

Middle Canyon

Middle Canyon had a very small amount of intermittent flow at its lower end. Water in the lower part of Middle Canyon appeared to be generally insufficient and seasonal, and therefore does not provide good fish habitat. A barrier very near the canyon mouth precludes fish movement upstream to the intermittent area, and even during high river flows, only a very short section of the stream at the canyon mouth would be usable by fish as a refugia area.

Castaic Creek

Castaic Creek is known to occasionally contain aquatic habitat for fish. When flow is released from Castaic Lake upstream or when rain events maintain surface flow for an extended period of time, adequate aquatic habitat exists to support various fish species found in the Santa Clara River watershed. Surface flow is intermittent and the creek eventually goes dry either stranding fish or receding at a slow rate where fish can migrate downstream to the Santa Clara River.

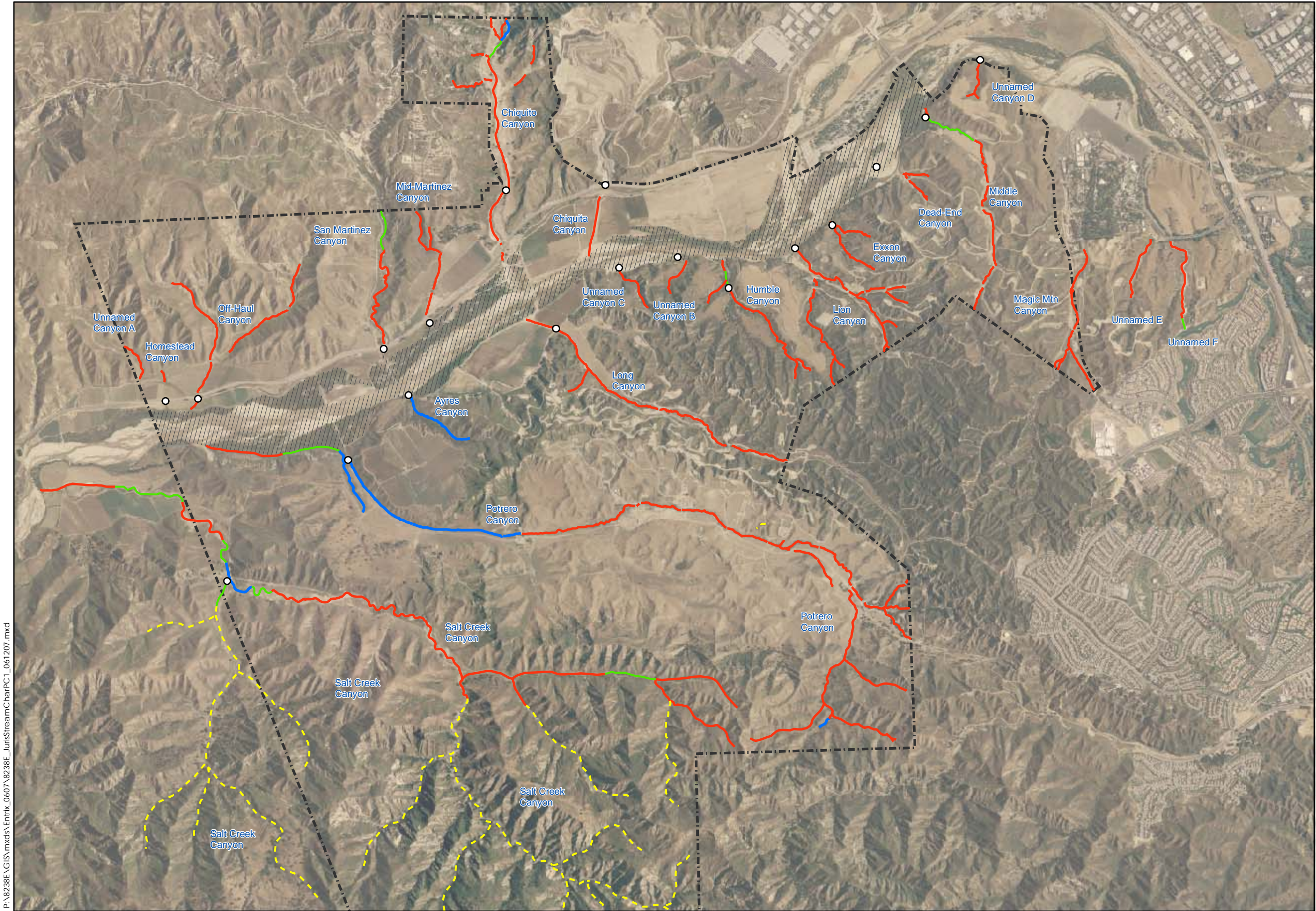
Hasley Canyon

Hasley Canyon, a tributary to Castaic Creek, had relatively good aquatic habitat in the concrete channel portion. Flows here were high enough to support fish, and excellent riparian canopy cover existed. However, the channel is inaccessible by fish moving upstream due to the large rip-rap barrier at the base of the concrete channel. Downstream of the barrier, flows decrease quickly and vegetation and instream structure is inconsistent. During periods of higher flows and when Castaic Creek is flowing, fish may utilize this lower section temporarily.

Unnamed Canyon F

Unnamed Canyon F had a very small amount of water present at its headwater area. Although we did observe numerous western toad juveniles and larvae in this area, there was little habitat for fish. The pooled water in the outlet structure likely provided the breeding area for the western toads, but the concrete and rock bottom would not provide any breeding area for fish. The flow below the outlet structure was very shallow and slow, and disappeared subsurface after a short distance, offering no suitable fish habitat. Furthermore, flow from the outlet appeared to be dependant on the upstream golf course and residential area runoff, suggesting the flow here is likely intermittent throughout the year. The upper portion of this stream, including the outlet structure, is inaccessible to fish moving upstream from the river due to the channelized barrier along Magic Mountain downstream.

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LEGEND

○ Fish Passage Barrier

Stream Characteristics

- Ephemeral
- Intermittent
- Perennial
- Unknown

Resource Management Development Plan

Santa Clara River CDFG Jurisdiction

Location	Type	Length by Type (ft)
Ayres Canyon	PER	2,464.4
Chiquita Canyon	EPH	1,849.8
	EPH	10,959.1
	INT	643.1
	PER	721.4
Chiquito Canyon		12,323.6
Dead-End Canyon	EPH	1,936.4
Exxon Canyon	EPH	3,542.7
Homestead Canyon	EPH	391.0
	EPH	5,922.0
	INT	574.6
Humble Canyon		6,496.5
Lion Canyon	EPH	11,952.8
Long Canyon	EPH	10,579.8
Magic Mtn Canyon	EPH	6,130.1
	EPH	5,925.2
	INT	1,670.2
Middle Canyon		7,595.5
Mid-Martinez Canyon	EPH	4,350.8
Off-Haul Canyon	EPH	8,238.3
	EPH	32,749.4
	INT	1,751.2
	PER	8,855.3
	UNK	370.7
Potrero Canyon		43,726.6
	EPH	25,034.2
	INT	6,788.3
	PER	1,439.7
	UNK	75,918.6
Salt Creek Canyon		109,180.8
	EPH	3,910.1
	INT	1,259.8
San Martinez Canyon		5,170.0
Unnamed Canyon A	EPH	1,293.7
Unnamed Canyon B	EPH	1,272.5
Unnamed Canyon C	EPH	1,574.1
Unnamed Canyon D	EPH	1,494.6
Unnamed E	EPH	2,020.2
	EPH	2,782.8
	INT	343.4
Unnamed F		3,126.2

APPENDIX F

RESUMES

Discipline/Specialty

- Aquatic Invertebrate Ecology
- Fisheries Biology
- Habitat Assessments and Mapping
- IFIM/PHABSIM
- Limnology
- Salmonid Biology
- Stream and Estuarine Ecology
- Water Quality Assessment
- Environmental Monitoring

Education

- B.S., Fisheries: Humboldt State University, Arcata, CA, 1999

Training/Certifications

- California Department of Fish and Game. Resident Scientific Collecting Permit No. 801293-01
- USFWS Project Permitted Tidewater Goby Specialist in Ventura and Santa Cruz Counties
- Theory and Application of the Physical Habitat Simulation System, Utah State University, May 2002
- Sampling Theory and Design Workshop, Humboldt State University, March 2002
- Aquatic Ecological Assessment Workshop, CDFG, March 2002
- Electrofishing Workshop, AFS and Smith-Root, March 2006

Affiliations

- American Fisheries Society, Oregon and Cal-Neva Chapters since 1998

Summary of Qualifications

Mr. Howard is an interdisciplinary scientist with an emphasis on aquatic studies including fishery habitat assessment and population surveys, fish species identification, fisheries techniques, fish passage assessment, fish and aquatic invertebrate population analysis, water quality assessment, and wildlife population and escapement surveys. Mr. Howard has preformed numerous projects in aquatic habitats ranging from high elevation lakes and streams to coastal estuaries. Mr. Howard has also conducted projects including subsurface soil and groundwater investigations, environmental impact studies, environmental monitoring, and site closure and remediation. Mr. Howard has been involved in permitting large power projects and smaller instream projects throughout California.

