

## Paul M. Bratovich

Vice President/Principal Scientist

### Education

Master of Science, Fishery Resources, University of Idaho, 1985

Bachelor of Science, Fisheries, University of Washington, 1977

### Professional Affiliations

American Fisheries Society, Member

### HDR | SWRI Tenure

11 years

### Industry Tenure

25 years

### Professional Experience

As the leader of HDR|SWRI's aquatic resources team, Mr. Bratovich is a highly accomplished, recognized fisheries expert. With over 25 years of practical experience, he actively participates in a broad range of forums in various strategic planning and technical expert capacities. He has conducted numerous consultations and negotiations with and participated in proceedings before federal and state agencies such as the Bureau of Reclamation, National Marine Fisheries Service, U.S. Fish and Wildlife Service, California State Water Resources Control Board, California Department of Fish and Game, and the California Department of Water Resources. Mr. Bratovich's professional practice emphasizes technical and strategic support for water rights and regulatory compliance projects.

### *HDR | SWRI Selected Project Experience*

#### Environmental Compliance and Consultation

**Yuba County Water Agency, Proposed Lower Yuba River Accord Environmental Impact Report/Environmental Impact Statement.** Mr. Bratovich is the Principal Scientist for the proposed Lower Yuba River Accord (Yuba Accord), comprised of a coalition of over 15 agricultural, environmental, and fisheries interests, including State and Federal agencies. The Yuba Accord is a collaborative settlement initiative, which will resolve nearly 17 years of controversy and litigation over instream flow requirements for the lower Yuba River, California. The science-based, consensus-oriented Yuba Accord proposes new instream flow requirements for the lower Yuba River that will increase protection for the river's fisheries resources and will improve habitat conditions for lower Yuba River Chinook salmon and steelhead – among the last remaining wild populations in California's Central Valley. The Yuba Accord also will represent the first major long-term water acquisition by the State of California for the CALFED Bay-Delta Program Environmental Water Account, and will improve water supply reliability for the major resource agencies. The Yuba Accord will promote the objectives of CALFED and the responsible stewardship of California's water supplies.

Mr. Bratovich was the Principal Scientist in the development of the Yuba Accord, and continues to serve on the Implementation Team and the multi-agency River Management Technical Team. He has led the environmental compliance process, which has included public meetings, workshops, and scoping sessions that were held as part of the preparation of a joint Environmental Impact Report/Environmental Impact Statement in compliance with the California Environmental Quality Act and the National Environmental Policy Act. He also is leading the consultations required by the State and Federal Endangered Species Acts.

**Sacramento City/County Office of Metropolitan Water Planning, Lower American River Flow Management Standard.** Mr. Bratovich is currently guiding the development and negotiation of a new flow management standard for the lower American River, California, directed toward the State Water Resources Control Board amendment of the Bureau of Reclamation's water rights permits. Development of the flow management standard considers indices of water availability for the American River Basin as well as

potential conflicts inherent in a regulated water system with numerous designated beneficial uses, such as: (1) Central Valley Project/State Water Project operational factors including storage and refill potential of CVP/SWP reservoirs, flood control, and Delta water quality objectives and demands; (2) American River Basin water supply and Folsom Dam hydropower generation; (3) requirements of the CVP Improvement Act including management of Section 3406 (b) (2) assets; and (4) regulatory requirements of the 1995 Bay-Delta Plan, California Fish and Game Code 5937, and biological opinions to protect Central Valley anadromous salmonids and delta smelt. Modeled flow requirements and rules to implement the requirements on a real-time basis have been developed. In addition to guiding the development of the flow management standard, Mr. Bratovich provides technical expertise and consultation regarding the development and implementation of a Monitoring and Evaluation Plan for the lower American River. Significant coordination with, and presentations to, resource agencies and stakeholders is an integral component of this process.

**National Marine Fisheries Service, Salmonid Recovery Planning.** Mr. Bratovich is assisting the National Oceanic Atmospheric Administration, National Marine Fisheries Service with the recovery planning process for the Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon evolutionarily significant units (ESU) and the Central Valley steelhead distinct population segment (DPS). This assistance includes conducting threats assessments and developing recovery goals, criteria, strategies, and actions for each ESU/DPS. Working collaboratively with the National Marine Fisheries Service, HDRISWRI developed threats assessment matrices for over 35 populations to structure ESU/DPS, population, life stage, and stressor information into hierarchically-related tiers so that stressors to each ESU/DPS could be prioritized. The prioritized list of ESU/DPS-specific stressors was then used to develop recovery actions designed to eliminate or minimize the most important threats to the species.

