

People of the Saltwater: Indigenous Cumulative Effects Assessment

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Abstract

Gitxaala Nation has participated in dozens of major project impact assessments over the past ten years under the jurisdiction of both Canada and British Columbia. Despite multiple renewals, regulations, and legislative changes, these assessments continue to miss the mark when addressing holistic cumulative effects assessments and examinations of direct and indirect impacts on Indigenous rights and governance. From a Gitxaala perspective, human wellbeing is embedded in the health and abundance of the territory, and territorial management decisions should be made with traditional laws and future generations in mind. This sustainable decision-making requires holistic and accurate baseline knowledge of the territory and impacts of developments. Faced with the shortcomings of standard assessments, Gitxaala has developed its own set of tools for understanding impacts to Gitxaala people and territory. One of these tools is the Gitxaala Marine Cumulative Effects Assessment (GMCEA). Building on methods developed by another Indigenous-led process, the Gitxaala Risk and Impact Assessment, novel vulnerability scores were deployed to assess the impacts of vessel traffic on marine territorial Indigenous Use and exclusion of use by marine shipping, which complements existing methods of assessing ecosystem impacts. This assessment process presents a holistic and Nation-specific cumulative impact assessment that supports Gitxaala governance and exercise of rights in the territory as development pressures mount.

Summary Statement

Gitxaala Nation's Marine Cumulative Effects Assessment holistically examines the status of ecosystems and Indigenous Use in relation to marine shipping impacts, informing leadership's decision making.

Introduction

Gitxaala Nation is a sovereign, self-governing, and self-sustaining Indigenous Nation. Also known as Git Lax M'oon, people of the saltwater, Gitxaala is one of the most ancient societies on the coast of what is commonly known as British Columbia, Canada. Nl̓uut'iksgm Laxyuubm Gitxaala (sacred Gitxaala Territory) has sustained Gitxaala Nation for generations. The village of Lax Klan (Kitkatla, BC) is on Dolphin Island, 60 km south of Prince Rupert, and has been continuously inhabited since time immemorial (Menzies 2016, 48; Figure 1). Gitxaala harvesters use nearly one hundred different marine and terrestrial resources to feed the community and many Gitxaala citizens are involved in the marine economy (Conacher et al 2023). An intact ecosystem and the ability for Gitxaala citizens to travel the territory and harvest is key to sustaining governance, rights, resource management, relationships with neighbouring First Nations, access to sacred and important places, health and wellbeing, and cultural and language transference (Conacher et al 2023, Gitxaala Nation 2022).

Gitxaala Nation plays an active role in management of its territory, including collecting baseline information via Traditional Use Studies, internal risk and impact assessments, and participating in Crown-led impact assessments. This study builds on and complements Gitxaala's years of regulatory work to create a snapshot of marine shipping cumulative effects on the ecosystem and Indigenous marine use in part of Gitxaala territory. Gitxaala has participated in regional cumulative effects assessments (Wilson 2020, Transport Canada 2022), however these studies have not captured all areas and subjects of concern to Gitxaala.

