Skeena Salmon

CU Habitat Report Card Summaries – Chinook, coho, pink, chum, and river sockeye

Version 1.0, January 2014

These CU habitat report cards are intended to allow assessment and comparison of CU habitat 'status' based on a combination of (1) intrinsic vulnerability of CU freshwater habitats, and (2) intensity and extent of human pressures/stressors on those habitats. A full description of indicators and data sources used for Skeena salmon CUs can be found in the main report (*Skeena salmon Conservation Units habitat report cards: Chinook, coho, pink, chum, and river sockeye.* Porter et al. 2014) available from PSF at: www.skeenasalmonprogram.ca.

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1. Introduction and Definitions. Brief description of the CU reporting exercise undertaken to assess salmon CU habitats and definitions for key terms that are used throughout the reporting.

2. Narrative. Short bulleted descriptions of key issues affecting the CU. This includes the principal habitat pressures on CU habitats as determined from the broad-scale analyses undertaken here, as well as more localized habitat impacts affecting the CU as identified by Skeena regional experts. Data source: Skeena TAC [2013].

3. Location. Map showing (i) the location of the CU boundary currently designated by DFO, (ii) spawning[1] and rearing/migration[2] zones of influence (ZOIs), as defined within this project for the Skeena drainage, and (iii) the location of the Skeena drainage within BC. DFO's delineated CU boundary is indicated by the dark black outline, the CU spawning ZOI is indicated by yellow shading, and the CU rearing/migration ZOI is indicated by grey shading (the spawning ZOI is nested within the rearing/migration ZOI such that yellow shaded areas of the map belong to both ZOIs). Note that egg incubation occurs in the same locations as spawning (although at a different time of year); therefore, habitat within the spawning ZOI is relevant to both spawning and incubation life stages although for brevity this is labeled simply as "spawning ZOI" throughout.

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CU overview of habitat vulnerabilities & pressures

4. Description of terms. Identification of the GIS-based habitat pressure indicators, habitat pressure 'Impact Categories', and habitat vulnerability indicators developed and used for analyses of salmon CU habitat status for rearing/migration, spawning, and incubation life stages.

5. Cumulative pressure—rearing/migration. Map of cumulative habitat pressure scores for watersheds located within the CU rearing/migration corridor zone of influence. Given the more diffuse nature of potential impacts affecting migrating salmon, the cumulative pressures scores are assigned to rearing/migration corridor watersheds based on the sum of the seven individual Impact Category scores for each watershed (rather than through a lower, moderate, higher risk categorical rule set across Impact Categories)[3]. Within each watershed, each Impact Category is scored as 0 (for a lower risk Impact Category), 1 (for a moderate risk Impact Category), or 2 (for a higher risk Impact Category). The cumulative pressure scores for the migration corridor watersheds can therefore range from 0 to 14 and are colour-gradated accordingly. Darker shaded watersheds represent areas within the rearing/migration corridor where relatively higher risk habitat impacts may be occurring.

6. Summary of pressure indicators—spawning. Area-weighted average of all watershed pressure indicator scores for 1:20K FWA (Freshwater Atlas) assessment watersheds within or intersecting the CU spawning ZOI. The area-weighted average score is normalized for each indicator

[1] The spawning zone of influence (ZOI) for each CU is defined as the 1:20K FWA assessment watersheds within DFO-delineated CU boundaries that overlap or intersect with the species-identified spawning reaches.

[2] The rearing/migration ZOI for each CU is defined as all 1:20K FWA assessment watersheds within the Skeena subdrainages (as delineated within the province's major watershed GIS layer) in which CU-specific spawning has been identified, plus the subdrainages along the required route from the CU spawning areas downstream through the Lower Skeena subdrainage to the Skeena estuary. For these salmon species, it has not been possible to identify the multiple potential localized migration routes and specific rearing areas, or to differentiate migration vs. rearing life-stage-specific differences in habitat use; consequently the CU rearing/migration life stages have been merged into a single combined and broadly-defined ZOI for habitat risk analyses.

[3] Note that the scoring approach to risk classifications (green, amber, red) for each Impact Category is based on the same defined indicator roll-up rule set that is used for watersheds within spawning ZOIs.

so that the lower to moderate risk threshold (t_1) occurs at 0.33 (s_m) and the moderate to higher risk threshold (t_2) is at 0.66 (s_h) on a scale of 0 to 1[4]. The greyed areas within the figure represent the separation of the individual indicators into the seven Impact Category groupings.

7. Cumulative pressure—spawning. Map of cumulative risk from habitat pressures for each watershed found within the CU spawning ZOI. The cumulative risk rating is based on the risk scoring of seven habitat pressure indicator Impact Categories (hydrologic processes, vegetation quality, surface erosion, fish passage/habitat connectivity, water quantity, human development footprint, and water quality). Categorical roll-up rule set for watersheds in rearing & spawning zones of influence: if ≥ 3 impact categories are rated as higher risk, then the watershed's cumulative risk classification = red (higher risk), else if ≥ 5 Impact Categories are rated as lower risk then the watershed's cumulative risk classification = green (lower risk), else the watershed's cumulative risk classification = amber (moderate risk).

8. Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation. Figures representing bivariate indices of the relative rankings across salmon CUs for scored cumulative habitat pressures and scored vulnerability to these pressures within CU ZOIs for rearing/migration, spawning, and incubation. Methods used for selecting scored CU cumulative habitat pressures and vulnerabilities are different for each life stage evaluated (see Porter et al. 2014). The larger solid blue circle in each figure represents the ranking of the particular CU relative to the other Skeena CUs for that species, and identifies its ranked position relative to a coloured gradation representing both increasing cumulative habitat pressure and increasing vulnerability to those pressures.

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Rearing/Migration vulnerability & pressures

Rearing/Migration period pressure

9. Rearing/Migration period pressures. Large-scale map of the identified CU rearing/migration areas showing cumulative rearing/migration risk scoring for watersheds within the CU's rearing/migration ZOI and the location of the ZOI within the larger Skeena River Basin.

Rearing/Migration period vulnerability

10. Fish accessible habitat (km)[5]. The total length all 1:20K FWA-defined stream reaches occurring within the CU rearing/migration ZOI that are considered accessible to salmonids. This reflects the total amount of stream habitat that could 'potentially' be available to salmonids for spawning or rearing, with a greater accessible length indicating a lower CU vulnerability to habitat pressures. The figure indicates the accessible habitat length within the CU rearing/migration ZOI and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: BC MOE Fish Passage layer [Oct 2011].

11. Flow sensitive accessible habitat (km) (all seasons). The total length of streams within the CU rearing/migration ZOI that is considered prone to experiencing low water flows (in either summer, winter, or both seasons), with associated potential for altered water temperatures. Low flow conditions experienced over extended distances can impact fish health and can increase encounters with flow-related obstacles/delays to adult fish passage etc. The figure indicates the total stream length for the CU that is considered to be within zones of low flow sensitivity and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: BC MOE ecoregional flow sensitivity map [Feb 23, 2011].

12. Flow sensitive accessible habitat (%) (all seasons). The total proportion of the stream length within the CU rearing/migration ZOI that is considered prone to experiencing low water flows (in summer, winter, or both seasons), with associated potential for altered water temperatures. Low flow conditions over extended distances can impact fish health and create obstacles/delays to adult fish passage, etc. The figure indicates the total proportion of the CU migration route that is considered to be within zones of low flow sensitivity (all seasons) and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: BC MOE ecoregional flow sensitivity mapping [Feb 23, 2011].

13. Coho CUs ONLY: Lake area (km^2). The total area of lakes present within the CU rearing/migration ZOI. Lakes can provide rearing areas and overwintering refugia for juvenile coho, with a smaller area of lakes indicating a potentially greater CU vulnerability to habitat pressures. The figure indicates the total lake area within the CU rearing/migration ZOI and illustrates the degree of this vulnerability (blue dotted line)

[4] Where the average score $\bar{s} < t_1$, the normalized score $\bar{s}_n = \bar{s}(0.33/t_1)$; where $\bar{s} \geq t_1$, $\bar{s}_n = s_m + (s_h - s_m)[(\bar{s} - t_1)/(t_2 - t_1)]$.

[5] Note that the Fish Passage layer used for this analysis is based on a model developed by the province that defines stream accessibility to salmonids in general and is not specific to species-specific passage abilities/constraints. As such, we have adjusted the general model to improve resolution for our analyses, such that for pink, chum, and river sockeye accessibility was restricted only to streams that were ≥ 4th order (as defined with the 1:20K FWS stream hydrology network) (i.e. smaller streams were not considered accessible to chum, pink and river sockeye for rearing purposes).

relative to other coho CUs within the Skeena drainage. Data source: FWA Lakes [2008], Skeena TAC [Sept 2013].

14. Coho CUs ONLY: Wetland area (km^2). The total area of wetlands present within the CU rearing/migration ZOI. Wetlands can provide rearing areas and overwintering refugia for juvenile coho, with a smaller area of wetlands indicating a potentially greater CU vulnerability to habitat pressures. The figure indicates the total wetland area within the CU rearing/migration ZOI and illustrates the degree of this vulnerability (blue dotted line) relative to other coho CUs within the Skeena drainage. Data source: FWA Lakes [2008], Skeena TAC [Sept 2013].

Spawning & incubation vulnerability

Spawning period vulnerability

15. Spawning locations. Map of known spawning reaches within the CU's defined spawning ZOI. Data source: Skeena TAC [Sept 2013].

16. Total spawning length (km). The total length of all spawning reaches within the CU's defined spawning ZOI. This reflects the total amount of habitat known to be used for spawning by the CU, with a greater length of spawning habitat indicating a lower CU vulnerability to habitat pressures. The figure indicates the total spawning length within the CU spawning ZOI and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: Skeena TAC [Sept 2013].

17. Spawning reaches summer flow sensitive – spawn timing (km). The total length of spawning reaches for the CU that occurs within areas considered to be summer low flow sensitive (i.e. during the period of primary spawning activity). This reflects the total amount of the CU's spawning habitat that is considered summer low flow sensitive, with a greater length of summer low flow sensitive habitat indicating a higher CU vulnerability to habitat pressures. The figure indicates the total length of reaches used by the CU for spawning that are considered summer low flow sensitive and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: Skeena TAC [Sept 2013], BC MOE ecoregional flow sensitivity map [Feb 23, 2011].

18. Spawning reaches summer flow sensitive – spawn timing (%). The total proportion of spawning reaches for the CU that occurs within areas considered to be summer low flow sensitive (i.e. during the period of primary spawning activity). This reflects the proportion of the CU's spawning habitat that is considered summer low flow sensitive, with a greater proportion of summer low flow sensitive habitat indicating a higher CU vulnerability to habitat pressures. The figure indicates the total percentage of reaches used by the CU for spawning that are considered summer low flow sensitive and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: Skeena TAC [Sept 2013], BC MOE ecoregional flow sensitivity map [Feb 23, 2011].

Incubation period vulnerability

19. Spawning reaches winter flow sensitive – incubation timing (km). The total length of spawning reaches for the CU that occurs within areas considered to be winter low flow sensitive (i.e. during the primary period of egg incubation). This reflects the total amount of the CU's spawning habitat that is considered winter low flow sensitive, with a greater length of winter low flow sensitive habitat indicating a higher CU vulnerability to habitat pressures. The figure indicates the total length of reaches used by the CU for spawning that are considered to be winter low flow sensitive and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: Skeena TAC [Sept 2013], BC MOE ecoregional flow sensitivity map [Feb 23, 2011]

20. Spawning reaches winter flow sensitive – incubation timing (%). The total proportion of spawning reaches for the CU that occurs within areas considered to be winter low flow sensitive (i.e. during the primary period of egg incubation). This reflects the proportion of the CU's spawning habitat that is considered winter low flow sensitive, with a greater proportion of winter low flow sensitive habitat indicating a higher CU vulnerability to habitat pressures. The figure indicates the total percentage of reaches used by the CU for spawning that are considered to be winter low flow sensitive and illustrates the degree of this vulnerability (blue bar graph or blue dotted line, dependent on presentation format used for the species) relative to other CUs for the species within the Skeena drainage. Data source: Skeena TAC [Sept 2013], BC MOE ecoregional flow sensitivity map [Feb 23, 2011].

Spawning pressure

Hydrologic Processes

21. Forest disturbance. Percentage of disturbed forest (recently logged, selectively logged, and recently burned) in each watershed within the CU spawning ZOI. Forest disturbance can impact salmon habitat through general changes to flow patterns and annual water yields. Defined benchmarks of concern (lower, moderate, higher) for forest disturbance are based on the relative distribution of values across all Skeena watersheds. Data source: VRI [updated annually, downloaded Dec 2012], RESULTS [updated daily, downloaded Dec 2012], FTEN [updated daily, downloaded Dec 2012].

22. Equivalent Clear-cut Area (ECA). The percentage of each watershed in the CU spawning ZOI that is considered functionally/hydrologically equivalent to a clear-cut. ECA is a calculated term that reflects the potential cumulative impact on fish habitats of harvesting and second-growth forest regeneration effects on peak flow. Defined benchmarks of concern (lower, moderate, higher) for ECA are science- and expert-based (MOF 2001; Smith and Redding 2012). Data source: VRI [updated annually, downloaded Dec 2012], RESULTS [updated daily, downloaded Dec 2012], FTEN [updated daily, downloaded Dec 2012], LCC2000-V [2000].

Vegetation Quality

23. Insect and disease defoliation. Percentage of the forest stands in each watershed within the CU spawning ZOI that has been defoliated by recent insect invasion or disease. Defoliation can impact salmon habitats through changes to flows and groundwater supplies from altered precipitation interception and reduced transpiration. Defined benchmarks of concern (lower, moderate, higher) for insect and disease defoliation are based on the relative distribution of values across all Skeena watersheds. Data source: VRI [updated annually, downloaded Dec 2012].

24. Riparian disturbance. Percentage of the riparian zone (defined by a 30m buffer around all water bodies) in each watershed within the CU spawning ZOI that has been altered by land use activities. Disturbance to the riparian zone can alter stream shading, water temperature, organic matter inputs, and bank stability. Defined benchmarks of concern (lower, moderate, higher) for riparian disturbance are science- and expert-based (Stalberg et al. 2009, Tripp and Bird 2004). Data source: VRI [updated annually, downloaded Dec 2012].

Surface Erosion

25. Road development. The density of all roads in each watershed within the CU spawning ZOI. Extensive road development can interrupt overland flow and increase fine sediment generation, impacting downstream spawning and rearing habitats. Defined benchmarks of concern (lower, moderate, higher) for road density are science- and expert-based (MOF 1995a&b, Stalberg et al. 2009, Porter et al. 2013). Data source: DRA [updated monthly, downloaded Dec 2012], FTEN [updated daily, downloaded Dec 2012].

Water Quantity

26. Number of water licenses. The total number of permitted water licenses (all types) for points of diversion in each watershed within the CU spawning ZOI. Diverted water can potentially reduce flows in streams, thereby limiting fish access to or use of habitats and/or changing hydrological processes. The defined benchmark of concern (lower & higher) for water licenses is a binary measure based simply on presence/absence of the pressure in the watershed. Data source: BC Points of Diversion with Water License Information [updated daily, downloaded Dec 2012].

Fish Passage/Habitat Connectivity

27. Stream crossing density. Number of crossings per km of defined fish habitat in each watershed within the CU spawning ZOI. Obstructions at stream crossings can impact salmon habitat conditions and hinder migration of fish or block access to useable habitats. Defined benchmarks of concern (lower, moderate, higher) for stream crossing density are based on the relative distribution of values across all Skeena watersheds. Data source: BC MOE Fish Passage layer [Oct 2011], FWA Stream Network [2008], DRA [updated monthly, downloaded Dec 2012].

28. Culvert passability. Fish passage classifications (passable - green, barrier - red, unknown - grey) for stream crossings that have been surveyed using provincial PSCIS culvert assessment protocols within the CU spawning ZOI. Stream crossings on DRA-defined roads that have not yet been surveyed are indicated by white circles. Data source: BC MOE PSCIS layer [Oct 2011], Skeena TAC [Mar 2013].

Human Development Footprint

29. Total land cover alteration. Land alteration (agriculture, residential/agriculture mix, recently burned, recently logged, selectively logged, mining, recreation, and urban) as a percentage of watershed area for each watershed within the CU spawning ZOI. Land cover alteration reflects a suite of potential changes to hydrological processes and sediment generation, with potential downstream impacts on spawning and rearing habitats. Defined benchmarks of concern (lower, moderate, higher) for land cover alteration are based on the relative distribution of values across all Skeena watersheds. Data source: LCC2000-V [2000], VRI [updated annually, downloaded Dec 2012], DRA [updated monthly, downloaded Dec 2012], FTEN [updated daily, downloaded Dec 2012], RESULTS [updated daily, downloaded Dec 2012], NTS [1998], Crown Tenure [updated daily, downloaded Dec 2012], Current Fire Perimeters [updated daily, downloaded Dec 2012], Historical Fire Perimeters [updated monthly, downloaded Dec 2012], BTM [1992].

30. Impervious surfaces. Percentage of each watershed within the CU spawning ZOI that is considered impervious: a calculated term that reflects the area covered by hard man-made surfaces (e.g. asphalt, concrete, brick, etc.). Extensive impervious surfaces from urban/rural development in a watershed can impact rainwater infiltration and groundwater recharge, and lead to stream habitat degradation through changes in geomorphology and hydrology. Impervious surfaces are also associated with increased loading of nutrients and contaminants in developed areas. Defined benchmarks of concern for impervious surfaces (lower, moderate, higher) are science- and expert-based (Paul and Meyer 2000; Smith 2005). Note that impervious surface coefficients (ISC) for land surface types used for this exercise were not Skeena-drainage-specific but were instead generalized from those used in other jurisdictions. Data source: LCC2000-V [2000], VRI [updated annually, downloaded Dec 2012], DRA [updated monthly, downloaded Dec 2012], FTEN [updated daily, downloaded Dec 2012], NTS [1998].

31. Linear development. Density of all linear construction (e.g. roads, utility corridors, pipelines, right of ways, railways, etc.) in each watershed within the CU spawning ZOI. Linear development is a general indicator of potential human impacts on fish habitats. Defined benchmarks of concern (lower, moderate, higher) for linear development are based on the relative distribution of values across all Skeena watersheds. Data source: DRA [updated monthly, downloaded Dec 2012], FTEN [updated daily, downloaded Dec 2012], NTS [1998].

32. Mining development (total number of mines). Total number of mines in each watershed within the CU spawning ZOI. The general footprint of a mine and its associated processes of mining can change geomorphology and the hydrological processes of nearby water bodies. Mining can also generate deposition of fine sediments which can affect salmon survival and prey densities. The defined benchmark of concern (lower & higher) for mines is a binary measure based simply on presence/absence of the pressure in the watershed. Data source: BCGOV MEM & PR databases [updated regularly, accessed Dec 2012].

Water Quality

33. Mining development (acid generating mines). Total number of acid generating mines in each watershed within the CU spawning ZOI. Acid generating mines have increased risk for potential outflow of acidic water, heavy metals and other contaminants, with associated harm to fish habitats. The defined benchmark of concern (lower & higher) for acid generating mines is a binary measure based on presence/absence of the pressure in the watershed. Data source: BCGOV MEM & PR databases [updated regularly, accessed Dec 2012], Skeena TAC identification of acid generating mines [2012].

34. Permitted waste water discharges. Total number of permitted waste water discharge sites in each watershed within the CU spawning ZOI. High levels of waste water discharge have the potential to impact water quality through excessive nutrient enrichment or chemical contamination. The defined benchmark of concern (lower & higher) for waste water discharge sites is a binary measure based simply on presence/absence of the pressure in the watershed. Data source: MOE Wastewater Discharge and Permits database [updated regularly, downloaded Dec 2012].

Future pressure

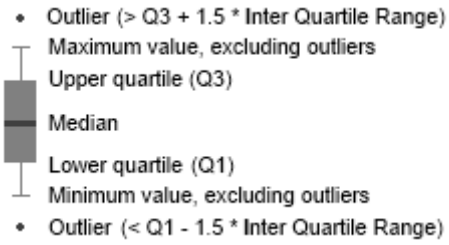
Proposed resource development projects (as of 2010)

35. Skeena overview map of the locations of new resource development projects proposed within the Skeena Basin (across a range of activities). This map includes an overlay of the CU rearing/migration and spawning ZOIs to show the locations of proposed new resource development projects in relation to watersheds used by this CU. Data source: Skeena TAC, extracted from multiple sources [2012].

36. CU summary of resource development projects. The total number or extent of resource development related projects that are known to be proposed for future development within watersheds affecting the CU (i.e., within rearing/migration and spawning ZOIs), and the potential increases (total and %) in these pressures (if any) over the current baselines. Data source: Skeena TAC, extracted from multiple sources [2012].

Additional notes

Key to interpreting pressure indicator box plots:



Data deficient areas. Mapped areas delineated as "data deficient" are those that have incomplete coverage for the core VRI or LCC2000 GIS data used for generation of some habitat indicators. These areas are mapped explicitly to identify any watersheds that have some level of relative uncertainty around a particular habitat indicator value. These areas have either been supplemented (i.e., patched) with GIS data from alternate sources, sometimes at a coarser resolution, to allow indicator generation/scoring, or else are areas lacking only minor elements of a larger suite of data components with limited influence on the final derived habitat indicator values.

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Acknowledgements

The Pacific Salmon Foundation and ESSA Technologies Ltd. would like to sincerely thank the members of the Skeena Technical Advisory Committee (TAC) for giving of their time and knowledge to guide the development of these CU habitat report cards. Their assistance has been invaluable. The following people participated in one or more workshops and many also contributed data to the project: Mark Cleveland, Sandra Devcic, David DeWitt, Alana Dickson, Hannes Eddinger, Jessica Hawryshyn, Walter Joseph, Derek Kingston, Greg Knox, Siegi Kriegl, Chrissy Melymick, Lana Miller, Don Morgan, Johanna Pfalz, Ken Rabnett, and Bruce Watkinson.

We would also like to offer our thanks to the following additional people and organizations for generously providing data towards this project: Selina Agbayani (WWF-Canada), Matthew Beedle, James Casey (WWF-Canada), Barb Faggetter, North Coast-Skeena First Nations Stewardship Society, Craig Outhet (NCFSNSS), Ron Ptolemy, Skeena Wild Conservation Trust, Russell Smith, Jack Stanford, World Wildlife Fund Canada.

This project is funded by the Gordon and Betty Moore Foundation.

Skeena Salmon: Chinook
Conservation Unit (CU)
Ecstall

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

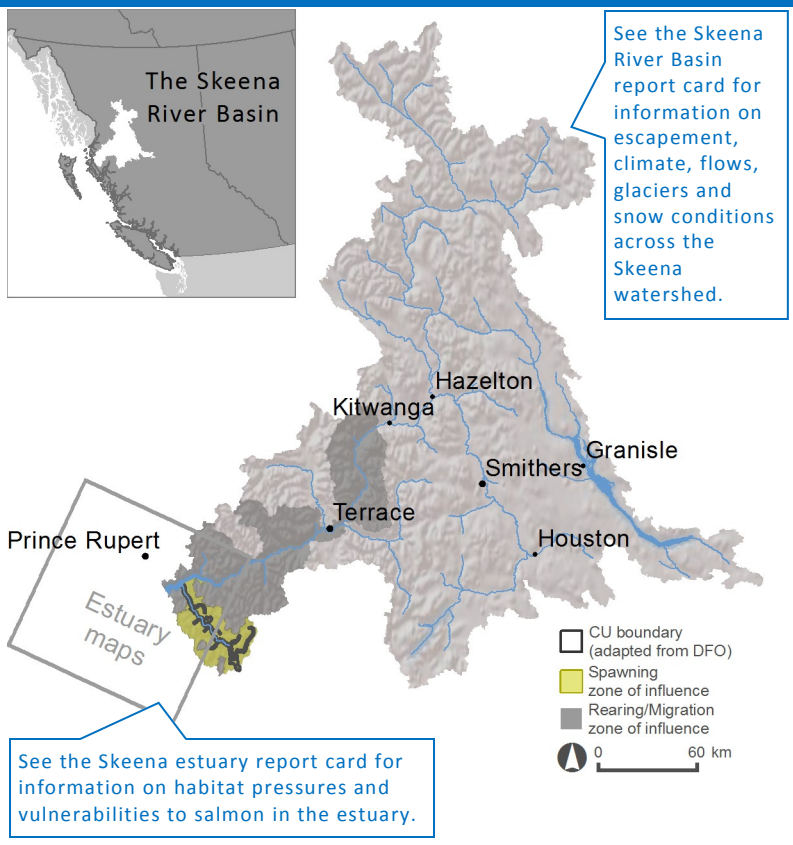
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Ecstall Chinook CU spawning and rearing habitats are in natural condition.
* Tidal influence extends approximately 42 km upstream of the Ecstall River mouth to Sparkling Creek and Chinook spawning is located upstream of that point unless in tributaries or on their fans. Ecstall River Chinook spawn in scattered pockets from the upper tidal limit with high densities from Johnston Creek upstream for 6 km, and with lower densities upstream to the Lower Lake outlet.
* Johnston Creek spawning grounds are the excellent gravels in the lower 1.4 km reach between Ecstall River and Johnston Lake.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, as well as changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

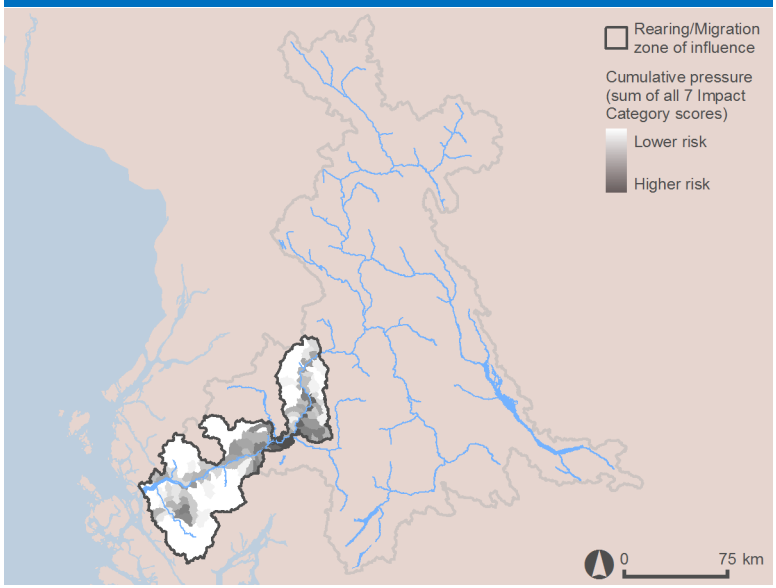
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

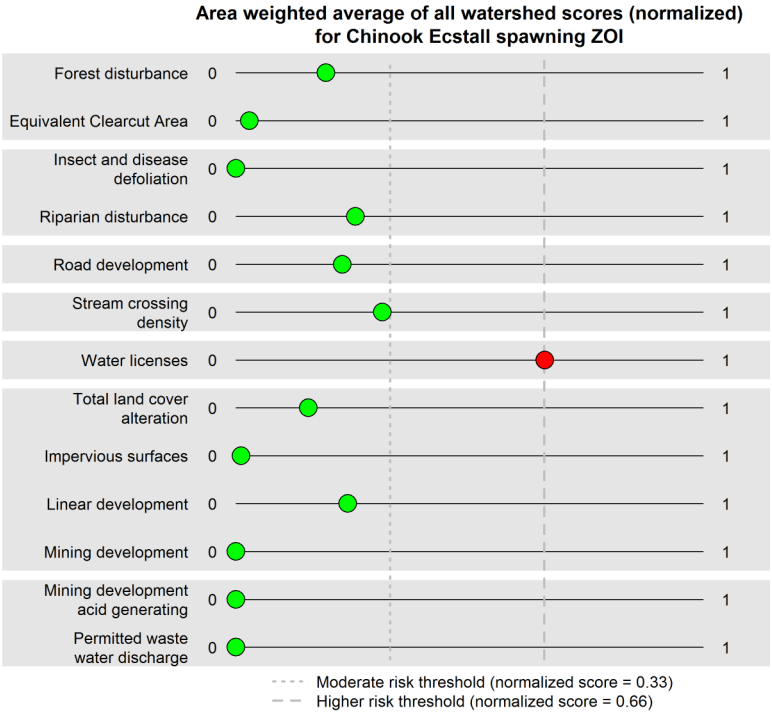
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

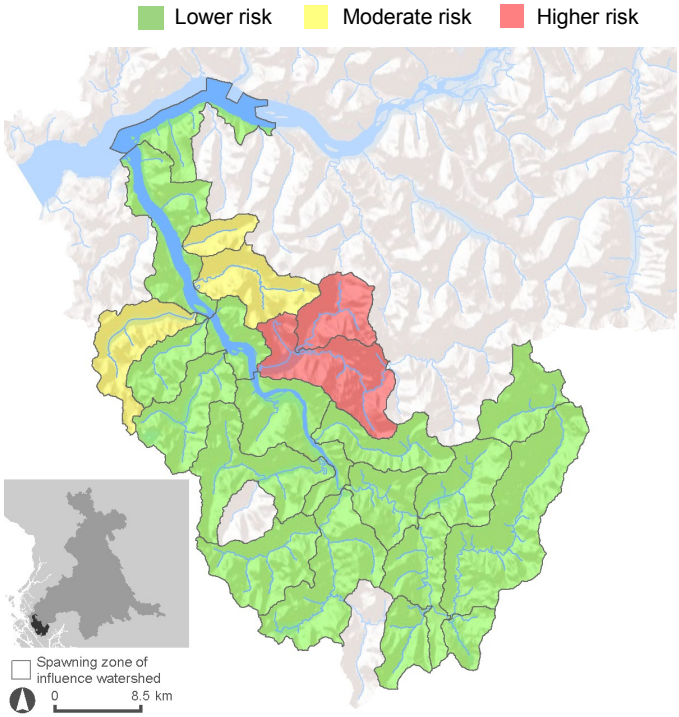
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

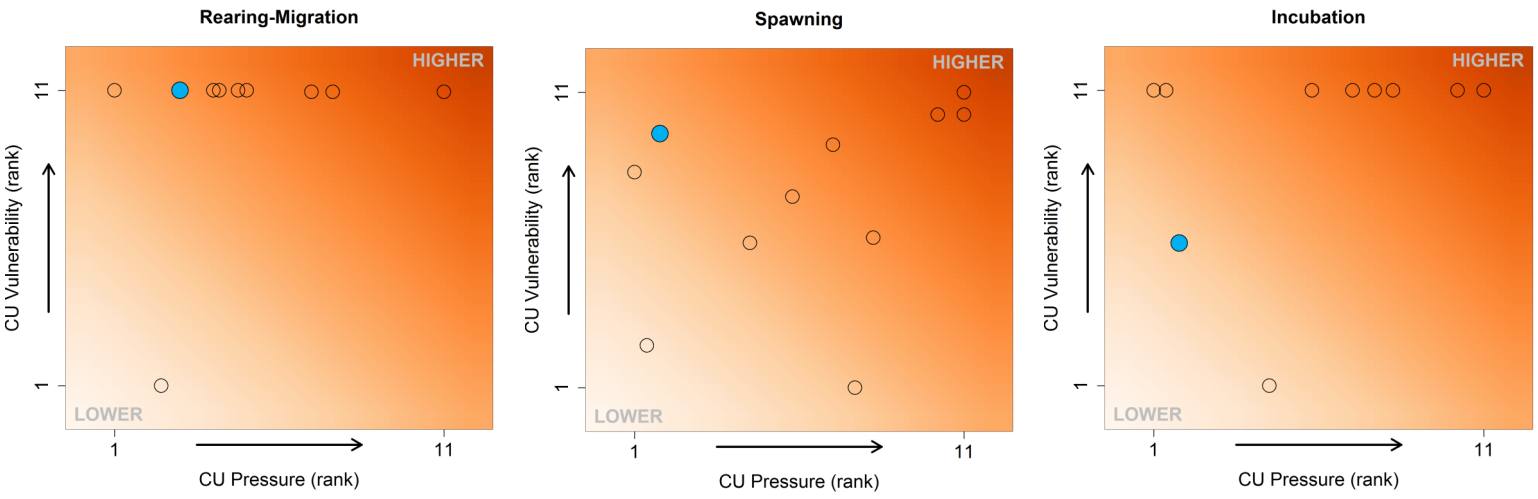


Cumulative pressure—spawning



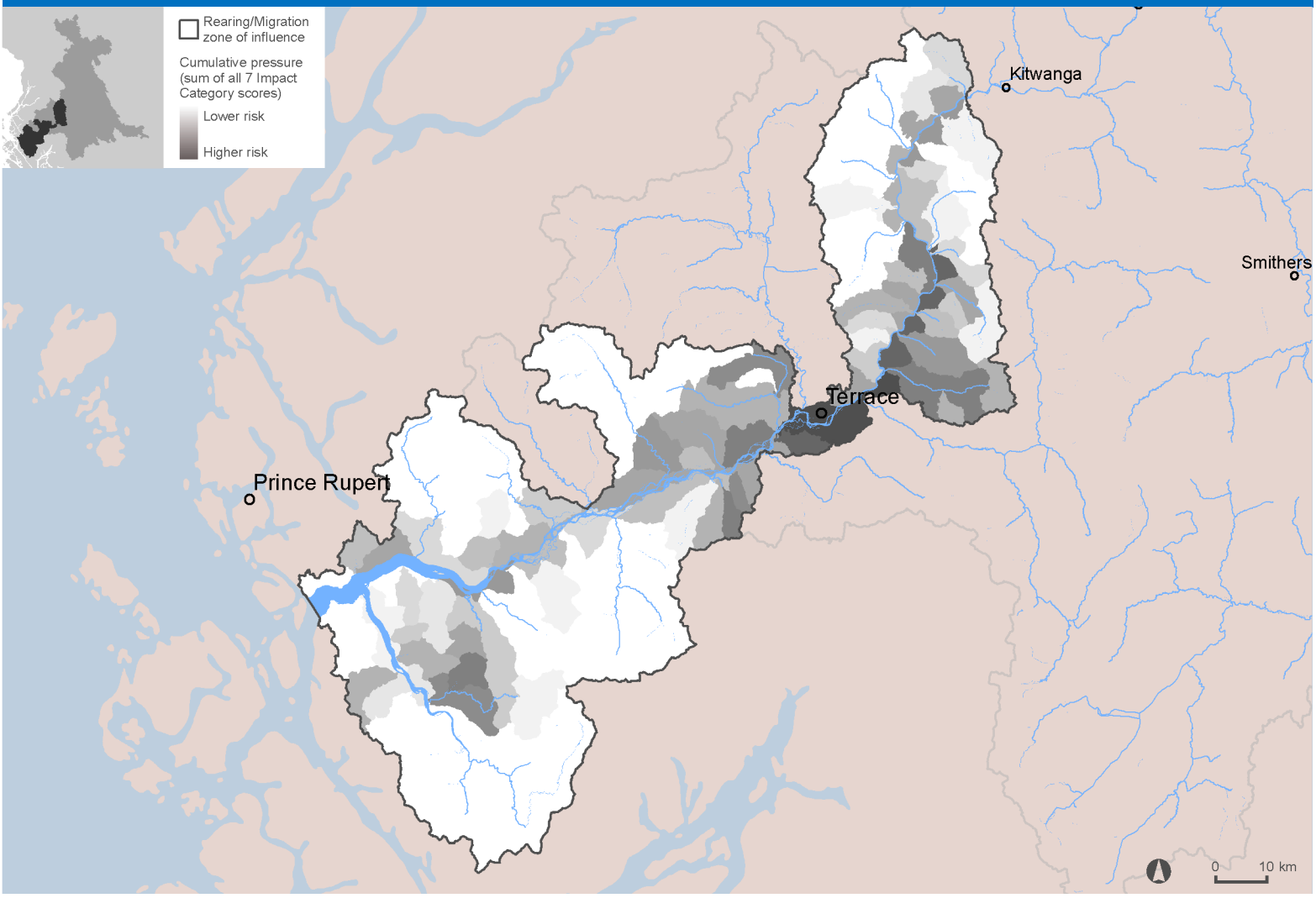
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Ecstall ○ = other Skeena Chinook CUs



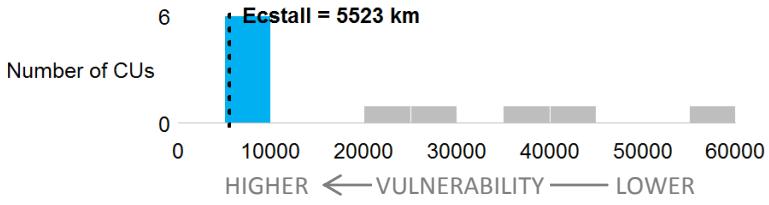
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

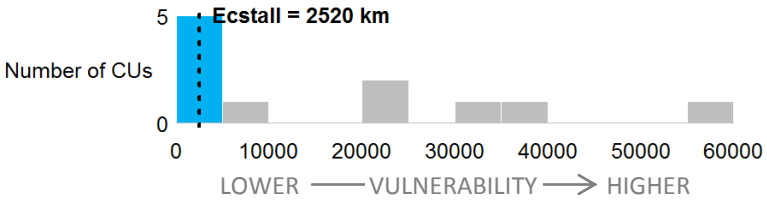


Rearing/Migration period vulnerability

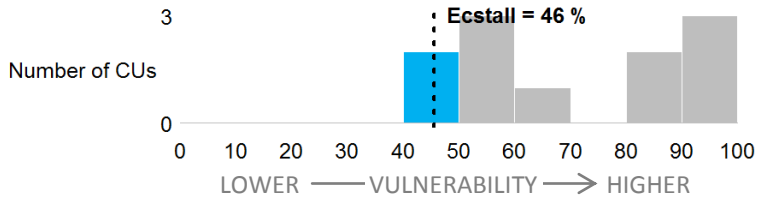
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



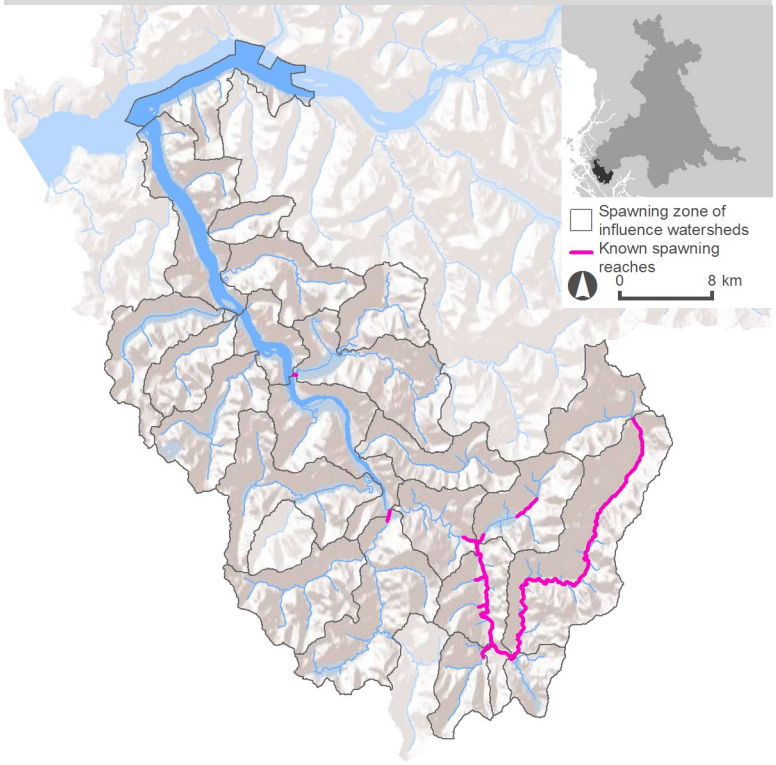
Flow sensitive accessible habitat (%) (all seasons)



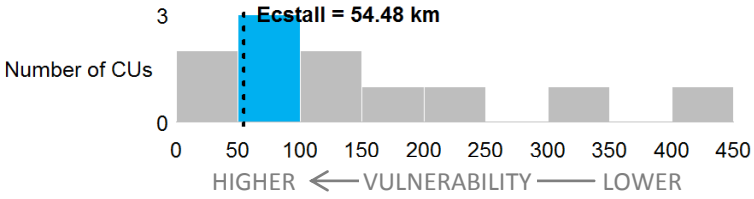
Spawning & incubation vulnerability

Spawning period vulnerability

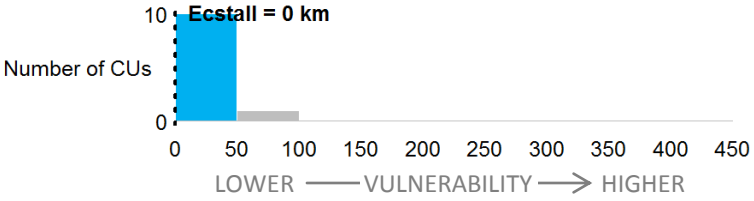
Spawning locations



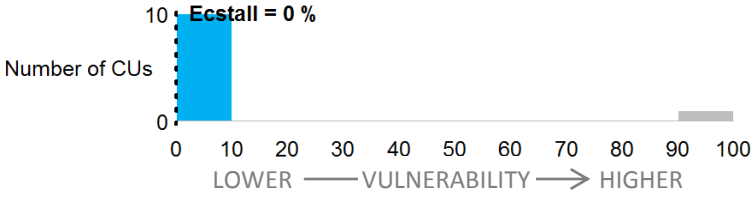
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

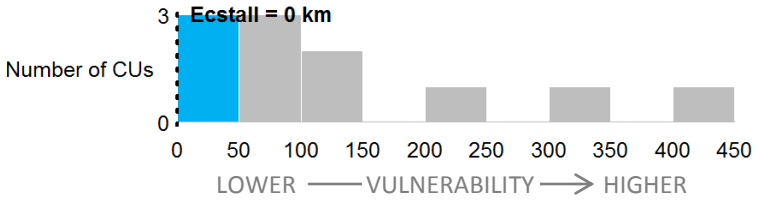


Spawning reaches summer flow sensitive - spawn timing (%)

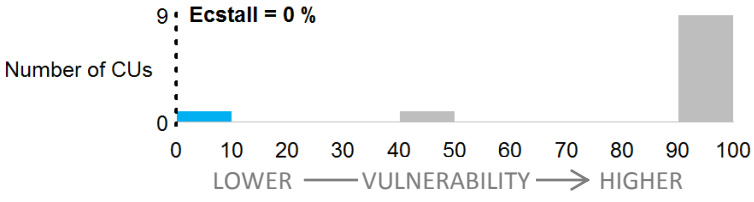


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



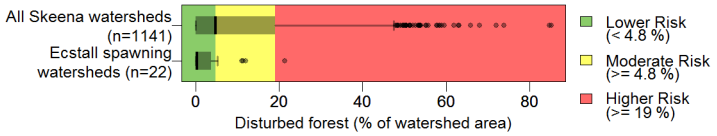
Spawning reaches winter flow sensitive - incubation timing (%)

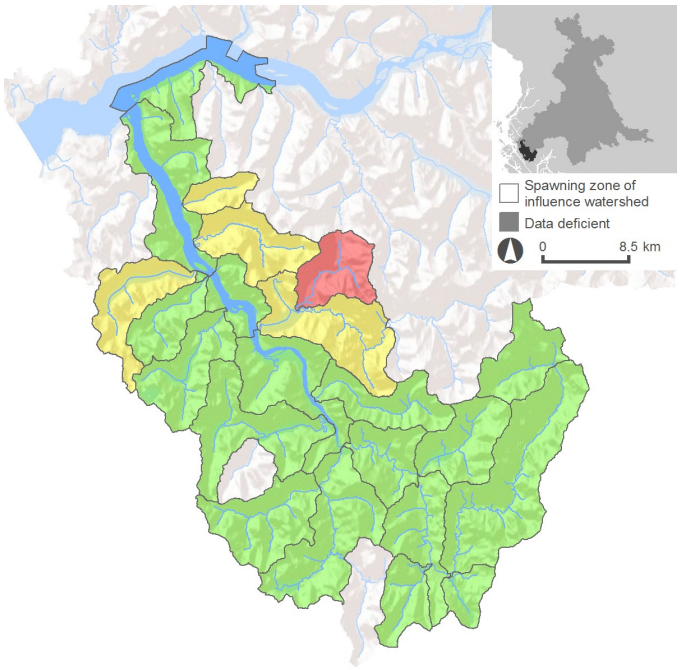


Spawning pressure

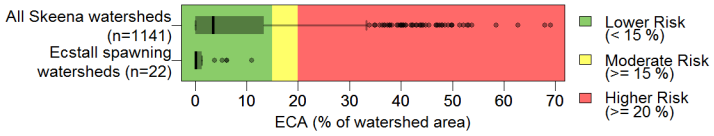
Hydrologic Processes

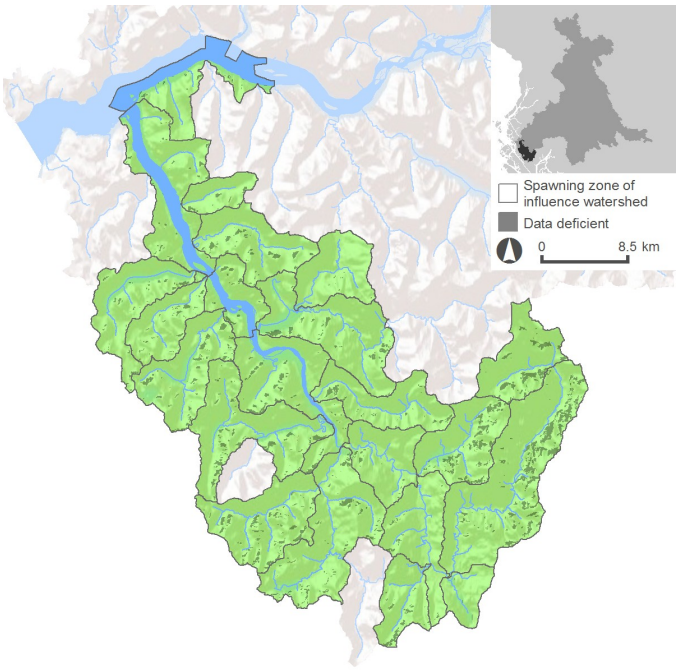
Forest disturbance





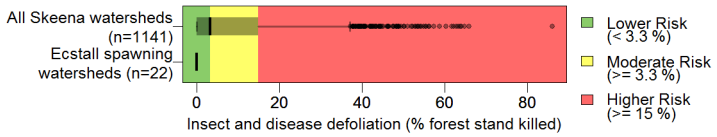
Equivalent Clear-cut Area

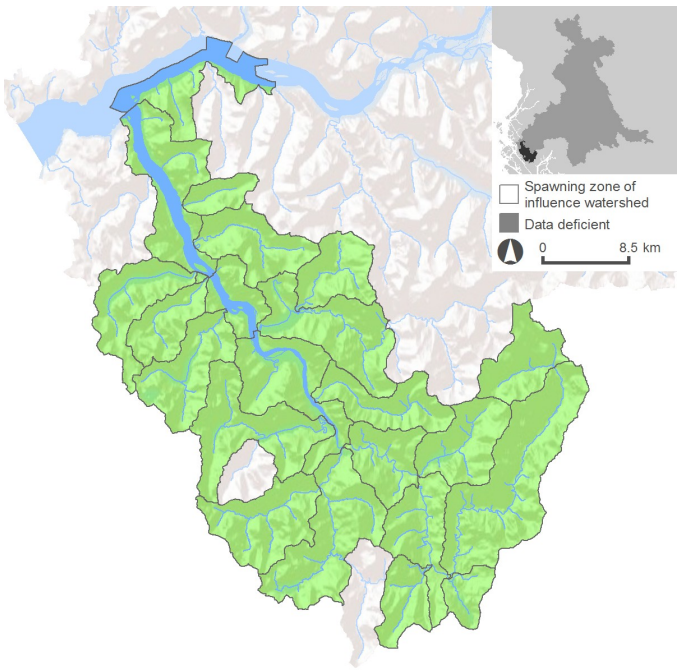




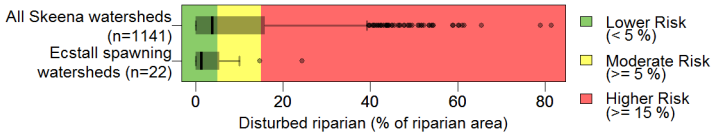
Vegetation Quality

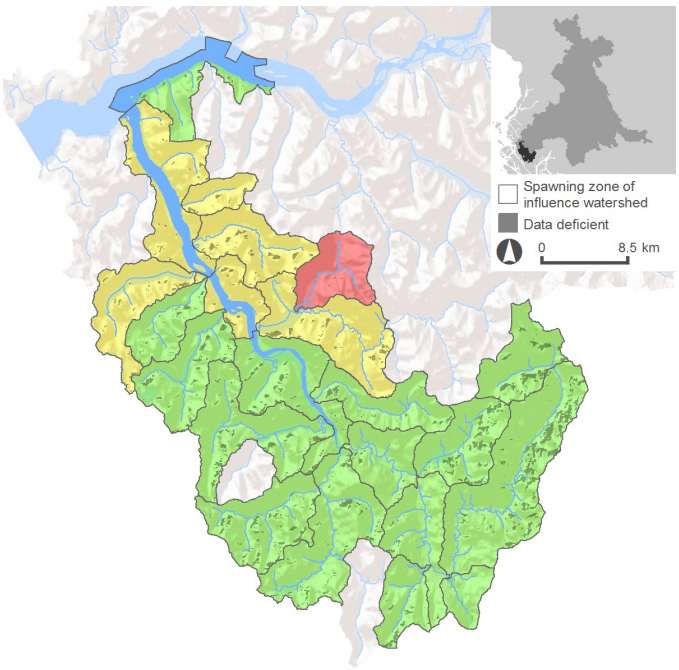
Insect and disease defoliation





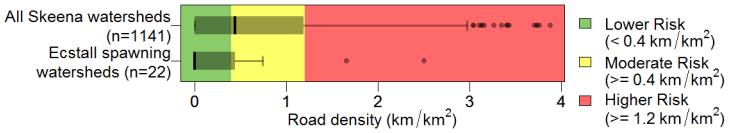
Riparian disturbance

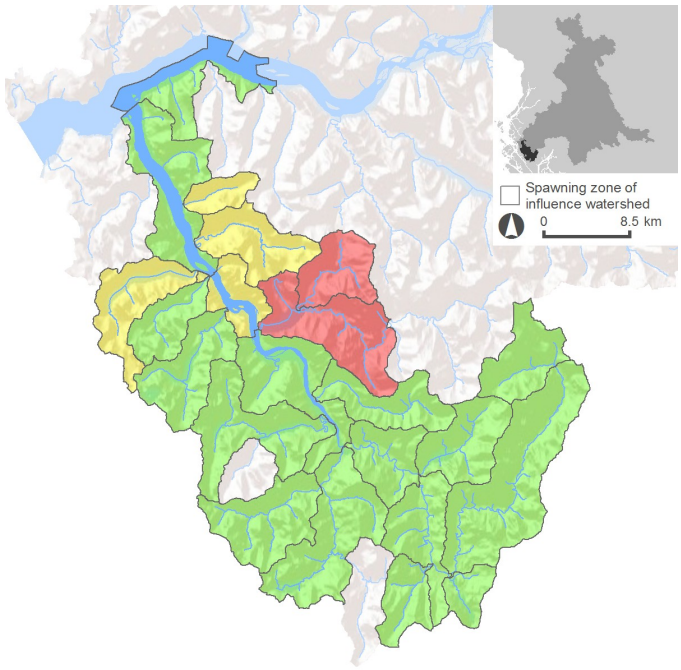




Surface Erosion

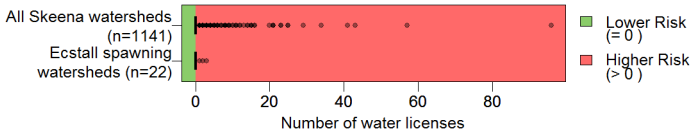
Road development

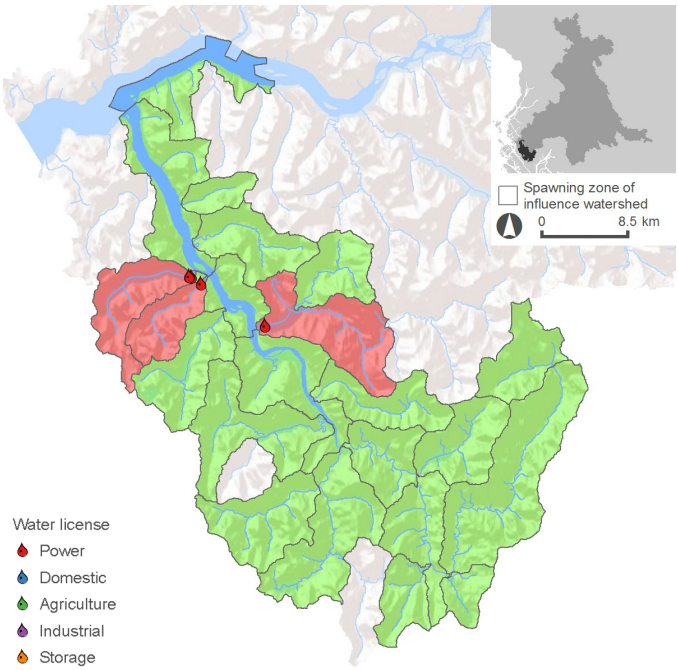




Water Quantity

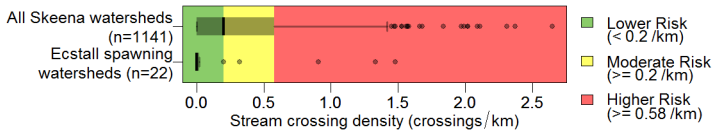
Number of water licenses

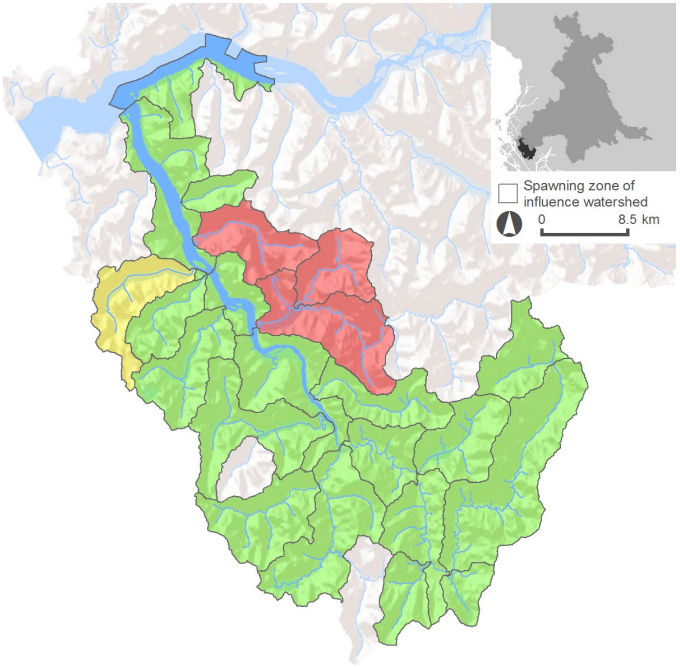




Fish Passage/Habitat Connectivity

Stream crossing density



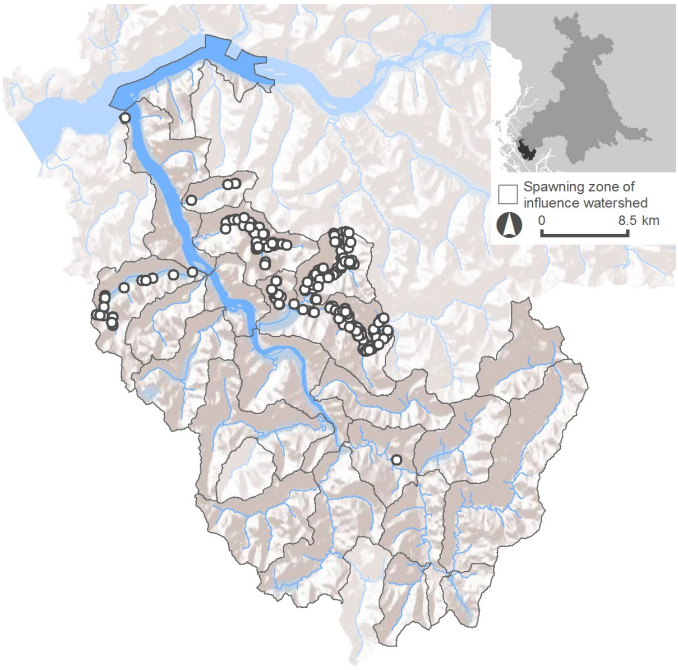


Culvert passability

Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

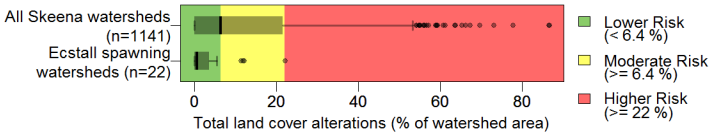
Assessed culvert
- Passable
- Unknown
- Barrier

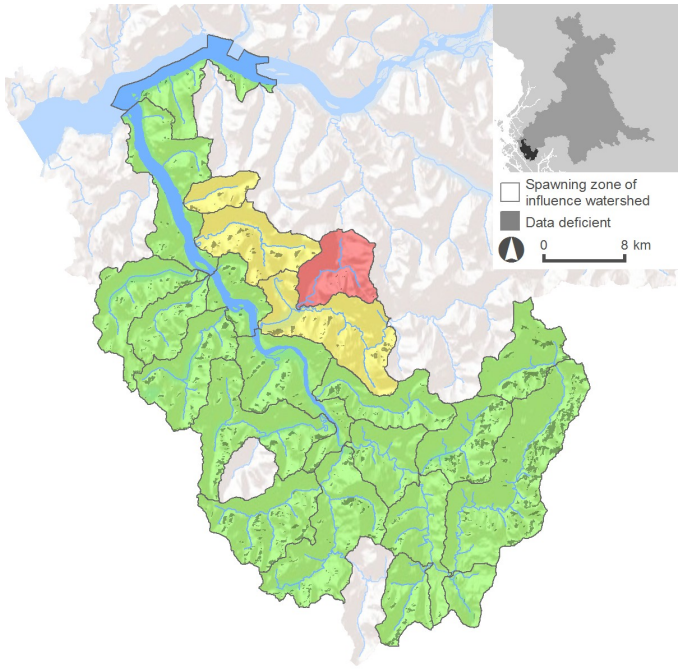
Potential culvert
- Road/Stream crossing



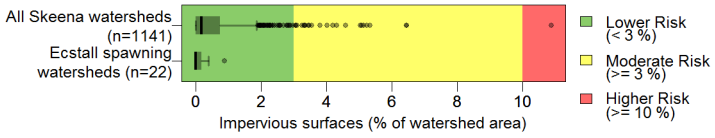
Human Development Footprint

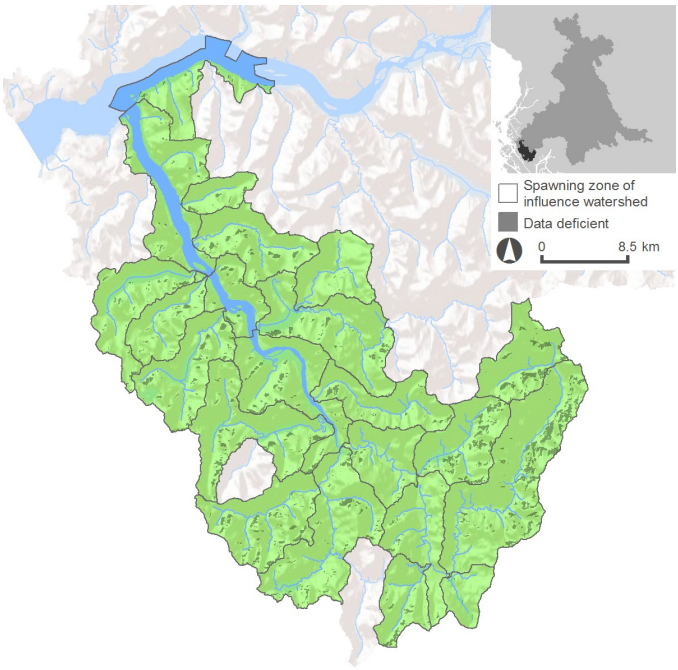
Total land cover alteration



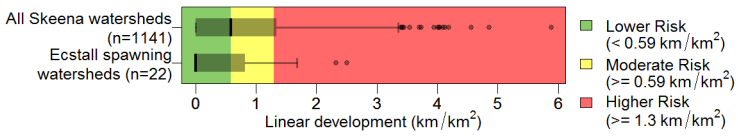


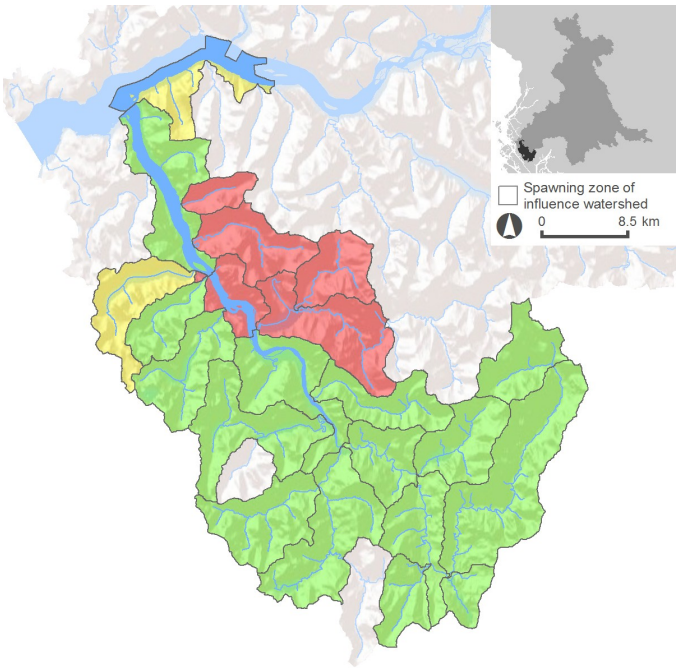
Impervious surfaces



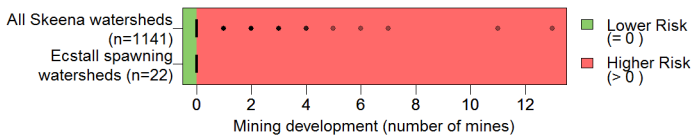


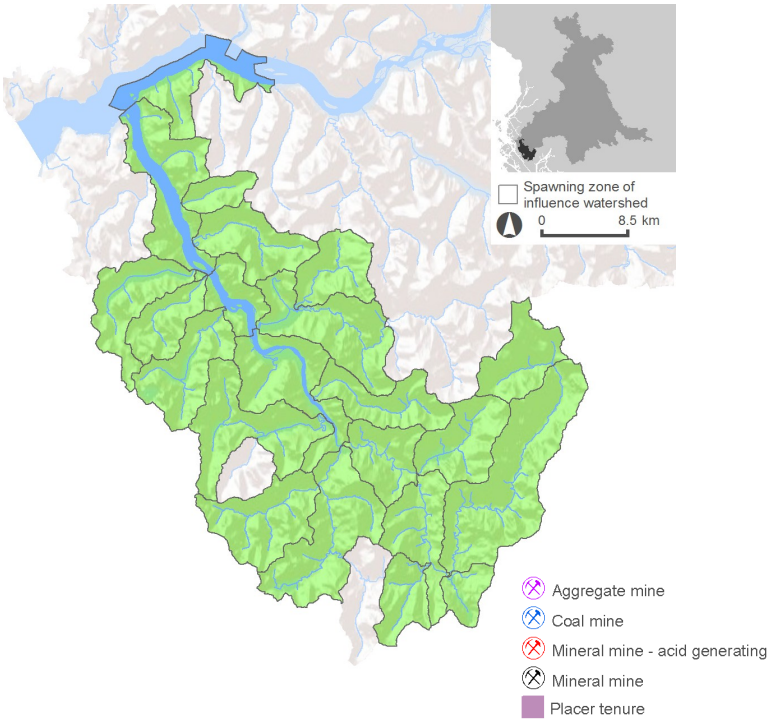
Linear development





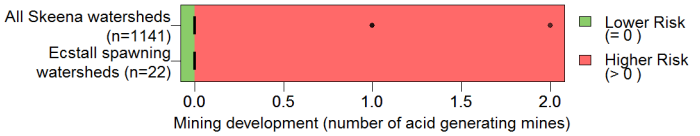
Mining development (total number of mines)

