

Porter Creek: A Case Study in Multi-Agency Management, Research and Applications

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Background

Porter Creek, a 7.5 mi² tributary of the lower Russian River watershed, has been identified as a priority stream for endangered Central California Coast coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*O. mykiss*). Years of monitoring data indicate that low streamflow impedes salmonid smolt passage and survival of summer-rearing juveniles. In recent years, numerous partners have been engaged in a variety of efforts to better understand and restore critical ecosystem functions within the watershed in order to support salmonid recovery. Efforts have ranged from coho salmon releases to intensive biological and environmental monitoring, making Porter Creek a model of multi-agency collaboration. All of this was made possible by gracious land owners granting access to the creek, and support from E & J Gallo Winery for entering into a 20-year water rights agreement pledging water for conservation use.

Coho Salmon Releases

- Each year, juvenile coho salmon are released into Porter Creek as part of the Russian River Coho Salmon Captive Broodstock Program.

Hatch year	Number released	Number PIT-tagged	Proportion PIT-tagged
2010	12,424	0	0.00
2011	9,122	0	0.00
2012	10,198	0	0.00
2013	8,045	1,207	0.15
2014	8,084	1,212	0.15
2015	0	0	0.00
2016	6,096	913	0.15
2017	6,062	1,728	0.29
2018	5,073	1,010	0.20



Juvenile coho being released into Porter Creek

Porter Creek Broodstock release data

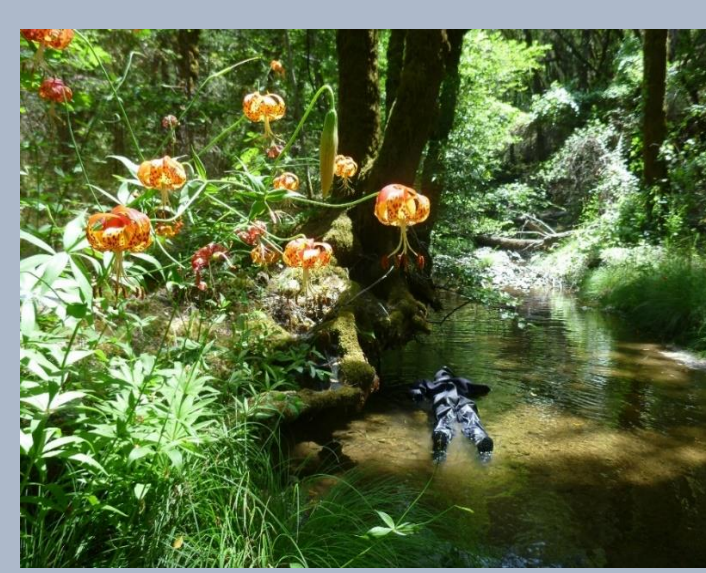
- A fraction of all releases are PIT-tagged so that movement and survival can be tracked using PIT tag detection systems placed throughout the watershed.

