

Study paved way for stocking state's 'true' greenback cutthroat into wild

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CU-Boulder professor Andrew Martin and Senior Research Associate Jessica Metcalf release endangered greenback cutthroat trout into Zimmerman Lake west of Fort Collins, Colo. on Aug 8. Their research identifying the 'true' greenback cutthroat trout native only to the South Platte River basin has spurred a new recovery effort involving state and federal wildlife agencies to bring Colorado's official state fish back home to its historical haunts. Credit: Photo by Glenn Asakawa/University of Colorado

A genetic sleuthing effort led by the University of Colorado Boulder that

resulted in the identification of Colorado's "true" native greenback cutthroat trout two years ago has come full circle with the stocking of the official state fish into Colorado's high country.

Roughly 1,200 greenback cutthroat fingerlings reared in federal and state hatcheries in Colorado were stocked into Zimmerman Lake, located in the South Platte River basin near Cameron Pass west of Fort Collins on Friday, Aug. 8. The Greenback Cutthroat Trout Recovery Team involving state and federal agencies hopes the milestone is the first step in reintroducing the federally protected fish into selected waters in the South Platte basin, which the CU-Boulder team inferred to be its historical haunt.

The stocking event was a conservation management milestone, a result of a novel 2012 genetic study led by CU-Boulder Senior Research Associate Jessica Metcalf of the BioFrontiers Institute that helped to clarify the native diversity and distribution of several Colorado [cutthroat trout](#) strains.

The study was largely based on DNA samples taken from specimens collected in Colorado as far back as 150 years ago that were stored in museums around the country. The samples subsequently were compared with DNA of modern-day cutthroat trout that were collected by Colorado Parks and Wildlife (CPW) Research Scientist Kevin Rogers.

The biggest surprise in 2012 was that the cutthroat trout strain native to the South Platte River drainage survived only in a single population—a small stream known as Bear Creek that actually is in the nearby Arkansas River drainage. The trout living in Bear Creek most likely were collected from the South Platte River drainage in the 1880s and stocked into Bear Creek.

"This is a conservation genetics success story," said Metcalf. "We were

able to use historical specimens to find out something quite novel about cutthroat trout biodiversity that has resulted in a management action. We are not just bringing a native species back to its historic range, but the greenback cutthroat trout, our Colorado state fish. I would have never imagined this outcome when we started our research in 2001."

According to Doug Krieger, senior aquatic biologist for CPW and the Greenback Cutthroat Recovery Team leader, about 3,500 greenback cutthroat trout—offspring of fish taken from Bear Creek—have been raised at the Mt. Shavano State Rearing Unit and the Leadville National Fish Hatchery. "We finally have the opportunity to bring these fish home," said Krieger.

A second, key set of data was all of the Colorado cutthroat trout stocking records over the past 150 years, a task spearheaded by study co-author and fish biologist Chris Kennedy of the U.S. Fish and Wildlife Service (USFWS). Between 1889 and 1925, for example, the study showed more than 50 million cutthroat trout from the Gunnison and Yampa river basins were stocked in tributaries of all major drainages in the state, jumbling the picture of native cutthroat strains in Colorado through time and space.

According to CU-Boulder Professor Andrew Martin, who spearheaded the 2012 study with Metcalf, researchers are trying to understand more about the characteristics of the greenback, including a collaborative effort to assess how the fish succeed in their new environment. "Living in Zimmerman Lake in the Arapaho and Roosevelt National Forest at an elevation over 10,000 feet will be very different from living in Bear Creek at 6,100 feet or living the 'cushy' life in a hatchery," Martin said.

Data from a random sample of 200 out of the 1,200 fingerlings being released at Zimmerman Lake will include DNA and various other physical measures of trout appearance, said Martin. In the next several

years Martin and his colleagues, including CU-Boulder students, will revisit the lake to follow the fate of the 200 individuals as a way to assess the success of the initial stocking effort and whether natural selection is playing a role in determining the success and failure of different individuals.

"This is an extremely challenging situation," said Martin of CU-Boulder's ecology and evolutionary biology department. "But this recovery effort has been a joint project of many different people with different interests and backgrounds combining their energy toward one specific goal. We have a chance to bring a native species back from the brink, and I'm happy to be a part of it."

The Greenback Cutthroat Recovery Team involves state and federal agencies including CPW, USFWS, the U.S. Forest Service, the Bureau of Land Management and the National Park Service. Colorado Trout Unlimited also is a partner in the effort.

Originating from the Pacific Ocean, cutthroat trout are considered one of the most diverse fish species in North America and evolved into 14 recognized subspecies in western U.S. drainages over thousands of years. In Colorado, four lineages of cutthroats were previously identified: the greenback cutthroat, the Colorado River cutthroat, the Rio Grande cutthroat and the extinct yellowfin cutthroat. Work by the CU team also identified a previously undiscovered San Juan Basin cutthroat trout that is now extinct.

The museum specimens used in the study came from the California Academy of Sciences, the Smithsonian Museum of Natural History in Washington, D.C., the Academy of Natural Sciences in Philadelphia and the Harvard University Museum of Comparative Zoology. Colorado cutthroat trout specimens were collected by a number of early naturalists, including Swiss scientist and former Harvard Professor Louis

Agassiz and internationally known fish expert and founding Stanford University President David Starr Jordan.

Metcalf and her colleagues first collected multiple samples of tissue and bone from each of the ethanol-pickled trout specimens, obtaining fragments of DNA that were amplified and then pieced together like a high-tech jigsaw puzzle to reveal two telltale genes of the individual specimens.

"This is a terrific example of how a team made up of different groups and agencies can pool their resources and do something very significant for biodiversity," said Metcalf.

The new method could pave the way for the gene sequencing of other wild creatures like reptiles and amphibians that were preserved in ethanol by early scientists, perhaps even helping researchers determine biodiversity levels in the late 1800s, said Metcalf.

The decline of native cutthroat trout in Colorado occurred because of a combination of pollution, overfishing and stocking of native and non-native species of trout, said Metcalf. "It's ironic that stocking nearly drove the greenback cutthroat trout to extinction, but a particularly early stocking event actually saved it from extinction."

Provided by University of Colorado at Boulder

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