

The Influence of Introduced Trout

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Ah, the wonders of glaciation in Yosemite. Waterfalls pouring off cliffs, polished rock, domes rising over all. Interesting bit of history was that the first theory of Yosemite valley formation came from Josiah Whitney, Harvard professor of geology, who thought a great block of rock had simply dropped out, into some unfathomable place, leaving the valley. Then this shepherd from Scotland comes along, scrambling around rocks and climbing peaks all over the place as says, this was carved out by a block of ice that bladed the rock walls clean as glass. Whitney blustered for awhile but turns out that John Muir was right, and his evidence made far more sense. That's how we know it today. Amazing how understanding and acceptance of geologic mechanics has been about as slow as glaciers. Like 19th century biologists first proposing the idea of continental drift, scoffed as if they were talking about some occult science, then come to find just over 50 years ago that the seafloor is actually spreading and pushing around continents on great plates.

Our research group has spent a fair bit of time exploring the headwaters over a lot of Yosemite doing a study of the effect of introduced exotic trout on stream ecosystems. Seems those same glaciers pushed most aquatic life off those high plateaus the last time around (the last glaciation about 15K yr) including native trout. Just after Muir's time, fishing enthusiasts decided all those fishless streams above the waterfalls in the Sierra needed some trout - Brown trout from Germany, Brook trout from the eastern US, and rainbow trout from the lower elevation streams were brought up into most of the high country. In fact, the California Dept. Fish and Game introduced them widely by dropping them out of planes into lakes all over the Sierra! So all these high elevation streams and lakes that had been like the lost world for smaller aquatic invertebrates, places that had been fishless since early glaciations millions of years ago, suddenly had giant predators in them. Any of the river valleys that had waterfalls of even just 5 meters high formed barriers blocking fish below from coming up. So there are all these endemic mountain-adapted aquatic insects in these fishless streams, what happens to them and the ecosystems of these headwaters? We designed a study to compare adjacent streams (paired watersheds) blocked by waterfalls at their lower ends, one with trout and the other without (in natural fishless state). Finding the fishless streams was the first challenge so we had to backpack all over the high country looking for those remote places still in their ancient condition of having no fish. Somebody had to it. Some of the best adventure hiking we've ever done. Looking at 21 stream pairs we found an impact of fish - loss of diversity, mostly of endemic mountain invertebrates without any co-evolved ability to cope with trout, and altered food webs, mainly with fish streams having about twice as much algae because the trout were eating insects that normally grazed down the algae growing on rocks. The published paper (available at our website) shows how the backpacking and exploring fun translates into numbers and science.