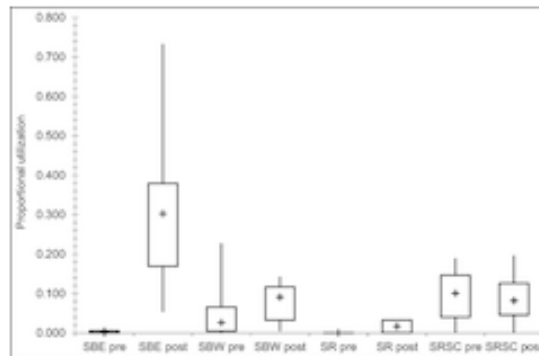


Do Adult Salmon Benefit from Gravel Augmentation?

Anadromous salmonid diversity and abundance have been adversely impacted by human activities, and millions of dollars are spent each year on stream habitat and restoration projects aimed at reducing and reversing these adverse impacts. However, do adult salmon actually respond to and benefit from these enhancement efforts? A lack of data comparing site use by salmon before and after restoration efforts makes it difficult to answer this question. In order to shed some light on the issue, Dr. Steve Zeug led a team of CFS scientists in collaboration with the Sacramento Water Forum, the USBR, and the USFWS on a study examining the impact of gravel augmentation on spawning site utilization by Chinook salmon and steelhead trout in California's Lower American River. The study examined gravel augmentation sites constructed in the river during 2008, 2009, and 2010, and analyzed data from spawning surveys by USBR for steelhead and Chinook salmon taken before and after the construction periods. As shown in the figure above, the study results indicate a significant positive effect of gravel augmentation on the proportion of spawning utilization for both species [\[click the figure for a larger view with caption\]](#). The study results were recently published in the journal *River Research and Applications*. The paper is available online: [Gravel Augmentation Increases Spawning Utilization by Anadromous Salmonids: A Case Study from California, USA](#). For more information, contact Steve Zeug by [email](#) or call (530) 888-7773.



R Training Course

Openings are still available for a new training course "Visualizing and Analyzing Environmental Data with R" produced in collaboration with the Northwest Environmental Training Center and taught by CFS scientist Kevin Ceder:

- [October 1-2 in Helena, MT](#)
- [November 13-14 in Sacramento, CA.](#)

This course is designed for participants who wish to gain beginning to intermediate skills in using R for manipulating, visualizing, and analyzing environmental data. The hands-on classes will be taught using real-world environmental data sets and instructor-led examples. It is recommended for researchers, students, data analysts, and anyone needing to become proficient in R basics. To register for a class, [click here](#). To learn more about this course, please contact Kevin Ceder by [email](#) or call (360) 455-7233.

What Is the Relationship between Stream Flow and Juvenile Salmon Survival?

CFS scientists Ian Courter and Tommy Garrison teamed with USGS scientists Toby Kock and Russ Perry to investigate the relationship between stream flow and survival of Chinook salmon smolts in the Yakima River, Washington. The multi-year study relies on radio telemetry data and mark-recapture models to estimate survival of emigrating juvenile salmon. The figure to the right shows the observed positive relationship between flow and survival in the river [\[click the figure for a larger view with a paragraph-length description of the study and findings\]](#). For more information, contact Ian Courter by [email](#) or call (503) 491-9577.

