



**Friends of  
Auburn Ravine**  
AuburnRavine.org

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Contacts for Friends of Auburn Ravine:

Jim Haufler [projects@auburnravine.org](mailto:projects@auburnravine.org) (916-672-9672)

Brad Cavallo [bcavallo@fishsciences.net](mailto:bcavallo@fishsciences.net) (530-613-8450)

Contact for California Department of Fish and Wildlife:

Colin Purdy, Environmental Program Manager, Region 2 [Colin.Purdy@wildlife.ca.gov](mailto:Colin.Purdy@wildlife.ca.gov)  
(916-358-2900)

Friends of Auburn Ravine website: [www.auburnravine.org](http://www.auburnravine.org)

PRESS RELEASE from Friends of Auburn Ravine

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## **INNOVATIVE NEW CAMERA SYSTEM SHOWS CHINOOK SALMON ARE ON THE PATH TO RECOVERY IN AUBURN RAVINE**

*A new camera system aided by state-of-the-art software uses advanced image processing to identify fish, eliminating hundreds of hours of manually reviewing footage*

The not for profit organization, Friends of Auburn Ravine (FAR), today announced that a new camera system aided by advanced image processing software has confirmed that fall run Chinook salmon are still returning to Auburn Ravine, despite the poor spawning conditions during the drought years. FAR president Jim Haufler reported this week that at least 26 adult Chinook salmon, ranging in size up to 36 inches and weighing up to 20 pounds, swam up the ravine to spawn from November 2018 through January 2019. Though these numbers represent a sharp decline from previous years (as compared to 50 salmon counted in the 2017-2018 season and 303 from 2016-

2017), Haufler noted that the latest figures are a positive sign for their population's prospects, considering California's long drought.

The Chinook salmon, also known as king salmon, are revered for their large size and unique migration patterns. Born in rivers, the babies swim out to the Pacific Ocean where they stay at sea for years until, propelled by biological instinct, they swim hundreds of miles back upstream in different seasonal "runs," transforming from saltwater fish back into freshwater fish to spawn and die.

Brad Cavallo, President of Cramer Fish Sciences, is a board member of FAR and guides the scientific aspects of the project. He said that while millions of wild salmon used to swim the Sacramento River en masse, today that [number has plummeted](#) due to dams and habitat degradation. California gold mining destroyed some of their natural habitats and pressure on the population has subsequently been exacerbated by manmade reservoirs, levees and diversions diminishing the wetlands and riverbanks the salmon rely on—and cutting off access to key streams where they lay their eggs. In fact, in central California alone, it's [estimated that Sacramento Chinooks](#) have lost an estimated 70 percent of their natural spawning habitat. Commercial fishing, unscreened agricultural water diversions and climate change (and in recent years, the California drought) have wrought additional havoc.

Their population decline has been particularly devastating as the salmon are a key element of the ecosystem and food chain, with their carcasses feeding bears, eagles, other predators and even vegetation. While federal legislation, fishing restrictions and hatcheries have helped slow the decline in abundance, the fish still remain at risk, [and reports warn](#) that California salmon may vanish in the next century – making education and awareness of their population numbers crucial.

Auburn Ravine Creek originates in Auburn, California, and flows 34 miles to the west where it enters the Sacramento River. On the way it passes through Lincoln, California and, during spring and summer, provides irrigation water to agricultural users in western Placer County and southern Sutter County.

Each fall and winter, salmon pass through Lincoln on their way to lay their eggs after completing their difficult journey upstream from the Sacramento River. FAR has been tracking the salmon run for three years in an effort to help educate and garner support amongst third parties, including government agencies and irrigation districts, to protect salmon habitats and facilitate natural migration.

To track and count fall run salmon this year, FAR employed a new camera system consisting of digital cameras which can monitor the stream 24 hours a day during migration season aided by lights at night. The video footage from the “Salmon Cams” is then processed by a newly developed software program which is designed to detect and document passing fish. Haufler said the 2018-2019 migration season is the first to be monitored with the new digital system and will allow FAR to build a scientifically valid database of salmon in the watershed.

The project is the result of a collaborative effort between FAR and the California Department of Fish and Wildlife, who provided the support structure for the cameras and who maintain the underwater viewing panels.