**Bureau of Reclamation/MWH, Sacramento River Water Reliability Study.** Mr. Bratovich is the Principal Fisheries Scientist for this study. Placer County Water Agency, Sacramento Suburban Water District, and the cities of Roseville and Sacramento have the goal of identifying additional water supplies that will meet their growing water supply demands as well as reliability objectives in their respective service areas. The water reliability study identifies a package of water supply infrastructure components, including new or expanded diversion(s) from the Sacramento, Feather, or American rivers, and new or expanded water treatment and pumping facilities, storage tanks, and major transmission and distribution pipelines. Additional work efforts have involved use of Regional Water Quality Control Board monitoring data to address fisheries and tributary return flow issues associated with the effects of wastewater treatment plant effluent discharge on instream aquatic habitat. HDRISWRI has assisted in the preparation of a feasibility study and is preparing an Environmental Impact Statement/Environmental Impact Report for identified water supply alternatives. Mr. Bratovich is supervising the preparation of the fisheries and water quality portions of the Environmental Impact Statement/Environmental Impact Report, as well as the National Marine Fisheries Service Biological Assessment.

**Bureau of Reclamation/CDM, Environmental Water Account Environmental Impact Statement/Environmental Impact Report/Action Specific Implementation Plan.** Mr. Bratovich, as the technical lead, assisted in development of a refined project description, identified the effects and interrelationships between related water acquisition and management programs, and developed alternatives that were analyzed and compared in the Environmental Impact Statement/Environmental Impact Report in the areas of surface water quality and quantity, fish and wildlife, and vegetation. This work included consulting with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and California Department of Fish and Game to: (1) identify endangered, threatened, and proposed or candidate species that may occur in the Area of Analysis; (2) develop an

appropriate approach for assessing species listed and proposed for listing as part of the Section 7 consultations required by the federal Endangered Species Act; and (3) determine to what extent the action may affect any of the identified species, including effects on Essential Fish Habitat.

Mr. Bratovich oversaw preparation of the fisheries and aquatic biology sections of the Environmental Impact Statement/Environmental Impact Report and Action Specific Implementation Plan. The Action-Specific Implementation Plan is a document established by the CALFED Bay-Delta Program to fulfill the requirements of, and initiate project-level compliance with, the federal and California ESAs and the Natural Community Conservation Planning Act. Tiering off the CALFED Multi-Species Conservation Strategy, Mr. Bratovich focused the Action-Specific Implementation Plan on evaluating the EWA Proposed Action's effects on evaluated species and habitats.

**Sacramento Area Flood Control Agency, Folsom Dam and Reservoir Interim and Long-Term Reoperation Agreement.** Mr. Bratovich served as a technical expert as part of the contract negotiation team on behalf of the Sacramento Area Flood Control Agency for the 10-year Folsom Dam and Reservoir Reoperation Agreement with the Bureau of Reclamation. He supervised wildlife and fisheries biologists and environmental planners, evaluated the potential impacts to federally threatened and endangered species and other significant biological resources due to simulated changes in reservoir storage and instream flow regimes throughout the Central Valley Project of California.

Mr. Bratovich also led the preparation of feasibility studies to determine the effects of reoperation given demands on the CVP and instream requirements of the lower American River. He assisted with the development of the modeling approach that was applied to the long-term studies and provided input regarding parameters and assumptions appropriate for the impact assessments, and prepared the fisheries and aquatic habitat impact analysis for the Final Environmental Assessment prepared for the project. Additional support included facilitating federal and state regulatory agency representative coordination to determine consultation requirements under the federal and state Endangered Species Acts.

**Sacramento City/County Office of Metropolitan Water Planning, Water Forum Agreement Environmental Impact Report and Fisheries and Aquatic Habitat Management Plan.** As Principal Scientist, Mr. Bratovich led stakeholders *via* interest-based negotiation and problem-solving that addressed the political, technical, and scientific issues of over 40 separate parties, which include non-profit organizations, private landowners, and federal and state resource agency representatives, culminating in the completion of the Environmental Impact Report in support of the Water Forum Agreement. Mr. Bratovich also led the development of the impact analysis framework for the Environmental Impact Report and prepared the fisheries and aquatic resources impact analysis.

