LAND & ECOSYSTEM MAPPING

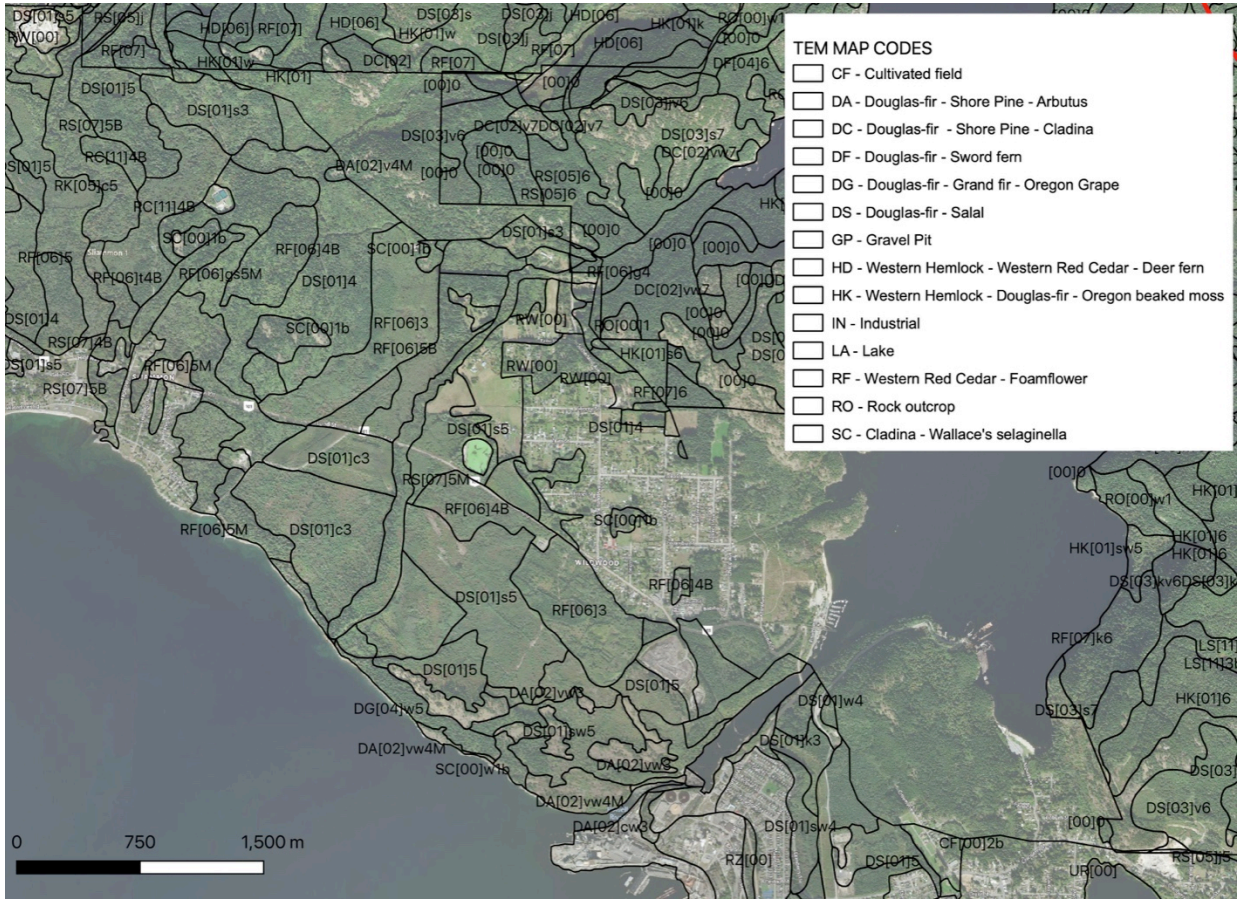
- Terrestrial Ecosystem Mapping
- Sensitive Ecosystems Inventory
- CDC Element Occurrence Mapping (ecological communities at Risk)
- Vegetation Resource Inventory
- Land Cover
- LIDAR derived Digital Elevation Models
- LIDAR derived Digital Surface Models

Description: To produce a Terrestrial Ecosystem Map (TEM) a mapper will look at the vegetation and landform within a satellite image. They will draw a polygon around vegetation that is similar in nature and assign codes to describe the ecosystem, soil and terrain. The mapper will then visit a percentage of the polygons to determine if their classification was correct and to collect additional information about the nature of the habitat type. Each polygon may have more than one ecosystem defined within it due to the presence of small pocket ecosystems e.g. wetlands with a forest.

Uses: The TEM collects very detailed information which means that it can have a number of applications, for example, Sensitive Ecosystem Inventory classifications can be extracted, age/structural information for a forest can be captured, the Conservation Data Centre can identify the location of ecological communities at risk.

Limitations: TEM can be difficult for someone who is not familiar with the methodology and codes to access all the information stored in this mapping approach.