Mr. Howard has conducted numerous fish population studies throughout many of the western states. Representative projects include chinook, steelhead and bull trout studies in northern California and Oregon, steelhead studies in central and southern California, various trout species studies in California, Oregon and Idaho, and native fish studies in Oregon and southern California. Mr. Howard has also conducted fish population surveys in southern and central California estuaries for the endangered tidewater goby.

Mr. Howard manages the majority of the aquatic projects in southern California. Proven management skills along with technical expertise with special status aquatic species, instream flow studies and mitigation compliance has been a key factor in the retention of on-call services contracts with several clients in southern California.

Relevant Experience
Fish and Wildlife Studies

McKenzie River Watershed Spring Chinook Population Study - Lane County, Oregon

Mr. Howard conducted chinook salmon spawning surveys, obtained biological samples from spawned-out salmon, collected downstream migrants, monitored fish passage through Leaburg dam, and monitored bull trout migration under the Western Oregon Research and Monitoring Program. Mr. Howard conducted these projects for the Oregon Department of Fish and Wildlife.

Oregon State Elk Population Study - Lane County, Oregon

Mr. Howard managed an initial statewide effort to obtain elk teeth and tissue samples throughout the state of Oregon. This effort was successful and set precedent for future Oregon Department of Fish and Wildlife elk tissue collection efforts.

United Water Conservation District FERC Relicensing Project - Ventura County, California

ENTRIX, Inc. designed multiple studies under agency consultation during the FERC application process. Mr. Howard conducted fish population studies and identified fish species present in Piru Creek below Santa Felecia Dam, within Piru Lake and above the lake in Piru Creek.

United Water Conservation District Steelhead Migration Project - Ventura County, California

ENTRIX, Inc. directed fish passage monitoring and fish rescue consultation involving steelhead on the lower Santa Clara River. Mr. Howard was the lead fisheries biologist for the project. The Vern Freeman Diversion fish passage facility includes a fish ladder, fish screens, and a downstream migrant fish trap. During steelhead migration, facilities at the diversion were inspected for stranded steelhead and resident rainbow trout for relocation to the appropriate habitat. These operations were interim mitigation measures for section 10 incidental steelhead take.

PacifiCorp FERC Relicensing Project - Jackson County, Oregon

ENTRIX, Inc. conducted numerous aquatic studies under agency consultation during the FERC relicensing application process. Mr. Howard analyzed fish population data in the upper Rogue River watershed to estimate salmonid population densities above and below dams.

Moyie River Fish Population Study - Bonner County, Idaho

ENTRIX, Inc. conducted a salmonid relative abundance survey in the Moyie River in Idaho. The survey was performed utilizing four divers at several gas pipeline river crossings. This was conducted in conjunction with past monitoring and a proposed expansion of the pipeline at the crossings in the Moyie River. Mitigation for each crossing consisted of installing Riprap wings to prevent bank Scour and rock-drop structures to form rearing and holding pools.

Ventura County Flood Control Tidewater Goby Project - Ventura County, California

ENTRIX, Inc. served as fisheries professional to the Ventura County Flood Control District during pipe maintenance in the Hueneme drain. A temporary impoundment was placed around the work area which trapped numerous fish including tidewater gobies. Mr. Howard identified fish species within the impoundment and relocated all fish away from the work area.

Ventura County Flood Control Bank Stabilization Project - Ventura County, California

ENTRIX, Inc. served as fisheries professional for Ventura County Flood Control District during a bank stabilization and habitat restoration project on the Sespe River. Mr. Howard was in charge of identifying fish species for relocation outside of the project boundary.

San Clemente Dam Retrofit Drawdown Project - Monterey County, California

ENTRIX, Inc. is conducting annual fish rescues upstream of San Clemente Dam and fish trapping and relocation activities to appropriate habitats downstream of San Clemente Dam for California-American Water Company. Water quality monitoring was also an important part of this project during the drawdown activities. Dissolved oxygen can drop dramatically during these types of projects. Aerators were installed throughout the reservoir to maintain adequate DO levels during the project. A low percentage of steelhead mortalities occurred during this project. Mr. Howard conducted fish rescues and relocations and water quality monitoring during this project. Mr. Howard was one of a few biologists permitted by NOAA Fisheries to conduct electrofishing and fish relocation activities during this project.

Haines Creek Native Fish Population Monitoring and Exotic Species Removal Project - Los Angeles County, California

ENTRIX, Inc. is involved in a multi-year fish population monitoring project on Haines Creek. Haines Creek is one of a few creeks that has sustaining populations of Santa Ana suckers and Santa Ana speckled dace. Numerous exotic species are also found in Haines Creek such as largemouth bass, green sunfish, mosquito fish and crawfish. Sampling is conducted by a 2-pass seining method in 200-meter sample sites.

San Lorenzo River Steelhead and Tidewater Goby Relocation Project - Santa Cruz County, California

ENTRIX, Inc. conducted steelhead and tidewater goby rescue and relocation activities during a bank stabilization project in the tidally influenced reach of the San Lorenzo River. A portadam was constructed around the work area and water was pumped out the impoundment. During fish rescue operations, Mr. Howard discovered the first known tidewater goby in the San Lorenzo River, which prompted further consultation to complete the project. Entrix, Inc. assisted in expediting this consultation process with the USFWS and NOAA Fisheries by monitoring water quality within the impoundment and describing tidewater goby habitat and in the San Lorenzo River.

Habitat Assessment Studies

Habitat Typing Projects - California and Oregon

ENTRIX, Inc. performs numerous habitat typing investigations for multiple clients throughout the United States. Mr. Howard has performed habitat typing field projects in northern California coastal rivers and in mountain streams in southern California and Oregon.

Steelhead Habitat and Passage Assessment - Ventura County, California

ENTRIX, Inc. conducted a steelhead habitat and passage assessment for the City of Ventura to be included in the Ventura River Habitat Conservation Plan. Mr. Howard was the lead fisheries biologist in charge of assessing steelhead habitat on North Fork Matilija Creek. A diversion facility on the Ventura River currently blocks access to headwater steelhead habitat in North Fork Matilija Creek and its tributaries. A fish passage facility is planned for construction in the near future allowing upstream migration to important steelhead habitat in the North Fork Matilija. This habitat assessment quantified spawning and rearing habitat for southern California steelhead trout.

Matilija Creek Steelhead Habitat Evaluation - Ventura County, California

ENTRIX, Inc. conducted a steelhead habitat evaluation for the Matilija Dam Ecosystem Restoration Project. Mr. Howard assisted a project team during this evaluation. The report supplemented the F3 Feasibility Study prepared by the US Army Corps of Engineers and Ventura County Flood Control District. The Matilija Dam project is the largest dam removal and restoration activity ever proposed in California. Restoration will connect endangered southern California ESU steelhead with nearly 50 percent of its historic Ventura River basin spawning and rearing habitat.

Salsipuedes Creek Fish Passage Project - Santa Barbara County, California

ENTRIX, Inc. modified an existing concrete apron to provide for fish passage along Salsipuedes Creek near Lompoc, California. Responsibilities included surveying, conducting site reconnaissance studies, preparing design drawings, permit information, and a grant application, and construction oversight. Mr. Howard assisted the project engineer on anadromous fish passage criteria for the project.