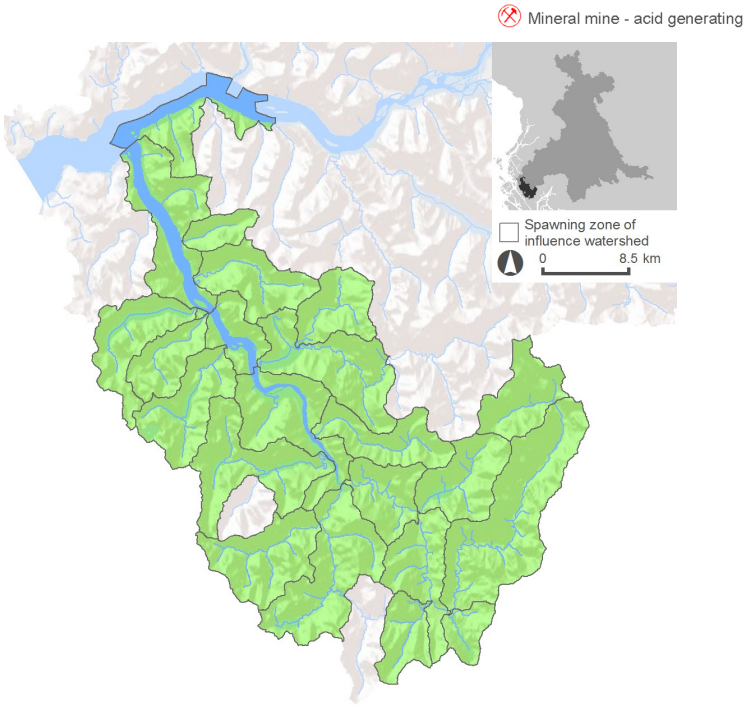




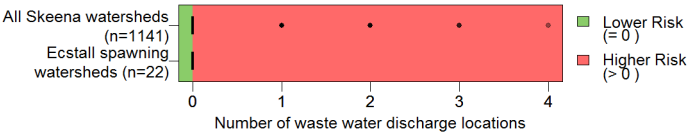
Water Quality

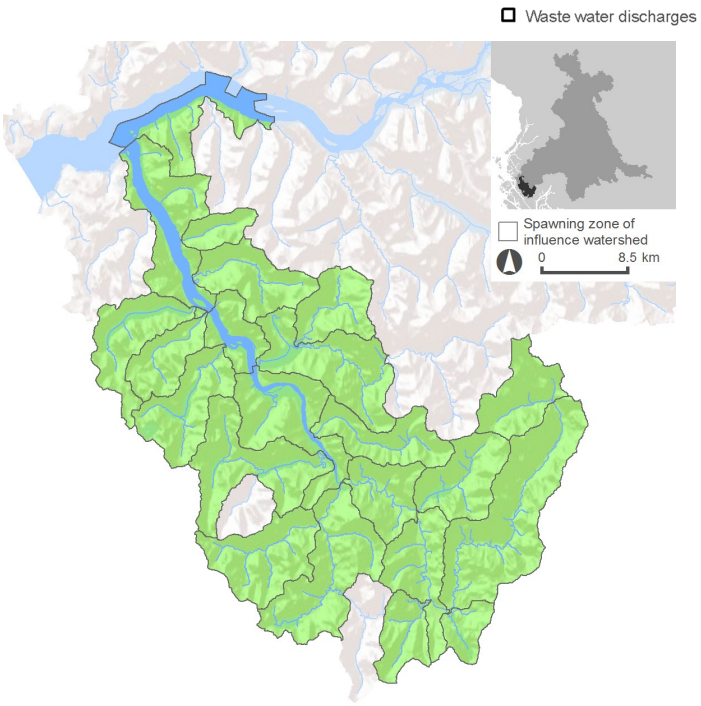
Mining development (acid generating mines)





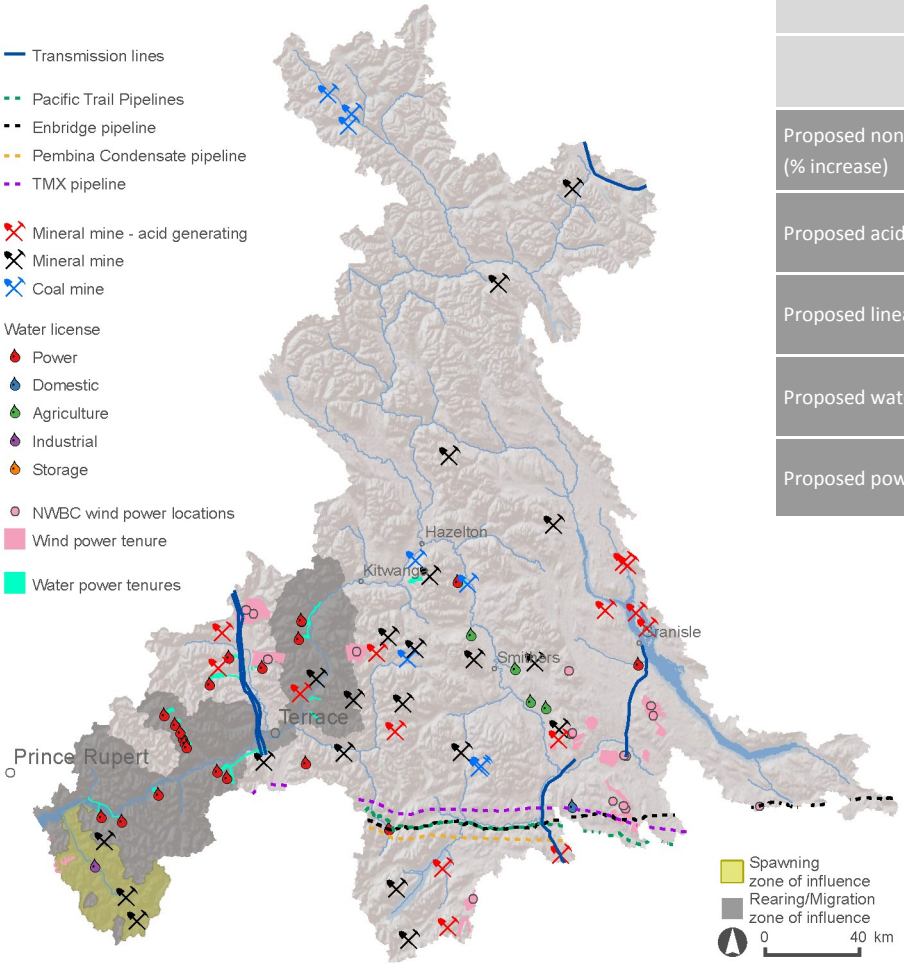
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Ecstall Chinook CU summary		
	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	4 (10%)	2 (NA)
Proposed acid generating mines (% increase)	1 (100%)	0 (NA)
Proposed linear development (% increase)	0.006 km/km^2 (0.9%)	0 km/km^2 (0%)
Proposed water licenses (% increase)	18 (16%)	2 (33%)
Proposed power tenures	116 km^2	7 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Kalum (early)

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

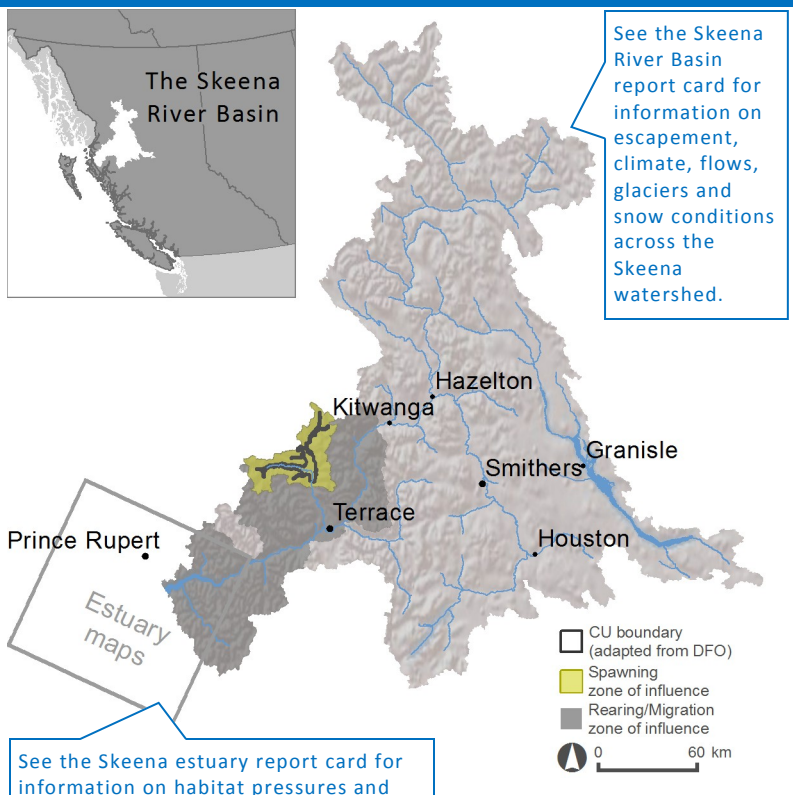
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Cedar River has significant and productive spawning beds upstream to Sterling Creek and possibly further. Clear Creek supports extensive Chinook spawning upstream for 9 km to the second reach break.
* Most of the streams flow clear water except for the glacially turbid Little Cedar River.
* Spawning and rearing habitats within this CU have been impacted by logging and related road development that has adversely affected high-value tributary Chinook habitat. Adverse effects have declined but many still remain.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

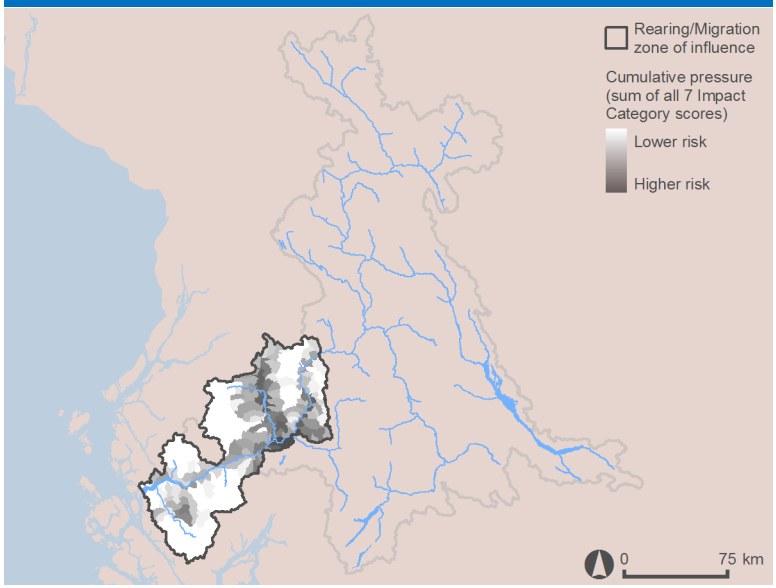
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

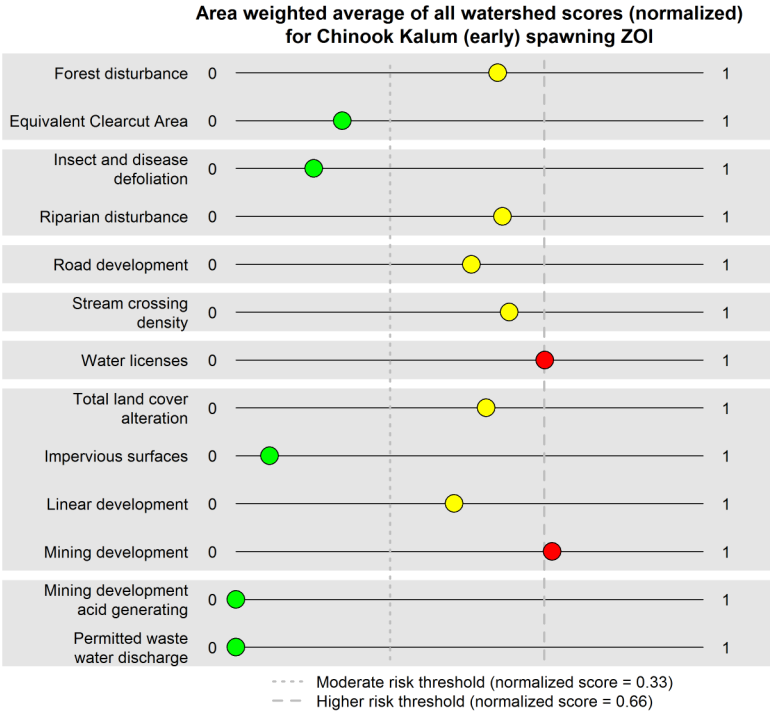
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

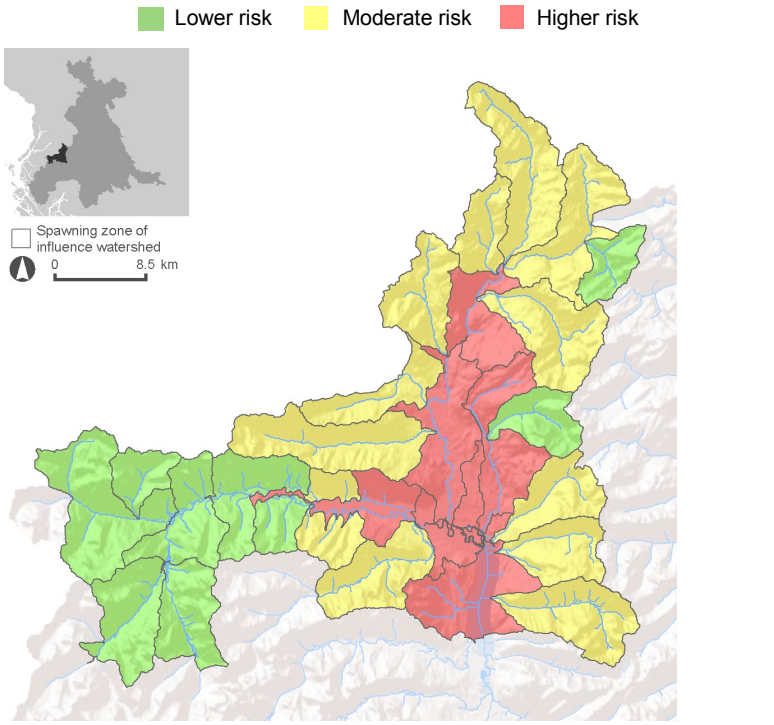
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

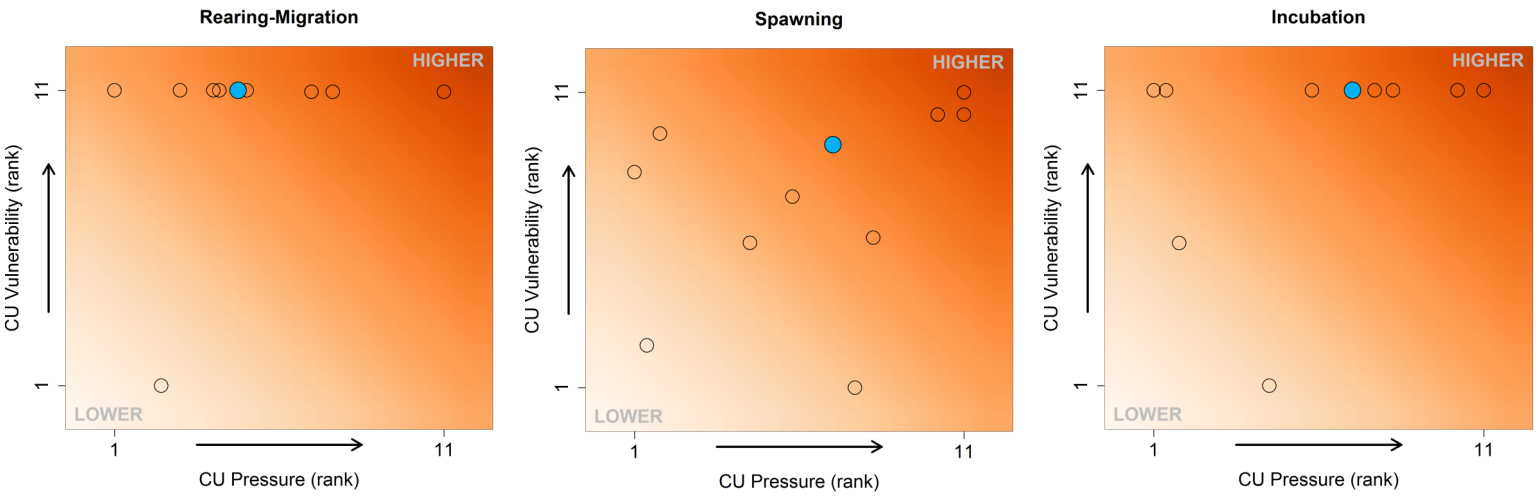


Cumulative pressure—spawning



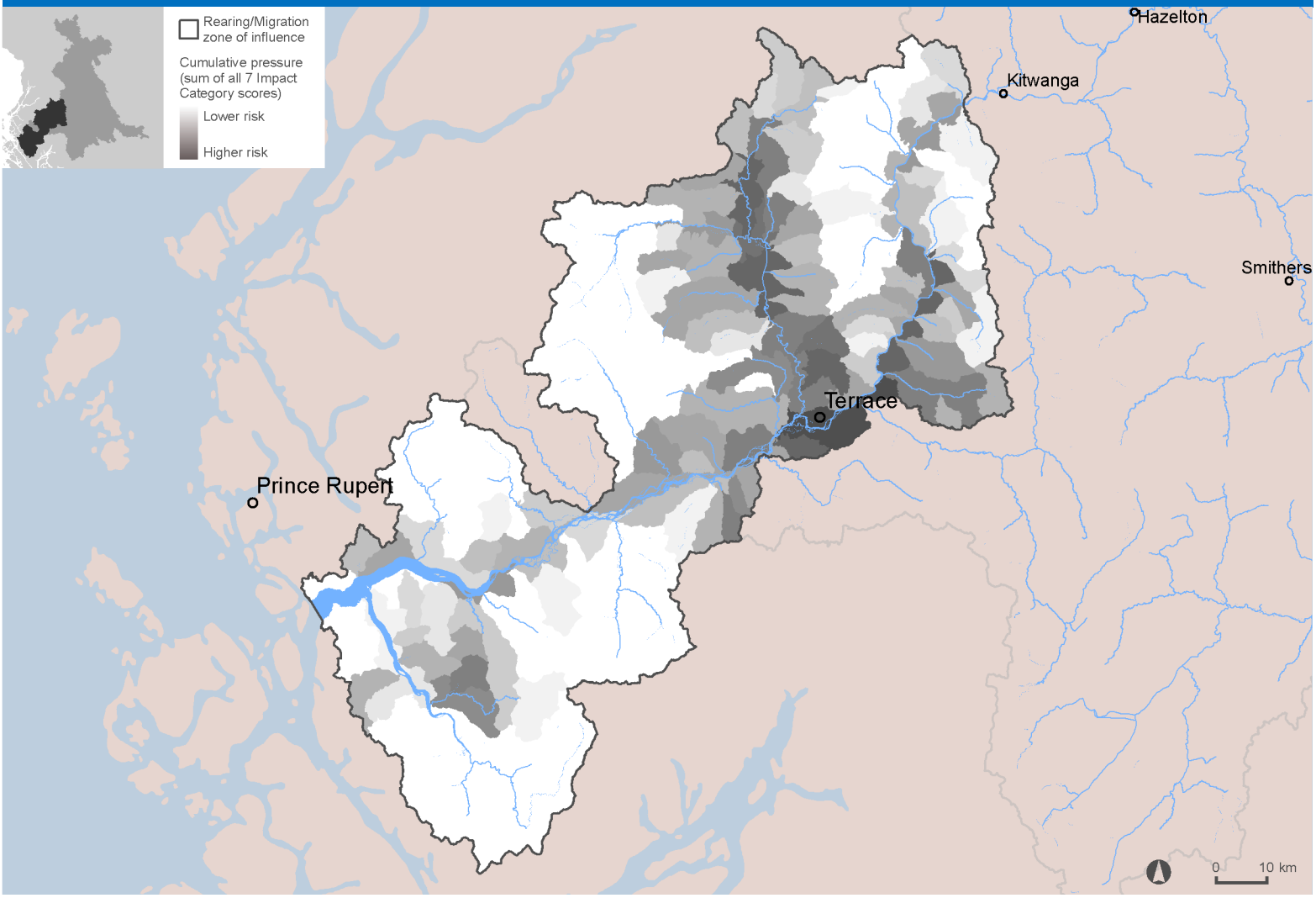
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Kalum (early) ○ = other Skeena Chinook CUs



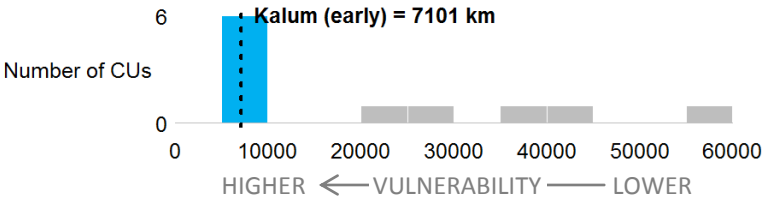
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

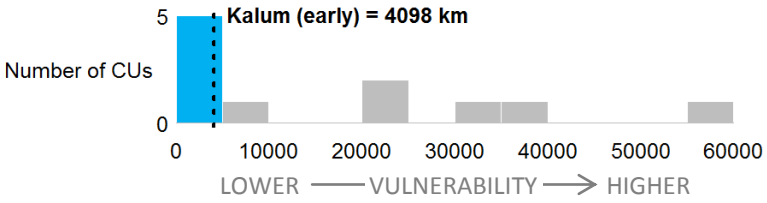


Rearing/Migration period vulnerability

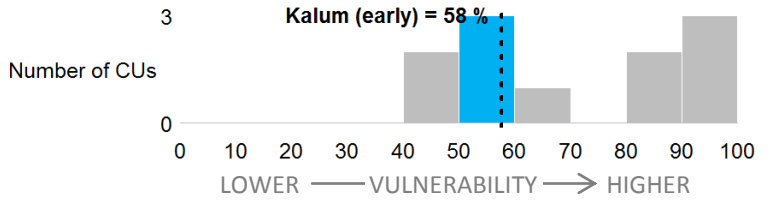
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



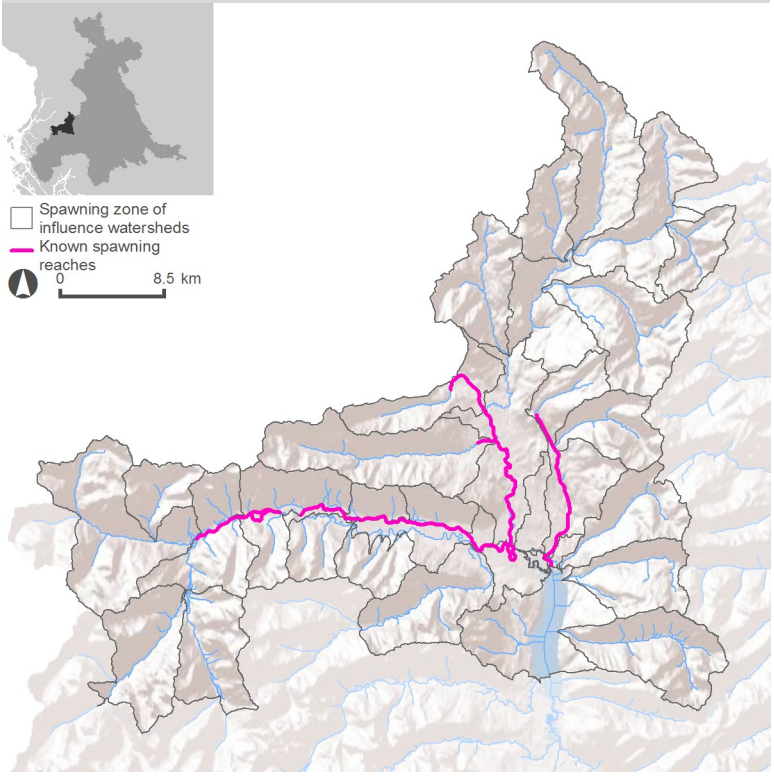
Flow sensitive accessible habitat (%) (all seasons)



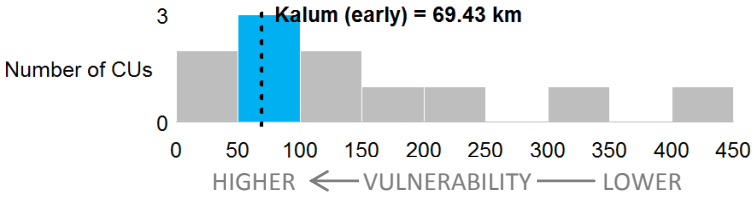
Spawning & incubation vulnerability

Spawning period vulnerability

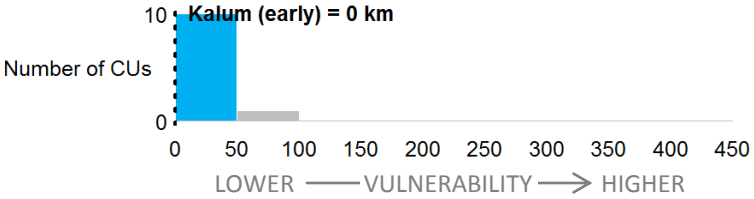
Spawning locations



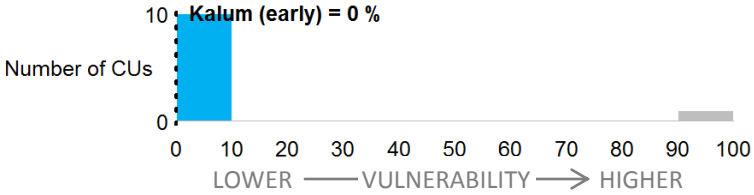
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

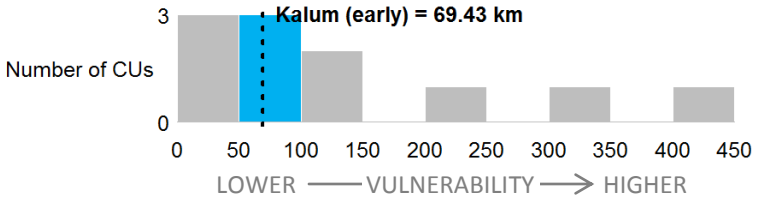


Spawning reaches summer flow sensitive - spawn timing (%)

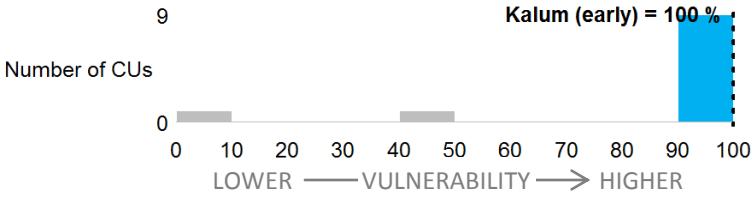


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



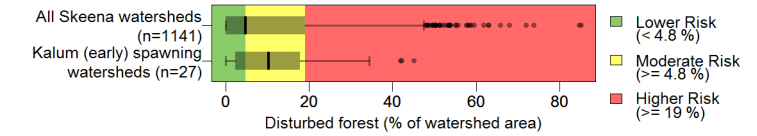
Spawning reaches winter flow sensitive - incubation timing (%)

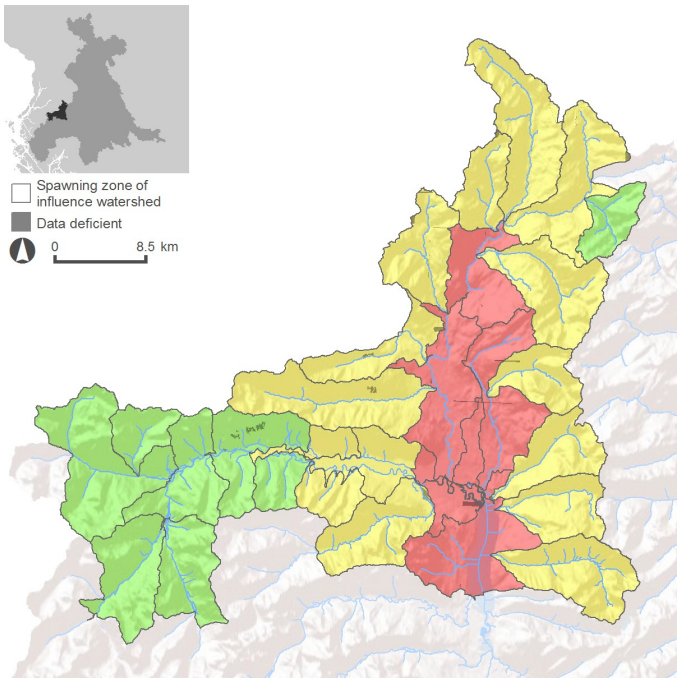


Spawning pressure

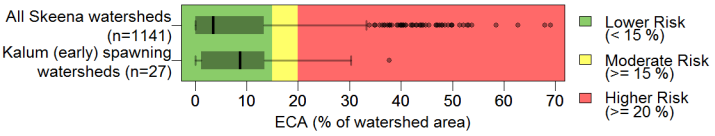
Hydrologic Processes

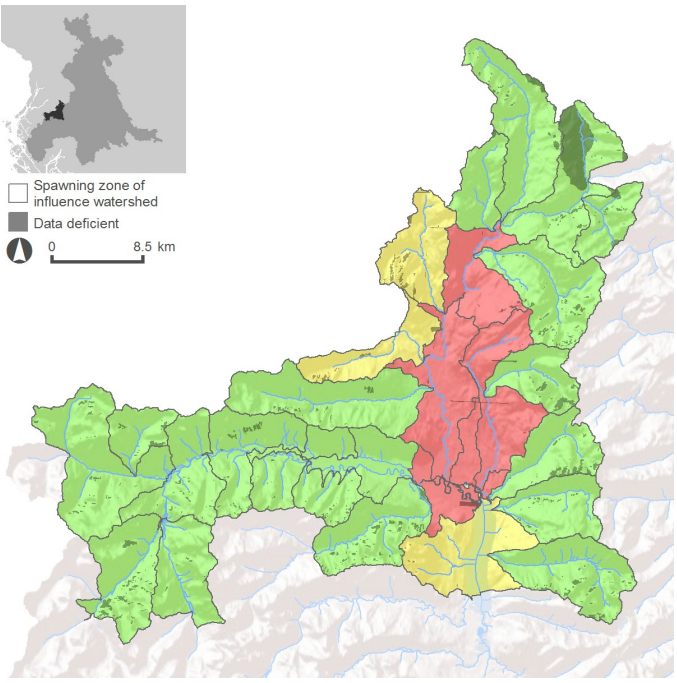
Forest disturbance





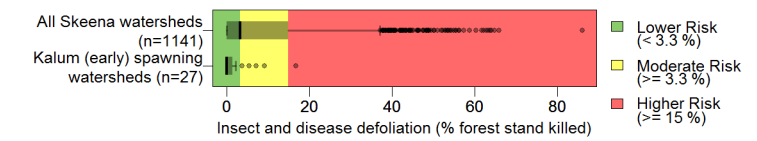
Equivalent Clear-cut Area

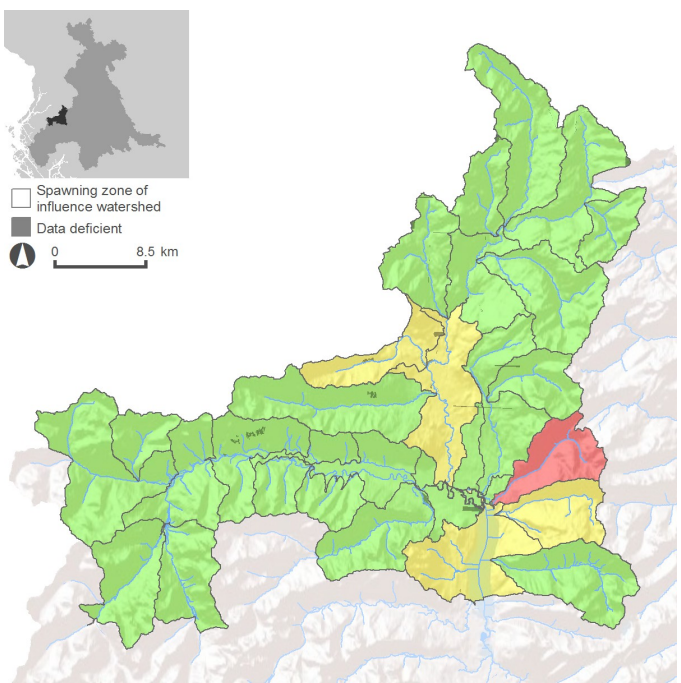




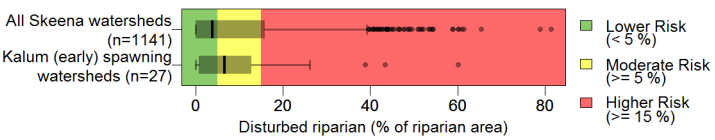
Vegetation Quality

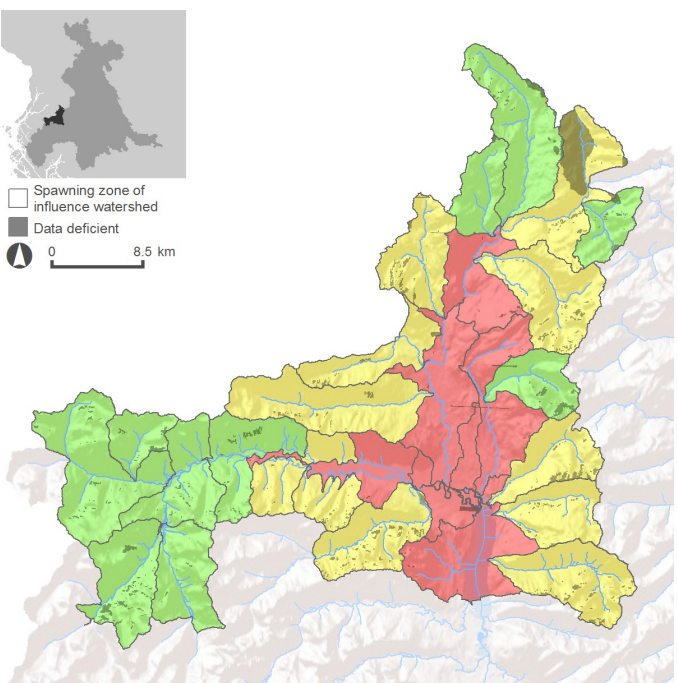
Insect and disease defoliation





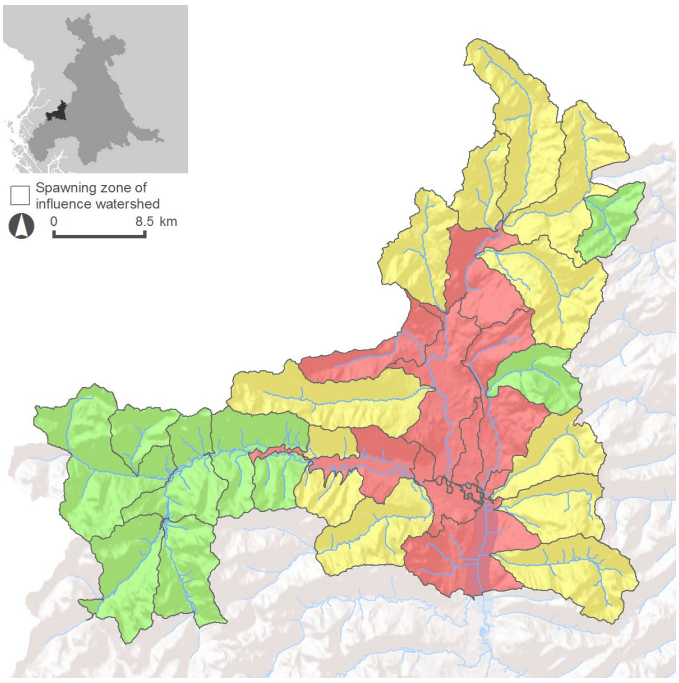
Riparian disturbance





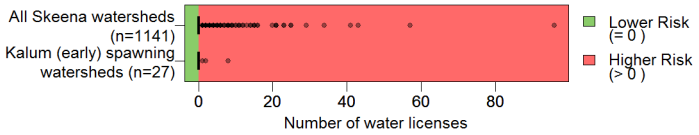
Surface Erosion

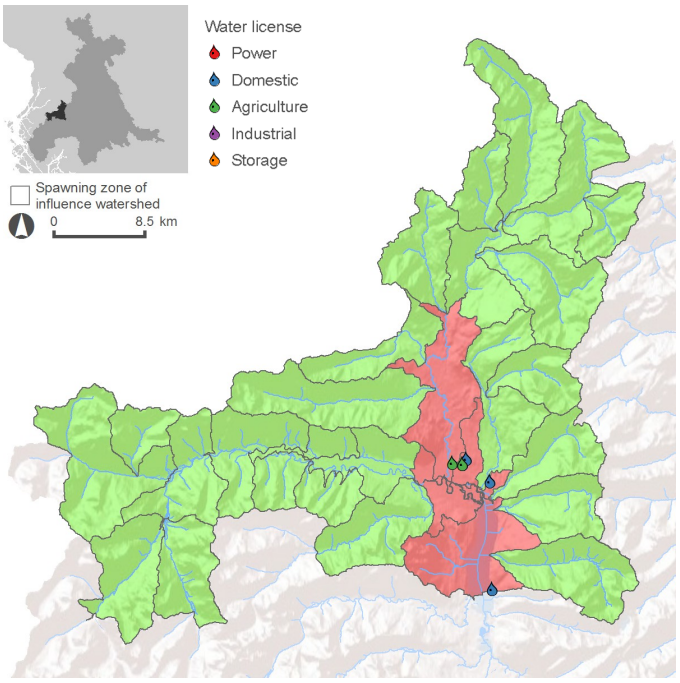
Road development



Water Quantity

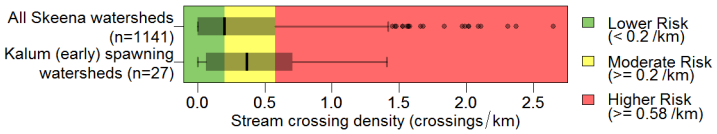
Number of water licenses

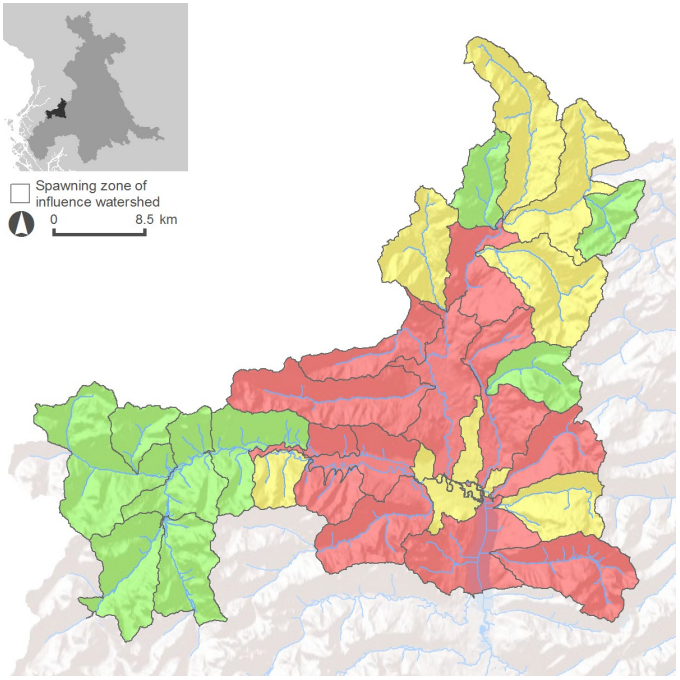




Fish Passage/Habitat Connectivity

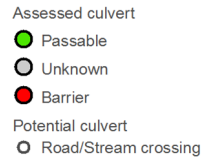
Stream crossing density

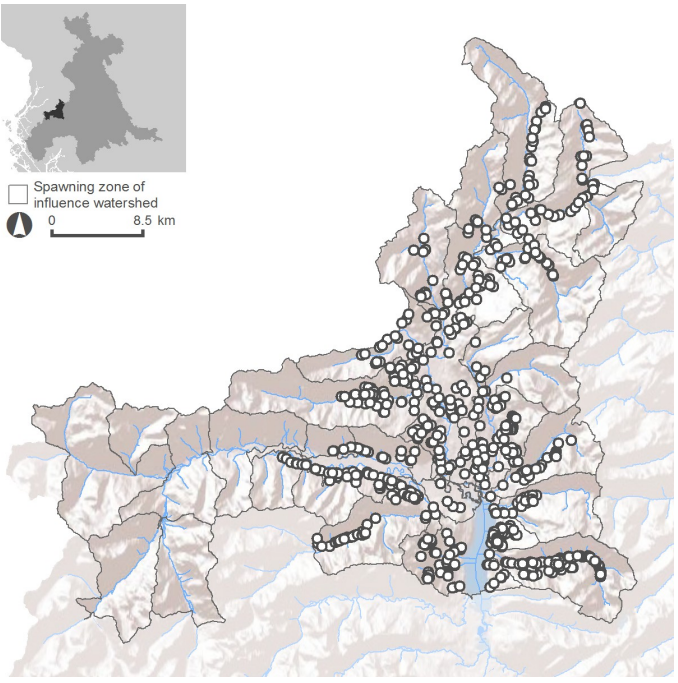




Culvert passability

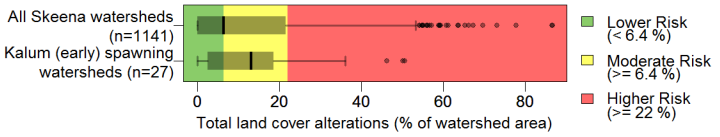
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

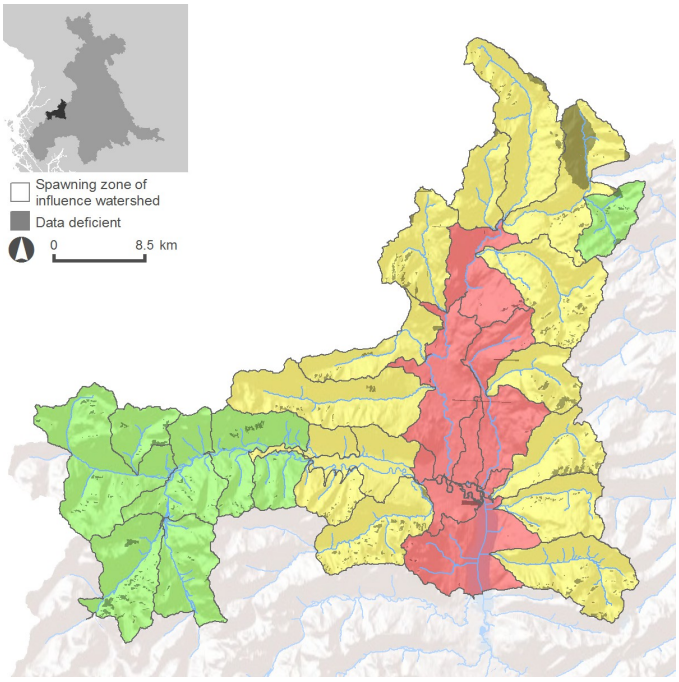




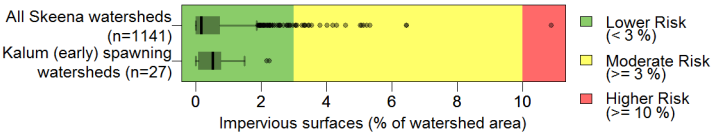
Human Development Footprint

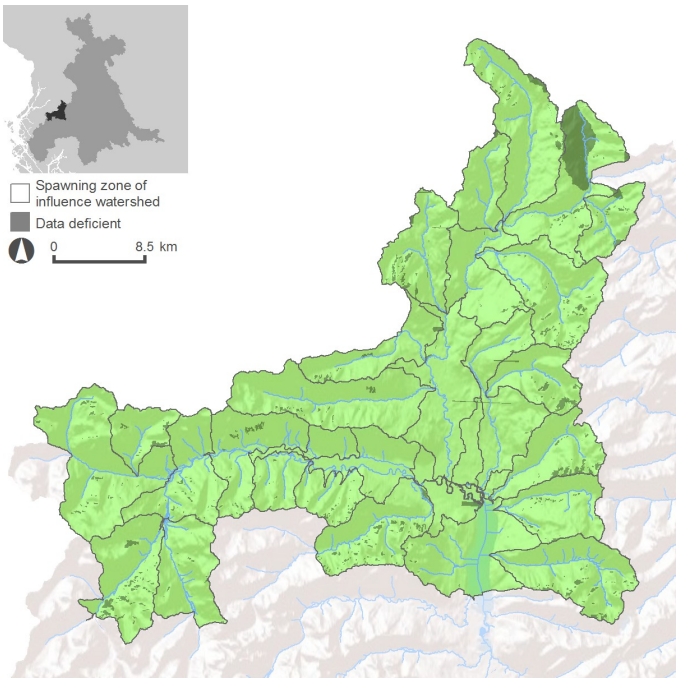
Total land cover alteration



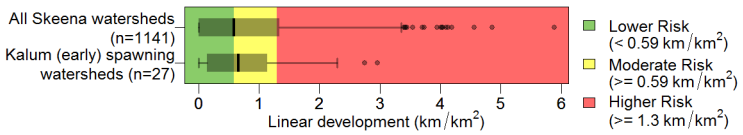


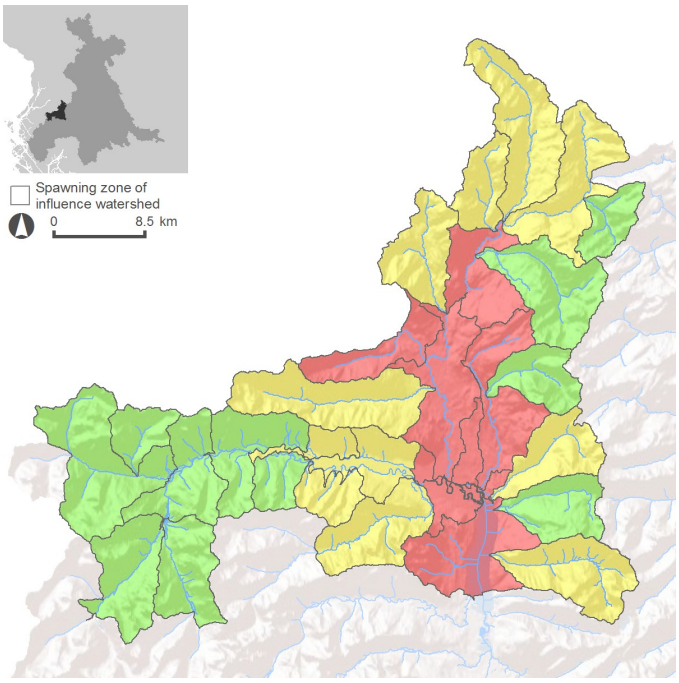
Impervious surfaces



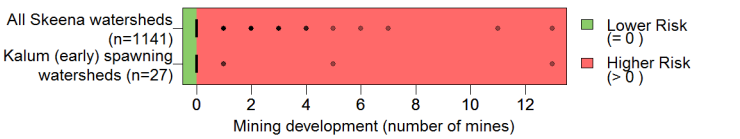


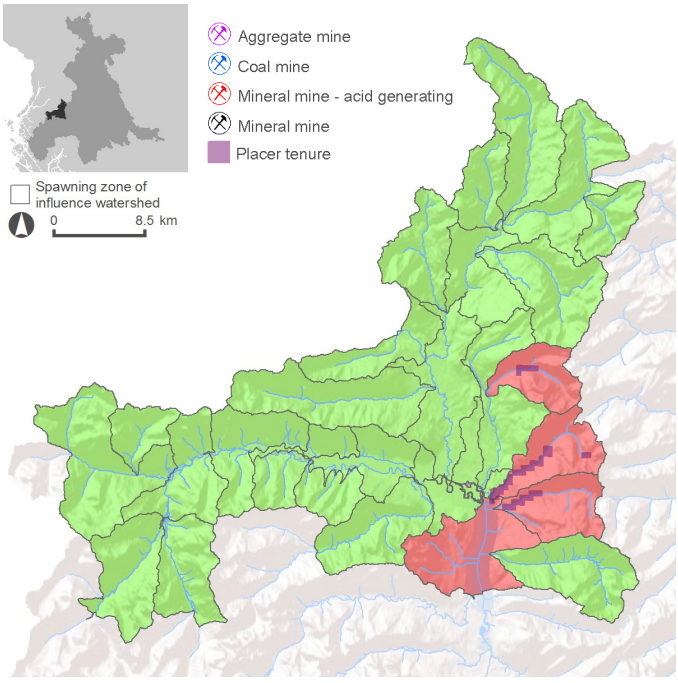
Linear development





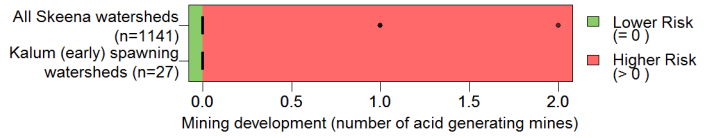
Mining development (total number of mines)

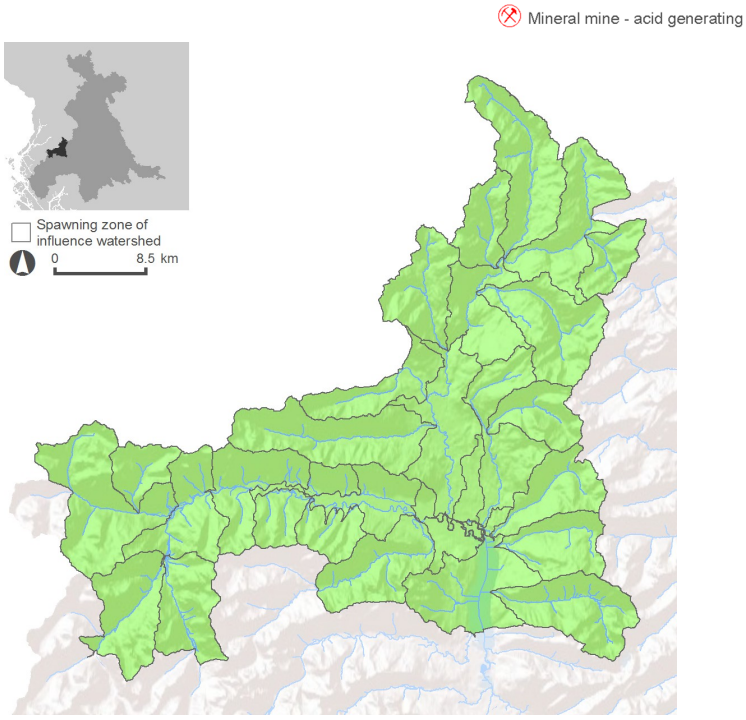




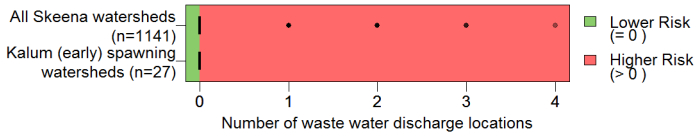
Water Quality

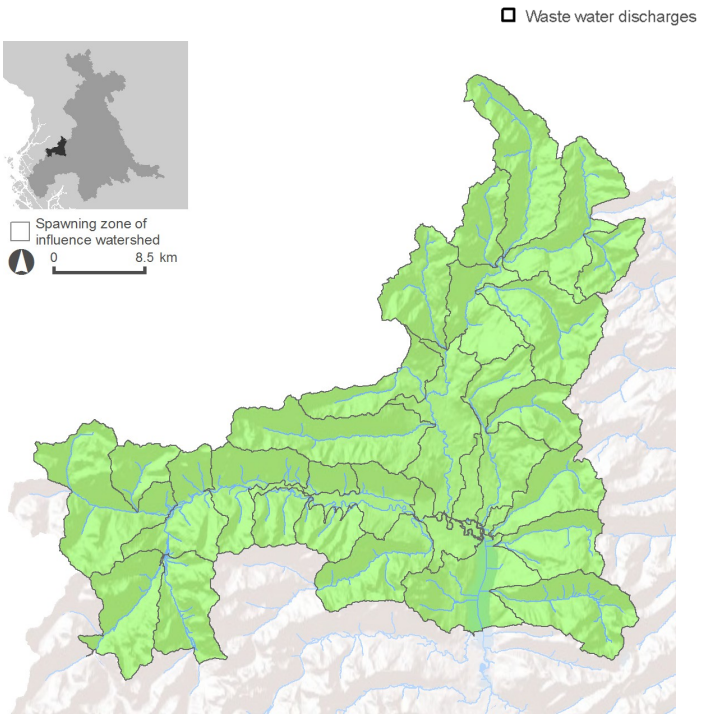
Mining development (acid generating mines)





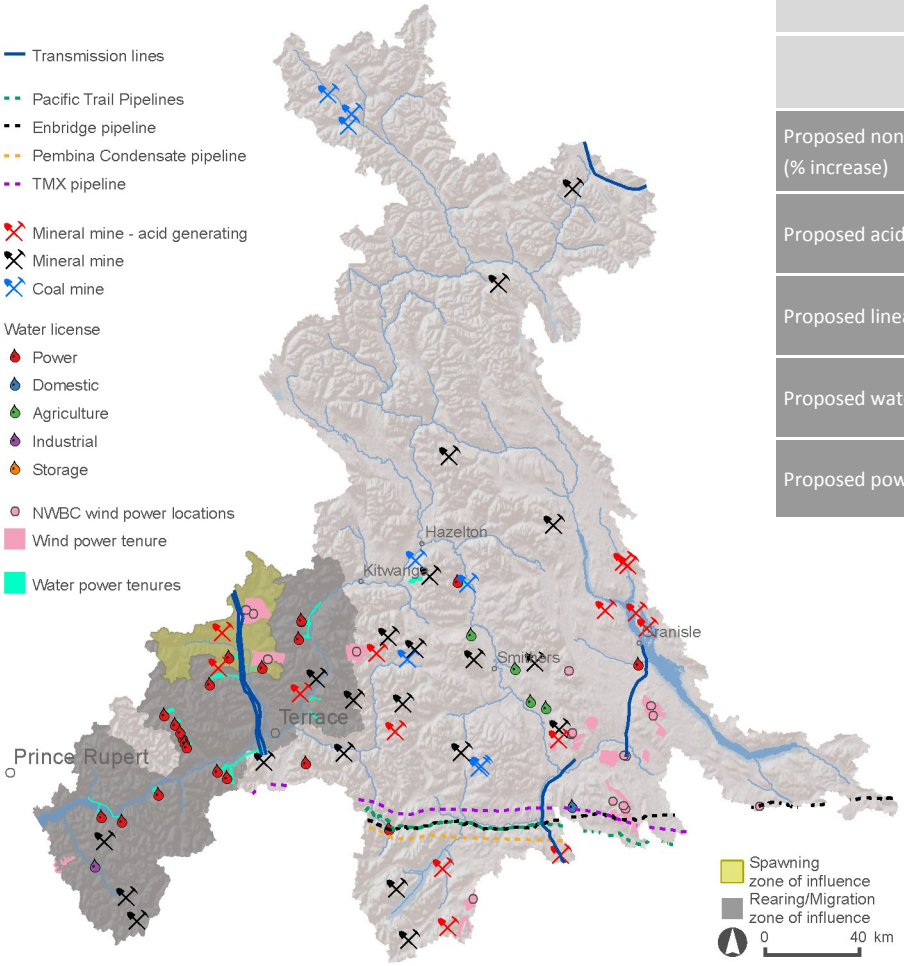
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Kalum (early) Chinook CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	4 (6%)	0 (0%)
Proposed acid generating mines (% increase)	3 (300%)	2 (NA)
Proposed linear development (% increase)	0.01 km/km^2 (2%)	0.05 km/km^2 (6%)
Proposed water licenses (% increase)	23 (16%)	3 (27%)
Proposed power tenures	272 km^2	143 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Kalum (late)

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

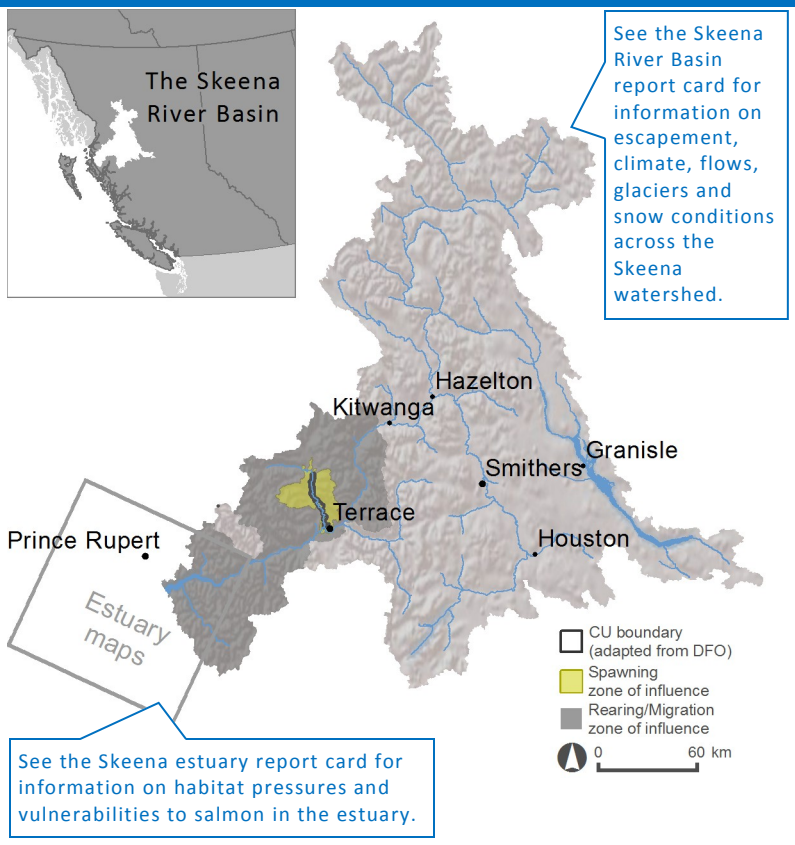
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Critical late Kalum Chinook spawning beds in Kitsumkalum River are distributed in the lower 3 to 9 km mainstem section and in the 0.5 km reach downstream of Kalum Lake outlet and are especially concentrated between Spring and Deep creek confluences.
* The limited life history information indicates that juvenile overwintering is minimal.
* Logging activity including channelizing the river to enable log drives and related road development heavily impacted Chinook habitat particularly downstream of Kalum Lake.
* This CU can suffer low egg-to-fry mortality from high and low-water events.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates; ongoing forestry development creating additional cumulative impacts, and changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

