



The WaterTalks Series is an ongoing program of educational events designed to provide people a place to learn about water-related topics. The program goal is to increase informed participation in water management policy decisions by providing a place for community members to interact with experts who have a diverse range of perspectives and to develop common understanding. Water Talks is a program of the Santa Clara Steelhead Coalition led by California Trout.

Connecting Headwaters to Ocean: Designing for Fish Passage and Enhanced Instream Flow

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The Southern steelhead Recovery Plan identifies fish passage barriers and lack of instream flow as the two critical limiting factors to steelhead recovery on the Santa Clara River watershed. To meet the specie's needs, adequate in-stream flow is necessary throughout the River corridor and creeks to maintain fish habitat and to support fish migration from the downstream ocean environment to the upstream rearing and spawning habitat.

In-stream flow originates as rainfall but is affected by operation of Pyramid and Santa Felicia Dams (on Piru Creek and discharging to the Santa Clara River upstream of Sespe creek) and Freeman Diversion (downstream of Santa Paula), along with several smaller water diversions.

Flow release and capture at these water utilities, especially during average or low water years, need to fit with natural rainfall occurrences so minimum instream depth supports steelhead life history needs.

Many studies attribute declining steelhead populations to insufficient water release during key life stages such as migration, spawning and rearing.



Vern Freeman diversion. Photo: Mike Weir

Various other physical factors limit steelhead passage through the Santa Clara River and its steelhead bearing tributaries. For example, structures as simple as road crossings inhibit fish passage. The Santa Clara River main stem as well as Sespe Creek, Piru Creek, and Santa Paula Creek contain numerous structures that fish are unable to navigate under mid to low flows. These have been included in the CA Department of Fish and Wildlife's Passage Assessment Database: <https://nrm.dfg.ca.gov/PAD/>

Santa Clara River Minimum Flow Requirements Study

A study performed in 2006 determined the minimum surface water flow rate, as well as when those rates occurred, for steelhead to migrate from the Santa Clara River mouth to Piru Creek (Harrison et al, UCSB Dept of Earth Science). Based on previous information, the study used a minimum water depth for fish passage as 0.6' present in any 10' wide portion of the River. The study also assumed fish were successful in navigating upstream past the Freeman diversion (located downstream of Santa Paula). This study found that:

- 800 cubic feet per second (cfs) river flow is needed to provide minimum water depth downstream of Santa Paula Creek and 700 cfs flow is needed to provide minimum depth upstream of Sespe Creek. The different flow rates are due to geometric and geomorphic features (such as river width and slope) as well as percolation and surface characteristics (soil type, vegetative canopy) of each area.
- Wet/Dry years are a big factor in the number of days the minimum depth of flow, and therefore fish passage opportunity, occur. For example, in the past 50 years about half the years had zero 3-day periods that minimum flow occurred downstream of Santa Paula Creek (3 days is about how long fish need to travel the distance to spawning habitat). In that same 50 years, 3 out of every 20 years had 12 or more 3-day periods that minimum flow occurred. The difference in number of 3-day periods is due to the historical highly variable drought flood cycle.
- When flow in the river at the junction with Piru Creek is 400-700 cfs, the minimum depth occurs downstream of Santa Paula Creek 88-93% of the time.
- The number of occasions minimum flow is present during any year is reduced by the Freeman diversion, with the greatest reduction happening during average rain years.

Physical Barriers and Water Consumption

Recent studies show there are about 130 barriers to Steelhead passage along the Santa Clara River and its tributaries (Stoecker and Kelley, 2005). On the Santa Clara River, existing fish passage mitigation such as fish ladders have not proven to be effective. National Marine Fisheries Service, in their 2016 5-year review of the Southern Steelhead Recovery Plan, concluded:

- Water withdrawal, storage, conveyance, and diversions for agriculture, flood control, domestic and hydropower purposes have greatly reduced or eliminated historically accessible steelhead habitat.

- Climate change will likely exacerbate the human impacts to salmon populations. For example, prolonged drought results in greater extraction of groundwater resources that are necessary for riparian vegetation and which provide base flow for summer habitat to steelhead.

Strategies for Achieving Desired Flow and Passage Conditions

- Designate a defined flow event, such as a 3-day period exhibiting minimum flow, as part of water utility structure operation criteria. For example, dam releases or diversion for groundwater recharge would occur providing the designated flow event is maintained. Flow events are defined based on scientific modelling such as performed in 2006 (Harrison et al, UCSB Dept of Earth Science) which incorporate rainfall as well as specific geometry, hydrology, and geomorphic features of key areas of the river.
- Partner with and provide technical support to local landowners to promote multi-benefit projects that meet both agricultural as well as steelhead life history needs, and integrate fish criteria into the engineering design of water infrastructure construction and ongoing operations.
- Identify and incentivize opportunities to support water conservation projects through capturing instream flow during wet years and seasons, to store off stream in tanks and/or ponds to use during drier years and seasons.

Coalition Projects

- The Coalition is advocating for a sustainable long-term fish passage alternative on the Vern Freeman Diversion Multiple Species Habitat Conservation Plan.
- Restoration of 700' of streambed on Santa Paula Creek to recover passage through the fish ladder below Harvey Diversion and open 12.3 miles of habitat is underway as a Coalition project.
- Replacement of a complete barrier to a bridge span (or other fish passage alternative) on Sisar Creek, a tributary of Santa Paula Creek, is under study by CalTrout and Friends of the Santa Clara River. Fish passage will result in 8 additional miles of highly productive spawning and rearing habitat.
- CalTrout will prepare a plan for Rose Valley Lakes modifications, including streambed restoration and removal of warm water habitat and associated aquatic invasive species (AIS). The modifications will result in AIS suppression and native species recovery.

Bill Trush has been pursuing river ecology his entire life and is currently an adjunct professor in Humboldt State University's Department of Environmental Science and Management as well as serving as Co-Director of the University's River Institute. Nothing is more important to him professionally than understanding how river ecosystems work and how to fix those that are damaged. Recently he has been studying how historic annual hydrographs once sustained healthy Southern California rivers ecosystems, and why hydrological changes now threaten steelhead populations.

Tom Hicks is a California water law and conservation attorney with special expertise in stream flow enhancement. He counsels the full range of individuals to agencies, including public interest organizations and landowners with transactional, administrative, regulatory, and litigation matters. Tom is currently working on a California Department of Fish & Wildlife Prop. 1 conservation easement in Humboldt County as well as 6 Wildlife Conservation Board projects for stream flow enhancement in Ventura, Santa Barbara, San Luis Obispo, Siskiyou, and Stanislaus Counties. He is a former whitewater raft guide, kayaker, and Colorado Outward Bound School instructor.

Ed Wallace is a principal with Northwest Hydraulic Consultants (NHC) and a licensed civil engineer with over 30 years of experience in water resources engineering, hydrologic and hydraulic studies, geomorphic assessments, and stream restoration. He combines computer modelling tools with design of stream and estuary restoration, fish passage and habitat enhancement projects. Recent projects Ed has worked on includes fish passage barrier removal, designs that mimic natural streambeds, and bio-technical stabilization of human-modified streams to improve habitat. Ed has been the design lead for many southern California steelhead fish passage restoration projects, including projects on the Santa Clara River and tributaries.

For more information on the 2017 WaterTalks Series contact Nina at ndanza@caltrout.org