

Flow releases: A strategy for coastal streamflow enhancement and salmonid recovery

Coho salmon generally spend the first full year of their lives in small streams, and steelhead can rely on this important habitat for even longer. In coastal California, many of these streams are flow-impaired and become intermittent, or dry completely, during the summer/fall dry season. Flow releases, which add water to streams from sources such as agricultural ponds, can enhance streamflow and improve habitat conditions for juvenile fish, thereby increasing their chances of survival.

The Russian River Coho Water Resources Partnership has worked with private landowners, municipalities, and agency partners to implement flow releases in tributaries that provide critical salmonid rearing habitat during the dry summer months. These releases emerged as an adaptive management strategy during the recent drought. Once their ability to improve habitat and water quality conditions became evident, they gained traction as an effective flow improvement tool, particularly when combined with long-term flow enhancement strategies.

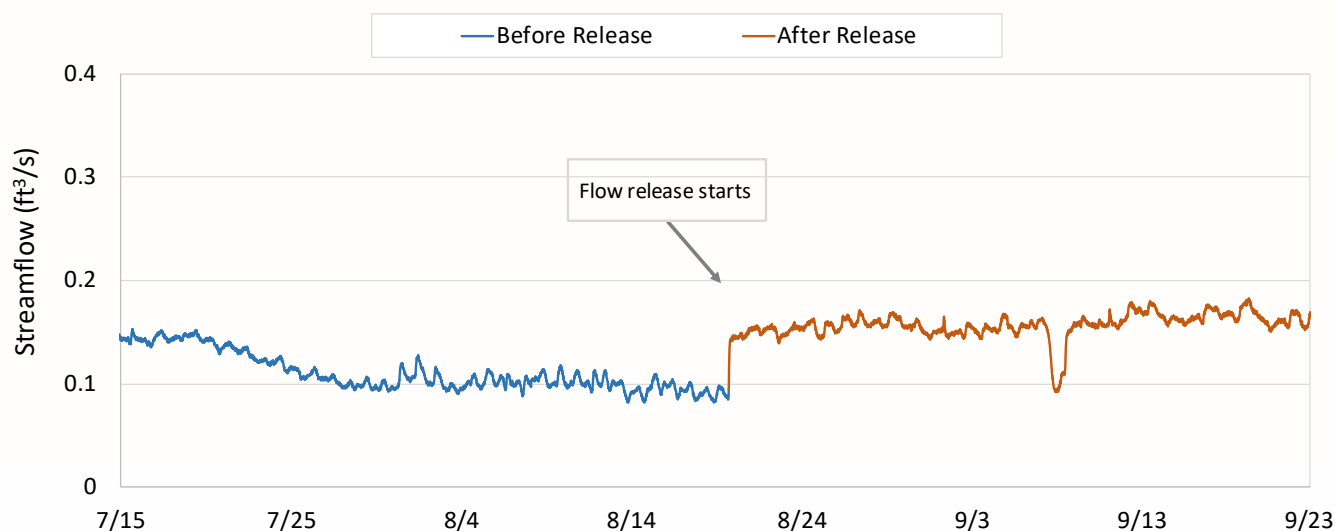


Lessons from the Russian River watershed

Even small flow releases can significantly improve flow

Flow releases in Russian River streams—which were sourced from agricultural ponds and from a small water district's well—ranged from 0.05 to 0.10 ft³/s and lasted up to three months. While this amount of water could be considered a nominal contribution, it comprised a significant proportion of the summer base flow of the streams being augmented—from 70% of pre-augmentation streamflow in a wet year to as much as 400% during a drought year. While the release amount does not always translate to the same volume of instream flow, releases have been found to significantly improve summer streamflow.

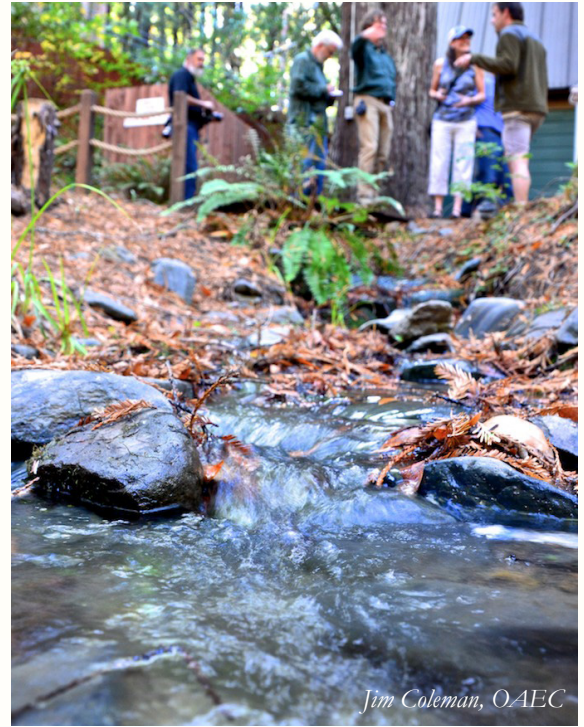
Streamflow conditions before and after release



Gage data from a dry year (2017) show a flow release increased streamflow conditions by approximately 175%.