Bioassessment and Invertebrate Studies

Olympic View Sanitary Landfill Wetland Evaluation - Kitsap County, Washington

ENTRIX, Inc. conducted statistical analysis of previously collected data to evaluate relationships between chemical and physical water parameters and the abundance and diversity of macroinvertebrates in a wetland adjacent to the landfill. Stepwise regression analysis attempted to correlate species abundance and richness with water quality and chemistry to assess localized impacts. Mr. Howard conducted this statistical analysis and assisted the project team with the final report.

Santa Clara River Estuary Bioassessment - Ventura County, California

ENTRIX, Inc. designed and conducted this bioassessment study which involved stratified sampling of several estuarine habitats for benthic macroinvertebrates in the Santa Clara River Estuary. Mr. Howard was the lead field biologist on this project. The macroinvertebrate data characterized the assemblage diversity and develops relationships between species abundance, density, richness and microhabitat preferences (grain size, salinity tolerances, etc.). The objective of this study was to support the City and LAWRQCB in the development of defensible site-specific NPDES limits for metals discharged to the estuary.

Big Creek FERC Relicensing Bioassessment Project - Sierra National Forest, California

ENTRIX, Inc. performed this study under agency consultation for the SCE Big Creek FERC relicensing application process. Mr. Howard was a lead biologist on this bioassessment project. The project was conducted in a large portion of the South Fork San Joaquin River watershed. Macroinvertebrate sampling occurred above and below large dams and small diversions to assess Southern California Edison project impacts.

Instream Flow Studies/PHABSIM Modeling

United Water Conservation District FERC Relicensing IFIM Project - Ventura County, California

ENTRIX, Inc. conducted an instream flow study to determine the impacts of Santa Felicia Dam on the steelhead habitat in Piru Creek. Mr. Howard lead a crew comprised of client staff and sub-contractors.

United Water Conservation District FERC Relicensing Steelhead Migration Project- Ventura County, California

ENTRIX, Inc. conducted a migration study on the Santa Clara River downstream of Piru Creek to determine adequate flow releases that would facilitate steelhead upstream migration to Piru Creek.

Ventura River IFIM Project - Ventura County, California

ENTRIX, Inc. conducted this instream flow study to determine the impacts of dams and diversions on the steelhead habitat in the Ventura River. The results of this study will assist in the identification of factors potentially limiting fish populations in the effected reaches of the Ventura River and to determine appropriate minimum instream flows. Mr. Howard conducted the field investigation, PHABSIM Modeling and produced the final report. Instream Flow Incremental Methodology (IFIM) studies in Oregon and California including the Ventura River. These projects use multiple flow regimes in determining fish habitat suitability downstream from dams and diversions.

Matilija Creek IFIM Project - Ventura County, California

ENTRIX, Inc. conducted this instream flow study to determine the impacts of releases from Matilija Dam on Steelhead rearing and spawning habitat from the dam to the Robles Diversion on the Ventura River. The

results of this study will assist in the identification of factors potentially limiting fish populations in the effected reach and to determine appropriate release flows and ramping rates. Mr. Howard conducted the field investigation, data collection, and modeling setup.

PacifiCorp FERC IFIM Project - Jackson County, Oregon

ENTRIX, Inc. conducted this instream flow study to determine the impacts of dams and diversions on fisheries habitat in the upper Rogue River watershed. Mr. Howard assisted in the field investigation and data collection.

Water Quality Studies

Santa Clara River Estuary Metals Translator Study - Ventura County, California

ENTRIX, Inc. conducted a yearlong investigation focused on determining the metals translators for copper, nickel, zinc, and lead in the Santa Clara River Estuary. There are chemical differences between the Ventura Water Reclamation Facilities (VWRF) discharged effluent and the receiving Santa Clara River water. The Metals Translator Study determined what fraction of metals in the VWRF effluent were dissolved in the receiving water, and therefore bioavailable. Mr. Howard was the lead investigator on the Santa Clara River Estuary Metals Translator Study for the City of San Buenaventura.

Big Creek FERC Relicensing Water Quality Project - Sierra national Forest, California

ENTRIX, Inc. conducted a water quality study related to the hydroelectric relicensing of Southern California Edison's Big Creek system in the San Joaquin River watershed. Study sites were selected by ENTRIX and a combined agency working group targeting large reservoirs, small impoundments, and streams below project facilities. Mr. Howard was in charge of multiple sampling teams working throughout the San Joaquin watershed.

Environmental Monitoring

360 Networks Fiber Optics Project - Modoc, Lassen, Tehama, Glenn, Butte, Yuba, and Sutter Counties, California

ENTRIX, Inc. monitored fiber optic installation that occurred within a variety of sensitive habitats including rivers, wetlands, vernal pools, caves, and cultural resource areas. Many species listed under the California and Federal endangered species acts were of special concern on this project. Mr. Howard was the lead environmental monitor on this fiber optics project for the California Public Utilities Commission. No significant environmental impacts, under the adopted environmental mitigation measures, occurred on this project.

Southern Trails Gas Pipeline Project - Riverside County, California

ENTRIX, Inc. monitored fiber optic installation that occurred within a variety of sensitive dessert habitats including rivers, washes, reptile and bird habitats, and cultural resource areas in the Mojave Dessert near Palm Springs, California. Mr. Howard was the Lead Field Coordinator for the California State Lands Commission on this project. The pipeline right-of-way was 8 miles long which crossed numerous washes including the San Gorgonio River. No significant environmental impacts, under the adopted environmental mitigation measures, occurred on this project.

Ventura County Water Protection District Sediment Removal- Ventura County, California

ENTRIX, Inc. monitored a sediment removal and channel maintenance project on Pole Creek in Fillmore, California. Mr. Howard served as fisheries professional and Environmental Monitor to the Ventura County Flood Control District on this project. This creek is a tributary to the Santa Clara River which supports a small population of endangered southern California steelhead trout. Mr. Howard assessed steelhead habitat quality and steelhead migration barriers. Additionally, Mr. Howard monitored construction to eliminate the possibility of project related steelhead impacts.

Ventura County Water Protection District Emergency Instream Restoration Projects- Ventura County, California

ENTRIX, Inc. assisted the County of Ventura during and following the floods events that caused extensive damage to private property, flood control and fish passage facilities, and the agricultural communities throughout Ventura County in 2004 and 2005. Mr. Howard managed 15 projects for the county following the flood events. Mr Howard, along with other ENTRIX biologists permitted to work with local endangered fish species including steelhead and tidewater gobies captured and relocated fish species prior to instream construction activities. Construction monitoring was also conducted to ensure emergency permit compliance and to minimise potential take of endangered species and their habitat.

El Paso Natural Gas Conversion Project- San Bernardino County, California

ENTRIX, Inc. monitored pipeline installation that occurred within a variety of sensitive desert habitats including rivers, washes, reptile and bird habitats, and cultural resource areas near Blythe, California. Mr. Howard was the Lead Field Coordinator for the California State Lands Commission and the BLM on this project. The pipeline right-of-way was 80 miles long. This project had multiple compliance challenges that were identified and managed onsite with oversight by the Lead Field Coordinator and Project Manager. No significant environmental impacts, under the adopted environmental mitigation measures, occurred on this project.

Discipline/Specialty

- Aquatic Ecology
- Fisheries Biology
- Amphibian Biology
- Rangeland Ecology

Education

- B.S., Environmental, Population and Organismic Biology, University of Colorado at Boulder, 2001

Certifications

- California Department of Fish and Game. Resident Scientific Collecting Permit No. 801144-01 (Valid through 6/09)
- Swiftwater Rescue Training, 2008
- Emergency Medical Technician, State of California, 2005
- SCUBA Advanced Open Water Diver, 2006

PROFESSIONAL TRAINING

- Mountain Yellow Legged Frog CDFG inter-regional training, 2001, 2002, 2003
- American Canoe Association Coastal Kayak Instructor Workshop and Examination, 2003
- State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Workshop, 2007

Summary of Qualifications

From his interdisciplinary background in the environmental sciences, Mr. Mulder has a range of experience in ecological studies, including aquatic and terrestrial ecology, fishery habitat assessment and population surveys, amphibian ecology and survey techniques, amphibian habitat restoration, rangeland ecology and monitoring, grazing related erosion and stream bank alteration, high desert and mountain meadow system botany, and invasive plant eradication. Mr. Mulder has led numerous field crews and volunteer groups, and is proficient at planning and executing project design and strategy.

