POB
POINT OF BEGINNING

Little River Poses Big Challenge for Large Dam Rehab Project

By Benjamin Taber, PE
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The Warm Springs Dam on Dry Creek, near Healdsburg, Calif., provides much needed water storage for residents of Sonoma and outlying counties in the northern part of the state.

In 2008, the National Marine Fisheries Service (NMFS) determined that the 13-mile tributary to the Russian River was lacking sufficient habitat diversity to support natural spawning and rearing for endangered coho salmon and steelhead trout. The dam is owned by the U.S. Army Corps of Engineers and operated by Sonoma County Water Agency for water supply purposes. Because of the creek's regulation, it is believed that higher than normal wintertime flows have caused degradation and erosion to the channel's banks. Summertime base flows are also too high for juvenile coho and steelhead to thrive in the main stem without areas of channel complexity where velocities are more favorable. NMFS recommended a few costly alternatives to alleviating the velocities in Dry Creek, one of which was to construct a bypass pipeline to be able to discharge water directly from Lake Sonoma into the Russian River. A second, more ecological approach was chosen to enhance six miles of degraded channel and overbank areas along Dry Creek over a 12-year period. The main purpose of these enhancements is to

provide lower velocity areas for juvenile rearing, which often is during times of higher releases from the dam due to peak water demand in the summer.

Targeted enhancement areas were determined by engineers and scientists based on the level of channel degradation and also with cooperation of landowners on the reach. Where appropriate, the conceptual channel designs are intended to mimic natural stream morphology by the way, reconnecting the main stem to secondary and tertiary high-flow channels and backwater features. Bank stabilization measures consist of bioremediation, rootwads and boulder/rock placement. Large woody debris features are engineered log jams consisting of strategically placed tree trunks and rootwads that are used to provide shelter for juvenile salmonids and to induce the formation of localized scour pools and bars.

Stream poses challenges

There are numerous river restoration, hydraulics and biological specialists working in conjunction with landowners and governmental regulators in order to provide a mutually beneficial solution to the problem. At cbec eco engineering, we specialize in multi-objective flood management and habitat rehabilitation and enhancement projects. We typically collect our own topographic, bathymetric and hydrodynamic data to support the development of our design and hydraulic modeling projects. For this project, we were tasked with performing a detailed channel survey for part of the enhancement reach and development of a two-dimensional hydrodynamic model to inform the design.

This type of project is fairly typical for cbec, and as such I spend a lot of time in the field and I have seen my fair share of issues when it comes to field work. This project was no exception. The once ephemeral stream now has a constant supply of water in the summer when it would historically have been dry. The riparian area is extremely lush and has also become overrun with invasive plants and trees, namely Himalayan blackberry. As with most small river surveys, the use of RTK GPS was out of the question due to the dense riparian canopy. The stream itself posed quite a few challenges, because there were lots of bed depth changes with extremely shallow sections transferring into pools 7-8 feet deep.

The use of a float tube or kayak was out of the question because velocities are too high to maneuver the boat safely. The only feasible option that we could come up with is to use an unmanned boat mounted with our portable Hydrolite echosounder from Seafloor Systems. Traditionally, we would use a tethered tri-hull boat with one person on each bank ferrying the boat across each transects. This posed a few issues, because we had to interface a moving boat with a Trimble S6 robotic total station in heavy tree canopy. With a two-man survey team, we would not have been able to have someone reposition the total station if it tracked behind some trees. Also, the vegetation was so thick in some spots that it would require a lot of bushwhacking to get a survey crew member a clear spot on both banks. The only viable solution was a small, unmanned survey vessel capable of interfacing to a robotic total station (RTS), and one with a very shallow draft. Most of the commercially available systems on the market did not meet the shallow draft or ability to interface to the RTS. However, I had seen many months earlier that Seafloor Systems was developing a small platform and low-cost remote controlled vessel (RCV) called the HyDrone RCV, so I gave them a call. I was a little skeptical at first performing this survey with so many moving parts all while we were doing a pretty complicated and physically demanding traverse through the riparian zone of Dry Creek.

All in all, I was pleasantly surprised with how well the survey commenced.

The Hydrolite echosounder system interfaced seamlessly via Bluetooth with the Trimble Access software in our data collector and the HyDrone provided just the right size and power to make quick work of some

rather complicated transects. From a safety standpoint, our team spent much less time in the water than anticipated and, although there were a lot more things that could have gone wrong, this method greatly reduced the personnel time needed to perform the survey. The HyDrone RCV proved to be extremely reliable, easy to assemble and operate with one person, and very rugged and able to withstand the harsh environment. The coupled Hydrolite echosounder system, with its 1-cm vertical accuracy, output a very dense and high-resolution point cloud.

The overall project came well within budget and time constraints, and the support provided by Seafloor Systems was more than adequate and extremely helpful.

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