California WaterBlog
A biologist, economist, engineer and geologist walk onto a bar...

Suction dredging is bad for fish

Posted on June 17, 2011by cathrynlawrence

Peter B. Moyle, Professor of Fish Biology, UC Davis

Suction dredge on the Klamath River

Suction dredging seems like a fairly innocent pastime. A few folks go to a stream on a nice summer day with a portable device to suck tiny amounts of gold out of a stream bottom. The device basically is a floating sluice box equipped with a gas-powered pump that sucks up water and gravel through a hose. A diver vacuums the stream bottom with the hose and the material is flushed into and through the sluice box where the heavier material, including gold, is collected. So why is there a moratorium on suction dredging in California?

The problem is that suction dredging in streams can harm fish and fisheries, especially salmon and steelhead. Because of this, dredge miners must obtain a permit from the California Department of Fish and Game (DFG) for about the cost of a fishing license. In the past, on average CDFG issued about 3400 permits per year although nearly 18,000 were issued in 1980 when gold prices were high. Given the recent trend in gold prices, this could happen again.

Not all streams contain gold. The streams that do have been mined repeatedly, creating cycles of mining disturbance. Many have more or less recovered from hydraulic and other severe mining of the past but suction dredging could easily reverse their recoveries. Is churning up hundreds of square meters of river bottom worth the 3.4 oz of gold the average dredger collects in a season?

In the Klamath Basin, the Karuk Tribe became so upset with the impact of dredgers and dredging on fish in their traditional waters that they sued DFG in 2005 for not adequately protecting the environment. As a result, in 2009, a court order mandated a stop to all dredge mining until further notice. A month later a state law (SB 670) halted suction dredging until DFG completed the court-ordered review of the permitting program and took action to correct any problems that might exist. The draft review report is now out and the information and analysis supports continuing the moratorium on dredging until better regulations and more funding for enforcement are in place (see http://www.dfg.ca.gov/suctiondredge/).

The effects of suction dredging on fish are well described in the peer-reviewed papers Harvey (1986) and Harvey and Lisle (1998) and in the numerous citations in the two DFG review documents (see below "Further Reading"). The effects vary according to size of stream, fish species present, season of dredging, and frequency and intensity of dredging. Direct effects include trapping invertebrates and small fish in the dredges, altering the habitat that supports fish food supply, and changing channel structure to make it less favorable for fish. In the Klamath, piles of dredge tailings in the Salmon and Scott Rivers and their tributaries create attractive spawning grounds for salmonids. But these tailings are so unstable that they are likely to scour under high flows, greatly reducing survival of the embryos placed within the gravel.

The key is that *suction dredging represents a chronic unnatural disturbance of habitats* supporting fish that are already likely to be stressed by other factors.

A more immediate effect of dredging is chronic disturbance of fishes, which can change their behavior so they move to stream areas with less favorable conditions. I am particularly concerned with dredging in or near thermal refuges (cold pools) that are key for survival of juvenile salmonids. As discussed in the 2003 National Research Council (NRC) report (of which I am a co-author) and references therein, the Klamath River and some of its tributaries can reach temperatures in excess of 65-70°F during the day in late summer. Such temperatures are very stressful or even lethal for many salmonids, so the fish seek out cooler areas, where small tributaries flow into the river or there is upwelling of ground water. Juvenile coho salmon, Chinook salmon and steelhead will often be packed into these areas during the day. When I swam in the river with a mask and snorkel to count the fish, I was struck by the concentrations of fish in the refuge areas (and the lack of them in the main river) and by how much even a minor disturbance of this habitat reduced the overall ability of the river to support fish.

Adult salmon and steelhead are also subject to being disturbed by intense dredging activities. I am particularly concerned with spring-run Chinook salmon, a species with which I have worked closely. Adult spring-run Chinook spend the summer in river pools, especially the Salmon River (and its forks). They have to survive the summer without feeding, using fat reserves and oils they bring up from the ocean. Chronic disturbance of the type created by dredging and dredgers can increase stress on these fish and has the potential to reduce their over-summer survival. When I was participating in a diving survey of spring-run Chinook in the Salmon River a few summers ago, I was impressed by the fact that suction dredgers had to agree not to dredge on the survey day so the water would be clear enough to see the fish. The next day, I observed pools cloudy with sediment again.