Coastal Monitoring Program

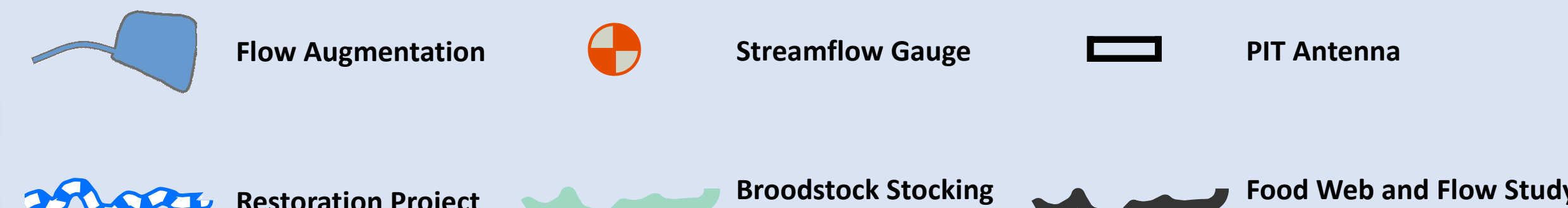
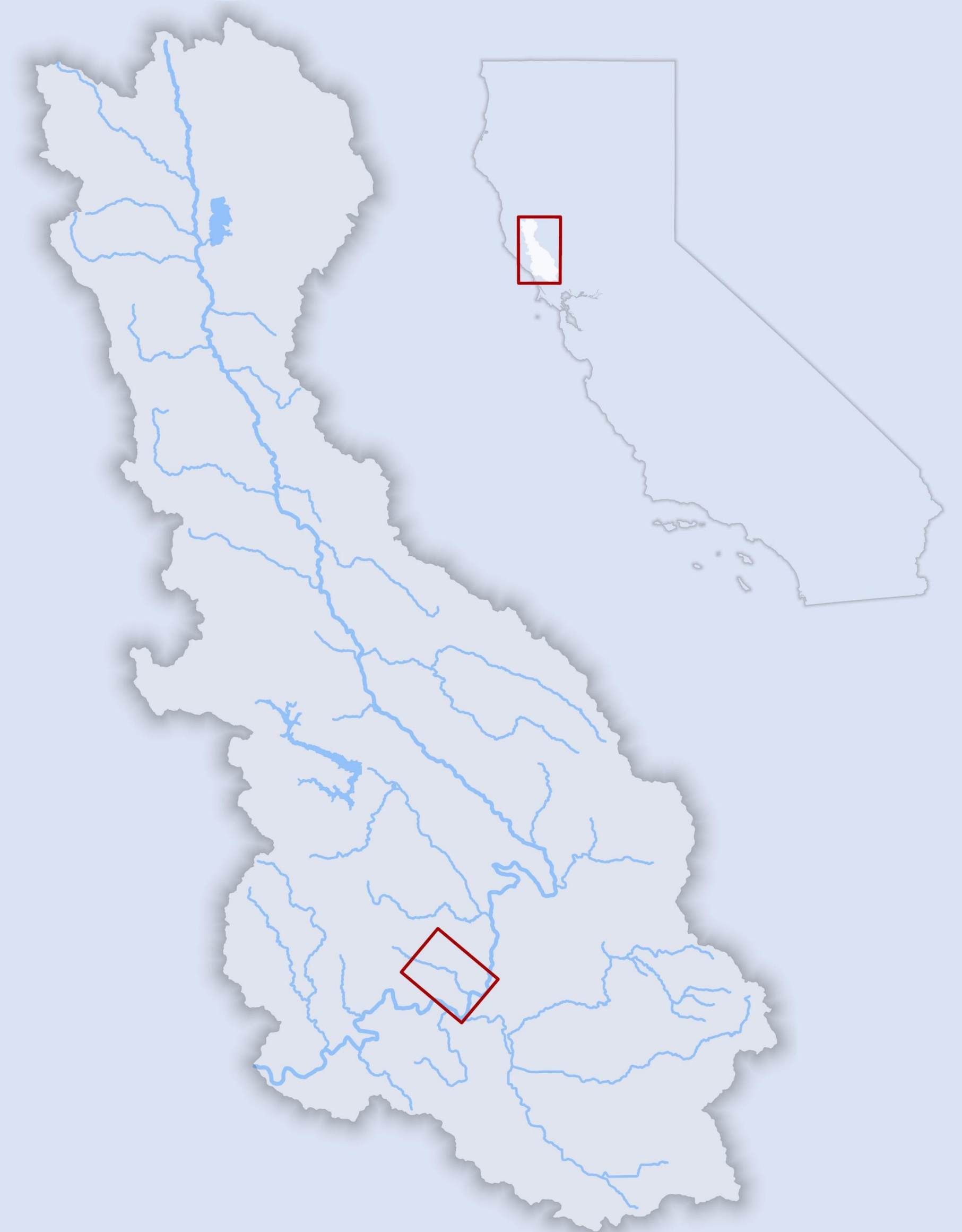
- Porter Creek, like the rest of the Russian River watershed, has seen adult returns diminish over time.
- Sonoma Water partners with California Sea Grant's (CSG) Russian River Salmon and Steelhead Monitoring to implement the California Coastal Monitoring Program (CMP) in the Russian River watershed, including Porter Creek.
- Every year CMP technicians utilize a variety of survey techniques, such as spawner and snorkel surveys, to document the number and distribution of returning adults and wild juveniles.
- The CMP has helped identify low streamflow as an impediment to smolt passage and the survival of summer-rearing juveniles.
- In winter 2018/19, CMP technicians observed 33 returning adult salmonids, 7 of which were coho salmon, and 23 redds on Porter Creek.



