California Rivers Assessment

California Rivers Assessment Interactive Web Database

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- Aggregated Information Model
- Future Directions
- Related Efforts
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Watershed Info

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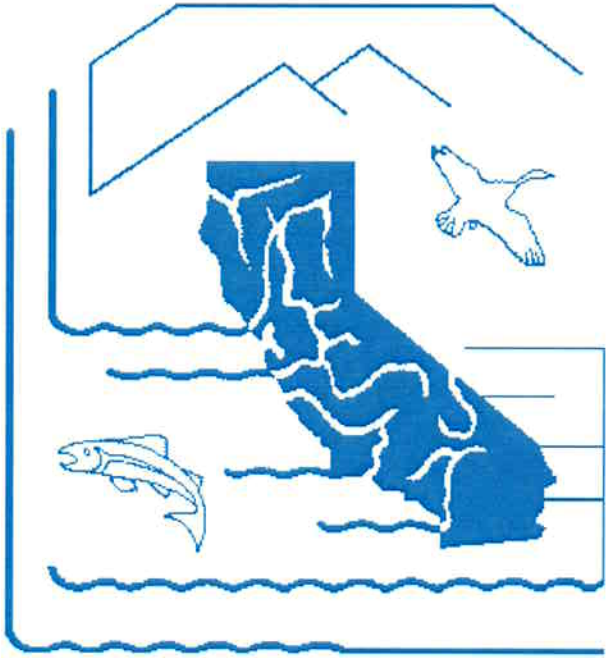

CARA Final Report

Rivers are central to the lives and livelihoods of Californians. We depend upon our rivers to supply drinking water, irrigate farmland, and generate electricity. We also value our rivers for their ability to support an intricate web of biologically significant communities and to provides us with places of beauty to recreate. Increasingly, Californians recognize the need for diligent stewardship of natural riverine processes to maintain these vital resources.

The California Rivers Assessment (CARA) is a computer-based data management system designed to give resource managers, policy-makers, landowners, scientists and interested citizens rapid access to essential information and tools with which to make sound decisions about the conservation and use of California's rivers.

PCWA-L-120

Information Center for the Environment

Final Report to the WildlifeConservation Board, California Riparian Habitat Inventory and Assessment,Agreement No. WC-4069.

REPORT TO THE CWCB

INSIDE THIS ISSUE:

Special Thanks

- The process would not have gotten started without the original impetus from the California Resources Agency, the California Wildlife Conservation Board and the executive members of the California Biodiversity Council

CARA DATA

The first fact to know about CARA is that participating groups or individuals collectively felt that scores of sets of facts were critical to their individual or cooperative work with California's rivers. In all, 99 sets of statewide, regional, or local data were integrated directly into CARA. Links were created to another 206 internet providers of information.

California Has:

172,000 miles of rivers
70,000 miles of river downstream from dams
13,631 miles rated by the CARA PJA
1,483 miles rated "Outstanding" for aquatic
1,287 rated "Limited" for aquatic
1,379 miles rated "Outstanding" for riparian
1,828 miles rated "Limited" for riparian
24,500 miles assessed by SWRCB
2,616 miles "non-supporting"
68,814 CEQA projects since 1982
Over 1,500 restoration projects underway
713 rivers in 220 cities
1000's of Rivers Facts at

http://endeavor.des.ucdavis.edu/newcara/

CARA contains 39 sets of mapped geographical information system (GIS) layers, 60 sets of tabular (database) and textual (text) data, as well as links (internet connections) to 510 additional maps, tables and texts located on other servers. All of this data is organized by watershed and theme. CARA makes the data available to interested parties over the internet for a wide variety of analytical and management purposes.

The CARA GIS data layers include the location of rivers, the distributions of riparian and aquatic species, the location of endangered species sightings, habitat locations, the locations of dams, water diversions, irrigation systems, road crossings, as well as all sorts of political and administrative boundaries. Each GIS layer has an accompanying database identifying the central and salient characteristics of all of the features located on the GIS map. The dams layer, for example, has an accompanying database that includes the year of construction, the size, the holding capacity, and many other fea-

(Continued on page 5)

IN THE BEGINNING...

