

## Glossary

- AGGRADATION:** The geologic process in which streambeds, floodplains, and the bottoms of other water bodies are raised in elevation by the deposition of material eroded and transported from other areas. It is the opposite of degradation.
- ALEVIN:** The life stages of salmonids that occurs after eggs have hatched but before young emerge from the gravel nests where they have incubated. Alevin still have yolk sacs attached to provide them with nutrition within the nest.
- ALLUVIUM:** A general term for all deposits resulting directly or indirectly from the sediment transport of streams, thus including the sediments lay down in riverbeds, floodplains, lakes, fans, and estuaries.  
*ALLUVIAL adj.*
- ANADROMOUS:** Fish that leave freshwater and migrate to the ocean to mature then return to freshwater to spawn. Salmon, steelhead, and shad are examples.
- ANTHROPOGENIC:** Caused by humans.
- ARCINFO:** ESRI (Environmental Systems Research Institute) proprietary software, which provides a complete GIS data creation, update, query, mapping, and analysis system.
- AERIAL:** Having to do with or done by aircraft. For example, aircraft equipped with cameras capture images of the earth in air photos.
- BANKFULL DISCHARGE:** The discharge corresponding to the stage at which the floodplain of a particular stream reach begins to be flooded; the point at which bank overflow begins.
- BANKFULL WIDTH:** The width of the channel at the point at which overbank flooding begins.
- BASIN:** see watershed.
- BOULDER:** Stream substrate particle larger than 10 inches (256 millimeters) in diameter.
- CALWATER:** A set of standardized watershed boundaries for California nested into larger previously standardized watersheds and meeting standardized delineation criteria.
- CANOPY:** The overhead branches and leaves of streamside vegetation.
- CANOPY DENSITY:** The percentage of the sky above the stream screened by the canopy of plants, sometimes expressed by species.
- CHANNEL:** A natural or artificial waterway of perceptible extent that periodically or continuously contains moving water. It has a definite bed and banks, which serve to confine the water.
- COAST RANGE:** A string of mountain ranges along the Pacific Coast of North America from Southeastern Alaska to lower California.
- COBBLE:** Stream substrate particles between 2.5 and 10 inches (64 and 256 millimeters) in diameter.
- COLLUVIUM:** A general term for loose deposits of soil and rock moved by gravity; e.g. talus.
- CONIFEROUS:** Any of various mostly needle-leaved or scale-leaved, chiefly evergreen, cone-bearing gymnospermous trees or shrubs such as pines, spruces, and firs.
- CONSUMPTIVE USE OF WATER:** Occurs when water is taken from a stream and not returned.
- COVER:** Anything that provides protection from predators or ameliorates adverse conditions of streamflow and/or seasonal changes in metabolic costs. May be instream cover, turbulence, and/or overhead cover, and may be for the purpose of escape, feeding, hiding, or resting.
- DEBRIS:** Material scattered about or accumulated by either natural processes or human influences.
- DEBRIS JAM:** Logjam. Accumulation of logs and other organic debris.

- DEBRIS LOADING:** The quantity of debris located within a specific reach of stream channel, due to natural processes or human activities.
- DECIDUOUS:** A plant (usually a tree or shrub) that sheds its leaves at the end of the growing season.
- DEGRADATION:** The geologic process in which stream beds and floodplains are lowered in elevation by the removal of material. It is the opposite of aggradation.
- DEPOSITION:** The settlement or accumulation of material out of the water column and onto the streambed. Occurs when the energy of flowing water is unable to support the load of suspended sediment.
- DEPTH:** The vertical distance from the water surface to the streambed.
- DISCHARGE:** Volume of water flowing in a given stream at a given place and within a given period of time, usually expressed as cubic meters per second (m<sup>3</sup>/sec), or cubic feet per second (cfs).
- DISSOLVED OXYGEN (DO):** The concentration of oxygen dissolved in water, expressed in mg/l or as percent saturation, where saturation is the maximum amount of oxygen that can theoretically be dissolved in water at a given altitude and temperature.
- DIVERSION:** A temporal removal of surface flow from the channel.
- EMBEDDEDNESS:** The degree that larger particles (boulders, rubble, or gravel) are surrounded or covered by fine sediment. Usually measured in classes according to percentage of coverage of larger particles by fine sediments.
- ECOLOGICAL MANAGEMENT DECISION SUPPORT (EMDS):** An application framework for knowledge-based decision support of ecological landscape analysis at any geographic scale.
- EMBRYO:** An organism in its early stages of development, especially before it has reached a distinctively recognizable form.
- ENDANGERED SPECIES:** Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man.
- EROSION:** The group of natural processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is worn away from the earth's surface. *EROSIONAL adj.*
- ESTUARY:** A water passage where the tide meets a river current.
- EXTIRPATION:** To destroy totally; exterminate.
- EXTINCTION:** The death of an entire species.
- FILL:** A) The localized deposition of material eroded and transported from other areas, resulting in a change in the bed elevation. This is the opposite of scour; B) The deliberate placement of (generally) inorganic materials in a stream, usually along the bank.
- FINE SEDIMENT:** The fine-grained particles in stream banks and substrate. Those are defined by diameter, varying downward from 0.24 inch (6 millimeters).
- FISH HABITAT:** The aquatic environment and the immediately surrounding terrestrial environment that, combined, afford the necessary biological and physical support systems required by fish species during various life history stages.
- FLATWATERS:** In relation to a stream, low velocity pool or run habitat.
- FLOOD:** Any flow that exceeds the bankfull capacity of a stream or channel and flows out of the floodplain; greater than bankfull discharge.
- FLOODPLAIN:** The area bordering a stream over which water spreads when the stream overflows its banks at flood stages.

