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Trial or Error?

Coalbed methane extraction at the headwaters of the Skeena, Nass and Stikine rivers in Northwest British Columbia would have harmful impacts on land, water and wildlife. A new report commissioned by the Pembina Institute warns that salmon could also face significant impacts.

Sustainable Energy Solutions

Coalbed methane (CBM) development has been proposed for Northwest British Columbia's Headwaters region, where the Skeena, Nass and Stikine rivers begin. Shell Canada holds rights, or tenure, to CBM resources within an area of the Headwaters about one eighth the size of Vancouver Island, called the Klappan Tenure.

CBM extraction can have significant environmental impacts. It requires a much higher density of wells, roads and pipelines than conventional gas, and typically leaves a very large footprint on the land. In addition, water must often be removed from the ground before coalbed methane can be produced.

CBM extraction has been underway for decades in the United States, and for several years in Alberta. However, the Headwaters region is different from any place where CBM has been extracted before. The Skeena, Nass and Stikine are three of the province's most important wild salmon rivers. Their headwaters form a sensitive alpine and sub-alpine eco-system that contains critical salmon habitat, including spawning grounds.

> The headwaters of the Skeena, Nass and Stikine – three of British Columbia's most important salmon-bearing rivers – are relatively pristine. Coalbed methane extraction would involve large-scale industrial development that could have significant impacts on salmon in the rivers. PHOTO: PAUL NICKLEN

An Experiment at the Headwaters

Commercial coalbed methane production has never before been attempted in salmonbearing watersheds. According to the new report, *Coalbed Methane and Salmon: Assessing the Risks*, a CBM project in the Headwaters would be a risky experiment. Thorough baseline r

experiment. Thorough baseline research and modelling is needed before potential impacts on salmon can be understood.

Without this information, it is impossible for communities in the Skeena, Nass and Stikine watersheds to make informed decisions about potential CBM development. Given the critical role that salmon plays in their economy and culture, local communities should be given the opportunity to fully understand and evaluate the risks associated with CBM extraction. Development should not occur without social license from local communities.

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Threats to Salmon

Coalbed methane extraction could negatively affect salmon and salmon habitat in two primary ways.



Every well requires a cleared well pad, access roads and right-of-ways for pipelines. The total amount of clearing can be as much as one to two hectares per well (larger than a baseball stadium), multiplied by hundreds or thousands of wells. Disturbance to land animals including bears and caribou can extend over an area as much as fifty times larger than the actual land cleared. PHOTO: THE PEMBINA INSTITUTE

A MUDDY FOOTPRINT

Coalbed methane extraction typically has a large footprint on land – but waterways can be affected as well. When land is cleared for wells, roads and pipelines, the amount of runoff increases, and the variation between high and low runoff flows becomes more extreme. This increases erosion and the amount of sediment entering streams. Sediment can cover spawning beds, smother fish eggs and reduce the spawning area available to future generations. It can also "muddy" the water, irritating the gills of juvenile fish and making it more difficult for fish to find food.

Coalbed methane extraction on the Klappan Tenure raises special concerns. These include:

- Erosion tends to be more significant in areas with steep terrain.
- Smaller streams such as the salmon-spawning tributaries found within the tenure area – are more sensitive to disturbance.
- Runoff will continue as long as land is bare. Cool, short growing seasons mean that regeneration could take decades after development has come and gone.



Preliminary data suggests that wells drilled on the Klappan Tenure will need to remove groundwater before CBM can be extracted. Several Olympic-size swimming pools full of water could be drained from deep aquifers every day. This could cause water to flow out of aquifers near the surface to refill deeper ones underground. As a result, less groundwater would enter streams from aquifers near the surface.

If this happens, the effects on salmon could be significant. First, a reduction in total stream flow could expose spawning grounds to air or cause them to disappear altogether. Second, because groundwater

acts as a temperature buffer – keeping it cool in the summer and warm in the winter – less groundwater would mean more extreme changes in stream temperature. This could lead to more eggs freezing in winter, fry hatching too late to feed adequately, and lower winter survival for juvenile fish.



Salmon and steelhead congregate yearround in areas where ground-water enters streams, in part because these areas are cooler in summer and warmer in winter. The phenomenon is known as behavioural thermoregulation. CBM extraction could lead to a reduction in groundwater-dependent habitat and cause changes in fish behaviour.