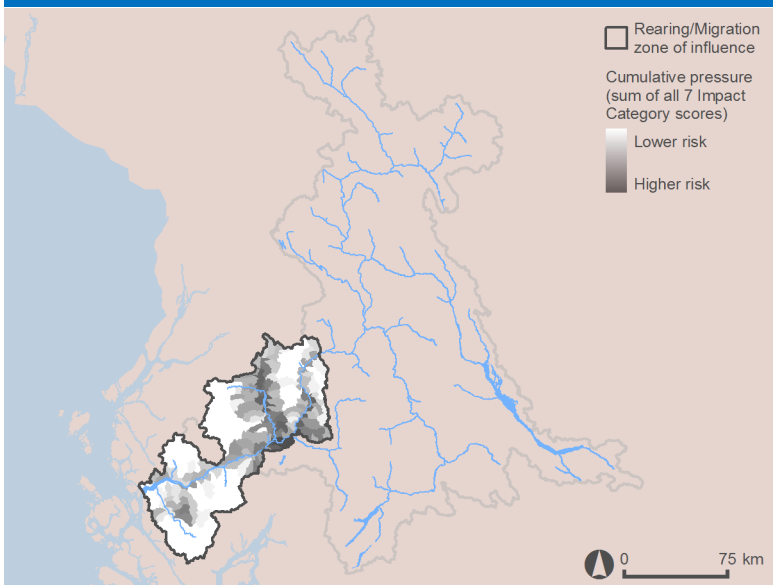
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

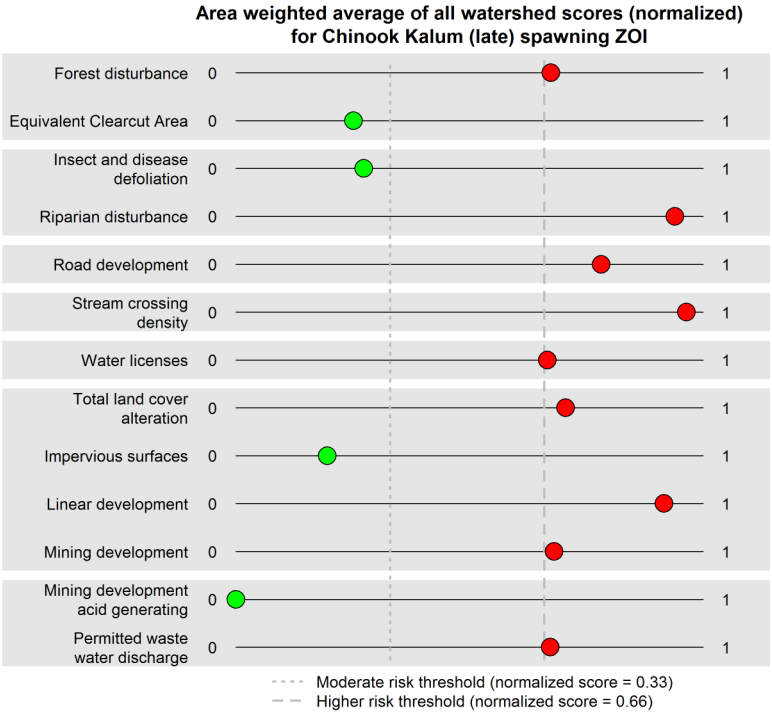
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

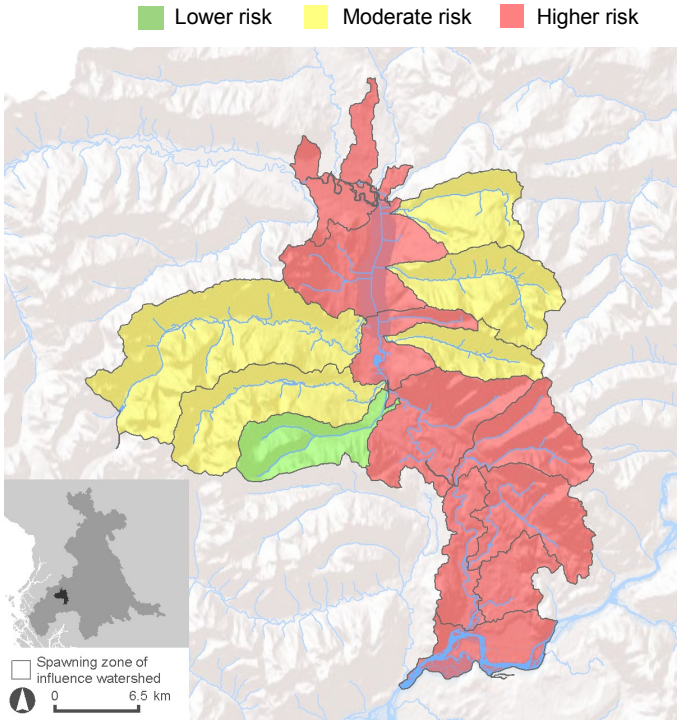
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

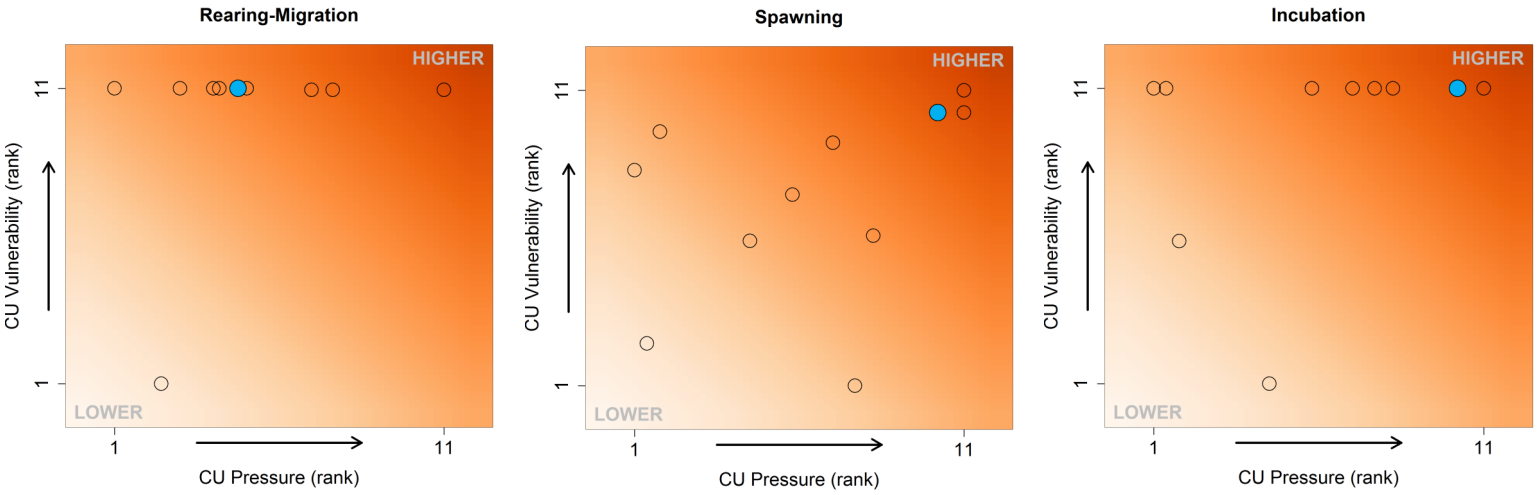


Cumulative pressure—spawning



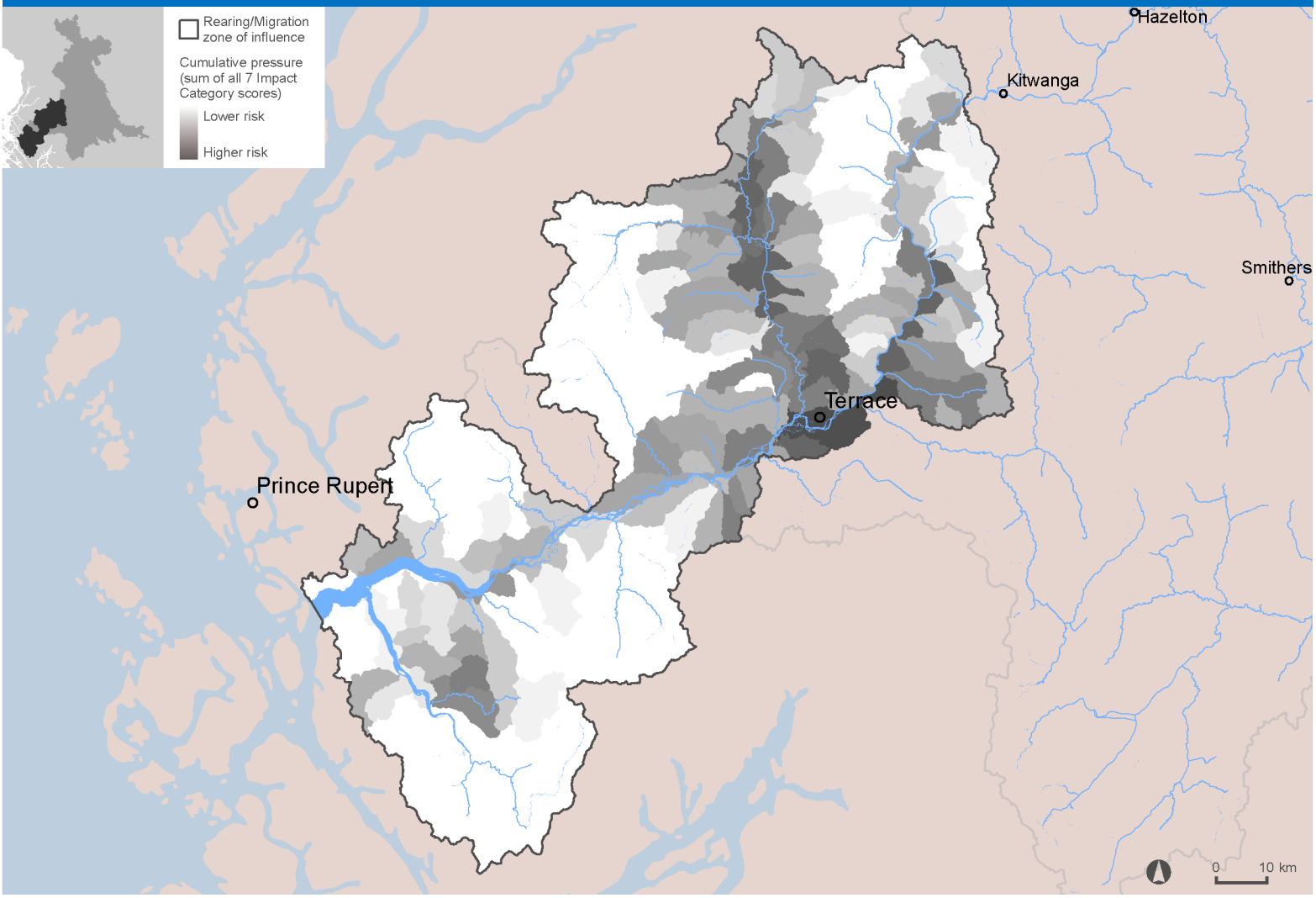
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Kalum (late) ○ = other Skeena Chinook CUs



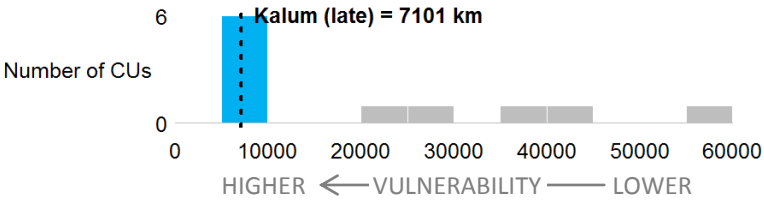
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

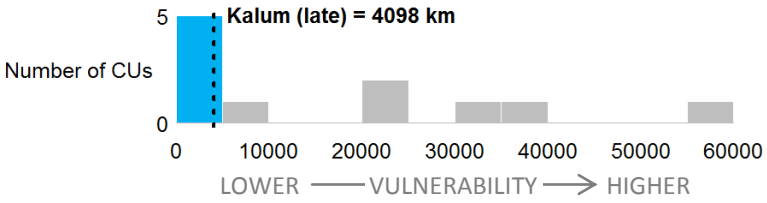


Rearing/Migration period vulnerability

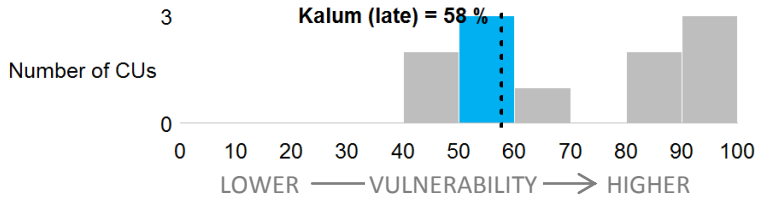
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



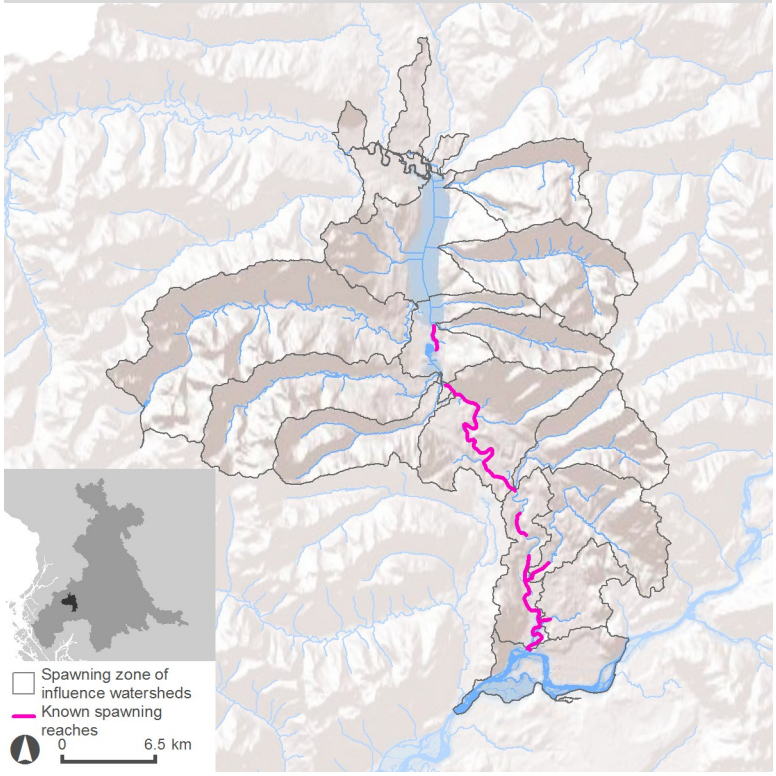
Flow sensitive accessible habitat (%) (all seasons)



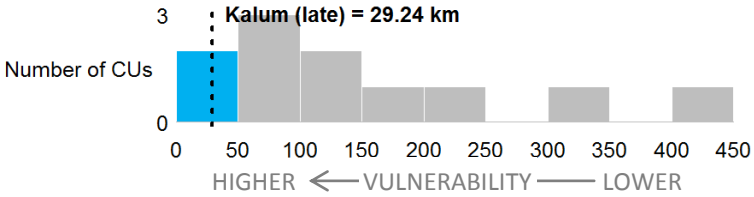
Spawning & incubation vulnerability

Spawning period vulnerability

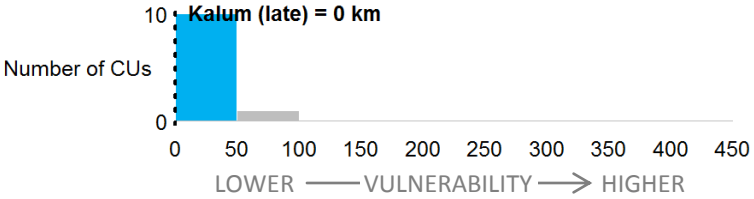
Spawning locations



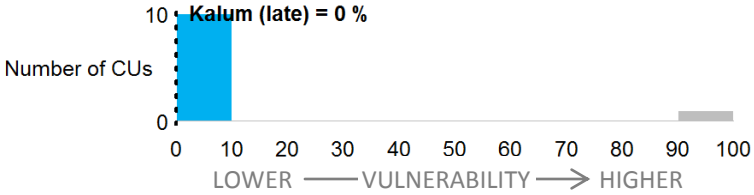
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

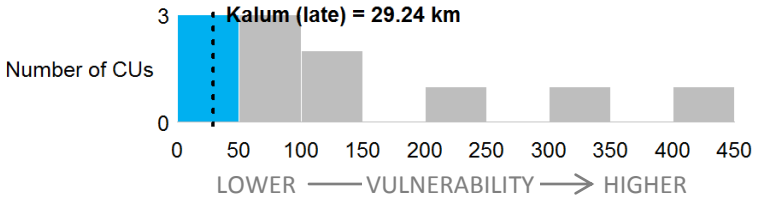


Spawning reaches summer flow sensitive - spawn timing (%)

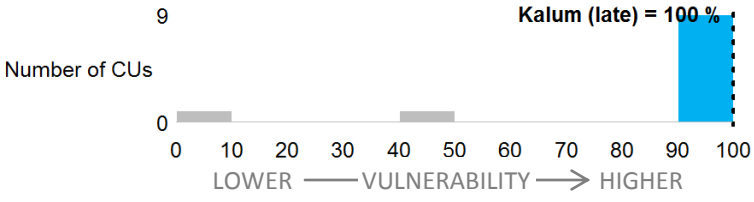


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



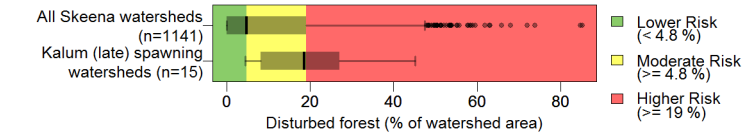
Spawning reaches winter flow sensitive - incubation timing (%)

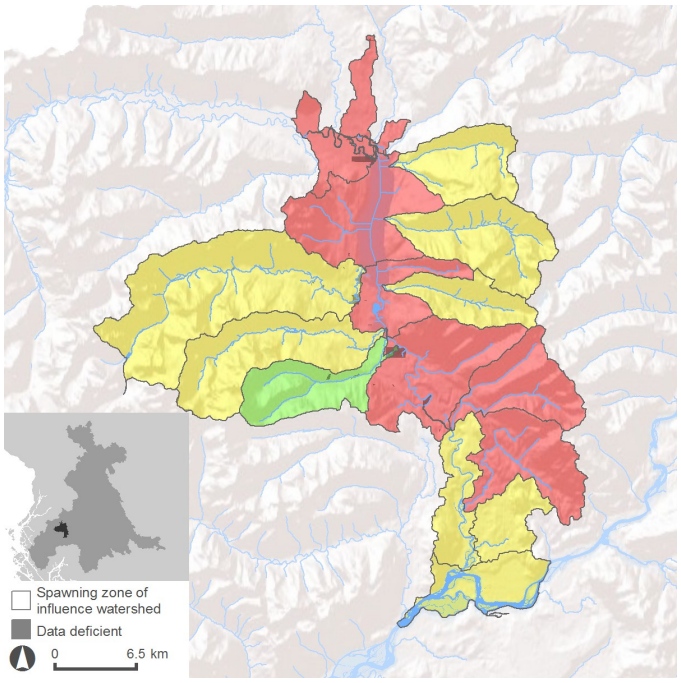


Spawning pressure

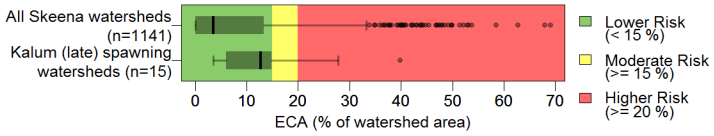
Hydrologic Processes

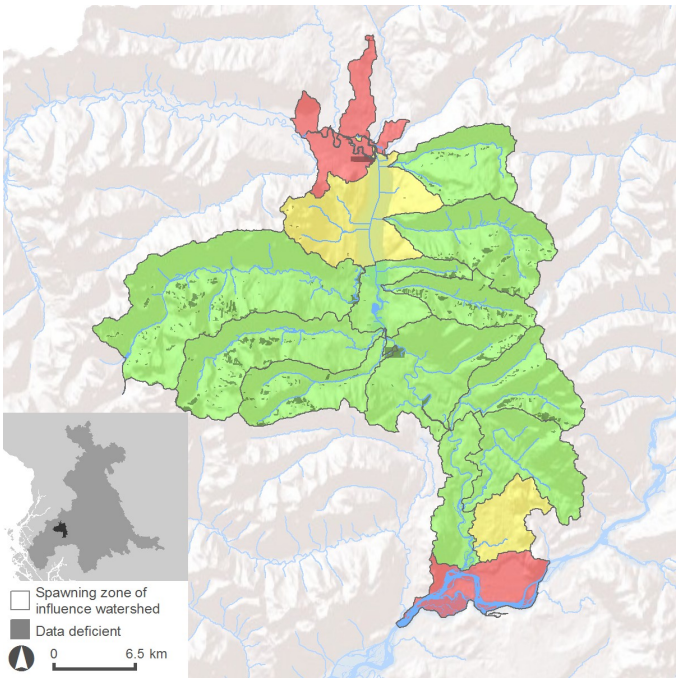
Forest disturbance





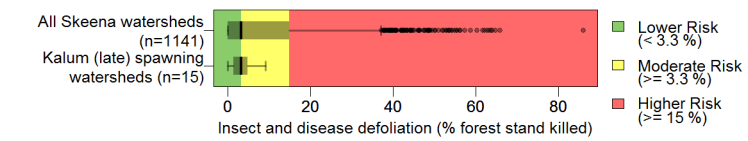
Equivalent Clear-cut Area

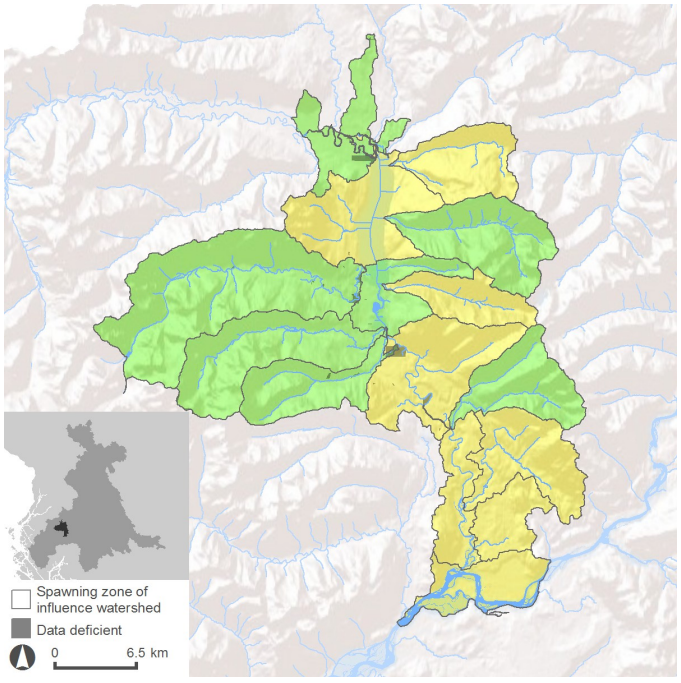




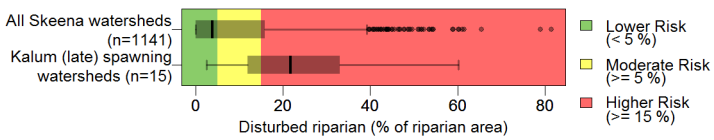
Vegetation Quality

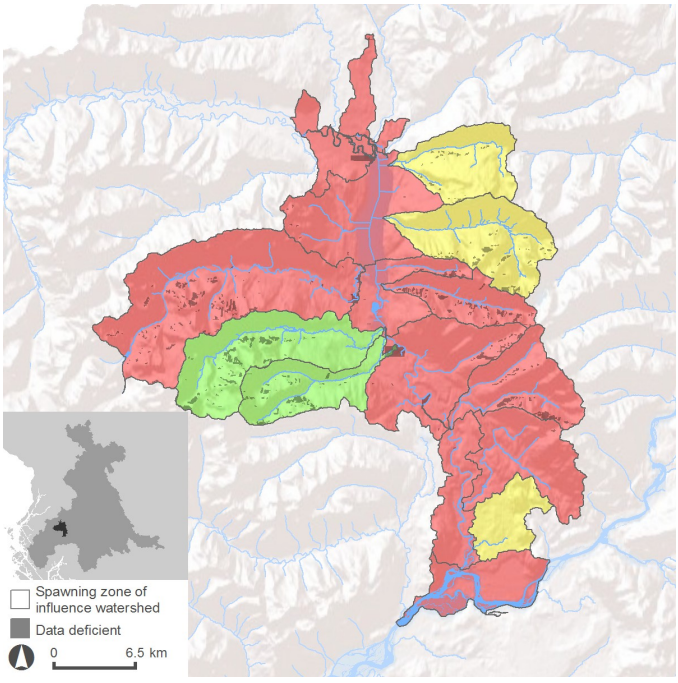
Insect and disease defoliation





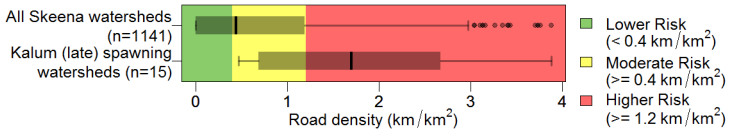
Riparian disturbance

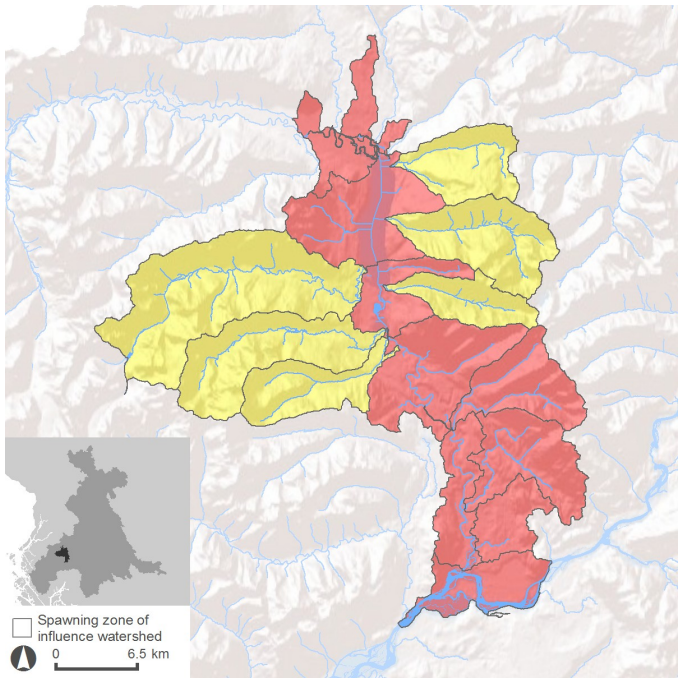




Surface Erosion

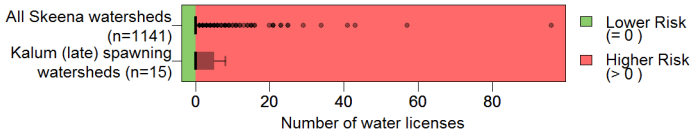
Road development

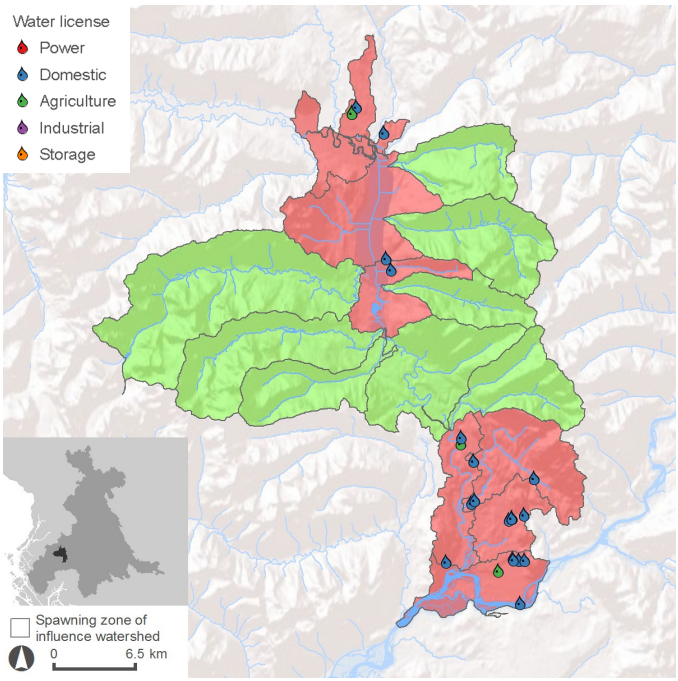




Water Quantity

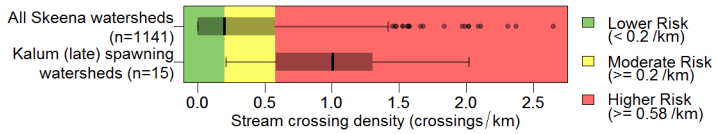
Number of water licenses

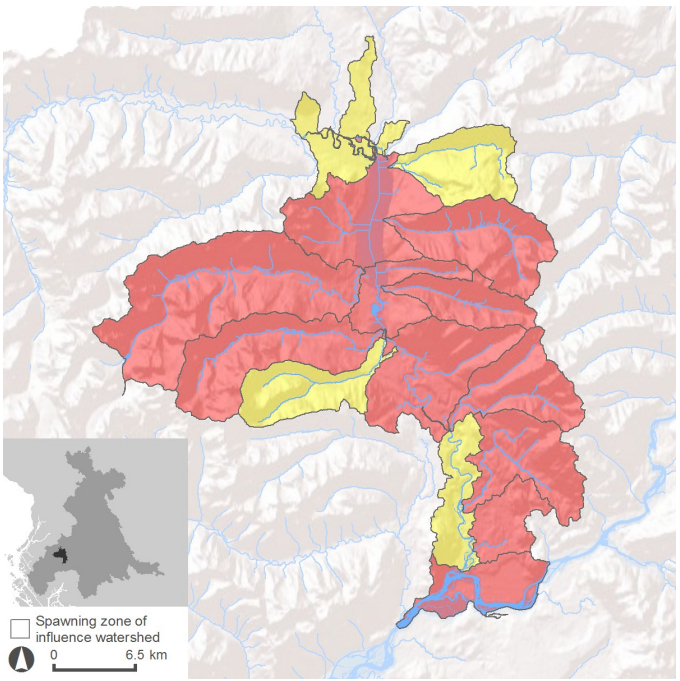




Fish Passage/Habitat Connectivity

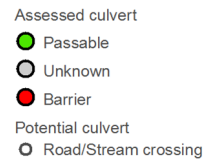
Stream crossing density

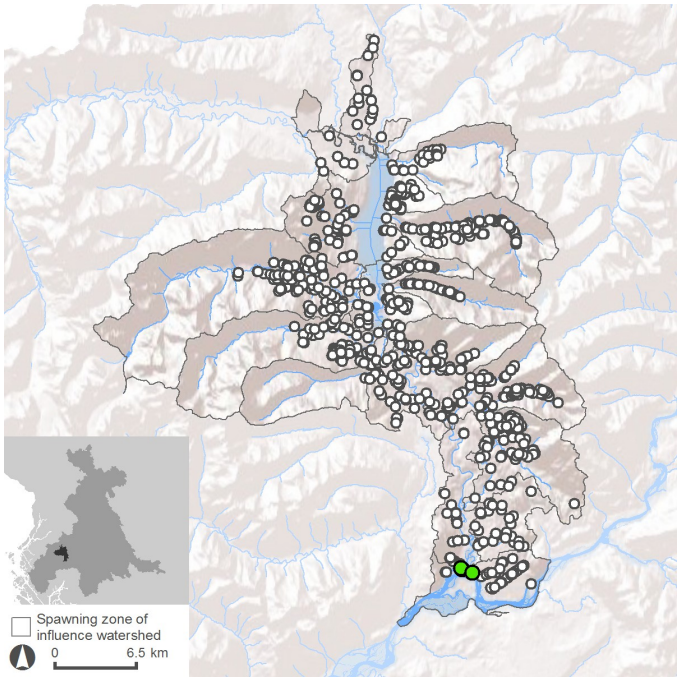




Culvert passability

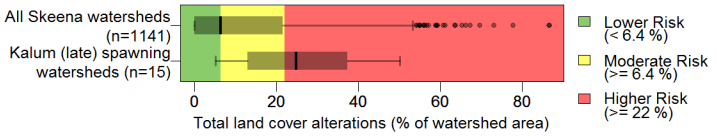
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

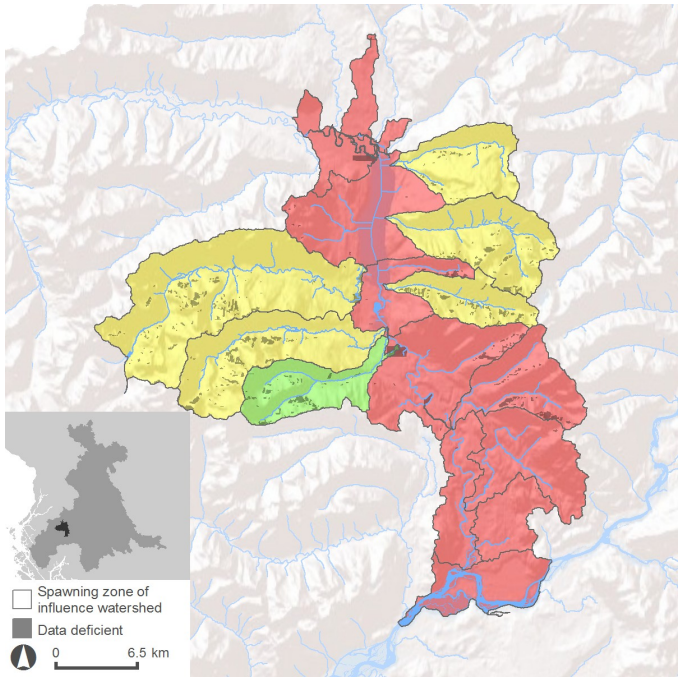




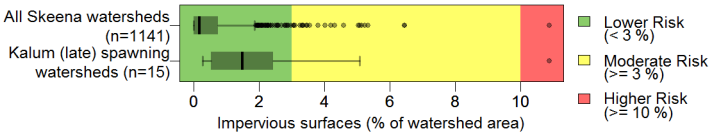
Human Development Footprint

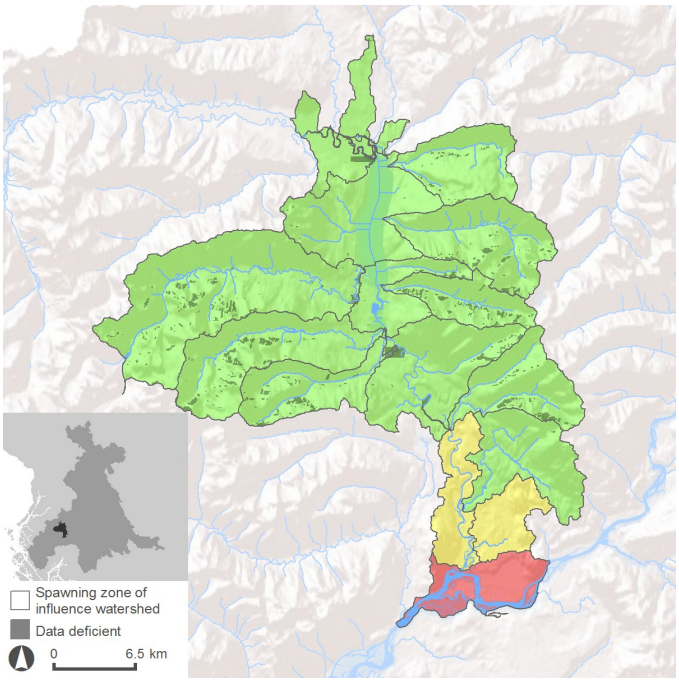
Total land cover alteration



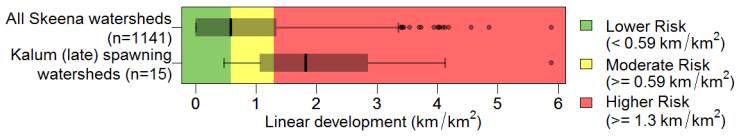


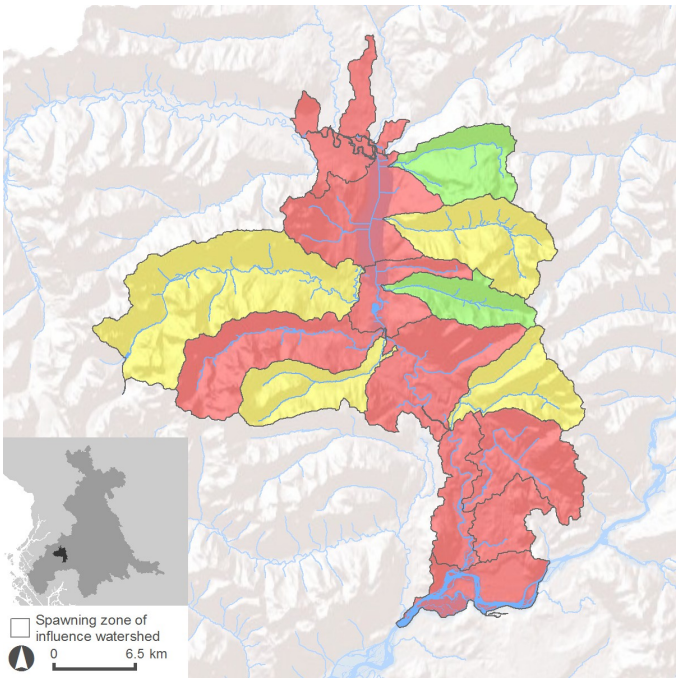
Impervious surfaces



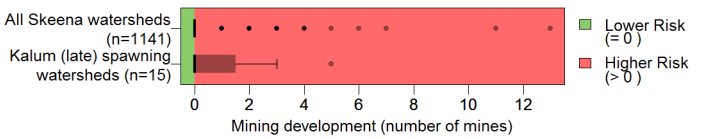


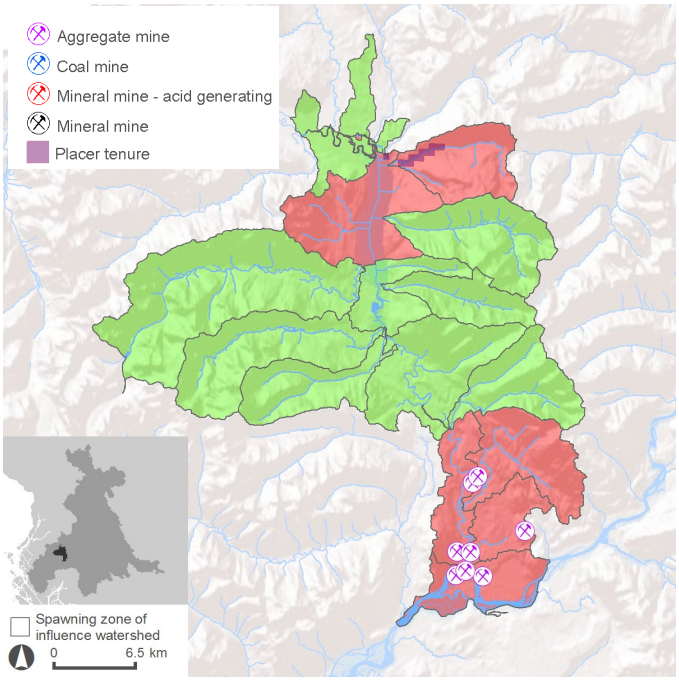
Linear development





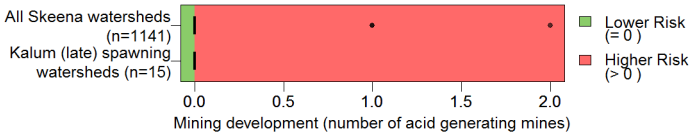
Mining development (total number of mines)

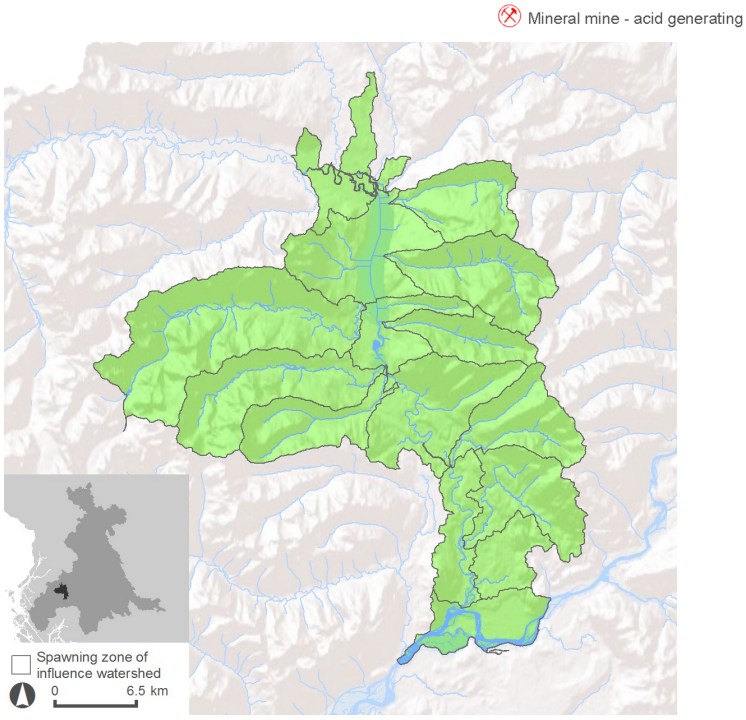




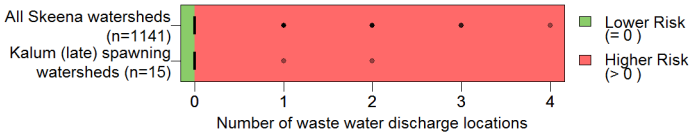
Water Quality

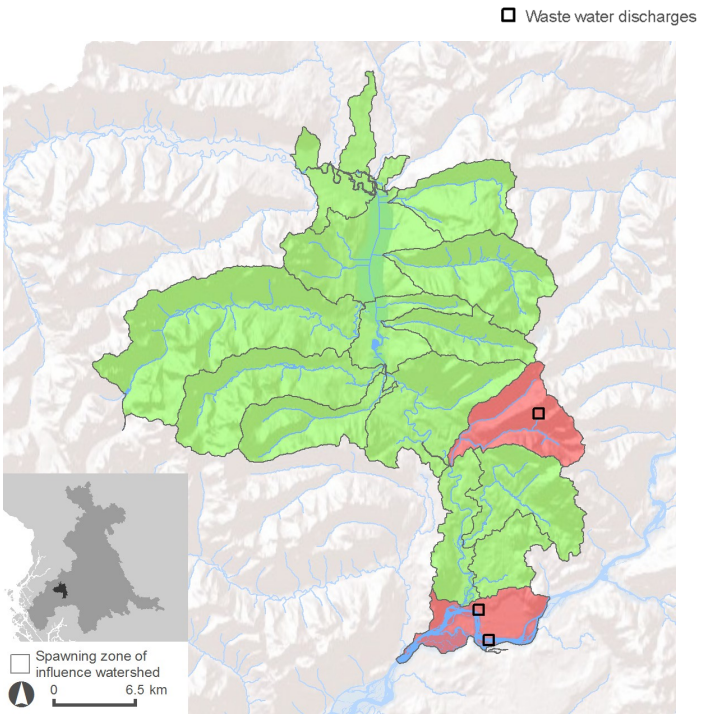
Mining development (acid generating mines)





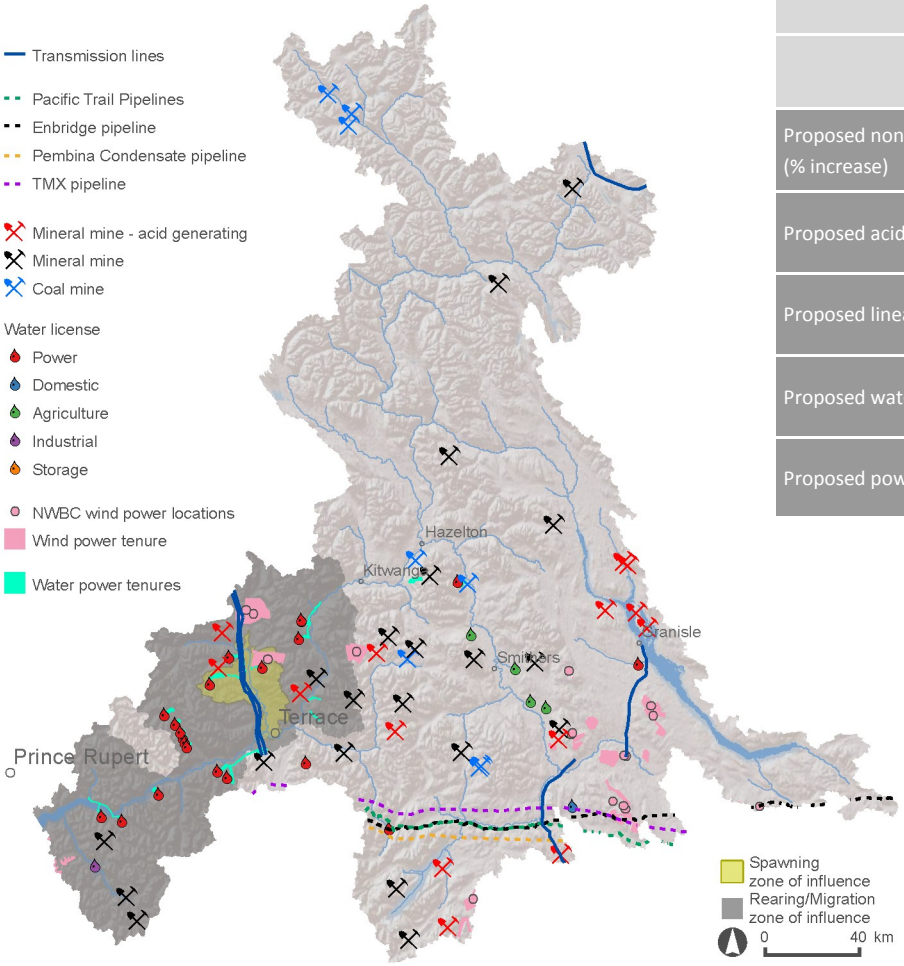
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Kalum (late) Chinook CU summary		
	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	4 (6%)	0 (0%)
Proposed acid generating mines (% increase)	3 (300%)	0 (NA)
Proposed linear development (% increase)	0.01 km/km^2 (2%)	0.07 km/km^2 (4%)
Proposed water licenses (% increase)	23 (16%)	3 (8%)
Proposed power tenures	272 km^2	51 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Lakelse

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

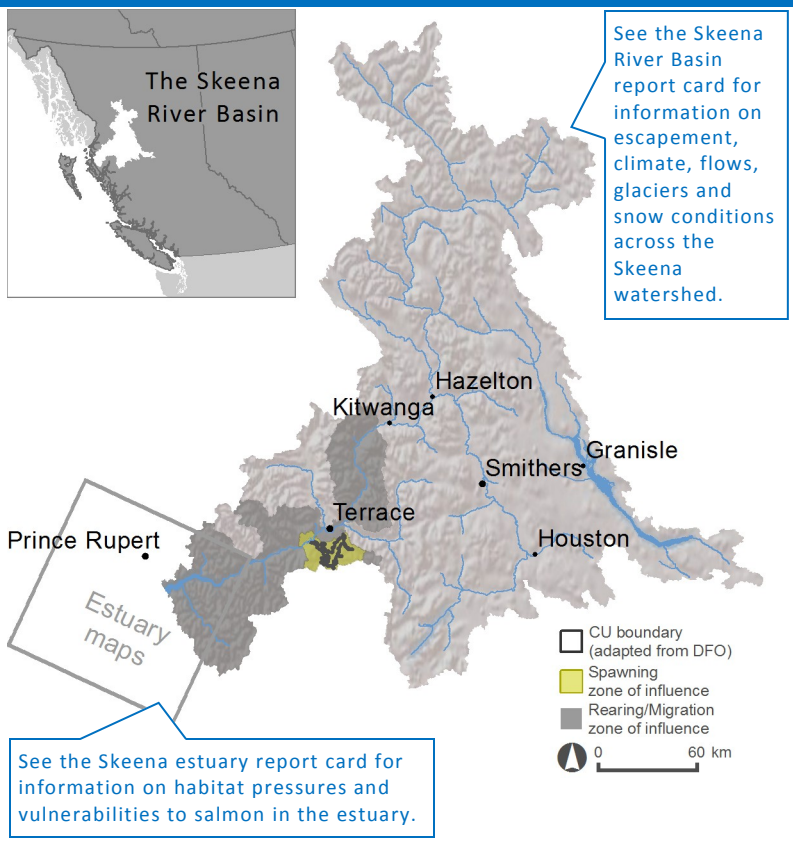
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Spawning and rearing habitats within this CU are composed of impacted sites in the tributaries and nearly natural condition sites in the Lakelse River.
* Chinook spawn principally downstream of the lake outlet with limited spawning in the Lakelse River mainstem in a patchwork of small groundwater receiving areas.
* Logging and related roads, as well as urban development are the most widespread land use activity that has adversely affected high-value tributary Chinook habitat.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

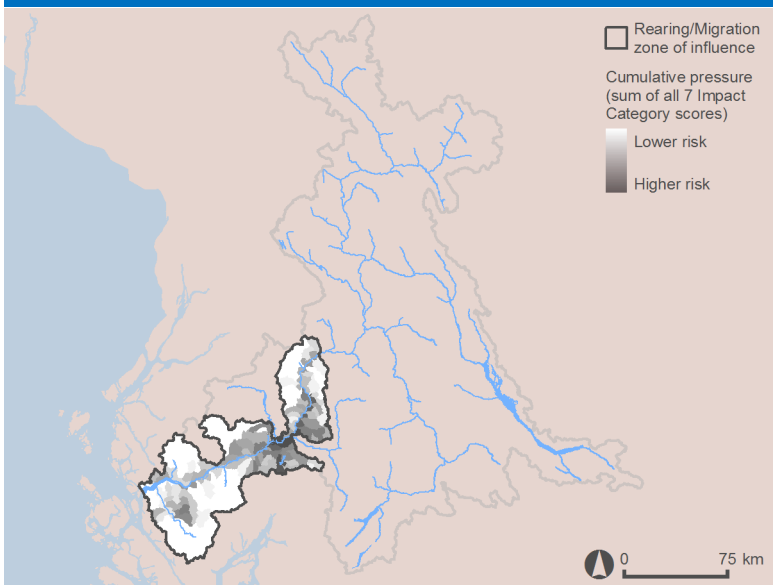
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

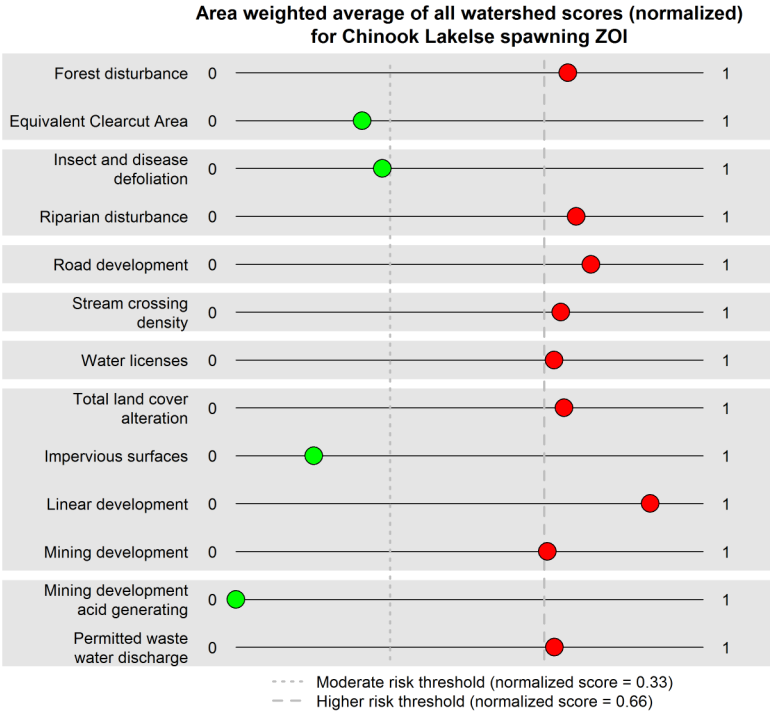
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

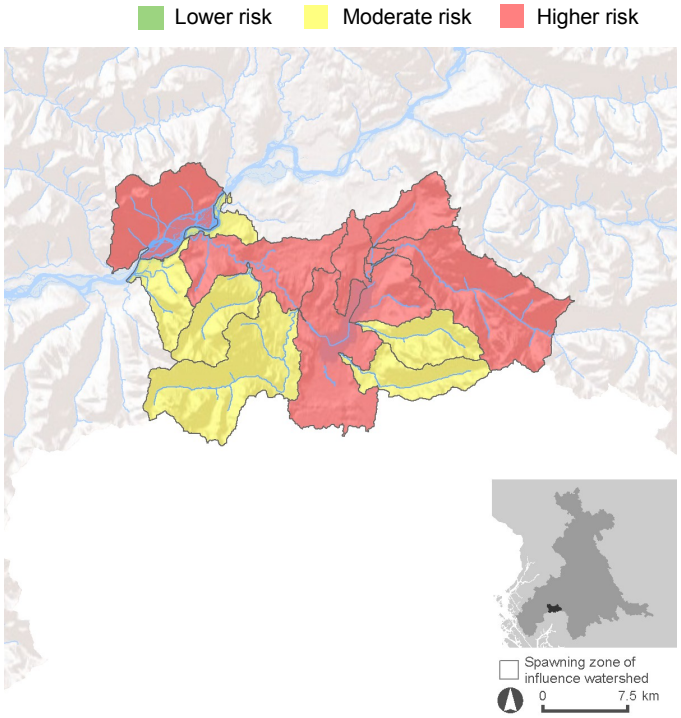
Cumulative pressure—rearing/migration



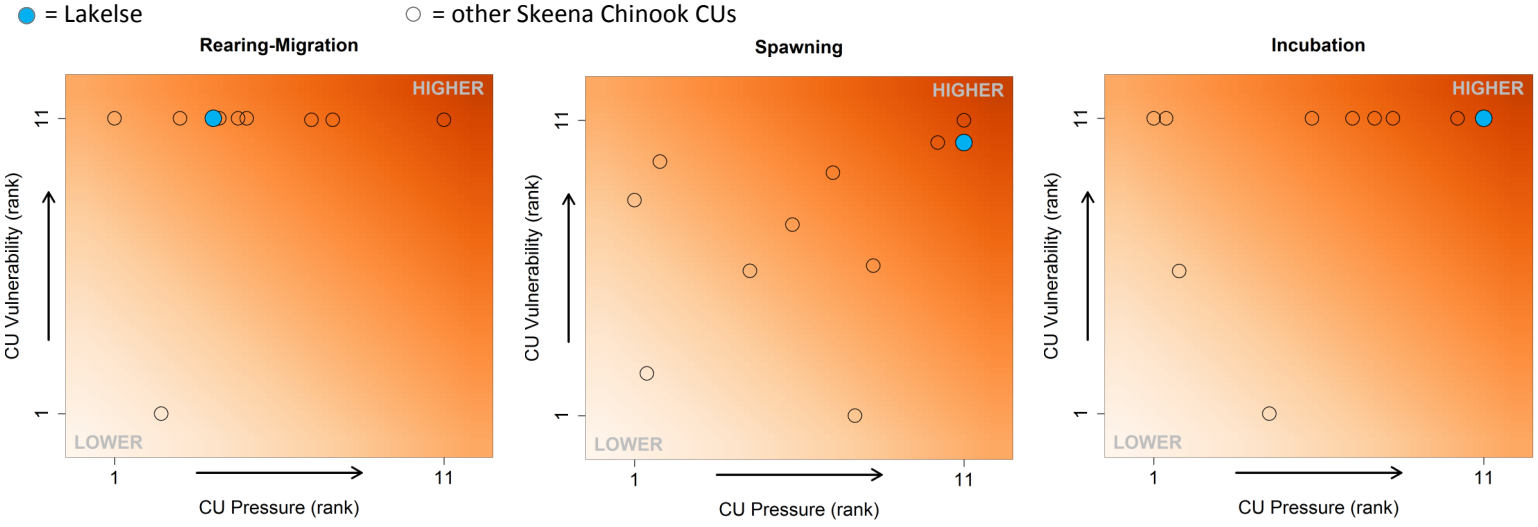
Summary of pressure indicators—spawning



Cumulative pressure—spawning

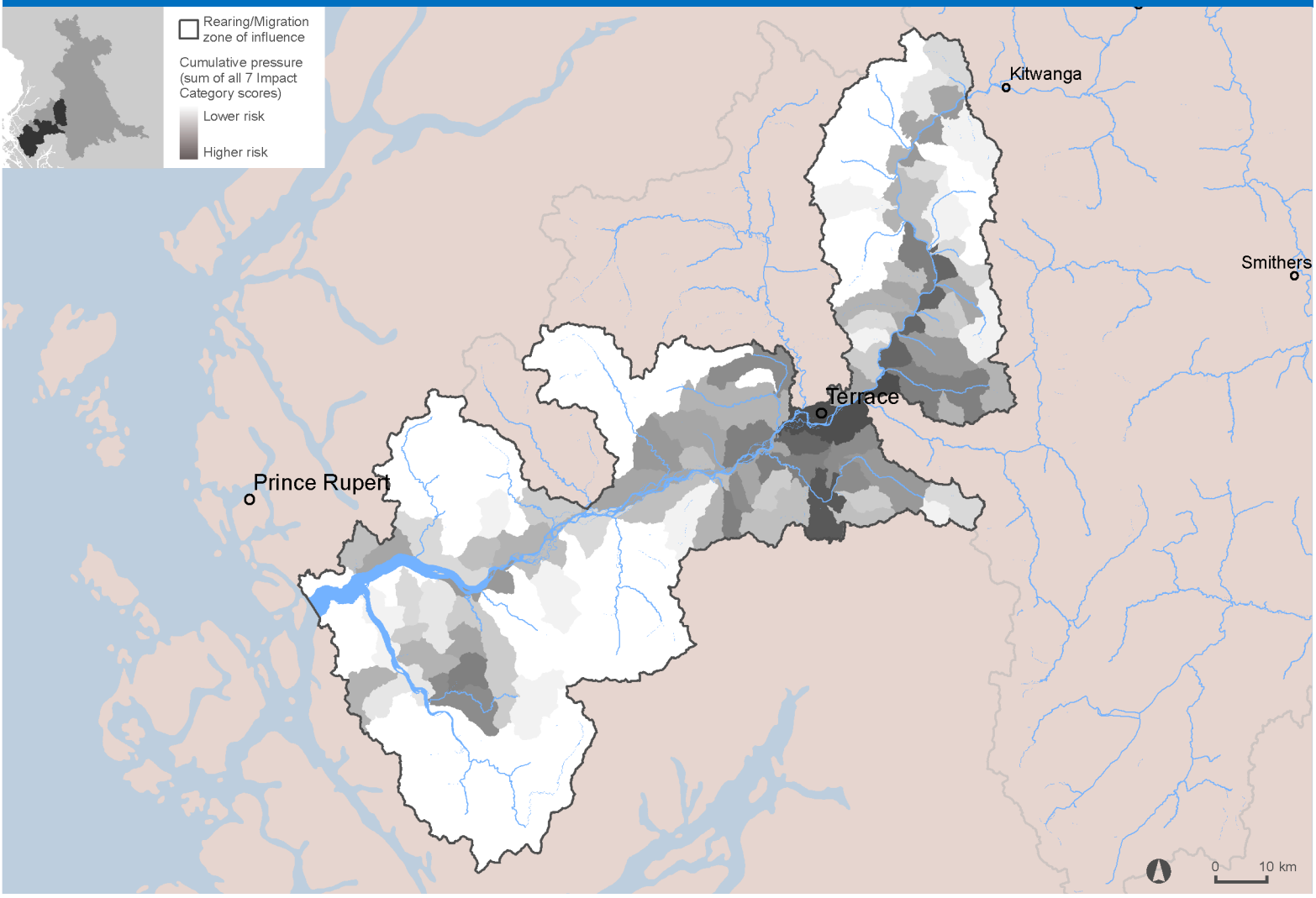


Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation



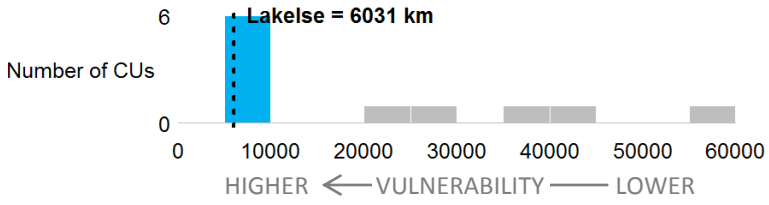
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

