WHAT ARE CUMULATIVE EFFECTS?

CLIMATE CHANGE

Climate change causes warmer air temperatures, as well as many different effects that range from changing the timing of ice-off, decreases in glacier volume, and altered seasonal patterns of rainfall and river flows.

Climate change overlays other impacts and can add to, and exacerbate, their negative impacts. Under climate change, any impact could be seen as a cumulative effect.

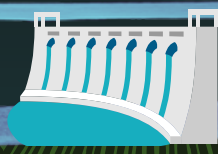
ACTIVITES→STRESSORS →IMPACTS

Land use activities (*e.g.*, logging) involve different stressors (*e.g.*, excessive inputs of sediments) that can change or harm salmon watersheds, potentially decreasing the survival of salmon (the impact).

IMPACTS

Stream temperatures are increasing due to land use activities like forestry removing riparian (stream-side) vegetation that shades rivers, and climate-change driven changes to the timing, and volume, of cold glacial snowmelt entering rivers.

The relationships among animals in salmon ecosystems are changing. For example, hungry bears now eat the whole fish as salmon populations decrease, with flow-on impacts for the rest of the ecosystem.



The timing of fish migrations and holding patterns are changing too, perhaps due to warming stream temperatures. This then influences the timing and location of salmon fisheries.

'DEATH BY A THOUSAND CUTS'

The combined impacts of multiple human land use activities that alter the heath of an ecosystem add up over time, and space, to potentially large consequences for salmon and their habitats.

WITNESSING CHANGE

Indigenous Peoples across BC have borne witness to this 'death by a thousand cuts,' watching as, over generations, these small (and not so small) cuts added up to profoundly alter salmon ecosystems and peoples' relationships with salmon.

A PATH FORWARD

There is hope. Indigenous communities are asserting their agency and acting to mitigate cumulative impacts, *e.g.*, demanding better regulation of forestry practices. The UNDRIP, *Declaration Act*, and collaborative projects like the Watershed Futures Initiative present further opportunities for communities.

*some icons are courtesy of FUSE Consulting, adapted from Atlas, W.I., J. Housty, E. White, W.G. Housty, C. Service, L. Greba, S. Harrison, S. Greening, K.I.R. Butts, W.M. Shepert, C. Sharpe, E. S.-B., D. Macintyre, A. Tuohy, A.J. Reid, N. Morven, J.W. Moore, K. Connors, N.C. Ban, and M.R. Sloat. 2020. Indigenous systems of management for culturally and ecologically resilient Pacific salmon (Oncorhynchus spp.) fisheries. *BioScience*.