Spawner surveys are conducted throughout the winter to record adult returns and to gather GPS locations for redds, live fish, and carcasses.



Snorkel surveys are conducted to estimate abundance of juvenile salmonids utilizing Porter Creek for nursery habitat.



Flow Augmentation

- To improve streamflow in Porter Creek for the benefit of fish populations, a private land-owner, the E&J Gallo Winery, entered into a voluntary drought agreement in 2014, and, funded through Proposition 1, built a telemetered pipe system diverting water from an off-channel reservoir owned by the winery into a reach of Porter Creek that runs through its property
- This also provided a unique opportunity for scientists to study ecosystem response to different flow regimes, with the ultimate goal of designing a plan to use a limited amount of stored water to yield the maximum ecological benefit.



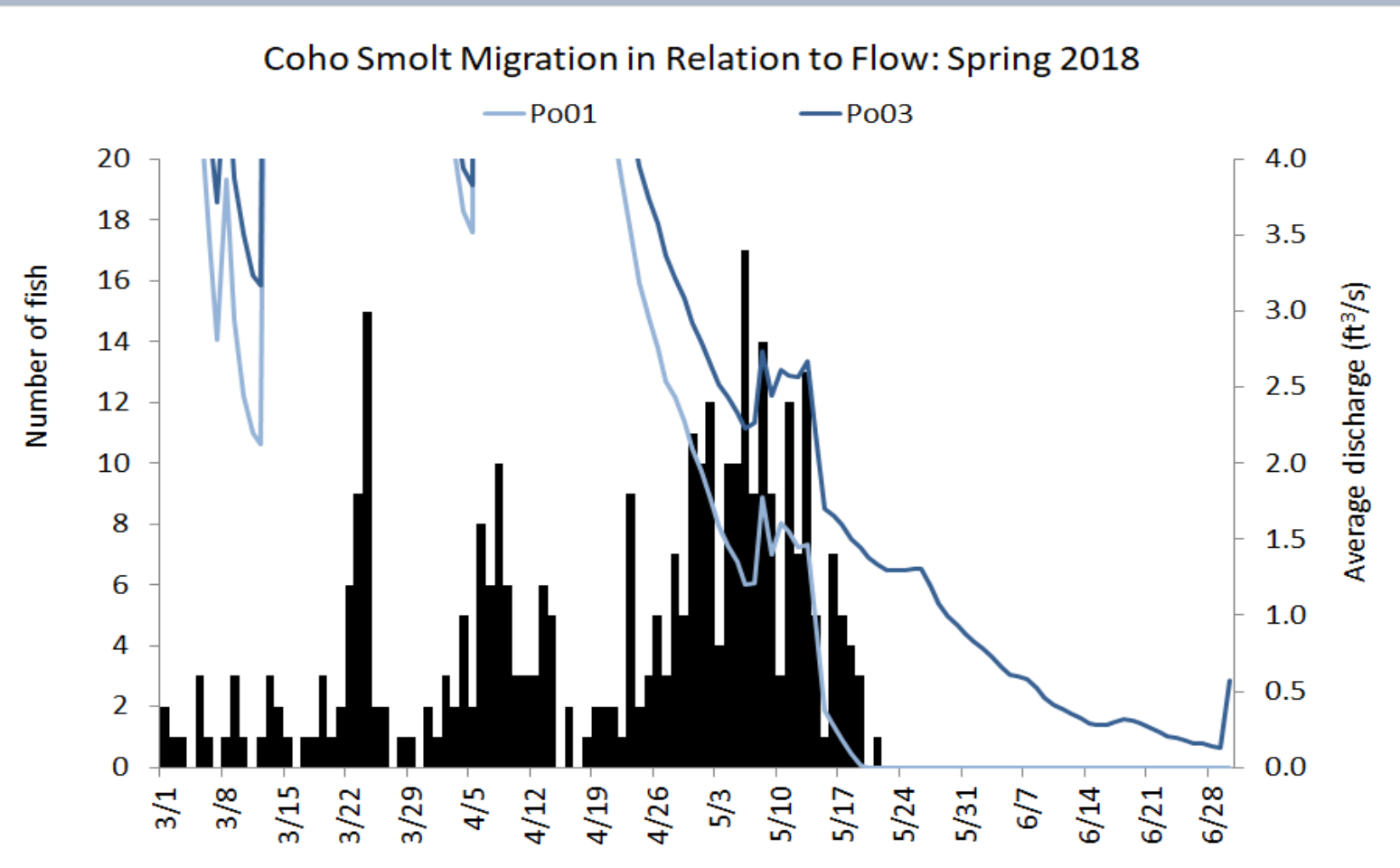
Augmentation pipeline release at 290 gallons per minute.