Example Classification: CDFmm/01 - Douglas-fir / dull Oregon-grape, *Pseudotsuga menziesii* - Gaultheria shallon



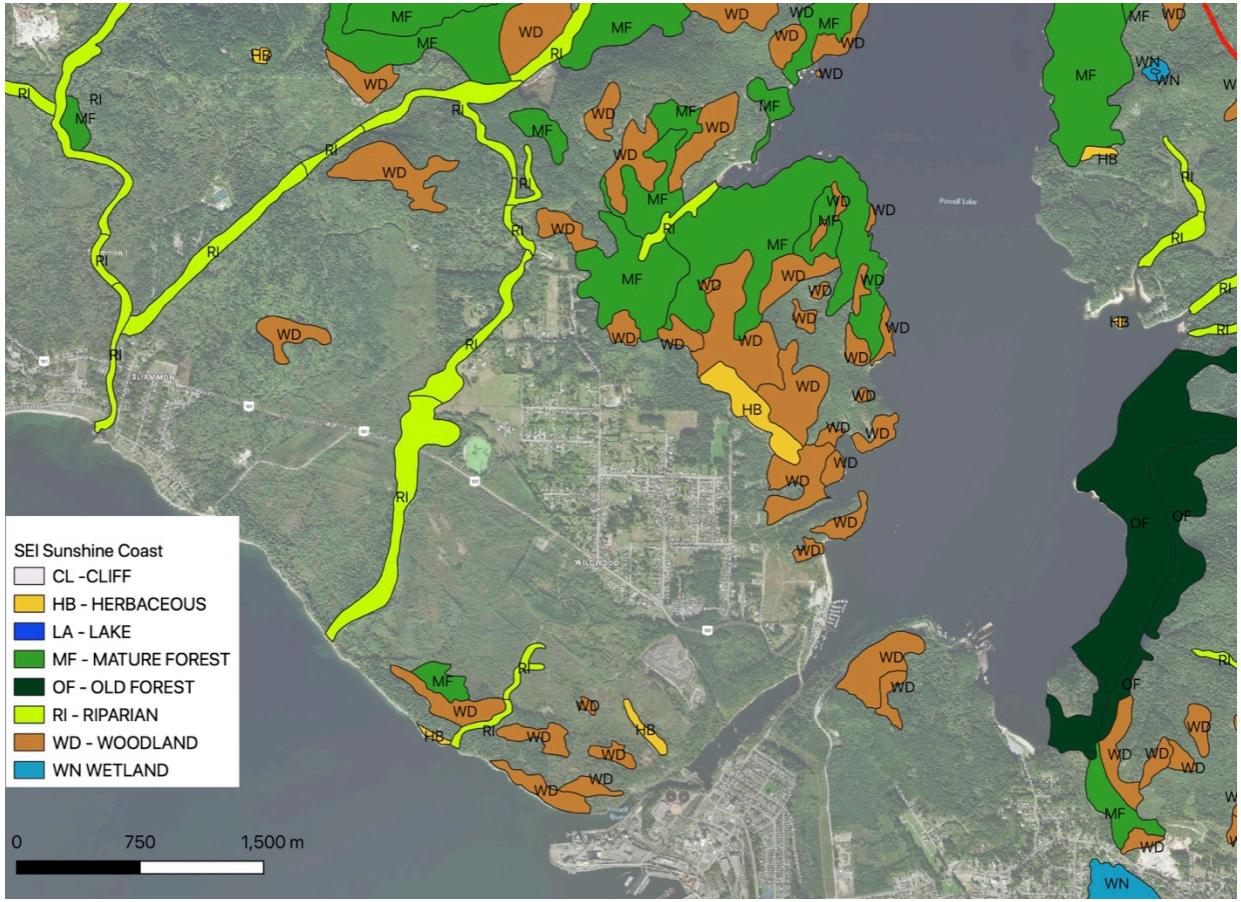
Terrestrial Ecosystem Mapping (1:20,000)

Description: The purpose of the Sensitive Ecosystem Inventory (SEI) is to identify remnants of rare and fragile terrestrial ecosystems and to encourage land-use decisions that will ensure the integrity of these ecosystems (RISC, 2006). To produce an SEI map a mapper will review satellite imagery and then visit a percentage of the sites on the ground to verify their classification. The location of sensitive ecosystems can also be derived from Terrestrial Ecosystem Mapping. The ecosystem types identified vary from region to region according to the natural ecosystems found there.

Uses: Decision makers use this information when they want to determine the location of rare and fragile terrestrial ecosystems and protect it through policy (e.g. Official Community Plans) and during their operations (e.g. forestry). This system of classification is used a lot because people are familiar with it and find it easy to interpret.

Limitations: The SEI bcomes out of date as forests mature in the interim between SEI surveys (which is sometimes decades). The SEI does not consider the role that ecosystems play even though they are not classified as rare/fragile habitats, e.g. habitat connectivity, carbon storage and this means that those ecosystems can be undervalued by decision makers. For the study area, most SEI mapping does not extend beyond the CDF and CWHxm BEC subzones.