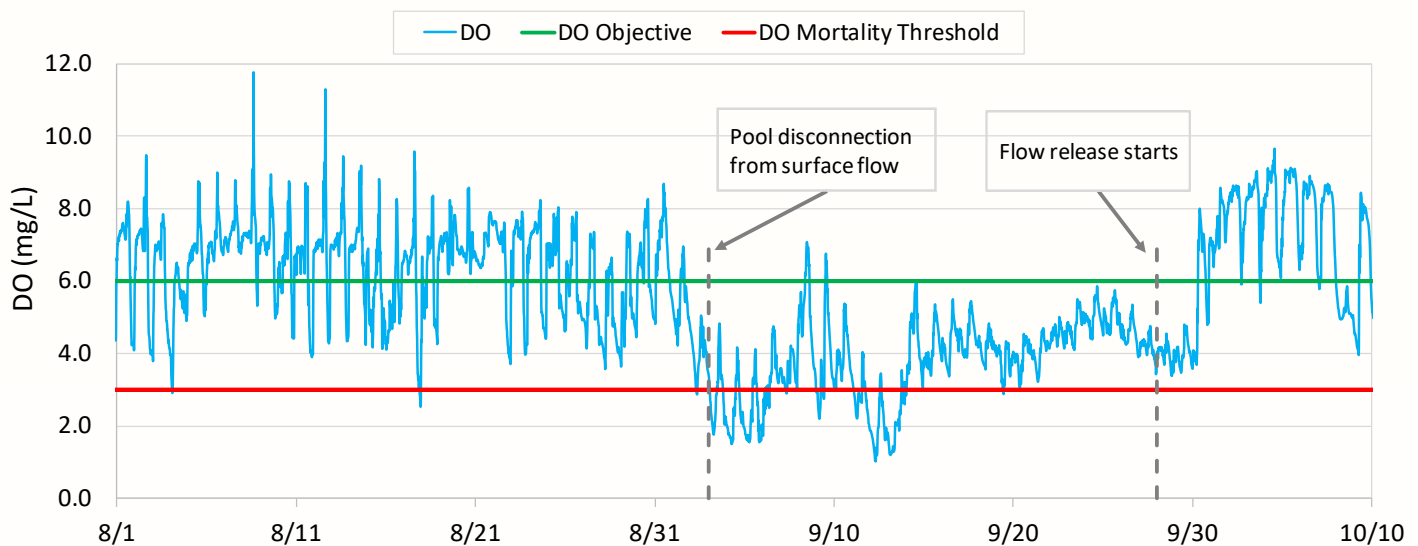
This additional water can benefit salmonids and other aquatic species

Enhanced streamflow from releases often improves surface flow connection and water quality. For example, a 2015 release in Dutch Bill Creek caused dry riffles as far as three kilometers downstream to rewet. Coho Partnership research has demonstrated that increasing stream connection increases the probability of juvenile salmon survival. Since it takes as little as 0.02 ft³/s to keep pools connected in these streams, even small flow improvements can help to support greater fish survival. Flow releases can also have beneficial impacts to water quality, helping to maintain the cold, well-oxygenated conditions salmon need to survive the summer. In 2017, for example, a flow release in Green Valley Creek more than doubled dissolved oxygen (DO) concentrations downstream and significantly reduced water temperatures from August through October.



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Flow release impacts on dissolved oxygen (DO)



DO logger data from an average water year (2017) show that a flow release increased average daily DO from 4.17 mg/L to 7.49 mg/L after the release reconnected the stream.

Considerations for flow releases

Each prospective opportunity is unique and must be approached thoughtfully. Water users and restoration practitioners contemplating flow release projects should consider the following:

- **Cold water:** It is critical that releases come from cold-water sources. Excessively warm water can be deadly to salmonids and other species.
- **Clean water:** Water released into stream channels must be clean. Polluted water can have serious detrimental impacts to water quality and aquatic organisms. It is also ideal for water to be aerated upon release to maximize DO concentrations.
- **Sufficient water:** Flow release sources must have sufficient volume to last through the dry season, once initiated.

Considerations for flow releases continued >>>

- **Planning and strategy:** In most cases, the total amount of water available to release will be limited. The timing, duration, and rate of the release must be determined each year in order to maximize benefits under variable climatic conditions. This requires careful planning, and project managers should avoid abrupt changes in flow that might leave fish stranded. If there are multiple releases in a watershed, they can be timed to complement each other.
- **Agency consultation:** At a minimum, consult with the State Water Resources Control Board, the Regional Water Quality Control Board, the California Department of Fish and Wildlife, and the National Marine Fisheries Service to discuss the plan for the release and to determine what permits and monitoring will be necessary. The permits may vary depending on the source and nature of the release. Start your planning early!
- **Monitoring:** Ideally, flow releases, like all streamflow improvement projects, should be monitored until the impact to the stream has been sufficiently documented.
- **Programmatic approach:** Because they generally rely on existing storage infrastructure, flow releases can yield substantial ecosystem benefits at a fraction of the cost of more conventional streamflow enhancement projects. However, because in many cases they do not provide long-term reliability, they should be paired with more comprehensive and long-term streamflow enhancement efforts whenever possible.

What you need to know: project takeaways

- Flow releases can be a valuable and relatively cost-effective method of improving the probability of fish survival in small, intermittent streams over the dry summer months.
- Flow releases as small as 0.05 ft³/s have been successful in improving streamflow, surface flow connectivity, and water quality conditions during wet, average and dry water years.
- There is no one-size-fits-all approach to flow releases. Projects require strategic planning, and results will vary between sites and even across years at the same site.
- Flow releases should be implemented as part of a larger program to enhance streamflow and address other factors that limit fish survival.
- Implementing flow release projects takes time, so start planning and agency consultation early.



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For more information, please visit the Coho Partnership website at cohopartnership.org.

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