

Cumulative Effects in Yukon: Challenges and Opportunities

Emily Crist and Kirsten Reid, Yukon Conservation Society (2022)

“The concept of cumulative environmental effects recognizes that the environmental effects of individual human activities can combine and interact with each other to cause aggregate effects that may be different in nature or extent from the effects of the individual activities. Ecosystems cannot always cope with the combined effects of human activities without fundamental functional or structural changes” (Impact Assessment Agency of Canada 2019).

Introduction

The many landscapes of the Yukon are often conceptualized as being pristine or undisturbed. But the land has been used and modified by Indigenous Peoples for at least the past 15,000 years. And since the Klondike Gold Rush at the end of the 19th century which positioned the Yukon as the land of opportunity, people and development alike have flocked to the Yukon, necessarily bringing disturbances with them. Since the Gold Rush, settlements have grown into cities, new roads and trails crisscross the landscape, and the Alaska Highway, constructed during World War II, has permanently connected the Yukon to southern Canada and beyond. Today, industrial activities such as placer and quartz mining, forestry, agriculture, and urban sprawl of the Territory’s growing communities, continue.

Change is inherent to landscapes and ecosystems. In the boreal forest, which covers much of the Yukon, wildfires are the dominant disturbance. Over tens of thousands of years, vegetation in the boreal forest has adapted to reproduce with this repeated cycle of disturbance. However, with the addition of anthropogenic, or human-caused, impacts such as increased concentration of atmospheric carbon dioxide and warming air temperatures, ecosystems are facing disturbances at scales and intensities much larger than they are naturally adapted to. Natural disturbances, like wildfires, are also becoming more frequent and intense with continued climate change (IPCC 2021). The interaction of natural and anthropogenic stressors over time can have negative results for ecosystems and species, including humans who rely on the many ecosystem services that the

environment provides. In general, arctic regions are warming at a rate of four times the global average (Rantanen et al. 2022). In the Yukon, climate change has manifested as a rise in air temperatures by 2°C over the past 50 years (Streicker 2016); by the end of the 21st century, temperatures are predicted to increase by 3.9 to 6.9°C compared to the 1961-1990 average (SNAP-EWHALE 2012). Climate variability is increasing, with greater frequency and intensity of large disturbances such as wildfires, floods, and permafrost thaw events (Streicker 2016).

Cumulative effects

Cumulative effects studies and frameworks seek to understand the ways in which multiple pressures, including climate change, anthropogenic activities, and natural disturbances, interact to influence ecosystems. Cumulative effects are difficult to measure due to the complexity of natural systems and the far-reaching effects that stressors can have (Jones 2016). There are a wide variety of scientific approaches used to monitor and assess cumulative effects and their associated environmental indicators, making cumulative effects management a significant effort (Jones 2016). Despite these challenges, an understanding of cumulative effects is crucial and should continue to be pursued despite the complexity of natural systems and organizational difficulties. In the Yukon, no single agency or group is responsible for cumulative effects management (North Yukon Land Planning Commission 2009); we, therefore, lack a nuanced understanding of the extent of past anthropogenic activities, how current and future anthropogenic activities influence the Yukon's biodiversity, and how past, current, and future land uses will influence environmental and socioeconomic values. As industrial activities continue, acting as if the Yukon's resources and landscapes are limitless cannot continue. Effective integration of cumulative effects into future development assessments is crucial to ensure the future environmental and social integrity of the Yukon's landscapes.

A cumulative effects framework is a set of policies, regulations, and tools that aid in development assessments that fully consider the cumulative effects of past, present, and future disturbances. Frameworks guide how available data are used to contribute to an understanding of cumulative effects (Dawson Regional Planning Commission 2021). Development assessments generally function on a project-by-project basis, but cumulative effects frameworks require

increased coordination, resources, and capacity because they include continuous monitoring of indicators and the identification of thresholds. When employed, cumulative effects frameworks can approach development assessment from a regional or project-based perspective. When projects are considered within a regional context, it is possible to gain a more integrative understanding of current landscape conditions and impacts from anthropogenic disturbances.