Mr. Bratovich coordinated the implementation of the Water Forum Agreement by serving as Principal Scientist in the preparation of a Fisheries and Aquatic Habitat Management Plan, an integral component of the Lower American River Corridor Management Plan. This plan includes an ecological and biological monitoring plan that: (1) establishes the baseline for assessing the health of the lower American River; and (2) identifies monitoring objectives, techniques and indicators, and performance standards to assess the ongoing health of fish and aquatic habitat and efficacy of the proposed restoration efforts.

**Mammoth Community Water District, Mammoth Creek Environmental Impact Report.** Mr. Bratovich is HDR\SWRI's Principal-in-Charge for assisting the District in the preparation of the Mammoth Creek Project Environmental Impact Report, which addresses proposed changes in Mammoth Creek bypass flow requirements, management constraints, point of measurement, and place of use. Key stakeholders in the project include the Los Angeles Department of Water and Power, California Department of Fish

and Game, CalTrout, and the Town of Mammoth Lakes, as well as the State Water Resources Control Board. HDRISWRI has provided support during the public scoping process, including summarizing comments received during the public scoping process, developing an approach to address those comments in the Draft Environmental Impact Report, and meeting with the State Water Resources Control Board staff to discuss and try to gain consensus regarding outstanding scoping issues. Mr. Bratovich has participated in Mammoth Creek Technical Committee meetings to assist in the development of the hydrologic operations model, identification of data and existing studies for inclusion into the document, and to provide updates on the California Environmental Quality Act environmental process. HDRISWRI is working with the District to revise and update sections of the prior Draft Environmental Impact Report, which was issued in 2000, and is responsible for developing and applying an operations model of the Mammoth Community Water District's system. HDRISWRI water resource engineering staff performed the conceptual design of the model, as well as data and model development. The model was then used to generate the flow data required for the environmental analyses of potential impacts associated with fisheries and aquatic resources, terrestrial and riparian resources, water quality, surface water supply, and cumulative impacts within the Environmental Impact Report.

**Bureau of Reclamation, Yuba County Water Agency, Yuba River Fisheries Technical Working Group (CALFED), Implementation Plan for Lower Yuba River Anadromous Fish Habitat Restoration Actions.** Mr. Bratovich served as the Principal Scientist in the development of a detailed implementation plan to enhance lower Yuba River aquatic and riparian habitats, and the anadromous species that use these habitats. This project was designed to guide future monitoring and data collection. The implementation plan was based on a detailed conceptual model of the Yuba River aquatic ecosystem, which was developed from a comprehensive technical review of available Yuba River fishery, ecological, and hydrologic information.

**M&T Ranch, Rancho Llano Seco Channel Alignment Temporary Maintenance Project.** Mr. Bratovich served as the Principal-in-Charge for the preparation of an Environmental Assessment/Initial Study for the Ranch Llano Seco Channel Alignment Temporary Maintenance Project. The project involves placement of longitudinal rock toe and tree revetment on the west bank, and removal of a debris island on the east bank of the Sacramento River near the confluence with Big Chico Creek. Mr. Bratovich led the efforts to prepare an Environmental Assessment/Initial Study and Action-Specific Implementation Plan to address the potential environmental impacts to fishes listed under the federal Endangered Species Act associated with construction activities.

**City of Roseville, Warren Act Contract Environmental Assessment/Initial Study and Biological Assessment.** Mr. Bratovich provided hydrologic analyses and fisheries and aquatic habitat impact evaluations for water-related resources, as well as a service area analysis, based on accepted U.S. Fish and Wildlife Service protocols for the City of Roseville. He assisted in the development of a comprehensive hydrologic impacts framework for the analysis in consideration of the City's existing water entitlements, system capacities, ultimate buildout projections, and various local political agreements. The service area impacts analysis (specific to the protection of listed and proposed threatened and/or endangered species) presented the planning and development approval process of the City, including the extent of and manner of implementation regarding relevant policies, ordinances, and regulations. Specific conservation projects were identified, as well as a detailed presentation of appropriate mitigation measures and monitoring.

