

Testimony of
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to the
Alaska Senate Judiciary Committee

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Good afternoon Chairman French and members of the Senate Judiciary Committee. My name is Margaret Palmer and I thank you for allowing me to speak to you today.

I am a Professor at the University of Maryland and Director of the National Science Foundation's National Socio-environmental Synthesis Center. I've been researching streams and watersheds for over 25 years and am an expert on stream restoration and the impacts of surface mining on streams.

As you know, PacRim Coal has proposed a large mining project in the Chuitna River watershed. This is a 25 year project that will impact a very large track of land not only due to the footprint of the mine itself but due to all the infrastructure and access needs for mining. Impacts to the Chuitna watershed will include destruction of fragile wetlands and 11 miles of salmon spawning streams.

I am here to describe irrefutable scientific evidence that the impacts of the proposed Chuitna mining project will be irreversible and that reclamation to support future salmon populations is not technologically feasible.

I wish to make three major points today:

- First, the examples of reclamation and restoration projects that have been provided by PacRim and others do not demonstrate that restoration at Chuitna is achievable.
- Second, reclamation at the Chuitna site to support salmon would require creation of streams and rivers, not restoration or reclamation, yet creation of streams is outside the realm of credible science.

- Third, there is extensive scientific documentation of widespread failures of restoration projects in watersheds far less impacted than what is proposed for the Chuitna watershed; and, thus the likelihood of reclamation success to support salmon populations is at or near zero.

Point 1: Irrelevance of PacRim reclamation examples

PacRim has put forward a number of examples of projects that they suggest are evidence that reclamation of wetlands and salmon streams lost due to the Chuitna project is technologically feasible. In fact, they are not evidence because the projects they describe are on sites only minimally impacted – this is nothing like what will happen to the Chuitna watershed if the proposed mining occurs.

The PacRim referenced projects have no bearing on what will be needed at Chuitna:

First, the referenced examples are in watersheds that still have intact headwaters and the streams are still connected longitudinally, which is not the case for Chuitna.

Second, groundwater flow paths in the examples they cite are still intact yet in the Chuitna case, with mining to depths of 300 feet or more, the existing groundwater flow paths will be destroyed. Keep in mind that groundwater is what feeds streams.

Third, many of the examples PacRim cites deal with restoration of stream *sections* that had been previously diverted or degraded ...not streams whose watersheds have been destroyed. The restoration actions required for their examples typically are just adding more bends in the existing stream, widening channels, or removing the diversion channels.

Fourth, the PacRim examples were not of mined-through streams in which the entire channel including its headwaters was exposed to major earth-moving activities. Such activities (which are to occur at the Chuitna sites) not only result in mining waste rock and soil being placed where streams once were but that material is seriously compacted.

Fifth, they provide examples from Illinois and Indiana for streams that are warm-water and do not support sensitive species like salmon.

Point 2: Stream creation is outside the realm of modern science

What PacRim is proposing is nothing like stream reclamation that is commonly practiced today. Instead it is an attempt to create a stream *de novo*. In other words,

streams and wetlands, including headwaters are to be completely destroyed, fill added and packed then after mining is complete, PacRim will dig ditches and route water to them.

In practice, ecological stream restoration varies along a continuum from: removing on-going impacts to a stream (e.g., preventing toxic inputs) and letting the system recover on its own; to enhancing in-stream habitat or the surrounding riparian zone (e.g., adding coarse woody debris to streams and planting vegetation) in an otherwise healthy stream; to full scale restoration that involves manipulations of an *existing* stream channel (e.g., re-grading banks and planting trees along a stream with eroding banks).

Yet under the plan proposed for Chuitna, there will be no existing channels remaining to 'restore'. They will be gone. Unfortunately, simply ditches and routing water to them does not create a living, breathing stream that will support insects, fish, wildlife and certainly not salmon.

Streams that are healthy enough to support salmon and other valuable species, must have the organically rich soils, wetlands, and mature native vegetation common to the region. Rainwater and snowmelt percolate into the ground, reaching the water table and then move laterally into streams and/or wetlands. Thus groundwater inputs to streams have moved through rich soils where nutrients and essential elements that are necessary for healthy streams and wetlands.

Claiming that a structure like a ditch dug on mined land is similar to a functional ecosystem because it has the same width and depth is analogous to claiming that all people of the same height are equally healthy. It's easy to understand the important difference between physical features and biological functioning when you think about people's health. For instance, my husband looks great, he is 6'2" and weighs 185. But guess what? He has really high blood pressure. Can you imagine a doctor saying he is healthy without ensuring his essential systems are working, like heart rate, blood pressure, glucose metabolism?

From a scientific point of view, it is equally unacceptable to say a stream will be healthy ecologically just because it happens to have rocks and water. It is particularly

remarkable to make such a claim in this case given the extensive watershed destruction.

Point 3: Widespread failures in much simpler reclamation projects mean large scale failure at Chuitna

The status of research evaluating the effectiveness of stream and wetland reclamation has advanced significantly in the last decade and there is now clear evidence of widespread ecological failures of projects attempted on sites far less damaged than what will occur at the Chuitna sites.

Recently, I led a national project that developed the first comprehensive database on stream and river restoration for the U.S. (38,000 projects in the database) and there is not a single case in which building streams in the manner they outline has been shown to work, much less fully compensate for what is lost when a stream is destroyed.

Additionally, there is a long list of peer-reviewed studies documenting failures from stream restoration projects. For example:

A study published in 2010 evaluated 78 independent stream restoration projects to determine if aquatic biodiversity recovered. Only 2 of those 78 showed improvement.

A special issue of the leading ecological journal, *Ecological Applications* was devoted to stream restoration in 2011 and there was not a single example provided of ecological recovery.

There are two recent publications demonstrating failure of recovery when reclamation of streams was attempted on previously minded land in ecoregions similar to the Chuitna site. The locations of those sites were in the North West Territories of Canada and in the Arctic.

The fact is, the current status of technology for stream reclamation is limited to small scales (usually single reaches), is only useful in intact water networks, and is certainly not designed nor tested for situations in which the underlying soils, geology, and associated groundwater flow paths are destroyed.

Summary

I would like to leave you with the understanding that there is no evidence that reclamation of streams and wetlands at the Chuitna site is feasible. And that in fact

there is strong evidence that it is not feasible based on strong science and extensive research. The current technology for reclamation has not yet been successful in watersheds or in streams with far less impact than what Chitna will experience. You should recognize that if the watershed is mined as proposed, you will not regain the salmon populations that frequent the streams now.

Thank you Mr. Chairman and Members of the Committee.

A handwritten signature in black ink, appearing to read "Margaret A. Palmer". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Margaret A. Palmer

February 19, 2012