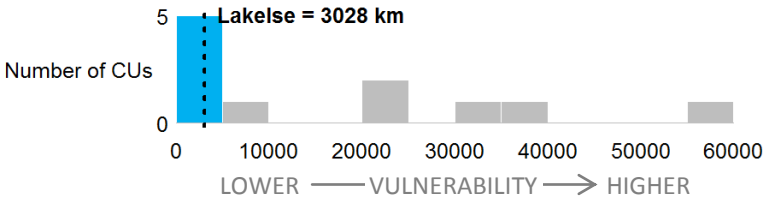


Rearing/Migration period vulnerability

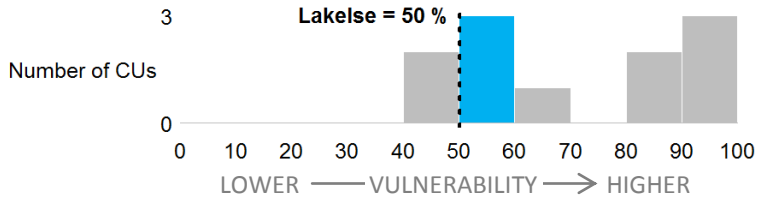
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



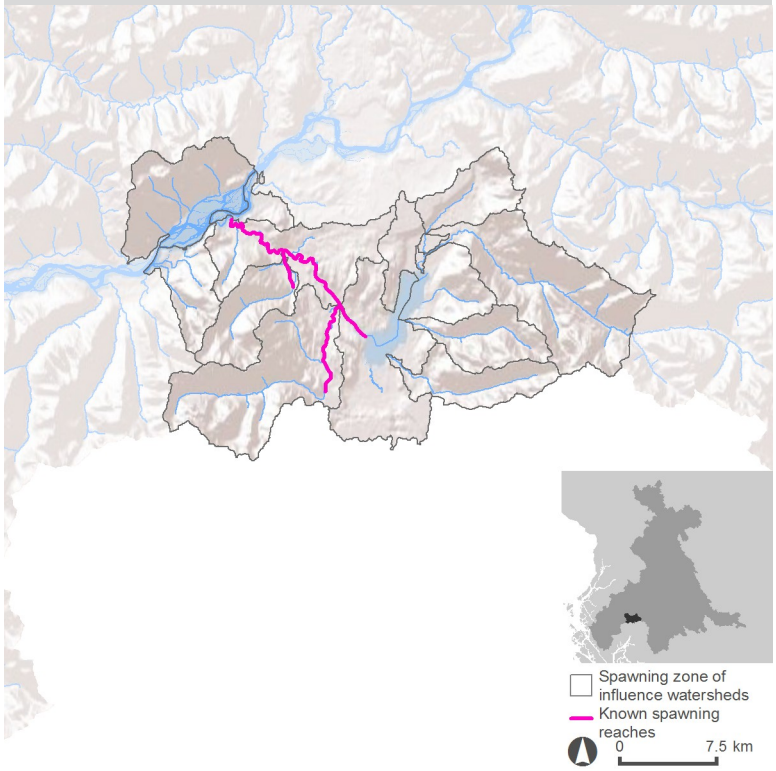
Flow sensitive accessible habitat (%) (all seasons)



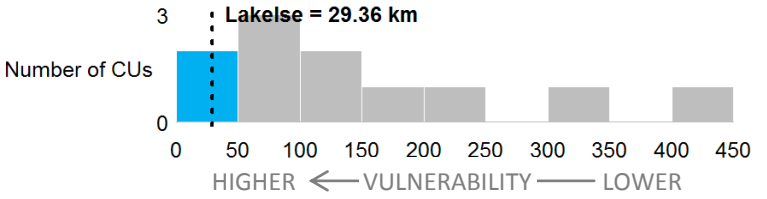
Spawning & incubation vulnerability

Spawning period vulnerability

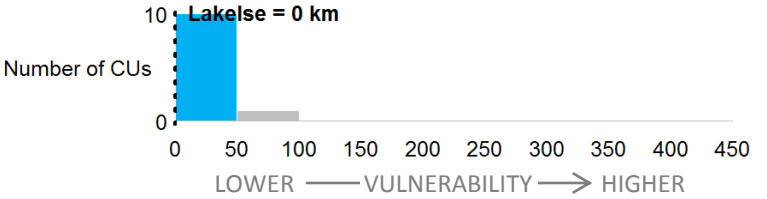
Spawning locations



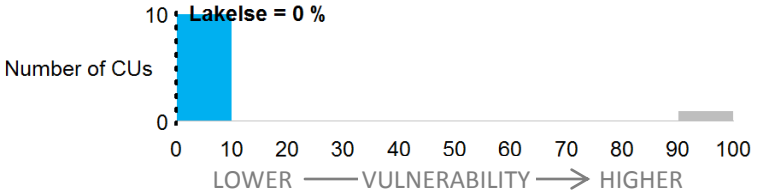
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

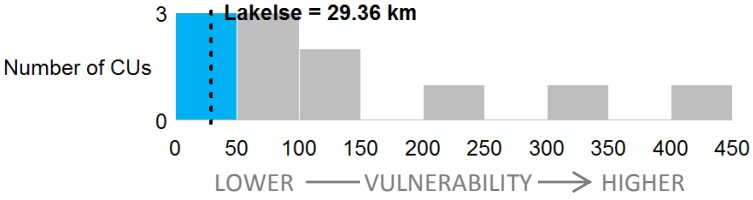


Spawning reaches summer flow sensitive - spawn timing (%)

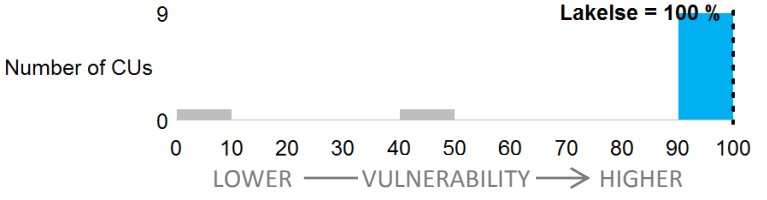


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



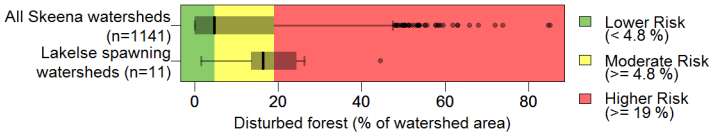
Spawning reaches winter flow sensitive - incubation timing (%)

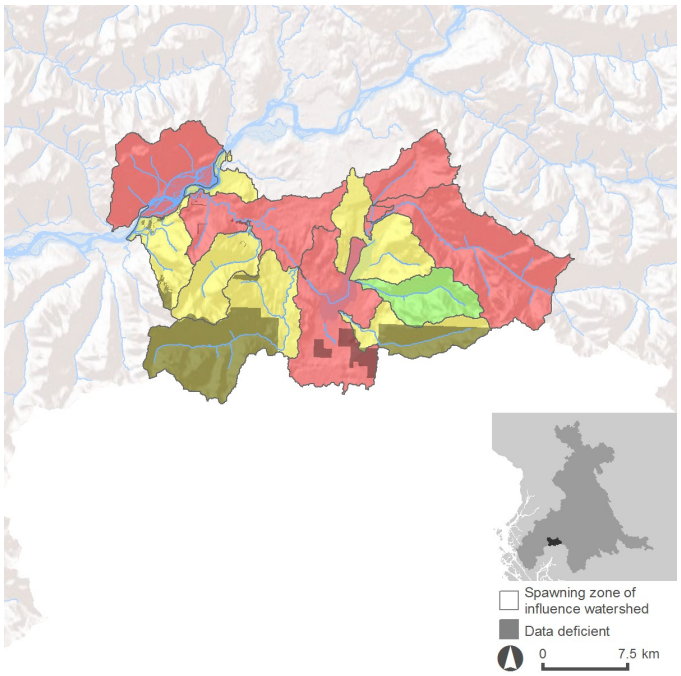


Spawning pressure

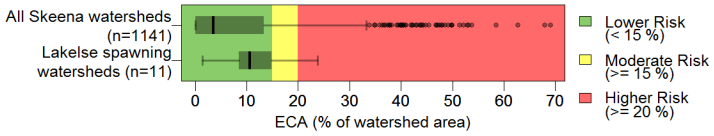
Hydrologic Processes

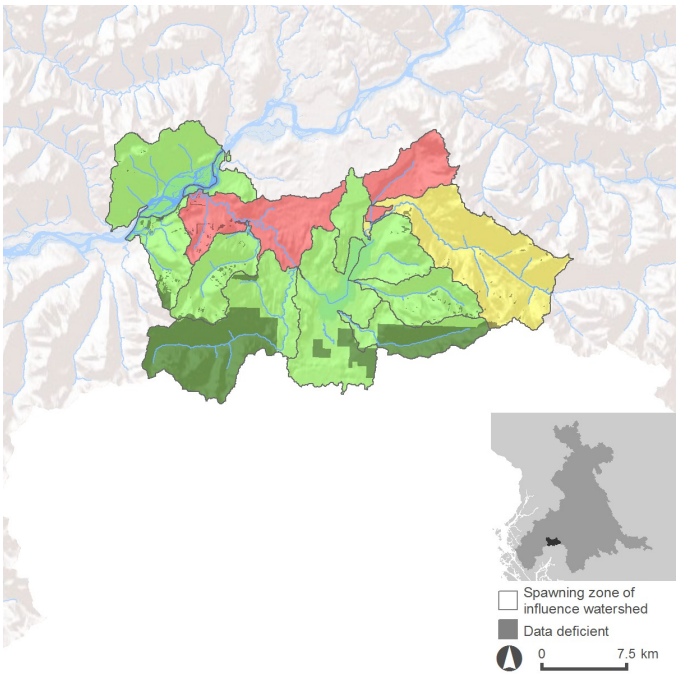
Forest disturbance





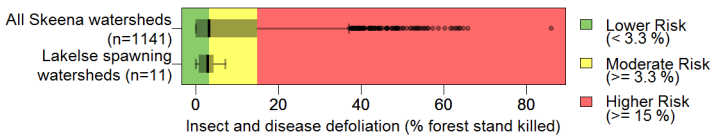
Equivalent Clear-cut Area

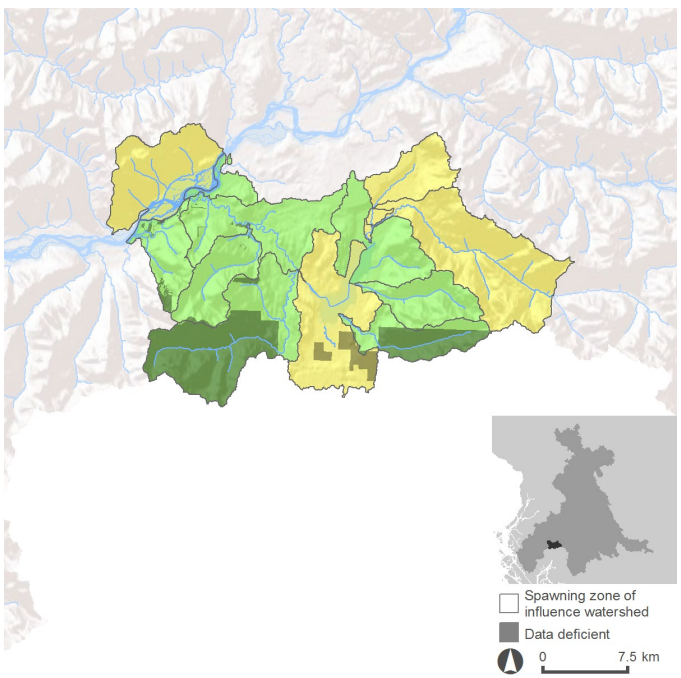




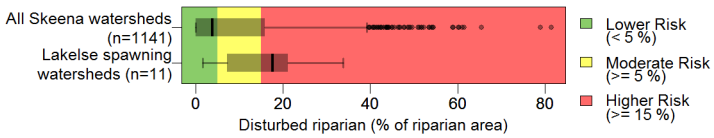
Vegetation Quality

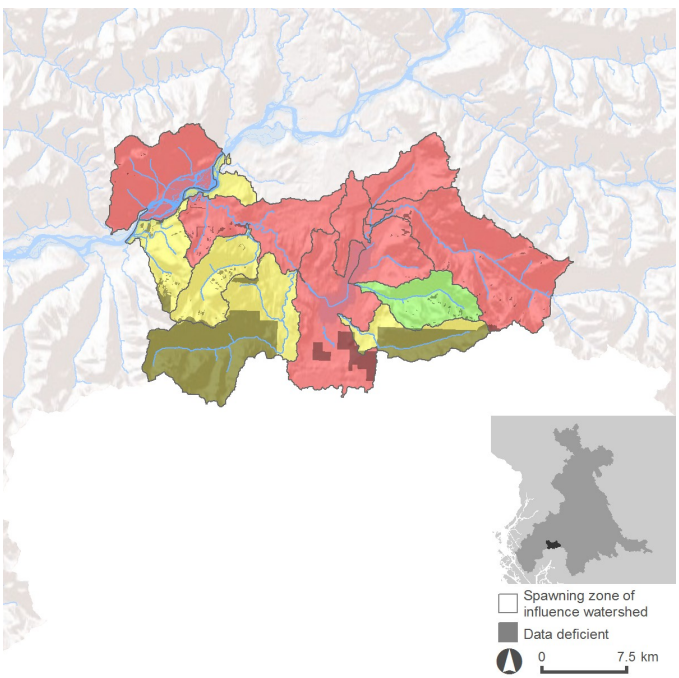
Insect and disease defoliation





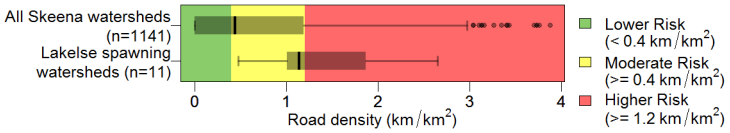
Riparian disturbance

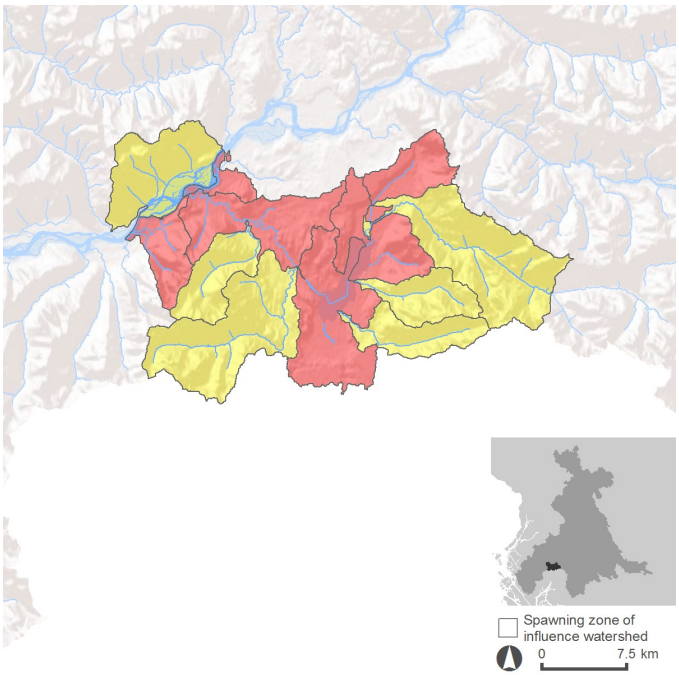




Surface Erosion

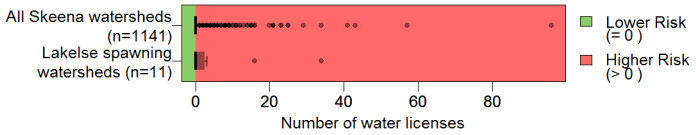
Road development

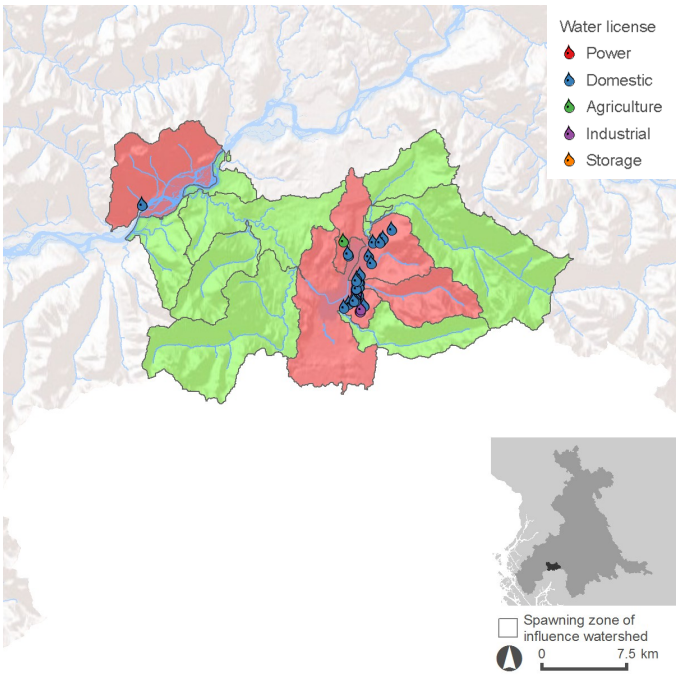




Water Quantity

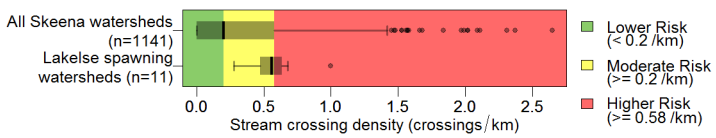
Number of water licenses

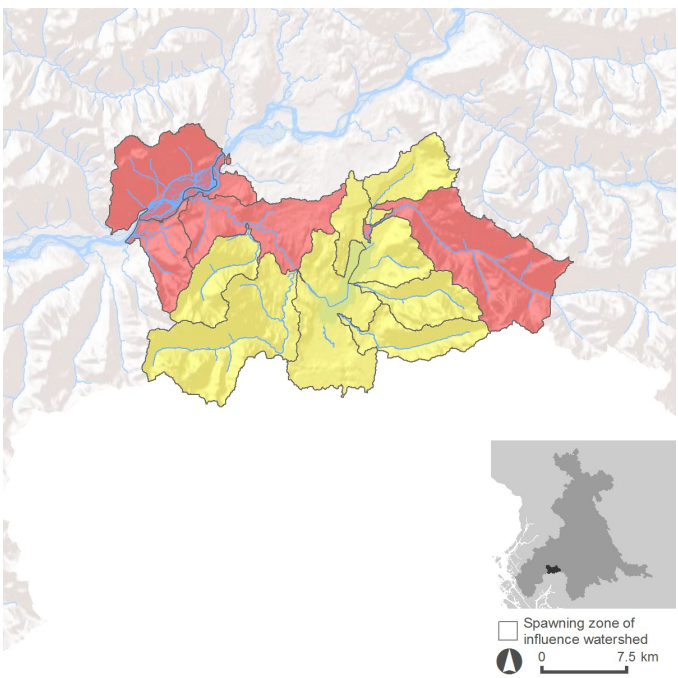




Fish Passage/Habitat Connectivity

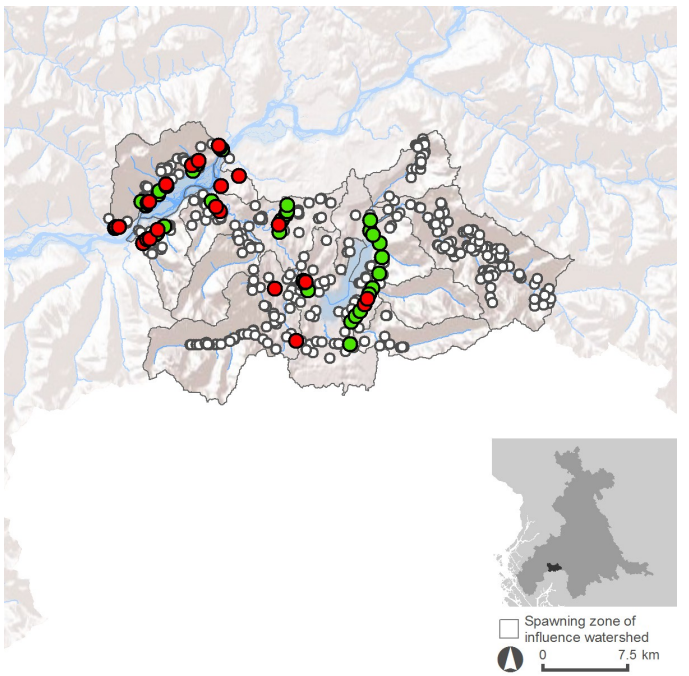
Stream crossing density





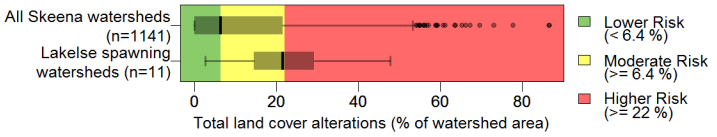
Culvert passability

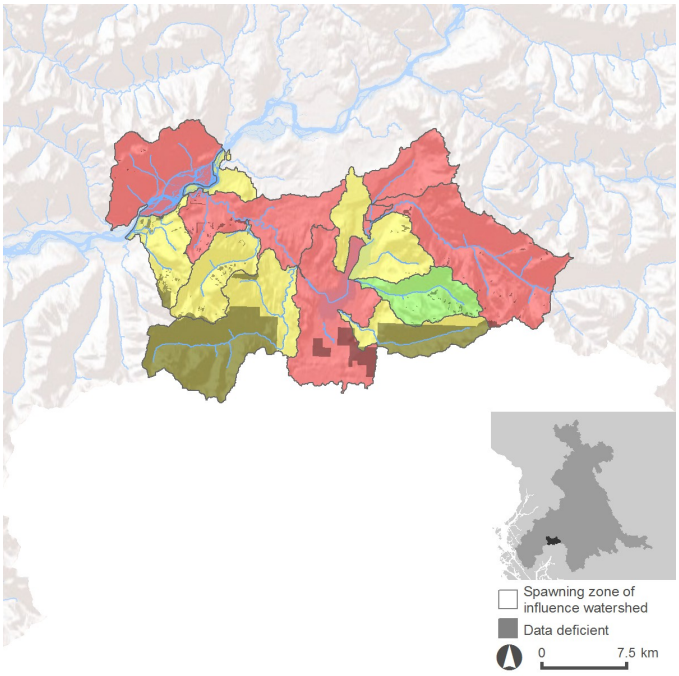
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



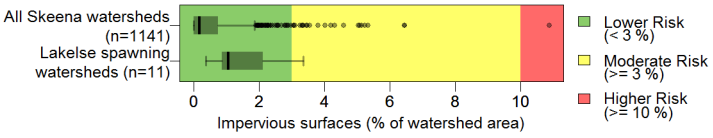
Human Development Footprint

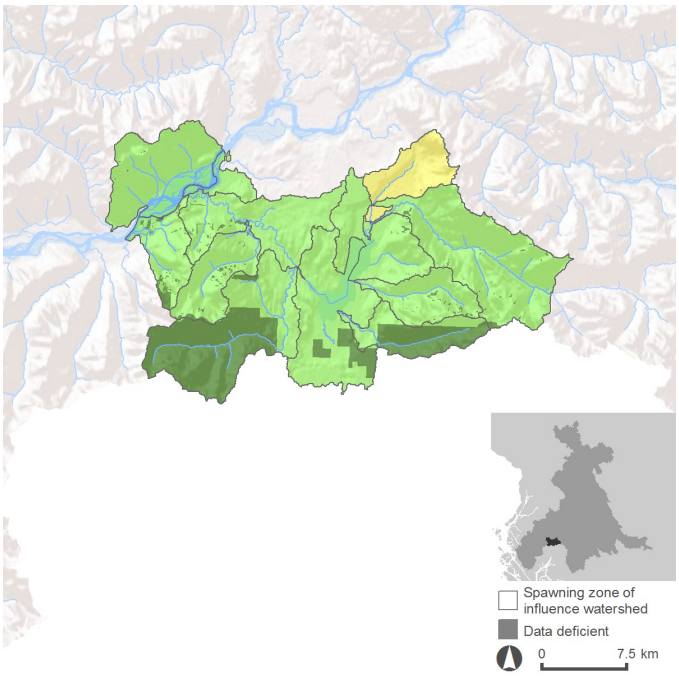
Total land cover alteration



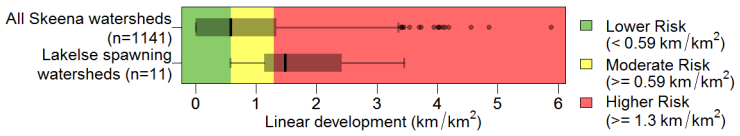


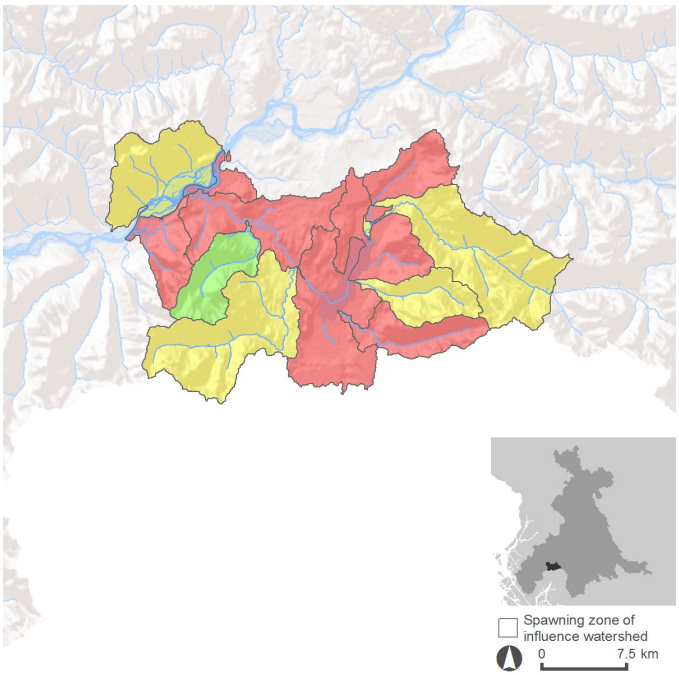
Impervious surfaces



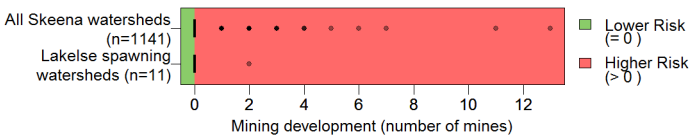


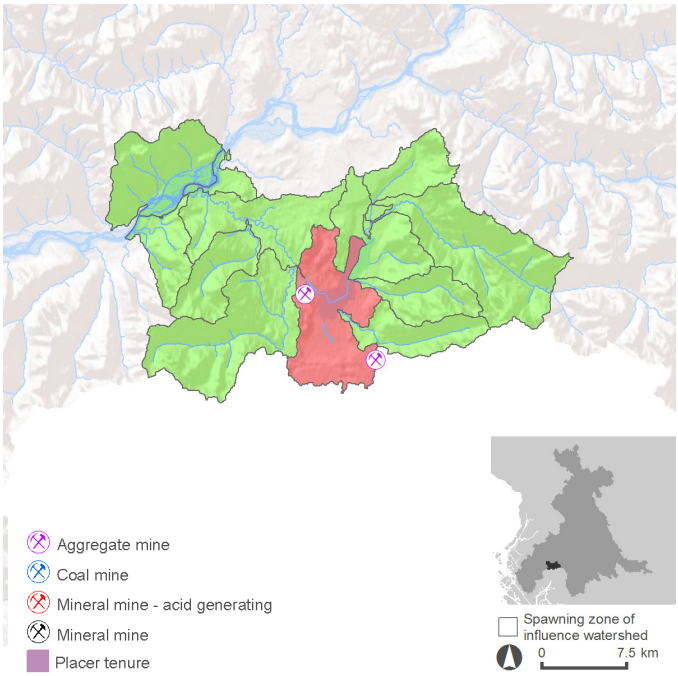
Linear development





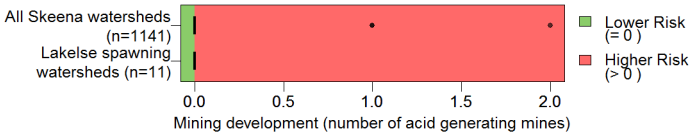
Mining development (total number of mines)

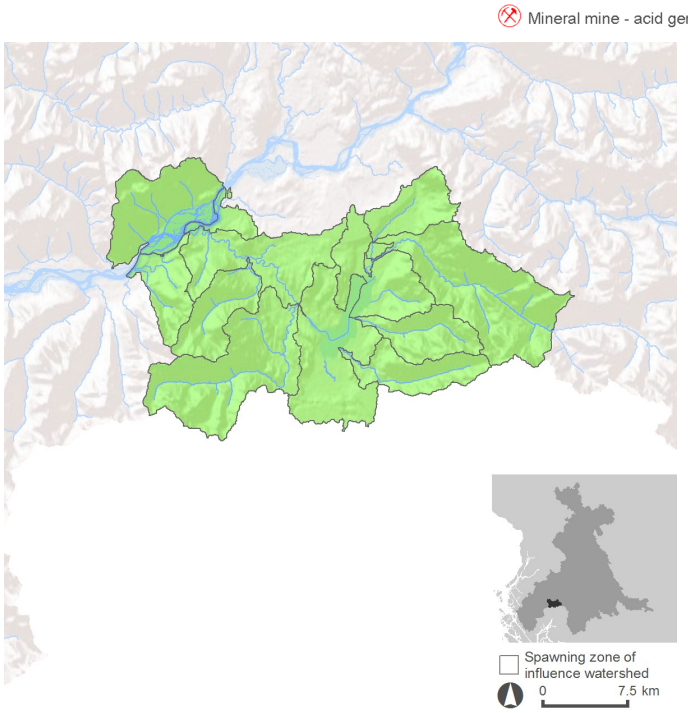




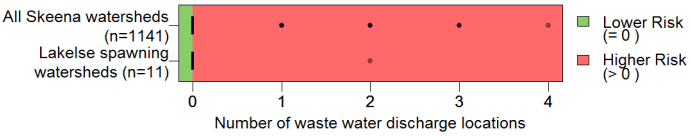
Water Quality

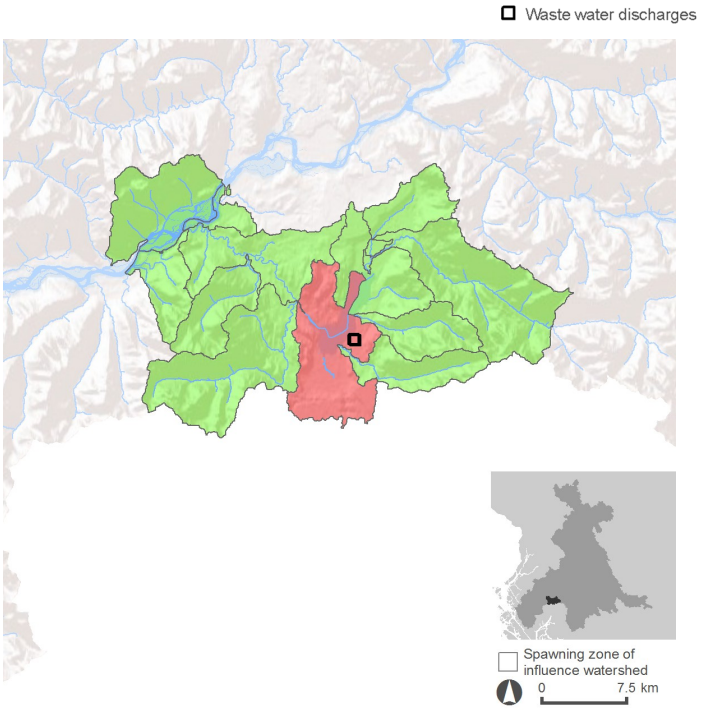
Mining development (acid generating mines)





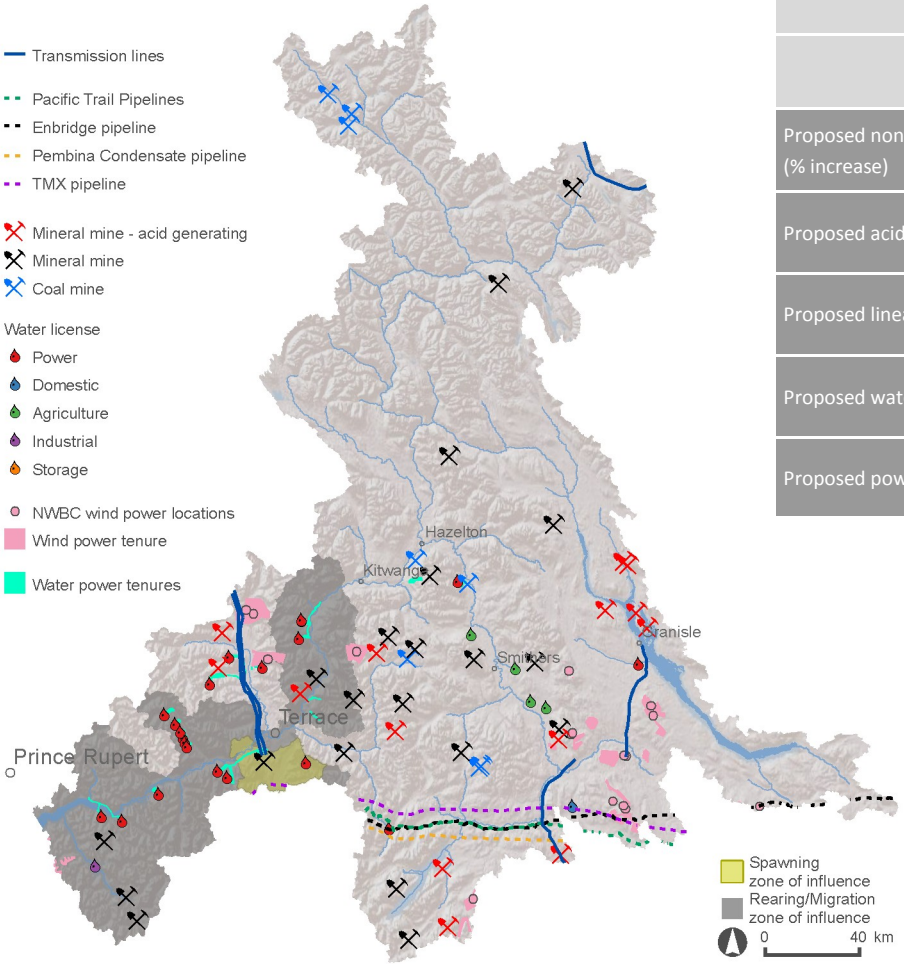
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Lakelse Chinook CU summary

	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	5 (11%)	1 (50%)
Proposed acid generating mines (% increase)	1 (100%)	0 (NA%)
Proposed linear development (% increase)	0.007 km/km^2 (1%)	0.02 km/km^2 (1%)
Proposed water licenses (% increase)	20 (12%)	2 (4%)
Proposed power tenures	119 km^2	10 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Lower Skeena

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

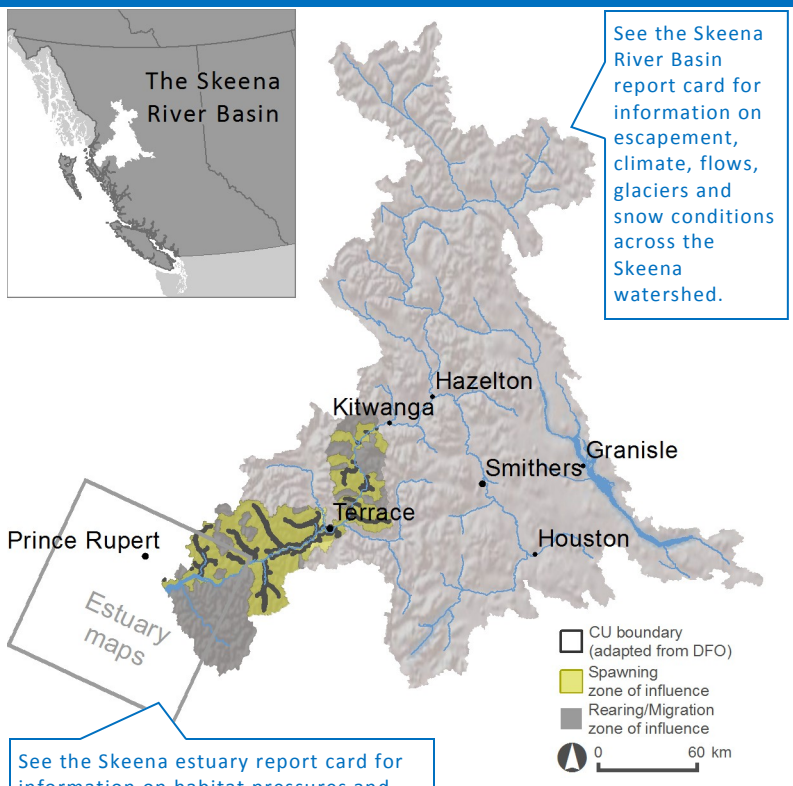
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Tidal influence extends approximately 55 km upstream to the Kasiks River and most Skeena mainstem Chinook spawning is located upstream to the Terrace area.
* Spawning and rearing habitats within this CU are composed of impacted and natural condition sites. Spawning sites are closely related to groundwater inflows. Generally the habitat is in good condition except for the Zymagotitz drainage.
* Logging and related road development is the most widespread land use activity that has adversely affected high-value tributary Chinook habitat particularly in the Zymagotitz system.
* Linear developments such as rail and road corridors have resulted in considerable impacts to high-value Chinook spawning and rearing habitat, especially side and back channel floodplain habitats cut-off from the Skeena mainstem.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, as well as changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

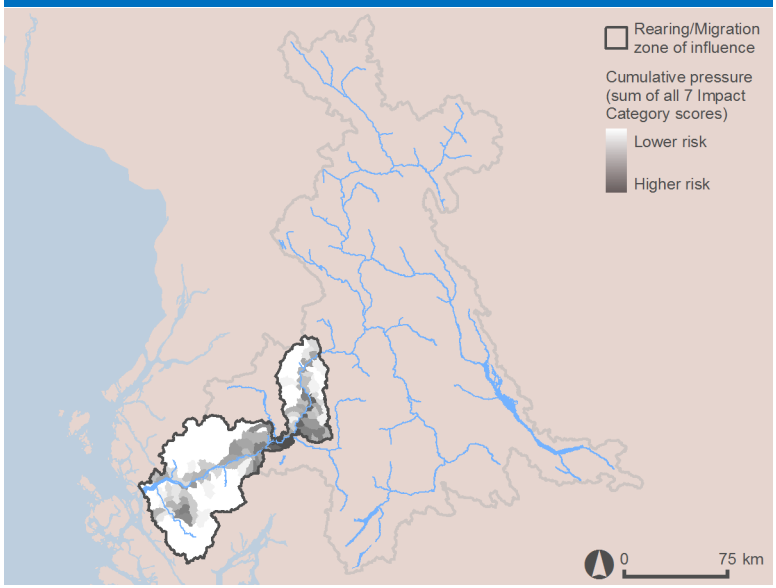
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

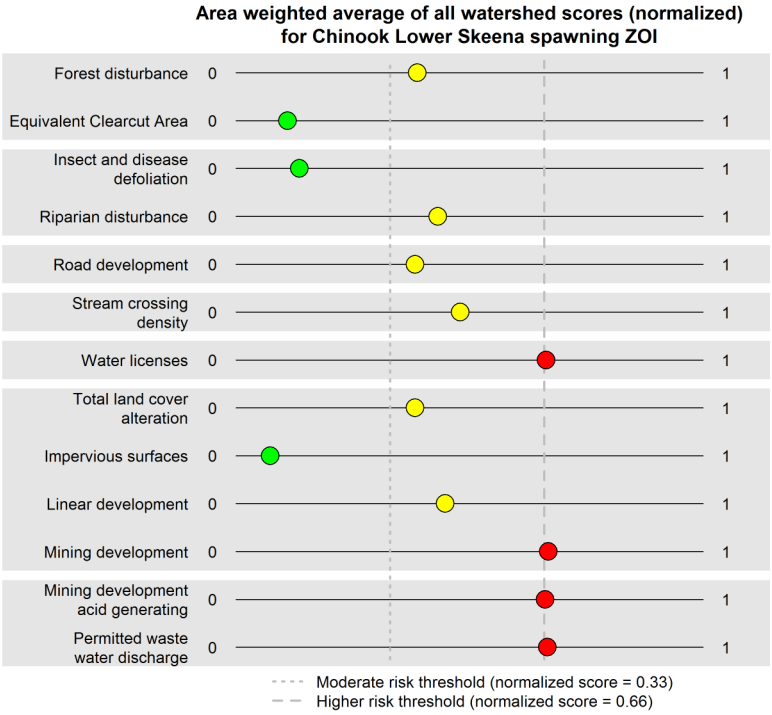
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

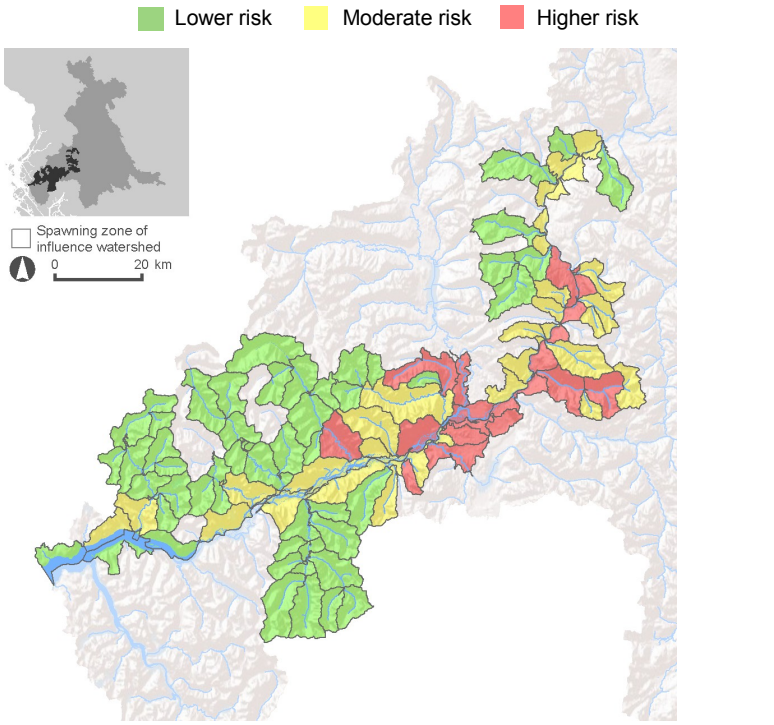
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

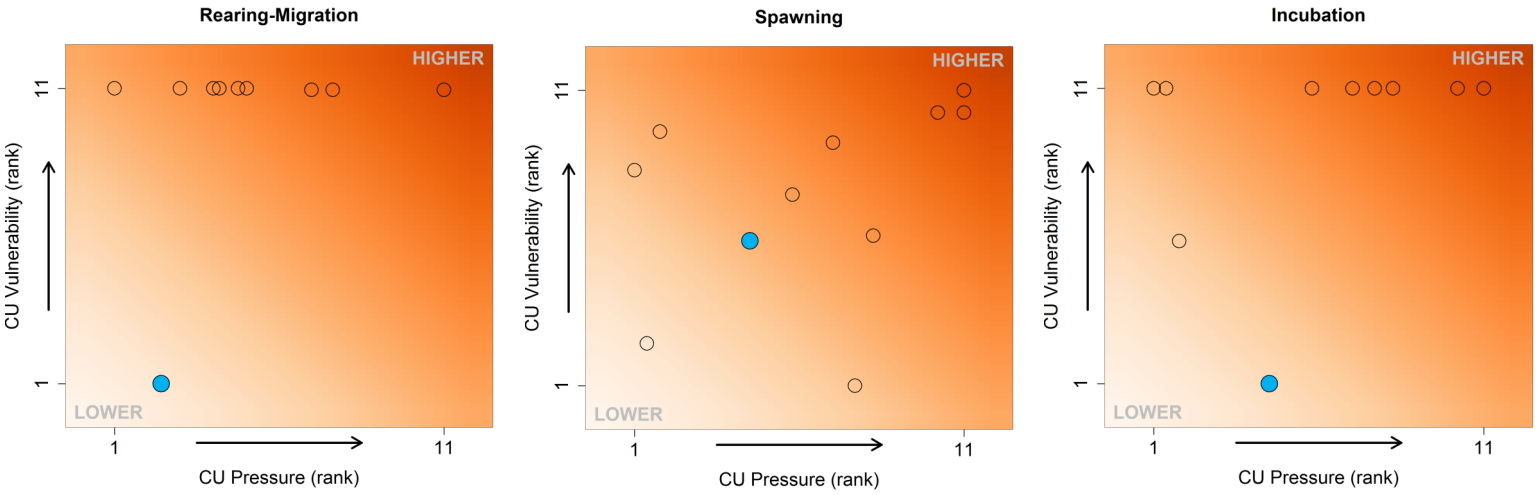


Cumulative pressure—spawning



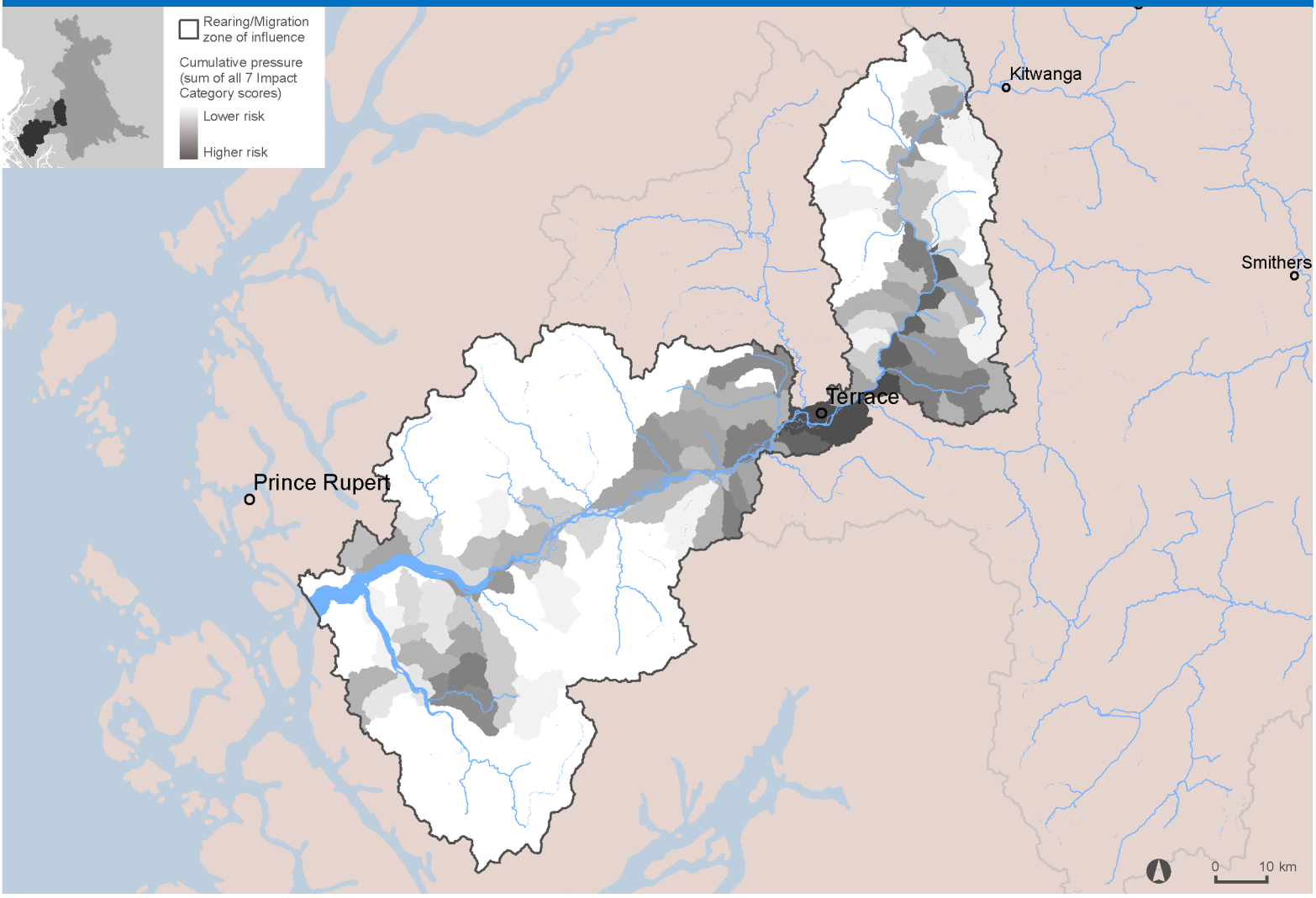
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Lower Skeena ○ = other Skeena Chinook CUs



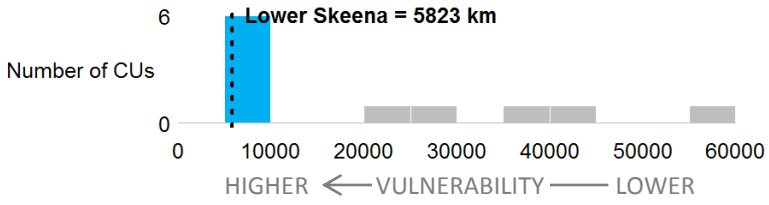
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

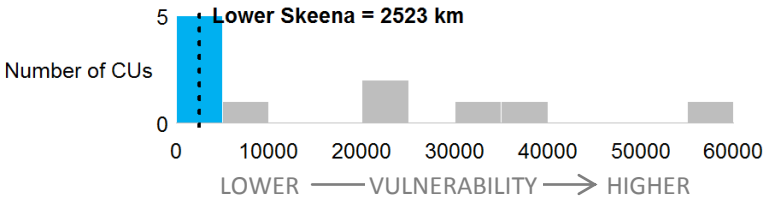


Rearing/Migration period vulnerability

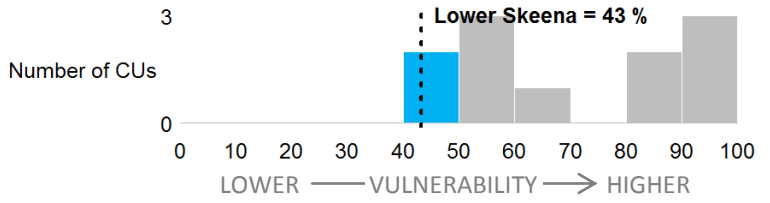
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



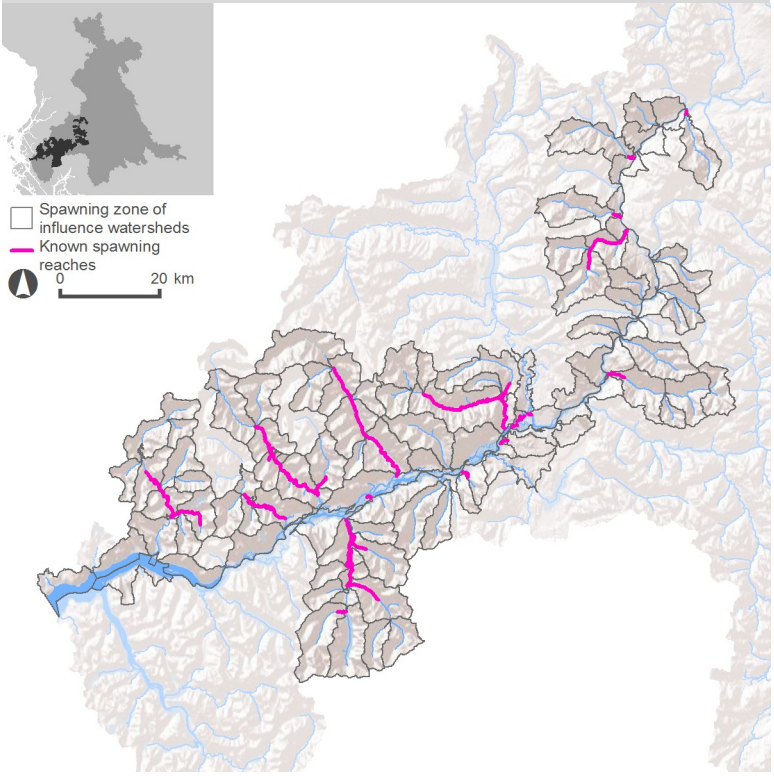
Flow sensitive accessible habitat (%) (all seasons)



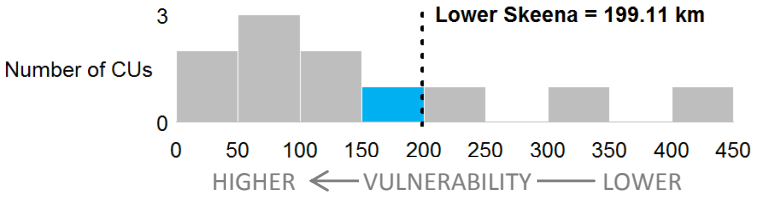
Spawning & incubation vulnerability

Spawning period vulnerability

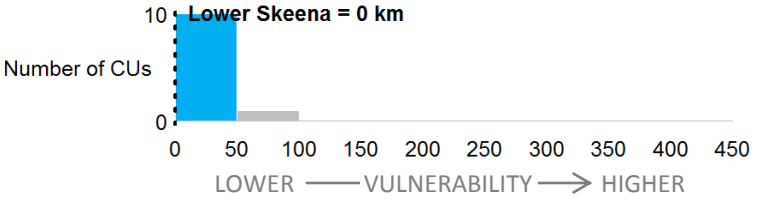
Spawning locations



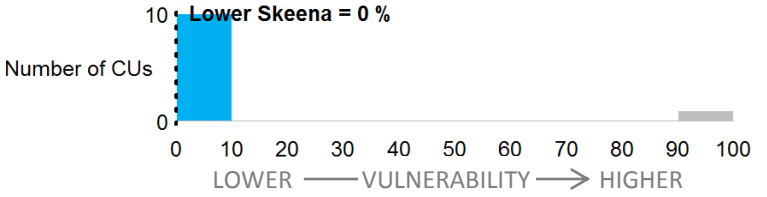
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

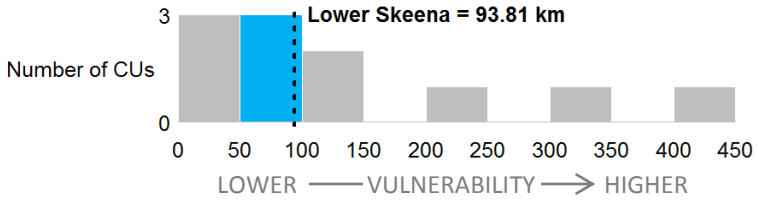


Spawning reaches summer flow sensitive - spawn timing (%)

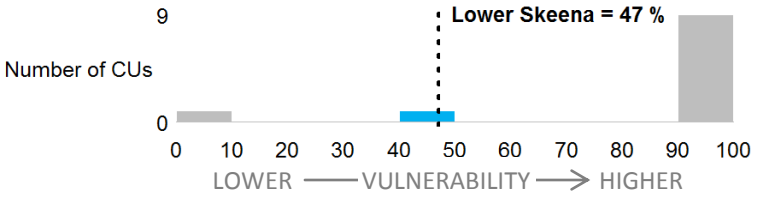


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



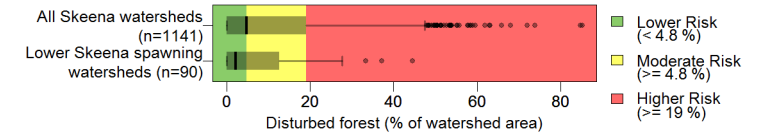
Spawning reaches winter flow sensitive - incubation timing (%)