Example Classification: Old Forest (>250yrs), Mature Forest (>80 yrs), Woodland, Herbaceous, Riparian, Wetland etc.



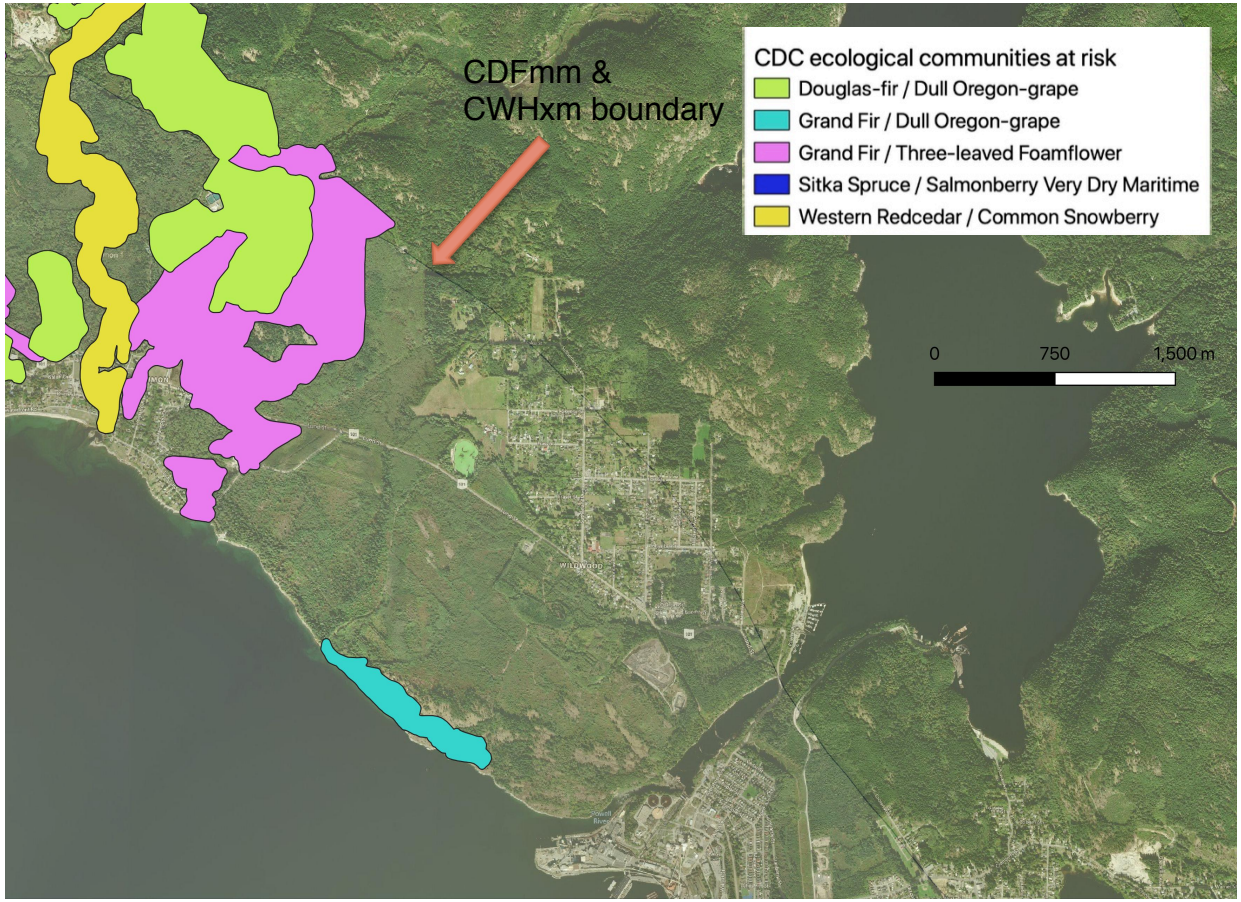
Sensitive Ecosystem Inventory (1:20,000 scale)

Description: Element occurrences are mapping units used by the Conservation Data Centre when mapping ecological communities at risk. An ecological community element, may represent a stand or patch or a cluster of patches.

Uses: Decision makers can access maps through the BC Species and Ecosystems Explorer and CDC iMap to prevent the loss or degradation of ecological communities at risk during planning.