In addition, the software, aptly named FishSpotter, was conceptualized and developed by a Hewlett Packard Enterprise (HPE) software engineer, Eric Hubbard, who contributes pro bono software engineering expertise through HPE’s community involvement program [HPE Gives](#). HPE provides employees with 60 hours of paid volunteer time off a year in addition to providing matching funds for volunteer time through the program.

Unlike most fish counting systems which rely on analog cameras, the FAR system is completely digital, with raw video uploaded to the cloud for processing by the FishSpotter software on virtual machines. Using advanced image recognition to detect activity and wildlife, FishSpotter automatically produces short GIF highlights which humans use to identify fish species, expediting and streamlining data review and fish counting. Prior to the development of FishSpotter, FAR volunteers were tediously reviewing thousands of hours of footage from the salmon run’s entire three-month duration, with many days featuring no fish whatsoever.

“Our community investment program, HPE Gives is the spirit of HPE employees giving back to the communities where we live and work, and this unique project is a great example of employees proactively finding opportunities to donate their technology skills to make a difference,” said Kathy Gu, program director of HPE Foundation, HPE’s non-profit charitable foundation. “At HPE, we know just how powerful technology can be in enabling sustainability and doing good. That’s why we’re proud to see one of our employees leveraging his much-needed engineering skills on a pro bono basis to assist Friends of Auburn Ravine in their mission, and aid endangered wildlife and local ecosystems with innovative technology.”

By eliminating the need to watch this large batch of data, FishSpotter was able to pare down 1.6 terabytes and 2,416 hours of raw data into just 101 gigabytes and 20.4 hours

of GIF highlights for volunteers to vet and verify as salmon (or other wildlife or activity) – though ultimately, there were only 78 seconds of salmon swimming by. In future seasons, Hubbard hopes to further refine FishSpotter’s image recognition capabilities to narrow this data set of possible suspects down even further to further accelerate insights.

Colin Purdy, Environmental Program Manager with the California Department of Fish and Wildlife, commenting on the value of projects like the Salmon Cam which bring together the efforts of his agency and community groups like FAR, said “This represents a unique opportunity for our agency to cooperate with community volunteers from Hewlett Packard Enterprise and Friends of Auburn Ravine in a program that directly benefits the salmon. We look forward to collecting meaningful data about the annual migration to aid us in protecting the resource.”

Additional assistance is provided by the City of Lincoln and the Nevada Irrigation District (NID).

The project is funded by grants from California Fly Fishers Unlimited (CFFU), the California Wildlands Grassroots Fund of the Rose Foundation for Communities and the Environment, Patagonia, and donations from the community.

Haufler said “This project wouldn’t be possible without the efforts of all the partners involved. We seek to improve wildlife diversity in such a way that human uses of the landscape can continue. We look forward to restoring a robust wild salmon population in the years to come.”

He added that restoring salmon to small streams like Auburn Ravine Creek, one of hundreds in California that historically supported the fish, could cumulatively help to bolster declining populations and build climate change resiliency. “The Salmon Cam system was developed to use standard hardware with the FishSpotter software, so it can be replicated on other small streams”, he said.

While other off-the-shelf software for counting fish exists, many require forcing fish through a well-lit tunnel with a white backdrop to provide a controlled viewing area, further altering the fish’s natural habitats. FAR’s overhead camera system and FishSpotter’s capabilities were designed to uniquely and accurately enable image recognition without disrupting the salmon’s migration patterns and environment.

In addition to salmon, FishSpotter has captured images of otter, pacific lamprey, beaver, great blue heron, black phoebe, belted kingfisher, western bluebird, red-shouldered

hawks, and other riparian critters which use the creek as home or highway. As an unexpected bonus, FishSpotter produced photographic images of two salmon migrating in late January, after the fall Chinook run was over. This might be the first documented evidence of winter run Chinook in the ravine.

Since NID installed a fish passage system in Lincoln eight years ago, salmon have been spawning each season between Lincoln and the Hemphill Dam. The Salmon Cam is helping to better document the numbers of adult salmon returning, which helps FAR to highlight additional actions needed to better support salmon on Auburn Ravine.

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