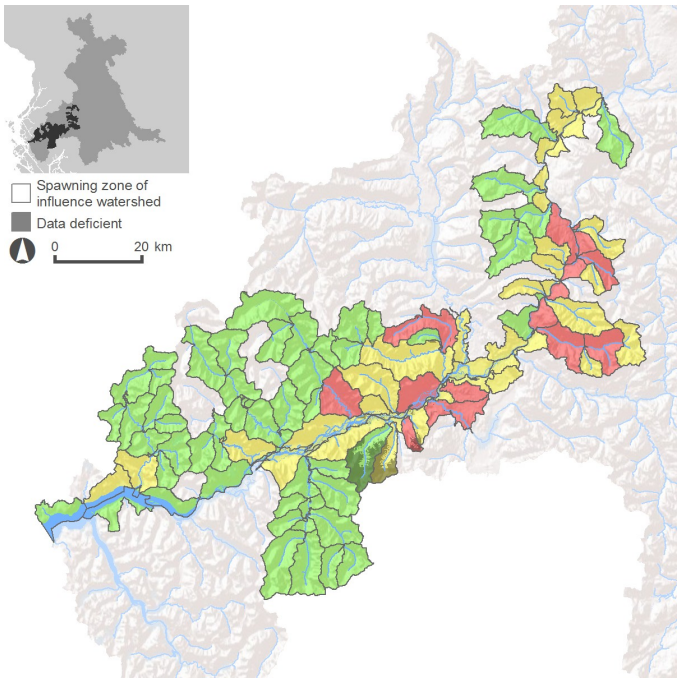


Spawning pressure

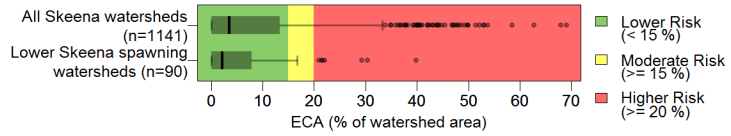
Hydrologic Processes

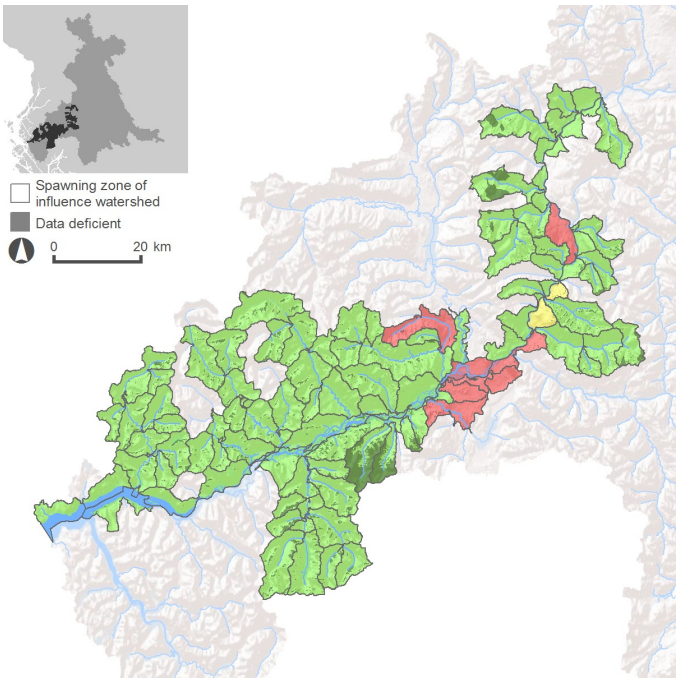
Forest disturbance





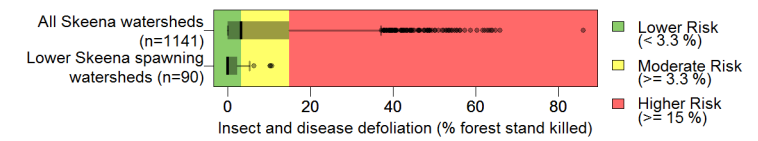
Equivalent Clear-cut Area

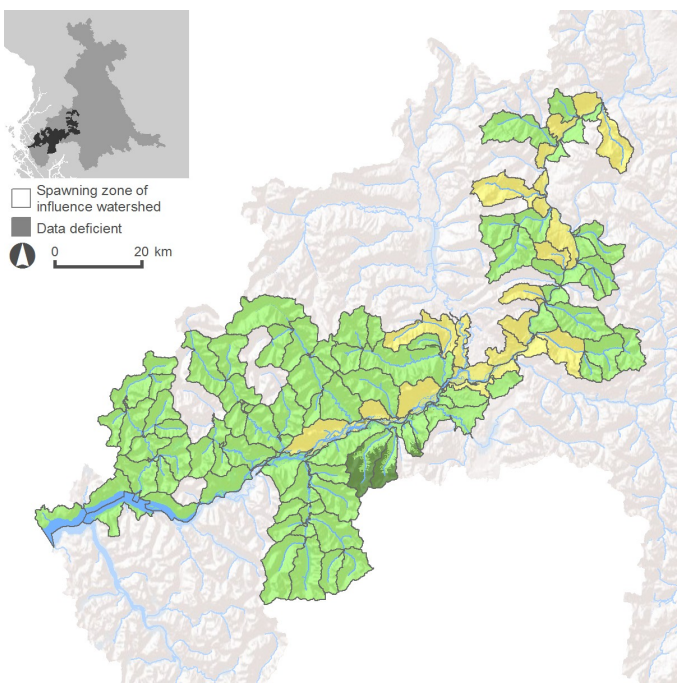




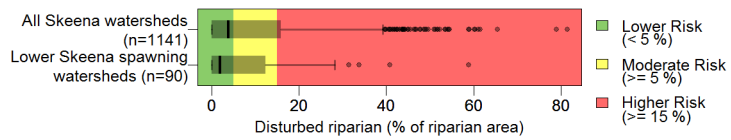
Vegetation Quality

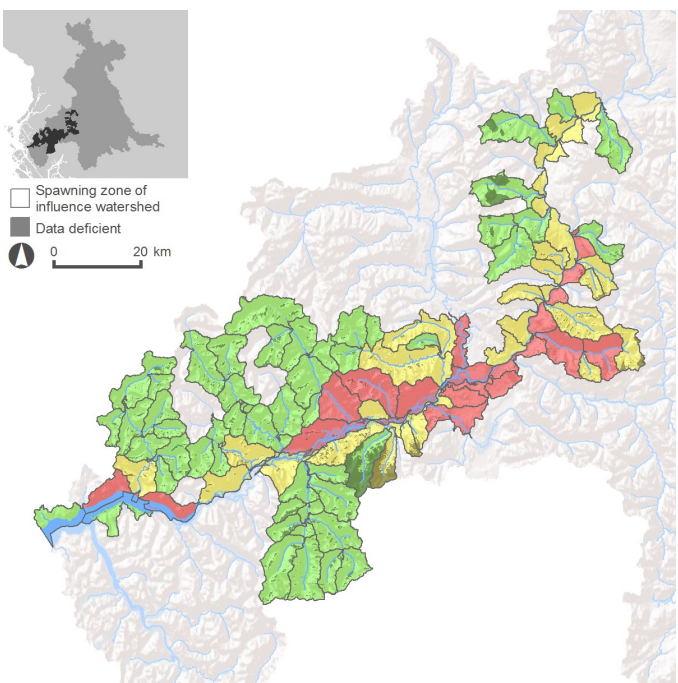
Insect and disease defoliation





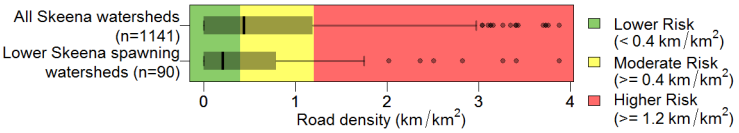
Riparian disturbance

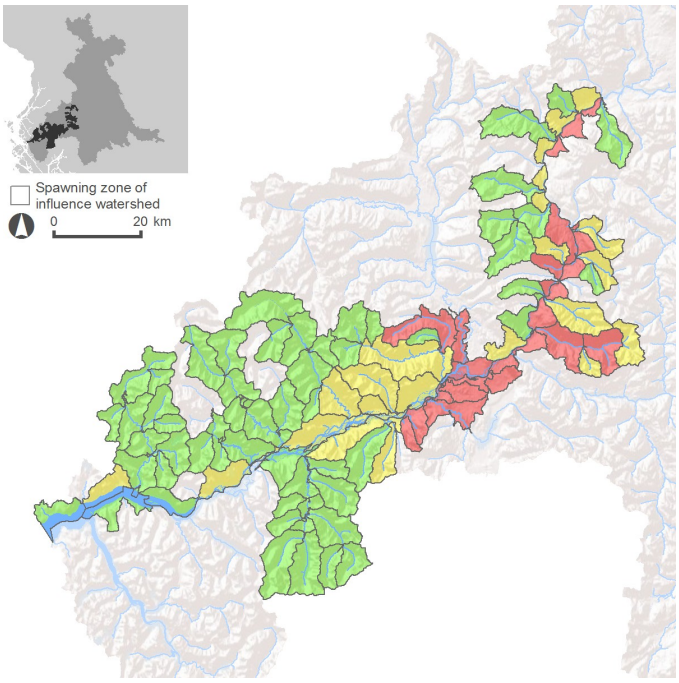




Surface Erosion

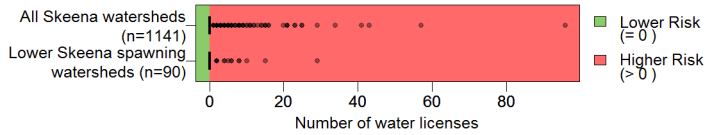
Road development

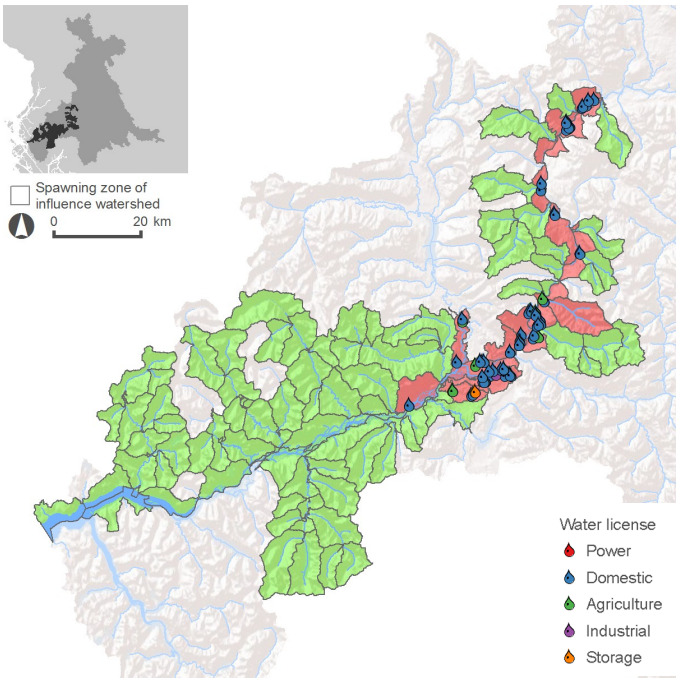




Water Quantity

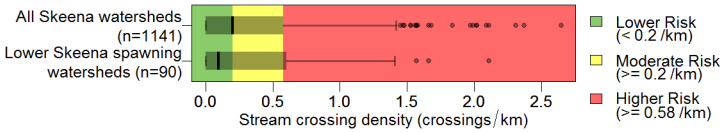
Number of water licenses

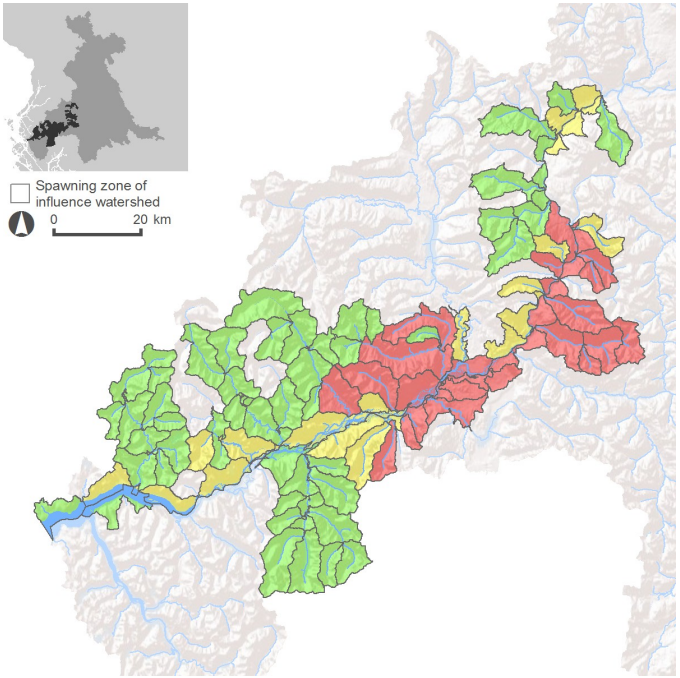




Fish Passage/Habitat Connectivity

Stream crossing density



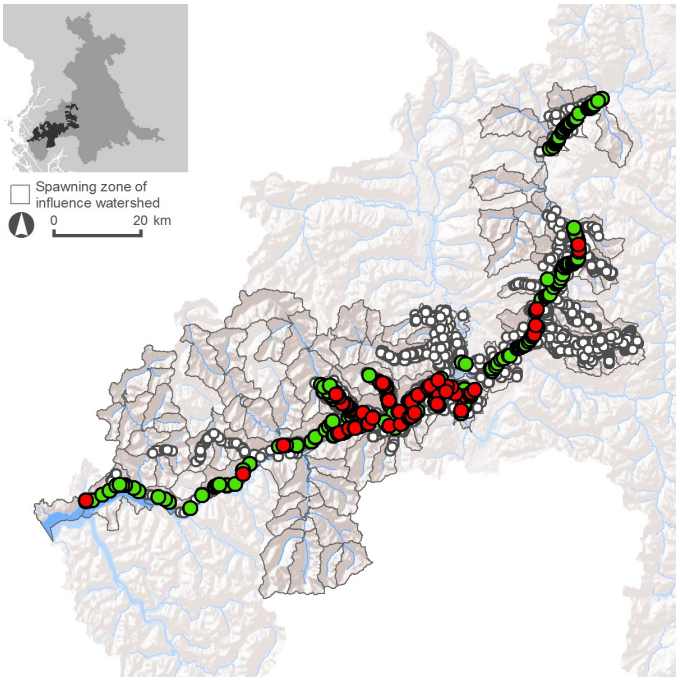


Culvert passability

Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

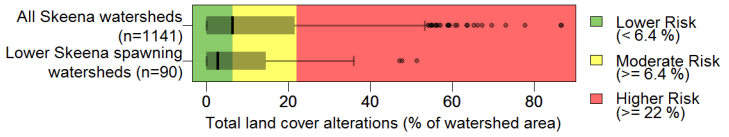
Assessed culvert
- Passable
- Unknown
- Barrier

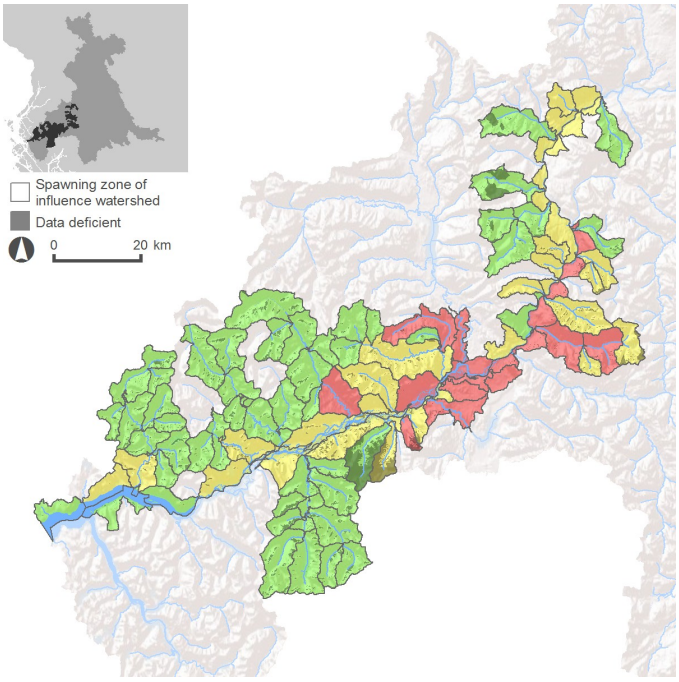
Potential culvert
- Road/Stream crossing



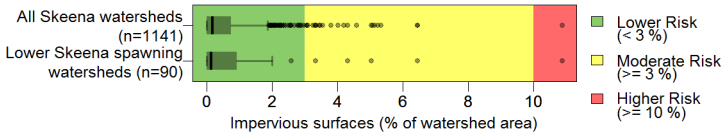
Human Development Footprint

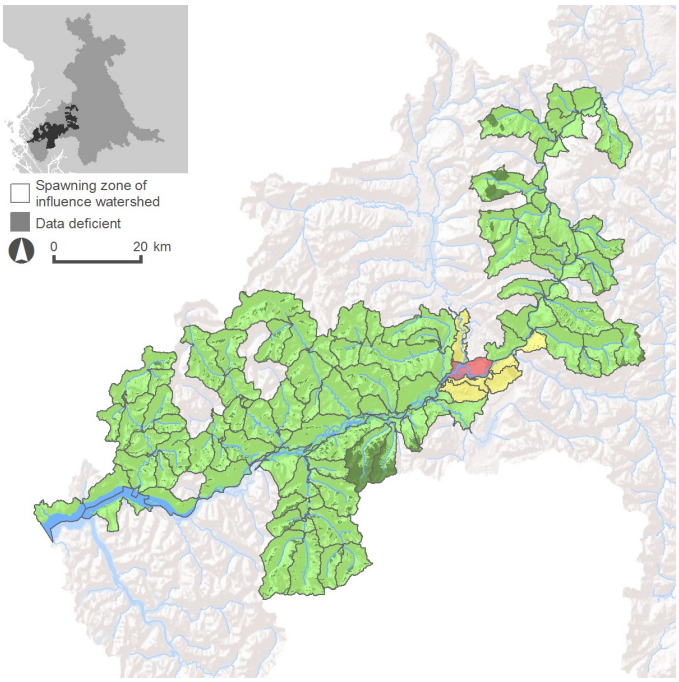
Total land cover alteration



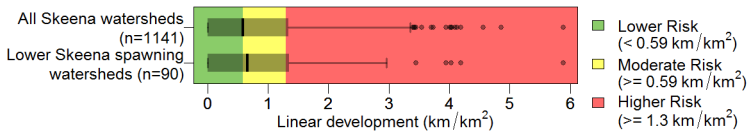


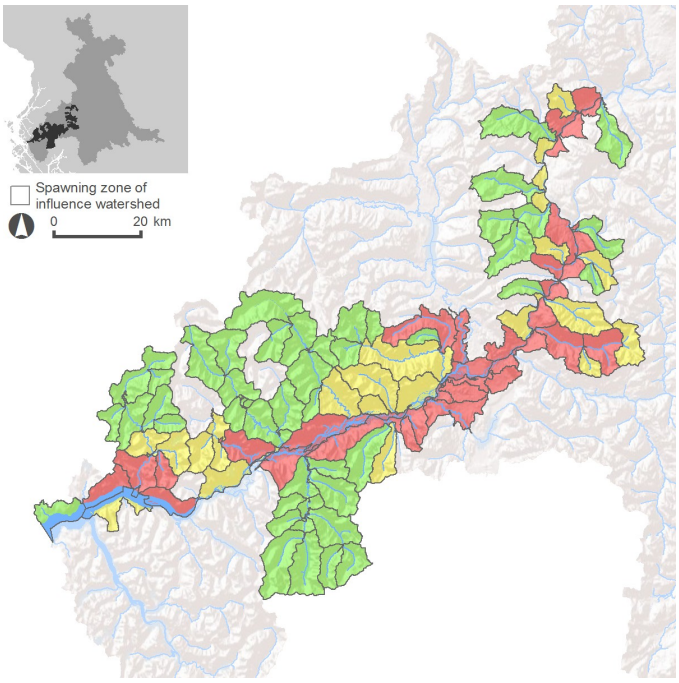
Impervious surfaces



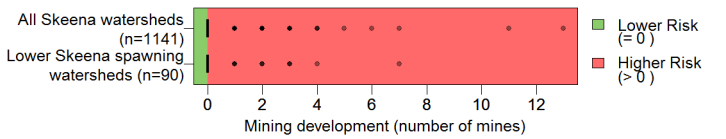


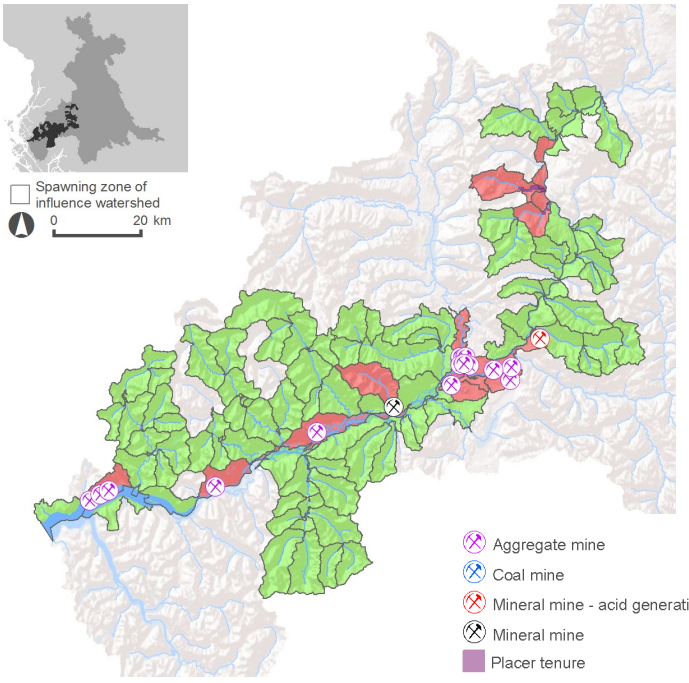
Linear development





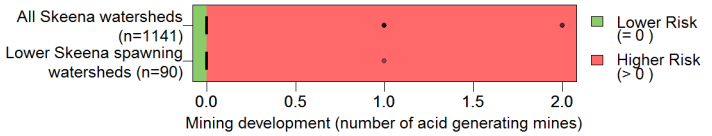
Mining development (total number of mines)

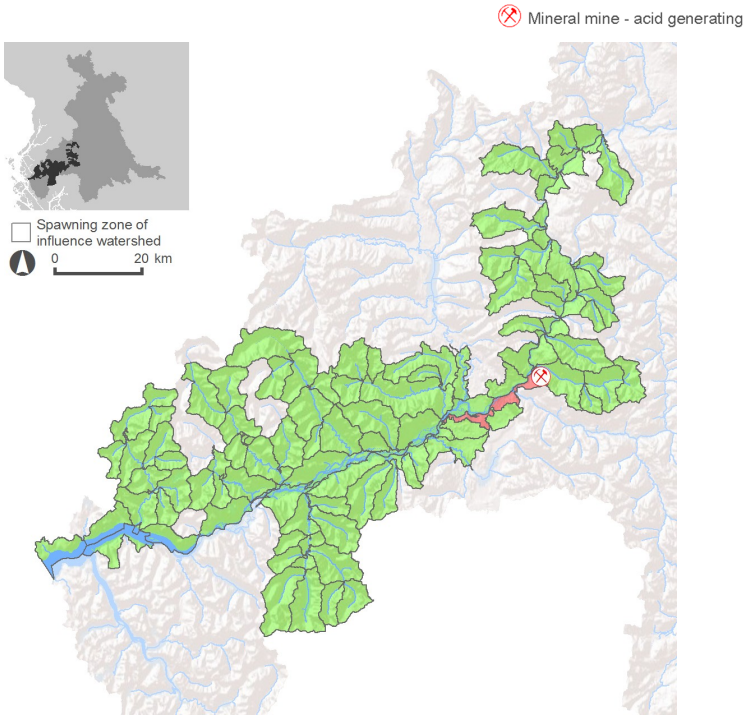




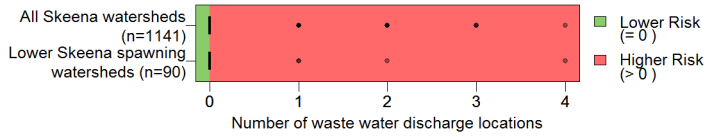
Water Quality

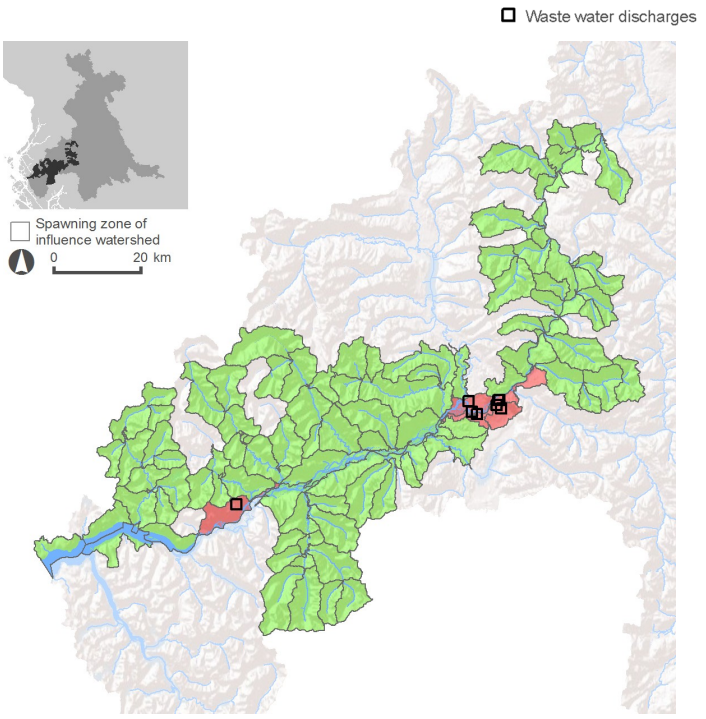
Mining development (acid generating mines)





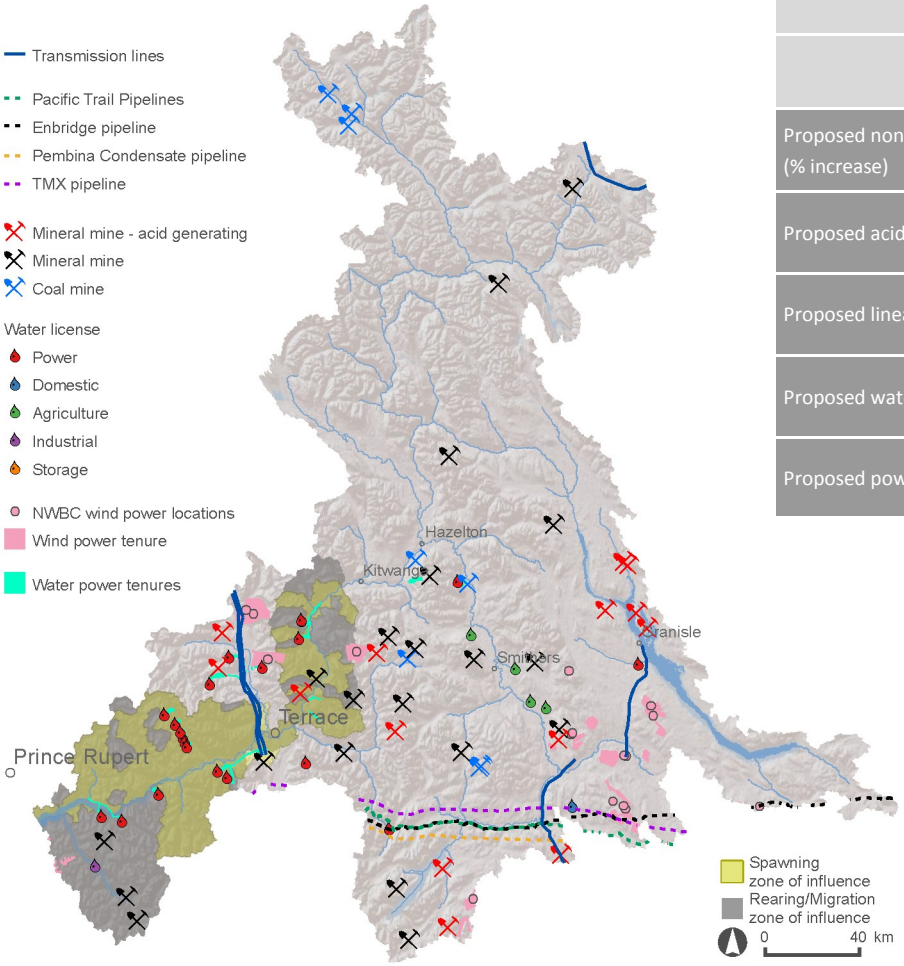
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Lower Skeena Chinook CU summary		
	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	4 (10%)	2 (7%)
Proposed acid generating mines (% increase)	1 (100%)	1 (100%)
Proposed linear development (% increase)	0.005 km/km^2 (0.9%)	0.01 km/km^2 (1%)
Proposed water licenses (% increase)	18 (16%)	11 (10%)
Proposed power tenures	116 km^2	78 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Mid Skeena Main Tributaries

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

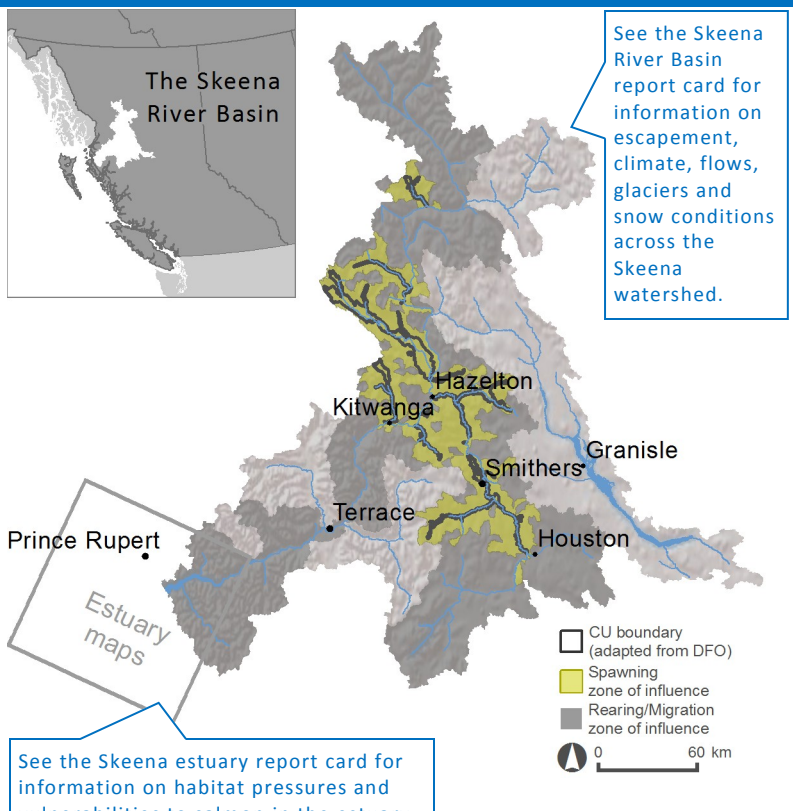
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* The diversity of habitats in this CU is large and complex.
* At least half of the Chinook spawning and rearing habitat within this CU has been impacted by logging, highway, railroad, agricultural, and urban development .
* Egg-to-fry mortality from high and low-water events can vary significantly.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

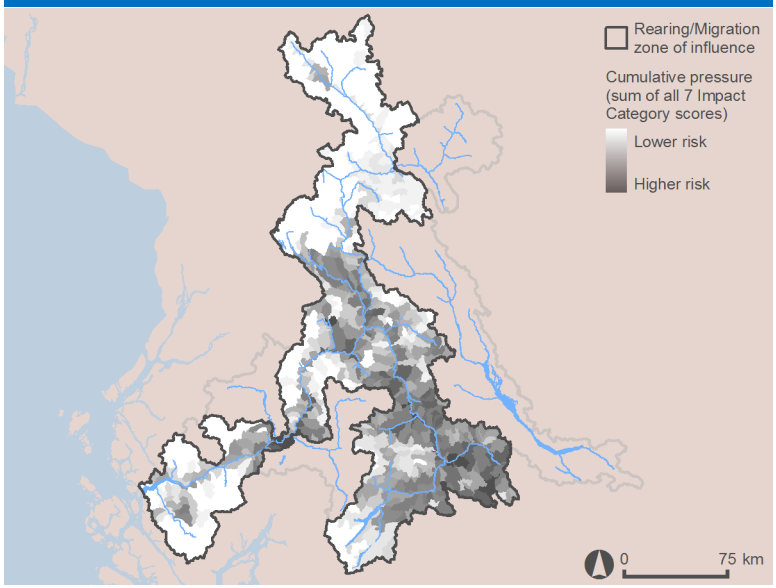
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

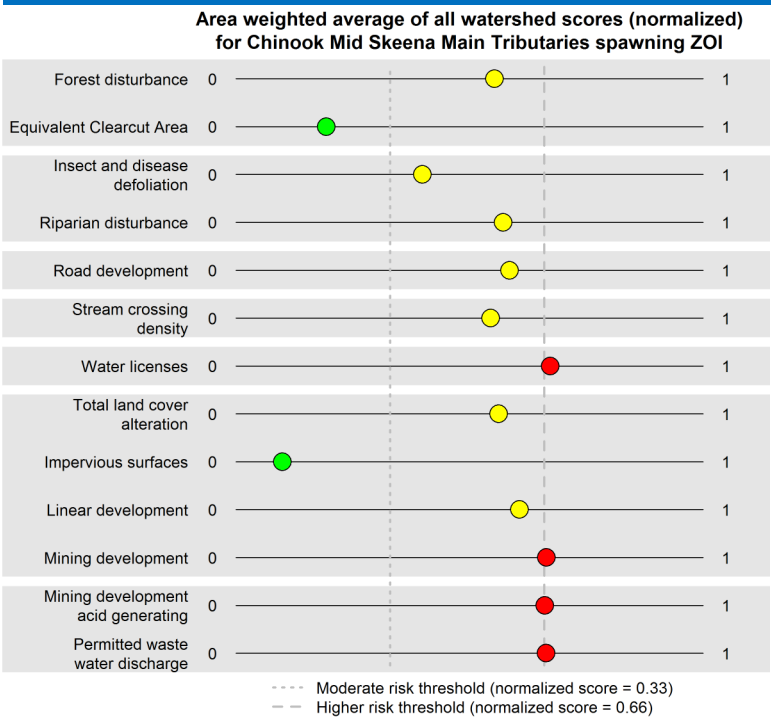
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

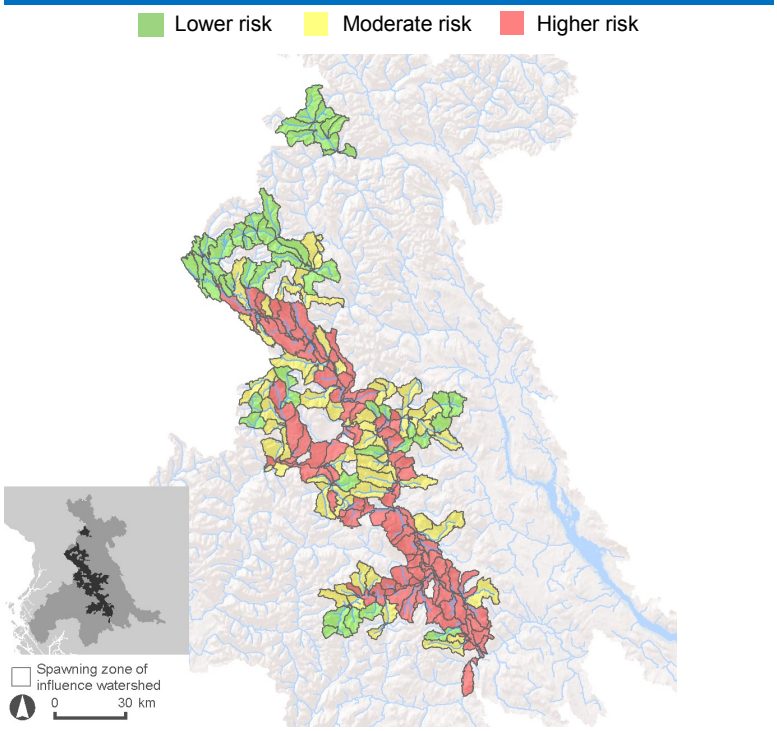
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

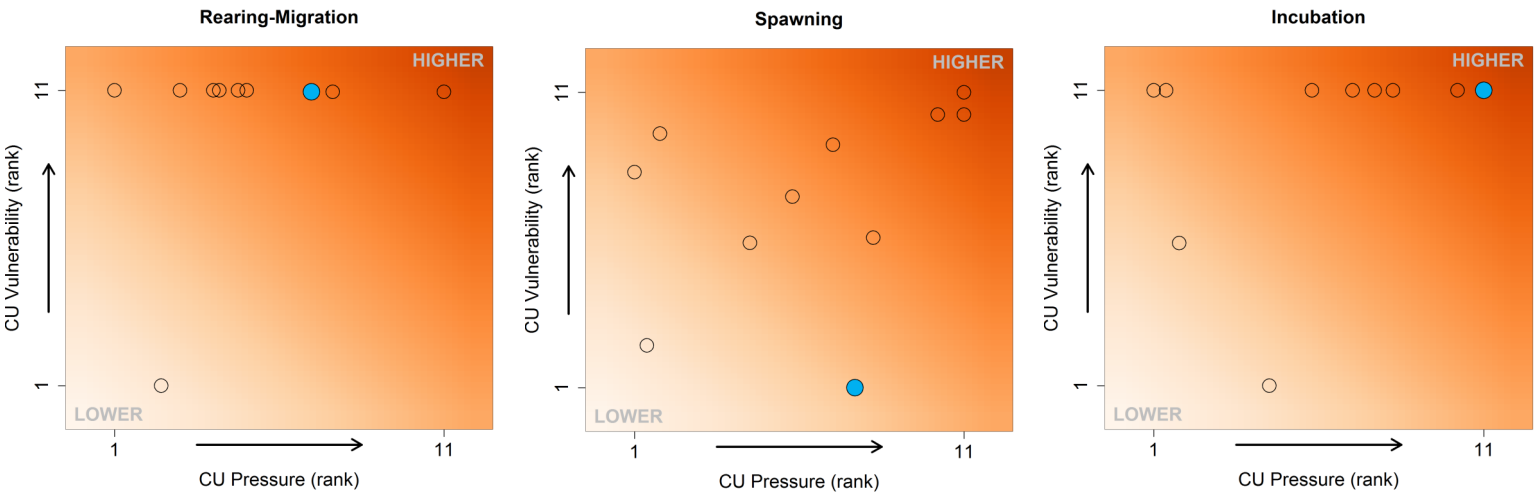


Cumulative pressure—spawning



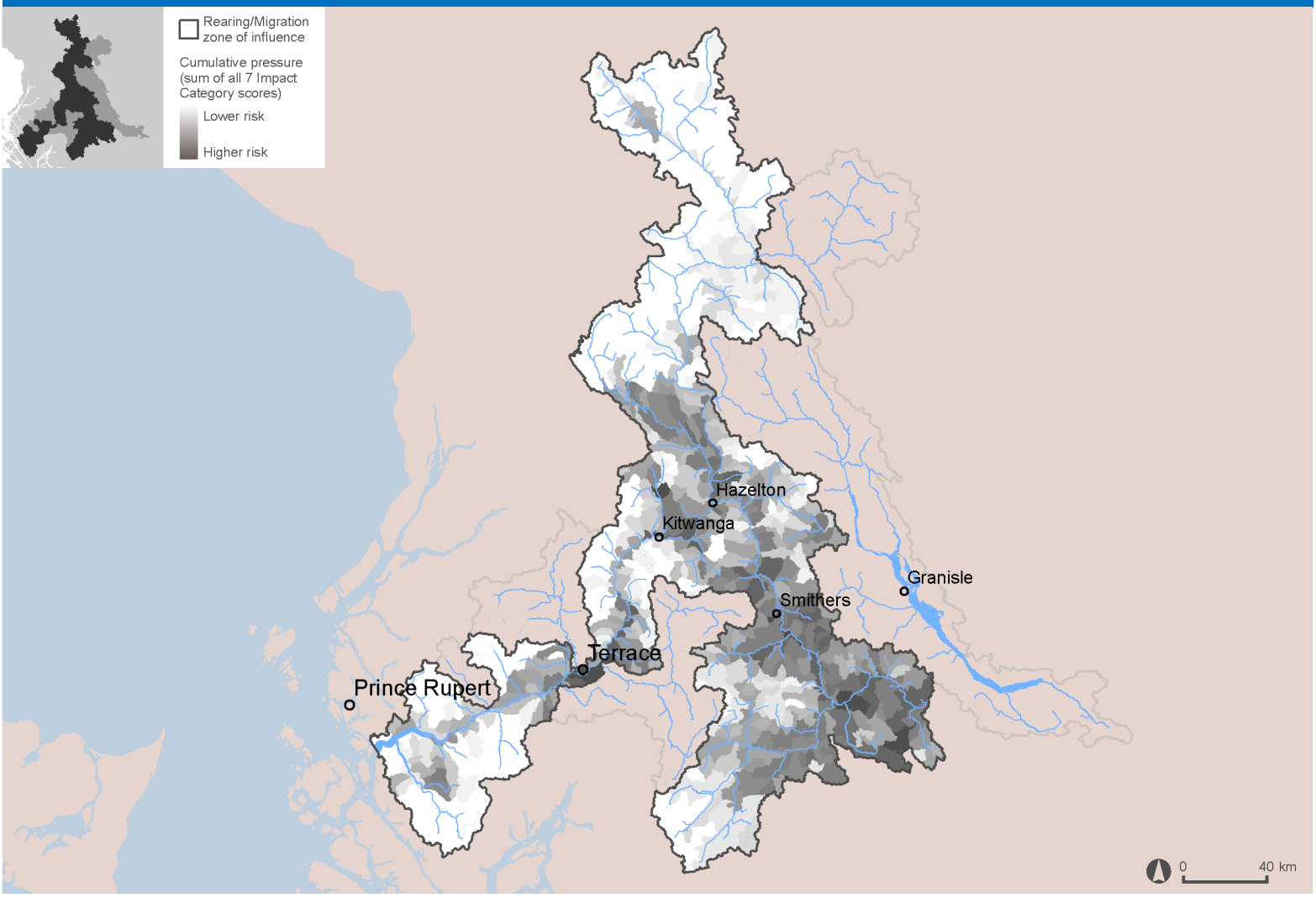
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Mid Skeena Main Tributaries ○ = other Skeena Chinook CUs



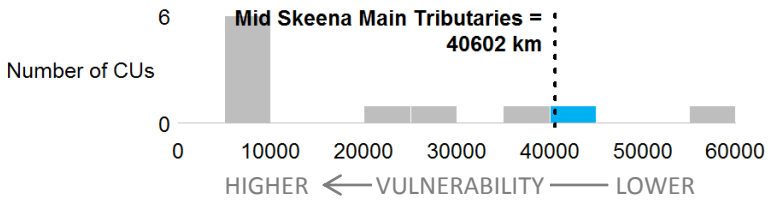
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

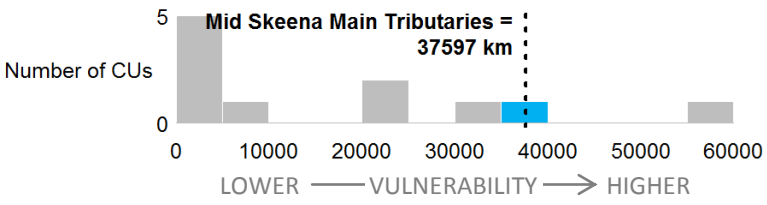


Rearing/Migration period vulnerability

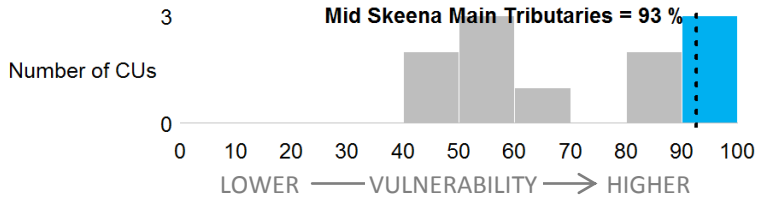
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



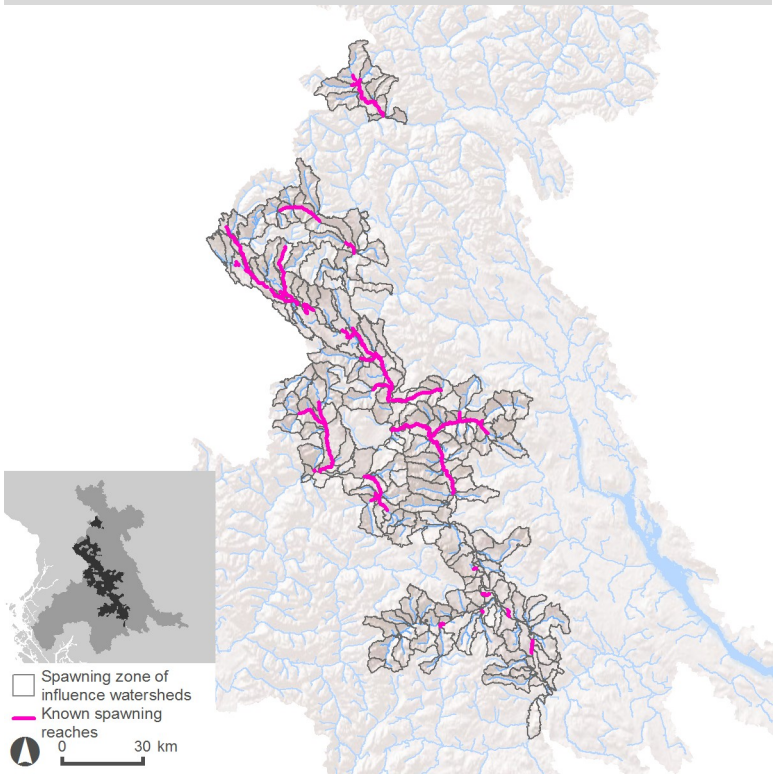
Flow sensitive accessible habitat (%) (all seasons)



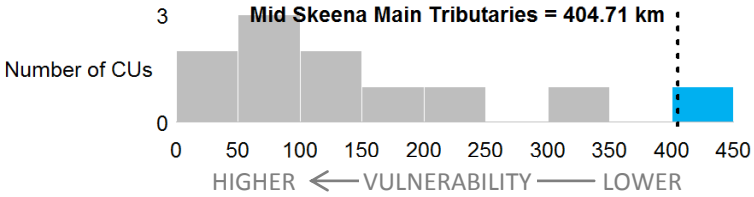
Spawning & incubation vulnerability

Spawning period vulnerability

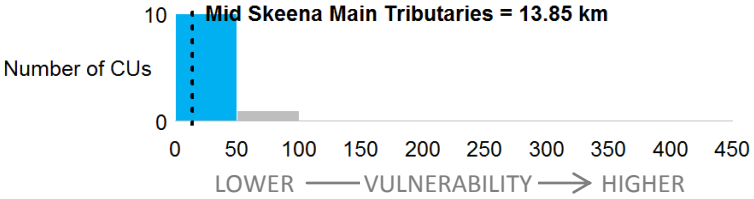
Spawning locations



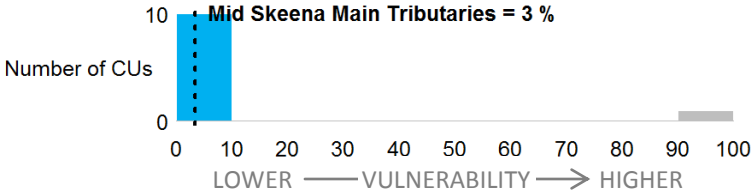
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

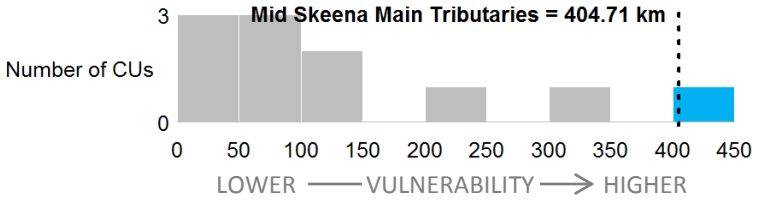


Spawning reaches summer flow sensitive - spawn timing (%)

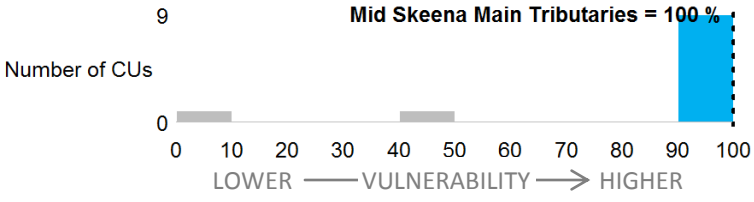


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



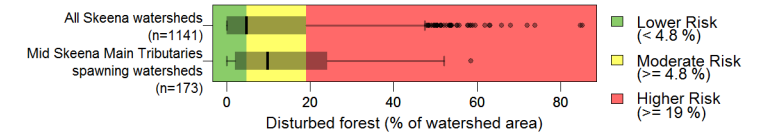
Spawning reaches winter flow sensitive - incubation timing (%)

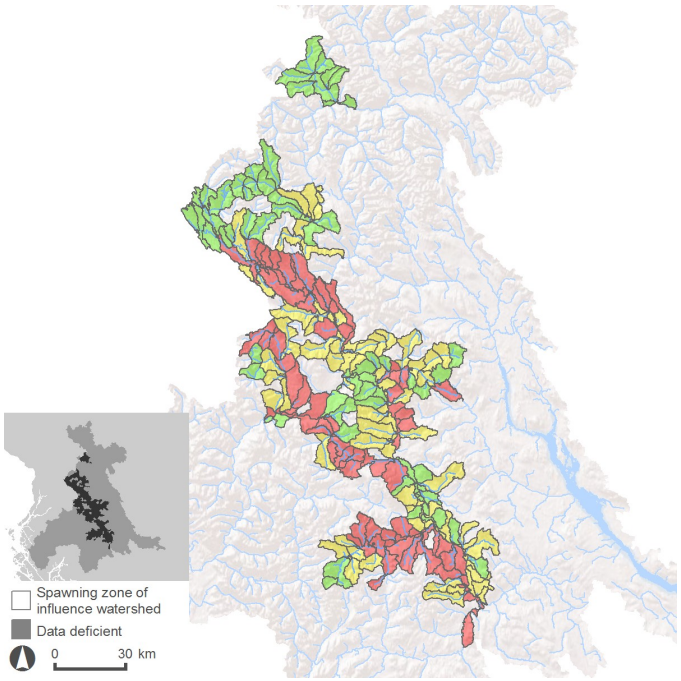


Spawning pressure

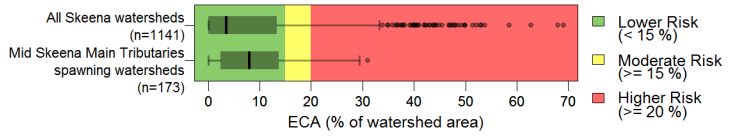
Hydrologic Processes

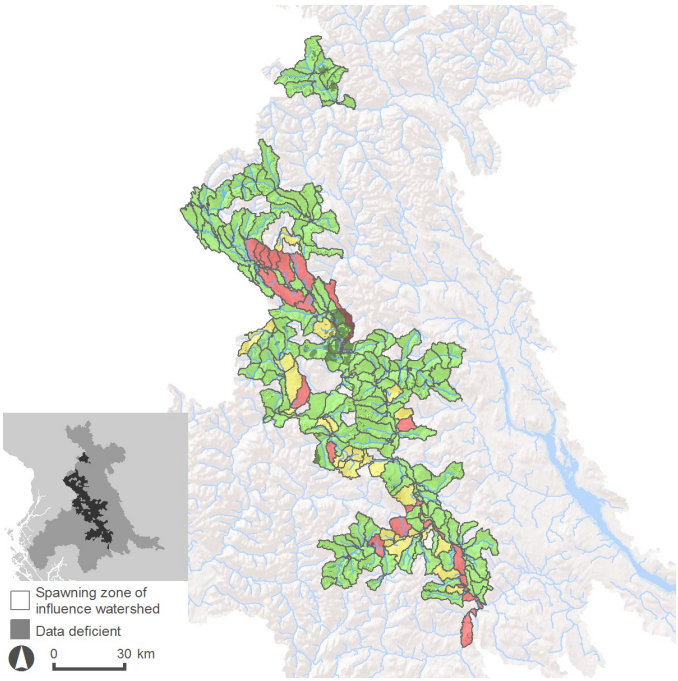
Forest disturbance





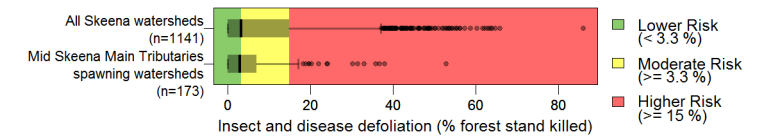
Equivalent Clear-cut Area

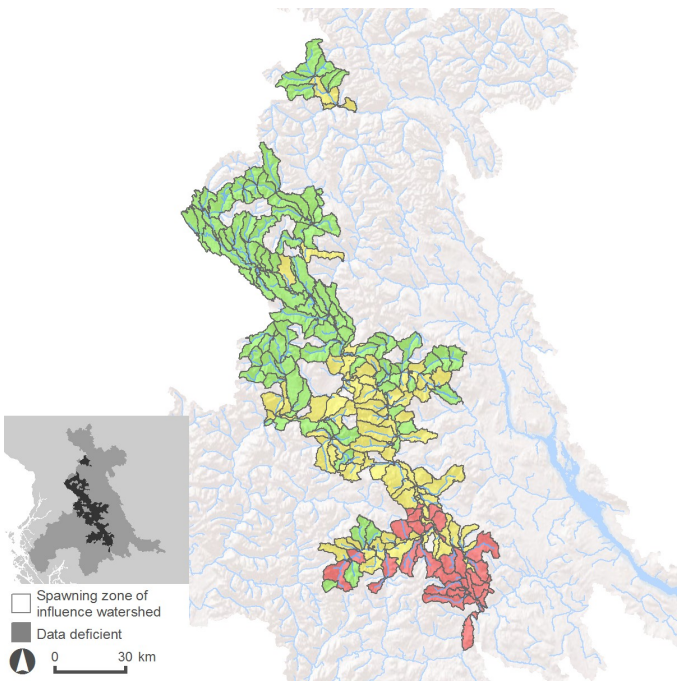




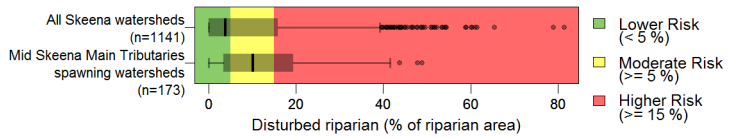
Vegetation Quality

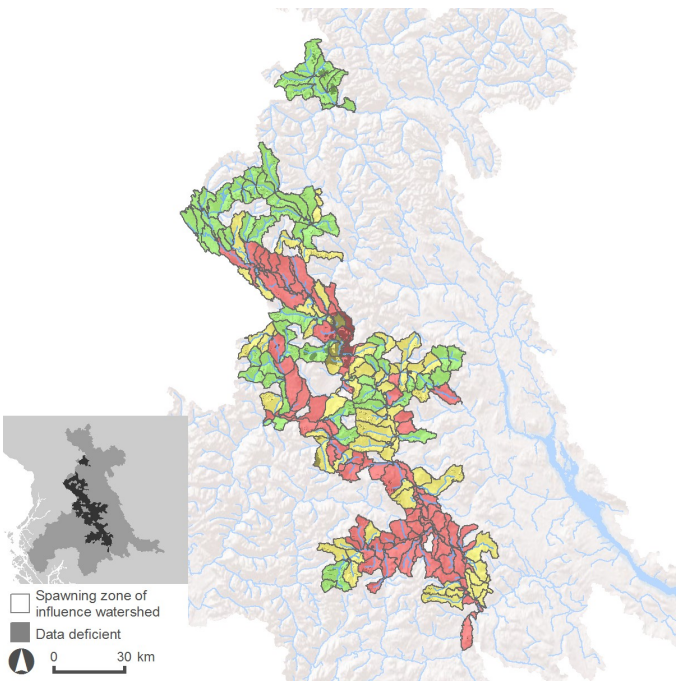
Insect and disease defoliation





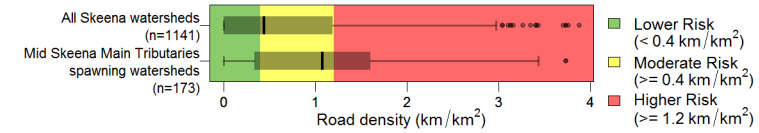
Riparian disturbance

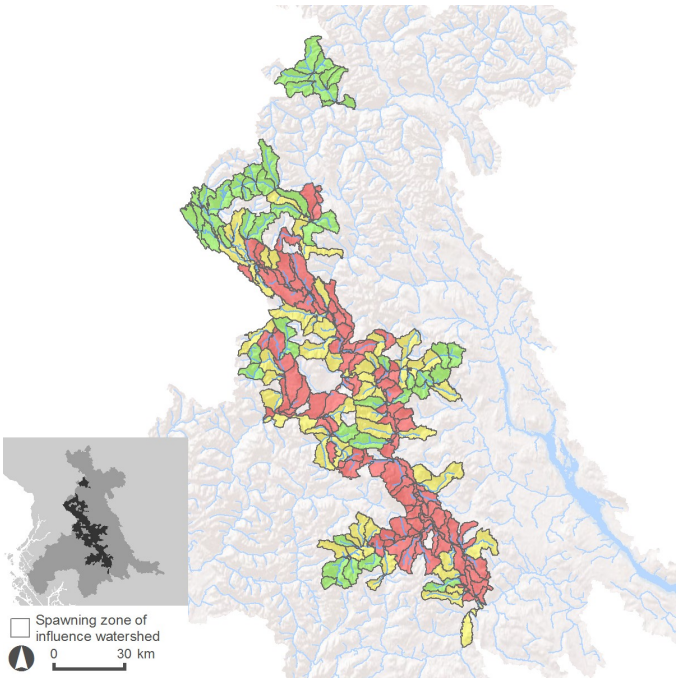




Surface Erosion

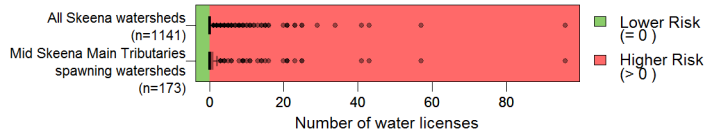
Road development

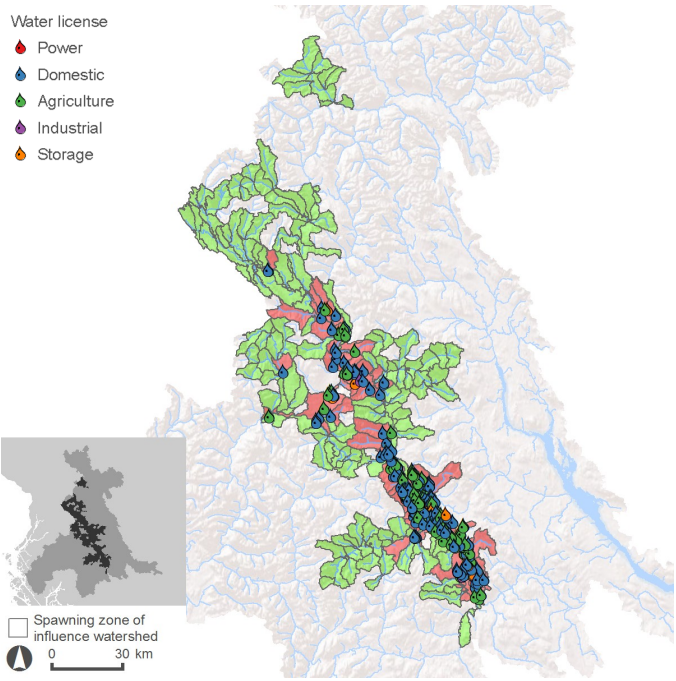




Water Quantity

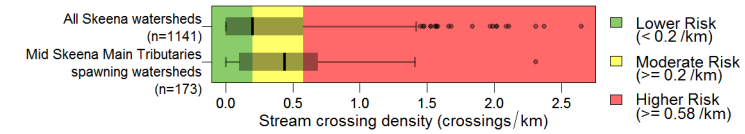
Number of water licenses

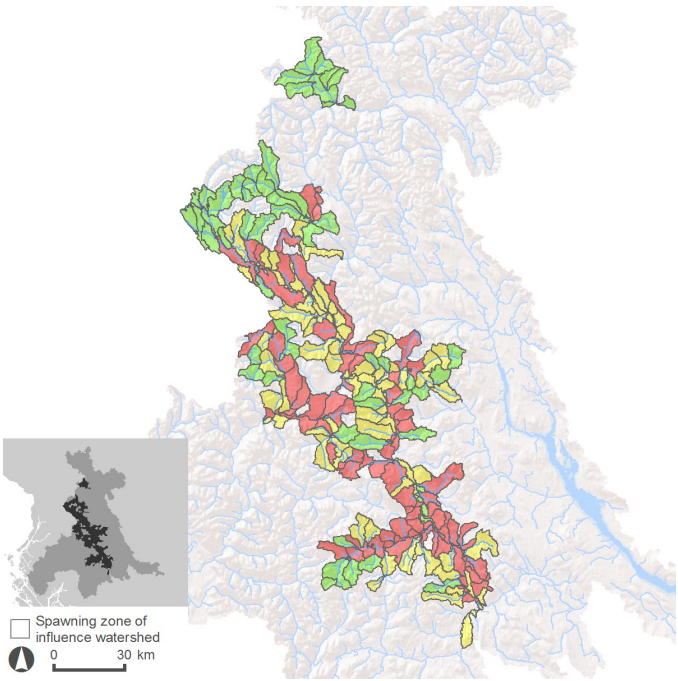




Fish Passage/Habitat Connectivity

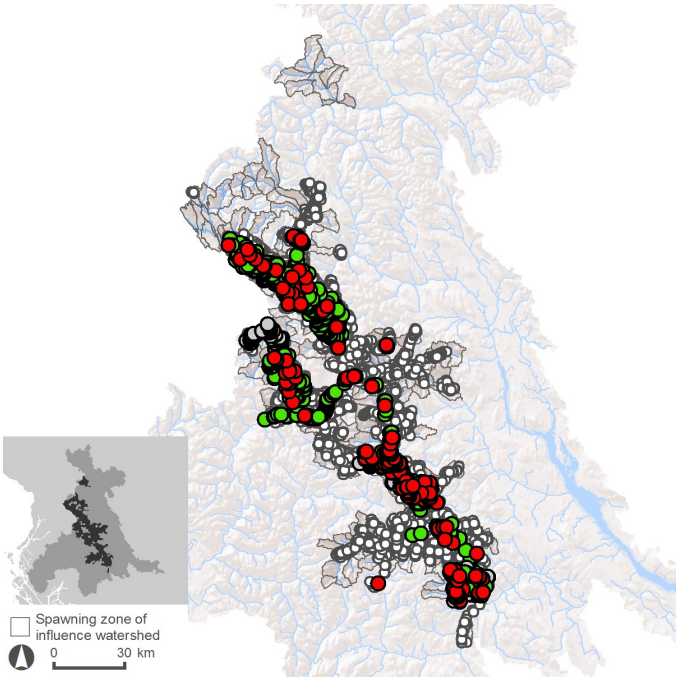
Stream crossing density





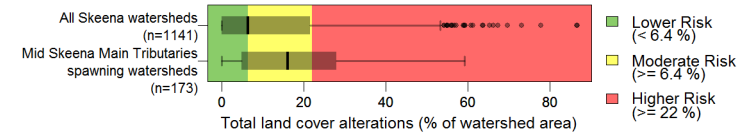
Culvert passability

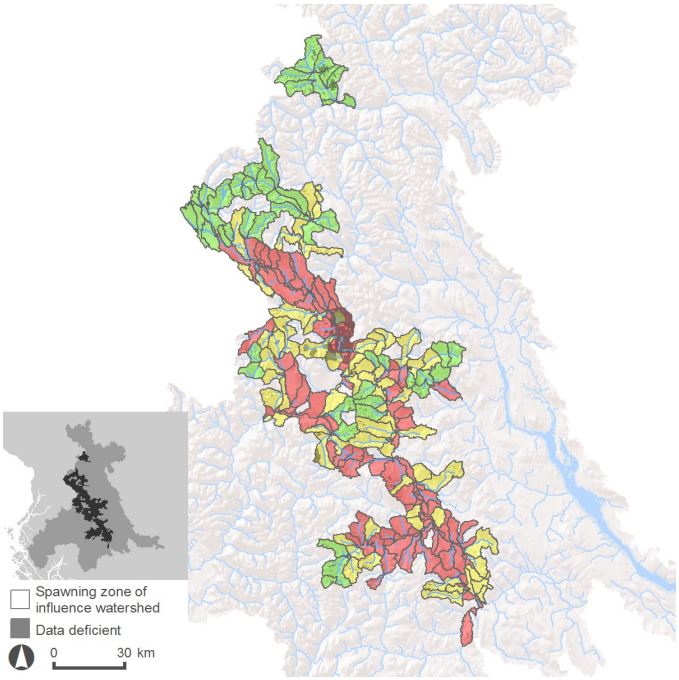
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



