Derivation of a Consolidated Human Disturbance Dataset for British Columbia from Publicly Accessible Data

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Objective

To create a consolidated human disturbance footprint dataset of British Columbia (BC) for spatial assessment in GIS (Geographic Information Systems). This dataset can be used for a variety of Cumulative Effects Framework (CEF) values assessments or similar natural resource sector programs. This dataset must be created from publicly accessible data and have reproducible methodology.

Disclaimer

The CEF Human Disturbance dataset was generated by Province of British Columbia GIS staff from publicly-accessible data, which have varying levels of quality, accuracy and completeness. Users are encouraged to view the BC Data Catalogue metadata records of the data inputs to the CEF Human Disturbance, for information on accuracy, completeness and data licencing (https://catalogue.data.gov.bc.ca/). The CEF Human Disturbance dataset has an accompanying Excel spreadsheet listing all data input sources, and their respective BC Data Catalogue record hyperlinks. It is also recommended to read the BC Data Catalogue disclaimer (https://www2.gov.bc.ca/gov/content/home/disclaimer), and explore the different terms of use for the Province of British Columbia's various data licences (https://bcgov.github.io/data-publication/pages/dps_licences.html).

Data Accuracy

This data is meant for coarse-filter GIS analysis, at the scale of the entire province of BC, for reporting by large assessment units (such as BC's landscape units). This data is not sufficiently accurate for site-specific analysis (such as a proposed industrial development). This data is merely a starting point for conversations about human activity and has many identified gaps when compared to satellite imagery of current land use.

Use of hierarchical order

To avoid double accounting of areas on the land base where there may be overlapping disturbance, data from a variety of layers were combined, in hierarchical order, such that more current and permanent disturbance would overwrite data spatially beneath it. Non-disturbed natural areas from the Baseline Thematic Mapping (1995) data were also included in order to provide 100% area coverage. Disturbance was classified as current (within 20 years of generation year) or historical (more than 20 years before generation year).

The table below outlines the hierarchy of the various data inputs. The hierarchy is applied such that the layers at the top of the list are the highest ranking and overwrite any overlapping layers below them, where 1 is the highest ranking level. The ranking applies within each group and between groups. For example, within the Mining_and_Extraction

Group, 1-1 is higher ranking than 1-2 (and so on). Group 1 is higher ranking than Group 2 Rail_and_Infrastructure, and so on.

Please advance to the next page for the data inputs hierarchy table.

Group - SubGroup Rank	Disturbance Group	Disturbance Sub Group	Description	Human Disturbance Class
1-1	Mining_and_Extraction	Baseline Thematic Mapping	BTM - Mining - mineral extraction or quarry	Current
1-2	Mining_and_Extraction	VRI Mining	VRI - Gravel pits, mines, rubbly mine spoils, mine tailings (>= 20% cover).	Current
2-1	Rail_and_Infrastructure	Railway BC	GeoBase - Rail lines buffered by 7.5m	Current
2-2	Rail_and_Infrastructure	Railway NEBC	GeoBase - Rail lines buffered by 17.5m	Current
2-3	Rail_and_Infrastructure	VRI Airports	VRI - Airport or associated areas (buildings, parking) (>= 20% cover)	Current
3-1	OGC_Infrastructure	Surface Land Use - OGC	OGC - Oil and Gas pipelines, well facilities, and ancillary features	Current
4-1	Power	Dams	Water - Linear dams, buffered by 25m	Current
4-2	Power	Transmission	GeoBase - Transmission lines, buffered to 12.5 m	Current
5-1	ROW	Surveyed ROW	Tantalis - Surveyed rights-of-way - including private and some crown	Current
5-2	ROW	Crown ROW	Tantalis - Surveyed rights-of-way - crown	Current
6-1	Urban	Baseline Thematic Mapping	BTM - Urban and Residential Agriculture Mixtures	Current
6-2	Urban	VRI Builtup	VRI - Urban and built-up areas (>= 20% cover)	Current
7-1	Recreation	BTM - Recreation	BTM - Recreation activities e.g. ski resort, golf course	Current
8-1	OGC_Geophysical	Surface Land Use - Geophysical	OGC Geophysical represents seismic survey activity in NE BC from the Oil & Gas industry. The disturbance from this survey type are cutlines in the vegetation cover. Airborne surveys were not considered a disturbance. It is anticipated such surveys will decline in	Current