Relevant Experience**Fish and Wildlife**

San Gabriel River Fish Toxicology Survey, Los Angeles County, California

Mr. Mulder has conducted fish surveys for the San Gabriel River Regional Monitoring Program, Annual Fish Toxicology Study. The monitoring program is sponsored by the Los Angeles and San Gabriel Rivers Watershed Council. Captured target fish species through a variety of sampling techniques including gill netting, seining, gigging and hook and line. Samples were used to assess fish toxicology associated with human consumption of fish from the San Gabriel River system.

California Wild Trout, North Central Mountain Region, California

As part of the California Department of Fish and Game's ongoing monitoring on sensitive reaches of river and stream containing wild trout, Mr. Mulder participated in backpack electro-shocking surveys to assess trout population numbers and health in sections of the Truckee River, East Walker River, and Upper Carson River. Mr. Mulder also coordinated volunteer groups assisting in the surveys and educated public observers.

Mountain Yellow Legged Frog Survey, North Central Mountain Region, California

Mr. Mulder served as California Department of Fish and Game crew leader for the north central mountain region of a statewide mountain yellow legged frog survey project. Surveys were conducted high mountain lakes of the Sierra Nevada. Mr. Mulder led a series of biological surveys for amphibians and fish which included visual encounter surveys for amphibians, gill net sampling, fish identification, backpack electro-shocking, otolith collection, fish barrier identification, fish spawning area identification, chitrid fungus inspections on mountain yellow legged frogs, fairy shrimp collection, and terrestrial and aquatic habitat surveys. Mr. Mulder was additionally responsible for the project's data management, fish population analysis, GIS mapping, restoration area identification, and co-presentations of project progress and results.

Exotic Species Removal Project, Big Tijunga Mitigation Project, Los Angeles County, California

Performed removal of exotic fishes, invertebrates, and amphibians in the Haines Creek ponds and in Haines Creek. Efforts included trapping, snorkel surveys, bullfrog gigging, spearfishing, and water quality testing.

Exotic Species Removal Project, San Mateo Lagoon Mitigation Project, Orange County, California

Performed removal of exotic fishes, invertebrates, and amphibians in San Mateo Lagoon and lower San Mateo Creek. Efforts included trapping, seining, bullfrog gigging, water quality testing and surveys for tidewater goby presence/absence.

City of Santa Clarita - Special Status Species Survey and Unarmored Threespine Stickleback Relocation, Los Angeles County, California

Conducted weekly pre-construction surveys for nesting special status and migratory birds. Conducted weekly surveys for sensitive upland reptile and mammal species. Conducted sensitive aquatic species surveys. Performed capture and relocation of federally endangered unarmored threespine stickleback during river diversion activities. Provided consulting for design, construction and implementation of a temporary river diversion channel.

Caltrans Fish Passage Survey, Ventura, Santa Barbara, Los Angeles and San Luis Obispo Counties, California

Conducted habitat and fish passage assessments throughout Ventura, Santa Barbara, Los Angeles and San Luis Obispo County highway systems. Conducted field surveys and analysis of potential fish passage barriers, and inventoried culvert and bridge locations.

Ventura County Watershed Protection District - Lower Santa Paula Creek Biological Assessment, Ventura County, California

Conducted benthic macroinvertebrate sampling in lower Santa Paula Creek using the California stream bioassessment procedure (CSBP) prior to maintenance and sediment removal activities. Sorted and identified all organisms sampled.

Ventura County Watershed Protection District - Doris Drain Repair Fish Rescue and Biological Monitoring, Ventura County, California

Served as fisheries professional to Ventura Watershed Protection District during riprap repair activities at Doris drain. Rescued, identified and relocated fish from construction area. Provided biological monitoring for construction activities and performed water quality sampling.

Ventura County Watershed Protection District - Hueneme Drain Tidewater Goby Project, Ventura County, California

Served as fisheries professional to Ventura Watershed Protection District during pipe maintenance activities in the Hueneme drain. A temporary impoundment was placed around the work area that trapped numerous fish including tidewater gobies. Responsible for identifying fish species within impoundment and relocated all fish away from work area.

City of Santa Barbara - Tidewater Goby Rescue, Laguna Creek Tide Gate Project, Santa Barbara County, California

ENTRIX, Inc. conducted tidewater goby rescue and relocation activities during a tide gate maintenance project in the tidally influenced reach of Laguna Creek. An aqua-dam was constructed around the work area

and water was pumped out of the impoundment. Mr. Mulder, in conjunction with other ENTRIX, Inc. scientists, rescued numerous tidewater gobies. Additionally, Mr. Mulder identified and rescued numerous individuals of nine other fish species.

Tidewater Goby Presence/Absence Survey, Pismo Creek, San Luis Obispo County, California

ENTRIX, Inc. conducted presence/absence surveys, for federally endangered tidewater goby, in Pismo Creek. Surveys were performed for an analysis of potential impacts from installation of a proposed oil field wastewater outfall system. Mr. Mulder assisted in conducting these presence/absence surveys and identifying the fish species present in the creek and the lagoon area.

Tidewater Goby Presence/Absence Survey, Las Flores Canyon, Los Angeles County, California

ENTRIX, Inc. conducted presence/absence surveys, for federally endangered tidewater goby, in the estuary of Las Flores Canyon. Surveys were performed for an upcoming creek and estuary rehabilitation project. Mr. Mulder assisted in conducting these presence/absence surveys and identifying the fish species present.

Tidewater Goby Presence/Absence Survey, Santa Clara River Estuary, Ventura County, California

ENTRIX, Inc. conducted presence/absence surveys, for federally endangered tidewater goby, in the estuary of the Santa Clara River. Surveys were performed for an analysis of potential impact of removing a current wastewater treatment plant outfall. Mr. Mulder assisted in conducting these presence/absence surveys and identifying the fish species present.

Golden Trout Habitat Assessment, Kern County, California

Mr. Mulder conducted stream condition inventory surveys in the Golden Trout Wilderness of California. These surveys were performed as part of an ongoing monitoring effort to assess riparian area grazing impact on golden trout habitat, stream bank stability, riparian vegetation, and stream geomorphology. Mr. Mulder participated in this project for the United States Forest Service.

Permitting

Rangeland Monitoring and Permit Compliance, Inyo County, California

Mr. Mulder performed an array of rangeland monitoring and survey techniques for United States Forest Service grazing permit compliance, and for a NEPA permitting process. As lead field technician, Mr. Mulder conducted toe-point surveys to assess vegetation populations, conducted utilization surveys on riparian and upland vegetation, contributed to inter-disciplinary team assessments of proper functioning conditions for lentic and lotic systems, performed watershed analysis, and assessed aspen stand health and risk.

Invasive Species Management

Caltrans San Mateo Creek and Lagoon, Exotic Removal Project, Orange County, California

Mr. Mulder assisted Entrix, Inc. senior staff in the management of and conduction of an exotic species eradication project. Species targeted included non-native fishes, crustaceans, and bullfrogs. Methods utilized included spearfishing, night gigging, trapping, seining, and snorkel surveys. Additionally, tidewater goby surveys were performed in the creek and lagoon.

Big Tijuana Wash Ponds, Exotic Removal Project, Los Angeles County, California

Mr. Mulder assisted Entrix, Inc. senior staff in the management of and conduction of an exotic species eradication project in the Big Tijuana Wash Ponds for Los Angeles County Parks. Species targeted included

non-native fishes, crustaceans, and bullfrogs. Methods utilized included spearfishing, night gigging, trapping, and snorkel surveys.