- FLOW:** A) The movement of a stream of water and/or other mobile substances from place to place; B) the movement of water, and the moving water itself; C) the volume of water passing a given point per unit of time. Discharge.
- FLUVIAL:** Relating to or produced by a river or the action of a river. Situated in or near a river or stream.
- FRESHETS:** A sudden rise or overflowing of a small stream as a result of heavy rains or rapidly melting snow.
- GEOGRAPHIC INFORMATION SYSTEM (GIS):** A collection of computer hardware, software, and geographic data used for capturing, managing, analyzing, and displaying all forms of geographically referenced information on the Earth's surface. Typically, a GIS is used to produce graphics (maps) on the screen or on paper to convey the results of analyses.
- GEOMORPHOLOGY:** The study of surface forms on the earth and the processes by which these develop.
- GRADIENT:** The slope of a streambed or hillside. For streams, gradient is quantified as the vertical distance of descent over the horizontal distance the stream travels.
- GRAVEL:** Substrate particle size between 0.08 and 2.5 inches (2 and 64 millimeters) in diameter.
- GULLY:** A deep ditch or channel cut in the earth by running water after a prolonged downpour.
- HABITAT:** The place where a population lives and its surroundings, both living and nonliving; includes the provision of life requirements such as food and shelter.
- HABITAT CONSERVATION PLAN:** A document that describes how an agency or landowner will manage their activities to reduce effects on vulnerable species. An HCP discusses the applicant's proposed activities and describes the steps that will be taken to avoid, minimize, or mitigate the take of species that are covered by the plan.
- HABITAT TYPE:** A land or aquatic unit, consisting of an aggregation of habitats having equivalent structure, function, and responses to disturbance.
- HIERARCHY:** A series of ordered groupings of people or things within a system.
- HYDROGRAPH:** A graph showing, for a given point on a stream, the discharge, stage, velocity, or other property of water with respect to time.
- HYDROLOGY:** The science of water, its properties, phenomena, and distribution over the earth's surface.
- HYDROGRAPHIC UNIT:** A watershed designation at the level below Hydrologic Region and above Hydrologic Sub-Area.
- HYPOTHESIS:** A tentative explanation for an observation, phenomenon, or scientific problem that can be tested by further investigation.
- INCUBATION:** Maintaining something at the most favorable temperature for its development.
- INSTREAM SHELTER:** Areas of shelter in a stream channel that provide aquatic organisms protection from predators or competitors and/or a place in which to rest and conserve energy due to a reduction in the force of the current.
- INTERMITTENT STREAM:** A stream in contact with the ground water table that flows only at certain times of the year when the ground water table is high and/or when it receives water from springs or from some surface source such as melting snow in mountainous areas. It ceases to flow above the streambed when losses from evaporation or seepage exceed the available stream flow. Seasonal.
- KNOWLEDGE BASE:** An organized body of knowledge that provides a formal logical specification for the interpretation of information.
- LIMITING FACTOR:** Environmental factor that limits the growth or activities of an organism or that restricts the size of a population or its geographical range.

