 2003, the first Lower American River Science Conference was held at CSUS, bringing together several hundred participants for two days of presentations and discussion about how to manage and protect the LAR and its resources. This event is now known as the American River Watershed Conference and will be held every other year.*

## Key issues

**Water Forum Successor Effort.** The Water Forum Successor Effort was created to implement the seven elements of the Water Forum Agreement over the next 30 years. The



Water Forum Coordinating Committee and its caucus groups meet regularly, identify and attempt to resolve problems at early stages, and guide implementation of the Water Forum Agreement.

**Lower American River Task Force.** The LAR Task Force and its three technical working groups continue to meet regularly to promote implementation of RCMP recommended actions and provide advice to program managers implementing studies and projects proposed for the LAR and the American River Parkway. Members have worked closely with project managers to provide feedback regarding potential impacts to the LAR and the Parkway during project implementation and recommendations to minimize such impacts, and where possible, coordinate permitting processes for LAR restoration actions.

**American River Operations Work Group.** The AROG continues to meet every two to four weeks, focusing on “real-time” management of the LAR, particularly water temperature and flow issues. A detailed description of how this group works appears earlier in this report.

\* Information in this section is derived from the RCMP and information from the Water Forum and SAFCA staff.

**Information Collection and Sharing.** As evidenced by the variety of information sources used to create this first SOR Report, numerous agencies have jurisdiction and responsibilities for management of natural resources, land use, recreation, water supply, and flood control in the LAR. A variety of local, state, and federal government agencies and university researchers (including Reclamation, CDFG, NOAA Fisheries, CSUS, UC Davis, the USFWS, the Sacramento Regional County Sanitation District, the USGS, SAFCA, and others) conduct monitoring activities related to the LAR.

Although a great deal of information has been generated about the LAR, its resources, and related management plans, this information is not in one place, nor always readily accessible. The LAR RCMP recommends improvements to the availability and management of information about the LAR so that information is readily accessible to resource managers and the public.



## Appendix I

### *River Corridor Management Plan Endorsements*

In January 2002, representative(s) of the agencies/organizations listed below endorsed the RCMP as the basis for continued multi-agency collaboration and coordinated resource management for the lower American River.

American Red Cross, Sacramento Sierra Chapter  
— Boat Safety

American River Flood Control District

American River Guides Association

American River Natural History Association

American River Parkway Advisory Committee

American River Parkway Foundation

Butterfield-Riviera East Community Association

CALFED Bay-Delta Program

California Canoe and Kayak, Inc.

California Department of Fish and Game

California Department of Parks and Recreation

California Department of Water Resources

California Exposition and State Fair

California Native Plant Society

California State Reclamation Board

California State University, Sacramento

Capitol Station District

City of Sacramento, Department of Parks and  
Recreation

City of Sacramento, Department of Planning and  
Building

City of Sacramento, Department of Utilities

County of Sacramento, Department of Planning  
and Community Development

County of Sacramento, Department of Regional  
Parks, Recreation and Open Space

Environmental Council of Sacramento

Friends of the River

Golden State Trollers

League of Women Voters of Sacramento

NOAA Fisheries/National Marine Fisheries Service

Protect American River Canyons

Regional Water Authority



River Park Neighborhood Association

Sacramento Area Bicycle Advocates

Sacramento Area Flood Control Agency

Sacramento County Recreation and Park  
Commission

Sacramento County Water Agency

Save the American River Association

Sierra Oaks Neighborhood Association

State Lands Commission

U.S. Army Corps of Engineers

U.S. Bureau of Reclamation

U.S. Fish and Wildlife Service

Water Forum

# River Corridor Management Plan Accomplishments as of 2004

The following is a list of the RCMP's recommended actions that were completed or were underway as of the end of 2004 along with those agencies or organizations that were key to implementing each action.