Technical Structure of Cumulative Effects Assessments

The *Canadian Environmental Assessment Act* outlines the general steps for performing cumulative effects assessments. The technical pathway to cumulative effects management includes the collection of baseline data, identification of Valued Ecosystem Components (VECs), and monitoring indicators which are used to assess the status of VECs (Figure 1). Data collection often involves coordination across multiple government agencies, academic institutions, and non-governmental organizations.

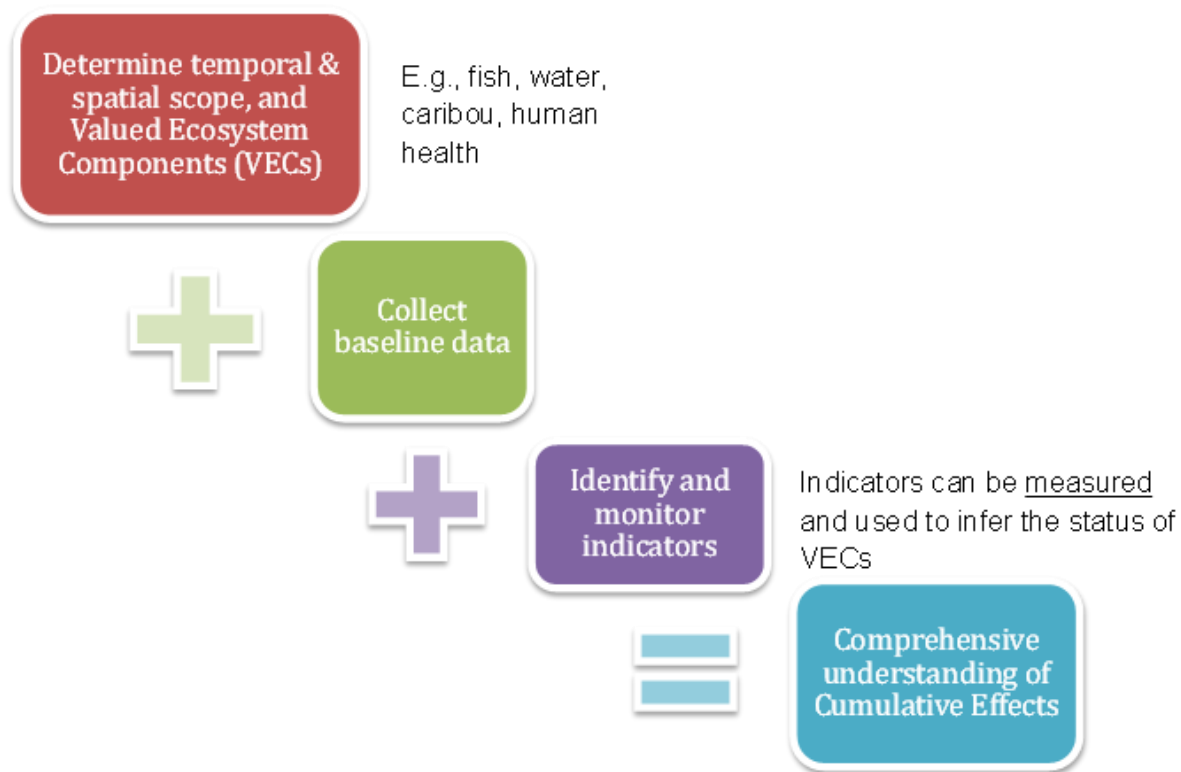


Figure 1. The general components required in all cumulative effects assessments. Note that this does not include political or regulatory considerations.