Representatives of 28 agencies gathered at the request of California Resources Secretary Douglas Wheeler in 1992. These agencies recognized that diverse programs, goals, missions, regulations, and geographic regions required diverse information to support decisions regarding the management and conservation of California's rivers. They agreed that "rivers assessment" was a process as well as a judgement. They recommended a process that began with a survey of professional judgement of California's river conditions, and continued with the accumulation, organization, and internet publication of a large and diverse body of facts and tools

(Continued on page 2)

CARA's Decision Support

From the beginning, the members of the CARA Steering Committee and the CARA Technical Advisory Committee argued forcefully that to best serve the diverse information needs of California rivers and riparian communities of interest, a vast distributed information system should be assembled. The other proposed alternative was to assess a one-time judgement of the condition of California's rivers, a practice that had precedent in twenty other states. The CARA advisory team vision proved successful for California. Many uses have benefited from interaction with the CARA system. A sampling of agency and organization efforts designed around or supported by CARA include the development of a system for identifying targets for riparian habitat conservation, the support of data storage and analysis affecting various sections of the Federal Clean Water Act, the development of the California Clean Water Action Plan, and the innovative designs for Caltrans' Nonpoint Source Stormwater Runoff Prediction experiments. Others are shown in the table on the adjoining page.

In the Beginning

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dedicated to the analysis and management of California's rivers.

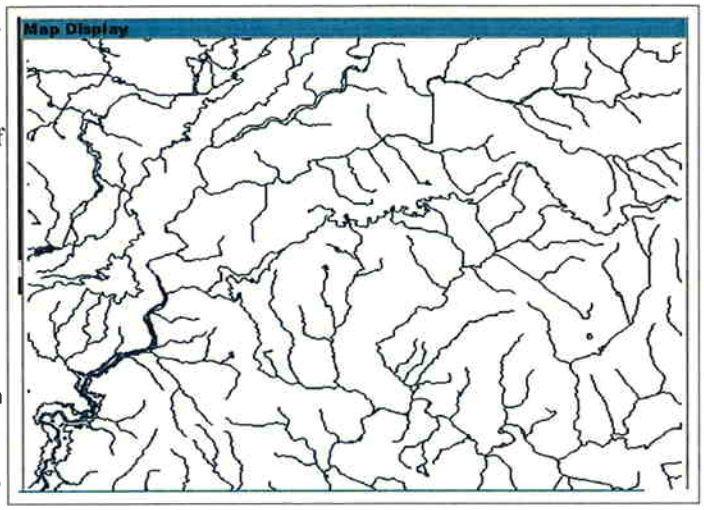
Hundreds of people from dozens of agencies, organizations, and programs have generously donated time and data to the California Rivers Assessment effort. The process would not have gotten started without the original impetus from California Resources Agency Secretary Douglas Wheeler, Wildlife Conservation Board Executive Officer John Schmidt, and the executive members of the California Biodiversity Council. Other individuals, too numerous to mention, have participated. The following organizations generously contributed staff and data to the CARA process:

California Department of Conservation; California Department of Fish and Game; California Department of Forestry; California Department of Parks and Recreation; California Department of Water Resources; California Division of Mines and Geology; California Farm Bureau Federation; California State University, Chico; California State University, Humboldt; California Resources Agency; California Trout; California Wildlife Conservation Board; County Supervisors Association of California; Friends of the River; National Park Service Rivers and Trails Conservation Assistance Program; Natural Heritage Institute; Natural Resources Conservation Service; Pacific Gas and Electric; State Coastal Conservancy; State Lands Commission; State Water Resources Control Board; The Nature Conservancy; The Trust for Public Land; University of California, Davis; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency; U.S. Bureau of Land Management; and the U.S. Bureau of Reclamation and numerous local watershed coalitions.