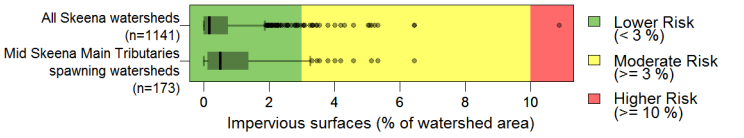
Human Development Footprint

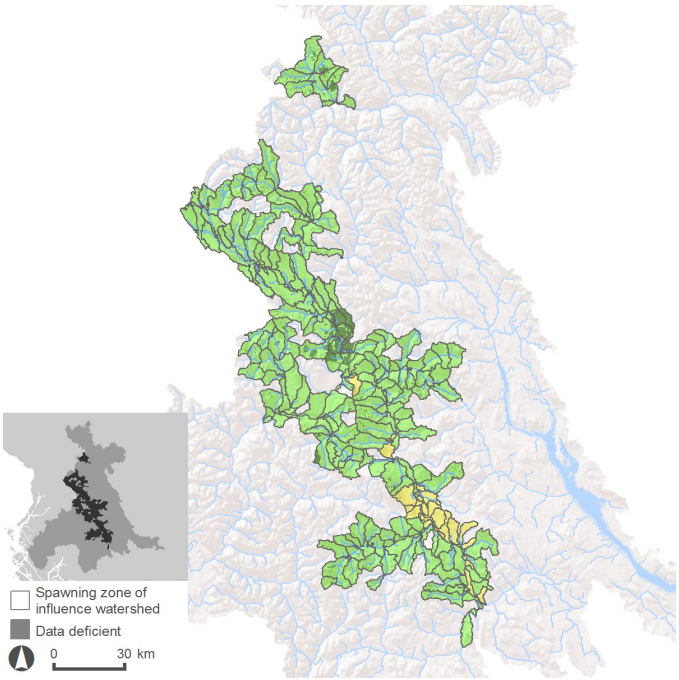
Total land cover alteration



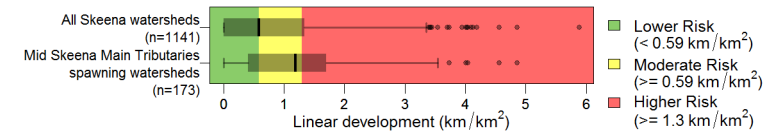


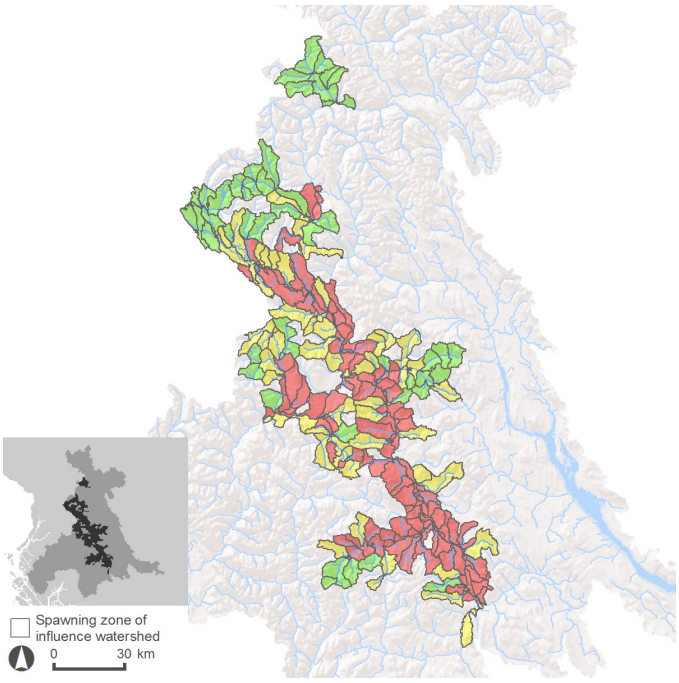
Impervious surfaces



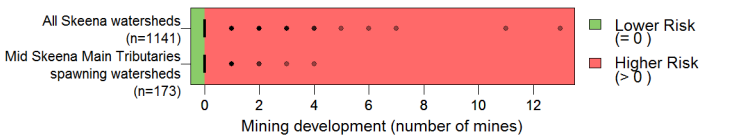


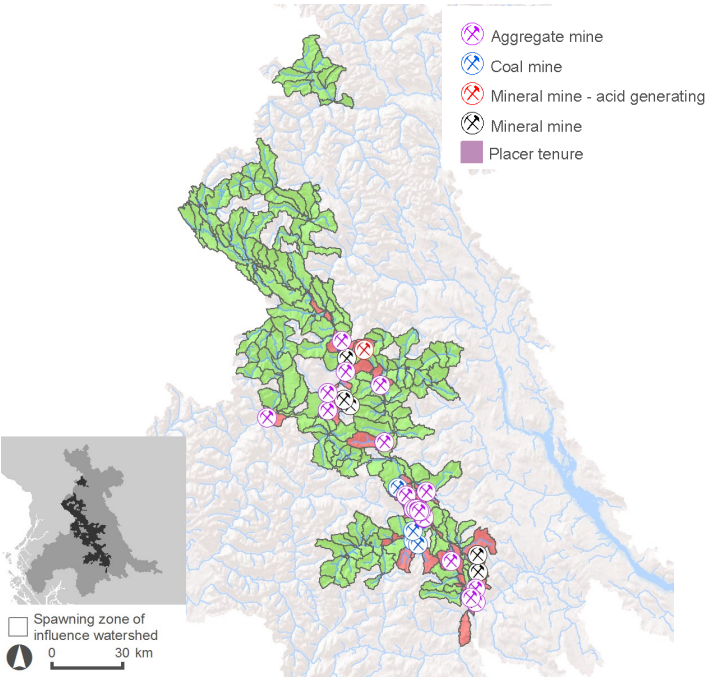
Linear development





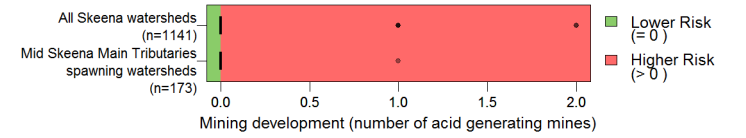
Mining development (total number of mines)

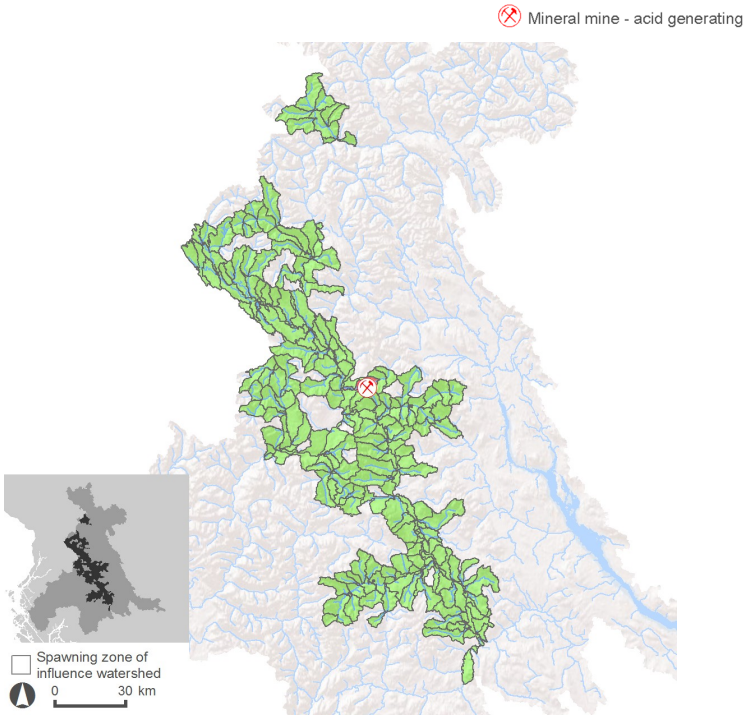




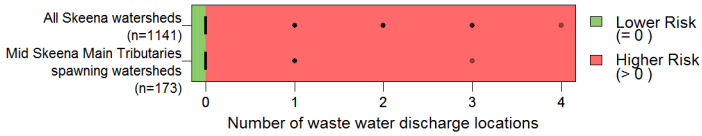
Water Quality

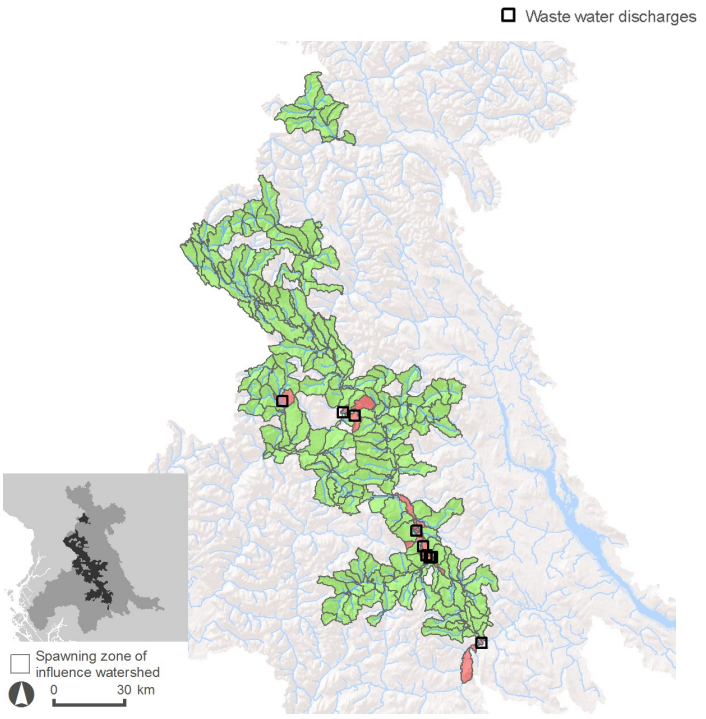
Mining development (acid generating mines)





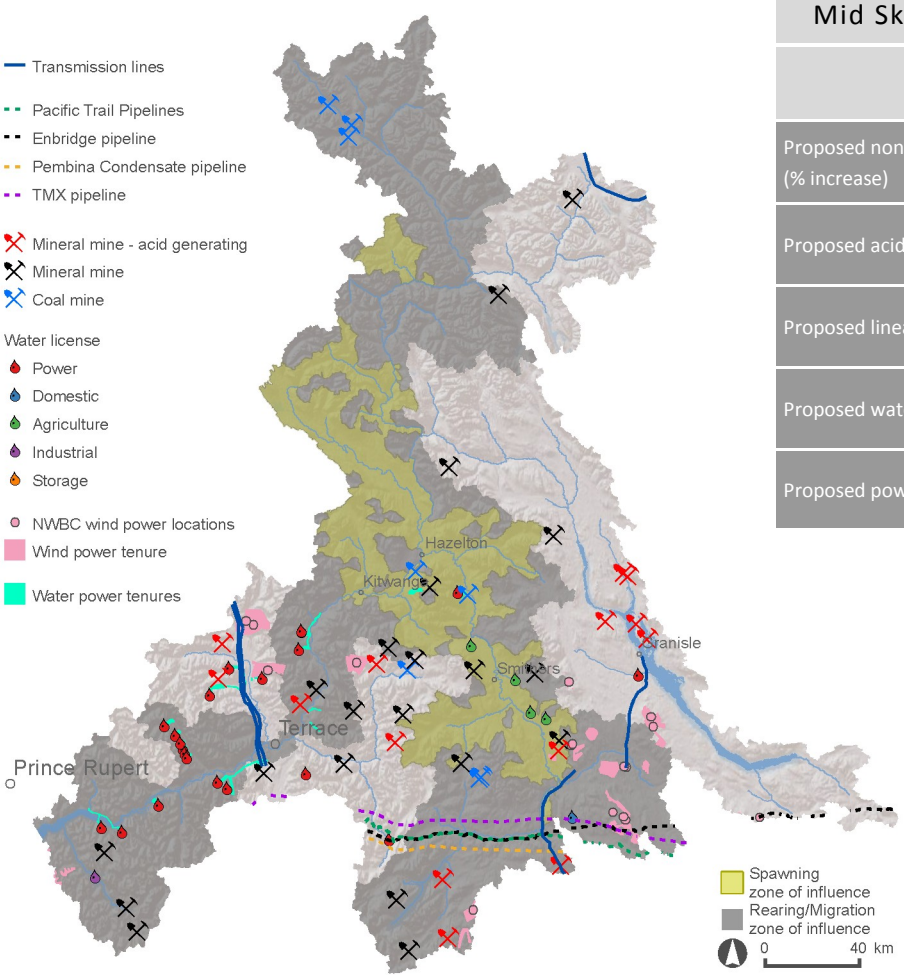
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Mid Skeena Main Tributaries Chinook CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	19 (20%)	9 (16%)
Proposed acid generating mines (% increase)	6 (120%)	2 (200%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.003 km/km^2 (0.2%)
Proposed water licenses (% increase)	25 (3%)	4 (0.7%)
Proposed power tenures	299 km^2	22 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Mid Skeena Large Lakes

Version 1.0 Jan 2014

Introduction

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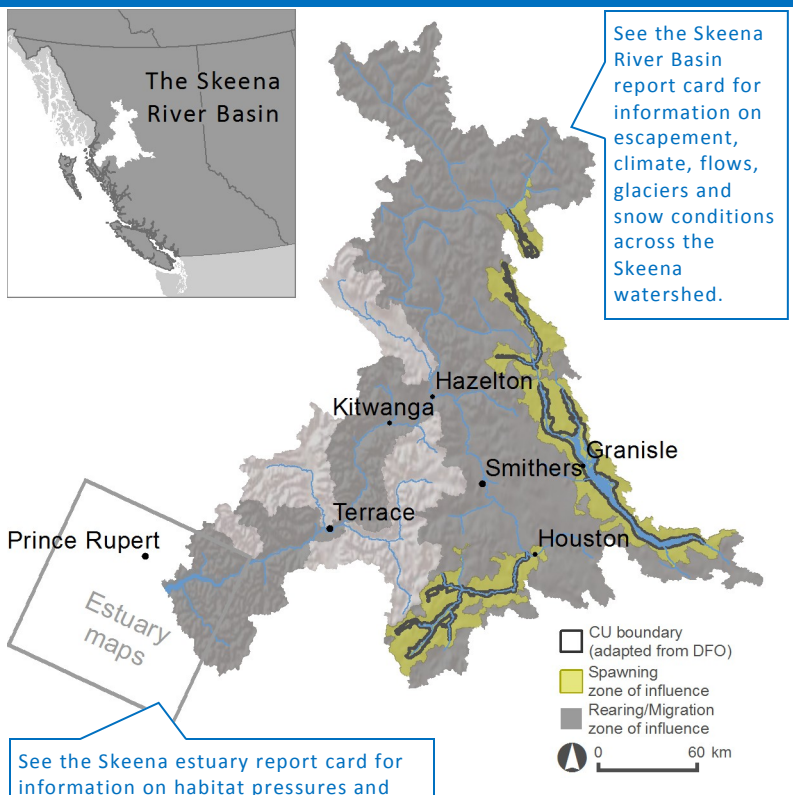
Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* The habitat downstream of the three large lakes is considered very high quality due to the attenuated flows, moderated temperatures, and groundwater flows though predators are often prevalent.
* Spawning and rearing habitat in the tributary streams ranges from moderate to good depending on upstream development disturbance.
* Egg-to-fry mortality from high and low-water events can vary significantly in tributaries and subsequent annual escapement variability can be moderate.
* Logging and related road development is the most widespread land use activity that has adversely affected high-value tributary Chinook habitat. On the Bear River, rail construction caused a series of landslides into the most valuable Chinook spawning habitat.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, resource development creating additional cumulative impacts, and changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

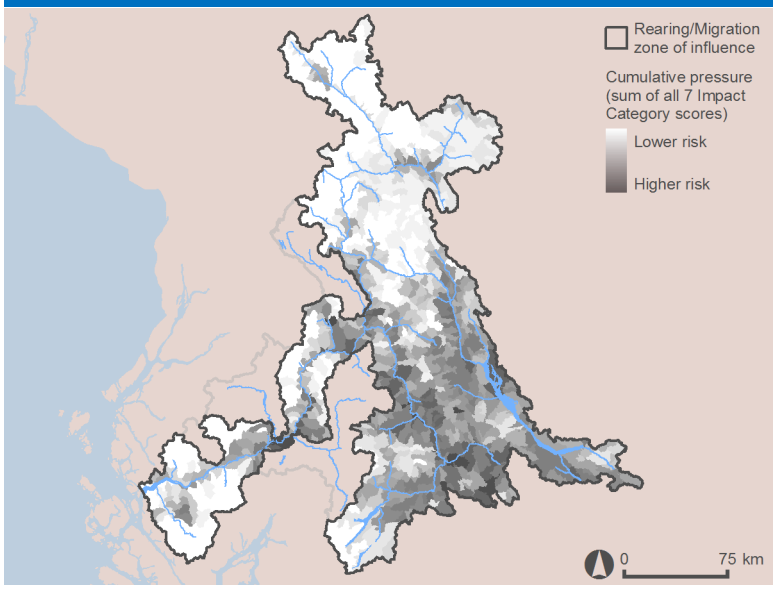
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

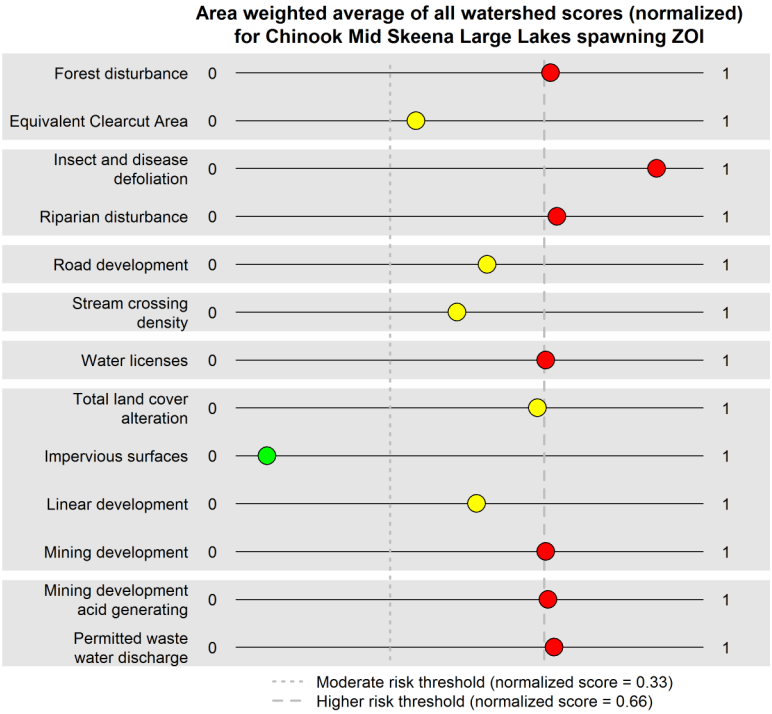
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

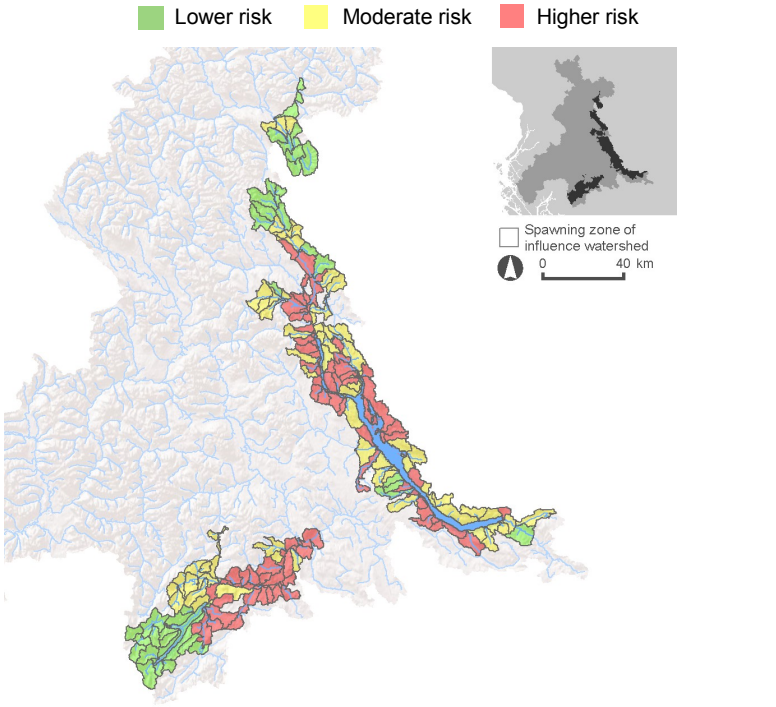
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

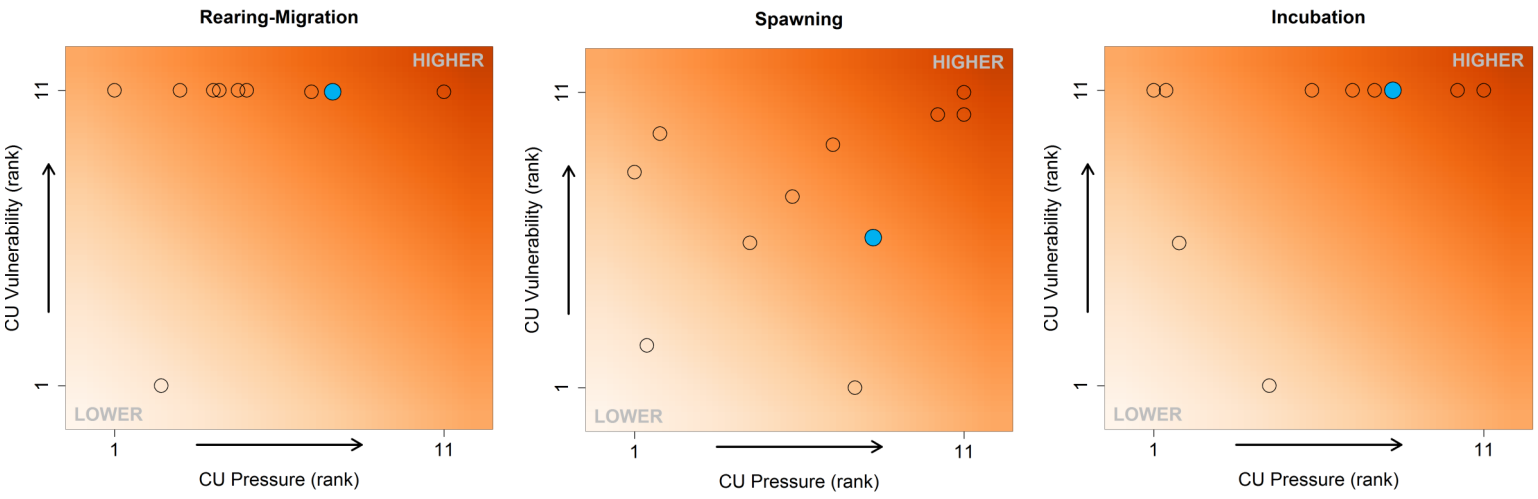


Cumulative pressure—spawning



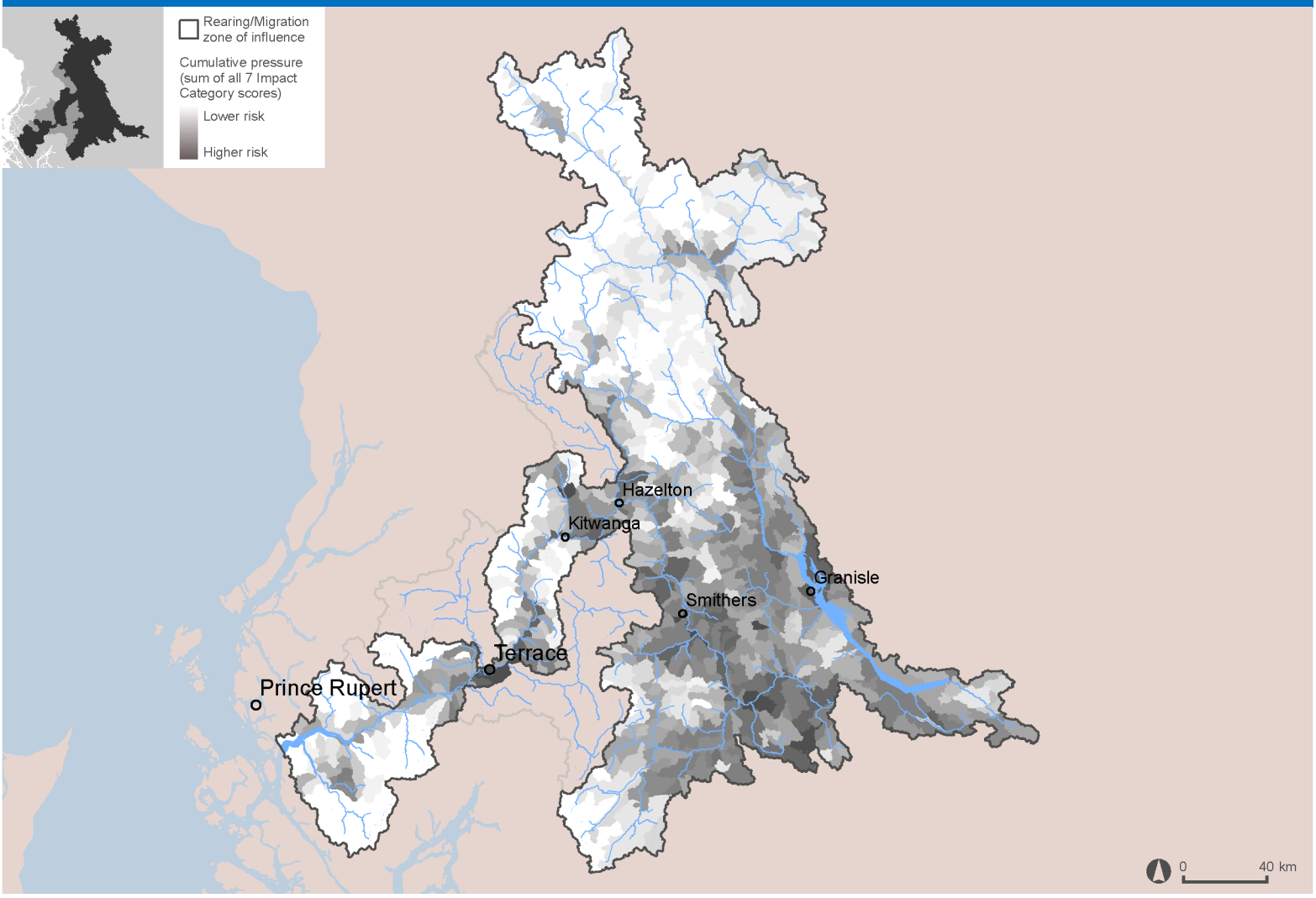
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Mid Skeena Large Lakes ○ = other Skeena Chinook CUs



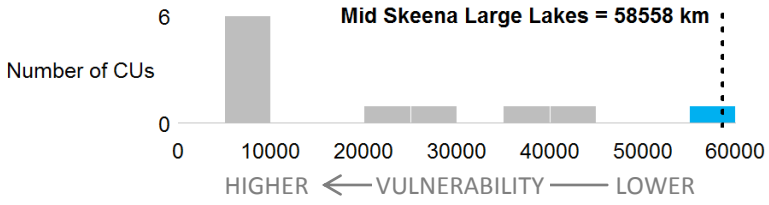
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

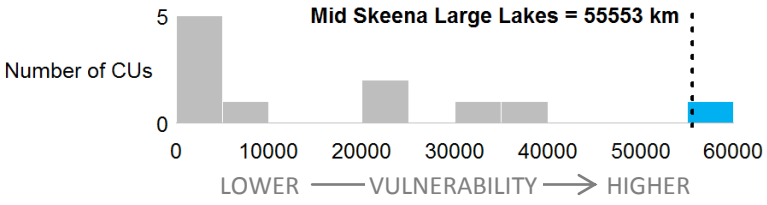


Rearing/Migration period vulnerability

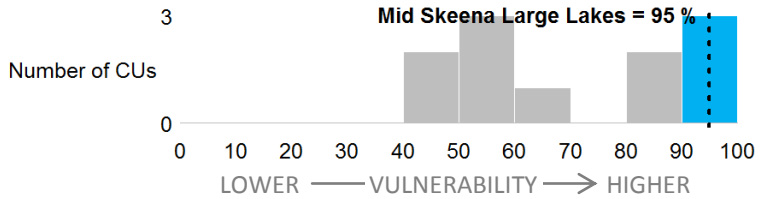
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



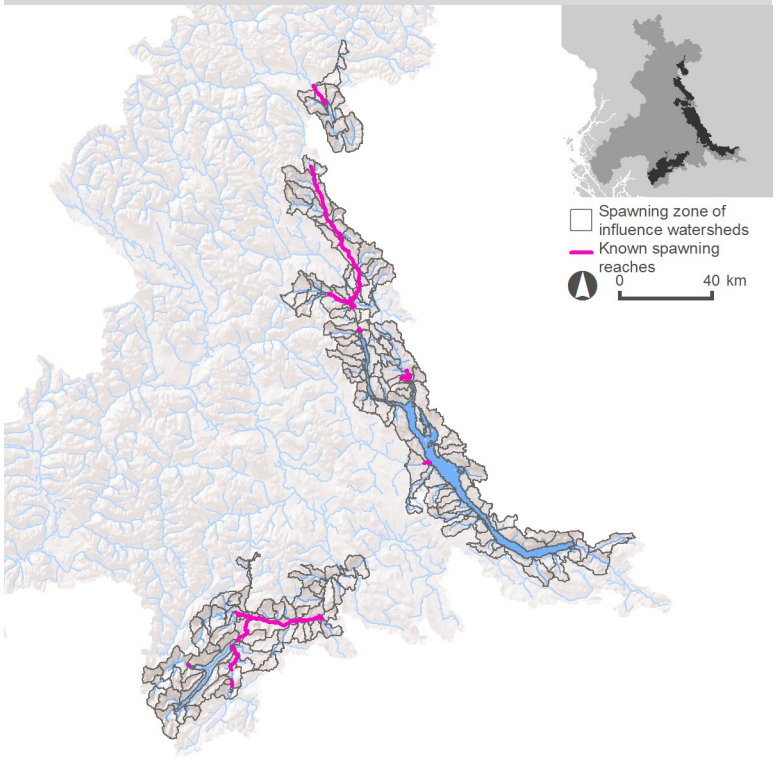
Flow sensitive accessible habitat (%) (all seasons)



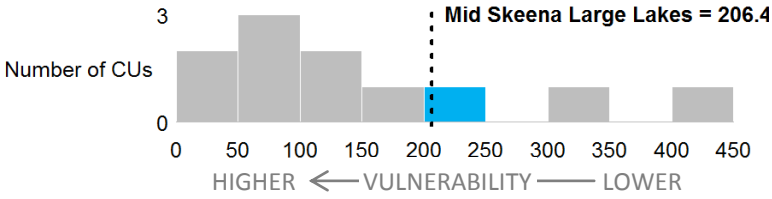
Spawning & incubation vulnerability

Spawning period vulnerability

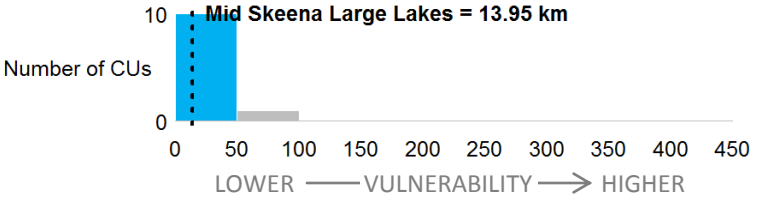
Spawning locations



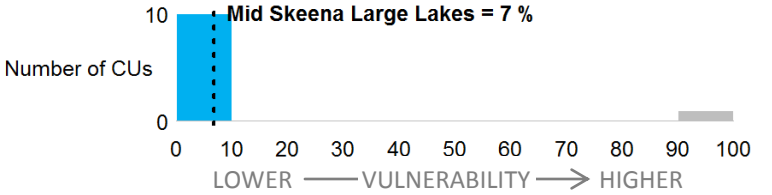
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

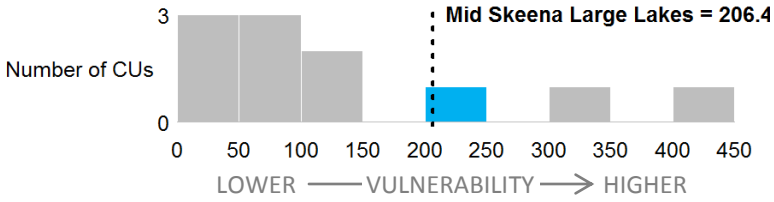


Spawning reaches summer flow sensitive - spawn timing (%)

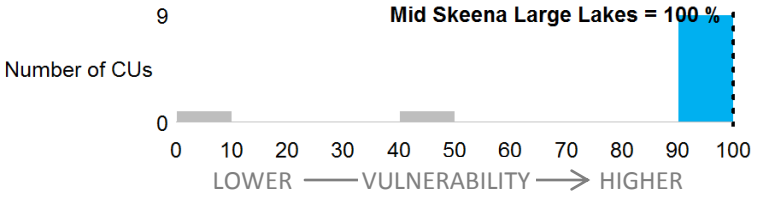


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



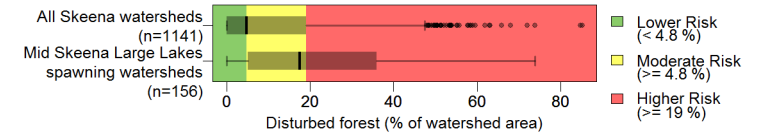
Spawning reaches winter flow sensitive - incubation timing (%)

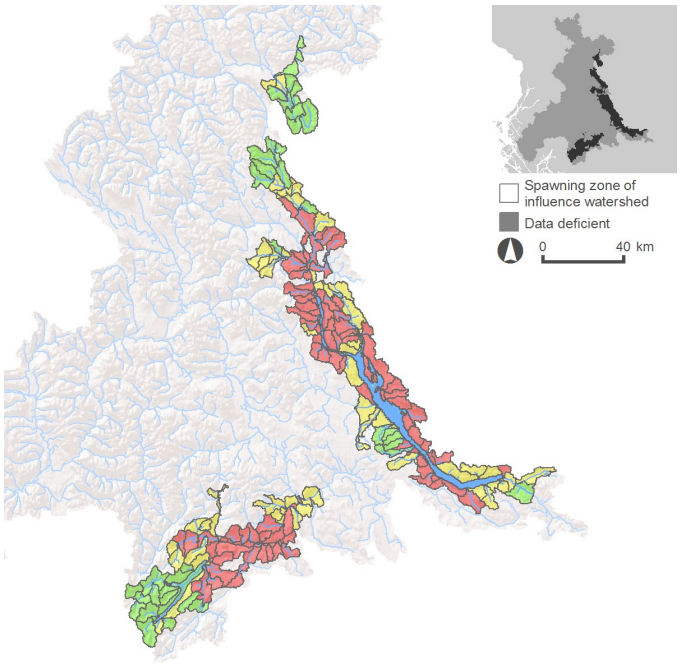


Spawning pressure

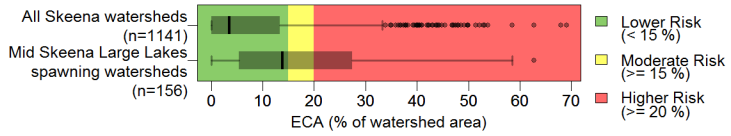
Hydrologic Processes

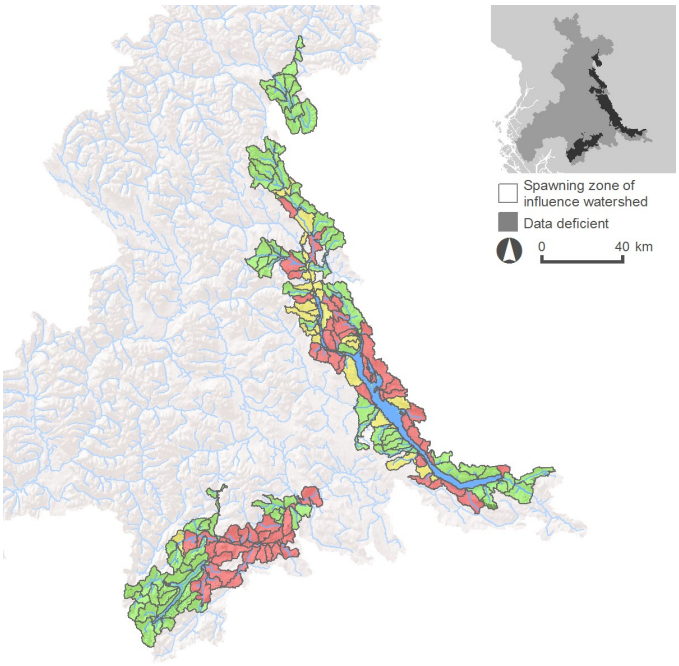
Forest disturbance





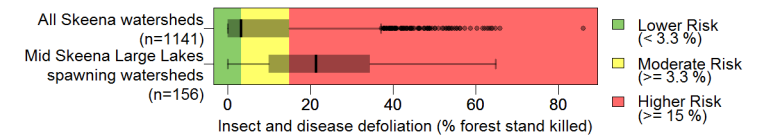
Equivalent Clear-cut Area

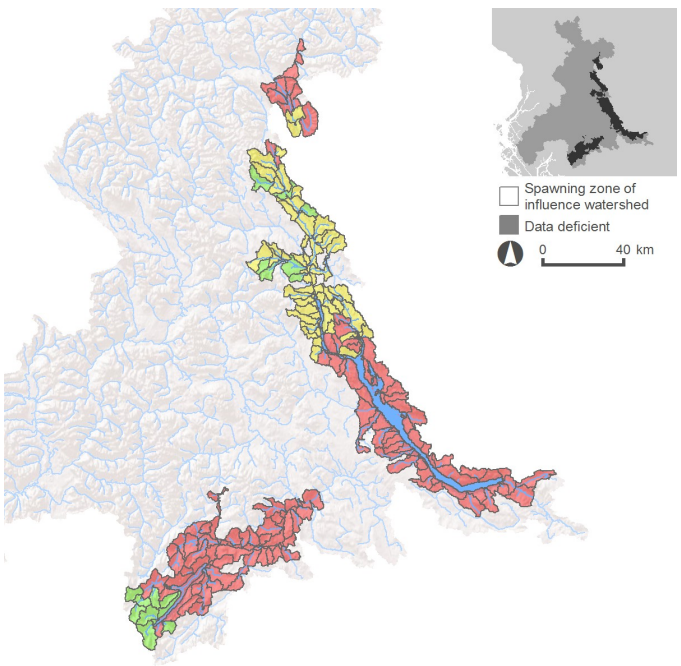




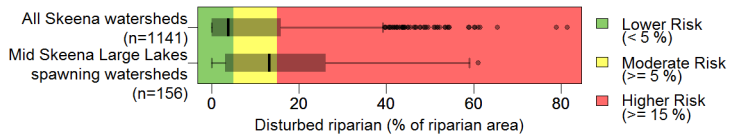
Vegetation Quality

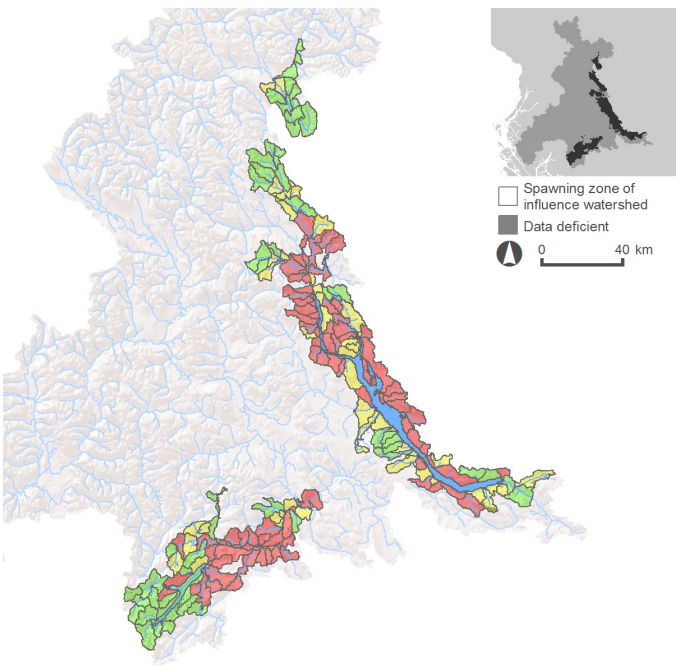
Insect and disease defoliation





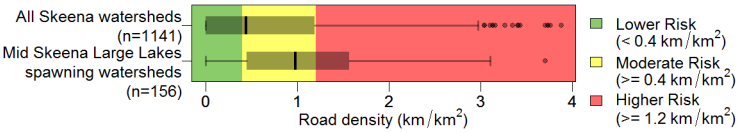
Riparian disturbance

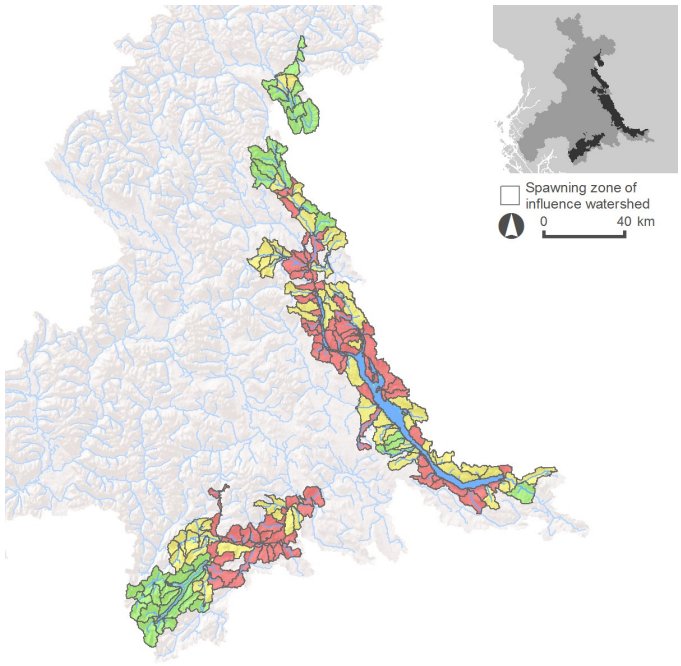




Surface Erosion

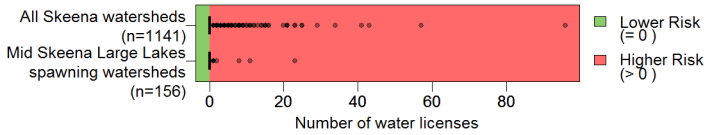
Road development

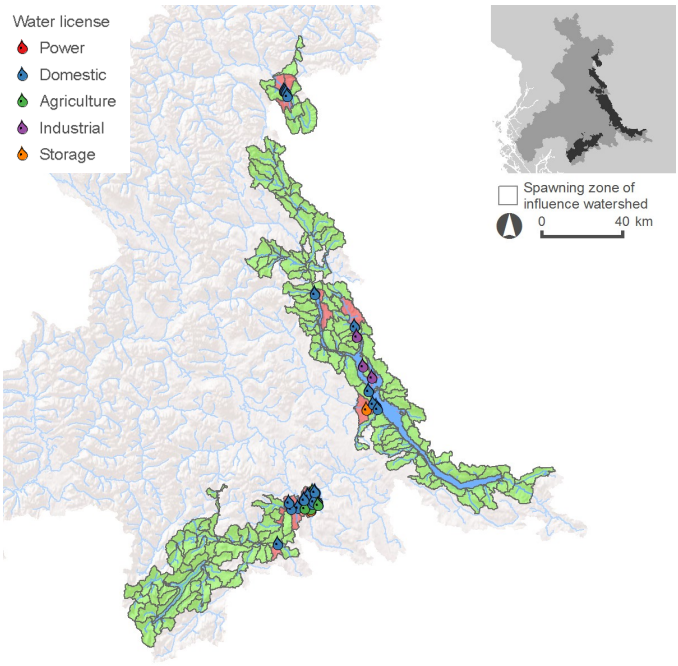




Water Quantity

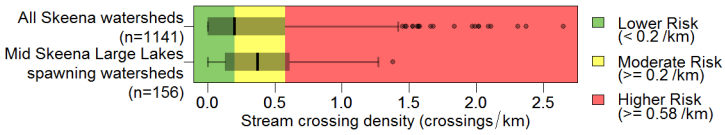
Number of water licenses

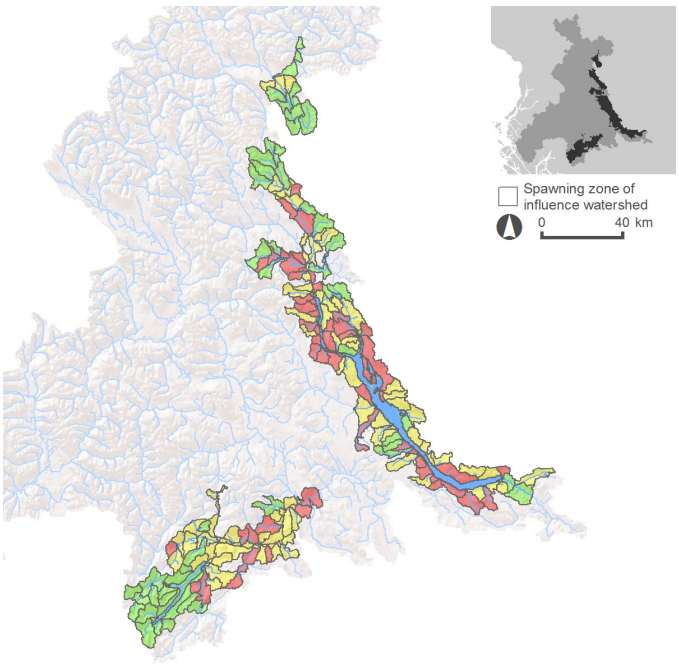




Fish Passage/Habitat Connectivity

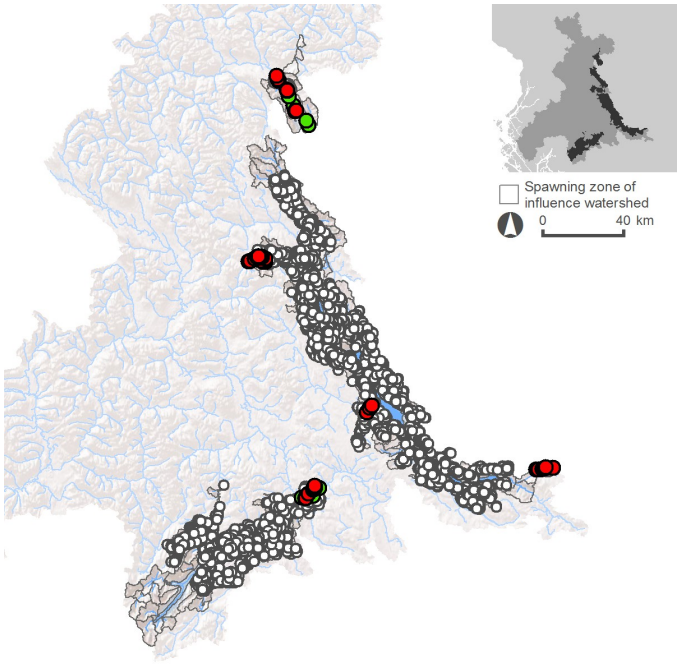
Stream crossing density





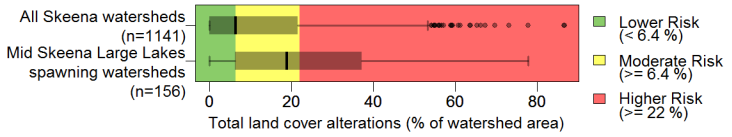
Culvert passability

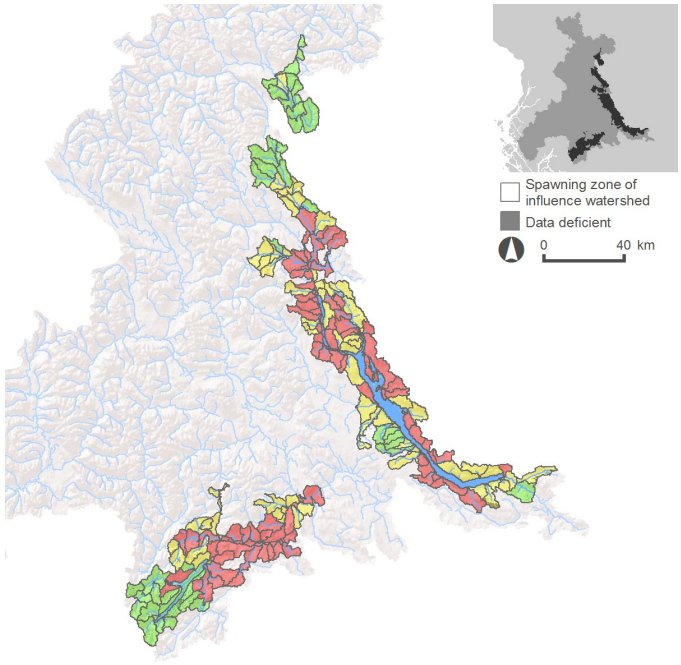
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



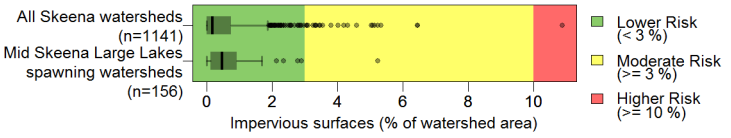
Human Development Footprint

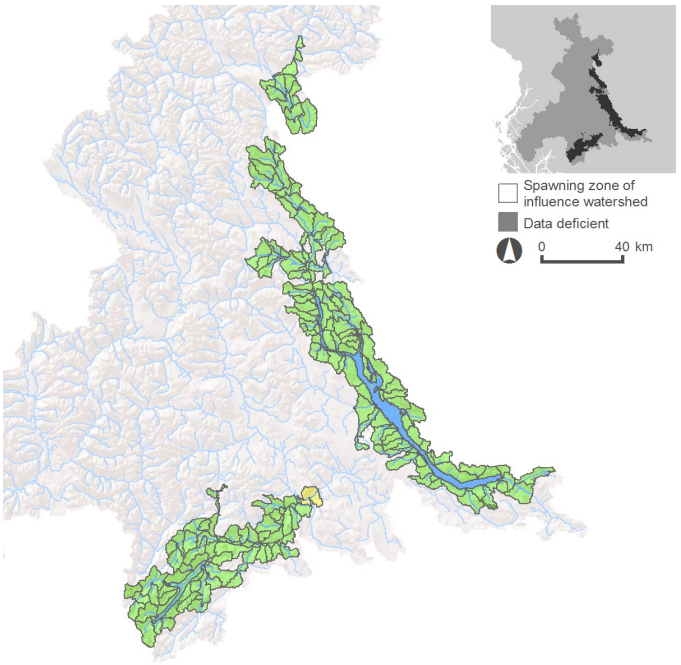
Total land cover alteration



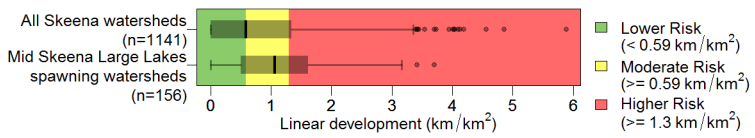


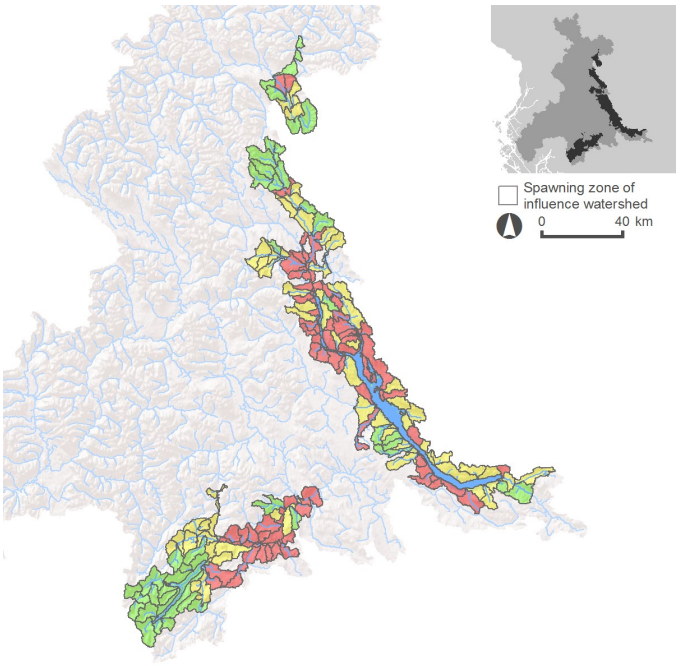
Impervious surfaces



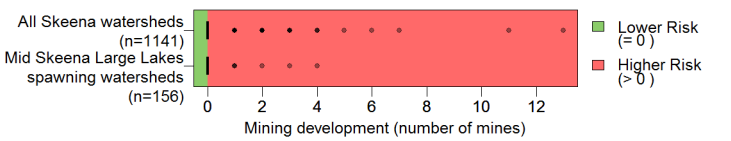


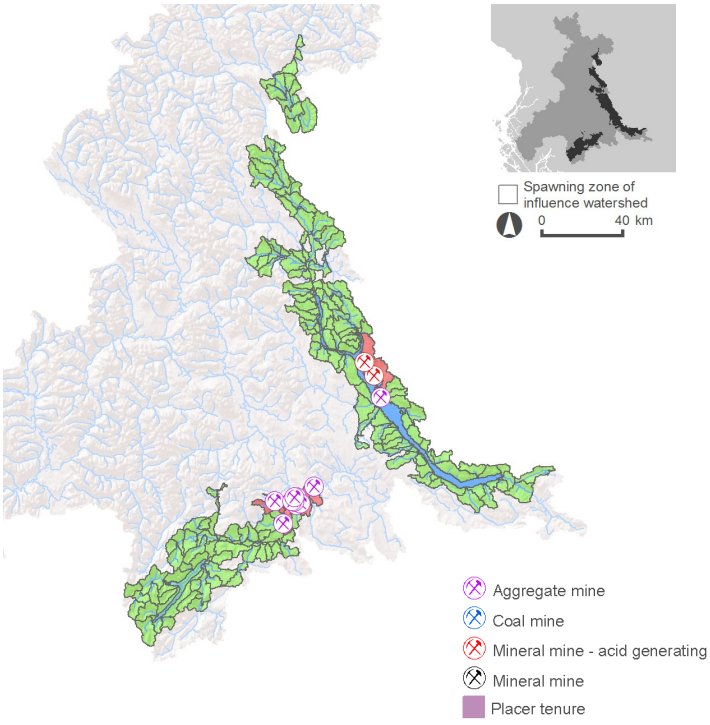
Linear development





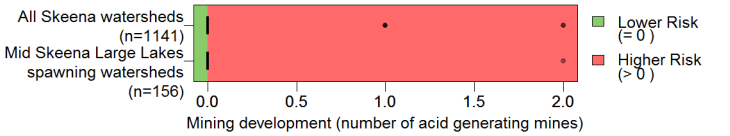
Mining development (total number of mines)

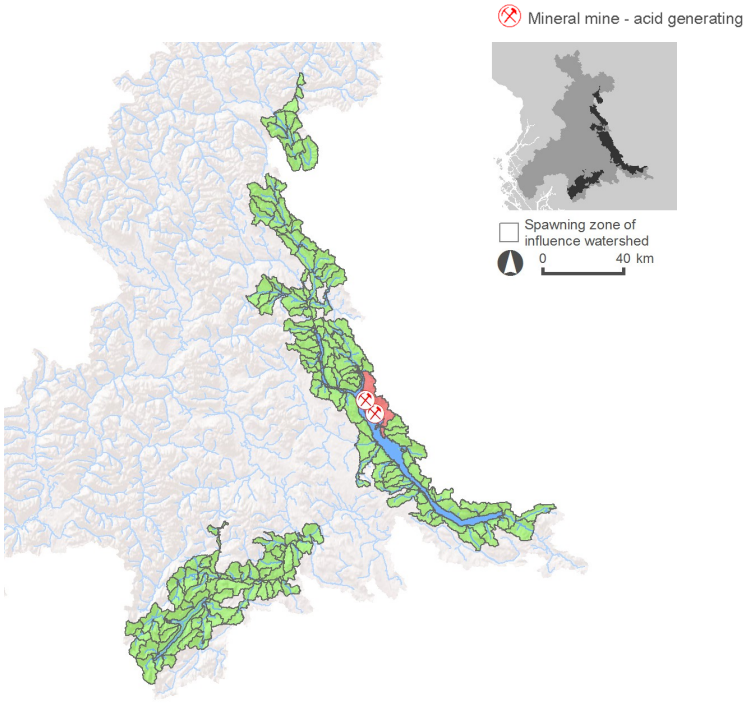




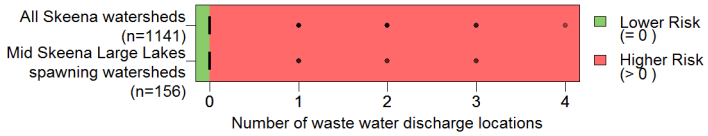
Water Quality

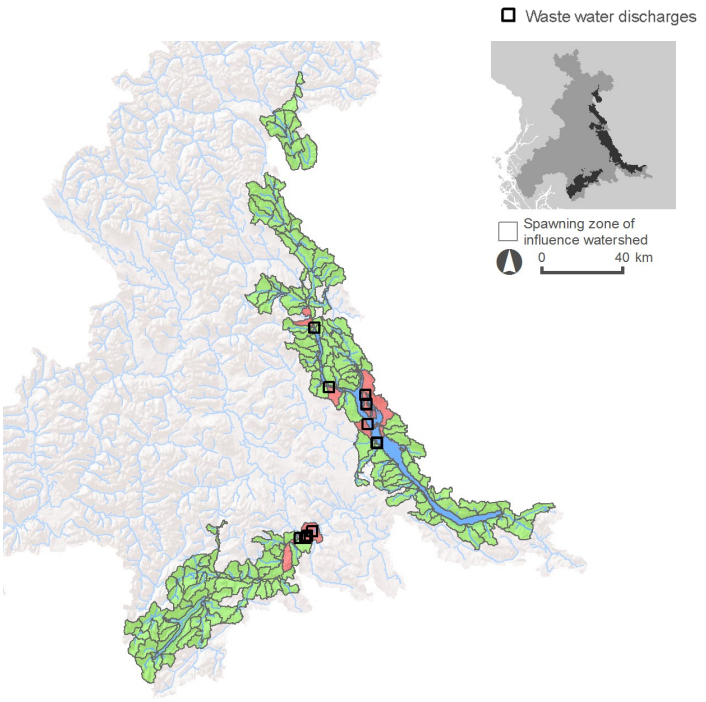
Mining development (acid generating mines)





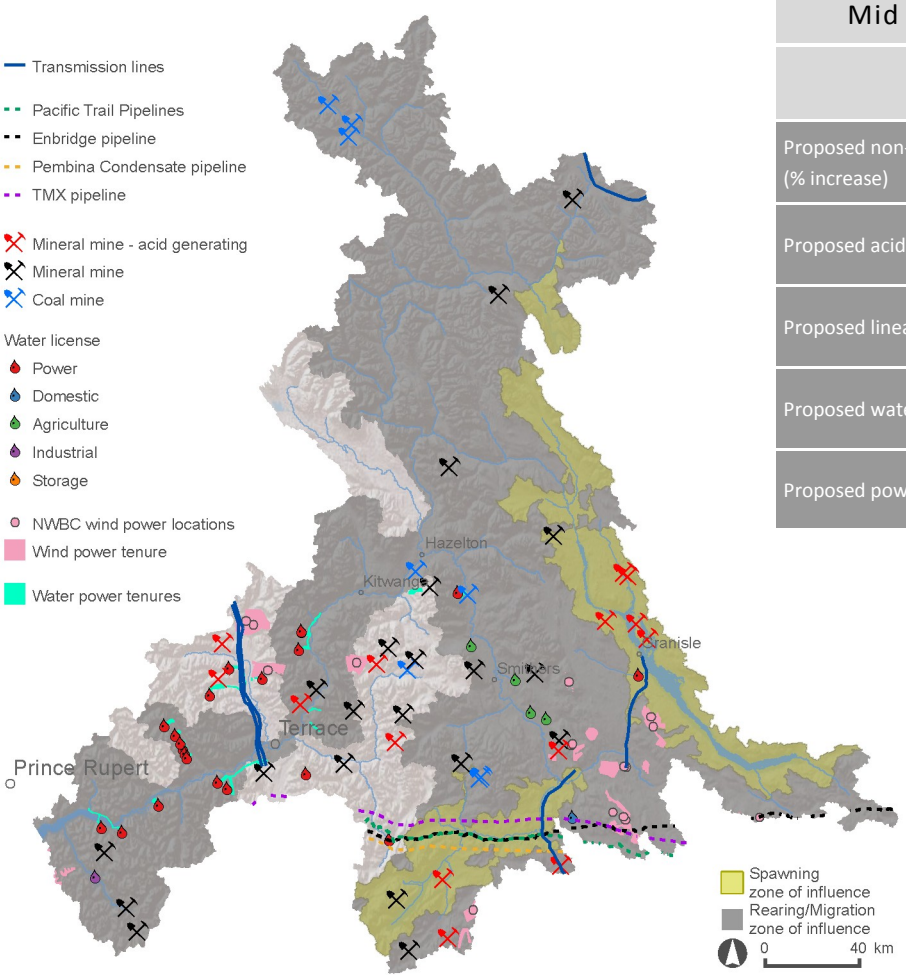
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Mid Skeena Large Lakes Chinook CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	19 (18%)	1 (8%)
Proposed acid generating mines (% increase)	11 (157%)	6 (300%)
Proposed linear development (% increase)	0.01 km/km^2 (2%)	0.04 km/km^2 (4%)
Proposed water licenses (% increase)	26 (3%)	1 (2%)
Proposed power tenures	335 km^2	31 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Sicintine

