

## Science in the Department of Fish and Game

Science is the systematic observation of natural events and conditions, in order to discover facts about them.

*Academic Press Dictionary of Science & Technology*

The real purpose of the scientific method is to make sure Nature hasn't misled you into thinking you know something you don't actually know.

Robert M. Pirsig, *Zen and the Art of Motorcycle Maintenance*

### Human Resources

**Internal** - Within its four major programs that use science everyday the Department currently employs about 650 scientists. These scientists all come to the Department with degrees in the various scientific specialties, many have post-graduate degrees.

**Partnerships** – Through contracts, memoranda of understanding and project specific collaboration, the Department conducts science with many partners that include academic institutions, other state and federal agencies, and non-profit organizations.

### Program Elements

**Interagency Ecological Program** – under the direction of a lead scientist, provides long term and real-time data sets on estuarine species and ecological processes to inform policy and management decisions for the Sacramento-San Joaquin Estuary.

**Bay Delta Conservation Program** - BDCP will have a governance structure for implementation of the plan and a science, monitoring and adaptive management program. Staff is making recommendations on how to integrate these BDCP programs into existing science and monitoring institutions, including the Interagency Ecological Program and the Delta Science Program.

**Ecosystem Restoration Program** - engaged in habitat restoration and related activities for the Delta and its tributaries; includes development of life cycle models, ecological flows tools models, studies investigating environmental stressors, mercury reduction, watershed stewardship, and fish passage. ERP coordinates with the Delta Science Program and the Delta Conservancy on science based restoration activities. A new Delta Independent Science Board replaces other Science Boards by virtue of the Sacramento-San Joaquin Delta Reform Act of 2009.

**South Bay Salt Ponds Science Program** – provides applied studies and ongoing monitoring projects through data collection and modeling through contracts. Work is overseen by a Project Science Technical Advisory Team.

**Cooperative Wetland Research** – is a cooperative program with local and national entities to monitor the effects of management and restoration actions on wetland dependent species and communities in the San Francisco Bay area.

**Instream Flow Program** – a multi-disciplinary approach to recommend flow regimes that will improve ecosystem health and meet species critical life-stage requirements. These efforts are being reviewed through a Quality Assurance program by outside university faculty.

**Water Quality** – prepares reports for Water Boards and develops, using scientific methods, biological objectives for water bodies, including recommendations for stream flows to support aquatic species.

**State and Federal Water Project Operations** – uses scientifically designed monitoring data to recommend real-time changes in project operations.

**Natural Community Conservation Planning (NCCP)** –mandates the use of independent scientific analysis and input, to assist plan participants in meeting scientifically sound principles for the conservation and management of species proposed to be covered by each NCCP. An NCCP must contain specific conservation measures that meet the biological needs of covered species and that are based upon the best available scientific information regarding the status of those species and the impacts of covered economic activities on them. An Independent Science Advisors report is the basis for every NCCP.

**Environmental Review and Planning Programs** – uses research and monitoring data to inform avoidance, minimization and management measures to conserve fish, wildlife, plants and their habitats in the permitting programs; requests new studies when necessary to inform decision making.

**Invasive Species Program** – conducts and reviews scientific studies to aid decision making for management actions to detect, prevent, control and eradicate aquatic invasive species.

**Climate Change Program** – conducts climate change related research internally and with collaborators to support adaptation planning efforts such as the revision of the California Wildlife Action Plan.

**Marine Life Management Act (MLMA)** – conducts field and laboratory work and analyzes data to make recommendations regarding the sustainability of marine fisheries. This work includes scientifically designed biological surveys (age, growth, fecundity, maturity, home range, abundance and stock assessments), catch and fishing effort data. Use these data to inform Fishery Management Plans.

**Marine Life Protection Act (MLPA)** – provide scientific support to Science Advisory Teams and Regional Stakeholder Groups; this support included data summarization, analyses and GIS support. Investigated fish density within and external to Marine Protected Areas; work in collaboration with the Marine Protected Areas Monitoring Enterprise.

**Scientific Study and Evaluation Program (SSEP)** – develops and implements various rigorously designed surveys to evaluate the status of certain marine mammals and

investigate mortality factors for these species and seabirds. Provides analyses of evidence and samples by the Petroleum Chemistry Laboratory and Water Pollution Laboratory. The Office of Oil Spill and Response also quantifies the injuries to wildlife, habitat and lost human use of resources damaged by oil spills and manages surveys to assess the level on non-native species, including the development of new genetic techniques to more quickly identify non-indigenous species.

**Vegetation Classification and Mapping Program** – develops and maintains the National Vegetation Classification System in California through standardization and training of resource professionals so that these data are used via best practices and that vegetation assessments are integrated.

**California Natural Diversity Database (CNDDDB)** – inventory of the status of rare plants and animals in California. This information is available to the public, other agencies and conservation organizations and is used to inform conservation and land use decisions.

**Areas of Conservation Emphasis** – is an internal effort to help guide and inform conservation priorities in California by analyzing spatial data on natural communities and these data sets are available online.

**Fisheries Management Program** – collects and analyzes data using scientifically sound protocols and mathematical modeling on the distribution, status, recruitment and trends in abundance of native inland and anadromous fish stocks that are harvested commercially and recreationally. Design and implement research to increase fish production capacity, and monitor state and private fish production facilities. Fish health monitoring uses DNA-based protocols. Other genetics work includes assessment and management of unique and valuable species.

**Wildlife Management Program** - collects and analyzes data using scientifically sound protocols and mathematical modeling on the distribution, status, recruitment and trends in abundance of wildlife species, some of which are harvested recreationally. Collaborate and conduct studies on rare, threatened or endangered species to assess status; use scientific literature and other studies to evaluate listing petitions. Using scientifically derived information, assess suitable habitats for species restoration. Provide state of the art training on animal restraint for research and other needs.

#### Distribution of Science and Technology Transfer

Many DFG scientists are members and/or officers of professional scientific organizations such as The Wildlife Society, American Fisheries Society, American Society of Mammalogists, as well as other specific professional scientific groups.

Through these organizations and affiliations, and through the Department's publications, including *California Fish and Game*, California's longest continuously published (since 1914) scientific journal, staff author technical publications and management reports that are disseminated through the Department's public website "document library", through portals such as the BIOS interactive database system, and through program websites.