- LARGE WOODY DEBRIS (LWD):** A large piece of relatively stable woody material having a diameter greater than 12 inches (30 centimeters) and a length greater than 6 feet (2 meters) that intrudes into the stream channel. Large organic debris.
- MAINSTEM:** The principal, largest, or dominating stream or channel of any given area or drainage system.
- ONCORHYNCHUS:** A genus of the family salmonidae (salmons and trouts). They are named for their hooked (onco) nose (rhynchus).
- PRODUCTIVITY:** A) Rate of new tissue formation or energy utilization by one or more organisms; B) Capacity or ability of an environmental unit to produce organic material; C) The ability of a population to recruit new members by reproduction.
- REDD:** A spawning nest made by a fish, especially a salmon or trout.
- REFERENCE CONDITIONS:** Minimally impaired conditions that provide an estimate of natural variability in biological condition and habitat quality.
- RIFFLE:** A shallow area extending across a streambed, over which water rushes quickly and is broken into waves by obstructions under the water.
- RILL:** An erosion channel that typically forms where rainfall and surface runoff is concentrated on slopes. If the channel is larger than one square foot in size, it is called a gully.
- RIPARIAN:** Pertaining to anything connected with or immediately adjacent to the banks of a stream or other body of water.
- RIPARIAN AREA:** The area between a stream or other body of water and the adjacent upland identified by soil characteristics and distinctive vegetation. It includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.
- RIPARIAN VEGETATION:** Vegetation growing on or near the banks of a stream or other body of water on soils that exhibit some wetness characteristics during some portion of the growing season.
- SALMONID:** Fish of the family *Salmonidae*, including salmon, trout, chars, whitefish, ciscoes, and graylings.
- SCOUR:** The localized removal of material from the streambed by flowing water. This is the opposite of fill.
- SEDIMENT:** Fragmented material that originates from weathering of rocks and decomposition of organic material that is transported by, suspended in, and eventually deposited by water or air, or is accumulated in beds by other natural phenomena.
- SMOLT:** Juvenile salmonid one or more years old that has undergone physiological changes to cope with a marine environment, the seaward migration stage of an anadromous salmonid.
- SMOLTIFICATION:** The physiological change adapting young anadromous salmonids for survival in saltwater.
- SPAWNING:** To produce or deposit eggs.
- STAGE:** The elevation of a water surface above or below an established datum or reference.
- STREAM:** (includes creeks and rivers): A body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation.
- STREAM BANK:** The portion of the channel cross section that restricts lateral movement of water at normal water levels. The bank often has a gradient steeper than 45 degrees and exhibits a distinct break in slope from the stream bottom. An obvious change in substrate may be a reliable delineation of the bank.

- STREAM CLASSIFICATION:** Various systems of grouping or identifying streams possessing similar features according to geomorphic structure (e.g. gradient, water source, spring, and creek), associated biota (e.g. trout zone), or other characteristics.
- STREAM CORRIDOR:** A stream corridor is usually defined by geomorphic formation, with the corridor occupying the continuous low profile of the valley. The corridor contains a perennial, intermittent, or ephemeral stream and adjacent vegetative fringe.
- STREAM REACH:** A section of a stream between two points.
- SUBSTRATE:** The material (silt, sand, gravel, cobble, etc.) that forms a stream or lakebed.
- SUBWATERSHED:** One of the smaller watersheds that combine to form a larger watershed.
- TAKE:** To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.
- TERRACE:** A former floodplain underlain by sediment deposited by a stream when the stream was flowing at a higher level; typically forming a relatively level bench along a valley side adjacent to a recent floodplain.
- TERRAIN:** A tract or region of the earth's surface considered as a physical feature, an ecological environment, or a site of some planned activity of man.
- TERRANE:** A term applied to a rock or group of rocks and to the area in which they crop out. The term is used in a general sense and does not imply a specific rock unit.
- THALWEG:** The line connecting the lowest or deepest points along a streambed.
- THREATENED SPECIES:** Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- TOPOGRAPHY:** The general configuration of a land surface, including its relief and the position of its natural and man-made features.
- TRIBUTARY:** A stream feeding, joining, or flowing into a larger stream. Feeder stream, side stream.
- UNDERCUT BANK:** A bank that has had its base cut away by the water action along man-made and natural overhangs in the stream.
- VELOCITY:** The time rate of motion; the distance traveled divided by the time required to travel that distance.
- WATERSHED ASSESSMENT:** An interdisciplinary process of information collection and analysis that characterizes current watershed conditions at a course scale.
- WATERSHED:** Total land area draining to any point in a stream, as measured on a map, aerial photograph or other horizontal plane. Also called catchment area, watershed, and basin.
- WATERSHED MANAGEMENT AREA (WMA):** In the context of the North Coast Regional Water Quality Control Board's Watershed Management Initiative, this represents a grouping of smaller watersheds into a larger area for identifying and addressing water quality problems, e.g., the Humboldt WMA includes all watersheds draining to the ocean or bays north of the Eel River to and including Redwood Creek.
- WETLAND:** An area subjected to periodic inundation, usually with soil and vegetative characteristics that separate it from adjoining non-inundated area.

## List of Abbreviations

<b>AFY</b>	Acre Feet per Year
<b>BTSCD</b>	Brooktrails Township Community Service District
<b>CalEPA</b>	California Environmental Protection Agency
<b>CCWPAP</b>	California Coastal Watershed Planning and Assessment Program
<b>CDF</b>	California Department of Forestry and Fire Protection
<b>CEQA</b>	California Environmental Quality Act
<b>CESA</b>	California Endangered Species Act
<b>CFS</b>	Cubic Feet per Second
<b>CDFG</b>	California Department of Fish and Game
<b>DWR</b>	California Department of Water Resources
<b>EMDS</b>	Ecological Management Decision Support
<b>EPA</b>	Environmental Protection Agency
<b>ESA</b>	Federal Endangered Species Act
<b>ESU</b>	Evolutionarily Significant Units
<b>FRGP</b>	Fishery Restoration Grants Program
<b>FISRWG</b>	Federal Interagency Stream Restoration Working Group
<b>FPA</b>	Z' Berg-Nejedly Forest Practice Act
<b>GIS</b>	Geographic Information System
<b>HA</b>	Hydrologic Area
<b>HR</b>	North Coast Hydrologic Region
<b>HAS</b>	Hydrologic Sub-area
<b>HU</b>	Hydrologic Unit
<b>IA</b>	Integrated Analysis
<b>LFA</b>	Limiting Factor Analysis
<b>LWD</b>	Large Woody Debris
<b>MOU</b>	Memorandum of Understanding
<b>MWAT</b>	Maximum Weekly Average Temperature
<b>NCWAP</b>	North Coast Watershed Assessment Program
<b>NEPA</b>	National Environmental Policy Act
<b>NMFS</b>	National Marine Fisheries Service
<b>PW</b>	Planning Watershed
<b>RM</b>	River Mile
<b>SWRCB</b>	California State Water Resources Control Board
<b>TMDL</b>	Total Maximum Daily Load
<b>USFS</b>	United States Forest Service
<b>USGS</b>	United States Geologic Survey
<b>WMA</b>	Watershed Management Area