CARA Informs Environmental Decisions

Decision Process	Participants	CARA Support
California Riparian Evaluation System	California Wildlife Conservation Board	GIS expert system based on CARA data ro evaluate priority sites for riparian conservation.
Geospatial Water Body System	US EPA, State Water Resources Control Board California Department of Forestry and Fire Protection	GIS and database system based on CARA data to more accurately conduct water-body assessments, as mandated by the National Clean Water Act.
California Clean Water Action Plan	Natural Resource Conservation Service and over 30 partner organizations	GIS system and database system based on CARA for prioritizing California Watersheds to qualify for Federal management and restoration funds.
Proper Functioning Condition Assessment	U.S. Bureau of Land Management Natural Resource Conservation Service U.S. Forest Service	Cooperative landowner/agency process incorporated into CARA Professional Judgement Assessment for assessing streams on private land.
Source Water Assessment Program	California Department of Health Services	GIS and field expert system for identifying threats to California's developed groundwater systems. Builds on CARA mapping system and CARA interactive World Wide Web mapping innovations.
Non-point Source Runoff Prediction	California Department of Transportation	GIS and computer model using CARA data and field observations to predict contributions to river sediment load from various land uses, a critical program for future TMDL assessment in California.
Individual Internet Uses	Watershed groups and members of the public at large	Over 1,400 individuals from non-governmental computer sites visit the CARA web every week. We know that many of these users are members of watershed groups, cooperative resource management planning groups, educational groups, and commercial and environmental organizations interested in the betterment of watersheds where they live or work.

CARA Information Infrastructure



The agencies, organizations, and individuals involved in the formation of CARA wanted it to be clear that they were interested in all of California's flowing waters. The first order of business was to find a common method for referencing each mile of every California river, stream, and creek. US. EPA had begun such a system, but it needed substantial work. A consortium of CARA partners, led by the California Department of Fish and Game, set out to adopt the U.S. EPA Reach File 3 as the backbone of the CARA system. Reach File 3 provided a ready reference to index all sorts of information related to segments of rivers. For example, a segment of a river could have a data field attached to it indicating adjacent land uses, resident fishes, or sediment loads. The CARA system also adopted the USGS Hydrologic Unit Code system to characterizr large watersheds and the Cal Water system to characterize moderate and small basins. These systems had the advantage of attributing broadly defined information across many water bodies. All of CARA's spatially distributed data was eventually related either to the U.S. EPA Reach File 3, the USGS Hydrologic Unit Code system, or to Cal Water watersheds. With all of the CARA systems data registered to one type of hydrologic feature or another, it became possible to develop GIS tools to inform particular interests in conservation, restoration, policy formation, and other decision processes.

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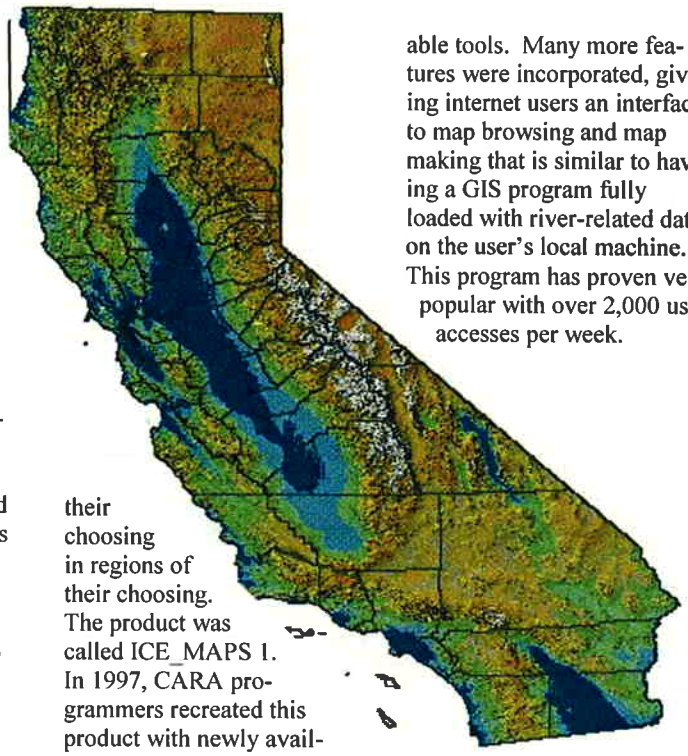
THE CARA WEB

River data must be stored in a relevant infrastructure like the Reach File or Hydrologic Unit system to be informative. It also must have an accessible delivery system in order to be useful. The CARA data system is available via World Wide Web to anyone with internet access. The site is organized by hydrologic unit, and contains a myriad of facts about every one of California's 149 USGS Hydrologic Units. Most of the information contained on this Web site was available in one way or another before CARA, but it had never been brought together or organized to reflect waterbody and watershed characteristics and conditions. All of the data on the CARA web was first dissected by hydrologic unit boundaries or Cal Water unit boundaries or attached to Reach File 3. It was reformatted in a database that indexed all of the data by watershed and/or river. The CARA data is served to the public over the internet in this referenced format.

