

Neexdzii Kwah Restoration Planning

Executive Summary



Version 0.3.2 DRAFT | 2026-08-27

Prepared for the Wet'suwet'en Treaty Office Society

Prepared by Al Irvine, R.P.Bio — New Graph Environment Ltd.

on behalf of the Society for Ecosystem Restoration in Northern British Columbia

[Full Report](#) | [Source Code and Data](#) | [Changelog](#) | [Latest Executive Summary](#)

Claude (Anthropic) assisted with analysis, writing, and code development. All scientific interpretation and conclusions are the responsibility of the authors.

Executive Summary

This report presents a governance and prioritization framework for restoration of the Neexdzii Kwah (Upper Bulkley River) watershed, grounded in Wet'suwet'en stewardship values and supported by an integrated suite of open-source spatial analysis tools. The framework is not a static plan — it is a living system designed to evolve as understanding deepens and new data becomes available.

Governance and prioritization. The prioritization framework proposes a four-tier governance structure — Stewardship Council, Technical Working Group, Implementation Partnerships, and Community Roundtable — that places Wet'suwet'en direction at the centre of restoration decision-making. Three diagnostic gates filter candidate sites before investment: certainty of diagnosis, whether active degradation is ongoing, and access and willingness to act. Scoring principles were developed from community workshops where participants ranked restoration parameters. Workshop groups converged on the same four priorities — Cultural Significance, Probability of Success, Watershed Function, and Proximity to High-Value Fish Habitat — though the relative weighting differed across groups. These priorities, and the diagnostic gates, post-date the scoring exercise described below and are not reflected in it. Cultural significance in particular is defined at a high weighting but cannot be scored without direction from Wet'suwet'en knowledge holders. The framework acknowledges that habitat restoration alone cannot deliver salmon recovery. Neexdzii Kwa chinook collapsed under historical in-river overharvest and have remained well below escapement targets since the local fishing ban in 1998. At the Skeena aggregate scale — through which these fish migrate — ocean and in-river harvest continues to exceed sustainable rates (Price et al. 2026). Restoring watershed-scale freshwater habitat is the lever available locally; it prepares the watershed to support rebuilding as harvest and productivity pressures are addressed.

Restoration site selection. Historic prescriptions were extracted from background reports and spatialized, combined with sites proposed through landowner engagement and local knowledge, and reviewed in the field. The resulting candidates were scored against GIS-derived parameters — an exercise retained in the appendix. It showed that ranking alone is insufficient here: site-by-site treatment addresses symptoms, and where the processes driving degradation remain active, gains are unlikely to persist. What determines whether restoration succeeds — and what success means — extends beyond the scored layers: land ownership and legal access, willingness to participate, meaningful project size, certainty of diagnosis, and whether a place invites the ongoing presence that stewardship requires. No forum existed to resolve them. The diagnostic gates and governance structure are offered as a means of working through these constraints collaboratively, so that spatial analysis informs decisions rather than standing in for them. Whether to concentrate early effort below Bulkley Falls, where chinook still return, or in upstream sub-basins where historic salmon use is documented and access is more limited, is well suited to consideration through the Stewardship Council and its partners as the framework matures.

Sub-basin delineation. The watershed was divided into 14 sub-basins to enable prioritization and facilitate communication of issues and opportunities within each area. Natural break points —

Bulkley Falls and Buck Falls — define the primary divisions due to their significance as barriers to salmon access. Within these regions, sub-basins were delineated based on groupings of habitat and landscape characteristics at comparable scales, using FWA-referenced spatial hydrology tools via [fresh](#). Each sub-basin integrates fish habitat modelling, land ownership, reserve lands, cultural sites, and land cover change into a single characterization that supports comparison and investment targeting.

Floodplain modelling and land cover change. The functional floodplain — where the river does geomorphic work including sediment storage, nutrient exchange, riparian recruitment, and large woody debris delivery — was modelled using the Valley Confinement Algorithm implemented in [flooded](#). Intact floodplains retain water on the landscape and release it slowly, moderating the low flows and elevated summer temperatures that limit salmon survival in this watershed. Within the modelled floodplain, 10 m resolution satellite imagery shows approximately 746 ha of tree cover lost across the watershed between 2017 and 2023 — counting change patches of at least 1 ha to suppress class-boundary noise from sub-pixel registration drift. Tree loss rates vary by sub-basin, from less than 1% to approximately 12% of floodplain area, with what the analysis classifies as agricultural land expanding into cleared areas in most cases. The floodplain extent was modelled conservatively — scoped to coho-accessible streams of 3rd order and larger, with lakes and wetlands included only where they connect to the fish-accessible network.

Historic aerial photographs. Nearly 10,000 provincial aerial photographs (1963–2019) have been downloaded and georeferenced using [fly](#). This collection represents the entire provincial dataset where photograph footprints land within the Neexdzi Kwah watershed. It is served as a [queryable spatial catalog](#) — available programmatically and from within GIS systems such as QGIS. This 50-year visual record allows direct comparison of historic and current conditions at any location in the watershed — building understanding of how the landscape has changed over time and grounding restoration targets in documented prior condition.

Site assessments. Field reviews at 26 locations over 2024–2025 documented conditions at past restoration sites, historic prescription locations, and newly proposed areas. A recurring theme was riparian and floodplain vegetation removal, channelization of streams and cattle-related degradation at scales far exceeding the footprint of past restoration investments. At sites where past work has been completed, riparian buffer widths were narrower than what current understanding suggests is needed for effective recovery. Road and rail erosion protection consistently lacked vegetated riprap, soft armouring, and effective riparian buffers. UAV flights at the majority of sites provide high-resolution baseline imagery for future monitoring, cataloged via [stac.uav.bc](#). These observations feed directly into the prioritization framework and provide the baseline against which future restoration effectiveness will be measured.