Limitations: Element Occurrence mapping does not represent all the areas in which ecological communities at risk occur or are likely to occur. The mapping is highly skewed toward areas which have undergone terrestrial mapping and/or have been more intensively surveyed (typically public lands in easily accessible areas). In addition, small patches of ecological communities may not be represented as they do not meet the CDC's criteria (e.g. too small, isolated etc.)In the study area, few ecological communities at risk have have been mapped outside the CDF BEC subzone.

https://a100.gov.bc.ca/pub/eswp/



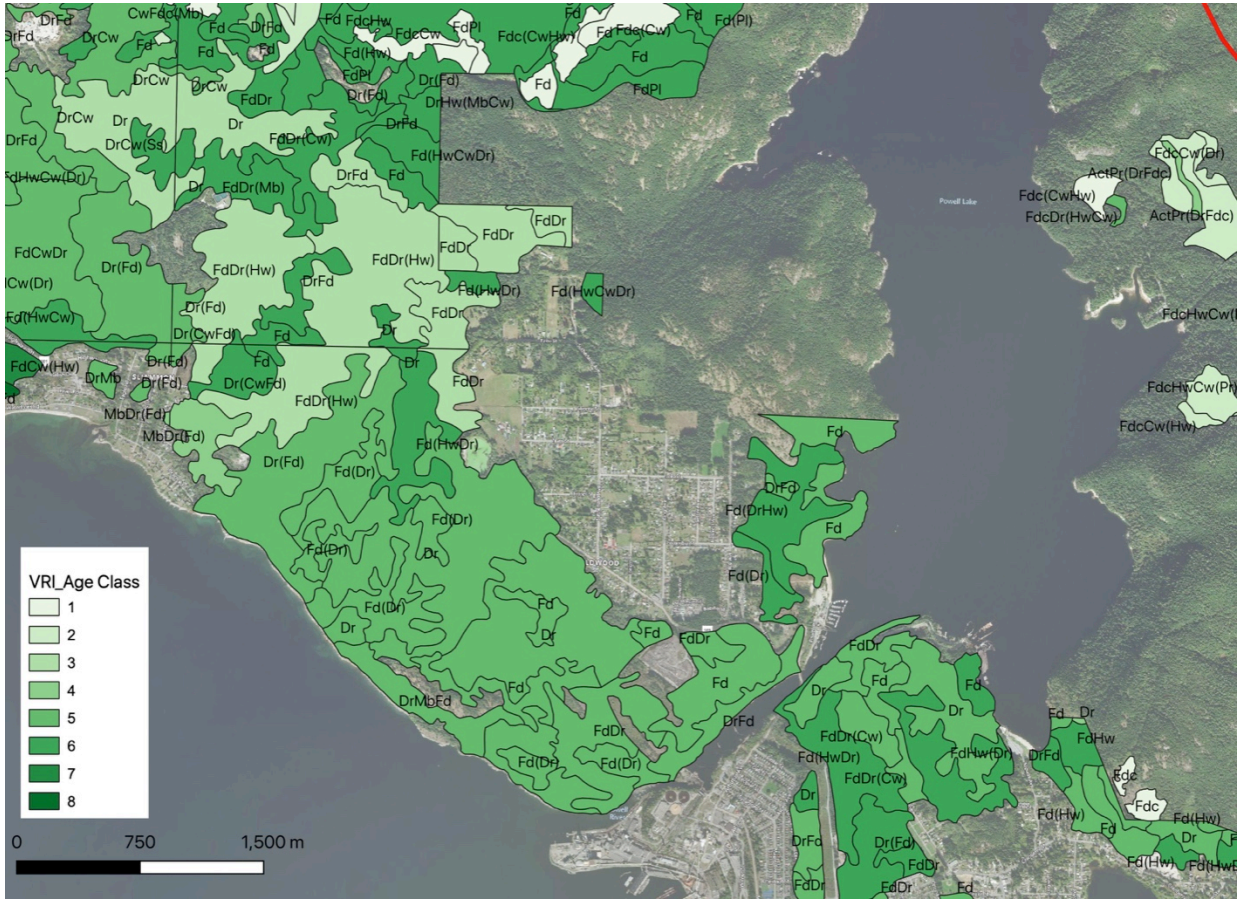
CDC Element Occurrences: Ecological Communities at Risk (1:20,000 scale)

Description: The Vegetation Resource Inventory is intended to cover the whole province irrespective of ownership. Photo/ Satellite Imagery is used to estimate the vegetation characteristics in an area (polygon). Ground sampling is then undertaken. The polygons are described by the BC Land Cover Classification Scheme (refer to definition). The polygons are assigned a description which included information on site location, ecological information, species composition, age of leading species, height of leading species.

Uses: Main use is by the forestry sector to monitor timber supply. Often used for ecosystem mapping and modelling where information on structural stage and stand composition are needed.

Limitations: the product can be old and therefore inaccurate due to land use change.

Example classifications: Broadleaf Forest, Coniferous Forest, Parkland, Shrubs, Wetland, Burnt Area, Gravel Pit etc.