Recommended Actions	Key Implementing Agencies
<b>Fish, Vegetation, and Wildlife Management</b>	
Development and implementation of a comprehensive water temperature monitoring plan for the LAR	Reclamation
Continuing development of an updated LAR Flow Management Standard	Water Forum, Reclamation, USFWS, NOAA Fisheries, CDFG
Convened a weeklong LAR Flow Fluctuation Workshop to identify measures and opportunities to minimize substantial flow fluctuation occurrences on the LAR that may adversely affect spawning and rearing opportunities for salmon and steelhead	Reclamation, SAFCA, Water Forum
Funding to automate the power penstock intake shutter system at Folsom Dam to provide increased operational flexibility and an opportunity to access and release target water temperatures for the benefit of LAR aquatic species	Reclamation, SAFCA, Corps
Monitoring of LAR spawning gravel restoration sites	CDFG, Reclamation, CSUS
Construction of a Temperature Control Device (TCD) to allow operators more flexibility to use or conserve the Folsom Reservoir coldwater pool depending on the fishery requirements downstream in the LAR and design of a second TCD pending funding.	Reclamation
Completion of low floodplain habitat improvements along 800 feet of the north bank of the LAR at River Mile (RM) 0.9	SAFCA, Corps, Reclamation Board
Creation of 8 acres of valley elderberry longhorn beetle (VELB) upland habitat on the Cal Expo floodplain.	Corps
Implementation of the American River Parkway Invasive Program to remove invasive plants from the ARP. Phase 1 complete. Phase 2 (2004-07) underway.	County Parks, SAFCA, Sacramento Weed Warriors
Development of interim guidelines for VELB management in the American River Parkway and an expansion of the collaborative effort to develop a VELB Habitat Management Plan	SAFCA, County Parks, UC Davis, American River Flood Control District, Pacific Gas and Electric, Sacramento Municipal Utility District, Western Area Power Administration, Sacramento Regional County Sanitation District, City of Sacramento Parks & Utilities Departments, CalTrans, Federal Highways Administration and the Reclamation Board/DWR
Implementation of a pilot vegetation management plan on the south side of the river between Interstate 5 and Highway 160 to discourage illegal activities and encourage legitimate recreational use in that area	SAFCA, County Parks
<b>Flood Management</b>	
Improved access to levees for maintenance purposes	American River Flood Control District
Funding of the development of the Folsom Dam flood management plan that focuses on weather forecast-based operations to provide increased flood protection	SAFCA, Corps
Stabilization work of American River levees	Corps, SAFCA, Reclamation Board
<b>Recreation Management</b>	
Completed repaving of the American River Parkway Bicycle Trail and improved pedestrian paths next to paved trails and other pedestrian trails	County Parks