The Cara Web is used by over 2,000 visitors per week

ICE MAPS

Tables of data are made more informative by the spatial indexing CARA provides on its World Wide Web database site. But there are limits to the usefulness of even a well indexed table of spatial data. The spatial relationship of elements, the degree of overlap of features, the relative abundance of habitat types, and many other concepts are best portrayed with maps. In 1994, CARA provided one of the first interactive user defined map generation applications on the internet. Using programming tools considered primitive by today's standards, CARA programmers crafted a product that allowed internet users to make maps of themes of their choosing in regions of their choosing. The product was called ICE_MAPS 1. In 1997, CARA programmers recreated this product with newly available tools. Many more features were incorporated, giving internet users an interface to map browsing and map making that is similar to having a GIS program fully loaded with river-related data on the user's local machine. This program has proven very popular with over 2,000 user accesses per week.



ICE MAPS are made by over 300 visitors per week

CARA DATA

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tures of each of California's 1,427 jurisdictional dams. Tabular data includes the huge "Storet" US EPA water-quality database, DWR flow data, Moyle Fish Count tables, and many others. References link to local data from city and county Governments, watershed groups and regional and state bodies.

In all, 99 sets of statewide, regional, or local data were integrated directly into CARA, and links were created to another 206 internet information providers.

FUNDING

Core funding for the California Rivers Assessment was provided by California Wildlife Conservation Board ($625,000), U.S. EPA Region IX ($150,000), the National Park Service Rivers Trails and Conservation Assistance Program ($15,000), and the U.S. EPA Center for Ecological Health Research at UC Davis ($120,000). These funds supported the people needed for interagency collaborative work; created the CARA data framework; produced, managed, and analyzed a Professional Judgement Assessment; collected and revised the diverse data holdings of dozens of institutions into a common format; developed the CARA World Wide Web site; and provided for the internet interactive map products ICEMAPS I and ICE_MAPS

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FUNDING

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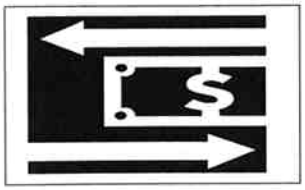

Additional funding was granted to UC Davis by many other sources for the additional collection of associated data supporting the CARA system or for the development of focused decision-support applications using CARA data. These focused projects, while funded separately from CARA, are a part of the CARA legacy. These projects are discussed in the "Decision Support" article on page 4 of this report. They include the projects in the table below.

Organization(s)	Project	Funding
US EPA, State Water Resources Control Board, California Department of Forestry and Fire Protection	Geospatial Water Body System	$180,000
California Biodiversity Council , California Department of Conservation, California Department of Fish and Game, California State Water Resources Control Board, U.S. Bureau of Land Management, U.S. Environmental Protection Agency	Natural Resources Project Inventories	$175,000
U.S. Fish and Wildlife Service	Incorporation of Klamath River Information System	$17,000
U.S. Environmental Protection Agency	CEHR Border Rivers Water Quality Assessment	$150,000
U.S. Environmental Protection Agency, U.S. Geological Survey, Cal Trout	California Reach File 3 Final Processing	$190,000
California Department of Transportation	North Coast River Loading Study	$247,000
National Park Service	Verification of Biological Inventory Database in California National Parks	$15,000
USGS - Biological Resources Division	Coastal Salmon Data Catalog	$30,000
USGS - Biological Resources Division	Coastal GIS Catalog	$15,000
California Department of Forestry	Public Access -- Sierra Nevada Ecosystem Project Data	$45,000
California State Water Resources Control Board	Non-point Source Mitigation Measures, Practices and Authorities	$165,000

CARA generated an additional $1.25 million in related research from 1995-1998

Information Center for the Environment
Department of Environmental Science
UC Davis
Davis, CA 95616

Phone: 530-752-0532
Fax: 530-752-3350
Email: ice@ucdavis.edu

We're on the web
ice.ucdavis.edu

Information, Communication, Education

ICE

About ICE

The Information Center for the Environment (ICE) is a cooperative facility supporting projects of an interdepartmental faculty, with funding from over a dozen agencies and programs.