Bull Thistle Removal Project, Inyo County, California

In order to treat several infestations of non-native bull thistle on federal land, Mr. Mulder served as Project Leader in directing volunteer and co-worker teams to perform eradication. The teams continued ongoing treatment of several known infestations, and initiated an ongoing treatment plan for a large, previously unknown and untreated infestation. Mr. Mulder organized teams, set field objectives and strategy, supervised removal, and prepared a final report of the bull thistle removal project for submittal to the United States Forest Service.

Employment History

- ENTRIX, Inc., Assistant Staff Scientist, 2006 - present
- United States Department of Agriculture – Forest Service, Inyo National Forest, Biological Science Technician, May 2006 - October 2006
- Paddle Sports of Santa Barbara, Manager/Head Guide/Head Instructor, March 2003 - May 2006
- California Department of Fish and Game, Scientific Aid, May 2001 - August 2003

Discipline/Specialty

- Ichthyology
- Fishery Biology
- Estuarine Biology

Education

- Ph.D., Department of Biology, Florida State University, Tallahassee, 1970
- M.A., Department of Zoology, University of Michigan, Ann Arbor, 1965
- A.B., Department of Zoology, University of California, Berkeley, 1963

Training/Certifications

- California Department of Fish and Game. Resident Scientific Collecting Permit No. 801056-01 with Memoranda of Understanding covering federally listed tidewater goby, Santa Ana sucker, unarmored threespine stickleback, southern steelhead & incidental take of redlegged frog and Species of special concern arroyo chub and speckled dace.
- USFWS U. S. Fish and Wildlife Service Scientific Collecting Permit (10A) No. TE793644-5 for tidewater goby, Santa Ana sucker and unarmored three-spined stickleback
- NOAA Fisheries project specific southern steelhead handling permit

Summary of Qualifications

Dr. Swift is one of the leading authorities on the biology, management, and conservation of the fresh and brackish water fishes of coastal southern California. He served on the Recovery Teams for the unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*) and tidewater goby (*Eucyclogobius newberryi*), both federally endangered species, and was an author for the recovery plans for both fish. He currently serves on the Technical Recovery Teams for tidewater goby (U. S. Fish and Wildlife Service) and southern steelhead (National Marine Fisheries Service). Dr. Swift is a member of the Desert Fishes Council.

With over 20 years of experience working in the field, Dr. Swift is one of the most knowledgeable persons in the state on the status and distribution of freshwater fishes of coastal southern California. He has a strong understanding of their biology, requirements for recovery, and habitat restoration needs to improve their conservation status. He has worked with a wide variety of public and private agencies to conserve these species and advise on habitat restoration for their benefit.

Dr. Swift also has major expeditionary experience in the fresh and estuarine waters of the southeastern United States, marine shore fishes of Pacific coastal Mexico and Costa Rica (including Cocos Island), the Indus River Delta, Pakistan, and Amazonian Peru. He has done extensive field work, led field crews, conducted literature searches, and written several comprehensive reports and peer reviewed publications. He serves as an expert witness in fishery conservation issues. He also has considerable experience in identification and analysis of archaeological and fossil fish bones from the southeastern United States, southern California, and coastal Pakistan.

Relevant Experience

Research Expertise

Dr. Swift is a recognized expert in the biology, conservation, and paleontology of freshwater and estuarine fishes in coastal southern California, including the federally endangered brackish water species, the tidewater goby, *Eucyclogobius newberryi*, the migratory (anadromous) and federally listed steelhead (*Oncorhynchus mykiss*), and the federally threatened Santa Ana sucker (*Catostomus santaanae*). Of approximately eight species of freshwater fishes native to the Los Angeles Basin, the Santa Ana sucker, Santa Ana speckled dace (*Rhinichthys csculus ssp.*), and arroyo chub (*Gila orcutti*) are endemic in this region and have been highly impacted by man. The severe alteration of freshwater and estuarine habitat in much of California has led to most of the freshwater and brackish water species having special conservation status.

Newhall Land and Farming - Special Status Aquatic Species EIR Assessment, Los Angeles County, California

Performed habitat surveys in the upper Santa Clara River for sensitive aquatic species with an emphasis on the federally listed endangered unarmoured threespine stickleback. Surveyed tributary habitat potential, mapped refugia areas and analyzed instream flow velocity model alternatives for project impacts on stickleback habitat.

Wastewater Impacts on Native and Sensitive Fish Species

Provide assessment of impacts of changes in water flow from San Bernardino Infiltration and Extraction Wastewater Treatment Facility (RIX) on populations of Santa Ana sucker, City of San Bernardino.

Environmental Compliance and Monitoring/Terrestrial Biology - The Old Road Outlet Project - Valencia, California

ENTRIX continues to provide environmental compliance assistance to Newhall Land and Farming Company and the City of Santa Clarita. ENTRIX provided environmental compliance via a Verification Request Letter submittal to ACOE and CDFG. Other services included a biological assessment of the project area, impact assessment and pre-construction surveys. ENTRIX continues to support The Old Road Outlet Project by providing environmental compliance work (i.e., environmental monitoring) for sensitive species, particularly the federally listed endangered unarmored threespine stickleback. Monitoring efforts also include weekly nesting bird and preconstruction monitoring.

City of Santa Clarita - Special Status Species Survey and Unarmored Threespine Stickleback Relocation, City of Santa Clarita, California

Conducted weekly pre-construction surveys for nesting special status and migratory birds for the Old Road Outlet Project. Conducted weekly surveys for sensitive upland reptile and mammal species. Conducted sensitive aquatic species surveys. Performed capture and relocation of federally endangered unarmored threespine stickleback during river diversion activities. Provided consulting for design, construction and implementation of a temporary river diversion channel.

Biological Assessment Santa Paula Creek Maintenance Project - Santa Paula, Ventura County, CA

In winter-spring of 2007, ENTRIX surveyed a 2+ mile reach of lower Santa Paula Creek to assess impacts of instream flood control measures that were placed in lower Santa Paula Creek just above the city of Santa Paula. Field surveys included vegetation mapping, general habitat assessment, wildlife observations, nesting bird surveys and bird monitoring, benthic macro-invertebrate sampling and fish sampling.

Owen's Lake Native Fishes Survey, Lone Pine, California

In late 2002 and early 2003, Dr. Swift directed and carried out surveys for the Owens pupfish and other native and non-native fishes in the lower Owens River and its delta in northern Owens dry lake bed. All of the known springs around the delta and dry lake beds (riverine, marsh, and hot spring environments) were sampled. This work was conducted for the Great Basin Unified Air Pollution Control District as a revision of their Environmental Impact Report.

Estuarine Fishes of Ballona Marsh, Los Angeles County, California

Dr. Swift is coauthor of "Estuarine Fish Communities of Ballona Marsh [Los Angeles County]", In: Ralph Schrieber, Ed., Biota of the Ballona Region, Los Angeles County. Suppl. No. 1, Marina del Rey/Ballona Local

Coastal Plan, Los Angeles Co. Dept. Regional Planning. This one year study sampled fishes monthly at 13 stations in the marsh and provided the most comprehensive study of the fish communities of the marsh to date. It continues to be followed to monitor changes to the fish community. Currently Dr. Swift serves on the Scientific Advisory Committee for the Ballona Marsh Restoration.

Santa Clara River Estuary Tidewater Goby Surveys and Expert Witness Testimony, Ventura, California
For over five years Dr. Swift has been conducting biannual sampling of the tidewater goby population in the Santa Clara River Estuary as an element of the compliance monitoring program for the City of San Buenaventura's National Pollutant Discharge Elimination System (NPDES) Permit. He participated in permit renewal workshops and provided expert witness testimony on the impacts of the City's discharge and estuarine hydrodynamics on tidewater goby and steelhead populations at Regional Water Quality Control Board hearings for the permit renewal.