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

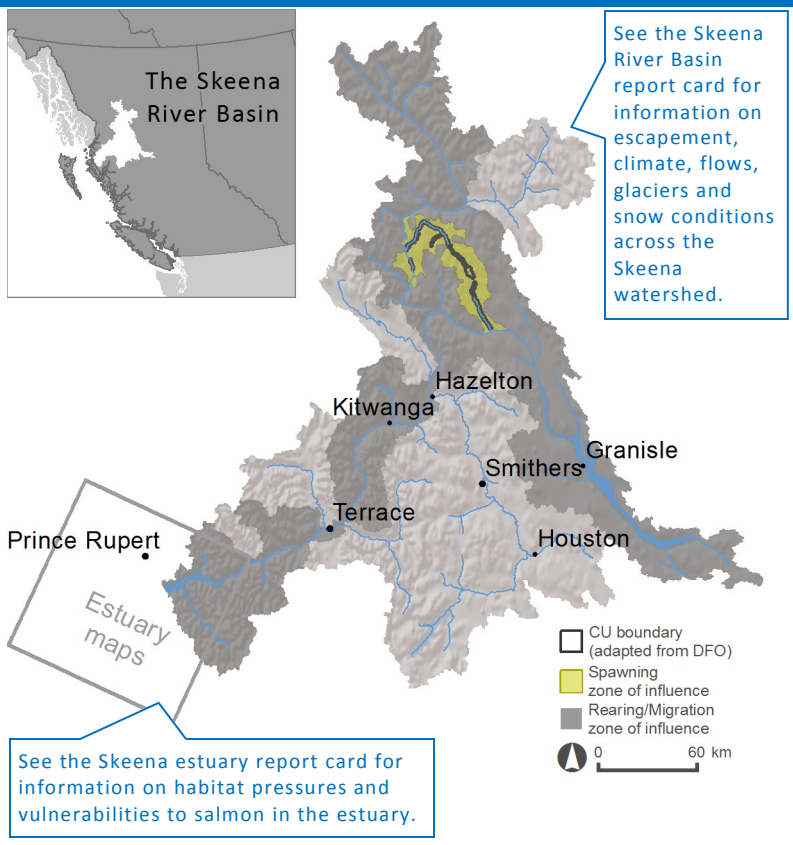
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Sicintine River provides the principal drainage flows for the Atna and Sicintine Ranges. The lower 49 km are mostly confined in a narrow steep-sided valley. The upper 24 km meanders in a mostly unconfined valley bottom with extensive wetlands and is headwatered by the upper and lower lakes. This latter section supports high quality Chinook spawning and rearing habitat.
* The tributaries supporting Chinook for the most part possess steep gradient; however, Maxhla Didaat Creek is low gradient for 2.5 km to its lake.
* Spawning and rearing habitats within this CU are in their natural condition.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, as well as changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

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- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
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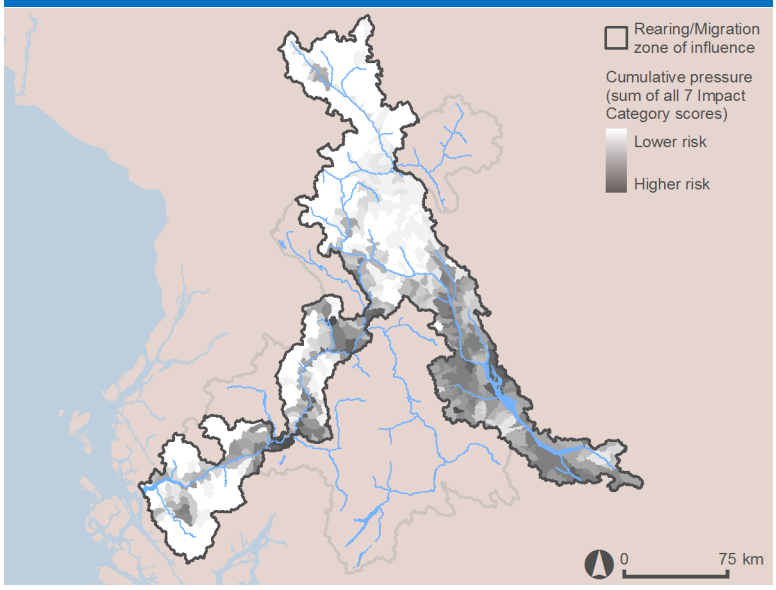
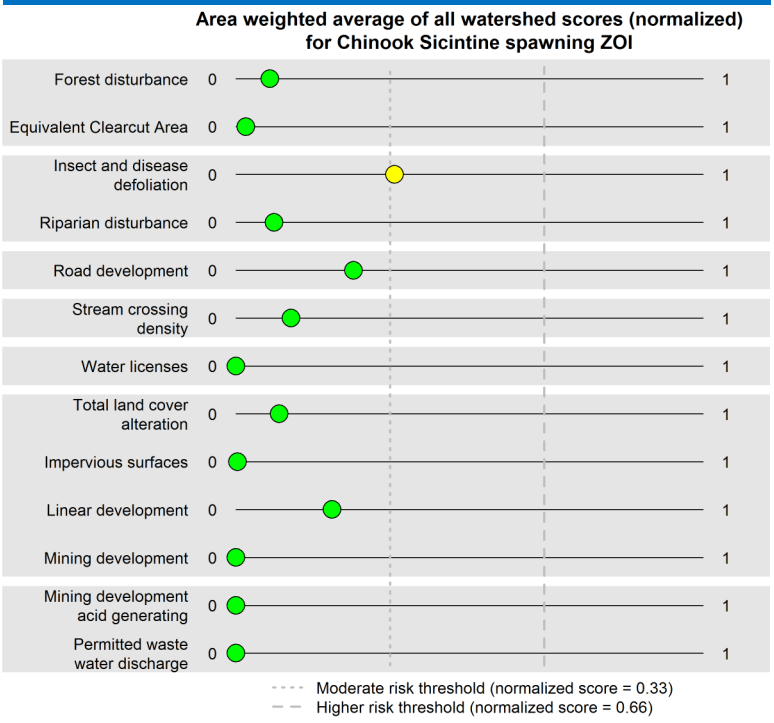
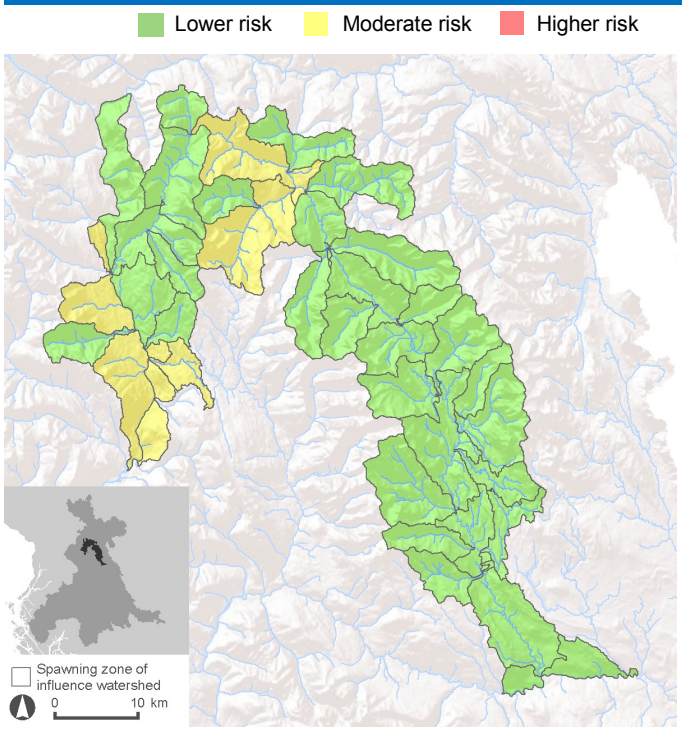
Cumulative pressure—rearing/migration



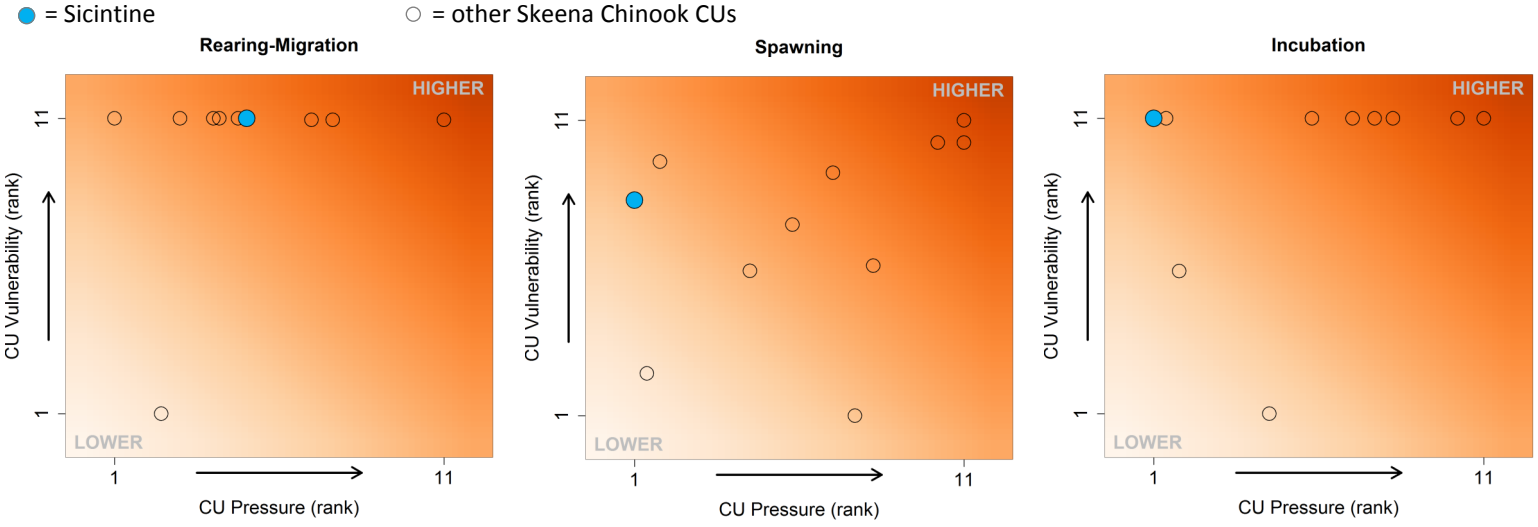
Summary of pressure indicators—spawning



Cumulative pressure—spawning

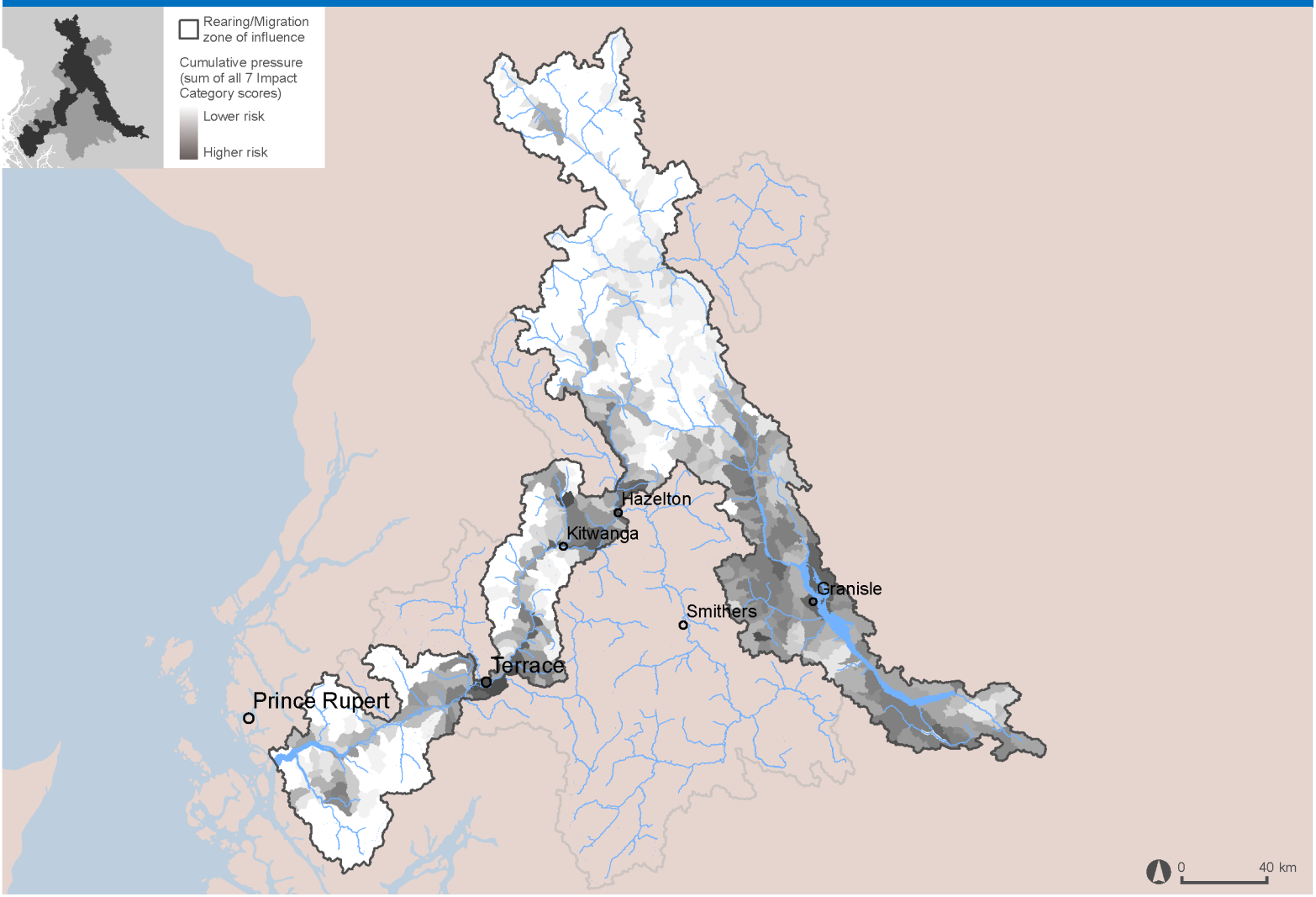


Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation



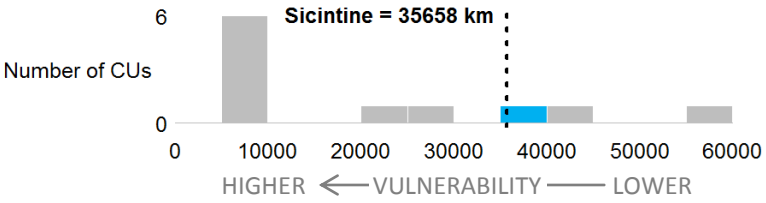
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

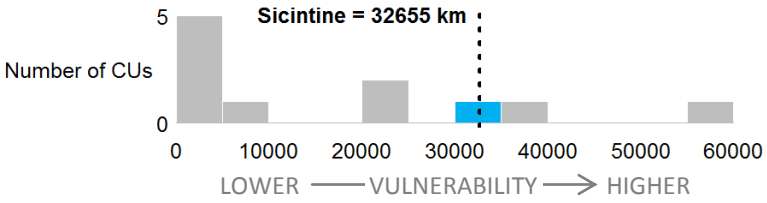


Rearing/Migration period vulnerability

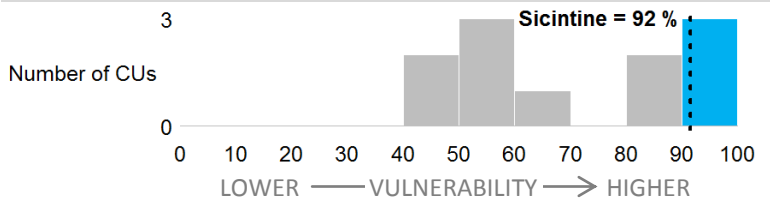
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



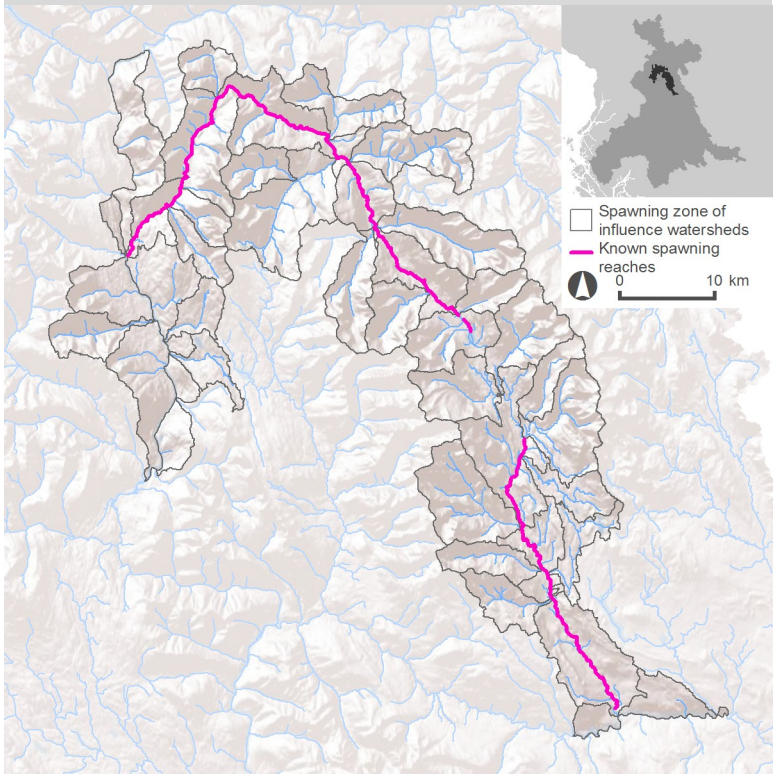
Flow sensitive accessible habitat (%) (all seasons)



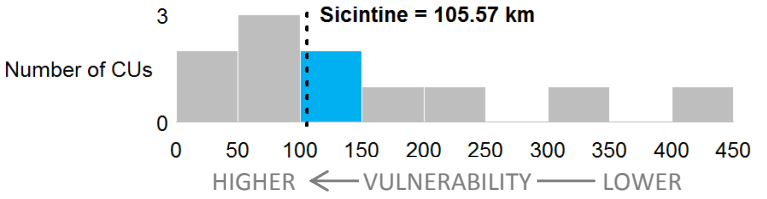
Spawning & incubation vulnerability

Spawning period vulnerability

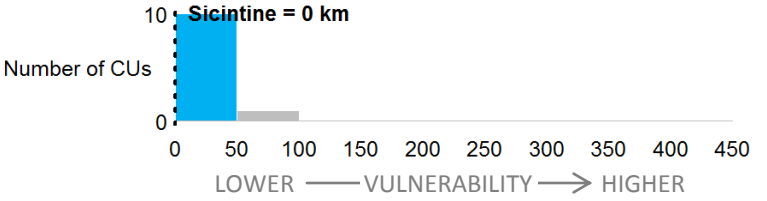
Spawning locations



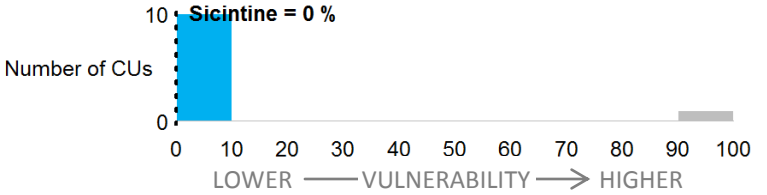
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

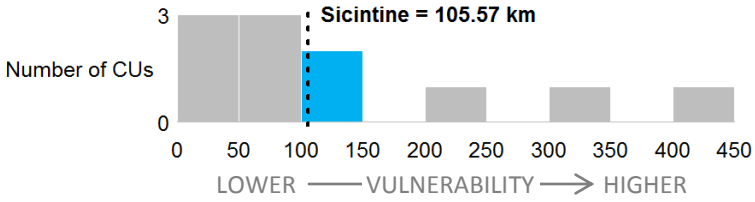


Spawning reaches summer flow sensitive - spawn timing (%)

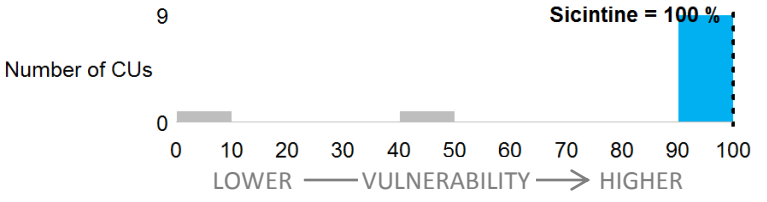


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



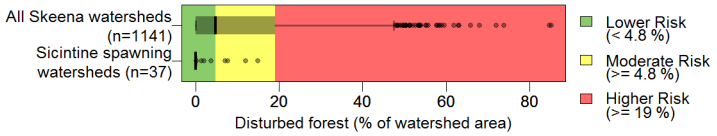
Spawning reaches winter flow sensitive - incubation timing (%)

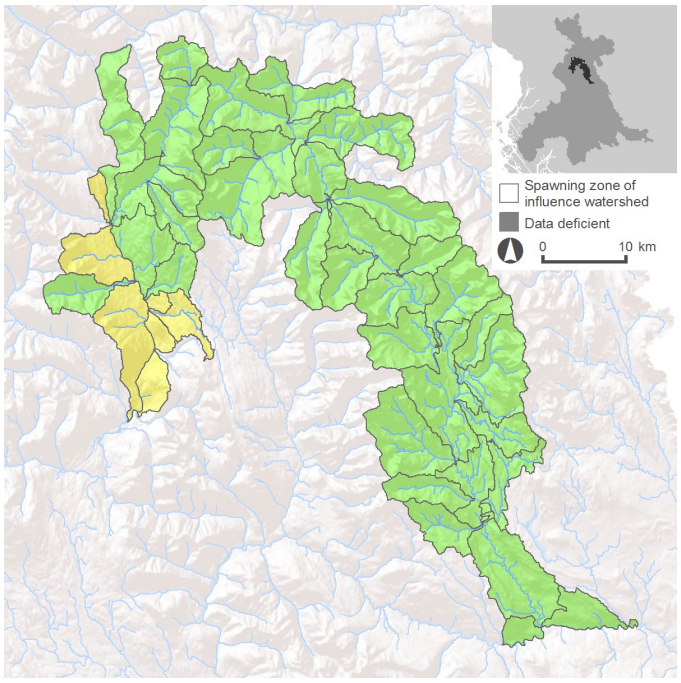


Spawning pressure

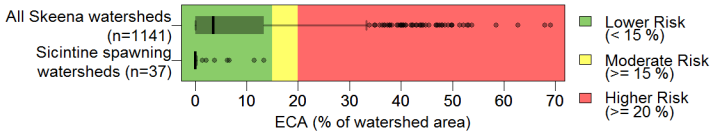
Hydrologic Processes

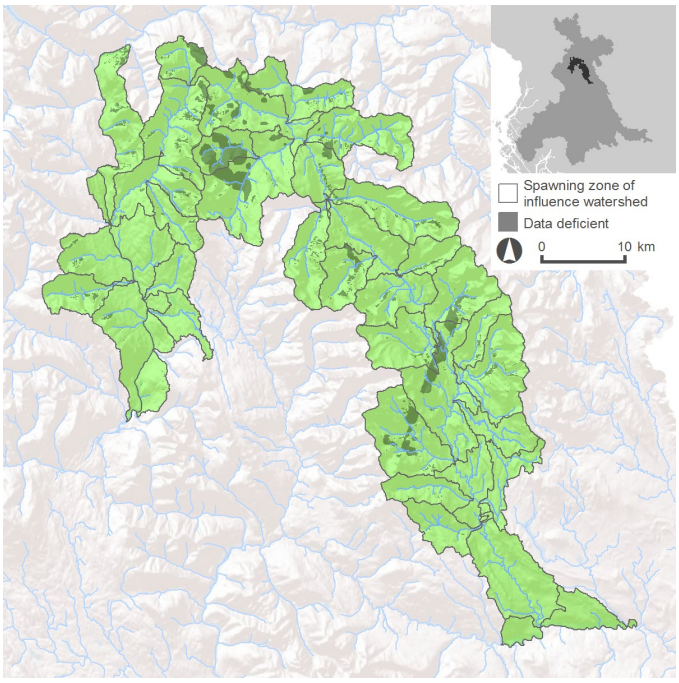
Forest disturbance





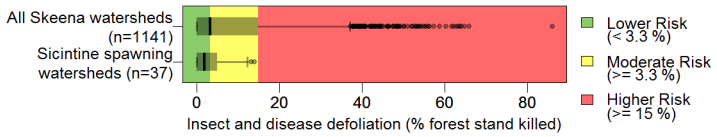
Equivalent Clear-cut Area

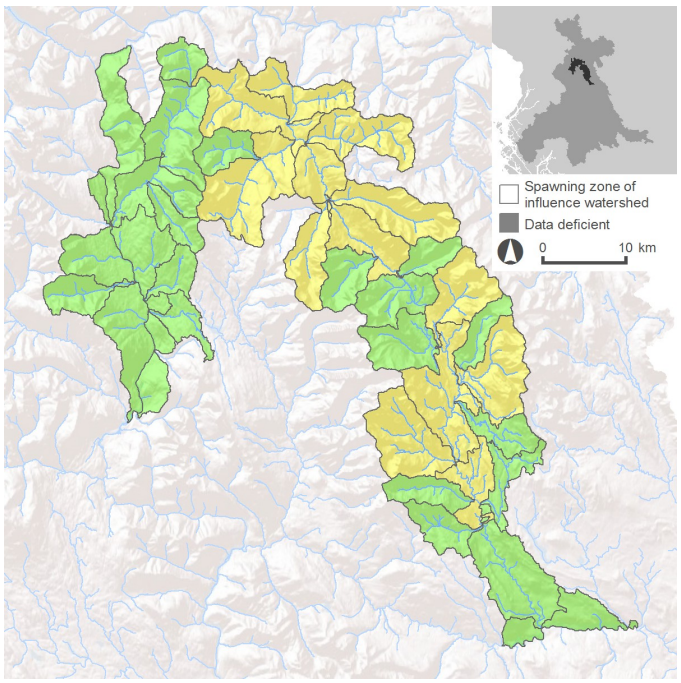




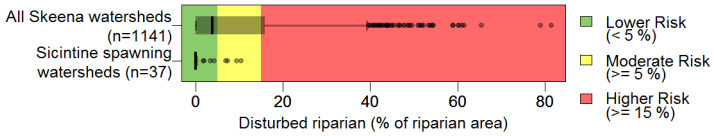
Vegetation Quality

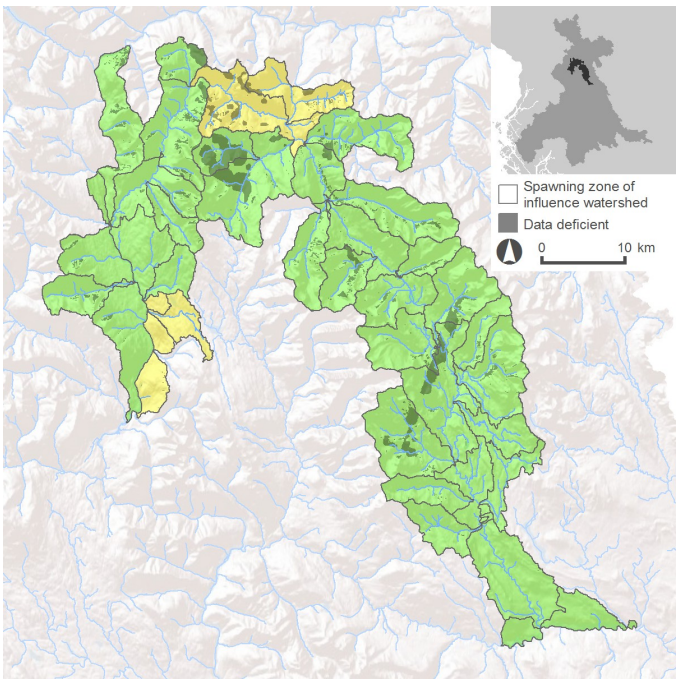
Insect and disease defoliation





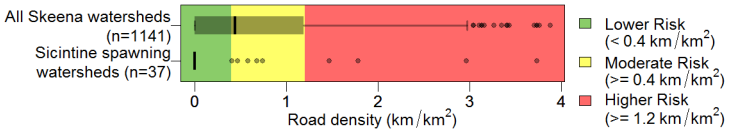
Riparian disturbance

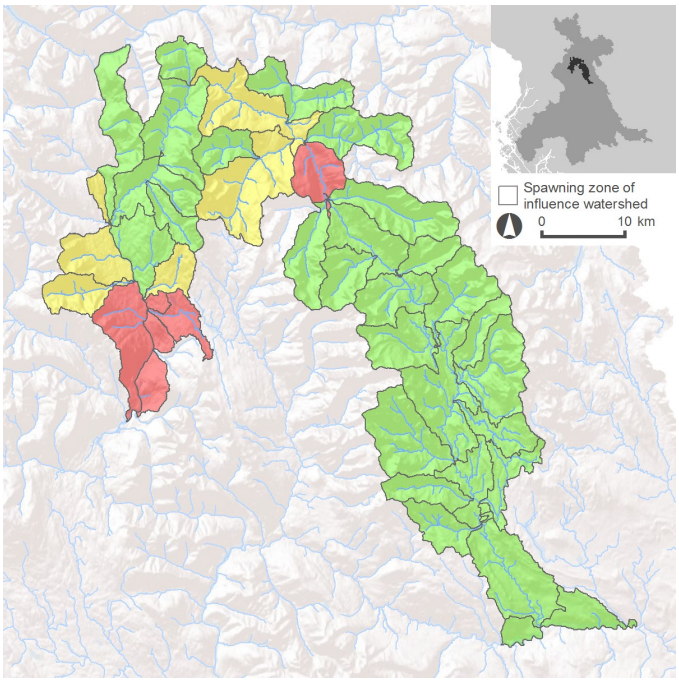




Surface Erosion

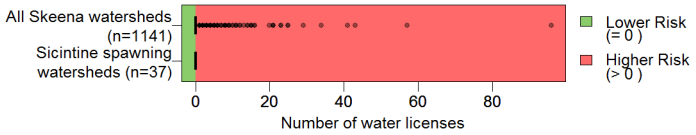
Road development

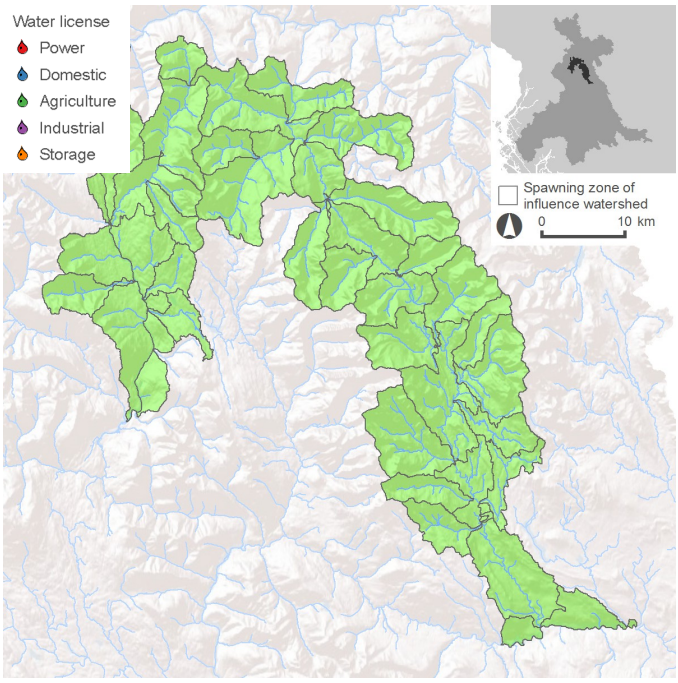




Water Quantity

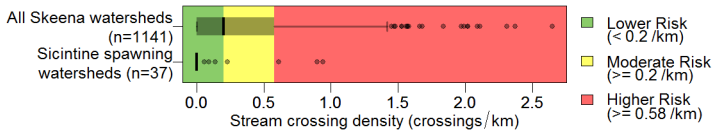
Number of water licenses

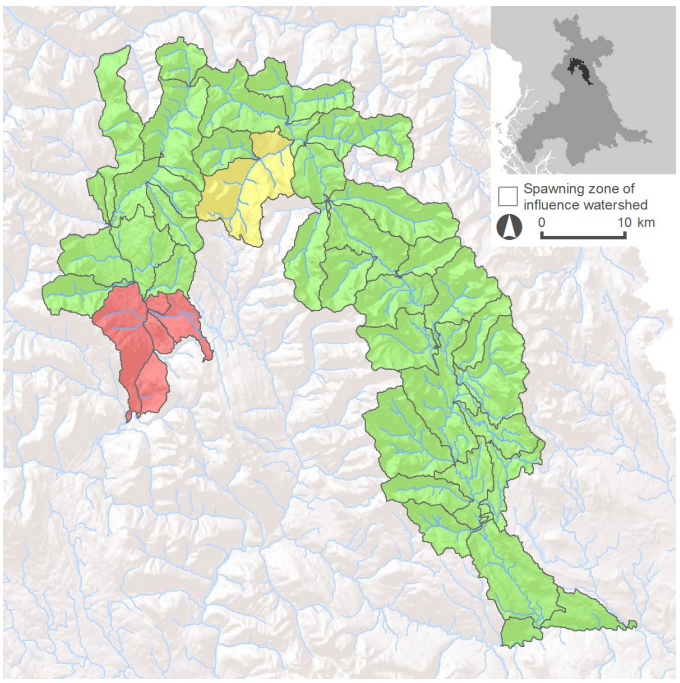




Fish Passage/Habitat Connectivity

Stream crossing density



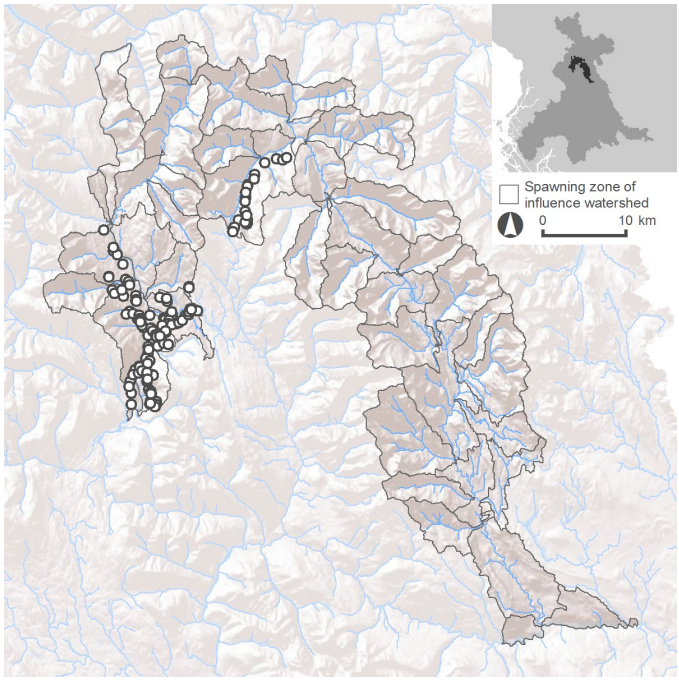


Culvert passability

Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

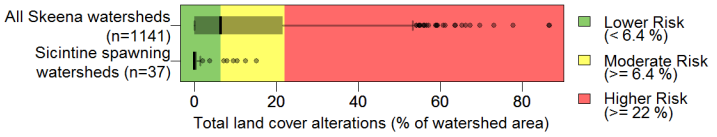
Assessed culvert
- Passable
- Unknown
- Barrier

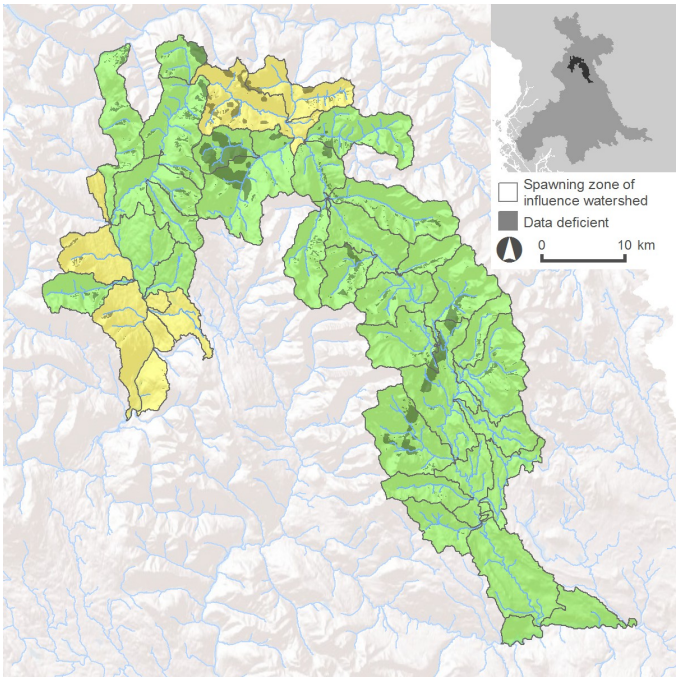
Potential culvert
- Road/Stream crossing



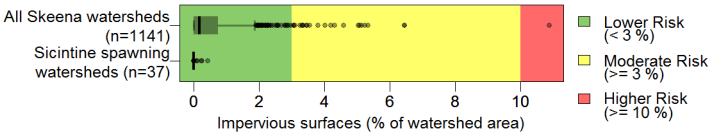
Human Development Footprint

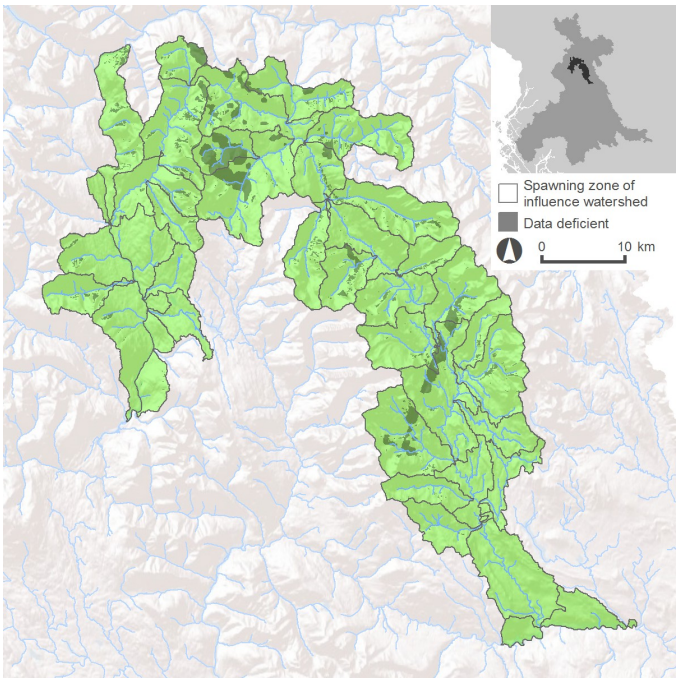
Total land cover alteration



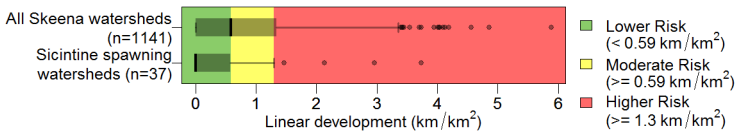


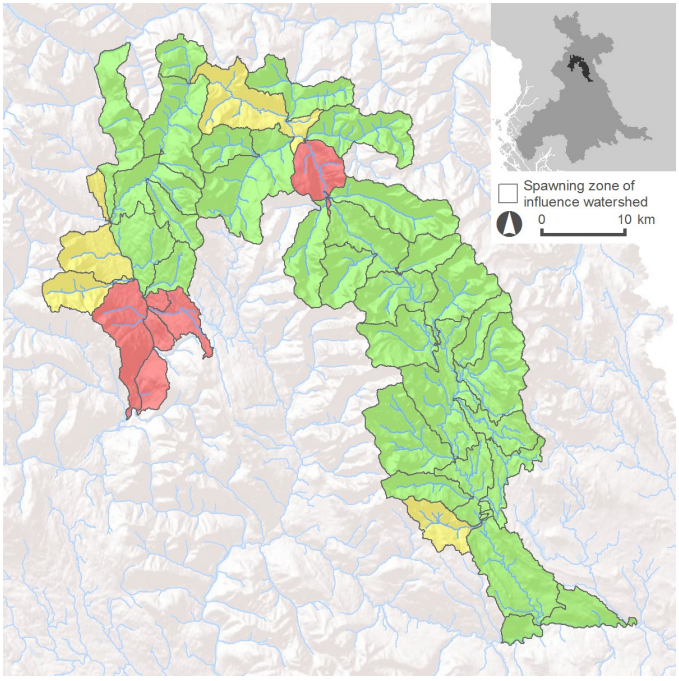
Impervious surfaces



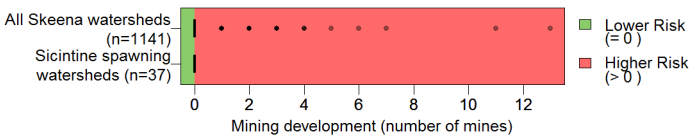


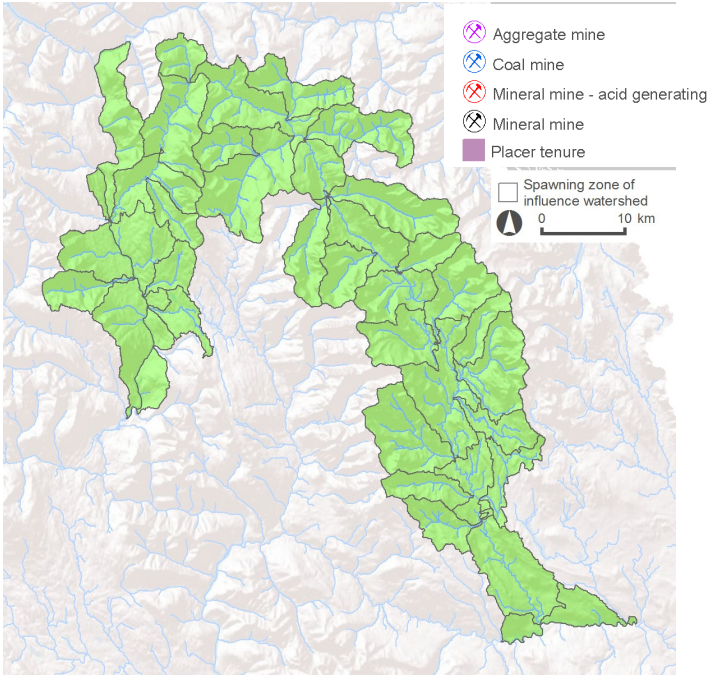
Linear development





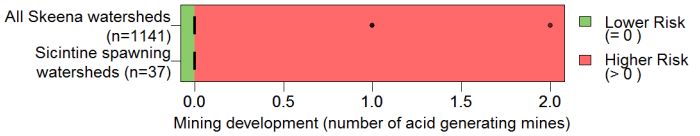
Mining development (total number of mines)

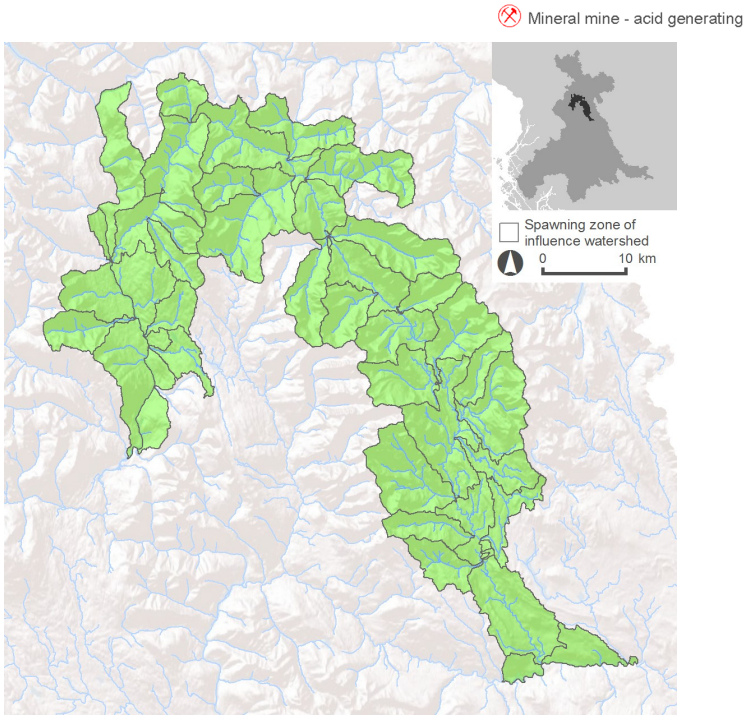




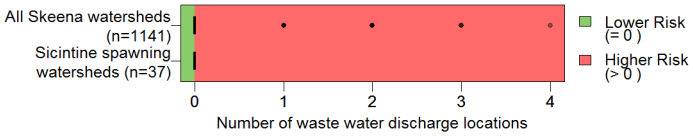
Water Quality

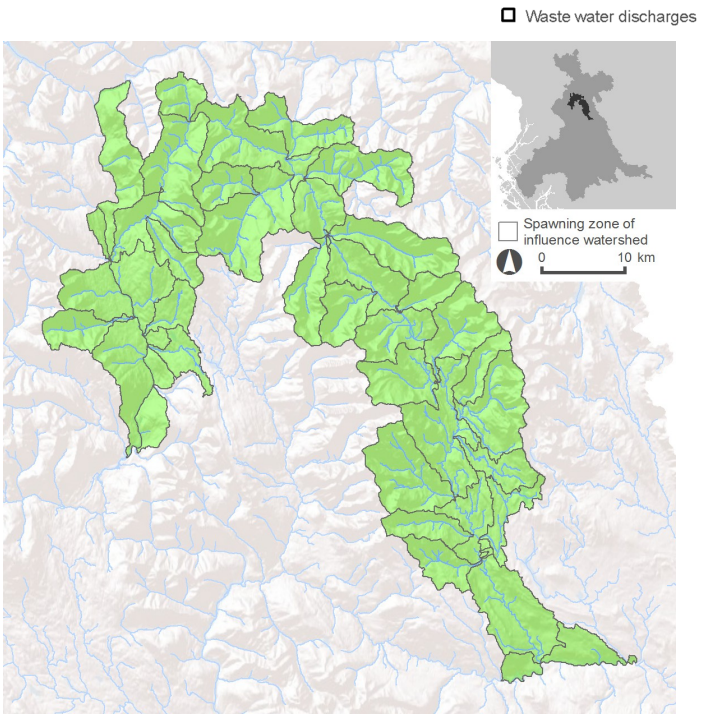
Mining development (acid generating mines)





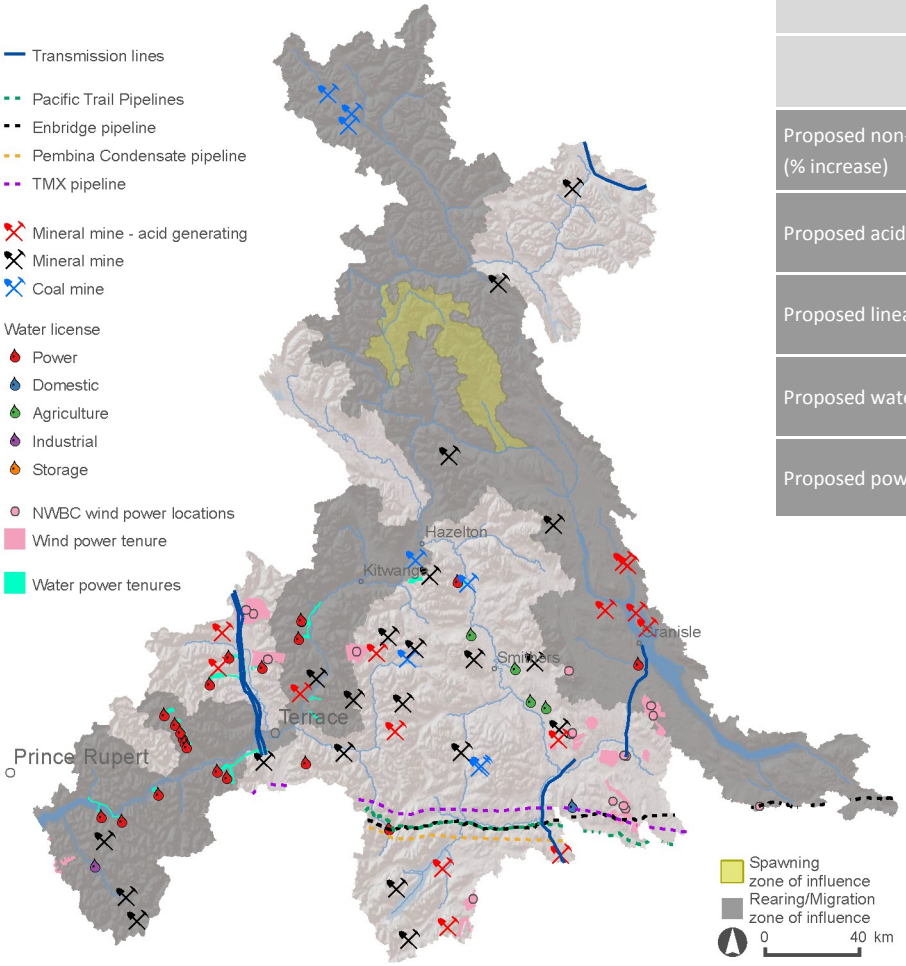
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Sicintine Chinook CU summary

	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	10 (18%)	0 (NA)
Proposed acid generating mines (% increase)	6 (150%)	0 (NA)
Proposed linear development (% increase)	0.004 km/km^2 (0.6%)	0 km/km^2 (0%)
Proposed water licenses (% increase)	19 (12%)	0 (NA)
Proposed power tenures	159 km^2	0 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Upper Bulkley

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

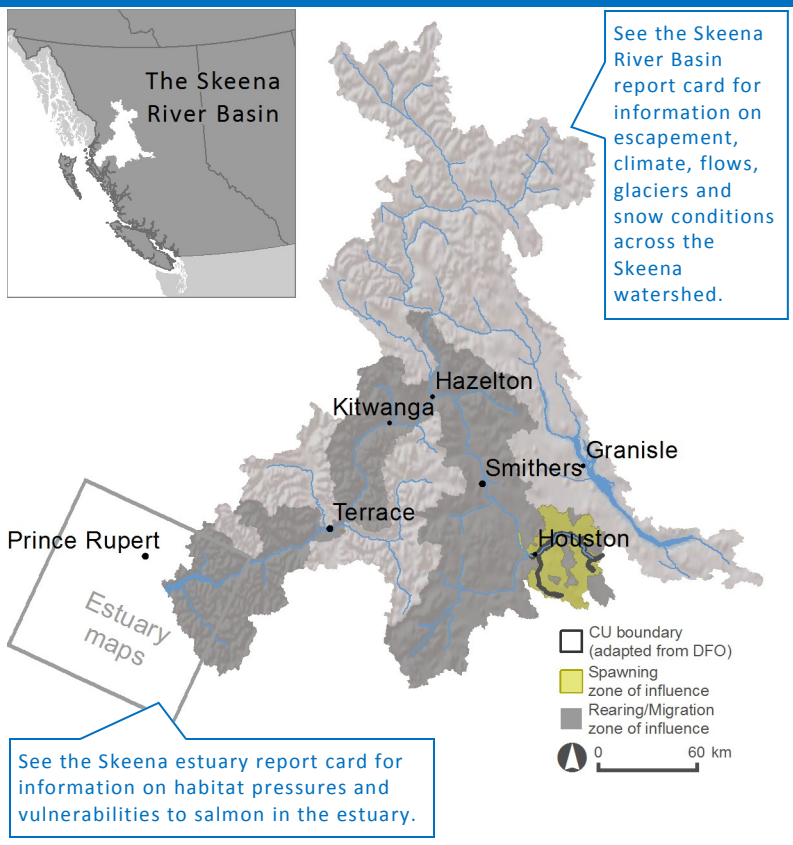
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* The upper Bulkley drainage is for the most part subdued, rolling country with some of the lowest precipitation and streamflows in Skeena watershed. The relatively low amount of precipitation causes the discharge of low and medium elevation tributaries to drop off sharply following spring freshet. Summer and early autumn are characterized by low flows.
* Bulkley Falls is considered impassable to fish at low water levels.
* Upstream and downstream of Bulkley Falls, persistent beaver dam activity typically obstructs fish passage.
* A century of habitat degradation has led to adverse cumulative effects to Chinook and their habitat. Hillslopes, roads, riparian areas, stream channels, and fish habitats have been impacted by land use practices. Development includes rail and highway corridors that continue to significantly impinge on fish habitat, logging and road construction. Agriculture practices have caused erosion and deposition of sediment on a moderate to large scale. Restoration activities have been minimal.
* Migration habitat issues center on the CN Rail line that was built through the middle of the floodplain, impacted access into the mainstem floodplain and tributaries, and caused sedimentation. The rail line functions as a contaminated linear corridor.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, a lack of fish habitat rehabilitation, and changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

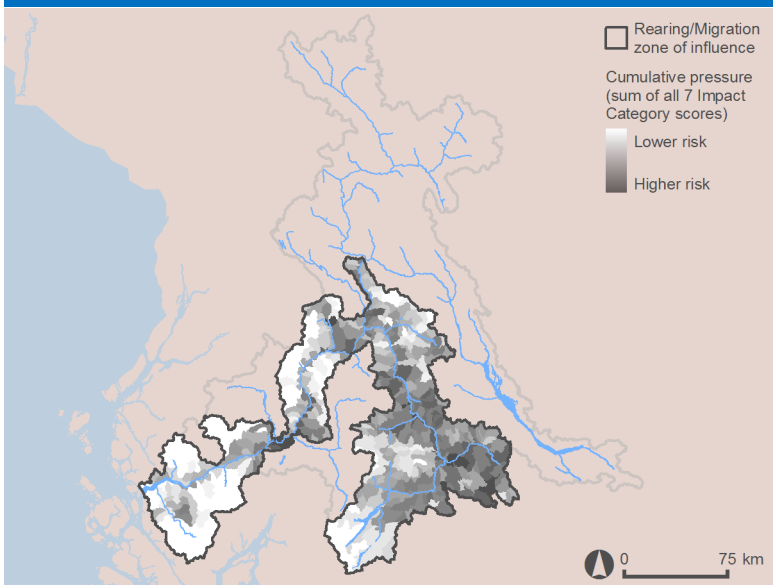
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

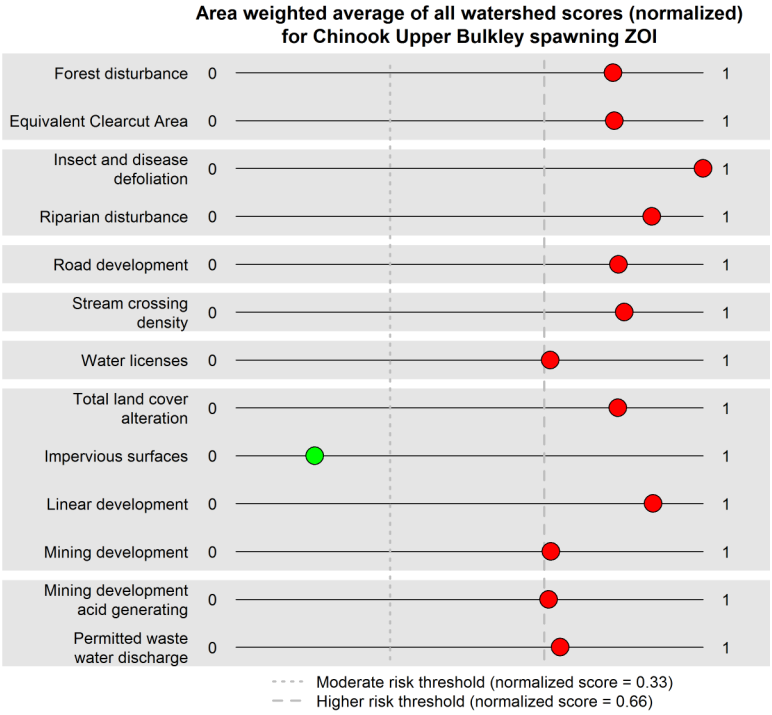
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

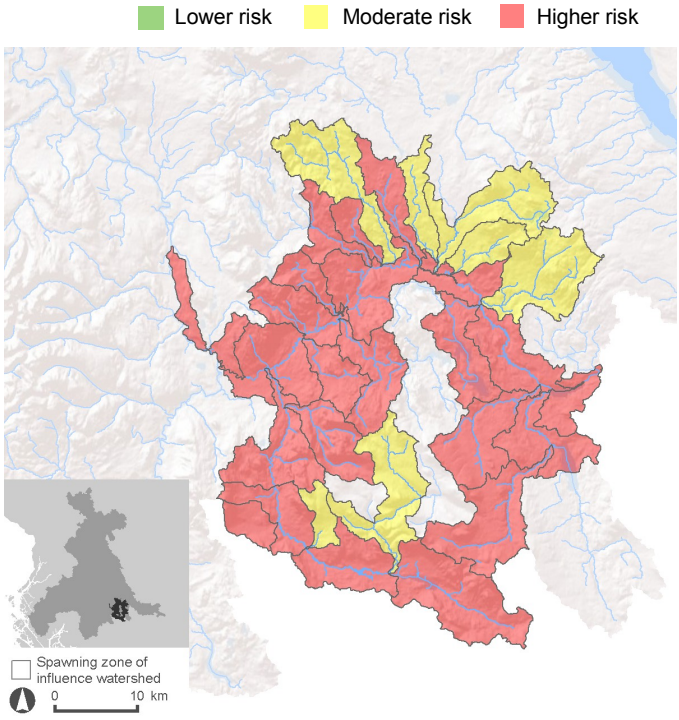
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

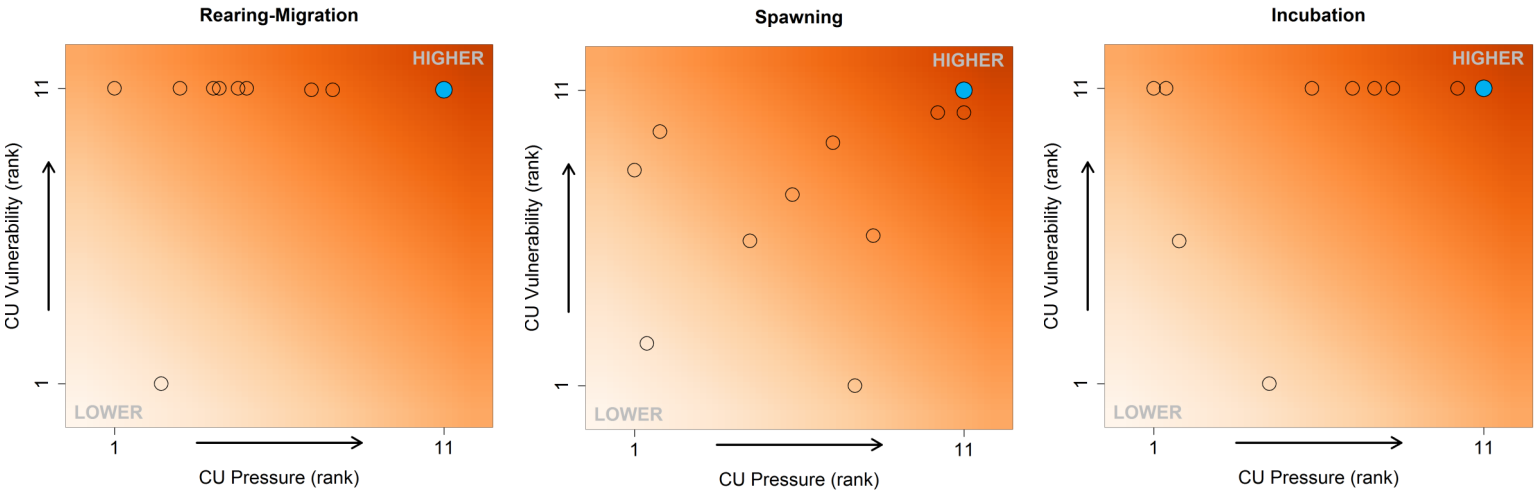


Cumulative pressure—spawning



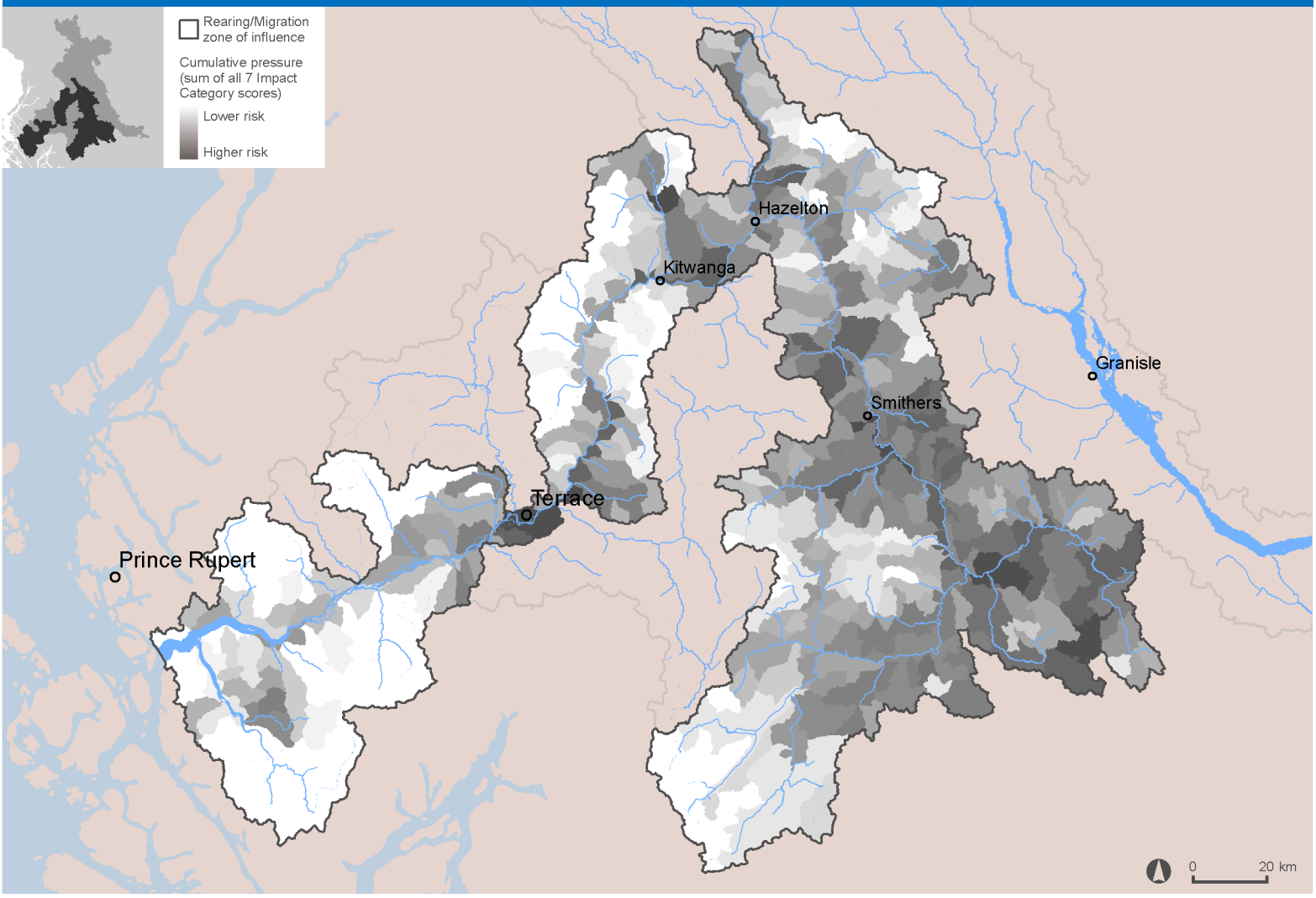
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Upper Bulkley ○ = other Skeena Chinook CUs