The control system of the pipe, at the pump house by Gallo's reservoir.

PIT Antennas

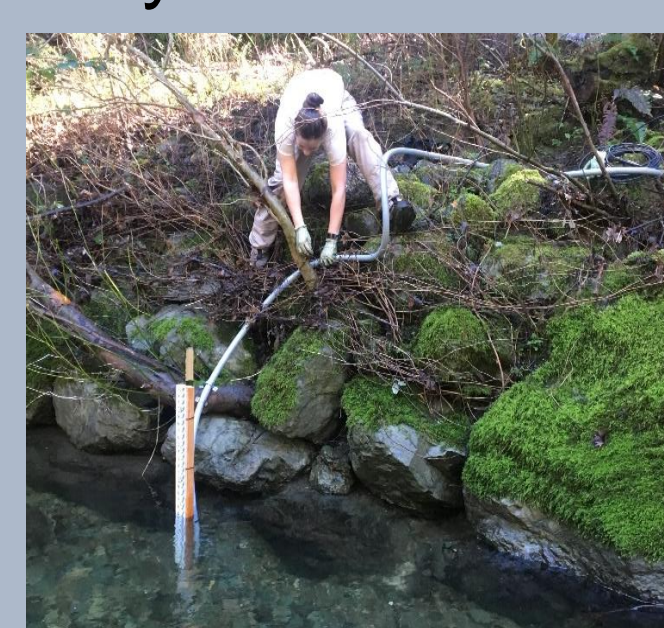
- CSG operates PIT antennas on Porter Creek which help to estimate smolt outmigration timing in relation to streamflow.
- In 2014 CSG technicians noted a large population of smolts trapped after Porter disconnected from the mainstem Russian in the spring. Using the flow release pipe, they were able to reconnect the creek to the river, and provide access to an estimated 25% of the creek's smolt outmigration that year.



PIT detections of outmigrating smolts from Porter Creek overlaid with streamflow data from TU, representing how flow augmentation assisted fish passage.

Streamflow

- Trout Unlimited (TU) installed four pressure-transducer streamflow gauges along the reach below augmentation to assess the impact of augmentation on instream flow, and support other research on the creek.
- TU also conducted wetted habitat surveys in 2017 and 2018 to assess hydraulic connectivity and water quality.



- A Trout Unlimited scientist installing a pressure transducer flow gauge.

Habitat Enhancement

- In an effort to improve salmonid rearing habitat, Sonoma Resource Conservation District and O'Connor Environmental installed approximately 30 large woody debris structures into Porter creek and removed one partial barrier to anadromy.



Large Woody Debris installed in Porter Creek by Sonoma Resource Conservation District

Food Web and Flow Study

- In 2017, UC Berkeley with assistance from CSG, studied the affects of streamflow augmentation on hydraulic connectivity, habitat and water quality.
- In 2018, the study was expanded to include impacts on salmonid behavioral and food web ecology, quantifying salmonid foraging behavior using video analysis, inter-pool movement measured with PIT antennas, and invertebrate drift.



A net catching invertebrate drift in one of the 2018 study pools.



Video of juvenile salmonids drift foraging during an augmentation flow in 2018.

Acknowledgements

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