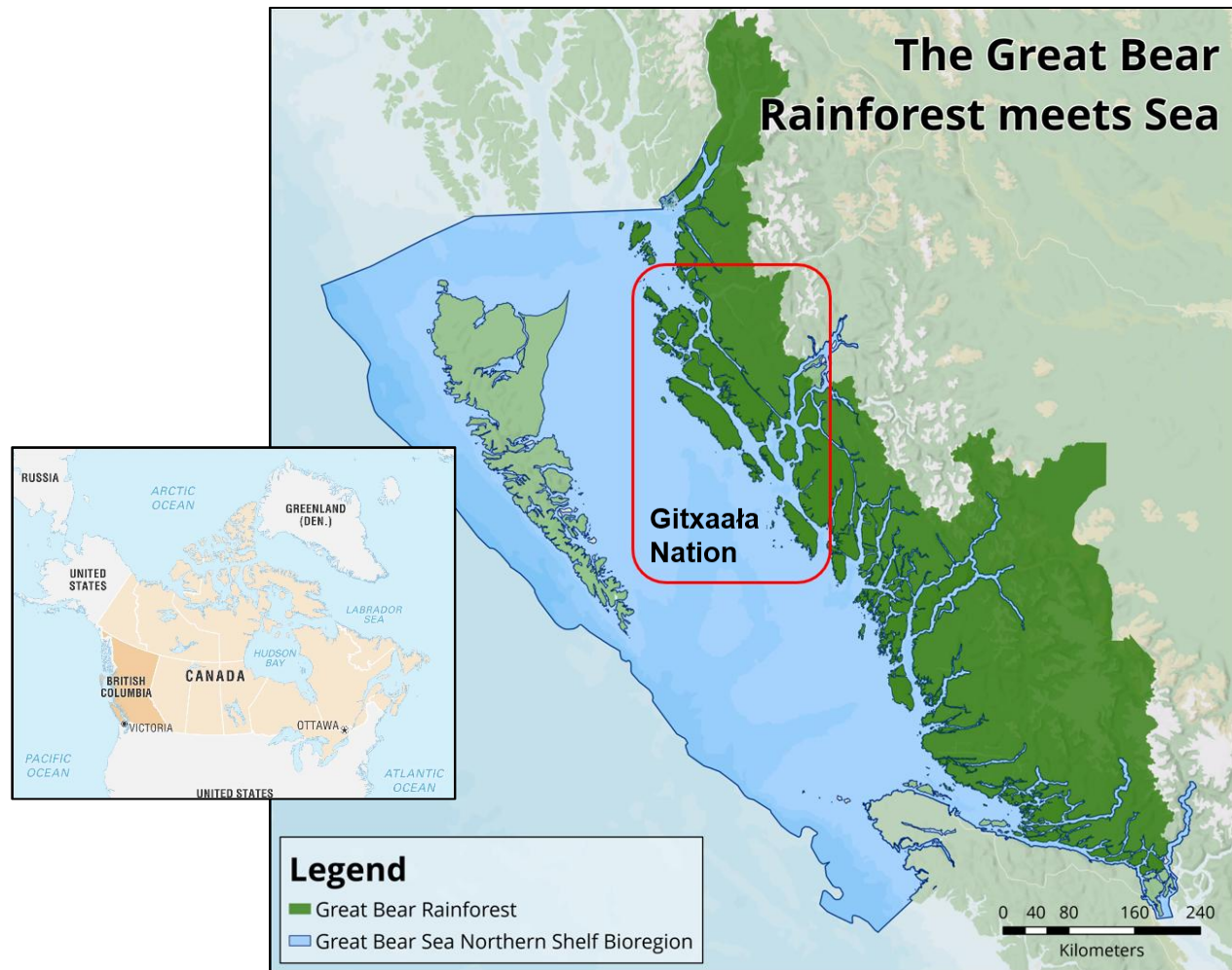


Figure 1: Map situating Gitxaala Territory in its regional context, with inset showing British Columbia's location on the west coast of Canada for reference. Below the map are scenes from Gitxaala, from left: processing salmon (photo by Jaka Vinsek), view from above the village of Lax Klan, drying seaweed in the late spring sun (photos by Lore Masters).

Methods

The methods for this assessment were built on widely used Cumulative Impact Mapping approaches to marine cumulative effects assessment (Halpern et al. 2009, Quemmerais-Amice et al. 2020, Korpinen et al. 2021, Ban et al. 2010, Murray et al. 2024, Tamburello et al. 2026). This project translates components of existing methodology developed for the Regional Assessment of the Cumulative Effects of Marine Shipping (CEMS) for the South Coast of British Columbia (hereafter South Coast CEMS, Tamburello et al. 2026) to the context of the Gitxaala territory, focusing on cumulative effects assessment around the Port of Prince Rupert due to the presence of concentrated development pressures in this area.

Scope

In the Gitxaala project, we built on the South Coast CEMS scope to better reflect community concerns and lived experience. The South Coast CEMS project assessed cumulative ecological impacts of interactions between vessel activities and their resulting “stressors” on “connections” (typically referred to as “valued components”) through spatial analysis of exposure (overlap in space and time) and vulnerability (how much a connection may be affected by a stressor if exposed to it). Stressors include ships’ wake and propeller wash, wastewater and petroleum discharges, and disturbance from anchoring, which were modelled at a fine spatial scale using regional and global datasets and methods developed in prior projects (Tamburello et al. 2026). Examples of connections include eelgrass beds, shoreline habitat, and fish habitat. In addition, while other CEMS work has examined cumulative effects on Indigenous Uses using qualitative methods (Transport Canada 2022, 36-37), this study aimed for a spatially-explicit and quantitative assessment of cumulative risk to Indigenous Use connections alongside Ecological connections.

This study developed new Indigenous Use connections for Shoreline Harvesting, Offshore Harvesting, and Travel Routes to capture a broader range of impacts from marine shipping to Gitxaala community members. Relying on Traditional Use studies featuring interviews and spatial data from dozens of Gitxaala harvesters, this study further split Open Water Harvesting into two connections: Short Set Fishing, which accounts for fishing that requires three hours of uninterrupted harvesting time (e.g. salmon, whole herring), and Long Set Fishing, which accounts for harvesting that requires eleven hours (e.g. groundfish, crab pots). These definitions enable Gitxaala to visualize and communicate pressures the harvesters are facing, as uninterrupted harvesting time continues to dwindle in the busy port area.