## Bibliography

- Aldrich, R. 1980. Memo: Ryan Creek, Mendocino County. California Department of Fish and Game, Willits, CA. 1p.
- Baumhoff, Martin A. 1958. California Athabascan Groups. University of California Anthropological Records 16(5): 157-238. Berkeley and Los Angeles, CA.
- Baker, P. 1985. Outlet Creek chinook trapping operation. California Department of Fish and Game, Yountville, CA. 1p.
- Baker, P., and F. Reynolds. 1986. Life history, habitat requirements, and status of coho salmon in California. Final Report. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Yountville, CA. 37p.
- Braswell, J. 1973. Initial Report of Fish and Wildlife Loss: Broaddus Creek. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Yountville, CA. 2p.
- Brown, C. 1972. Standing crops and distribution of fishes in selected reaches of the Eel River system. California Department of Fish and Game, Bay Delta and Special Water Projects Division, Red Bluff, CA. 28p.
- Brown, C. 1976. Observations of king salmon spawning in Outlet Creek, Eel River, 1975-76. California Department of Fish and Game, Redding, CA. 6p.
- Brown, C. 1976. An annotated bibliography of Eel River fish and wildlife reports which were prepared by the contract services section. Information Report. California Department of Fish and Game, Region 1, Contract Services Section, Redding, CA. 18p.
- Brown, L. R., and P. B. Moyle. 1989. Eel River Survey: Third year studies. University California Davis, Department of Wildlife and Fisheries Biology, Davis, CA. 68p.
- California Department of Fish and Game. 1972. Stream Survey: Broaddus Creek. Mendocino County, CA. 3p.
- California Department of Fish and Game. 1972. Stream Survey: Bloody Run Creek. Mendocino County Fisheries Management Unit, Yountville, CA. 3p.
- Department of Water Resources. 1965. Bulletin 142-1: North Coastal Hydrographic Area. V1: Southern Portion, Preliminary Edition. pp 212-218.
- California Department of Fish and Game. 1980. Field note - Cherry Creek tributary to Outlet Creek, Mendocino County, at mile post 5.78 on the Longvale-Covelo Road. Mendocino County Fisheries Management Unit, Ukiah, CA. 2p.
- California Department of Fish and Game. 1981. Stream Survey: Ryan Creek. Salmonid Fisheries Resource Assessment, Willits, CA. 2p.
- California Department of Fish and Game. 1982. Summary of observations made during chinook spawning surveys, 1981-1982. Humboldt County Fisheries Management Unit, Eureka, CA. 3p.
- California Department of Fish and Game. 1987. Electrofishing Data Sheet: Ryan Creek. Mendocino County Fisheries Management Unit, Ukiah, CA. 1p.
- California Department of Fish and Game. 1987. Willits Creek. Unknown Source. 2p.

