
SOPHIA PHILIP UNGER, PH.D.

EXPERTISE: Ecological analyses for water resources projects, fisheries, water quality, computer modeling

TOTAL YEARS OF EXPERIENCE: 35

KEY QUALIFICATIONS:

Dr. Unger is an aquatic ecologist and fisheries biologist with 35 years of experience, emphasizing environmental impact assessment and permitting, aquatic and fisheries ecology, fisheries modeling, limnology, water quality, and statistical sampling design. Her technical skills include computer modeling, hydroacoustics, statistics, and sampling for fisheries, plankton, macroinvertebrates, and water quality. Dr. Unger has worked on a wide range of aquatic ecosystem issues in rivers and streams, lakes and reservoirs, estuaries, and marine systems in California, such as impacts of water development and hydropower projects, flow and water quality effects on fish habitat, lake thermal stratification and zooplankton, effects of water levels on reservoir fish habitat, use of benthic macroinvertebrates as indicators of biotic integrity, fish entrainment, habitat restoration, and artificial kelp reefs. She has also worked on fisheries issues in other regions, including shrimp stock abundance in Texas bays, acid precipitation impacts in small Adirondack Mountains lakes, salmonid forage abundance in the Laurentian Great Lakes, and population dynamics and feeding ecology of fish in a South American Lake. Dr. Unger has successfully managed aquatic impact assessments for Endangered Species Act consultation, Section 401 certification, NPDES permitting, FERC relicensing, and CEQA/NEPA documents for projects in the Sacramento-San Joaquin Delta/Estuary and many rivers, streams and reservoirs in California. She worked successfully with staff of many regulatory agencies.

EDUCATION:

Doctor of Philosophy in Aquatic Ecology, University of Colorado, Boulder, Colorado, 1985

Bachelor of Arts in Biology, Harvard University, Cambridge, Massachusetts, 1970

Continuing Education: SAS Institute Courses: Categorical Data Analysis; Biosonics Course: Hydroacoustics; U.S. Fish and Wildlife Service: Expert Witness Course; Hazardous Waste Operations and Emergency Response; Advanced Open Water Scuba Diving

Professional License: Certified Fisheries Scientist (American Fisheries Society); Certified Expert Witness; Hydroacoustic Assessment; Hazardous Waste Operations and Emergency Response; PADI Certified SCUBA

Professional Societies: American Fisheries Society

EXPERIENCE RECORD:

San Joaquin River Restoration Program, California, U.S.A.

Client: U.S. Bureau of Reclamation

Preparing fisheries resources assessments for EA, BA and PEIS/R of the Upper San Joaquin River, Millerton Lake and the Delta. (2009)

WaterWise Consulting - Fisheries, Aquatic Ecology, and Water Quality

Delta Smelt Population Assessment and Analysis, California, U.S.A.

Client: Metropolitan Water District of Southern California

Developed stage-structured computer model to simulate population dynamics of Delta smelt and evaluate effects of alternative water management regimes on the species. Analyzed environmental data to improve model accuracy and estimate survival and growth rates of Delta smelt and effects of environmental factors. (2006-2008)

Upper San Joaquin Storage Investigation, California, U.S.A.

Client: U.S. Bureau of Reclamation

Evaluated opportunities and constraints for aquatic biological resource and water quality issues of alternative measures to increase storage in the Upper San Joaquin River Basin. Developed Millerton Lake habitat model to quantify effects of water levels on fish spawning and rearing habitat. Completed aquatic biology and water quality sections for Initial Alternatives Information Report and Plan Formulation Report. (2001-present)

Borel Hydropower Project Relicensing, California, U.S.A.

Client: Southern California Edison

Managed aquatic biology, water quality and limnology issues for FERC relicensing and Section 401 certification of the Borel Hydropower Project on the Kern River and Lake Isabella in the Sierra Nevada foothills and completed sections of the license application evaluating effects of project operations on limnology, water quality, entrainment, fish populations, and macroinvertebrate communities in Lake Isabella and the Kern River. Designed, managed and implemented additional information request studies to evaluate use of DIDSON camera remote sensing technology to quantify fish populations, monitor and model water temperatures in the Kern River, and conduct fish rescue operations during canal dewatering events. (2000-present).

Lake Almanor Water Release Alternatives Assessment, U.S.A.

