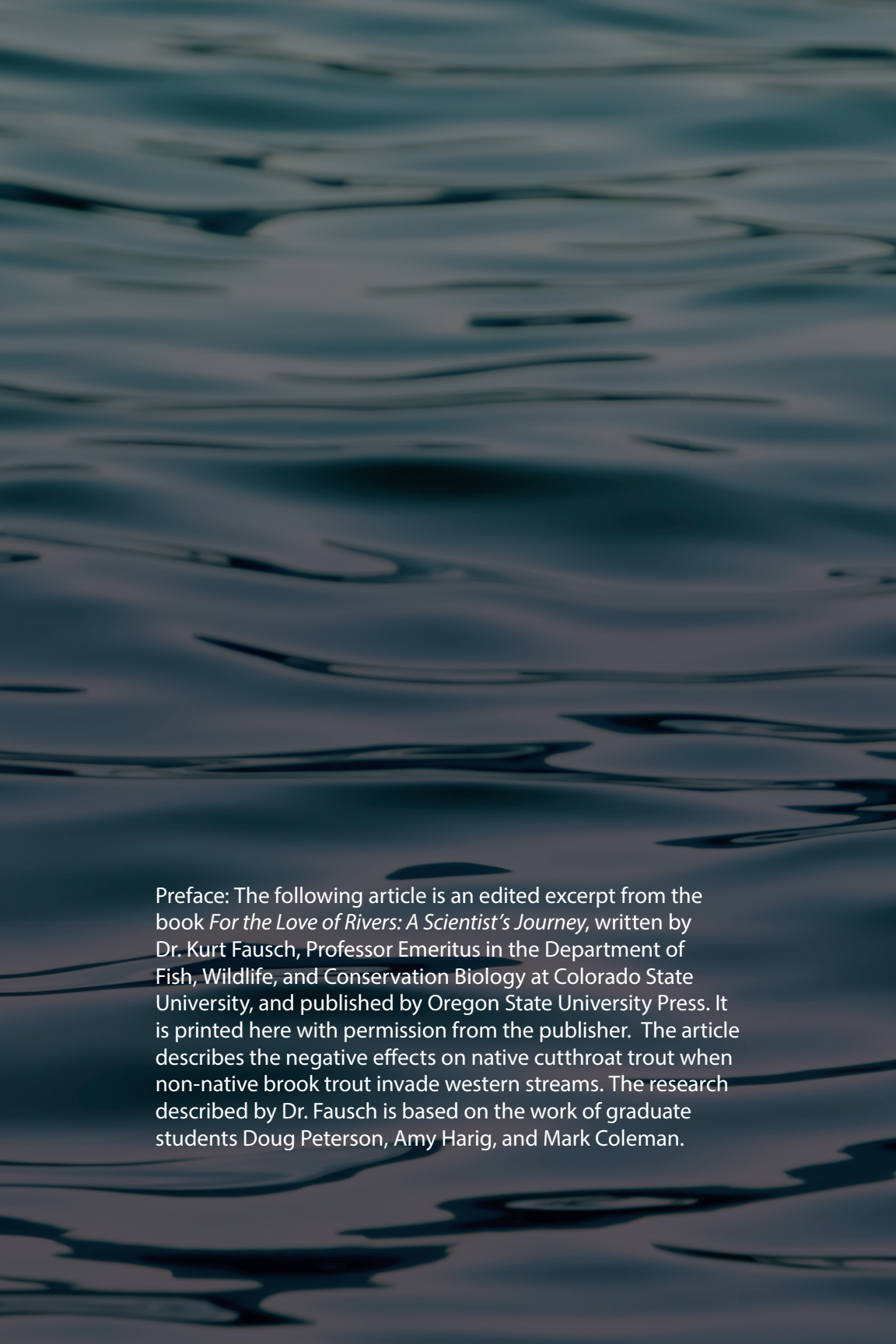
Helping to Restore

COLORADO'S NATIVE TROUT

Dr. Kurt Fausch



Preface: The following article is an edited excerpt from the book *For the Love of Rivers: A Scientist's Journey*, written by Dr. Kurt Fausch, Professor Emeritus in the Department of Fish, Wildlife, and Conservation Biology at Colorado State University, and published by Oregon State University Press. It is printed here with permission from the publisher. The article describes the negative effects on native cutthroat trout when non-native brook trout invade western streams. The research described by Dr. Fausch is based on the work of graduate students Doug Peterson, Amy Harig, and Mark Coleman.

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Evidence from the past reveals that **brook trout are a potent invader** once they reach streams with cutthroat trout. CSU Professor Robert Behnke, who in the 1960s began spurring efforts to restore greenback cutthroat trout to streams of their native range east of the Continental Divide in Colorado, reported that once brook trout gained access to streams, **the cutthroat trout were virtually gone within five years.** This pattern repeated itself in most streams throughout the region when brook trout invaded. To prevent the extinction of greenbacks, fisheries managers built barriers, usually small dams, near the downstream ends of headwater streams, and used one of several chemicals to remove the nonnative brook trout from upstream. But in many cases either a few fish were able to survive the chemical treatment in beaver ponds or spring seeps, or the barrier failed to keep all fish out, and the brook trout invaded again, each time taking over in about five years. How does this happen, and when during their lives are cutthroat trout most vulnerable?

CSU Professor Kurt Fausch and his colleagues decided to carry out a large-scale field experiment to address this question. Four stream segments were identified in Northern Colorado where cutthroat trout were temporarily holding their own and were still about equal in number to the brook trout invading upstream. In two "treatment" streams the researchers removed brook trout for four years in a row from the study stream segments that averaged about 1,100 yards long, The researchers predicted that survival of the cutthroat trout they marked

