

# Fisheries Impacts at the Pebble Mine

Large metal mines require substantial infrastructure. Roads to support the Pebble Mine could cross 20 known salmon streams and numerous potential fish-bearing streams. This fact sheet describes how road construction can pose barriers to fish passage and what this may mean for fish stocks.

## Background

Fish need unobstructed passage among disconnected habitats. Adult fish migrate to spawning and feeding habitats and juvenile fish migrate to and from rearing and refuge habitats. Each stream has unique characteristics. Each fish population in a particular stream is uniquely adapted to maximize survival in that stream. Collectively, populations comprise a complete stock complex that sustains the region's valuable fisheries. Blocking access to essential habitats can cause declines in fish productivity and diversity reducing the likelihood of long term sustainability. The return of anadromous fish also maintains stream productivity as decomposing carcasses release nutrients to the food chain to provide food for rearing salmon, resident species, terrestrial animals and vegetation.

## Challenges

A fish population cannot survive if free passage to essential habitats is blocked. Poorly-functioning culverts and bridges create conditions in which water is too shallow or fast for fish to cross, and culverts are too high for fish to jump.

Although well-designed bridges provide better fish access than culverts, culverts are often used and regulators must recognize the need and challenges to assure adequate fish passage. Some challenges include:

### Design

- to accommodate 100-year floods and high water debris
- to accommodate passage of all fish species of all sizes

### Installation

- according to fish-friendly designs

### Maintenance

- to prevent damming and washouts



In addition, higher gradient streams (> 1%) present greater challenges for design and installation, and stream crossings planned and installed for today’s environmental conditions may become inadequate if global climate change leads to more frequent and intense storms.

**How serious is the problem?**

Fish passage problems associated with inadequate design, installation, or maintenance of stream crossings, particularly culverts, have been widely documented. Examples include<sup>1</sup>:

Study Area	Date	Crossings with passage problems
Tongass National Forest, AK	2000	66% of culverts across salmon streams and 85% of culverts across trout streams considered inadequate
Mat-Su Valley, AK	In prep	More than 44% of 130 culverts were deemed inadequate for fish passage; 10% were deemed adequate
Kenai Peninsula, AK	In prep	More than 44% of 130 culverts were deemed inadequate for fish passage; 10% were deemed adequate
Near Tyonek, AK	In prep	83% of 29 culverts were deemed inadequate for fish passage; 3% were deemed adequate
Labrador, Canada	2005	53% with poor design or installation
Western Montana	2005	76-85% of culverts were velocity barriers depending on streamflow and fish life stage
California, Washington, Oregon	2000	Current salmon biomass in streams is 3-4% of historic biomass; habitat loss is due in part to obstructed fish passage

**What does this mean for the Pebble Project?**

A 104-mile access road is proposed from the mine site to a deep-water port in Cook Inlet.<sup>2</sup> The road will also serve as a corridor for an ore slurry pipeline, a waterline to return recycled water to the mine site, and a corridor for the power line. Approximately one third of the distance crosses higher-gradient terrain which creates design challenges. The road may require as many as 120 crossings of streams ranging from small and intermittent to large perennial rivers such as the Newhalen River. After this road has been pioneered, the construction of connecting roads and spur roads is likely. Construction and maintenance of these roads are likely to create collateral fish passage issues.



This culvert is undersized and the water velocity is too fast.

## Conclusion

Many streams in the Pebble area support anadromous and resident fish, and all contribute to spawning, rearing, or refuge habitat used by these species over the course of their life-cycles. Poorly designed, installed, or maintained stream crossings will jeopardize fish fully utilizing these streams for spawning, rearing and refuge habitats, reducing population and genetic stock complexity. Such losses of biodiversity can adversely affect long term sustainability of salmon populations.

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Text by William J. Hauser, Fish Talk Consulting. May, 2008.

Photos credit: Spawning salmon, Mike Wiedmer; Culverts, Alaska Department of Fish and Game.

<sup>1</sup> Study references are available in the original paper posted at [www.pebblescience.org](http://www.pebblescience.org). Another source of information is Alaska Department of Fish and Game <http://www.sf.adfg.state.ak.us/SARR/Fishpassage/fishpass.cfm> and USDA Forest Service <http://www.stream.fs.fed.us/fishxing/index.html>.

<sup>2</sup> <http://www.pebblepartnership.com/pages/project>

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**Appendix 1. Common and scientific names of fish species known to occur in the Nushagak and Kvichak River watersheds, Bristol Bay, Alaska.**

Common name	Scientific name
<b>Anadromous Salmon</b>	
sockeye salmon	<i>Oncorhynchus nerka</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
coho salmon	<i>Oncorhynchus kisutch</i>
pink salmon	<i>Oncorhynchus gorbuscha</i>
chum salmon	<i>Oncorhynchus keta</i>
<b>Resident Fish</b>	
longnose sucker	<i>Catostomus catostomus</i>
northern pike	<i>Esox lucius</i>
least cisco	<i>Coregonus sardinella</i>
broad whitefish	<i>Coregonus nasus</i>
humpback whitefish	<i>Coregonus pidschian</i>
round whitefish	<i>Prosopium cylindraceum</i>
Arctic grayling	<i>Thymallus arcticus</i>
lake trout	<i>Salvelinus namaycush</i>
Arctic char	<i>Salvelinus alpinus</i>
Dolly Varden	<i>Salvelinus malma</i>
rainbow trout	<i>Oncorhynchus mykiss</i>
burbot	<i>Lota lota</i>
threespine stickleback	<i>Gasterosteus aculeatus</i>
ninespine stickleback	<i>Pungitius pungitius</i>
slimy sculpin	<i>Cottus cognatus</i>

**Further Reading and References**

[Federal Highway Administration. 2007. Design for fish passage at roadway-stream crossings: Synthesis report. Federal Highway Administration, McLean, VA. \(pdf file 4.79 mb\)](#)