Study of Santa Ana Sucker Biology on the Middle Santa Ana River, Riverside, California

As part of the Santa Ana Sucker Conservation program on the Santa Ana River, Dr. Swift participated in a long-term study to assess the population size and distribution of Santa Ana Suckers in the Santa Ana River near the city of Riverside, California. The program was administered by the multi agency Santa Ana Water Projects Authority (SAWPA) in Riverside. Survey protocols included annual summer surveys employing electrofishing using three pass depletion transects at locations in the mainstem Santa Ana River near the city of Riverside. Santa Ana suckers were measured, weighed, and tagged with PIT tags if over about 80 mm standard length. Dr. Swift holds federal permits for capture, handling and PIT tagging of the suckers. In addition to the mainstem river sites, electrofishing efforts were conducted at sites in the mainstem and tributaries of the river to detect tagged suckers. Dr. Swift participated in the program from 1999-2003, which formed the beginning of a long term annual survey of population size, movements and distribution of the Santa Ana sucker in the river.

U.S. Geological Survey, National Water-Quality Assessment Program, Santa Ana River, California

Dr. Swift participated in the USGS NAWQA program, a nationwide river monitoring and quality assessment designed to assess the status and trends in the quality of freshwater streams and aquifers, and to provide a sound understanding of the natural and human factors that affect the quality of these resources. The program included a three year survey of Santa Ana suckers on the Santa Ana River. Survey protocols required electrofishing of a total of one kilometer of river in 100 meter increments at two localities on the Santa Ana River. The goal of this assessment was to characterize, in a nationally consistent manner, the broad-scale geographic and seasonal variations of water-quality related to major contaminant sources and background conditions.

California Department of Fish and Game Native Fish Surveys, San Gabriel River, California

The California Department of Fish and Game periodically assesses the status of wild trout, Santa Ana sucker, speckled dace, and arroyo chubs in the San Gabriel River system. Dr. Swift participated in four of these sampling efforts in the early 1990s. Survey protocols included electrofishing with three pass depletion of 100 meter transects in the West Fork of the San Gabriel River and its tributary Bear Creek. Fish were identified, measured and released back to the stream.

Restoration of the Santa Maria River Estuary, Santa Barbara County, California

Dr. Swift prepared a historical analysis of coastal estuaries, habitat change, and restoration options for the estuary at the mouth of the Santa Maria River, Santa Barbara County, CA for California Department of Fish and Game Oil Response Team, for its contribution to the Trustees of Guadalupe Site, through Hagler-Bailly Inc., Boulder, Co. Field work. In addition Swift collaborated with ENTRIX biologists in surveying the estuary for tidewater gobies and preparing a report on their current status at the site.

Big Tujunga Mitigation and Restoration, Sunland, CA

On behalf of the Los Angeles County Department of Public works, Dr. Camm Swift, with Dan Holland, designed and implemented the exotic removal program at Big Tujunga Wash from 2000 to 2004. Work included extensive trapping for crayfish, gill netting and snorkeling for bass, removal of bullfrog egg masses, and monitoring of the three native fish species in Haines Creek. Dr. Swift was instrumental in making recommendations with respect to the refinement of methods, equipment needs and sampling design and strategy. Effectiveness monitoring of the eradication efforts included periodic surveys of the native fishes in the streams at randomly selected transects along the 1.7 km of stream in the mitigation area.

Expert Witness Testimony Big Tujunga Wash, CA

In support of the California Department of Fish and Game's Community Arbitration with Foothill Golf and Development in California State Superior Court, Los Angeles, Dr. Swift provided extensive and detailed information on the biology of Southern California Coastal Minnow and Santa Ana Sucker to support the Department's position of the extreme importance of the wash habitat for the continued existence of the native fishes and other native species in this surviving remnant fish community consisting of the Santa Ana sucker (federally threatened) and Santa Ana speckled dace and arroyo chub, both California species of special concern.

Exotic Predators on Tidewater Gobies on Marine Corps Base Camp Pendleton

Dr. Swift, working with Mr. Holland, used their extensive experience on the Base to prepare a management plan for exotic fishes and other species on Marine Corps Base Camp Pendleton. Many of these prey on tidewater gobies and this plan included methods for removal of exotics and for prevention or minimizing their impact on native aquatic species. Since 1998, Dr. Swift has led teams of biologists to implement the exotic species removal plan at San Mateo Lagoon on the Base.

San Juan Creek Native Fish Survey - La Novia Bridge, San Juan Capistrano, California

Dr. Swift provided biological support and pre-construction monitoring for a project involving widening of the La Novia Street Bridge over San Juan Creek. The project included field surveys and monitoring, developing best management practices for fish avoidance and developing mitigation measures for post-construction planning. Species of concern included migrating southern steelhead, unarmored three-spine stickleback and arroyo chub.

Tidewater Gobies on Vandenberg Air Force Base

Cooperative Agreement between National Biological Service (now part of USGS) and Loyola Marymount University for study of the biology of the federally endangered tidewater goby on Vandenberg Air Force Base, Santa Barbara County. Included three to four paid undergraduate research assistants at Loyola Marymount University. This contract extended for two years and comprehensively studied the biology and distribution of

the tidewater gobies at five sites on Vandenberg Air Force Base. A comprehensive report detailed many aspects of needs for restoration of habitats on the Base.

Bixby Ranch Steelhead, Tidewater Goby and California Red-Legged Frog Baseline Habitat Assessment, Santa Barbara, California

Dr. Swift conducted a baseline biological assessment of the Bixby Ranch in Santa Barbara, California. The focus of this assessment was to assess aquatic habitat conditions as it pertains to steelhead, tidewater goby, California red-legged frog, and southwestern pond turtle. Terrestrial habitat was also assessed but was limited by access constraints. New populations of tidewater gobies were discovered during this assessment.

Tidewater Gobies on Marine Corps Base Camp Pendleton

Dr. Swift, working with Mr. Dan Holland, did multiple surveys from 1991 to 2000 for the tidewater gobies and other members of the estuarine fish community at seven estuaries and lagoons on Marine Corps Base Camp Pendleton, coastal southern California. They provided the first descriptions of the estuarine fish communities for several of these sites and provided recommendations for maintenance and improvement of habitat for the species on the Base. With Dan Holland, Camp Pendleton Amphibian and Reptile Survey, Fallbrook, CA for Marine Corps Base Camp Pendleton

Surveys of Freshwater Fishes of Southern California

Dr. Swift has extensive experience surveying, researching and studying freshwater species of special concern. A representative sample of these surveys includes:

- Advised a Six Agency committee of southern California water and power purveyors, including Metropolitan Water District of Southern California on the quality and rationale for U.S. Fish and Wildlife Service Critical Habitat designations for endangered big river fishes of the Colorado River, southwestern United States. Responsibilities included expert testimony, literature research and report writing.
- Supervised crews of three to six graduate students surveying the estuarine and freshwaters of southern California for fishes for four months and prepared report for the California Department of Fish and Game on the status and distribution of these fishes, at Natural History Museum of Los Angeles County.
- Evaluated the status of the native freshwater fishes of southern California, including the status of the estuarine tidewater goby, *Eucyclogobius newberryi*, with recommendations for preserves to maintain their existence. California Department of Fish and Game Contract FG-7455, one year. Compiled data bases on fish records collaborating with Peter Moyle, U. C. Davis, to incorporate data into the California Department of Fish and Game's Natural Heritage Data Base, at Natural History Museum of Los Angeles County.
- Participated in a Cooperative Agreement between National Biological Service (now part of USGS) and Loyola Marymount University for study of the biology of the federally endangered tidewater goby on Vandenberg Air Force Base, Santa Barbara County. Included three to four paid undergraduate research assistants at Loyola Marymount University.
- Analyzed bottom samples from Delta Mendota Canal, central California, for invertebrate densities of the Asiatic clam, *Corbicula fluminea*, as a research assistant Zoology Department, University of California, Berkeley.
- Identified freshwater and coastal fish habitats to determine Significant Ecological Areas for Regional Planning Department, Los Angeles County, via contract to Natural History Museum of Los Angeles County.