and released would increase, at least for some age classes. In the other two "control" streams they simply measured and marked all cutthroat and brook trout in the study reaches and released them and predicted that survival of at least some age classes of cutthroat trout would be low. The streams were arranged in two treatment-control pairs, one pair at mid-elevation (about 8,500 feet) and the other pair at high elevation (10,500 feet; Willow Creek in Rocky Mountain National Park was the high-elevation treatment stream). The researchers also installed fish traps each summer to find out whether invading brook trout forced cutthroat trout to leave, and to measure how many brook trout immigrated into the study reaches.

After four summers of field research and four winters of detailed statistical

> *"The work was grueling, no doubt about it. Wading up streams with a thirty-five-pound backpack electrofishing unit on your back, bending and probing beneath brushy stream banks to capture and net fish, stumbling and slipping along over slick cobble and boulder streambeds is real work. Add either rain or snow and it becomes something to be endured, and makes it even more important to coax the crew onward with promises of a sumptuous hot meal at the end of the day. The reward for two or three hours of carrying the backpack "shocker" is to work on the processing crew, sometimes huddling in the cold rain to measure, weigh, and tag hundreds of trout per hour, up to your elbows in cold water. In between batches of fish, it is a relief to warm up by carrying the buckets along hummocky banks to the live baskets in the stream where the tagged fish can recover. Even recording the data becomes challenging when our semi-waterproof paper eventually succumbs to the cold drizzle that seeps into everything. Don't get me wrong. I love everything about the beautiful fish we work with and the challenge of the work itself, right down to the willow twigs and spruce needles that fall down your back when you lunge to net fish that flash deep beneath undercut stream banks. (We say that you didn't have a good day electrofishing unless your arms are scratched up and your underwear is full of these gifts from the forest.) But there are few things that have brought me to a more complete state of fatigue than a day of stream electrofishing." – Kurt Fausch*

analyses, **the results revealed by the research were striking.** During their first year of life, cutthroat trout fry in the mid-elevation treatment stream where brook trout were removed survived more than 13 times better than those in the paired control stream where brook trout remained, and survival of yearling cutthroat trout was more than twice as high. For their part, brook trout fry in the control stream survived ten times better than the cutthroat fry. More surprising, however, was that adult cutthroat trout, those two years old and older, survived just as well as the adult brook trout.