Cumulative Effects Frameworks in Canada

Cumulative effects assessment is a required component in the *Canadian Environmental Assessment Act* at the federal level. There is currently no cumulative effects framework established for the Yukon to address the required *Yukon Environmental and Socio-economic Assessment Act* section 42(1)(d) requirement. Elsewhere in Canada, Nunavut, Northwest Territories, British Columbia, and Alberta (on a regional basis) have, or are in the process of creating, cumulative effects frameworks (these jurisdictions are current as of September 2022, based on an internet search).

A cumulative effects monitoring program and framework in the Northwest Territories

The Northwest Territories has similar Indigenous governance structures as the Yukon. Like the Yukon, agreements between First Nations and the territorial government include specified land and environmental criteria. Three nations, Gwich'in, Sahtu, and Tłı̨chǫ, made cumulative effect management a crucial component of their land claim agreements with the territorial and federal governments. The *Mackenzie Valley Resource Management Act* and the Inuvialuit Settlement Region have both been added as partners to the Northwest Territories' cumulative effects program (below) since its establishment.

The Northwest Territories' Cumulative Impact Monitoring Program (CIMP) focuses on three VECs: caribou, water, and fish. The program's main purpose is to collect data and forward research which supports resource management decisions and tracks trends of cumulative effects on the landscape (NWT Cumulative Impact Monitoring Program 2021). Data collected from the CIMP program will feed into a future cumulative effects framework. At its current capacity, CIMP facilitates communication between rights and stake holders about management objectives, coordinates, conducts and funds research and data analysis, and communicates results to regulators and the public. The program is guided by a board of Indigenous governments and organizations with participation from the federal and territorial governments and industry. Activities are implemented by the NWT Department of Environment & Natural Resources staff (NWT Cumulative Impact Monitoring Program 2021). Their current action plan (2021 – 2025)

involves an audit of regulatory regimes and programs every five years to ensure that objectives are being met. A key feature of the program includes an open-access database with the results of all monitoring programs.

The framework used by NWT can offer guidance for the Yukon because of the similarity in some Indigenous governance structures, landscapes, disturbances (e.g., mining, road infrastructure), and climate change effects. The NWT's framework can offer guidance on how to structure a cumulative effects framework that functions under co-management with Indigenous governments, coordinates different policies, areas of government, and organizations to work toward cumulative effects objectives, and equally considers non-Indigenous and Indigenous Knowledge.

Cumulative Effects in the Yukon

Despite there being no established framework, cumulative effects have been included in the land management framework of regional land-use plans.

Current Development Assessment in the Yukon

Yukon Environmental and Socio-economic Assessment Act Board (YESAB), controls and administers the Yukon assessment process. Development assessments are considered on a project-by-project basis by YESAB; cumulative effects are not included in their assessment framework, although the legislation requires it. YESAB states that “The cumulative effects of other activities and processes... can affect the existing condition of VESECs [Valued Ecosystem and Socio-economic components] and provide important context for making determinations about whether the likely adverse effects of the project are significant or not” (YESAB 2021).

YESAB will consider cumulative effects as a contextual factor for certain project assessments but does not integrate the concept into all its assessments to date, despite the legal requirement to do so. Additionally, YESAB does not collect its own data, and as such, is reliant on data provided by proponents of the project, commenters, First Nations, and federal and territorial

governments. Since there is no framework to provide consistency and the data collected is not for the specific purpose of understanding cumulative effects, YESAB's current integration of cumulative effects falls short of providing a full picture of interacting disturbances.

A cumulative effects framework would ideally work separately but in conjunction with YESAB. Figure 1 shows the technical pathway to a comprehensive understanding of cumulative effects; YESAB does not complete any of the steps outlined here.

Chapter 11 Regional Land-use Planning

A regional land-use plan describes goals for land allocation, use, and management, and is created by an independent commission and supported by the governments. In the Yukon, regional land-use planning is enabled by the Yukon First Nations' Final Agreements s.35 treaties between each Yukon First Nation and the federal and territorial governments. Land-use planning can assist the YESAA process by providing an understanding of cumulative effects in specific land management units within the regional planning area (North Yukon Planning Commission 2009).