- California Department of Fish and Game. 1988. Ryan Creek, Mendocino County. Mendocino County Fisheries Management Unit, Ukiah, CA. 7p.
- California Department of Fish and Game. 1988. Salmon carcass surveys, Mendocino County 1987-88. Salmon Restoration Program, Fortuna, CA. 9p.
- California Department of Fish and Game. 1988. Eel River Carcass Survey Daily Salmon Spawning Stock Survey: Willits Creek. Salmon Restoration Program, Fortuna, CA. 2p.
- California Department of Fish and Game. 1988. Report of activities for the month of December, 1988. Central Coast Region, Yountville, CA. 2p.
- California Department of Fish and Game. 1989. Carcass surveys, Mendocino County, 1988/89. Mendocino County Fisheries Management Unit, Ukiah, CA. 5p.
- California Department of Fish and Game. 1989. Electrofishing Data Sheet: Rowes Creek. Mendocino County Fisheries Management Unit, Ukiah, CA. 2p.
- California Department of Fish and Game. 1989. Outlet Creek, Mendocino County. Mendocino County Fisheries Management Unit, Ukiah, CA. 4p.
- California Department of Fish and Game. 1989. Ryan Creek, Mendocino County. Mendocino County Fisheries Management Unit, Ukiah, CA. 1p.
- California Department of Fish and Game. 1989. Report of activities for the month of February, 1989. Central Coast Region, Yountville, CA. 1p.
- California Department of Fish and Game. 1994. Watershed Overview: Alder Creek. North Coast Watershed Improvement Center, Fortuna, CA. 2p.
- Coyle, C., and W. Jones. 1994. Field Note: Willits Creek. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 4p.
- California Department of Fish and Game. 1995. Habitat Inventory Data Form: Unnamed Trib to Bloody Run Creek. North Coast Watershed Improvement Center, Fortuna, CA. 15p.
- California Department of Fish and Game. 1995. Stream Inventory Report: Ryan Creek. North Coast Watershed Improvement Center, Fortuna, CA. 4p.
- California Department of Fish and Game. 1995. Stream Inventory Report: Willits Creek. North Coast Watershed Improvement Center, Fortuna, CA. 12p.
- California Department of Fish and Game. 1995. Habitat Inventory Data Form: Alder Creek. North Coast Watershed Improvement Center, Fortuna, CA. 33p.
- California Department of Fish and Game. 1995. Stream Inventory Report: Cherry Creek. North Coast Watershed Improvement Center, Fortuna, CA. 10p.
- California Department of Fish and Game. 1995. Stream Inventory Report: Outlet Creek. North Coast Watershed Improvement Center, Fortuna, CA. 5p.
- California Department of Fish and Game. 1995. Stream Inventory Report: Bloody Run Creek. North Coast Watershed Improvement Center, Fortuna, CA. 4p.



- California Department of Fish and Game. 1995 Stream Inventory Report: Long Valley Creek. North Coast Watershed Improvement Center, Fortuna, CA. 3p.
- California Department of Fish and Game. 1995 Stream Inventory Report: Willits Creek. North Coast Watershed Improvement Center, Fortuna, CA. 15p.
- California Department of Fish and Game. 1995 Stream Inventory Report: Broaddus Creek. North Coast Watershed Improvement Center, Fortuna, CA. 3p.
- California Department of Fish and Game. 1995 Stream Inventory Report: Haehl Creek. North Coast Watershed Improvement Center, Fortuna, CA. 3p.
- California Department of Fish and Game. 1995 Stream Inventory Report: Baechtel Creek. North Coast Watershed Improvement Center, Fortuna, CA. 4p.
- California Department of Fish and Game. 1999. Results of salmonid monitoring on Willits Creek (Mill Creek), Mendocino County Chinook salmon age-0 emigration, Willits Creek downstream migrant trapping results for 1999. Draft Report (dated 1999). Salmonid Fisheries Resource Assessment, Willits, CA. 4p.
- California Department of Fish and Game. 1995. Watershed Overview: Willits Creek. North Coast Watershed Improvement Center, Fortuna, CA. 2p.
- California Department of Fish and Game. 1997. Eel River, salmon and steelhead restoration action plan, final review draft. Inland Fisheries Division, Sacramento, CA. 56p.
- California Department of Fish and Game. 1998. Summary of community salmon survey, (fall 1998). Salmonid Fisheries Resource Assessment, Willits, CA. 1p.
- Elwell, R. F. 1957. Stream Survey: Broaddus Creek. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Yountville, CA. 7p.
- Emig, J. 1985. Outlet Creek trapping operations, 1985. California Department of Fish and Game, Yountville, CA. 5p.
- Flosi, G. et al. 1998. California Stream Habitat Restoration Manual. California Department of Fish and Game, Fortuna, CA. 5p.
- Galehouse, J.S., 2002, Data from theodolite measurements of creep rates on San Francisco Bay region faults, California - 1979-2001: USGS Open File Report 02-225.
- [Gallo, K. 2002](#). Field protocols: Aquatic and Riparian Effectiveness Monitoring Program for the Northwest Forest Plan: Version 1.0. U.S. Forest Service, Corvallis, OR. 54 pp.
- Gilroy, I. 1988. Field Note: Haehl Creek. California Department of Fish and Game, North Coast Watershed Assessment Program, Fortuna, CA. 5p.
- Grass, A. 1985. Letter: Electrofishing 1983. California Department of Fish and Game, Yountville, CA. 1p.
- Griffin, M. and K. Walton. 1988. Field Note: Tributary to Haehl Creek (Outlet Creek), Mendocino County. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 5p.
- Griffin, M., M. Long, C. Sprague, and I. Gilroy. 1989. Field Note: Outlet Creek salmonid carcass surveys. California Department of Fish and Game, North Coast Watershed Assessment Program, Fortuna, CA. 26p.