The experiment proved that brook trout decimated cutthroat trout, but only during the first two years of life. And, it also gave a flash of insight into something that Fausch and his students had observed but hadn't made sense of before. In other streams with barriers to prevent brook trout invasion, the researchers often found adult cutthroat trout that had moved downstream over the barrier were living fat and apparently happy among the many brook trout. Now we knew why.

The data from the high-elevation pair of streams added more to the story. There, **the cutthroat trout were zombies, the swimming dead.** The remnant cutthroat trout populations in both of these small cold headwater streams above 10,000 feet produced very few or no young in four years. Although the adult cutthroat trout in such streams may live for up to a decade, the brook trout have them backed into a corner. They rarely or never reproduce, and when they die out completely, the populations will be extirpated.

Two other four-year research projects carried out by Fausch and his colleagues revealed the reasons why cutthroat failed to reproduce in these streams. In short, if water temperatures average much below 50°F during the warmest month of the summer (July or August), when cutthroat trout fry have just emerged from the gravel and are beginning to feed, they cannot grow large enough and store enough fat to have a good chance of surviving through the winter. Water temperatures during winter are harsh, hovering near the freezing point for four to six months each year in these high-elevation streams, and when the snow melts the small fry must swim in frigid water to hold their positions against the swift flows during runoff. In contrast, the brook trout

fry emerge earlier, in late spring, and have a longer growing season to feed as fry, so they are more likely to grow large enough at these low summer water temperatures to survive the winter.

To add insult to injury the researchers found that ***the brook trout just kept coming.***

The fish traps showed that about as many cutthroat trout entered the study reaches as left, regardless of whether the researchers removed brook trout or not. However, large numbers of brook trout were swimming upstream into the reaches during all seasons of the year. Each summer the researchers removed from the two treatment streams all the brook trout that they captured in the fish traps and by electrofishing. Unfortunately, the researchers had to remove the traps each fall when the streams began to ice up, or risk losing them in the high flows the next spring when the snow melted. By the time they could install the traps again the next summer after flows had subsided, eight months later, the immigrating brook trout had replaced close to half of the original brook trout population that had been removed from the high-elevation treatment stream, and the entire population in the mid-elevation stream. In short, the brook trout didn't need to reproduce well in these high, cold headwaters because they sent waves of adult invaders from warmer reaches downstream. By the end of our four-year study the researchers realized that **brook trout are the ideal invader** in these Rocky Mountain streams.

> *"Did these daunting results help us provide answers that aid cutthroat trout conservation? If brook trout kill most young cutthroat trout each year through competition and predation, and keep coming from downstream, then is there any hope of managing the brook trout invasion and conserving native cutthroat trout? The best option is to find long stream segments with natural barriers (waterfalls or dry reaches) and remove all brook trout from above the barrier, to create a refuge for the native trout."*
> *– Kurt Fausch*

Postscript: Research is ongoing to restore greenback cutthroat trout to the headwaters of the Cache la Poudre watershed – "The Poudre Headwaters Project." This is a highly collaborative effort among the USDA Forest Service, Rocky Mountain National Park, the U.S. Fish and Wildlife Service, Colorado Parks and Wildlife, Colorado State University, Colorado Trout Unlimited, and Rocky Mountain Flycasters, a Chapter of Trout Unlimited. Proven techniques will be used to remove nonnative species. Ongoing management and research will create and monitor permanent barriers to conserve these unique native trout in a sanctuary that provides flow and temperature regimes that allow them to reproduce and thrive. – Kurt Fausch

To learn more, and to help restore Colorado's native trout,
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