Land-use planning has currently been completed or started in three regions: North Yukon, Peel Watershed, and Dawson. Elsewhere, First Nations, territorial and federal governments are working toward for the regional land-use planning process to begin. The North Yukon, Peel Watershed, and Dawson Plans employ a results-based management approach. That is, higher-level planning goals and objectives are monitored through the use of environmental indicators. The Plans acknowledge that applying results-based management can be a good step to the management of cumulative effects and that monitoring indicators contribute towards an understanding of the cumulative effects of human land use (North Yukon Planning Commission 2009). The two indicators used for the existing plans are direct surface disturbance and linear density. The monitoring of these two indicators ensures that impacts to several values are monitored, both directly and indirectly (North Yukon Planning Commission 2009, Dawson Regional Planning Commission 2021). The plans recommend indicator thresholds for each land management unit which act as benchmarks for development and land-use planning as well as conservation efforts (North Yukon Planning Commission 2009, Dawson Regional Planning Commission 2021).

The Recommended Dawson Plan (September 2022), involves a sizeable cumulative effects section. This represents the greatest step forward in implementing the cumulative effects framework in the Yukon to date. This Plan identifies several additional indicators that have more discrete relations to valued ecosystem components, including salmon, wetlands, stewardship, and socio-economics. The Planning Commission acknowledged that more work is required to finalize socio-cultural and socio-economic values that are to be included in the Plan (Dawson Regional Planning Commission 2022). The number and variety of values being considered in this framework are commendable and will contribute to a more robust Plan with strong ecological outcomes. Developing indicators for these values is more complex than the more general indicators, such as linear density and direct surface disturbance, but means that the Commission recognizes that impacts can extend beyond physical land-use changes, and can be biological, chemical, or social in nature. The Plan also clearly outlines the links between VECs, plan objectives, and indicators (Figure 4.3 in the Recommended Plan; Figure 2 below). This simple yet effective explanation will help Plan-users and decision-making bodies to implement the cumulative effects framework going forward.

In summary, the cumulative effects framework laid out in the Recommended Dawson Regional Land Use Plan represents the most robust framework for assessing cumulative effects in the Yukon to date. This framework builds on many existing or proposed frameworks and is conscious in suggesting numerous VECs that represent various interests. The framework explicitly links the various components (e.g., VECs and indicators) demonstrating how they are conceptually and tangibly connected. Finally, the framework indicates how it is intended to be used by various parties and decision bodies: *“When determining whether a project is in conformity with the Plan, a recommendation or decision body should apply the cumulative effects framework in conjunction with the LMU management intent, special management directions, and general management directions”*. There is still room for improvement within the cumulative effects framework of the Recommended Dawson Regional Land Use Plan. We see suggest that the standards laid out within this plan are considered the minimum standard for future cumulative effects frameworks.