Seed collection. A seed collection program was initiated with Seed the North to build local capacity for native plant propagation. Seed collection is itself a stewardship activity — it brings people onto

the land, builds understanding of what grows where, and develops the capacity to collect, propagate, and plant that sustained revegetation requires. Collections of soapberry, red osier dogwood, highbush cranberry, and mountain ash are held in storage for future propagation.

Collaborative GIS. A shared QGIS project integrating provincial background layers, field data collection forms, spatialized historic restoration prescriptions, and all analysis outputs serves as the spatial integration layer for this work. Through cloud-based mobile GIS, the full project travels into the field on mobile devices — functioning as both the primary navigation system during site visits and the platform for standardized data collection. The ability to overlay fish habitat modelling, historic prescriptions, floodplain change detection, land tenure, and traditional knowledge in a single environment allows users to understand the spatial context of each location and make informed decisions about restoration priorities. Critically, this is not just an analytical tool — it is the primary platform for field data collection and the spatial integration layer that connects all other project components.

Aquatic health monitoring. Benthic invertebrate sampling at three mainstem sites reveals a clear gradient: stream health improves with distance upstream from Houston. Near town, the community includes a higher proportion of nutrient-tolerant species — midges and net-spinning caddisflies — and the biotic index indicates possible slight organic enrichment, consistent with elevated phosphorus documented in the historical water quality record for this reach. Moving upstream, these give way to sensitive mayflies, stoneflies, and caddisflies that indicate clean conditions. The upstream site below McQuarrie Creek supports reference-quality conditions suitable as a benchmark for future monitoring. Statistical testing confirmed these are genuinely different communities, not random variation. Compared to previous sampling in 2004 and 2018, the near-Houston community appears to have shifted toward more pollution-tolerant species, though differences in sampling season complicate direct comparison. Full results including approximately 50 years of compiled water quality data are presented in a [dedicated report](#), with data to be uploaded to the federal CABIN database. An expanded monitoring network across the watershed is proposed.

Environmental DNA (eDNA) sampling targeting chinook, coho, sockeye, and bull trout was conducted below Bulkley Falls and approximately 1 km downstream to detect species presence within the reach at the time of collection, with analysis pending from the University of Northern British Columbia.

Open-source software and data products. The spatial analysis packages and catalogs developed through this and related work are open-source and designed to work at any scale and in any watershed in the province:

- Stream network spatial hydrology — [fresh](#)
- Floodplain delineation — [flooded](#)
- Land cover change detection — [drift](#)
- Airphoto footprint estimation and optimal coverage selection — [fly](#)

- Provincial LiDAR digital elevation models (DEMs) — [stac_dem_bc](#)
- UAV imagery catalog — [stac_uav_bc](#)
- Historic airphoto catalog — [stac_airphoto_bc](#)

These tools were developed across multiple projects and through ongoing research investment — they are not single-use products tied to any one initiative. The capacity they build — for ourselves and for others — to understand and manage conservation and restoration is as much a deliverable as the analysis results themselves.

This report is a living document, with ongoing revisions and updates tracked in the [project changelog](#). The research and monitoring programmes described here are not just technical exercises — they are acts of territorial stewardship, grounded in the understanding that health, ecosystems, social systems, and watershed management must be governed together (Harris 2011). The United Nations Decade on Ecosystem Restoration (2021–2030) reinforces these principles through international standards of practice that call for addressing root causes of degradation, benefiting the people with the deepest connection to the ecosystem, and integrating governance across scales (FAO et al. 2023). We are humbled by the depth of knowledge that exists for this region, both through traditional knowledge and scientific study. Recovery efforts must go beyond technical interventions and include a commitment to learning from the vast body of knowledge held by the Wet'suwet'en people — including cultural practices, oral tradition (Kungax), Wet'suwet'en Law (Anuk Nu'at'en), and the deep connections between families, house groups, and the lands and waters that sustain them (University of British Columbia Library, n.d.; Morin 2016).

References

- FAO, SER, and IUCN CEM. 2023. *Standards of Practice to Guide Ecosystem Restoration: A Contribution to the United Nations Decade on Ecosystem Restoration. Summary Report*. FAO. <https://doi.org/10.4060/cc5223en>.
- Harris, Sandra Martin. 2011. "Yinka Dinii Ha Ba Ten, the Ways of the People of the Earth: A Social-Ecological Framework for Sustainability." Master's thesis, University of Northern British Columbia. https://unbc.arcabc.ca/islandora/object/unbc%3A16575?solr_nav%5Bid%5D=211239513a91efe5652d&solr_nav%5Bpage%5D=0&solr_nav%5Boffset%5D=0.
- Morin, Mélanie H. 2016. *Niwhts'ide'ni Hibi'it'ën: The Ways Of Our Ancestors. Witsuwit'en History & Culture Throughout The Millennia*. 2nd ed. School District #54 (Bulkley Valley) and Witsuwit'en Language and Culture Authority. <https://www.sd54.bc.ca/contact-us/>.
- Price, Michael H. H., S. Vincent, J. Doire, et al. 2026. *Towards Rebuilding Giis (Chinook Salmon) in the Widzin Kwa: State of Knowledge Report*. BC Salmon Restoration and Innovation Fund.
- University of British Columbia Library. n.d. "Delgamuukw Trial Transcripts Collection." Accessed February 19, 2025. <https://open.library.ubc.ca/collections/delgamuukw>.