Also unique to this study is the inclusion of wake height as a new stressor relevant to Indigenous Use (in addition to wake energy which is more relevant to Ecological impacts via coastal erosion). Wake waves from vessels represent a safety concern for Gitxaala marine users on the shoreline, where high wakes can disrupt or knock down people engaged in shoreline harvesting, and in small boats, where high wakes can destabilize, overtop, or capsize vessels. Wake height was calculated at the shoreline and along Gitxaala travel routes using established empirical modelling methods (Tamburello et al. 2026), based on AIS data across a full calendar year.

Assessing Exposure of Indigenous Uses to Vessel Traffic

To determine exposure, the spatial extent of Indigenous Use activities was drawn from existing Traditional Use Studies and community mapping exercises carried out by Gitxaala Nation. In addition, overall understanding of exposure was further refined through discussion with Gitxaala community members to better understand the mechanisms and timing of effects based on lived experience to arrive at community-relevant indicators of exposure (e.g., the availability of uninterrupted periods of a specific duration needed to carry out short-set versus long-set fisheries).

Assessing Vulnerability of Indigenous Uses to Vessel Traffic

To determine vulnerability, the qualitative scoring frameworks and criteria originally developed to assess ecological vulnerability (e.g., per Teck et al. 2010) were co-opted and restructured to be relevant to local community experience. In this study, vulnerability criteria scoring rubrics for Indigenous Use connections were aligned with existing methodology developed for Gitxaala project-specific risk and impact assessments that centre on impacts to Gitxaala Rights and Governance. For each vulnerability criterion, we considered the Indigenous Use equivalent speaking to the same dimensions of vulnerability and defined new community-oriented levels of vulnerability. For example, the original Ecological criterion of “Trophic Impact” (reflecting how far impacts on a connection may cascade through the food web) was translated into a corresponding Indigenous Use criterion of “Social Scope” (reflecting how impacts affect cascade across levels of Gitxaala society).

This new rubric outlines how any applicable stressor can impact Gitxaala people on a range of levels - from individual, house or house group, clan, or to the whole Nation. While the individual level does not have implications for governance, any higher level does, such that effects will be felt unequally across Gitxaala territory and Gitxaala people. Gitxaala governance is rooted in the principles of rank, connections between

place and person, and historical knowledge (Menzies 2016, 27-8). Access and ownership to areas of the territory vary by house group, and any damage to held territory is damage to status of Sm'gigyet (hereditary leaders; Menzies 2016, 35).

Similarly, the Ecological criterion of “Sensitivity” (the average tendency of a species, trophic level, community, or ecosystem change its “natural” state in response to a threat) was translated into the Indigenous Use criterion of “magnitude” (the degree to which the ability to maintain the Indigenous Use practice will be modified, reduced, or lost). Lastly, the Ecological criterion of “Recovery Time” (the time needed for ecological recovery after impacts occur) was translated into the Indigenous Use criterion of “Persistence” (the persistence of effects on Indigenous Uses once impacts occur, from transient impacts to multi-generational impacts). Gitxaala is keenly aware of the consequence of multi-generational impacts - once the chain of knowledge and language transmission is broken, loss can be permanent. “Spatial scale”, “frequency”, and “climate change risk” were assessed using the same rubric for Ecological and Indigenous use connections.

In this way, Ecological and Indigenous Use connections were scored using separate but corresponding and complementary scoring scales in a way that allowed them to be rolled together in an overarching cumulative impact map.

Results

The top-level findings of this work are synthesized in a cumulative impact map that reflects the effects of all stressors on all vulnerable connections through relative impact scores for each grid cell on the map (Figure 2). Results indicate that the greatest relative cumulative effects occur around the Port of Prince Rupert, where vessel activity is concentrated around anchorages, industrial terminals, and docks. However, log-transforming the data reveals a broader distribution of effects when viewed as changes across orders of magnitude. Members of the community have shared that the log-transformed map more closely reflects how cumulative effects are experienced on the water, where changes in the order of magnitude of vessel traffic over space and time may be as noticeable as, or more noticeable than, the overall amount of vessel traffic in a given area. For this reason, the log-transformed map should not be interpreted as a subjective alternative to the linear map, but as a complementary representation of how cumulative effects may become noticeable, disruptive, and consequential for Gitxaala marine users across a broader area. Presenting cumulative impact maps using multiple scales can therefore improve interpretation, communication, and engagement across audiences by better reflecting their lived experience in a more relatable way.