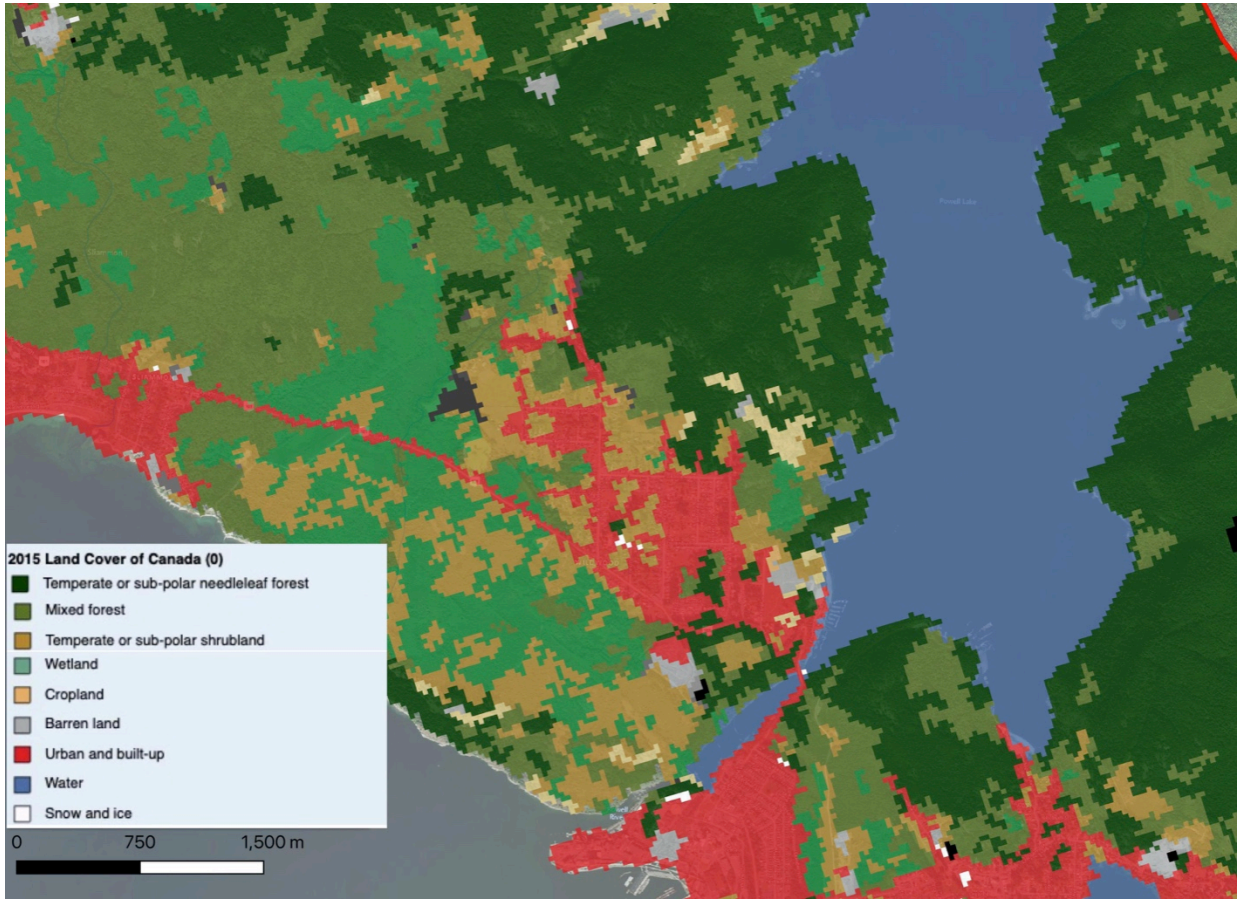
Vegetation Resource Inventory (1:20,000 scale)

Description: Land cover mapping is typically derived from remote sensing. Pixel sizes are often 20-30m pixels, because this is the satellite imagery that is now available for free. Land cover classes describe the physical surface of the ground and include the make-up of vegetation, urban infrastructure, water, and bare soil.

Uses: Tracking environmental change, climate change impacts and cumulative effects of human activities; planning, monitoring, and evaluation of development, industrial activity, or reclamation.

Limitations: Land cover classifications vary widely between projects. Variable standards and accuracy. Limited ability to accurately determine vegetation species composition. Accuracy may require ground verification and/or human interpretation.

Source: https://open.canada.ca/data/en/dataset/4e615eae-b90c-420b-adee-2ca35896caf6



NALCMS Land Cover Mapping (30m pixels)

Description: The NALCMS Land Cover change map shows land cover class transitions from 2010 to 2015/ Changes have been assessed from Land Cover maps at 30 meters resolution derived from Landsat Imagery over Canada and United States in 2010 and 2015, andLandsat and RapidEye Imagery over Mexico in 2010 and 2015 respectively.

Uses: Can be used to track change over time, and to cost-effectively other mapping layers (by 'burning in' changed areas to different mapping layers).

