

Coal and Water Quality

Introduction:

Coal contains numerous pollutants that are toxic at low concentrations such as mercury, lead, arsenic, uranium, thorium and polycyclic aromatic hydrocarbons (among others). Even though billions of tons of coal are moved adjacent to and over freshwater and marine ecosystems, there is a lack of rigorous scientific investigation related to its effect on water quality. This lack of information was acknowledged in 2005 in a peer-reviewed article titled "Biological effects of unburnt coal in the marine environment" (Ahrens, M.J. & Morrisey, D.J.), published in the journal "Oceanography and Marine Biology".

Despite this inadequacy, certain studies that have been conducted over the years have demonstrated that unburned coal can negatively impact water quality and aquatic ecosystem function. The studies referenced below focus on impacts to aquatic inhabitants rather than impacts to human health via consumption. Since Lake Pend Oreille serves as a potable drinking source to thousands of residents, the potential impact to human health should be taken into account as well.

Findings:

Chemical consequences –

- Oxidizing coal (particles / dust) reduces dissolved oxygen levels, creating adverse conditions for macroinvertebrates and bottom dwellers, which can have impacts throughout the food web¹.
- Exposure to coal (particles /dust) can result in reduced growth rates in trout², mortality of Steelhead and Cutthroat trout³, reduced spawning success of fathead minnows⁴ and alteration of viral cellular metabolic processes in juvenile Chinook salmon⁵.
- Coal can contribute to reduced diversity⁶ and number⁷ of aquatic species in freshwater streams.
- Mineral salts in coal oxidize when exposed to water, which can increase salinity levels and impact aquatic organisms in freshwater ecosystems⁸.
- Coal in water can be a source of increased salinity, acidity, trace metals, hydrocarbons, chemical oxygen demand and macronutrients^{9,10}.
- Toxic polycyclic aromatic hydrocarbons (PAHs) from unburned coal may be an important source of contamination in aquatic environments¹¹.

Physical consequences –

- Coal dust accumulates in aquatic sediments¹.
- Coal behaves similarly to other suspended or deposited sediments through abrasion, smothering and light attenuation⁸.
- Accumulating silt reduces the diversity and number of species in certain aquatic ecosystems¹².

- Reduced water clarity from suspended sediments can negatively impact predator fish species from acquiring food¹³.

References:

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- ⁸ Ahrens, M.J. & Morrisey, D.J. (2005). "Biological effects of unburnt coal in the marine environment". *Oceanography and Marine Biology*. Volume 43, pages 69-122.
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- ¹² Terrados, J., Duarte, C.M., Fortes, M.D., Borum, J., Agawin, N.S.R., Back, S., Thampanya, U., Kamp-Nielsen, L., Kenworthy, W.J., Geertz-Hansen, O. & Vermaat, J. (1998). "Changes in community structure

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