- Griffin, M., M. Long and C. Sprague. 1989. Field Note: Baechtel Creek. California Department of Fish and Game, North Coast Watershed Assessment Program, Fortuna, CA. 13p.
- Grotzinger, John, Jordan, T.H., Press, Frank, and Siever, Raymond, 2007, Understanding Earth: New York, W.H. Freeman and Company, Fifth Edition, 579 pages, 4 Appendices, and Glossary.
- Harris, S. 1999. Summary of Chinook salmon spawner surveys conducted in Mendocino County Eel River basin. California Department of Fish and Game, Salmonid Fisheries Resource Assessment, Willits, CA. 2p.
- Harris, S. 2000. Federal Aid in Sport Fish Restoration Act. Annual Performance Report. California Department of Fish and Game, Salmonid Fisheries Resource Assessment, Willits, CA. Grant Agreement F- 51-R-13. 30p.
- Harris, S. 2000. Federal Aid in Sport Fish Restoration Act. California Department of Fish and Game, Salmonid Fisheries Resource Assessment, Willits, CA. Annual Performance Report F- 51-R-14. 79p.
- Harris, S. 2000. Federal Aid in Sport Fish Restoration Act. Annual Performance Report. California Department of Fish and Game, Salmonid Fisheries Resource Assessment, Willits, CA. Grant Agreement F- 51-R-14. 59p.
- Harris, S. 2000. Annual Performance Report: Salmon spawning stock inventory. Federal Aid in Sport Fish Restoration Act Grant Agreement F-51-R-13, Project No. 22, Job No. 3. California Department of Fish and Game, Willits, CA. 6p.
- Harris, S. 2000. Annual Performance Report: Juvenile salmon and steelhead stock assessment. California Department of Fish and Game, Willits, CA. 6p.
- Harris, S. 2000. Annual Performance Report: Downstream (out) migration of juvenile salmon and steelhead. Federal Aid in Sport Fish Restoration Act Grant Agreement F-51-R-13, Project No. 22, Job No. 2. California Department of Fish and Game, Willits, CA. 12p.
- Harris, S. 2000. Personal Communication: Anadromous populations of salmonids in Mendocino County carcass recovery and spawning activity, 1998/1999 & 1999/2000. Draft Report (dated 2000). California Department of Fish and Game, Salmonid Fisheries Resource Assessment, Willits, CA. 4p.
- Harris, S. 2001. Annual Performance Report: Salmon spawning stock inventory. Federal Aid in Sport Fish Restoration Act, Grant Agreement F-51-R-13, Project No. 22, Job No. 3. California Department of Fish and Game, Willits, CA. 4p.
- Harris, S. 2001. Outlet Creek. Unknown Source. 2p.
- Harris, S. 2001. Personal Communication: Responses to questions about Outlet Creek basin. California Department of Fish and Game, Willits, CA. 1p.
- Harris, S. 2001. Personal Communication: Outlet Creek system. California Department of Fish and Game, Willits, CA. 1p.
- Harris, S. 2002. Inland and Anadromous Sport Fish Management and Research: Salmon spawning stock inventory. California Department of Fish and Game, North Central District Salmon and Steelhead Management. Annual Performance Report No. F-51-R-14. 4p.
- Harris, S. 2002. Annual Performance Report: Salmon spawning stock inventory. Federal Aid in Sport Fish Restoration Act Grant Agreement F-51-R-14, Project No. 22, Job No. 3. California Department of Fish and Game, Willits. 11p.

- Harris, S. 2003. Inland and Anadromous Sport Fish Management and Research: Salmon spawning stock inventory. California Department of Fish and Game, North Central District Salmon and Steelhead Management. Annual Performance Report No. F-51-R-14. 5p.
- Harris, S. 2004. Annual Performance Report: Salmon spawning stock inventory. California Department of Fish and Game, Willits, CA. Federal Aid in Sportfish Restoration Act, Grant Agreement F-51-R-16, Project No. 56, Job No. 3. 4p.
- Harris, S. 2004. Annual Performance Report: Salmon Spawning Stock Inventory. Federal Aid in Sport Fish Restoration Act Grant Agreement F-51-R-16, Project No. 56, Job No. 3. California Department of Fish and Game, Willits, CA. 4p.
- Harris, S. L. 2005. Field activities of North Central District salmon and steelhead resource assessment. California Department of Fish and Game, Willits, CA. 1p.
- Hunter, B. 1985. Outlet Creek. California Department of Fish and Game, Yountville, CA. 4p.
- Jones, W. E. 1979. Memo: Ryan Creek, Mendocino County - concern for a private culvert-road crossing. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 3p.
- Jones, W. 1979. Stream Survey: Unnamed tributary to Broaddus Creek. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 3.
- Jones, W. 1984. Memo: chinook salmon trapping, Outlet creek, Mendocino County. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 2p.
- Jones, W. 1986. Willits Creek, Mendocino County, Chinook salmon carcass survey, 1986. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 2p.
- Jones, W. 1987. Willits Creek, Mendocino County, electroshocking. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 1p.
- Jones, W. 1988. Salmon carcass surveys, Mendocino County, 1987-88. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 9p.
- Jones, W. 1990. Memo: Outlet Creek, Mendocino County, railroad construction impacts on fish and wildlife resources. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 8p.
- Jones, W. and S. Monroe. 1993. Field Note: Long Valley Creek, Mendocino County, salmonid carcass survey 2/10/93. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 3p.
- Jones, W. 1994. Field Note: Ryan Creek, Mendocino County, salmon carcass surveys. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 2p.
- Jones, W. and C. Coyle. 1995. Field Note: Willits Creek, Mendocino County. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 3p.
- Jones, W. 2000. NMFS California anadromous fish distributions California coastal salmon and steelhead current stream habitat distribution table. Draft. California Department of Fish and Game, Ukiah, CA. 128p.
- Jones, W. 2001. Personal Communication: Dutch Henry Creek. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 1p.