**Santa Ynez River Adaptive Management Committee.** Mr. Bratovich was retained to evaluate the trends in steelhead use of the lower Santa Ynez River and, if necessary, recommend alternatives and revisions to the recommended actions outlined in the “Lower Santa Ynez Fish Management Plan.” As such, the Adaptive Management Committee continues to: (1) make management decisions in response to annual and seasonal variation in hydrologic conditions and water supply availability; (2) capitalize on opportunities to implement habitat improvement measures on public and private property as they arise; (3) evaluate the results of implemented actions; and (4) recommend appropriate modifications to the Fish Management Plan based on these evaluations.

**Bureau of Reclamation, American River Basin Cumulative Report.** Mr. Bratovich was the Principal Scientist for the evaluation of cumulative impacts within the American River Basin due to increased diversions from federal actions involving the U.S. Bureau of Reclamation Central Valley Project system. He was responsible for coordinating multi-agency interests and a multi-disciplinary team in the simulation and assessment of existing and future hydrologic conditions. Key resource issues included direct and indirect cumulative effects on endangered, threatened, and other special-status aquatic and terrestrial species and habitats along components of the Central Valley Project system and within over 20 water service areas in Sacramento, Placer, and El Dorado counties. This report serves as the basis for compliance with the California Environmental Quality Act, National Environmental Policy Act, and Endangered Species Act requirements for reasonably foreseeable American River-related projects anticipated to occur by 2030. This analysis was used in the cumulative impacts analysis for the American River Pump Station Project. The project required working closely with the Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the California Department of Fish and Game regarding biological resources and service area issues.

**California Department of Water Resources, Oroville Facilities Federal Energy Regulatory Commission Relicensing Project.** As HDRISWRI’s Principal-in-Charge and Fisheries Technical Lead for the Oroville Facilities Federal Energy Regulatory Commission relicensing efforts, Mr. Bratovich led the HDRISWRI and DWR team in the development of over 70 aquatic resources study plans. These study plans included several methodologies for evaluating Chinook salmon, steelhead, and green sturgeon passage above potential impediments in the lower Feather River and above Oroville Dam. Mr. Bratovich led a team that modified an existing passage methodology to create a quantitative, repeatable, and defensible assessment methodology utilizing hierarchical decision trees, which incorporated anadromous salmonid performance metrics, and standard data collection procedures to determine the potential for passage above potential barriers in the tributaries upstream of Lake Oroville. To determine the biological and economic feasibility of a program to transport adult Chinook salmon and steelhead above Oroville Dam, Mr. Bratovich helped develop a Microsoft Excel-based Fish Passage Model utilizing information gained from extensive and comprehensive research to evaluate the potential success of various combinations of alternative fish passage program elements and goals.

**Placer County Water Agency, Middle Fork Project Federal Energy Regulatory Commission Relicensing Project.** Mr. Bratovich serves as a Principal Scientist in the relicensing of Placer County Water Agency’s Middle Fork American River Project facilities. Mr. Bratovich served as Principal Scientist in the preparation and implementation of the Middle Fork Project Water Temperature Monitoring Plan, which included stream, reservoir, and meteorological monitoring components. He continues to be engaged in several activities in support of the Federal Energy Regulatory Commission relicensing project, including consulting and coordinating project specific guidelines with the state and federal resource agencies, developing study plans in collaboration with the

political, technical and scientific stakeholders, implementing study plans, analyzing study plan results, and identifying potential mitigation and enhancement measures (based on study plan implementation and evaluation). Mr. Bratovich is a member of the Placer County Water Agency Middle Fork Project Relicensing Strategic Team, which is responsible for the overall strategic planning and implementation of all Middle Fork Project Federal Energy Regulatory Commission relicensing-related activities.

**Sonoma County Water Agency, Potter Valley Federal Energy Regulatory Commission Relicensing Project.** Mr. Bratovich prepared comments on Federal Energy Regulatory Commission's Draft Environmental Impact Statement, "*Protection and Maintenance of Fishery Resources at the Potter Valley Project, California*" and the Final Environmental Impact Statement, "*Proposed Changes in Minimum Flow Requirements at the Potter Valley Project*" on behalf of Sonoma County Water Agency as a requirement of the Federal Energy Regulatory Commission relicensing process. These comments addressed the biologic analysis of the Eel River, including the evaluation methodology and fishery impact assessment proposed in the draft and final environmental impact statements.