Client: Plumas County Flood Control and Water Conservation District

Evaluated effects of increased cold-water releases from Lake Almanor on the fisheries in the lake. Reviewed available limnological modeling studies and permitting documents to assess effects of increased releases on volume of cold, well-oxygenated habitat required for cold water fisheries. (2007)

Sacramento Deep Water Ship Channel Fish Passage Facilities Plan, California, U.S.A.

Client: U. S. Bureau of Reclamation

Task manager for feasibility assessment to investigate use of ship lock technology to provide fish passage for Delta facilities. Supervised fieldwork, including netting and fish identifications, and operated hydroacoustic system to monitor fish movements. Analyzed hydroacoustic and fisheries data and prepared portions of final report. The information from this project is provided to the Delta Cross Channel/Through Delta Facilities team and CALFED. (2003-2006)

Oroville Facilities Relicensing, California, U.S.A.

Client: California Department of Water Resources

Consulting team technical lead for water quality. Prepared and implemented studies designed to investigate effects of the Oroville Project on water quality and fisheries in Lake Oroville and the Feather River, developed measures to enhance fisheries and water quality, including habitat restoration, and completed water quality section of the PDEA and the Biological Assessment for NMFS. (2001-2005)

Borel Hydropower Project NPDES Permit, California, U.S.A.

Client: Southern California Edison

Designed, implemented, managed and completed study to assess effects of copper sulfate treatments to control algae in the Borel Project Canal on the benthic macroinvertebrate community of the Kern River downstream of the Borel Powerhouse. Developed study design and NPDES permit requirements in consultation with State Water Resources Control Board and California Department of Fish and Game. (2004-2005)

State Water Resources Control Board Periodic Review of 1995 Bay Delta Plan, California, U.S.A.

Clients: San Joaquin County, Stockton East Water District, Central Delta Water Agency, and South Delta Water Agency

Conducted literature reviews and fisheries analyses on effects of San Joaquin River flows and Delta exports, and prepared presentations for the State Water Resources Control Board's Public Workshop regarding plan amendments or revisions of the 1995 Bay Delta Plan. (2005)

Pleasant Grove Verona Mutual Water Company Biological and Cultural Assessments for Water Diversion/Fish Screen, California, U.S.A.

Client: Pleasant Grove Verona Mutual Water Company

Project manager for biological assessment and cultural resources assessment of CALFED-sponsored project to construct a new water diversion with fish screen on the Sacramento River. Managed ESA consultation with NMFS and U.S. Fish and Wildlife Service regarding fisheries and wildlife issues and developed mitigation measures to minimize project impacts. Submitted report on findings to NMFS. (2001-2002)

Project No. 184 Hydropower Relicensing, California, U.S.A.

Client: Eldorado Irrigation District

Managed aquatic biology and water quality issues for FERC relicensing and Section 401 certification of Project No. 184, a hydropower project in the Sierra Nevada, and completed sections of the license application evaluating effects of project operations on fish and plankton populations of high altitude storage reservoirs and on fish and macroinvertebrate communities of the project area streams. (1998-2000)

Alternatives Analysis for Reconfiguring Italian Slough, California, U.S.A.

Client: California Department of Water Resources

Project manager for an environmental impacts assessment of alternative reconfigurations of a Delta slough affected by construction of a new Clifton Court Forebay intake for the California Department of Water Resources (DWR), the U.S. Bureau of Reclamation and CALFED. Developed habitat restoration options to complement the slough reconfigurations. Submitted report on findings to DWR. (2000)

Interim South Delta Project, California, U.S.A.

Client: California Department of Water Resources

Managed aquatic resources issues for EIR/EIS for the Interim South Delta Project and evaluated effects of flow control structures and changes in State Water Project operations on fish of the Sacramento-San Joaquin Delta. Completed the Aquatic Resources chapter for the Draft EIR/EIS. ESA consultation with U.S. Fish and Wildlife Service, NMFS and the California Department of Fish and Game. (1995-1999)

Regional Strategy for Managing the Placement of Dredged Materials in the San Francisco Bay Region, California, U.S.A.

Client: U.S. Environmental Protection Agency

Managed aquatic biological resources issues for Draft EIS/EIR and completed section of EIS/EIR evaluating effects of placing dredge materials in the bay. (1996)

Proposed CALFED Solutions Database, California, U.S.A.