- Jong, B. 2002. Mill Creek (B&M Creek no 343). Memo to Files. California Department of Fish and Game, North Coast California Anadromous Salmonid Project, Arcata, CA. 1p.
- Kilbourne R.T., 1984, Geology and geomorphic features related to landsliding, Longvale 7.5' quadrangle, Mendocino County, California: California Department of Conservation, California Geological Survey, OFR 84-18, 1:24,000.
- Leos, R. 1983. Memo: Outlet Creek, Mendocino County, salmon spawning stock surveys, 1982-83. California Department of Fish and Game, Special Rivers Fisheries Investigations, Arcata, CA. 1p.
- Long, M. 1987. Preliminary Stream Survey: Baechtel Creek, tributary on property of Clark Curtis. California Department of Fish and Game, North Coast Watershed Improvement Program, Fortuna, CA. 3p.
- Long, M. 1989. Field Notes: Broaddus Creek. California Department of Fish and Game, North Coast Watershed Assessment Program, Fortuna, CA. 1p.
- Macedo, R. 1996. Upper Eel River chinook stock rescue program. California Department of Fish and Game, Lake County Fisheries Management Unit, Clear Lake, CA. 8p.
- McEvoy, Arthur F. 1986. *The Fisherman's Problem*. Cambridge University Press.
- McLaughlin, R.J., Ellen, S.D., Blake, M.C., Jayko, A.s., Irwin, W.P., Aalto, K.R., Carver, G.A., and Clarke, S.H., Jr., 2000, Teology of the Cape Mendocina, Eureka, Garverville, and southwestern part of the Hayfork 30 X 60 minute quadrangles and adjacent offshore area, Northern California: USGS Miscellaneous Field Studies MF-2336, six sheets and pamphlet, 1:137,000.
- Mesman, C. 1994. Field Note: Long Valley Creek. California Department of Fish and Game, North Coast Watershed Improvement Center, Fortuna, CA. 1p.
- National Marine Fisheries Service (NMFS). 2003. Draft Report: Preliminary Conclusions regarding the updated status of listed ESUs of West Coast salmon and steelhead, B. Steelhead Trout. Northwest Fisheries Science Center, Seattle, WA.
- Nielsen, J. L., M. Maahs, and G. Balding. 1990. Anadromous salmonid resources of Mendocino Coastal and inland rivers, 1989-1990; an evaluation of rehabilitation efforts based on carcass recovery and spawning activity. Prepared by Salmon Trollers Marketing Association, Inc., Fort Bragg, CA. for California Department of Fish and Game, Fisheries Division, Fisheries Restoration Program. Contract No. FG9364. 110p.
- Reynolds, F. L. 1983. Status report of California Wild and Scenic Rivers salmon and steelhead fisheries. California Department of Fish and Game. 203p.
- Simpson, G.D., 2005, Findings from fault hazard investigations along the Maacama fault for the proposed Willits hospital, Willits, California: Geological Society of America Abstracts with Programs v. 37, no. 4, p. 83
- Sommerfield, K.C., D.E. Drake, R.A. Wheatcroft. 2002. Shelf Record of Climatic Changes in Flood Magnitude and Frequency, North Coastal California. Geological Society of America 30 (5):4.
- Sprague, C., and M. Long. 1989. Field Note: Reeves Canyon Creek salmonid carcass survey of 12/9/88 and 1/4/89. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah. 2p.
- Sprague, C., and M. Griffin. 1989. Field Note: Mill Creek salmonid carcass surveys. Mendocino County Fisheries Management Unit, Ukiah. 3p.