Mr. Bratovich provided technical expert consultation regarding instream flow regimes and fisheries and aquatic habitat assessment in the Eel River at the Federal Energy Regulatory Commission Relicensing Workshop in June 1999. As the fisheries expert for the project team, he developed instream flow recommendations to protect Chinook salmon and steelhead in the Eel River, reviewed existing fisheries data and reports, interpreted hydrologic computer model output, developed instream flow regimes, reviewed project documents and reports, prepared comments, and developed responses to comments raised by various state and federal resource agencies and special interest groups.

**Northern California Power Agency, Consulting Services for Trinity River Issues.** Mr. Bratovich provided fisheries biology and aquatic habitat analysis and assessment regarding steelhead and spring-run Chinook salmon escapement spawning surveys, and review of resource agency annual reports for monitoring of these species in relation to the information contained in the Trinity River Environmental Impact Statement, in addition to liaison activities with state and federal resource agency representatives.

## **Expert Witness and Administrative Proceedings**

**Somach, Simmons and Dunn, Klamath Water Rights.** Mr. Bratovich is providing strategic assistance and technical support, including expert witness representation, associated with the Klamath River Water Rights Adjudication. The cases involve: (1) the Klamath River instream flows required for anadromous salmonid passage between the Oregon-California border and Upper Klamath Lake; and (2) the upper Klamath Lake water surface elevations required for five target fish species, including Lost River sucker, shortnose sucker, Klamath largescale sucker, rainbow trout, and Chinook salmon.

**Yuba County Water Agency, Water Rights Extension Petition Hearing.** Mr. Bratovich provided expert written and oral testimony at the 2006 State Water Resources Control Board hearing regarding fisheries issues associated with the petition for extension of the effective date of State Board-ordered long-term instream flow requirements.

**Yuba County Water Agency, Administrative Hearing and Litigation Support.** Mr. Bratovich served as the lead scientific expert witness regarding fisheries and aquatic habitat resources in the lower Yuba River on behalf of the Yuba County Water Agency. In response to requests to increase the instream flow requirements in the lower Yuba River, the State Water Resources Control Board held a series of administrative hearings in 2000. In support of Yuba County Water Agency, Mr. Bratovich led the development of an instream flow pattern based on seasonal hydrologic and biologic conditions. The State

Water Resources Control Board held supplemental hearings in 2003 and Mr. Bratovich served as the principal expert witness during these proceedings regarding fish resource issues and instream flow and temperature recommendations for the Yuba River. Mr. Bratovich also prepared a declaration related to Yuba County Water Agency's petition for reconsideration.

**Mammoth Community Water District.** Mr. Bratovich provided expert written and oral witness testimony at the SWRCB hearing regarding inflow requirements for brown and rainbow trout in Mammoth Creek located in Mono County, California on behalf of the Mammoth Community Water District. Testimony included discussion of physical habitat (weighted usable area), fish population dynamics, hydrologic interpretation and facilities operation with respect to water rights issues. Mr. Bratovich also prepared additional testimony for presentation before Mono County Superior Court.

**Northern California Power Agency, Trinity River Litigation Issues.** Mr. Bratovich prepared expert witness testimony in advance of litigation regarding the resources of the Trinity River addressing flow, water temperature, water quality, fisheries and aquatic habitat assessment, and policy analysis. Mr. Bratovich prepared declarations regarding these issues on behalf of the Northern California Power Agency.

#### **Additional Administrative Proceedings Experience**

In addition to the above-listed Expert Witness and Administrative Proceedings experience, Mr. Bratovich has held lead coordination roles for the following liaison technical teams and working groups, and Environmental Impact Report/Environmental Impact Statement Certification Public Hearings:

- Technical Expert on the Lower American River and Delta Tributaries Technical Team, Anadromous Fish Restoration Program, Central Valley Project Improvement Act, 1995 - 1996.
- Technical Expert on the Multi-Agency Lower American River Operations Working Group, ongoing.
- Participated in the Federal Energy Regulatory Commission Relicensing Workshop, June 1999, on behalf of the Sonoma County Water Agency.
- Placer County Water Agency/Bureau of Reclamation American River Pump Station Project Environmental Impact Statement/Environmental Impact Report Certification Public Hearing, October 2002.
- City/County Office of Metropolitan Water Planning, Sacramento Water Forum, Water Forum Proposal Environmental Impact Report Certification Public Hearing, December 1999
- City of Sacramento Fish Screen Replacement Project Initial Study/Mitigated Negative Declaration Adoption Public Hearing, November 1999.
- Placer County Water Agency/Northridge Water District Groundwater Stabilization Project Environmental Impact Report Certification Public Hearing, November 1999.
- Bureau of Reclamation, Sacramento County Water Agency, San Juan Water District, and City of Folsom P.L. 101-514 Central Valley Project Water Service Contracts Environmental Impact Statement/Environmental Impact Report Certification Public Hearing, April 1999.

- ❑ Bureau of Reclamation, California Department of Fish and Game, Corps of Engineers, and Glenn-Colusa Irrigation District Hamilton City Pumping Plant Fish Screen Improvement Project Environmental Impact Statement/Environmental Impact Report Certification Public Hearing, May 1998.
- ❑ Bureau of Reclamation and Sacramento Area Flood Control Agency Folsom Dam and Reservoir Interim Reoperation Environmental Impact Report/Environmental Assessment Certification Public Hearing, December 1994.

### **Fish Screen and Passage Projects**

**Rubicon Estate, Bear Canyon Creek Fish Passage Project.** Mr. Bratovich was the Principal-in-Charge for the preparation of an Environmental Assessment/Initial Study, with requisite Endangered Species Act compliance documentation, for fish passage improvements on Bear Canyon Creek, located on the Rubicon (formerly Niebaum-Copola) Estate Winery in the Napa Valley.

**Natomas Central Mutual Water Company, American Basin Fish Screens and Habitat Improvement Project.** Mr. Bratovich compiled preliminary biological information related to fisheries for use in a Biological Resources Report. The information was used to evaluate the relative benefits between various alternative plans for consolidating and screening Natomas Central Mutual Water Company's various diversions in and around the Sacramento River. Mr. Bratovich prepared the fisheries resources section of the Biological Resources Report, which focused specifically on three project areas including the Sacramento River, Natomas Cross Canal, and the Internal Canal System. Mr. Bratovich also provided technical review of the Fish Screen Technical Report and coordinated its activities, findings, and issues identification through attendance at project status coordination meetings and ongoing interactive dialogue with the project team.

**City of Sacramento, Sacramento River Fish Screen Replacement Project.** As Principal Scientist, Mr. Bratovich completed the Environmental Assessment/Initial Study for the improvement of the fish screen at the City of Sacramento on the Sacramento River. Although the fish screen was in accordance with screen criteria when built, the screen was not in compliance with current California Department of Fish and Game and National Marine Fisheries Service screening criteria. HDRISWRI coordinated with the resource agencies for the screen design and prepared all environmental documentation for the screen improvements. Analysis included evaluation of impacts to resources such as fisheries and aquatic habitat, recreation, water quality, and terrestrial vegetation and wildlife.

**Glenn-Colusa Irrigation District, Hamilton City Pumping Plant Fish Screen Improvement Project.** Mr. Bratovich was Principal-in-Charge for the successful completion of an Environmental Impact Report/Environmental Impact Statement for implementation of new screening facilities at the Hamilton City Pumping Plant on the Sacramento River. Mr. Bratovich managed all aquatic habitat and fisheries impacts analyses, which focused on the state and federally endangered winter-run Chinook salmon. He acted as client liaison for Technical Advisory Committee meetings, field surveys, and interpretation of engineering alternatives.

**California Department of Water Resources, Oroville Facilities Federal Energy Regulatory Commission Relicensing Project.** Mr. Bratovich led the development of several methodologies for evaluating Chinook salmon, steelhead, and green sturgeon passage above potential impediments in the lower Feather River, and above Oroville Dam. He developed a methodology to evaluate the effects of Oroville Facilities operations on Chinook salmon passage above potential impediments in the lower Feather River, and two methodologies for evaluating passage upstream of Oroville Dam.



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Mr. Bratovich led a team to determine the potential for passage above potential barriers in the tributaries upstream of Lake Oroville, and to evaluate the biological and economic feasibility of a program to transport adult Chinook salmon and steelhead above Oroville Dam.