Limitations: Accuracy and sensitivity to change depends on scale, methods and classifications used to derive original land cover map. Yet to be deterimined if this method is more accurate and/or cost effective than using humans to interpret imagery to detect cover change

North America Land Cover Map 2015
http://www.cec.org/north-american-environmental-atlas/land-cover-30m-2015-landsat-and-rapideye

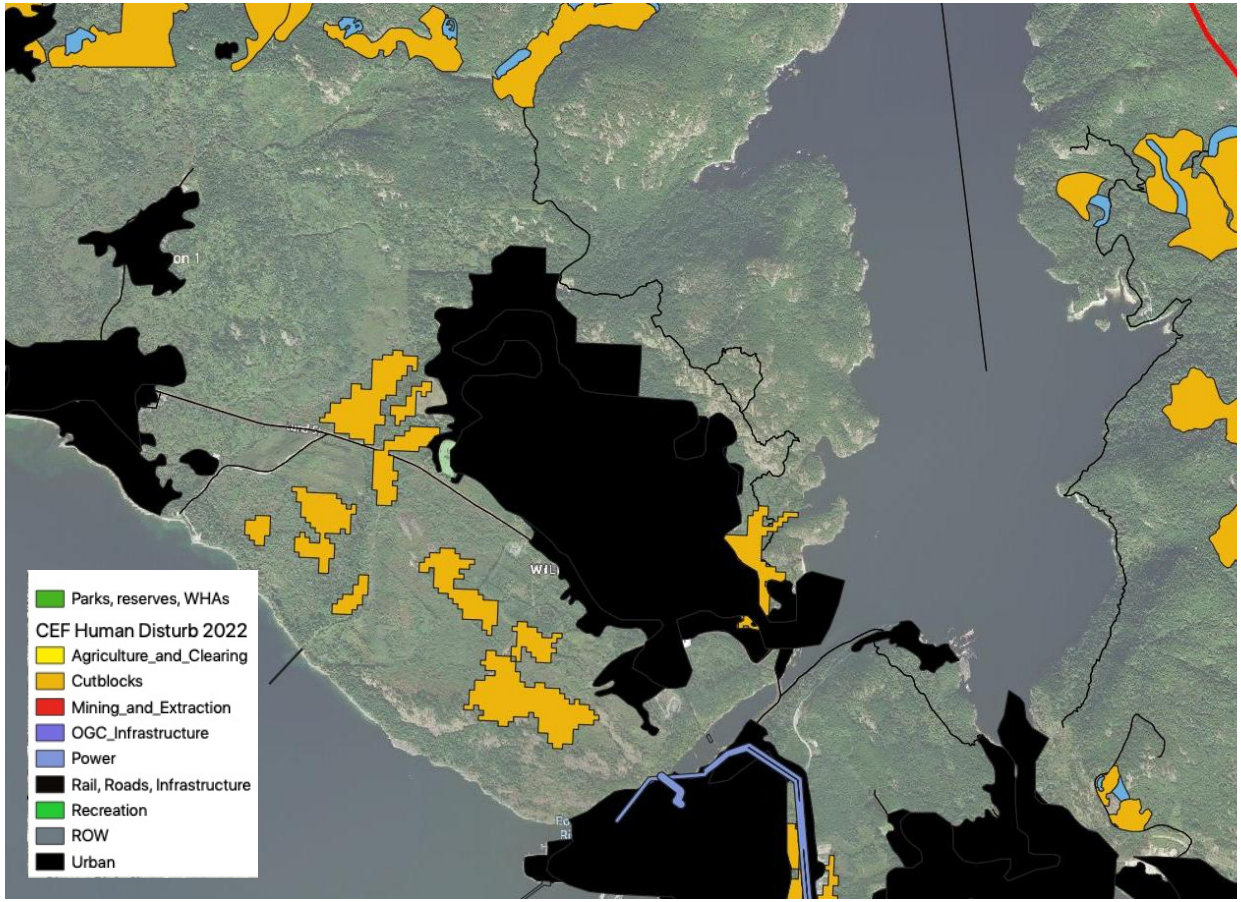
NALCMS Land Cover Change Mapping 2010 to 2015 (30m pixels)

Description: Combined data extracted from various provincial spatial layers to show recent disturbance including urban, recreational, agricultural, mining and extraction, forest harvesting, oil and gas activities. Disturbance was classified as current (within 20 years of 2021) or historical (pre-2001).

Uses: strategic level cumulative effects analysis; identifying landscape level disturbance

Limitations: only meant for coarse GIS analysis, summarized by large areas such as BC's landscape units. Dataset has varying levels of quality, accuracy and completeness, and should not be used for site-specific analysis.

https://catalogue.data.gov.bc.ca/dataset/ce-disturbance-2021



Cumulative Effects Framework: Human Disturbance Mapping

Description: Lidar digital surface models (DSMs) encompass more points than just the bare earth. Other surface feature such as vegetation, buildings and manmade structures are included.

Uses: DSMs can be used to determine forest canopy height and vegetation structure. At finer resolutions they can distinguish individual trees

Limitations: On their own, DSMs have limited ability to determine vegetation species composition

https://search.open.canada.ca/openmap/957782bf-847c-4644-a757-e383c0057995

LIDAR-derived High Resolution Digital Surface Model

Description: Digital elevation models (DEMs) are one of many products that can be derived from lidar data, though they can also be derived from other sources. DEMs are digital representations of the earth's topographic surface. They're a "bare-earth" product because they do not include surface features like buildings and vegetation.