Group - SubGroup Rank	Disturbance Group	Disturbance Sub Group	Description	Human Disturbance Class
			the future with less invasive methods.	
9-1	Cutblocks	Current - FAIB	FAIB - Forest harvesting cutblocks within 20 years. Excludes select in-block reserves	Current
9-2	Cutblocks	Historic - FAIB	FAIB - Forest harvesting cutblocks from longer than 20 years ago). Excludes select in-cutblock reserves.	Historic (>20 yrs)
9-3	Cutblocks	Historic - BTM	BTM - Historically logged or selectively logged areas. Does not consider in-cutblock reserves.	Historic (>20 yrs)
10-1	Agriculture_and_Clearing	Baseline Thematic Mapping	BTM - Agricultural areas	Current
10-2	Agriculture_and_Clearing	VRI Clearing	VRI - Clearings and agricultural areas - clearings are undifferentiated as to type (type may vary)	Current
11-1	Cutblock_Reserves	RESULTS Reserves	Select harvest reserves and natural feature from RESULTS. These may have varying age but are considered as undisturbed & part of the natural landbase. This is a custom generated dataset with a specific selection criteria.	Natural Landbase
12-1	BTM Natural Landbase - Range Lands	BTM - Range Lands	Unimproved pasture and grasslands, sparse forest	Natural Landbase
12-1	BTM Natural Landbase - Forest Land	BTM - Forest Land	Forested areas or old burns	Natural Landbase
12-1	BTM Natural Landbase - Shrubs	BTM - Shrubs	Naturally occurring shrub cover with at least 50% coverage	Natural Landbase
12-1	BTM Natural Landbase - Wetlands Estuaries	BTM - Wetlands Estuaries	Swamps, marshes, bogs or fens; saltwater mud flats and inter tidal areas	Natural Landbase
12-1	BTM Natural Landbase - Fresh Water	BTM - Fresh Water	Rivers, Lakes	Natural Landbase

Group - SubGroup Rank	Disturbance Group	Disturbance Sub Group	Description	Human Disturbance Class
12-1	BTM Natural Landbase - Salt Water	BTM - Salt Water	Salt water, ocean	Natural Landbase
12-1	BTM Natural Landbase - Alpine SubAlpine Barren	BTM - Alpine SubAlpine Barren	Alpine or sub alpine areas virtually devoid of trees; rock barrens, badlands, sand and gravel flats, dunes, and beaches where un-vegetated surfaces predominate	Natural Landbase
12-1	BTM Natural Landbase - Glaciers and Snow	BTM - Glaciers and Snow	Glaciers and relatively permanent snow	Natural Landbase

For further description of each layer's source and selection criteria, please see the associated spreadsheet, 'GISInputList' Tab.

Methodology Discussion

1. *BC Crown Land Tenure Data versus Disturbance Footprints* - Tenure data reflects an area *licensed* for a particular activity, but often not the footprint of area *impacted* by that licensed activity. For example, mineral tenures may encompass a much larger area than where mining extraction activity occurs, and data capturing mine footprints within tenured areas of BC is not complete. Due to the lack of a of province-wide dataset capturing all disturbance footprints, the BC CEF Human Disturbance dataset in certain cases uses data inputs representing licensing (For example: Surveyed rights-of-way). The use of data inputs representing licensing can result in an overestimation, or underestimation, of the actual impact of a particular activity. BC Crown Land tenure polygons were purposely excluded from the BC CEF Human Disturbance with the BTM dataset, as they represent only a general tenure area where activity may be permitted, but where the disturbance footprint is within that tenure is unknown. The exclusion of Crown land tenure polygons includes recreation tenures (heli-skiing, eco-lodges, etc.), mineral exploration tenures and agricultural land reserves. Please refer to the GIS input list table for a list of the publicly-available tenure data that was considered, but was not included in the disturbance data (in grey font, at the bottom of the list, coded with IDs of '99').

2. *Road Centrelines vs. Road Clearing Polygons* – The BC CEF Human Disturbance dataset does not include clearings from roads. BC does not collect province-wide data on all road development clearings. BC does collect road centrelines, but for specific purposes, such as ambulance routing, or forest road tenuring. BC's road

centreline data was conflated into a stand-alone dataset called the BC CEF Integrated Roads dataset. This stand-alone road dataset allows roads to be treated uniquely, depending on the BC CEF value being assessed. For example, the road centreline data can be used to create custom road clearing polygon buffers that are suited to a specific value and the nature of impacts to a value of concern. While the inclusion of road buffers (polygons generated to represent road clearing area) in BC CEF Human Disturbance dataset was considered, considerable processing time would be required, with the possibly of potential data processing issues. Due to the unpredictable scope of these impacts, a separate, stand-alone road buffer dataset was created, but is not added to the BC CEF Human Disturbance with BTM dataset. The BC CEF Integrated Roads dataset is available from the BC Data Catalogue.

3. *Baseline Thematic Mapping (BTM)* – Although BTM data layer has been revised in specific portions of British Columbia, full and consistent coverage of the entire province was only available in BTM version 1 (circa 1995), which provided the basis for the natural/non-disturbed areas, and some historical disturbance.

4. *Oil & Gas Seismic Lines* – Seismic lines, which are quite extensive in the Northeast Natural Resource Region of British Columbia. However, in many cases, seismic lines may be less permanent on the landscape than the data represents. A fuller understanding of the permanence and vintage of seismic lines in Northeast B.C. will help advise whether they should be included in future versions of this dataset. The use of digging trenches to put down seismic line equipment is in decline, in favour of less invasive means of measuring subsurface materials. It remains to be seen when seismic lines will no longer contribute to surface disturbance (removal of bushes, trees, etc.).

5. *Natural Disturbances*
   The BC CEF Human Disturbance with BTM dataset does not include natural disturbances, such as from wildfires and pests. However, certain BC CEF protocols, such as Forest Biodiversity, may incorporate such natural disturbances into their assessments. For more information on natural disturbance data for BC's forests, please view the Forest Analysis and Inventory Branch (FAIB) of BC's Data Management and Access webpage:
   https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resource/forest-inventory/data-management-and-access