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- Co-author, U.S. Fish and Wildlife Service Recovery Plan for Endangered Unarmored Threespine Stickleback, as member of Unarmored Threespine Stickleback Endangered Species Recovery Team.
 - Author, Estuarine Fish Communities of Ballona Marsh [Los Angeles County], In: Ralph Schrieber, Ed., Biota of the Ballona Region, Los Angeles County. Suppl. No. 1, Marina del Rey/Ballona Local Coastal Plan, Los Angeles Co. Dept. Regional Planning.
 - Served on an expert panel, habitat suitability criteria and curves for three native cyprinoid fishes (state species of special concern) of the Santa Ana River, southern Calif., EA Engineering and Technology (Lafayette, CA) for Southern California Edison Company.
 - Surveyed for freshwater fishes of the Los Angeles River. Field work and report writing, as part of contract from the California Department of Fish and Game to the Natural History Museum of Los Angeles County, to assess the fauna and flora of the river.
 - Monitored populations of native federally endangered fish species during streambed alterations in the Santa Clara River, southern. Performed both field work and report writing.
 - Surveyed for the proposed endangered fish, the tidewater goby, in coastal estuaries of Camp Pendleton Marine Base, southern California. Performed both field work and report preparation.
 - Surveyed for the federally endangered tidewater goby in the estuarine Shuman Lagoon, Vandenberg Air Force Base, Santa Barbara County, CA for U.S. Fish and Wildlife Service, Ventura Field Office,
 - Analyzed diet of the endangered bird, the least tern, with Patricia Baird, Department of Biology, California State University, Long Beach. Under U.S. Navy contract (to P. Baird) at Long Beach, with three undergraduate research participants at Loyola Marymount University.
 - Prepared draft recovery plan for tidewater goby as a member of the Tidewater Goby Technical Recovery Team, with U. S. Fish and Wildlife Service, Ecological Services, Ventura California.
 - Prepared historical analysis of coastal estuaries, habitat change, and restoration options for the estuary at the mouth of the Santa Maria River, Santa Barbara County, CA for California Department of Fish and Game Oil Response Team, for its contribution to the Trustees of Guadalupe Site. Performed field work, research and report writing in collaboration with Entrix Inc., retained by UNOCAL Corporation.
 - Surveyed for the endangered fish species, the tidewater goby on Marine Corps Base Camp Pendleton, coastal southern California, and provide recommendations for maintenance and improvement of habitat for the species on the Base. With Dan Holland, Camp Pendleton Amphibian and Reptile Survey, Fallbrook, CA for Marine Corps Base Camp Pendleton.
 - Prepared management plan for exotic fishes on Marine Corps Base Camp Pendleton, including methods for removal of exotics and for prevention or minimizing their impact on native aquatic species. With Dan Holland (Principal Investigator), Camp Pendleton Amphibian and Reptile Survey, Fallbrook, CA.
 - Surveyed for native and introduced freshwater fishes in the middle Santa Ana River in the Prado Dam vicinity with special reference to Santa Ana sucker and arroyo chub. For U. S. Army Corps of Engineers, Los Angeles CA.
 - Surveyed, downstream trapping, and analysis of habitat quality for the three endangered fishes (southern steelhead, tidewater goby, and unarmored threespine stickleback) in San Antonio Creek, Santa Barbara County for Vandenberg Air Force Base.
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- Surveyed, downstream trapping, and food habit studies of Santa Ana suckers in the Santa Ana River to document movements into diversions and impact of exotic species on suckers. Phase II for Santa Ana Water Project Authority, Riverside, CA.
 - Expert witness on Southern California Minnow/sucker community for California Department of Fish and Game in their arbitration with Foothill Golf and Development, State Superior Court, Los Angeles, No. 99-0600-DW (This fish community consists of Santa Ana sucker, Santa Ana speckled dace, and arroyo chub).
 - Prepared preliminary assessment of impacts of shore dredging on the fisheries of Big Bear Lake, for Big Bear Municipal Water District.
 - Surveyed and estimate population sizes of endangered unarmored threespine stickleback and tidewater goby, and analyze steelhead habitat on several drainages on Vandenberg Air Force.
 - Monitored population of tidewater goby in San Luis Obispo Creek Lagoon in relation to Avila Beach clean up site. For Unocal through Essex Environmental, San Luis Obispo.
 - Surveyed for tidewater gobies in Santa Clara River Lagoon, Ventura County. For City of Ventura CA.
 - Surveyed for populations of sensitive native freshwater fish in the Santa Ana River near Colton and Loma Linda, CA.
 - Surveyed for populations of native fishes in the Santa Ana River in the vicinity of the Interstate 210 crossing, for Cal Trans, CA.
 - Monitored for Santa Ana suckers and assess effects of bridge maintenance, sand mining, and alternative bridge design on this fish. For Riverside County Transportation Department.
 - Surveyed for the federally endangered tidewater goby in lower San Luis Rey River, CA. with Camp Pendleton Amphibian and Reptile Survey, Fallbrook, CA.
 - Surveyed and monitored for the federally endangered tidewater goby in San Mateo Lagoon, Camp Pendleton Marine Corps Base with recommendations for restoration and recovery.
 - Interaction of native and exotic freshwater fishes during El Nino disturbance in the Santa Margarita River, southern California. With USGS Laboratory, San Diego State University with partial support of the Nature Conservancy.
 - Determined possible effects on steelhead of UNOCAL remediation of soil contamination in the vicinity of the lower Santa Maria River.
 - Reviewed and assessed mitigation features for Seven Oaks Dam on the Santa Ana River in relation to populations of Santa Ana sucker downstream. For the U. S. Army Corps of Engineers.
 - Review and assess mitigation plans and Biological Assessments for tidewater goby and steelhead in relation to Lower Mission Flood Control Project of U. S. Army Corps of Engineers. For City of Santa Barbara, CA.
 - Survey for fishes and assess possible impacts of the construction of a pipeline crossing over Dominguez Channel in Wilmington.
 - Directed surveys for Santa Ana speckled dace in lower Fremont, Blackstar, and Silverado canyons, Orange County.

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- Survey for native freshwater fishes and advise on mitigation for quarry operations at the mouth of Fish Canyon, near Azusa, CA.
 - Implement eradication plan for exotic fishes in Los Angeles County Public Works mitigation area of lower Big Tujunga Canyon-Haines Creek area. With Camp Pendleton Amphibian and Reptile Survey, Fallbrook, CA, for Los Angeles County Department of Public Works.
 - Identify freshwater fossil fish remains from a variety of late Pleistocene freshwater sites in Riverside County.
 - Monitor, rescue, and transfer federally threatened Santa Ana suckers from diversion of Santa Ana River, Orange County. For U. S. Corps of Engineers
 - Provide assessment of impacts of changes in water flow from San Bernardino Infiltration and Extraction Wastewater Treatment Facility (RIX) on populations of Santa Ana sucker. For City of San Bernardino.
 - Survey for native fishes in relation to highway crossing of streams at Temecula Creek, San Diego County and Chino Creek, San Bernardino County. For CalTrans.
 - Provide assessment of impacts and mitigation possibilities for native sensitive fish species in lower San Juan Capistrano Creek, Orange County and lower San Mateo Creek, northern San Diego County for various alternatives of the proposed new highways. For Foothill/Eastern Transportation Corridor Agency.
 - Provide expertise and field work to study steelhead in Topanga Creek including snorkel surveys, habitat assessment, and up and downstream migrant trapping. With Resource Conservation District of the Santa Monica Mountains, Topanga, CA.
 - Prepare draft Recovery Plan for combined South Central Coast Steelhead (federally threatened) and South Coast Steelhead (federally endangered) as member of NOAA Technical Recovery Team for Southern Steelhead.

Professional Affiliations and Honors

Dr Swift has held various elected and appointive positions in the California-Nevada Chapter of the American Fisheries Society, Southern California Academy of Sciences, and American Society of Ichthyologists and Herpetologists. Secretary, Vice-president, and President of the Academy; elected President-elect, and proceeded to President, and past President of California Nevada Chapter, 1997-1999. Served on host committees for Los Angeles meetings of the American Society of Ichthyologists and Herpetologists (twice), Society of Vertebrate Paleontology, California-Nevada Chapter of the AFS, and the Southern California Academy of Sciences (three times).

Dr. Swift served as a member of the Unarmored Threespine Stickleback Endangered Species Recovery Team (1972-1995). He currently serves on the Technical Recovery Team for the Tidewater Goby (2003-present), both for U.S. Fish and Wildlife Service, and is a member of the Southern Steelhead Technical Recovery Team (2003-present) for the National Marine Fisheries Service.