A high-resolution DEM can be derived from lidar point-cloud data by stripping away the surface features and sampling the ground elevation in uniform increments to produce a bare earth model.

Uses: DEMs are used to make high resolution topographic models. They are useful in helping identify small watercourses (especially those under forest), wetlands, floodplains and watershed boundaries.

Limitations: Not as effective for identifying watercourses in flat areas with limited topography; in these cases (e.g. Fraser Valley) water courses can be difficult to distinguish from ditches and roads.

https://search.open.canada.ca/openmap/957782bf-847c-4644-a757-e383c0057995

LIDAR-derived High Resolution Digital Elevation Model

SPECIES MAPPING

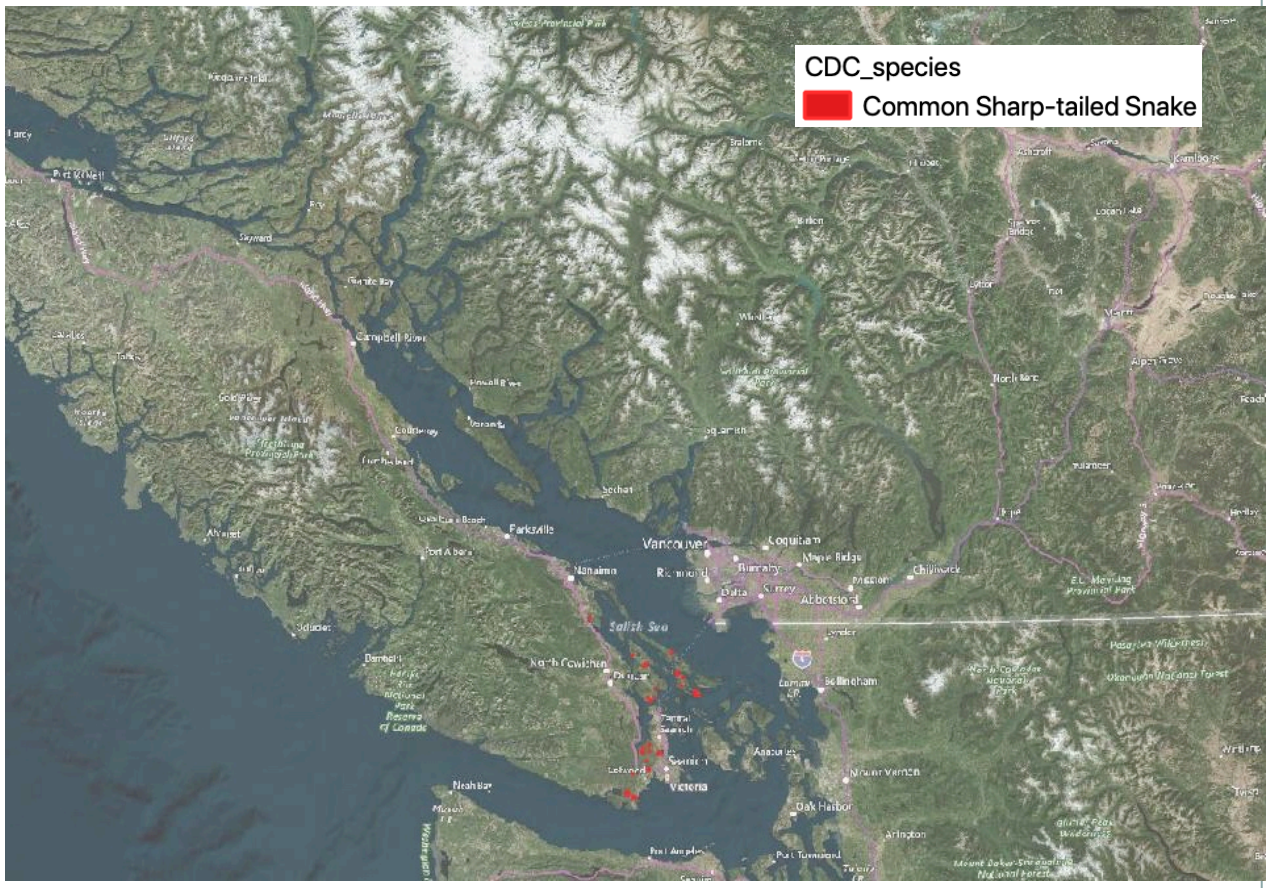
- CDC Element Occurrence Mapping (ecological communities at Risk)
- CDC Species Range Mapping
- Species Distribution Models (no example shown)
- Crowd Sourced Observations (e.g. iNaturalist; no example shown)

Description: Element occurrences are mapping units used by the Conservation Data Centre to indicate the verified (by CDC staff) presence of species communities at risk. A species element occurrence often corresponds to a local population, while an ecological community element, may represent a stand or patch or a cluster of patches.

Uses: Decision makers can access maps through the BC Species and Ecosystems Explorer and CDC iMap to prevent the loss or degradation of species and ecological communities at risk during planning.