An often-overlooked impact of dredging is that the people involved may live on or close to the stream in remote areas for weeks at a time, where they also swim, bathe, fish (sometimes illegally), and leave trash behind. Such activity can cause spring-run Chinook to use up precious energy reserves if they have to move to less favorable areas or swim about avoiding people.

It is important to note that the Klamath River and its tributaries, the focus of the Karuk lawsuit, support the highest diversity of sea-run fishes of any California river: Coho, chum and Chinook salmon, coastal cutthroat trout, steelhead, eulachon, green sturgeon, white sturgeon, Pacific lamprey and river lamprey. This is the reason, of course, why the river also supported major fisheries by the native peoples who live along the river. Today virtually all the species are in decline or threatened with declines from multiple factors (NRC 2003). Therefore, it should be assumed that dredging causes harm, unless it can be proven otherwise.

One reason for taking this conservative position is that we simply do not know much about the effects of dredging on many species, especially when the intensity of dredging is increasing. For example, juvenile Pacific and river lamprey live in soft materials along the stream edge or in slow-moving sections of stream. Dredging of areas where the juveniles are abundant will push them into the water column where they can be readily consumed by predators, contributing further to the decline of the species.

Even for salmonids, information on the effects of dredging, with the exception of a few studies such as that of Harvey (1989), is largely anecdotal or in non-peer reviewed reports (see, for example, the bibliography of DFG EIS). Studies are also largely confined to looking at immediate effects of single dredges and they do not examine the cumulative or long-term effects of multiple dredges and activities associated with the dredges. Indeed little has changed since DFG (1994, p. 71) listed the need for additional studies on practically every important aspect of the environmental impacts of dredging. Harvey and Lisle (1998) present a strategy for acquiring much of the needed information.

In my opinion, no dredging should be allowed where sensitive salmonid species are present, including spring run Chinook salmon and coho salmon. The CDFG draft EIS/EIR points to this approach, as well as towards instituting strict, if complex, new regulations elsewhere. If dredgers don't like these results, they should pay for an appropriate, independent study to be done. The burden of proof should lie with the miners to prove they are *not* doing harm to fish and fisheries, rather than with the beleaguered management agencies to prove dredging is doing harm in every case.

Further Reading:

Department of Fish and Game, California (1994), *Final environmental impact report: adoption of regulations for suction dredge mining*, DFG, Sacramento, 173 pp.

California Department of Fish and Game, Suction Dredge Permitting Program (2009), *Literature Review on the Impacts of Suction Dredge Mining in California*, CDFG, Redding, CA.

Harvey, B. C. (1986), "Effects of suction gold dredging on fish and invertebrates in two California streams," *North American Journal of Fisheries Management* 6:401-409.

Harvey, B. C. and T. E. Lisle (1998), "Effects of suction dredging on streams: a review and an evaluation strategy," *Fisheries* 23(8):8-17.

Moyle, P. B. (2002), *Inland Fishes of California*, Revised and Expanded, Berkeley: University of California Press, 502 pp.

Moyle, P. B., R. M. Yoshiyama, J. E. Williams and E. D. Wikramanayake (1995), *Fish species of special concern of California*, California Department of Fish and Game, Sacramento, California, 2nd ed. 272 pp.

National Research Council (2003), *Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery*, Committee on Endangered and Threatened Fishes in the Klamath River Basin, Board on Environmental Studies and Toxicology, National Academy Press.

Related

Coho in Crisis, Part 1: The decline toward extinction in California
In "Conservation"

Stressed Out—Dealing with the Delta's non-native landscape
In "California Water"

Reconciliation or extinction—the future of California?
In "reconciliation"

This entry was posted in California Water, Fish and tagged California Department of Fish and Game, gold, Klamath river, salmon, suction dredging, UC Davis Center for Watershed Sciences. Bookmark the permalink.

One Response to *Suction dredging is bad for fish*

Pingback: *The Berkeley Science Review » Science in Sacramento: Researchers and gold miners*