Dr. Swift was elected Fellow of the Southern California Academy of Sciences in 1991 and Emeritus Associate Curator of Fishes, Natural History Museum of Los Angeles County in 1993. He received the Award of Excellence from California Nevada Chapter of the American Fisheries Society in 1997.

Dr. Swift is an active member in numerous professional associations including: American Fisheries Society, including California Nevada Chapter, Estuarine Research Foundation, American Society of Ichthyologists and Herpetologists, Desert Fishes Council, Southeastern Fishes Council, Society of Vertebrate Paleontology, Sigma Xi (Loyola Marymount University Chapter), American Association for the Advancement of Science, Southern California Academy of Sciences, Society for Conservation Biology, Society of Systematic Biology, Biological Society of Washington, Japanese Ichthyological Society, Western Field Ornithologists, and California Native Plant Society

Publication, presentation and grant list available

Publications: 1989-present

1993. Swift, T. H. Haglund, M. Ruiz, and R. Fisher. Status and distribution of the freshwater fishes of southern California. *Bull. S. Calif. Acad. Sci.*, 92(3):101-168.
1996. Chapter 30. Distribution and migration. Pp. 595-630. (excluding literature cited in single collection at end of book). In: Carl Bond. *Biology of Fishes*, (textbook) Second Edition. Harcourt, Brace, and Co., Philadelphia.
1996. Lafferty, K., R. Swenson, and C. C. Swift. Tidewater goby; endangered species profile. *Environmental Biology of Fishes*, 46:254.
1998. The fish fauna of Ballona Marsh, an urban estuary on the western of the Los Angeles Basin. p. 1427 (Abst). In: Orville T. Magoon, et al. Eds, *California and the World Ocean '97*. 2 vols. American Society Civil Engineers, Reston, VA
1999. K. Lafferty, C. C. Swift and R. Ambrose. Postflood persistence and recolonization of endangered tidewater goby populations. *North American Journal of Fisheries Management*, 19(2):618-622.
1999. _____. Extirpation and recolonization in a metapopulation of an endangered fish, the tidewater goby. *Conservation Biology*, 13(6):1447-1453.
2002. Swift, K. Hieb, and R. Swenson. Family Gobiidae. pp. 7-9. IN: William S. Leet, Christopher M. Dewees, Richard Klingbeil, and Eric J. Larson (editors), *California's Living Marine Resources: A status report. The Errata*. California Department of Fish and Game, Sacramento, CA (December, 2001) (www.dfg.ca.gov/mrd) [The larger work appeared in hard copy in earliest 2002 minus this Gobies article later added to an electronic Errata on the web site for inclusion in the Section on Bay and Estuarine Finfish Resources]
2002. M. N. Dawson, K. D. Louie, M. Barlow, D. K. Jacobs, and C. C. Swift. Comparative phylogeography of sympatric sister species, *Clevelandia ios* and *Eucyclogobius newberryi* (Teleostei, Gobiidae), across the California transition zone. *Molecular Ecology*, 11, 1065-1075.
2002. Swift and D. C. Holland. Exotic Fish species and their impacts on small costal lagoons in southern California. (Abst.) *Bull. S. Calif. Acad. Sci.*, 101(2), Supplement, p. 32
2002. Interaction between native fish, habitat, and exotic fish species in the middle Santa Ana River, southern California. (Abst.) *Bull. S. Calif. Acad. Sci.*, 101(2), Supplement, p. 32.

2006. Chapter 29. Distribution. Pp. 601-638. IN: Michael Barton, Bond's Biology of Fishes, 3rd Edition, Thompson Brooks/Cole, Belmont, CA.

Presentations: (1999 to present)

The disappearing fishes of southern California. In: Swimming Upstream: Restoring California's rivers and streams for salmon, steelhead and other species. Educational Workshop sponsored by the Sierra Club and California Trout, 12 June 1999, Los Angeles Zoo, Los Angeles, CA

Biodiversity and conservation of the freshwater fishes of southern California. (with Jonathan Baskin) In: Planning for Biodiversity: Bringing research and management together. A symposium sponsored by the USDA Forest Service and USGS Western Ecological Research Center. California State Polytechnic University, Pomona, 29 February-2 March 2000.

Dramatic effects of rainfall on species distributions in the Santa Margarita River. (with Manna Warburton [presenter] and Robert N. Fisher), California-Nevada Chapter, American Fisheries Society, 34th Annual Meeting, Ventura, CA 31 March-1 April 2000.

Freshwater fishes of the Los Angeles River, southern California. (with Jeffrey Seigel and Dan Holland), and Fish population fluctuations 1997-2000 in small lagoons on Marine Corps Base Camp Pendleton. (with Dan Holland), Annual Meeting, Southern California Academy of Sciences, University of Southern California, Los Angeles, CA 19-20 May 2000.

El Nino effects on the native and exotic fish populations of the Santa Margarita River southern California. (with Robert N. Fisher [presenter] and Manna Warburton). Society for Conservation Biology Annual Meeting, Hilo Hawaii, 29 July-Aug. 1, 2001.

El Nino effects on estuarine fish populations associated with the southernmost populations of tidewater goby, 1990-2001 (with Dan Holland), and The federally threatened Santa Ana sucker in the Santa Ana River-Distribution, habitat, and exotic predators. Ann. Meeting, California Nevada Chapter American Fisheries Society, Tahoe City, CA April 19-20, 2002

Exotic fish species and their impacts on small coastal lagoons in southern California (with Dan Holland, presenter), and Interaction between native fish, habitat, and exotic fish species in the middle Santa Ana River, southern California. Annual. Meeting, Southern California Academy of Sciences, Claremont, CA June 7-8, 2002.

Fish populations of small coastal lagoons in southern California. California Estuarine Research Society, Inaugural Meeting, Hubbs Sea World Research Institute, San Diego, CA, April 14, 2003

Status of and prognosis for the freshwater fishes of coastal southern California. Swift [presenter], Jonathan N. Baskin, Robert Fisher, and Thomas Haglund; Status, Habitat, and restoration of southern Steelhead in Topanga Creek and State Park, just south of Malibu Creek. Rosi Dagit [presenter] and Swift; Visual Display of stream habitat survey profiles using GIS: An example from Topanga Creek, coastal Southern California. Kevin Reagan [presenter], Rosi Dagit, and Swift; and a Poster: Genetic structure in the staghorn sculpin from Alaska to southern California. Kristina D. Louie [presenter], K. P. Kloeppfli, D. K. Jacobs, and Swift. Western Division/Cal-Neva Chapter of American Fisheries Society,

Joint Annual Meeting, San Diego, April 14-17, 2003. In addition Swift organized two days of symposia on the freshwater fish, amphibian, and aquatic reptile fauna of coastal southern California.

Organized one day Symposium for California Nevada Chapter of the American Fisheries Society Meeting, San Luis Obispo, March 30, 2006. Chaired session and presented "Annual and seasonal variations in fish populations of San Mateo Lagoon, San Diego County, CA" with Dan Holland, Melissa Booker, Brian Lohstroh, and Eric Bailey.

Status and distribution of freshwater fishes of coastal southern California. In symposium on Aquatic Vertebrates of Southern California. Southern California Academy of Sciences Meeting, Pepperdine University, Malibu, 13,14 May 2006.

Expanding distributions of invasive fishes in coastal southern California estuaries and freshwaters. Presentation at the California Nevada Chapter of the American Fisheries Society Meeting, Lake Tahoe, Nevada, April 2008.

Employment History

- ENTRIX, Inc., Senior Project Scientist, September, 2003 - present
- Emeritus Associate Curator, Natural History Museum of Los Angeles County, January, 1993 - present
- Part-time instructor, Mount San Antonio College, 1993 - 1994
- Visiting Assistant Professor of Biology, Loyola Marymount University, Los Angeles, 1994 - 1998
- Part-time instructor, East Los Angeles, Rio Hondo, and Valley colleges, 1993-1994, 1998 - 1999
- Associate Curator of Fishes, Natural History Museum of Los Angeles County; and Adjunct Assistant Professor of Biology, University of Southern California, 1970 - 1993