MOUNTAIN PINE BEETLE: SALMON ARE SUFFERING TOO

Climate change, mountain pine beetles and salvage logging add to challenges facing BC's spectacular Fraser salmon runs.

Up and down BC's vast Fraser River watershed, one crisis after another has hit in recent years—forest fires, missing salmon runs, the Prince George ice jam, and mountain pine beetles. In 2007, record snow pack led to fears of massive spring flooding.

The common thread is climate change that is happening here and now—not in abstract global climate models or projected future scenarios. The mountain pine beetle sweeping BC's interior illustrates the catastrophic results of seemingly minor temperature shifts. It is also making life harder for the magnificent runs of wild Pacific salmon that swim thousands of miles from the open ocean, fighting their way up the Fraser River to spawn and die in the streams where they were born.

Pacific Fisheries Resource Conservation Council
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When a 1999 outbreak of the tiny native mountain pine beetles jumped out of control and flashed across BC's interior, it was unprecedented in both scale and impacts. The beetles have now chewed their way through forests four times the size of Vancouver Island, crossed the Rockies and are spreading east with no natural barriers. By 2014, 80 per cent of BC's pine forests will be gone, with enormous economic, environmental and social consequences. Projections of the total cost range to over $170 billion—more than the province's annual Gross Domestic Product (GDP).

Threats to salmon

Over 60 per cent of the Fraser watershed is affected. Lost forest cover and secondary impacts on streams and rivers will significantly alter the watershed's ecology, threatening already-stressed salmon runs. Salvage of beetle-killed lumber will intensify those risks.

Apart from the mind-boggling scope, the beetle infestation presents a highly complex problem to tackle because it cuts across jurisdictions, agencies, industries and sectors. Competing interests are at stake, with upstream and downstream effects and cascading, cumulative impacts.

Concerns about the threat to salmon stocks prompted a 2007 workshop in Prince George that brought together federal and provincial staff, scientists, First Nations and salmon conservation groups, including the Pacific Fisheries Resource Conservation Council (PFRCC).

The '**Mountain pine beetle threats to salmon and fisheries resources in BC**' workshop was convened in Prince George in January 2007 by the **Fraser Salmon and Watersheds Program**, with support from the **Pacific Salmon Foundation**, the **Fraser Basin Council** and the **Pacific Fisheries Resource Conservation Council**." A follow-up workshop was hosted by the **Upper Fraser Fisheries Conservation Alliance** in December 2007.

Map: Mark Johannes, Golder Associates.

Aerial view of extensive attack by mountain pine beetle. Photo by Lorraine Maclauchlan, Ministry of Forests.

The workshop found cause for concern. Notwithstanding efforts already underway, the massive response to the mountain pine beetle needs more emphasis on potential impacts to wild salmon. Workshop participants identified possible solutions and urged prompt action to address knowledge gaps, improve collaboration and mitigate impacts.

Population explosion

These tiny beetles, the size of a rice grain, are not an exotic species. Localized outbreaks are natural but severe cold spells killed off over-wintering populations to control past outbreaks. The recent long hot summers and past forestry management practices also fuelled the population explosion and made trees more vulnerable. Now the beetles seem to be attacking younger trees previously thought to be immune.

The federal and provincial governments have responded with multi-million dollar action plans that focus on accelerated logging to salvage beetle-killed pine before the trees rot in place. Permitted harvest levels are up by 36 per cent overall and as much as doubled in some areas.

While the economic argument is clear, this approach has its costs, including heightened risks to sensitive watersheds and direct links to fisheries, drinking water and flood-prone downstream communities.

More floods, more drought

Forests attacked by these beetles have more extreme water cycles—more flash flooding and longer summer droughts. In healthy forests, pine branches intercept snow and rain and shade the forest floor, slowing spring melt, while their roots absorb huge quantities of water.

Sedimentation in Mooney Creek near Quesnel from upstream road construction for salvage logging. Fisheries & Oceans staff intervened in this case to mitigate the damage to salmon habitat downstream. Photo by Shane Smith, Fisheries & Oceans Canada.

Forests of beetle-killed trees have higher snow packs, higher water tables, faster snow melt, higher spring floods, more flash flooding and erosion. Faster spring runoff also means longer summer droughts. The effects can be dramatic and they are not good news for salmon.

But beetle-killed trees don't make it a dead forest. Chris Ritchie, Mountain Pine Beetle Response Manager for BC's Ministry of Environment, noted that removing the trees intensifies many of these changes to normal stream and river flows. Logging activity itself further disturbs salmon habitat.

In March 2007, the Forest Practices Board reported on a study of Baker Creek, a Fraser River tributary near Quesnel, which showed peak flows were 60 per cent higher after the beetle moved through this watershed. Total annual flows were 30 per cent higher. After salvage logging removed 80 per cent of trees in the watershed, peak flows were even higher (92 per cent). Flood frequency also increased significantly, with projections that a former 20-year flood would occur every three years on average. The report warned that the beetle would affect flooding, channel stability and fish habitat within similar watershed. It said the beetle "substantially" increased flood hazard and salvage activity intensified that hazard.

Leaving salmon high and dry

Meanwhile, the effects of global climate change are expected to overlay and accentuate these more extreme water cycles, with BC's climate already shifting faster than the global average. Human development adds a further dimension, with competition for water in the Fraser watershed expected to continue growing.

While all eyes are on the mountain pine beetle, **unusual outbreaks of other bark beetles, insects and diseases that attack trees like spruce and firs are also spreading** and could pose higher risks to Fraser salmon. They mostly affect the wetter eastern parts of the watershed, where deforestation would cause more extreme stream flows than in the drier Chilcotin. The eastern watersheds are also home to more wild salmon stocks, like the Quesnel and Horsefly runs. These other beetles are also advancing more slowly, which offers more opportunity to contain them.