The Skeena, Nass and Stikine headwaters form a sensitive sub-alpine and alpine ecosystem that includes unique wetlands complexes (above). Coho, chinook and sockeye salmon have been observed in tributaries of the Skeena, including Kluayaz Creek, Tantan Creek and Otsi Creek, and in the Bell Irving River, a tributary of the Nass. Steelhead, whitefish and char are also found there.

Unanswered Questions

The report, *Coalbed Methane and Salmon: Assessing the Risks*, concludes that, "given the sensitivity of salmon to disturbance... it is fully possible that impacts [from CBM] cannot be adequately mitigated."

While research indicates that salmon will likely be affected by CBM, not enough research has been done to determine how significant the impacts could be. The fact that salmon spawn within the Klappan Tenure is itself a recent discovery. Without further study, the possibility of socially or ecologically unacceptable impacts cannot be excluded.

For example, many basic questions still need to be answered before scientists can determine how groundwater removal will affect salmon. These include:

- What is the hydrogeology of the Skeena, Nass and Stikine headwaters?
- What connections exist between aquifers deep underground, aquifers near the surface, and streams, lakes and wetlands?
- How much volume does groundwater contribute to salmonspawning streams: 20%, 50% or more?
- How many salmon are there in the tenure and what habitats do they prefer?

A Time for Precaution

Communities and First Nations throughout the Skeena, Nass and Stikine watersheds deserve an opportunity to assess potential impacts before deciding whether or not they support CBM extraction in the Headwaters. Until local communities have the information they need to make this assessment, no further development should be allowed.

Because the Headwaters region is relatively pristine, even pilot activities could permanently change the landscape. Therefore, not even exploratory activity should be allowed while development decisions are pending.

Complexity, Uncertainty, Risk

- Coalbed methane has never before been extracted from salmon-bearing watersheds.
- CBM development requires extensive land clearing for well pads, access roads and pipelines.
- Commercial CBM production typically requires hundreds – and sometimes thousands – of wells.
- Up to 1.6 square kilometres of land – about the size of 270 football fields – could be cleared for every 100 wells drilled in the Klappan Tenure.
- Runoff and erosion due to land clearing would increase sediment in streams and could affect salmon spawning grounds.
- For every square kilometre of land cleared, more than 50 square kilometres of prime habitat for large mammals including bears and caribou would be affected.
- In the Klappan Tenure, CBM extraction is likely to involve groundwater removal from coal seams.
- Groundwater removal can lower the water table and affect stream flow, depending on local geology.
- Impacts on stream flow in the Klappan Tenure may be significant, according to preliminary analysis.
- Salmon and steelhead often depend on groundwater inflow to help regulate body temperature.

In the remote and pristine Headwaters region of Northwest British Columbia, impacts of CBM development on salmon may exceed limits of what is ecologically or socially acceptable.



Want More Information?

For more information on coalbed methane in Northwest British Columbia, read the full report, *Coalbed Methane and Salmon: Assessing the Risks.* It can be downloaded at:

bc.pembina.org

and

www.afterthegoldrush.ca.

For more information on the need for effective CBM regulations, read our backgrounder, *Concerns about British Columbia's Approach to Coalbed Methane.* It can be downloaded at:

bc.pembina.org

This primer was prepared by Jaisel Vadgama of The Pembina Institute:

www.pembina.org



Searching for Solutions

British Columbia needs to develop province-wide regulations that address the risks associated with CBM extraction.

Potential impacts on salmon in the Headwaters region are just one of many concerns about CBM extraction. In recent years, proposals to extract CBM have met with controversy in communities across the province, including Telkwa, Fernie, Hudson's Hope, Princeton and Comox.

A systematic framework for assessing whether, and under what conditions, coalbed methane projects are acceptable is urgently needed.

The Pembina Institute recommends that this framework include the following three principles at a minimum:

Coalbed methane should not occur without social license. Given the unique risks associated with CBM, communities should be empowered to decide whether or not they support CBM extraction in their area before development proceeds. Adequate information about potential risks and benefits is essential to community decision-making.

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Coalbed methane projects should always be evaluated in their entirety as large-scale developments, not well by well. CBM resources are typically developed in full with hundreds of wells – or not at all. Therefore it is appropriate, and important, to consider impacts and risks associated with an entire project's build-out scenario before granting approvals.



Some areas may be too environmentally sensitive for coalbed methane development. Many coalbed methane resources in British Columbia are located in areas with little or no history of industrial development, where risks associated with CBM may not be acceptable. In remote and pristine environments, the appropriateness of CBM extraction needs to be evaluated based on full build-out scenarios before even exploration or pilot activities are allowed.