

## Comments on the FAHCE draft EIR.

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I have extensive experience since the 1980's with steelhead ecology in Santa Clara County streams and streams in coastal San Mateo and Santa Cruz counties.

Although I have potential comments on various parts of the EIR (including comments provided for the original scoping effort), I will confine comments here to the issue of providing **passage for steelhead smolts in spring.**

Balancing releases among adult migration access, late spring through winter rearing, and smolt outmigration passage, with limited stored water, is difficult. Since releases for rearing are generally limited to the reaches that provide for percolation into water supply ground water basin, there is not a water supply cost to providing rearing habitat. However, the additional releases in winter for adult steelhead passage in drier years does result in the need to provide water through to San Francisco Bay and does entail a reduction of potential water supply water. Fortunately adults tend to quickly move into and through these short streams when passage flows are available, even during brief storm periods. However, adults may attempt to migrate from at least January through March, so multiple natural or managed pulses may be needed. Similarly, smolt movements downstream require passage through to the Bay, at a time when natural flows are declining rapidly and managed releases would entail a loss of stored water, much of which would not be percolated into the water supply groundwater basin.

Extended, detailed studies by Shapovalov and Taft (1954) at Waddell Creek (Santa Cruz County) and other studies throughout coastal California show that the smolt migration in spring occurs as a rather continuous movement of fish during an extended period in March through June. Individual late rains may trigger some fish to move with the storm, but the movement continues after the brief pulse. Multiple pulses over an extended period would be necessary to allow most of the smolts to successfully emigrate. In wet coastal streams the pathway to the ocean is usually open, even in drier years. Pathways in Santa Clara County are not.

In 1987-1989 I conducted smolt trapping weekly in late March through June on the San Lorenzo River during three dry years when stream flows were dropping quickly and passage in the downstream portion of the river was becoming a problem. The results (shown below) were at first counterintuitive. Most of the smolts did not migrate in winter when passage flows were assured, but waited until late March through May, when declining stream flows can be very problematic (as would be especially expected in the 1987-1989 drought years). The reason for the risky late migration is that survival in the ocean is very size-dependent, and spring is a time of clearer, warming water, increasing insect abundance, and good juvenile fish growth. In the 1987-1989 drought years, the mild winter conditions allowed the fish to start growing earlier in winter (warmer, clearer water), but despite the earlier start to growth and the early reduced flows for outmigration, about half of the steelhead smolts still migrated in May or early June, as Shapovalov and Taft (1954) found in Waddell Creek. Scale analysis showed that fish that were already large at last annulus migrated earlier, but smaller fish used much of spring to provide for extra growth before migrating; the spring increment of growth progressively increased with

the later date of migration, allowing smaller fish to reach a size with improved ocean survival. Small fish that emigrate early are too small for ocean survival; those that linger and grow are “fitter” due to improved potential ocean survival, but risk passage difficulties from declining flows during outmigration.

Droughts or management actions which block migration at the end of April (when releases in FAHCE are sharply reduced to “rearing” releases within the percolation zone) may prevent half of the smolt migration, unless potential smolts are already large in winter; the fish in Guadalupe and Stevens creek watersheds are not large (although they may be in Coyote Creek). The FAHCE Plus alternative (to improve passage) provides only a brief pulse for smolt migration in mid-April and is further restricted by storage rule curves. Smolt migration will be blocked during most of the migration in most years, and during drier years few smolts will successfully migrate to the Bay. Smolts attempting to emigrate will move downstream into the seasonal dry-back zone and be killed during the dry-back. The steelhead success bottleneck in these streams, with extensive percolating channels into both water supply and the downstream perched upper aquifer, is the ability for a good percent of smolts to successfully emigrate, survive in the ocean, and return as adults. Rearing fish, without successful adult and smolt migration, can convert the population to a resident rainbow trout population, as in Upper Penitencia Creek, and which briefly occurred in Stevens Creek during the 2013-2016 drought (attached reports).

At the very least, smolt trapping at the downstream end of the rearing zone (upstream of the passage bottleneck) should be used to document smolt migration timing, and adjustments (adaptive management) made to provide a more extended spring period of pulse flows for emigrating smolts (such as is provided by the MOA for Uvas Creek in South Santa Clara County).