Client: CALFED

Project manager for preparation of a comprehensive database of proposed solutions to the problems of the Sacramento-San Joaquin Delta for the CALFED program. (1996)

Habitat Restoration Modeling, California, U.S.A.

Client: Bay Delta Modeling Forum

Organized workshop on habitat restoration modeling. (1996)

Central Valley Improvement Act EIR/EIS, California, U.S.A.

Client: United States Bureau of Reclamation

Completed reports on delta smelt, longfin smelt, and Sacramento splittail as part of a programmatic EIS/EIR for the Central Valley Project Improvement Act. Developed a computer model for quantifying salinity habitat of estuarine species. (1993-1995)

Tres Pinos Creek Steelhead Trout Assessment, California, U.S.A.

Client: Paicines Quarry

Surveyed fish species and habitat in Tres Pinos Creek, San Benito County, as part of informal ESA consultation with NMFS to evaluate habitat quality for steelhead and assess potential effects of gravel quarry activities on the species. Submitted report on findings to NMFS. (2004)

Pacific Gas and Electric Company Hydropower Divestiture EIR, California, U.S.A.

Client: Public Utilities Commission

Assessed impacts on aquatic biological resource issues in southern Sierra Nevada foothill streams for EIR to evaluate transfer of ownership of Pacific Gas and Electric's hydropower projects. (2000)

San Clemente Mitigation Kelp Reef EIR, California, U.S.A.

Client: California State Lands Commission

Managed preparation of biological resources section of EIR for artificial kelp reef project near San Clemente and completed section of EIR evaluating effects of reef on existing sand-bottom and kelp reef communities. (1997-1999)

Avian Use of Proposed Kenetech and Cares Wind Farm Sites in Klickitat County Washington, California, U.S.A.

Client: R.W. Beck

Prepared sampling design, conducted statistical analyses, and wrote impacts section for an EIR to assess impacts of wind turbines on raptor populations. (1994)

Constructed Wetlands Demonstration Project, California, U.S.A.

Client: Sacramento Regional Wastewater Treatment Plant

Helped develop the experimental and sampling design for constructed wetlands demonstration project. (1994)

Fisheries Study of Alternative to Increase Use of Existing Russian River Projects, California, U.S.A.

Client: Sonoma County Water Agency

Prepared environmental assessment of the effects on salmonids and other fishes of water diversion projects in the Russian River and wrote draft report of results. (1993)

Mono Lake EIR, California, U.S.A.

Client: State Water Resources Control Board

Evaluated effects of changes in surface elevation of Mono Lake on productivity of brine shrimp and alkali fly as part of an EIR for amendment of appropriative water rights in the Mono Lake Basin, and participated in water rights hearings. Completed chapters on Mono Lake limnology for EIR. Statistically analyzed econometric data to evaluate economic impacts for EIR. (1992-1993)

Delta Smelt: General Ecology and Effects of Contra Costa Water District Diversions, California, U.S.A.

Client: Contra Costa Water District

Prepared report on delta smelt distribution, abundance, and life history requirements and diversion impacts. (1992-1993)

Yuba River Fish Screen Evaluations, California, U.S.A.

Client: Yuba River Water Agency

Reviewed and critiqued studies and sampling designs to determine salmon smolt mortality at fish screens on the Yuba River. (1992)

Haypress Hydroelectric Project, California, U.S.A.

Client: State Water Resources Control Board

Statistically analyzed a 7-year fish population database to determine impacts from diversions on resident rainbow trout in Haypress Creek, a Yuba River tributary stream, as part of water rights conditions. (1992)

Clinical Trials of Medical Devices, Texas, U.S.A.

Client: Intermedics Orthopedics, Inc.

Evaluated experimental design of clinical trials and developed appropriate statistical analyses for obtaining U.S. Food and Drug Administration approval of medical devices. (1991-1992)

Texas Commercial and Recreational Fisheries, Texas, U.S.A.

Client: Texas Parks and Wildlife Department, Coastal Fisheries Branch

Designed sampling programs to monitor fish and shellfish stocks and to estimate commercial and recreational landings in Texas coastal waters. (1988-1991)

Hydroacoustics Laboratory, New York and Maryland, U.S.A.