Limitations: Element Occurrence mapping does not represent all the areas in which species at risk occur or are likely to occur. The mapping is highly skewed toward areas that have been more intensively surveyed (typically public lands in easily accessible areas).

https://a100.gov.bc.ca/pub/eswp/



CDC Element Occurrences: Species at Risk (Sharp-tailed Snake)

Description: Species range maps created using BC CDC methods The ranges are based on Ecosections which are defined according to their physical, oceanographic, and biological characteristics; Ecosections tend to affect species distribution within a bio-geographic region. Input data (observations) were obtained from the following data sources:

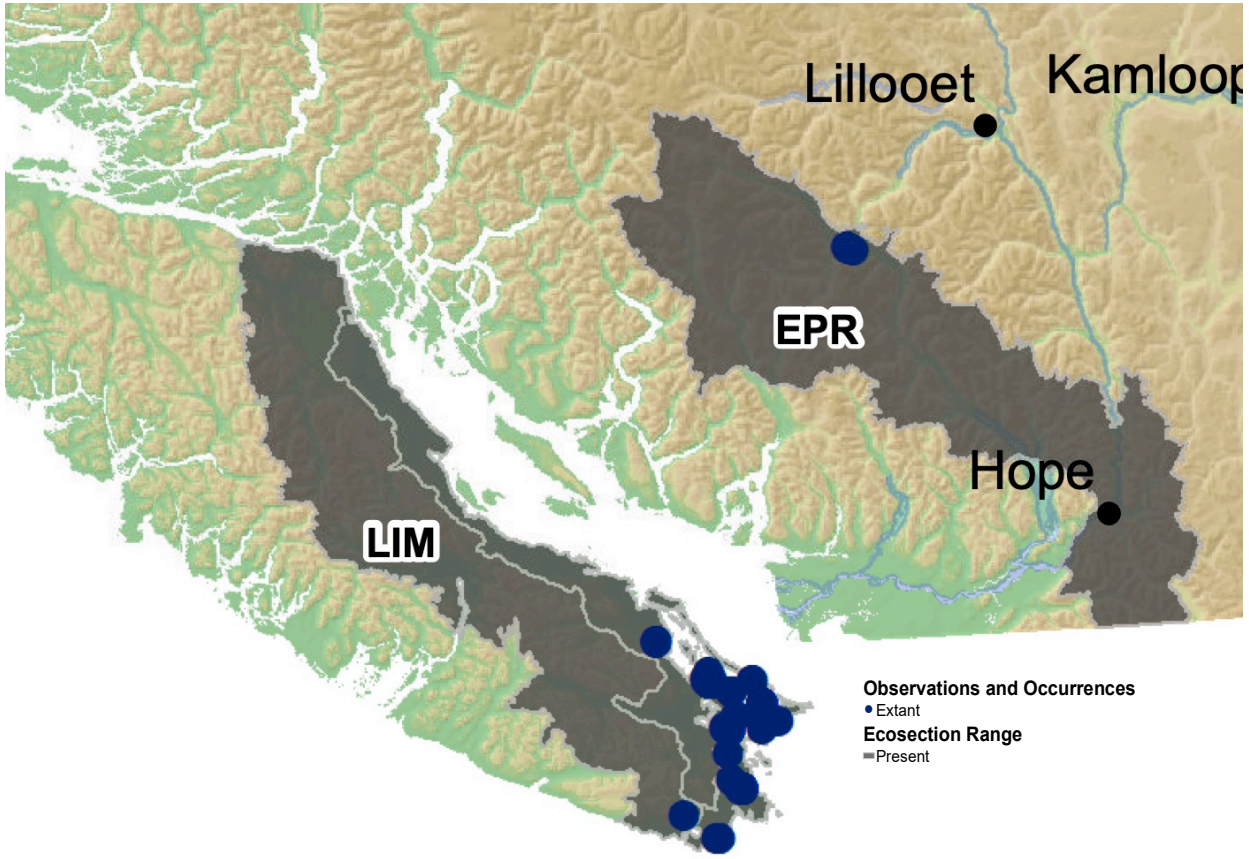
- BC Conservation Data Centre – Element Occurrences
- Wildlife Species Inventory, Survey and Incidental Observations
- Global Biodiversity Information Facility (GBIF)
- iNaturalist
- Museum of Vertebrate Zoology,
- University of California, Berkeley (MVZ)
- Department of Fisheries and Oceans
- Contributions from subject matter experts

Observations were overlaid on Ecosection polygons; any polygons that contained observations were flagged as“Present”. A group of species experts reviewed the resultant maps and identified incorrect data . Ecosection polygons that may contain the species were marked as “Presence”

Uses: Shows where a species at riak can potentially occur, when the right habitat is present.

Limitations: Doesn’t distinguish actual habitat features used by the species

https://bcreptilesandamphibians.trubox.ca/range-maps/



CDC Species Range Maps (Sharp-tailed Snake)