The Center is housed within the College of Agriculture and Environmental Sciences at UC Davis. Begun as an agricultural extension school, the College of Agriculture and Environmental Sciences has a long history of applying natural resource science to environmental issues of local, regional, national, and international significance.

ICE continues this tradition, providing the following services:

- Research on environmental conditions and processes and the social institutions and policies that support them.
- Consultation on the role of information in environmental decision support processes
- Development and support of easy-to-use public access to a wide variety of environmental information Our ICE Web server hosts data, maps, models, reports, and other related products
- Geographic information systems (GIS), database, and computer modeling development and support.
- Facilitation and hosting of conferences and workshops on a broad range of environmental topics.

The Professional Judgement Assessment

Knowledge about aquatic and riparian habitat conditions in California ranges from field measurements and satellite imagery to the personal experiences of onsite professional resource managers. Much of what we collectively know, as a society, about California's rivers resides in the memories and unpublished records of individual observers.

CARA distributed a questionnaire to more than 1000 individuals in 375 public agencies and private organizations in two massive distribution efforts, two years apart. The PJA questionnaire sought information in seven categories. The Professional Judgment Assessment succeeded in collecting information for 616 segments on 145 rivers.

The first phase of CARA, the Professional Judgment Assessment (PJA), drew upon the knowledge, expertise, and opinions of resource managers, scientists, and other river experts. The goal of the PJA was to assemble a database of information about the condition of riparian and aquatic resources for 13,631 miles of California's 196 largest rivers. To obtain this valuable information,

Each piece of information received was geographically coded using both the U.S. Geological Survey's Hydrologic Unit Code and the Environmental Protection Agency's River Reach File system. This coded data was then entered into CARA's PJA database. Because of its unique code or "address," each piece of river-related information is electronically