Client: University of Maryland and State University of New York

Supervised quantitative hydroacoustics research laboratories for fisheries studies in the Laurentian Great Lakes and Chesapeake Bay. (1985-1988)

Hydroacoustic Surveys of Fish and Zooplankton in Small Acid Lakes, New York, U.S.A.

Client: State University of New York

Project manager for a study in the Adirondack Mountains and northern Wisconsin to evaluate hydroacoustic methodologies for monitoring fish populations in lakes affected by acid precipitation. (1985)

PUBLICATIONS AND PRESENTATIONS

- Unger, P.A., C. Nations and R.Sitts. 2008. Survival rate of delta smelt and longfin smelt larvae before and during the POD years. CALFED Science Conference. Sacramento, CA
- Unger, P.A., R.Sitts, C. Nations and B. Adams. 2008. Survival rate of delta smelt larvae before and during the POD years. Annual Workshop of the Interagency Ecological Program. Asilomar, CA
- Unger, P. A. 1996. Modeling delta smelt salinity habitat. 1996 Delta Smelt Interagency Workshop. Concord, CA.
- Unger, P. A. 1995. Quantifying optimal salinity habitat in the Sacramento-San Joaquin Delta/Estuary. Annual Meeting of the CALNEVA Chapter of the American Fisheries Society. Napa, CA.
- McEachron, L. W., G. C. Matlock, C. E. Bryan, P. Unger, T. J. Cody, and J. H. Martin. 1994. Winter mass mortality of animals in Texas bays. *Northeast Gulf Science* 13:121-138.
- Unger, P. A. 1994. Quantifying salinity habitat of estuarine species. Newsletter of the Interagency Ecological Program for the Sacramento-San Joaquin Estuary. Autumn 1994:7-10.
- Matlock, G. C., L. W. McEachron, J. A. Dailey, P. A Unger, and P. Chai. 1993. Short term hooking mortality of red drum and spotted seatrout caught on single barb and treble hooks. *North American Journal of Fisheries Management* 13:186-189.
- Brandt, S. B., D. M. Mason, E. V Patrick, R. L. Argyle, L. Wells, P. A. Unger, and D. J. Stewart. 1991. Acoustic measures of the abundance and size of pelagic planktivores in Lake Michigan. *Canadian Journal of Fisheries and Aquatic Sciences* 48:1-15.
- Unger, P. A., and W. M. Lewis, Jr. 1991. Population ecology of a pelagic fish, *Xenomelaniris venezuelae* (Atherinidae), in Lake Valencia, Venezuela. *Ecology* 72:440-456.
- Unger, P. A., and S. B. Brandt. 1989. Seasonal and diel changes in sampling conditions for acoustic surveys of fish abundance in small lakes. *Fisheries Research* 7:353-366.
- Unger, P. A., and W. M. Lewis, Jr., and D. H. McClearn. 1984. Nonvisual feeding in a visual planktivore, *Xenomelaniris venezuelae*. *Oecologia* 64:280-283.
- Unger, P. A., and W. M. Lewis, Jr. 1983. Selective predation with respect to body size in a population of the planktivorous fish, *Xenomelaniris venezuelae* (Atherinidae). *Ecology* 64:1136-1144.
- Unger, P. A. 1978. The crayfishes (Crustacea: Cambaridae) of Colorado. *Natural History Inventory of Colorado* 3:1-30.
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EMPLOYMENT HISTORY:

2006 to present **WaterWise Consulting, LLC**
Owner

2004 to 2006 **Philip A. Unger, Environmental Consulting**
Owner

2001 to 2005 **MWH Energy and Infrastructure**
Senior Consultant

1997 to 2001 **Resource Insights**
Senior Scientist

1995 to 1997 **ENTRIX, Inc.**
Senior Project Scientist

1992 to 1995 **Jones & Stokes Associates, Inc.**
Environmental Specialist

1991 to 1992 **Intermedics Orthopedics, Inc.**
Statistician

1988 to 1991 **Texas Parks and Wildlife Department, Coastal Fisheries Branch**
Research Specialist

1987 to 1988 **University of Maryland, Chesapeake Biological Laboratory, Postdoctoral Research**
Postdoctoral Research Associate

1985 to 1987 **State University of New York, College of Environmental Science and Forestry**
Postdoctoral Research Associate

1984 to 1985 **Western Environmental Analysts**
Research Assistant

WaterWise Consulting – Fisheries, Aquatic Ecology, and Water Quality