Hired an additional Interpretive Specialist for the Effie Yeaw Nature Center, a new Natural Resources Specialist, and two additional ranger park patrol peace officers to enforce existing rules and regulations and increase efforts to deter illegal camping in the American River Parkway	County Parks, SAFCA
Developed of an email notification system to enhance communication between agencies and residents adjacent to the American River Parkway regarding crime incidents	County Parks, Save the American River Association Public Safety Committee
Continuing partnerships between local agencies and community volunteer efforts on programs and activities that benefit the American River Parkway, such as trail patrols, the Great American River Clean-Up, and assistance with implementation of the Invasive Plant Management Program	County Parks, City Parks, American River Parkway Foundation, Sacramento Weed Warriors
Development underway of environmental and construction documents to construct a bicycle trail that will connect the American River Parkway to Ueda Parkway	City Parks
Development underway of environmental and construction documents to construct a bike trail (Two Rivers Trail) on the south side of the American River from the confluence with the Sacramento River to the future Sutter's Landing Park	City Parks
Constructed a new assembly building at the Effie Yeaw Nature Center to include classroom and exhibit construction spaces.	County Parks
Construction completed on three single lane concrete ramps at Howe and Watt Avenue and Sailor Bar to provide additional access points to the LAR for water-dependent activities	County Parks
Construction completed on new parking lot and access point at Northgate.	County Parks
Interpretive kiosks installed at all major Parkway sites with accompanying graphics and text to be installed upon completion.	County Parks
Completed plans and acquired permits for a visitor center at the William B. Pond Recreation Area.	American River Parkway Foundation
Restrooms replaced at Howe and Watt Avenues, renovated restrooms at Goethe Park and new restrooms constructed at the Fair Oaks Bridge (all compliant with the Americans with Disabilities Act). In addition, other capital improvements such as repairs to the Jibboom Street Bridge, and ongoing maintenance of parking lots and fences have been completed.	County Parks
Relocated the bike trail at the 0.9 mile mark away from the eroding riverbank as part of a mitigation project.	SAFCA, County Parks
Acquired properties on the Fair Oaks Bluff to create a continuous bluff trail in public ownership.	County Parks, Citizens to Save the Fair Oaks Bluff, and Fair Oaks Recreation and Park District
Coordination and feedback from the Lower American River Task Force and its three technical working groups on alignment alternatives and technical issues related to the Downtown/Natomas/Airport transit line	LAR Task Force; FISH, Bank Protection, Floodway Management and Recreation working groups
<b>Monitoring</b>	
Ongoing monitoring of LAR water quality through the Sacramento Coordinated Monitoring Program partnership	City of Sacramento, County of Sacramento, Sacramento Regional County Sanitation District
Monitoring of bank protection mitigation	Corps, SAFCA, County Parks
Monitoring of Folsom Reservoir operations and ongoing inter-agency coordination and communication through the American River Operations Work Group	Reclamation, USFWS, NOAA Fisheries, CDFG, Water Forum, Western Area Power Administration, Sacramento Municipal Utilities District, Save the American River Association
Funding to develop a protocol for estimating adult steelhead abundance in the LAR	Reclamation, CDFG

**Appendix 2**

*OEHHA Fish Consumption Guidelines for Lake Natoma and the LAR\**

Type of Fish	Women of childbearing age and children age 17 and younger	Women beyond childbearing years and men
	<b>Eat No More Than:</b>	<b>Eat No More Than:</b>
Channel Catfish	DO NOT EAT	Once a Month
All Bass	Once a Month	Once a Month
White Catfish	Once a Month	Once a Week
Pikeminnow	Once a Month	Once a Week
Sucker	Once a Month	Once a Week
Bluegill	Once a Week	3 Times a Week
Sunfish	Once a Week	3 Times a Week
Other Sport Fish Species	Once a Week	3 Times a Week

**MANY OTHER WATER BODIES ARE KNOWN OR SUSPECTED TO HAVE ELEVATED MERCURY LEVELS.** If guidelines are not already in place for the water body where you fish, women of childbearing age and children aged 17 and younger should eat no more than one sport fish meal per week and women beyond childbearing age and men should eat no more than three sport fish meals per week from any location.

**EAT SMALLER FISH OF LEGAL SIZE.** Fish accumulate mercury as they grow.

**DO NOT COMBINE FISH CONSUMPTION ADVICE.** If you eat multiple species or catch fish from more than one area, the recommended guidelines for different species and locations should not be combined. For example, if you eat a meal of fish from the one meal per month category, you should not eat another fish species containing mercury for at least one month.

**SERVE SMALLER MEALS TO CHILDREN. MEAL SIZE IS ASSUMED TO BE 8 OUNCES FOR A 160-POUND ADULT.** If you weigh more or less than 160 pounds, add or subtract 1 oz to your meal size, respectively, for each 20-pound difference in body weight.

\* For the complete OEHHA fact sheet, including why OEHHA has developed a health advisory for fish from Lake Natoma and the LAR and to learn more about the human health effects of methylmercury, visit the OEHHA web site at [www.oehha.ca.gov](http://www.oehha.ca.gov) and click on the Fact Sheets link or call 916/327-7319.

# Information Sources for the State of the River Report

## **This report is derived from:**

- American River Parkway Plan (December 1985)
- American River Steelhead (*Oncorhynchus mykiss*) Spawning: 2001–2003
- Aquatic Resources of the Lower American River: Baseline Report (February 2001)
- Lower American River Chinook Salmon Escapement Survey: October 2003–January 2004
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