- Stokes, J. 1981. Ecological Characterizations of Central and Northern California Coastal Region, Eel River Watershed Unit, Bureau of Land Management and United States Fish and Wildlife Service prepared by Jones and Stokes, Inc., Sacramento, CA.
- Ukiah Republican Press. 1897. The Egg Station. December 10, 1897, Ukiah, CA.
- U.S. Environmental Protection Agency. 2004. Upper Eel River and Tributaries (including Tomki Creek, Outlet Creek, and Lake Pillsbury) Total Maximum Daily Loads for Temperature and Sediment. Region IX. San Francisco, CA.
- U. S. Fish and Wildlife Service. No date. Eel River fishery investigation 1967-68. Memo to Files. Unknown Source. 17p.
- Walton, K. 1988. Field Note: Broaddus Creek salmonid carcass survey of 12/18/87 and 2/10/88. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 7p.
- Walton, K., I. Gilroy, and M. Griffin. 1988. Field Note: Baechtel Creek salmonid carcass survey of 12/18/87 and 2/10/88. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 9p.
- Walton, K., and M. Griffin. 1988. Field Note: Davis Creek salmonid carcass survey of 12/18/87 and 2/11/88. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 7p.
- Walton, K., M. Long, and I. Gilroy. 1988. Field Notes: Outlet Creek salmonid carcass surveys. California Department of Fish and Game, Mendocino County Fisheries Management Unit, Ukiah, CA. 12p.
- Woolace, A.C., Kelsey, H.M., Sarna-Wojcicki, A.M., and Simpson, G.D., 2005, Late neogene and Quaternary stratigraphy and structure of Little Lake (Willits) Valley, northern California coast range, California: Geological Society of America Abstracts with Programs v. 37, no. 4, p. 68.

# Spatial Data Availability, Catalog, Standards and Analyses

## ***Data Availability***

For GIS data associated with this report please contact the individual agencies listed below:

CaSIL – California Spatial Information Library (formerly Teale – Stephen P. Teale data center, State of California): <http://gis.ca.gov/>

CDF – California Department of Forestry and Fire Protection: [www.fire.ca.gov](http://www.fire.ca.gov)

CGS – Department of Conservation, California Geological Survey: [www.consrv.ca.gov/CGS](http://www.consrv.ca.gov/CGS)

CWMC – California Watershed Mapping Committee: <http://www.ca.nrcs.usda.gov/features/calwater>

CWPAP – Coastal Watershed Planning and Assessment Program: <http://www.coastalwatersheds.ca.gov>

CDFG – California Department of Fish and Game: <http://www.dfg.ca.gov>

DOD – Department of Defense: <http://www.defenselink.mil/>

DWR – California Department of Water Resources: <http://www.water.ca.gov/>

FRAP – Forest Resource Assessment Program: <http://frap.cdf.ca.gov/>

NCRWQCB – North Coast Regional Water Quality Control Board: <http://www.swrcb.ca.gov/rwqcb1/>

RNSP – Redwood National and State Parks: <http://www.nps.gov/redw>

SSRRCDC – Sotoyome-Santa Rosa Resource Conservation District: <http://sotoyomercd.org/>

USDA – United States Department of Agriculture: <http://www.usda.gov/wps/portal/usdahome>

USGS – United States Geological Survey: <http://www.usgs.gov/>

## **Spatial and Geographic Information Systems (GIS) Data Standards and Analyses**

Data records were collected for synthesis and analysis purposes and most of these data were either created in a spatial context or converted to a spatial format. Effective use of these data between the five partner departments required establishing standards for data format, storage, management and dissemination. Early in the assessment process, we held a series of meetings designed to gain consensus on a common format for the often widely disparate data systems within each department. Our objective was to establish standards that could be easily used by each department, that were most useful and powerful for selected analysis, and would be most compatible with standards used by potential private and public sector stakeholders.

As a result, we agreed that spatial data and base information disseminated to the public through the program would be in the following format (See data catalog for a complete description of data sources and scale):

*Data form:* standard database format usually associated with a GIS shapefile<sup>®</sup> (ESRI) or coverage. Data were organized by watershed and distributed among watershed synthesis teams. Electronic images were retained in their current format.

*Spatial Data Projection:* spatial data were projected from their native format to both Teale Albers, North American Datum (NAD) 1927 and Universal Transverse Mercator (UTM), Zone 10, NAD 1983. Both formats were used in data analysis and synthesis.

*Scale:* most data were created and analyzed at 1:24000 scale to 1) match the minimum analysis scale for planning watersheds, and 2) coincide with base information (e.g., stream networks) on USGS quadrangle maps (used as Digital Raster Graphics [DRG]).

*Data Sources:* data were obtained from a variety of sources including spatial data libraries with partner departments or were created by manually digitizing from 1:24000 DRG.

The metadata available for each spatial data set contain a complete description of how data were collected and attributed. Spatial data sets that formed the foundation of most analysis included the 1:24000 hydrography and the 10-meter scale Digital Elevation Models (DEM). Hydrography data were created by manually digitizing from a series of 1:24000 DRG then attributing with direction, routing, and distance information using a dynamic segmentation process (see

<http://support.esri.com/index.cfm?fa=knowledgebase.whitepapers.viewPaper&PID=43&MetaID=294> for more information). The resulting routed hydrography allowed for precise alignment and display of stream habitat data and other information along the stream network. The DEM was created from base contour data obtained from the USGS for the entire assessment region.

Source spatial data were often clipped to watershed, planning watershed, and subbasin units prior to use in analysis. Analysis often included creation of summary tables, tabulating areas, intersecting data based on selected attributes, or creation of derivative data based on analytical criteria. For more information regarding the approach to analysis and basis for selected analytical methods, see the integrated analyses section.