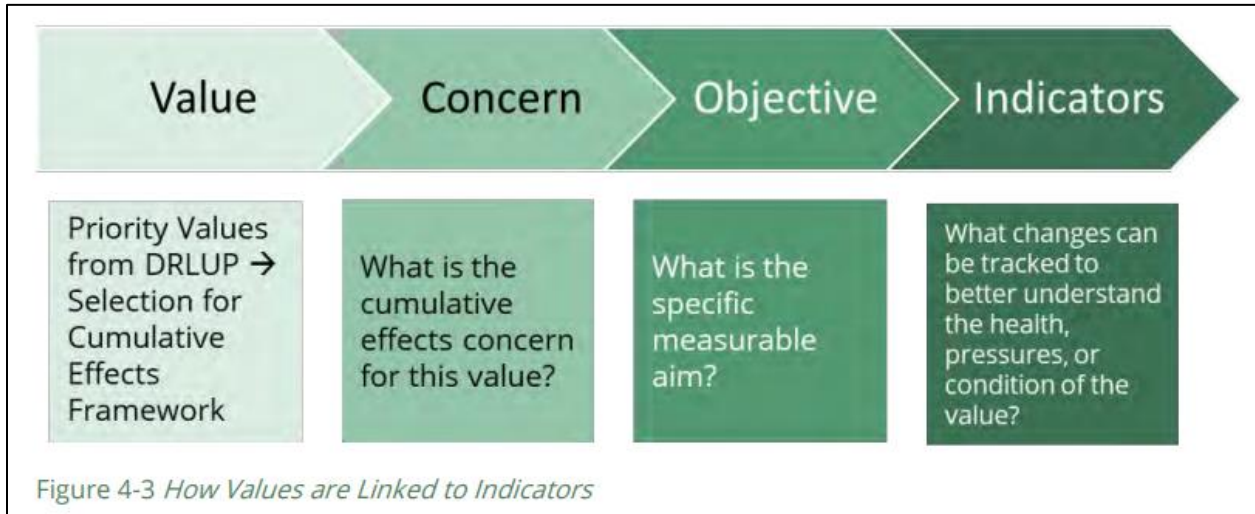


Figure 2. From the Recommended Dawson Regional Land Use Plan, the relationship between Values (Valued Ecosystem Components; VECs), concerns, Plan Objectives, and Indicators.

References

- Dawson Regional Planning Commission. (2021). Draft Regional Plan 2021. <https://dawson.planyukon.ca/index.php/publications/draft/2011-draft-regional-plan/file>
- Impact Assessment Agency of Canada. (2019). Reference Guide: Cumulative Environmental Effects. <https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/reference-guide-addressing-cumulative-environmental-effects.html>
- IPCC, 2021. Climate Change 2021 The Physical Science Basis Summary for Policymakers, in: Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S.L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M.I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J.B.R., Maycock, T.K., Waterfield, T., Yelekçi, O., Yu, R., Zhou, B. (Eds.).
- Jones, F. C. (2016). Cumulative effects assessment: theoretical underpinnings and big problems. *Environmental Reviews*, 24(2), 187–204. <https://doi.org/10.1139/er-2015-0073>
- North Yukon Planning Commission. (2009). North Yukon Regional Land-use Plan. <https://yukon.ca/sites/yukon.ca/files/emr/emr-north-yukon-regional-land-use-plan.pdf>
- NWT Cumulative Impact Monitoring Program (NWT CIMP). (2021). Retrieved August 16, 2022, from https://www.enr.gov.nt.ca/sites/enr/files/resources/2021-25_nwt_cimp_action_plan_final_dec2021.pdf
- Rantanen, M., Karpechko, A.Y., Lipponen, A. et al. The Arctic has warmed nearly four times faster than the globe since 1979. *Commun Earth Environ* 3, 168 (2022). <https://doi.org/10.1038/s43247-022-00498-3>
- SNAP-EWHALE, 2012. Predicting future potential climate-biomes for the Yukon, Northwest Territories and Alaska. Scenarios Network for Arctic Planning, and Ecological Wildlife Habitat Data Analysis for the Land and Seascape Laboratory, University of Alaska Fairbanks, Fairbanks. <http://www.snap.uaf.edu/attachments/Cliomes-FINAL.pdf>
- Streicker J. 2016. Yukon Climate Change Indicators and Key Findings 2015. Northern Climate Exchange, Yukon Research Centre, Yukon College, Whitehorse, Yukon.
- YESAB (2021). Information Bulletin: The Significance Of Cumulative Effects As A Matter To Be Considered In YESAB. Retrieved August 17, 2022, from <https://www.yesab.ca/wp-content/uploads/2021/07/YESAB-Cumulative-Effects-Information-Bulletin-6-10-2021-1.pdf>