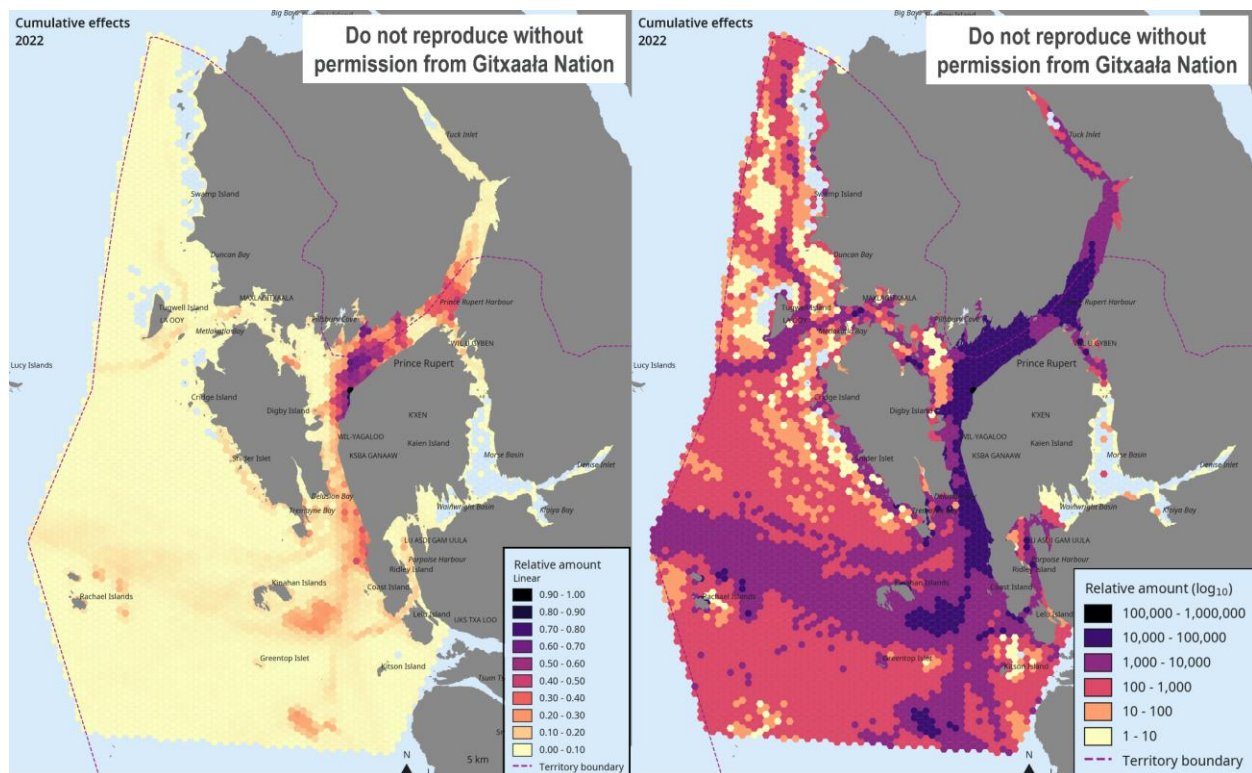


Figure 2: Cumulative impact maps for the region around Prince Rupert, British Columbia, Canada, reflecting the cumulative effects of all vessel traffic stressors on all Ecological and Indigenous Use connections assessed. Panels represent relative impact scores on a natural linear scale, which best highlights the areas of greatest predicted cumulative effect (LEFT), and relative impact scores on a logarithmic scale, which best highlights step changes in cumulative effects by orders of magnitude (RIGHT).

Conclusion

Layering individual stressor-connection maps to create a cumulative hotspot map enables focused examination of potential issue areas and an understanding of relative risk. From this work, Gitxaala can make informed choices about undertaking field studies or increased surveillance monitoring. This study will also be used to inform Gitxaala Nation's management conversations with regulators and engagement with project proponents. The study's flexible design means that additional stressors or connections can be scoped in, the time frame can be expanded, and the study area can grow to cover other areas of interest or the entire territory.

Cumulative effects frameworks continue to attempt to simplify an unbounded world. This study has built upon existing cumulative effects architecture to bring in more of the world, with people and place integrated. Collaboration between First Nations and other governments can be one path forward to creating more holistic frameworks. Yet First Nations also have the right to lead the way.

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