Removing beetle-infected trees intensifies changes to normal stream and river flows. Photo by Gordon Ennis.

The extent of the threat to wild salmon survival is less cut and dry. Scientists at the Prince George workshop called for better monitoring, more research and management approaches that identify the most vulnerable watersheds and salmon stocks. The scale of logging, how carefully it is done, and how well mitigation measures are enforced, will also matter. In its March 2007 report, the Forest Practices Board cited inadequacies in current legislation and policies, and a need for new government policy and strategies to protect drinking water and fish habitat in watersheds attacked by the mountain pine beetle.

Cumulative impacts are another worry. Localized deforestation impacts on one creek can be predicted. But with this happening repeatedly across the vast Fraser watershed, and combined results flowing into one major river, we are in uncharted territory.

While BC's iconic wild salmon are remarkably resilient, they already face a multitude of threats. For them, cumulative impact means contending with even more. Some Fraser stocks are thriving. Those in trouble include Early Stuart sockeye, which migrate 1,100 kilometres upriver through the heart of the beetle infestation to spawning grounds northwest of Prince George. Poor ocean rearing conditions linked to climate change are also thought to be causing declines in many salmon stocks. Recent hot, dry summers jeopardise returning adult salmon migrations and spawning. Efforts to mitigate beetle impacts by diversifying local economies could further intensify competition for water in the dry interior, leaving spawning salmon high and dry.

"Our creek is a microcosm of a hundred other creeks in this system, Issues include dying pine forests, extensive logging, competition from other uses such as agriculture, and man-made impacts such as road and bridge construction. Salmon in that creek are already trying to contend with four or five major issues, so it will require nothing less than a major coordinated effort by government to address this."

—Williams Lake resident at a recent public meeting held by the Pacific Fisheries Resource Conservation Council

The scale of logging, how carefully it is done, and how well mitigation measures are enforced will affect wild salmon survival. Photo by E. MacIsaac, Department of Fisheries and Oceans.

A disaster for First Nations

If wild salmon are an icon to British Columbians, they especially hold great cultural and socio-economic value to First Nations. Many upstream communities have not met their food fishing requirements in recent years due to low salmon returns. These same communities are also now at the epicentre of the beetle crisis.

In 2005, BC First Nations responded by coming together to develop their own Mountain Pine Beetle Action Plan, which called it "the single greatest natural disaster our communities have ever faced." It is not just a threat to the resource and the ecosystem, said Chief Thomas Alexis of the Tl'azt'en Nation. First Nations view it as a socio-economic problem that directly threatens the people.

Similarly, from Prince George to Johnstone Strait, impacts to Fraser salmon will affect other British Columbians whose livelihoods hinge on the survival of BC's commercial and recreational fishing industries.

Action needed to protect salmon

The massive government response is starting to consider threats to salmon. Provincial scientists are adapting existing mapping tools to identify vulnerable watersheds. Provincial studies highlighted the need to better protect small streams during logging and suggested better ways to manage harvesting to meet both economic and ecological objectives. And thanks to decades of experience in forestry management, we already have valuable tools and knowledge that can be used to better protect salmon and their habitat.

Many First Nations communities upstream have not met their food fishing requirements in recent years due to low salmon returns. Photo by Department of Fisheries and Oceans.

Dr. Art Tautz, senior biologist at BC's Ministry of Environment, described the pine beetle as a new type of problem involving "catastrophic change." Governments will need new approaches to cope, including risk assessment, adaptive management and ecosystem-based management. Others have cited the need for more conservative fisheries management, better monitoring, research to address knowledge gaps, and better data management and sharing. At PFRCC community meetings in the Fraser watershed, local residents repeatedly stressed the urgency of reforming BC's archaic Water Act to empower governments to mitigate impacts through improved water management that assures water for salmon.

Allison Webb, Regional Policy Director for Fisheries and Oceans Canada, proposed new mechanisms that can bring different groups together to consider trade-offs and balance competing interests. Tautz suggested that such complex problems are best tackled with collaborative, community-based approaches. Others talk about the need for a broader outlook and balancing of long- and short-term benefits.

Local communities have stressed the importance of better linkages between agencies, government levels and local communities. BC's many salmon conservation groups and agencies will need to work together more closely and First Nations can contribute in key areas.

With all the challenges climate change brings, we need to do a better job of managing those things over which we do have control, like ensuring salvage logging is fish friendly, to ensure salmon are protected for future generations.

More on salmon and their ecosystems at:
Pacific Fisheries Resource Conservation Council: www.fish.bc.ca

More on the mountain pine beetle and threats to salmon:
BC Ministry of Forests and Range—Mountain Pine Beetle information: www.for.gov.bc.ca/hfp/mountain_pine_beetle/
Natural Resources Canada—Mountain Pine Beetle program: http://mpb.cfs.nrcan.gc.ca
Forest Practices Board: www.fpb.gov.bc.ca
Fraser Salmon and Watersheds Program: www.fswp.ca
First Nations Mountain Pine Beetle Initiative: www.fnmpbi.com

BC's many salmon conservation groups and agencies, along with First Nations, need to work together to manage forest harvesting and preserve salmon habitats.
Photo by BC Forest Practices Board.

TO LEARN MORE about the state of Pacific salmon, visit the Pacific Fisheries Resource Conservation Council online at

www.fish.bc.ca

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Beetle photo by Dion Manastyrski, Ministry of Forests.

Back cover:
Spawning salmon.
Photo by Elan Park.