**City of Sacramento, American River Intake Expansion Project.** Mr. Bratovich served as the Principal Scientist in the expansion of the E.A. Fairbairn water treatment plant intake structure project. He coordinated with the National Marine Fisheries Services, U.S. Fish and Wildlife Service, and California Department of Fish and Game in screen design and environmental compliance aspects of the project.

### **Marine Fisheries Investigations**

**Playa Capitol Company LLC, Ballona Freshwater Wetlands Restoration Project Operations and Maintenance Manual.** Mr. Bratovich was the Principal-in-Charge for the preparation of an Operations and Maintenance Manual for the Ballona Freshwater Wetlands Restoration Project in Los Angeles County. The project involves the restoration of a coastal freshwater marsh and riparian system as mitigation for a large residential, commercial, and light industrial development. Integrated various biological, flood control, and water quality parameters of the project into a manual to be used by Playa Vista staff and future homeowner/business associations to manage and maintain the wetland system.

### ***Non-HDR | SWRI Project Experience***

**Grant County Public Utility District, Mid-Columbia River Habitat Conservation Plan.** Participated in the preparation of a Habitat Conservation Plan for anadromous salmonids for the mid-Columbia River, which included extensive consultation with state and federal resource agency representatives.

**Marin Municipal Water District, Lagunitas Creek Instream Flow Study.** Mr. Bratovich designed and conducted biological investigations to determine instream flow requirements of coho salmon and steelhead trout in Lagunitas Creek, emphasizing identification of spawning habitat, habitat availability, sediment composition and hydraulic-sediment interactions. In addition, he participated in the identification of erosion control opportunities, and consideration of large hydraulic roughness (boulders) elements as coho salmon and steelhead habitat enhancement measures.

**Sacramento County, Lower American River Aquatic Ecology Investigation.** Mr. Bratovich was responsible for the experimental design, implementation, and report preparation of a multi-faceted aquatic ecology investigation of the lower American River. Investigative elements included habitat classification and mapping, application of the Instream Flow Incremental Methodology to determine instream flow needs, estimation of Chinook salmon abundance and distribution by habitat type, microhabitat suitability data acquisition, juvenile salmon emigration data acquisition, and water temperature monitoring.

The results of these investigations were used by Mr. Bratovich in his service as a technical expert on the Alameda County Superior Court, Lower American River Technical Advisory Committee associated with the retained jurisdiction in the case of the *Environmental Defense Fund et al. versus East Bay Municipal Utility District*.

**Project Manager, Marin Municipal Water District.** Developed and conducted field studies to evaluate the spatial and temporal distribution of coho salmon smolts, and their prey base (Mysid shrimp) in Tomales Bay, California.

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**Project Manager, Vogt & Associates, Inc.** Identified potential impacts of a sand dredging operation on the aquatic resources and habitat in the Sacramento-San Joaquin Delta. Project participation included coordination and consultation with local, state, and federal agencies.

**Senior Scientist, Grey & Osborne, Inc.** Participated in drogue and dye studies to evaluate tidal current patterns near a sewage effluent outfall in southern Puget Sound, Washington.

**Senior Scientist, Confidential Client.** Participated in a Natural Resource Damage Assessment (NRDA) survey to estimate the extent of insular ecosystem inundation resulting from an oil spill in Tampa Bay, Florida.

**Senior Scientist, ANATEC Laboratories, Inc.** Conducted hydroacoustic pelagic fish sampling in San Pablo Bay, California, and benthic fish and macroinvertebrate data analysis and report preparation.

**Biological Assistant, National Marine Fisheries Service.** Conducted research aboard vessels in the Bering Sea and in the Pacific Ocean off the Washington and Oregon coasts. Obtained experience in trawl-fishing operations, marine fish, mollusk and crustacean identification, demersal resource stock assessment, and population estimation procedures.

**Fisheries Technician, Fisheries Research Institute, University of Washington.** Participated in studies to determine the response of chum salmon fry to increased suspended sediment concentrations resulting from industrial dredging in Hood Canal, Washington.

**Commercial Fisherman.** Purse-seined pink salmon around Kodiak Island, Alaska, and gill-netted sockeye salmon in Bristol Bay, Alaska.