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THE PJA

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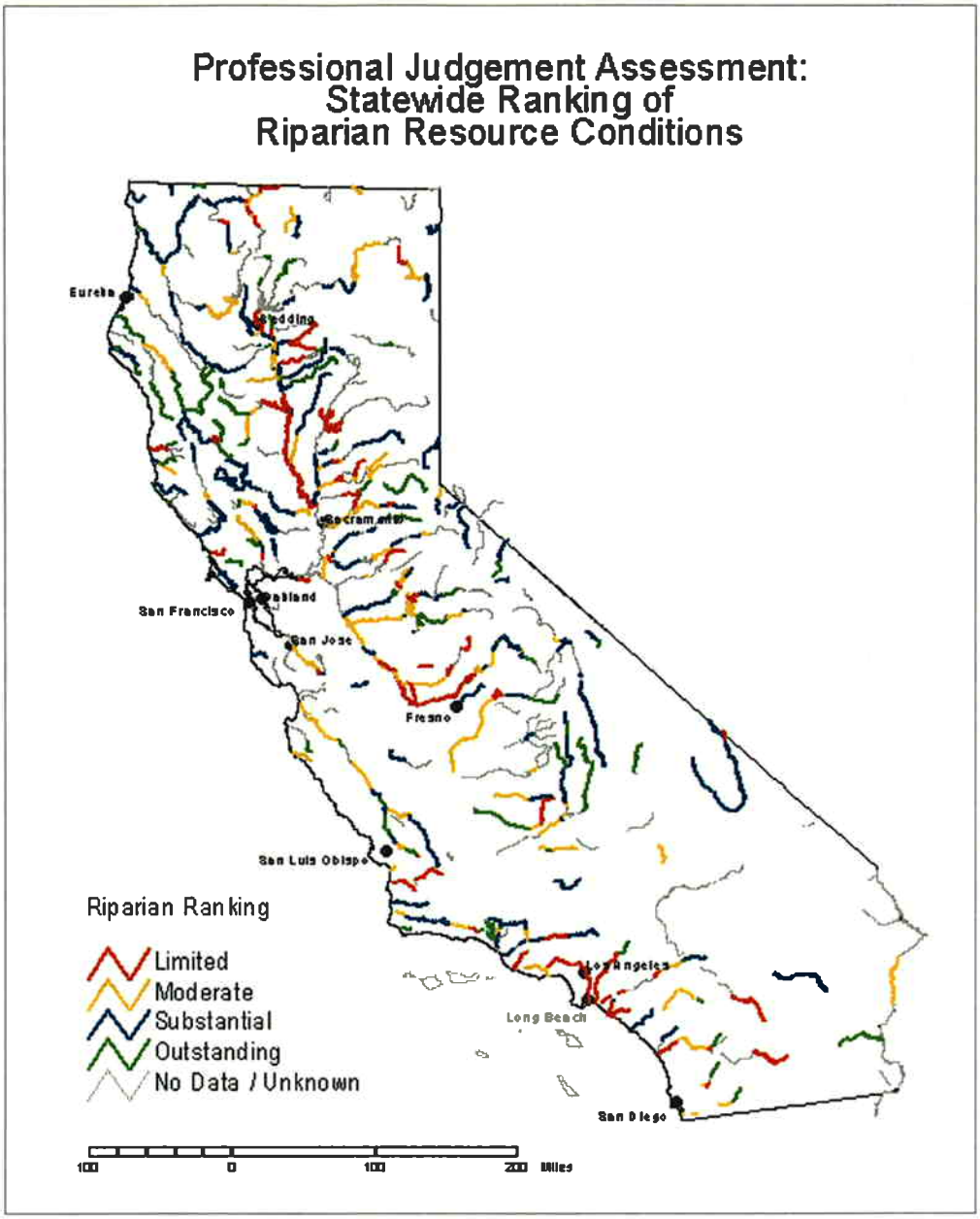
linked to its particular river and watershed location. An evaluation of this data was developed by the CARA steering committee with assistance from project staff. A set of criteria using a list of "indicator" responses to the survey questions most frequently answered was developed. Rivers were scored based on these criteria. For presentation purposes, the scores were distributed into four groups: "Outstanding," "Substantial," "Moderate," or "Limited."

A second survey instrument was distributed. It was developed by the Bureau of Land Management in conjunction with the Natural Resource Conservation Service and the U.S. Forest Service. This instrument was designed to measure the functionality of riparian ecosystems.



PJA Results

	Total Sought		Outstanding		Substantial		Moderate		Limited		No Information	
	Miles	%	miles	%	miles	%	miles	%	miles	%	miles	%
PJA Aquatic	13,631	100%	1,483	11%	2,911	21%	2,643	19%	1,287	9%	5,307	39%
PJA Riparian	13,631	100%	1,379	10%	3,150	23%	2,120	16%	1,828	13%	5,155	38%
			Proper Functioning Condition		Functioning at Risk		Non-Functional					
PFC			1,111	33%	1,757	52%	499	15%				

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- Search by Congressional District

County Information

County Name:	Placer
County FIPS Code:	06061
Area:	958098.5 acres
Total Population from 1990 Census:	172796
Total Population from 1996 Census:	210807
Number of Major Cities:	6

Additional County Information

Related Information from CERES

Land Use Planning Information Network (LUPIN)

Related Information from the Environmental Working Group

Violations of Federal Health Standards for Tap Water
Facilities Reporting TRI Discharges to Water
U.S. Army Corps of Engineer's Wetlands Permitting
Federal Farm Subsidies

Additional Information from "AIM"

Watershed	Congressional District	State Assembly District
Lake Tahoe (CA & NV)	2	2
Lower American	3	3
Lower Bear	4	4
Lower Sacramento		5

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Lower Sacramento		5
North Fork American		
South Fork Amercan		
Truckee (CA & NV)		
Upper Bear		

Upper Coon - Upper Auburn
Upper Yuba