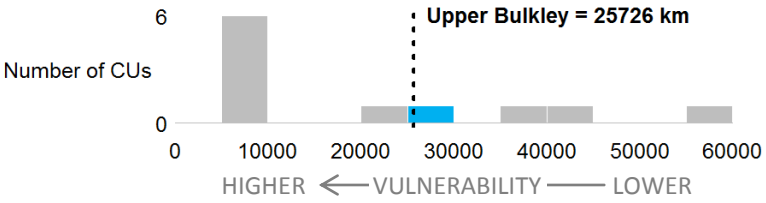
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

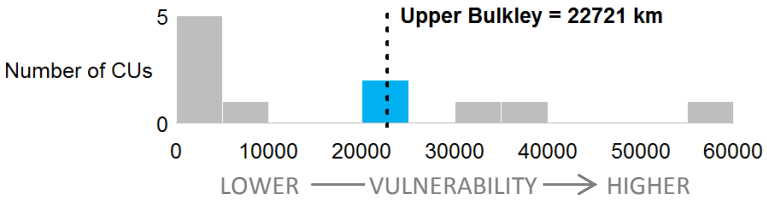


Rearing/Migration period vulnerability

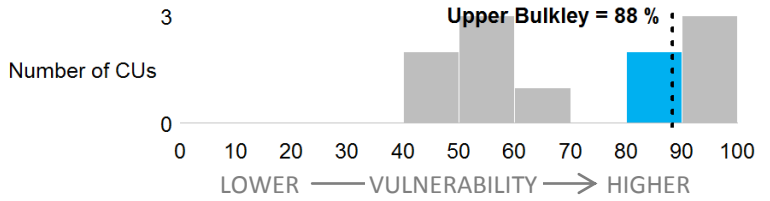
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



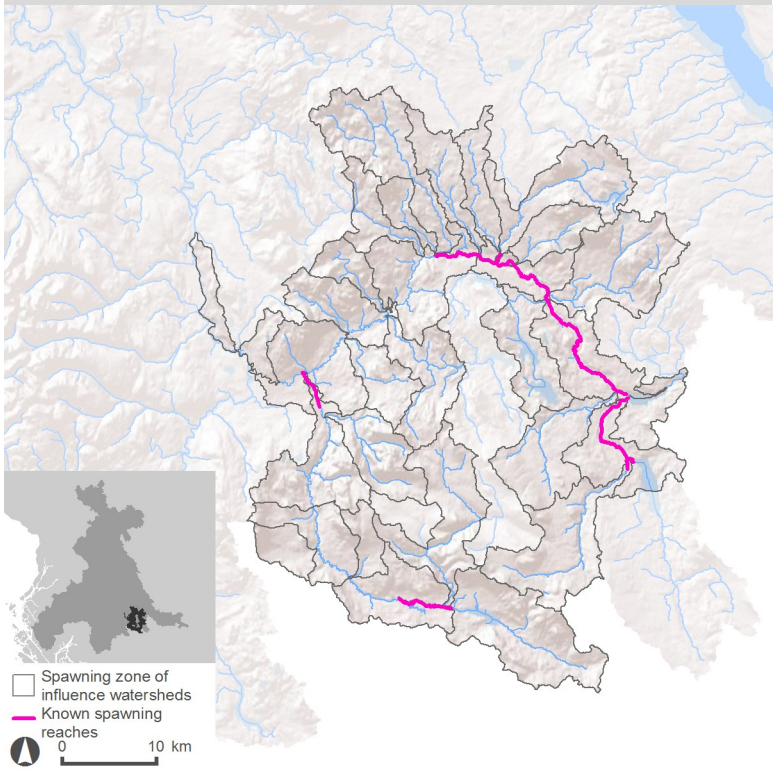
Flow sensitive accessible habitat (%) (all seasons)



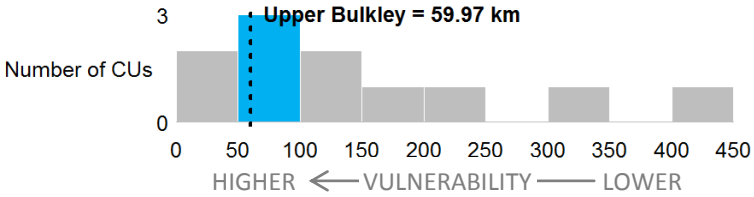
Spawning & incubation vulnerability

Spawning period vulnerability

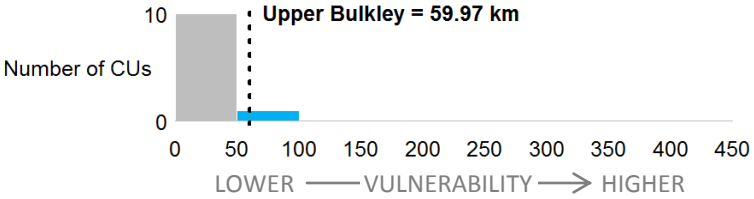
Spawning locations



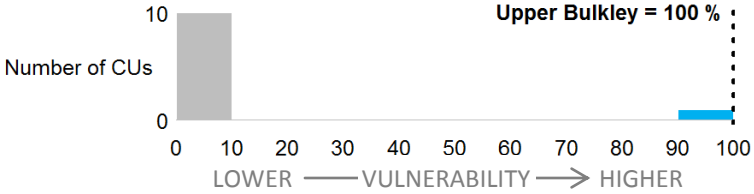
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

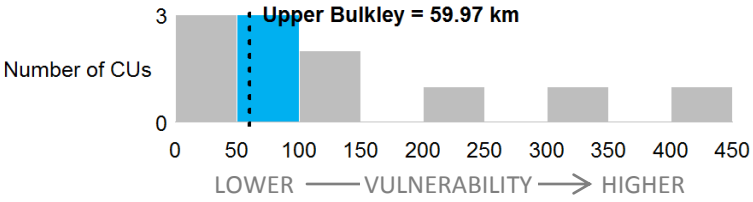


Spawning reaches summer flow sensitive - spawn timing (%)

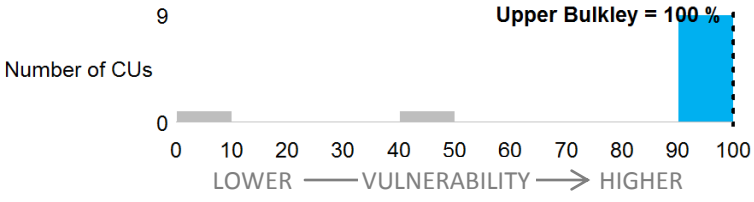


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



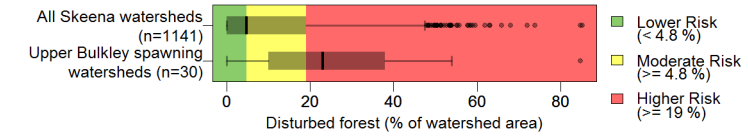
Spawning reaches winter flow sensitive - incubation timing (%)

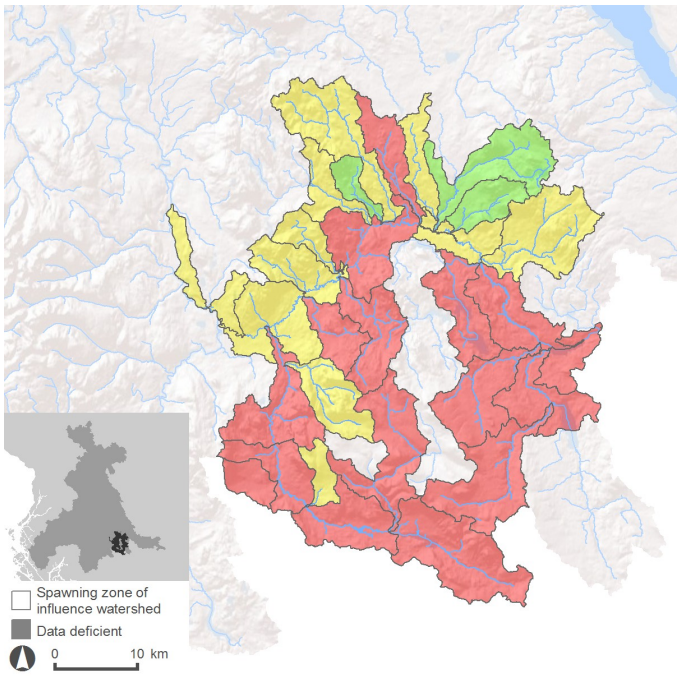


Spawning pressure

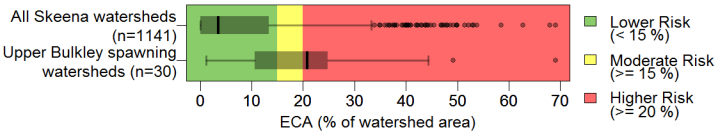
Hydrologic Processes

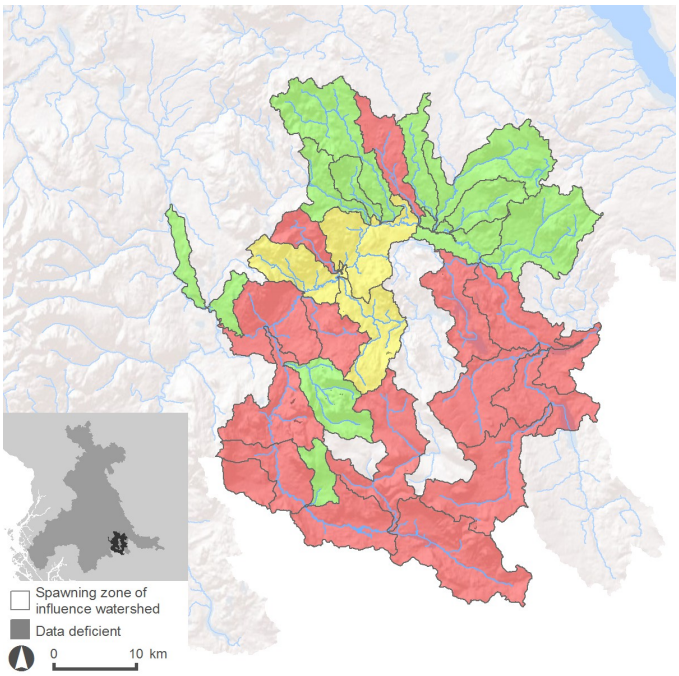
Forest disturbance





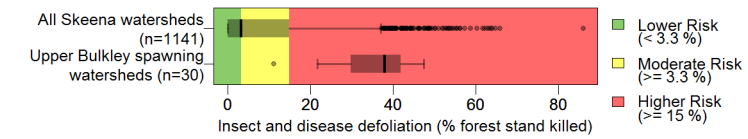
Equivalent Clear-cut Area

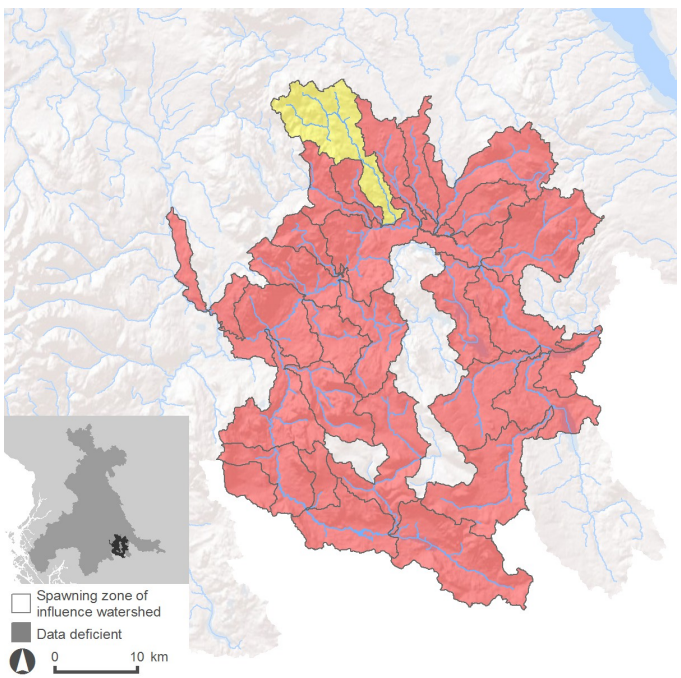




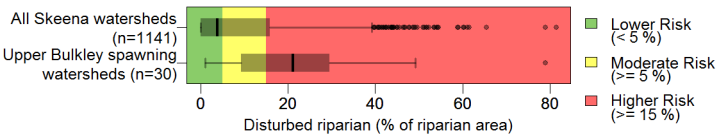
Vegetation Quality

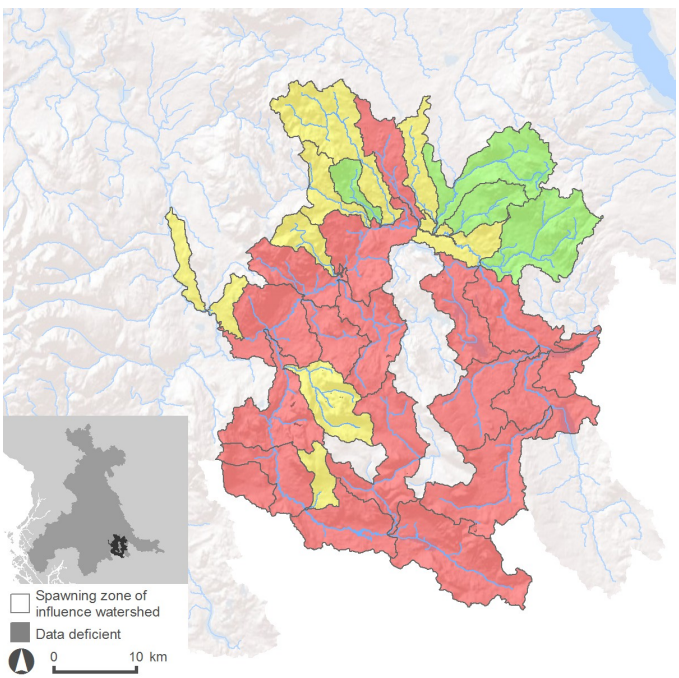
Insect and disease defoliation





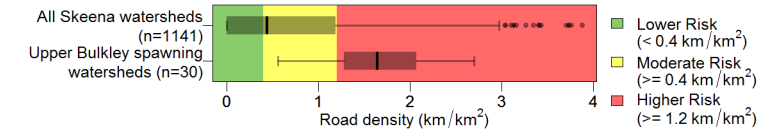
Riparian disturbance

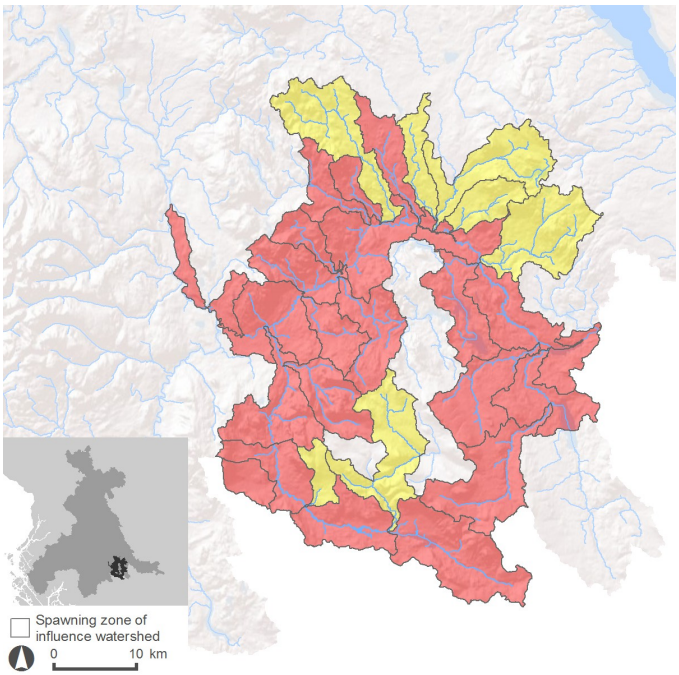




Surface Erosion

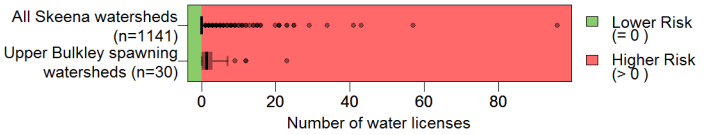
Road development

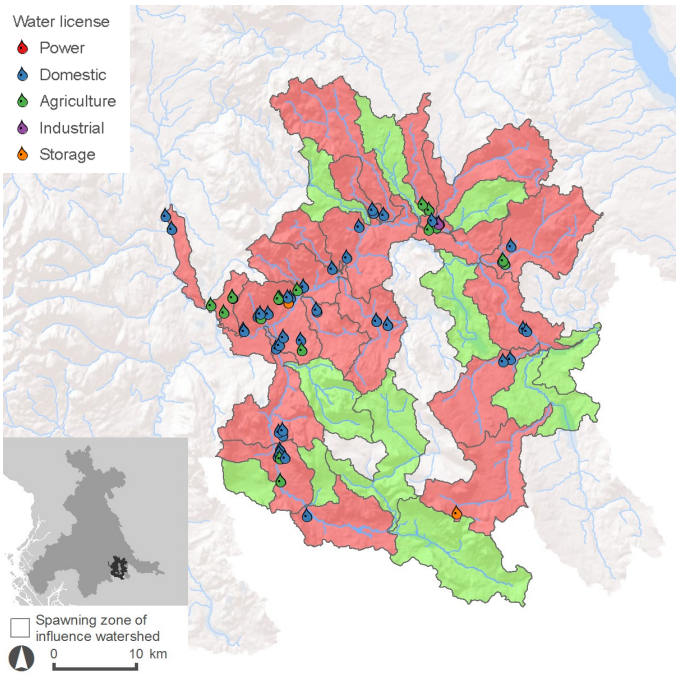




Water Quantity

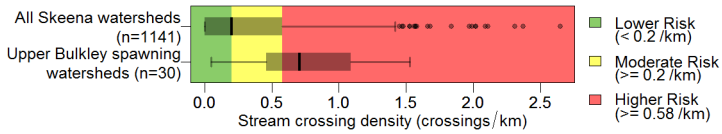
Number of water licenses

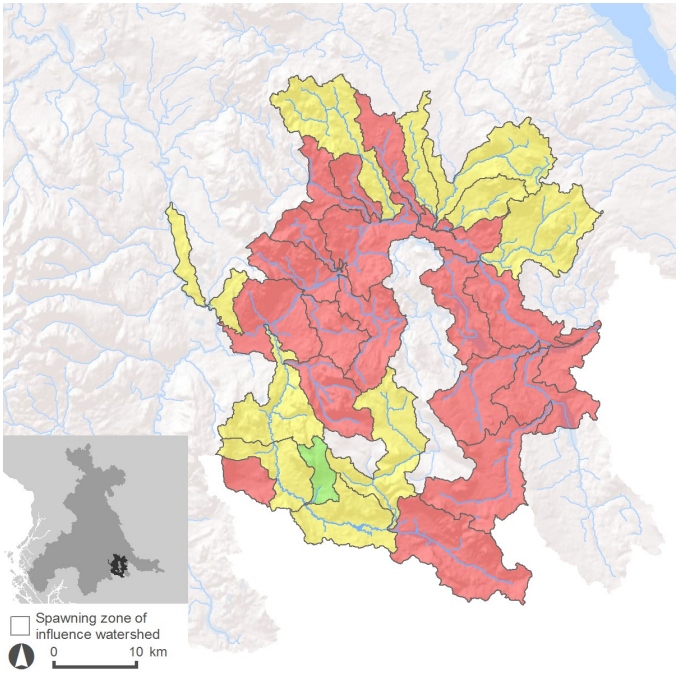




Fish Passage/Habitat Connectivity

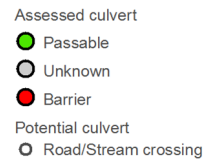
Stream crossing density

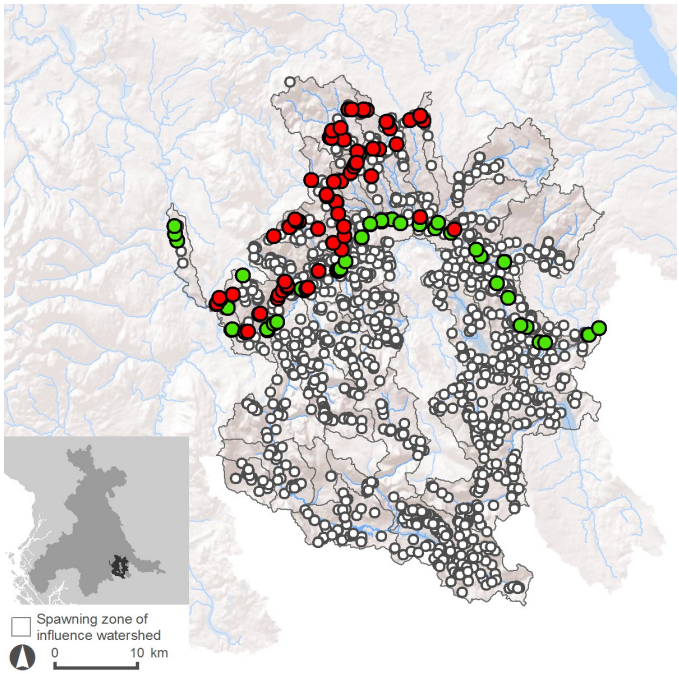




Culvert passability

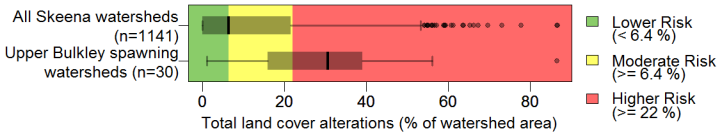
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

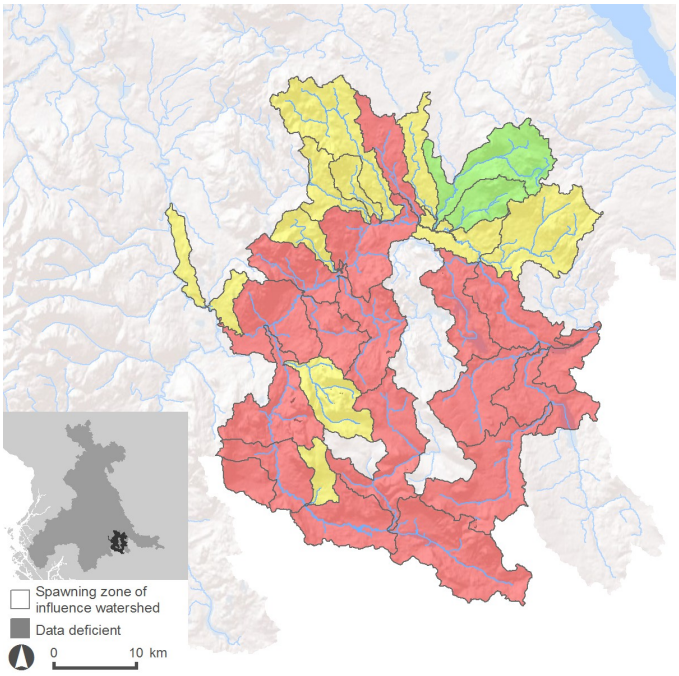




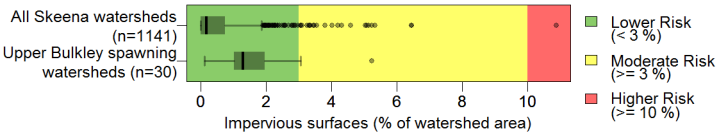
Human Development Footprint

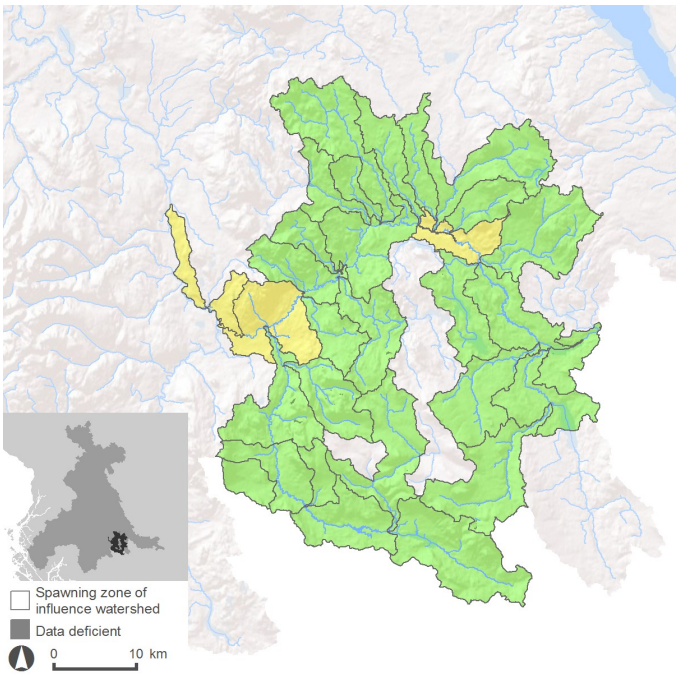
Total land cover alteration



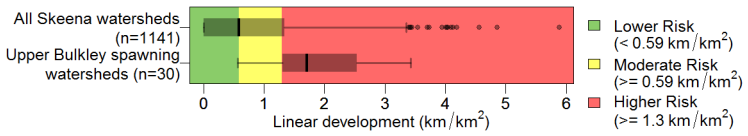


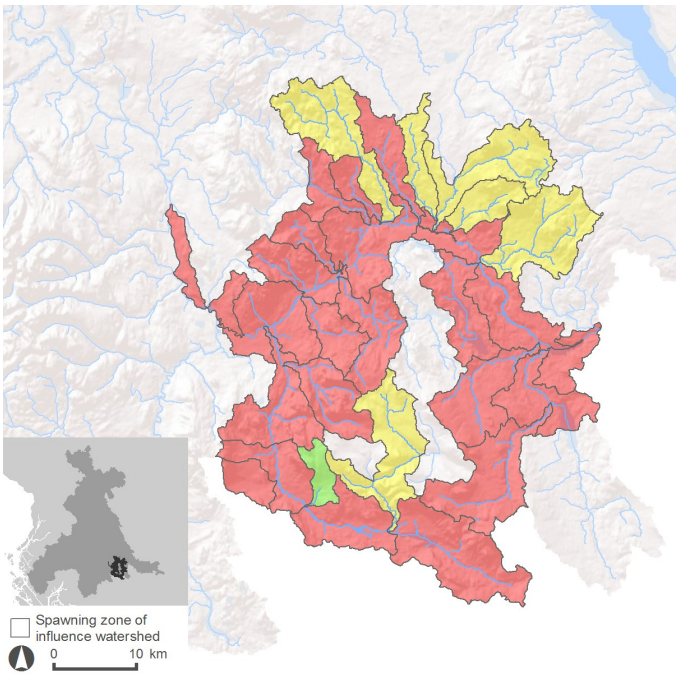
Impervious surfaces



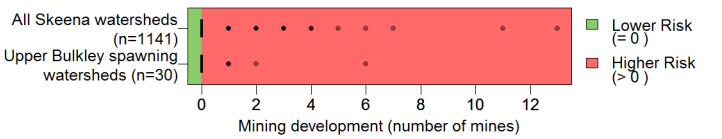


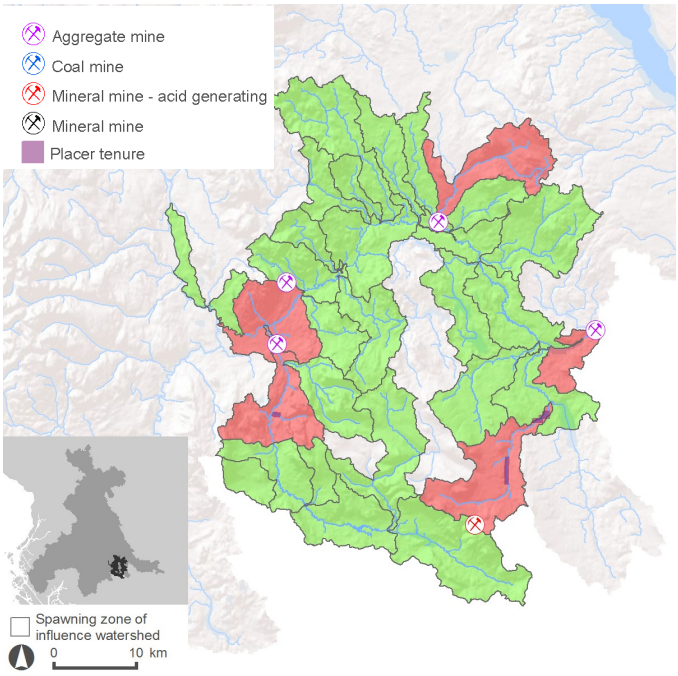
Linear development





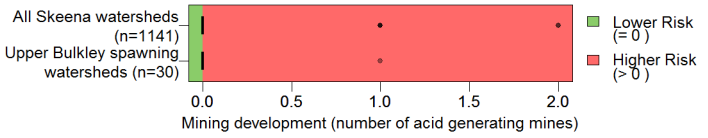
Mining development (total number of mines)

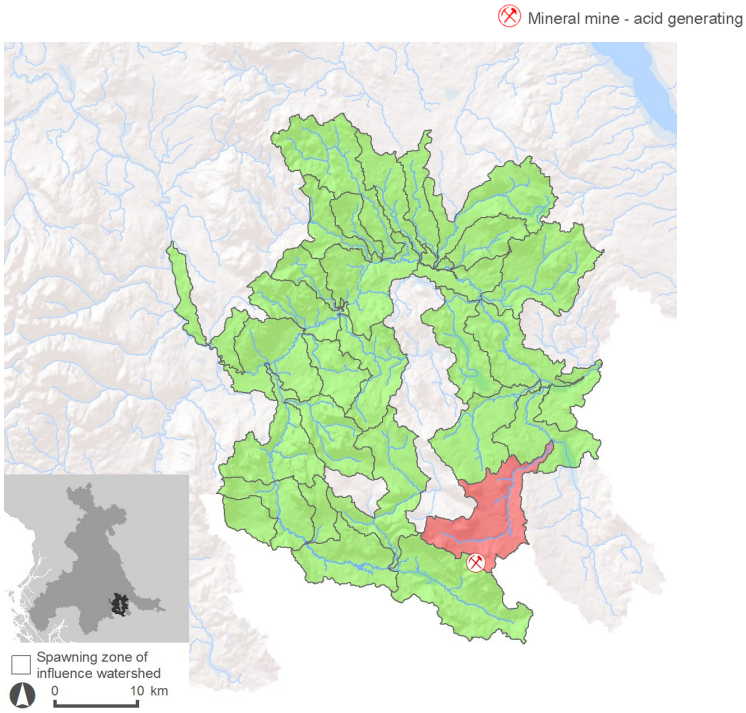




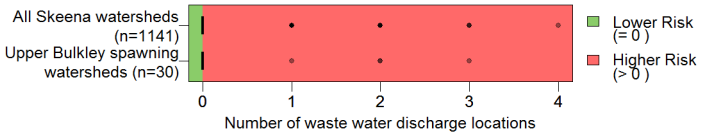
Water Quality

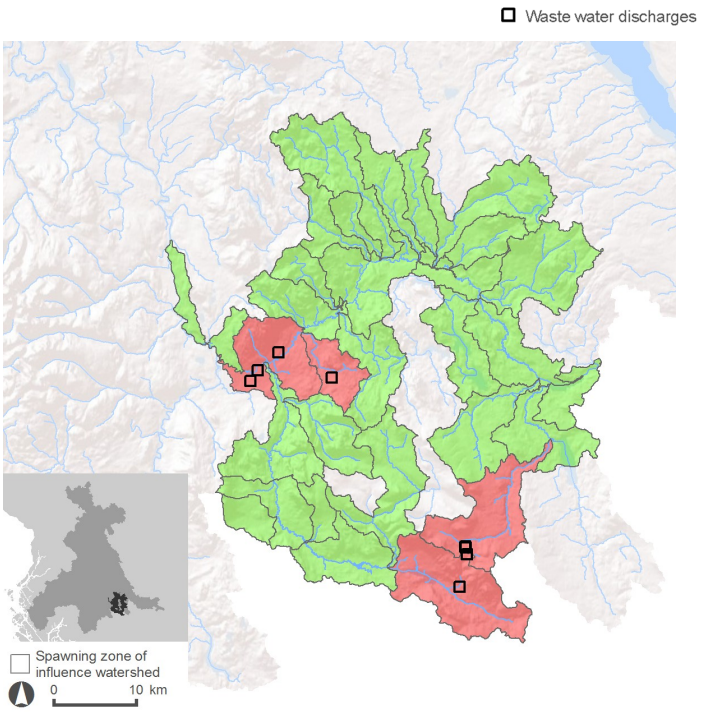
Mining development (acid generating mines)





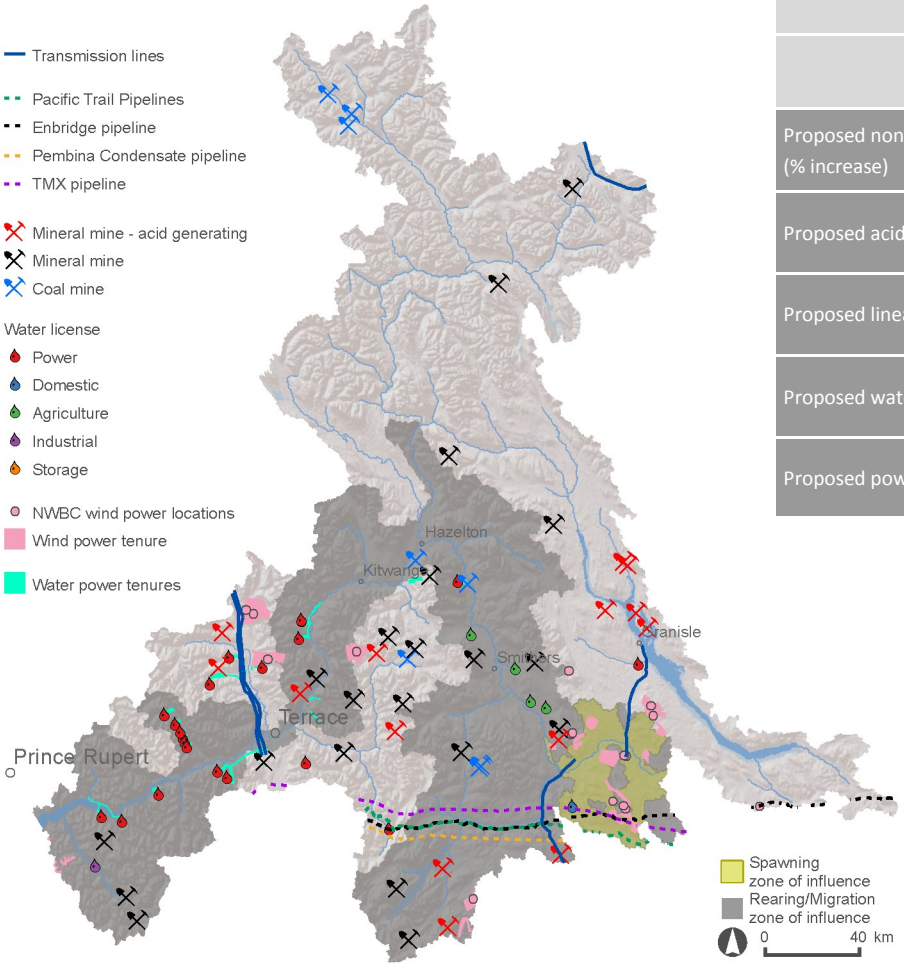
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Upper Bulkley Chinook CU summary

	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	14 (15%)	0 (0%)
Proposed acid generating mines (% increase)	6 (120%)	0 (0%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.07 km/km^2 (4%)
Proposed water licenses (% increase)	25 (3%)	1 (1%)
Proposed power tenures	292 km^2	84 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Upper Skeena

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

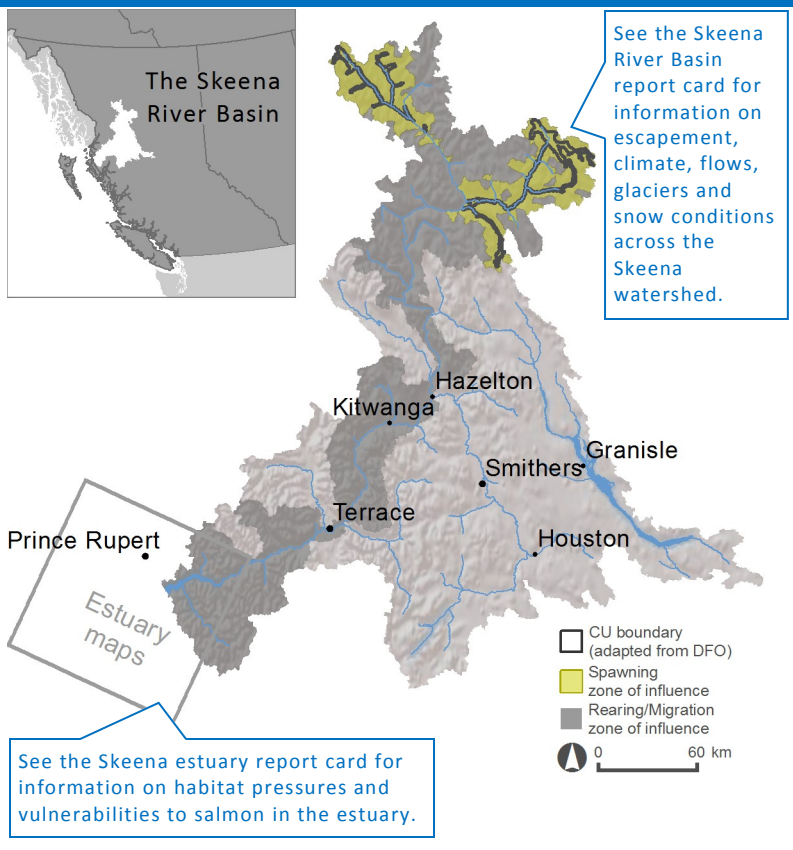
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* This CU covers a large portion of the high interior headwater zone and the diversity of habitats is complex. The majority of the spawning habitat lies at relatively high elevations; for instance, spawning at Kluakaz Creek occurs at 1,372 m, while the Moosevale–Sustut confluence lies at 1,160 m elevation.
* The upper Skeena bisects the northwestern Skeena Mountains, while the Sustut cuts through the northeastern Skeena Mountains; both are steep and rugged.
* Most of the spawning occurs just downstream from lake outlets or is controlled by groundwater flows. Few spawning habitats have been surveyed.
* Linear developments such as rail and road corridors in the upper Sustut and upper Skeena have resulted in direct or indirect impacts to high-value Chinook spawning and rearing habitat.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, as well as changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.
* Proposed mineral and coal mine developments utilizing the abandoned BC Rail grade have multiple-scale habitat issues and concerns.

Location



CU overview of habitat vulnerabilities & pressures

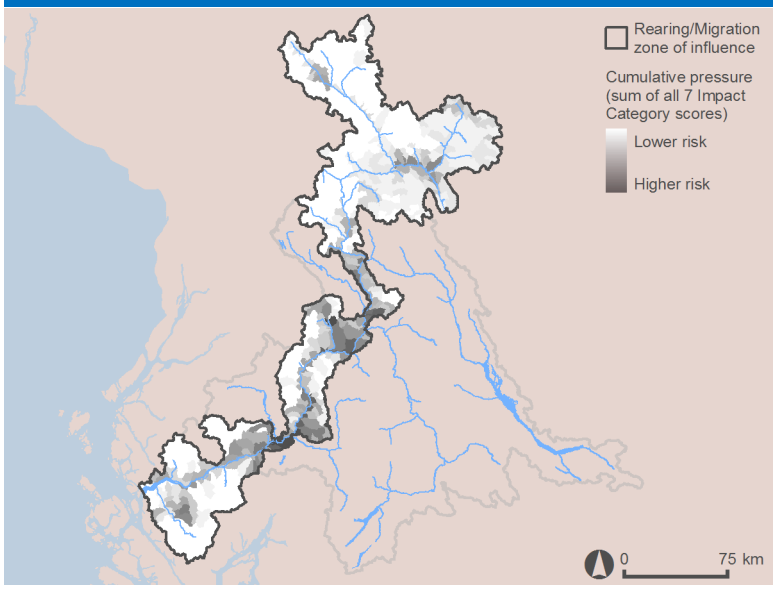
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

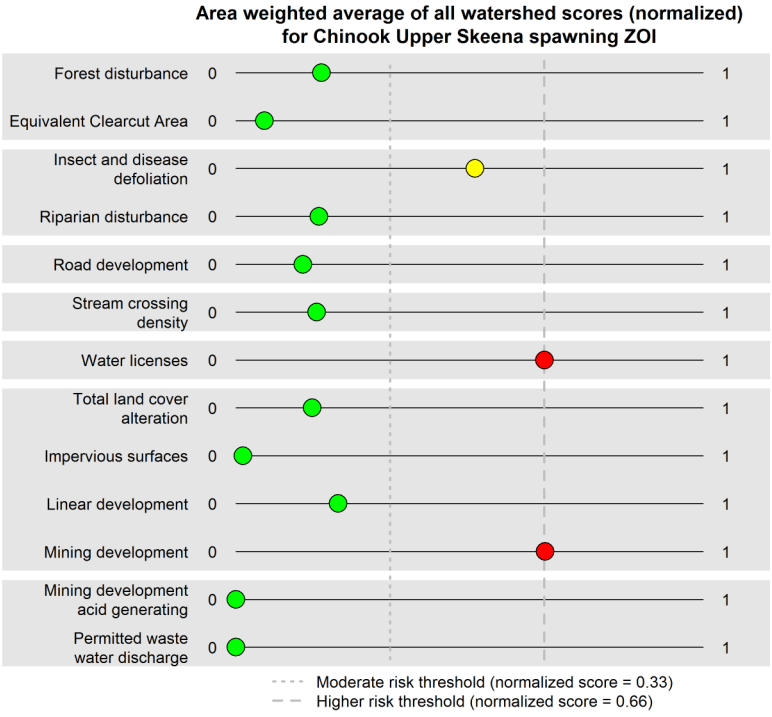
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

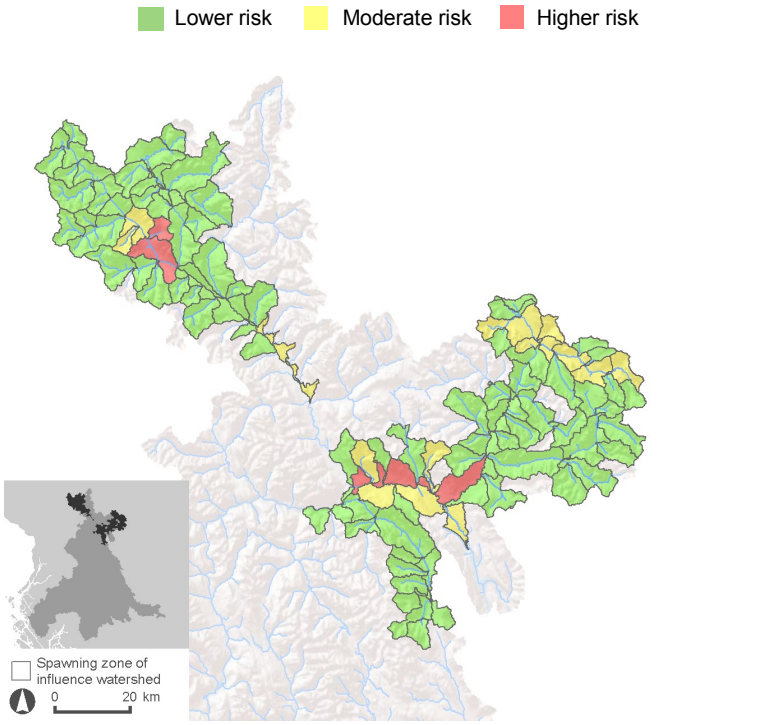
Cumulative pressure—rearing/migration



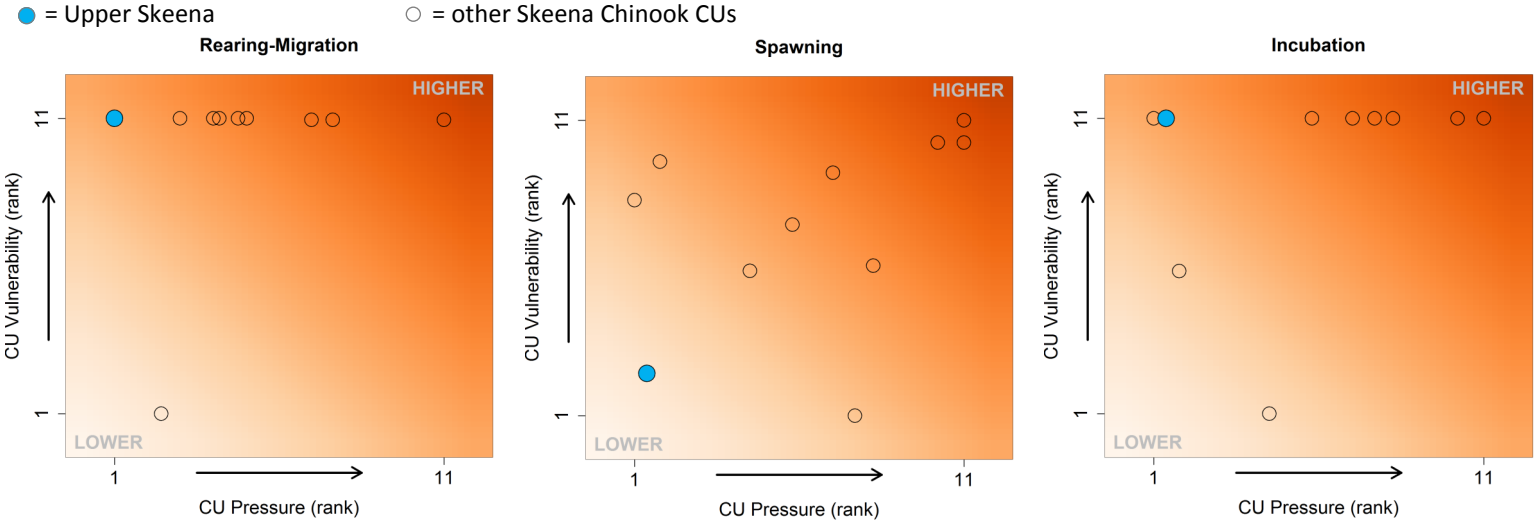
Summary of pressure indicators—spawning



Cumulative pressure—spawning

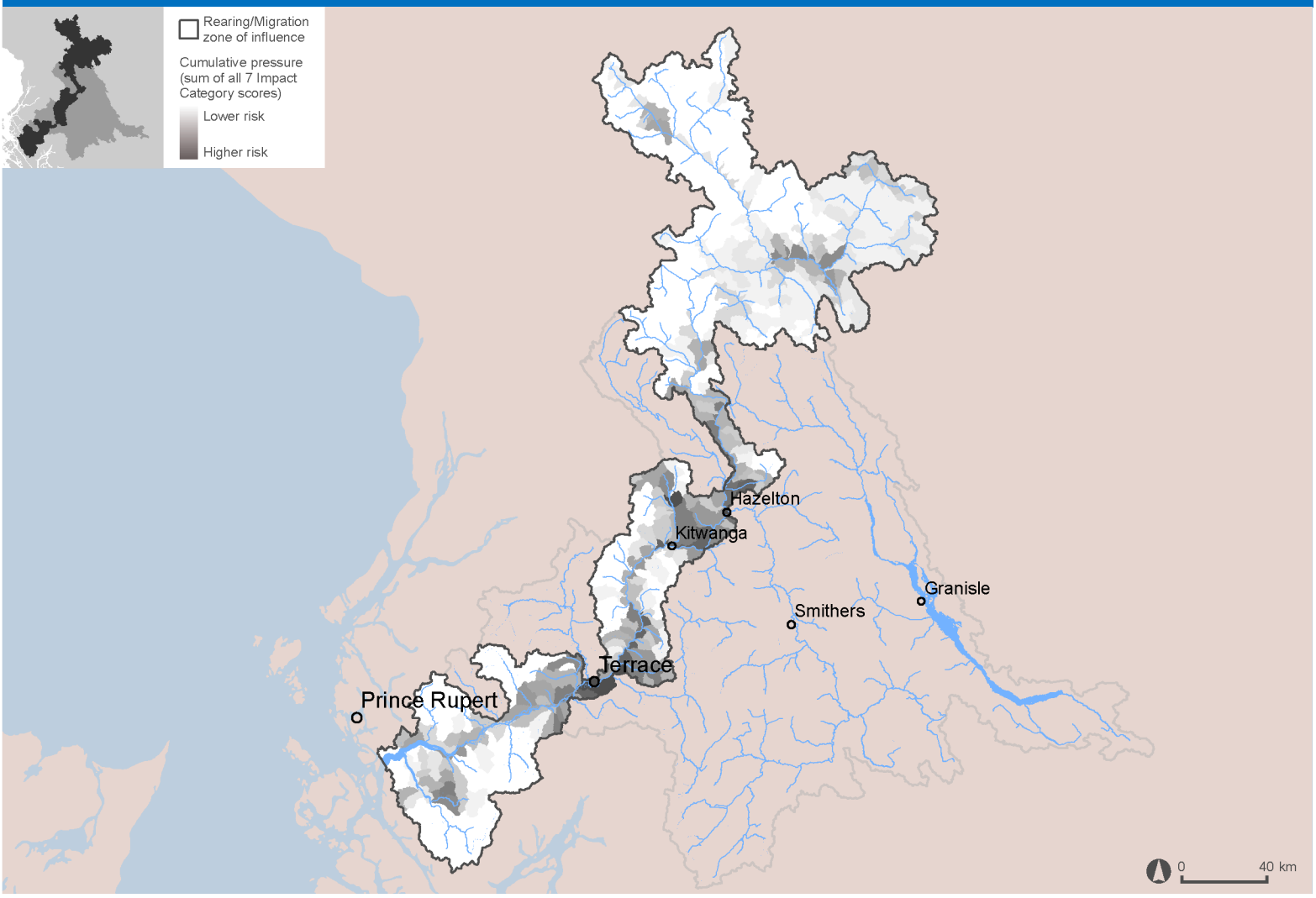


Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation



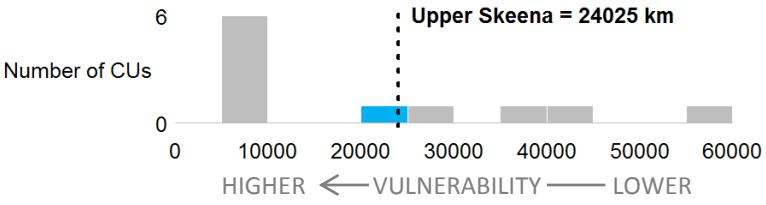
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

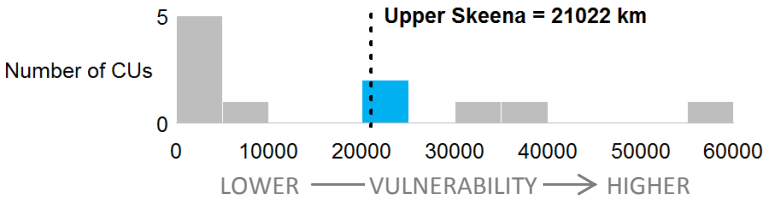


Rearing/Migration period vulnerability

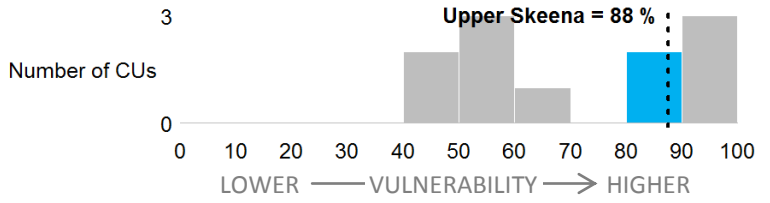
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



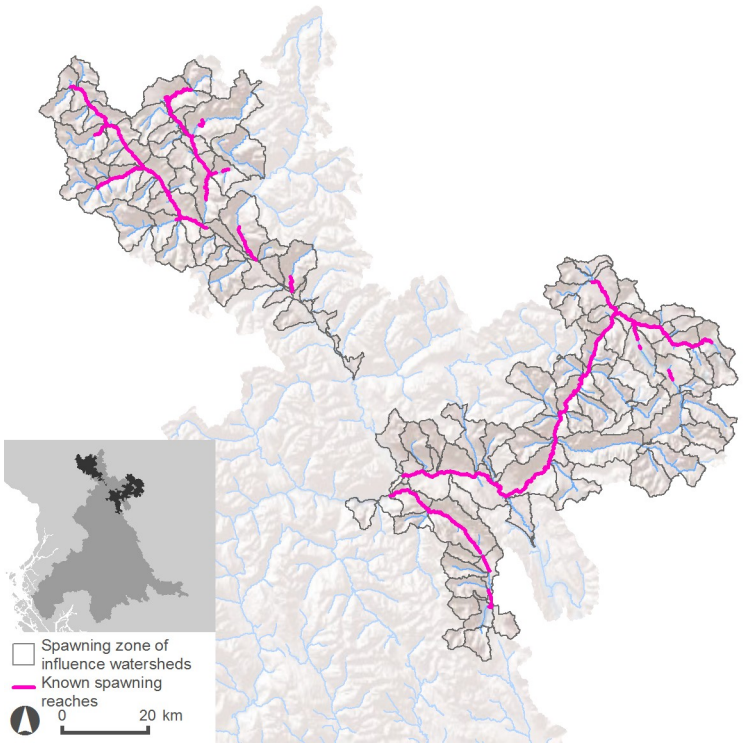
Flow sensitive accessible habitat (%) (all seasons)



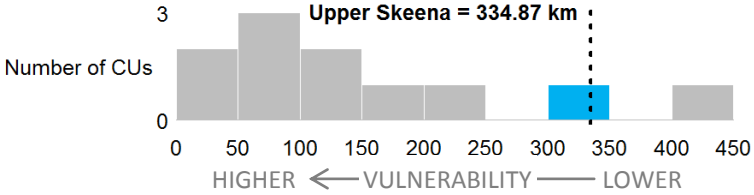
Spawning & incubation vulnerability

Spawning period vulnerability

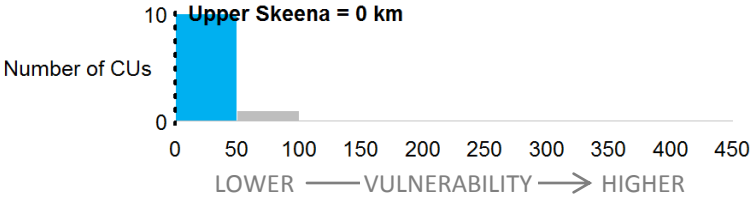
Spawning locations



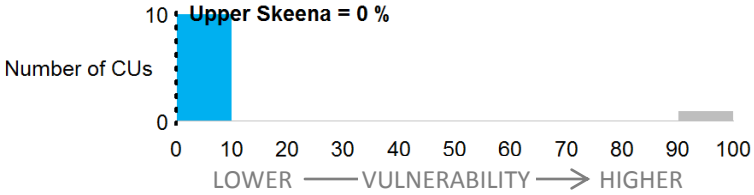
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

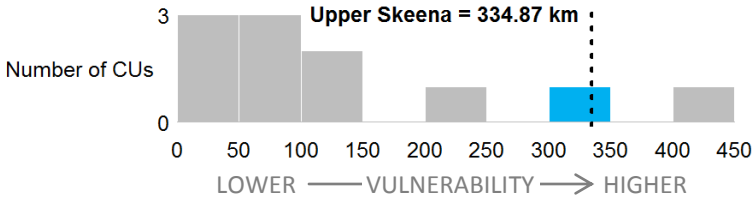


Spawning reaches summer flow sensitive - spawn timing (%)

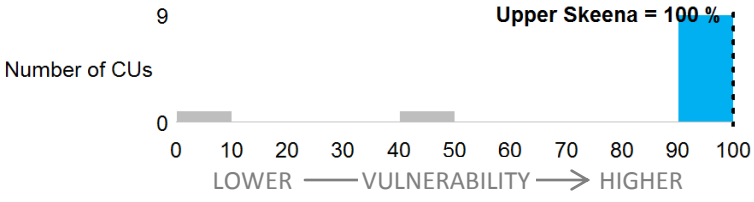


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



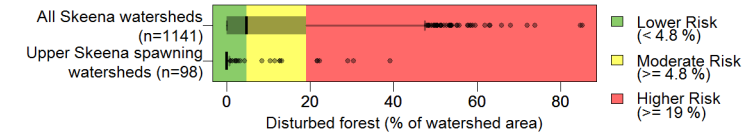
Spawning reaches winter flow sensitive - incubation timing (%)

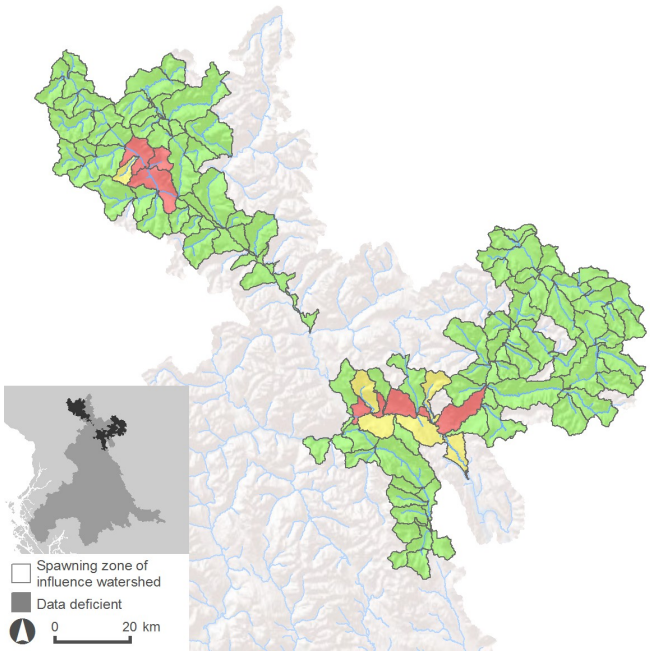


Spawning pressure

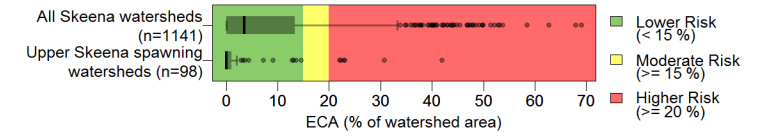
Hydrologic Processes

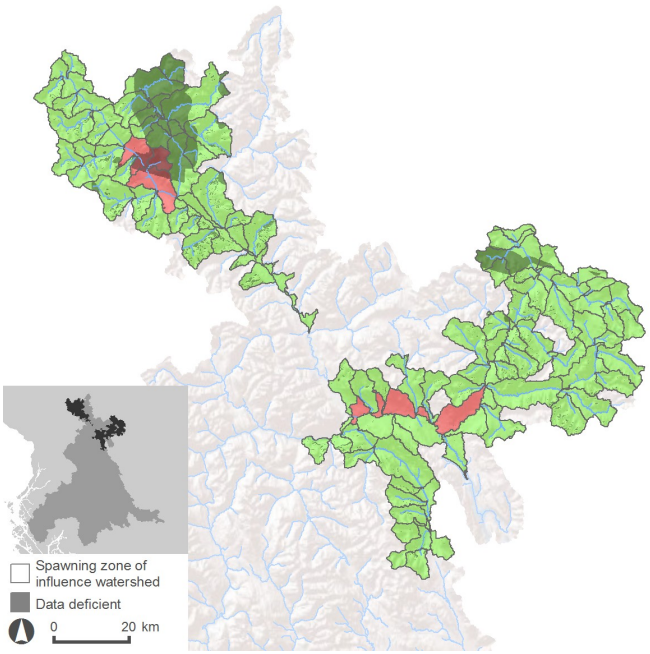
Forest disturbance





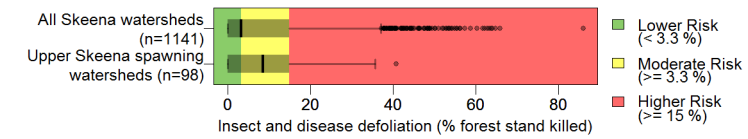
Equivalent Clear-cut Area

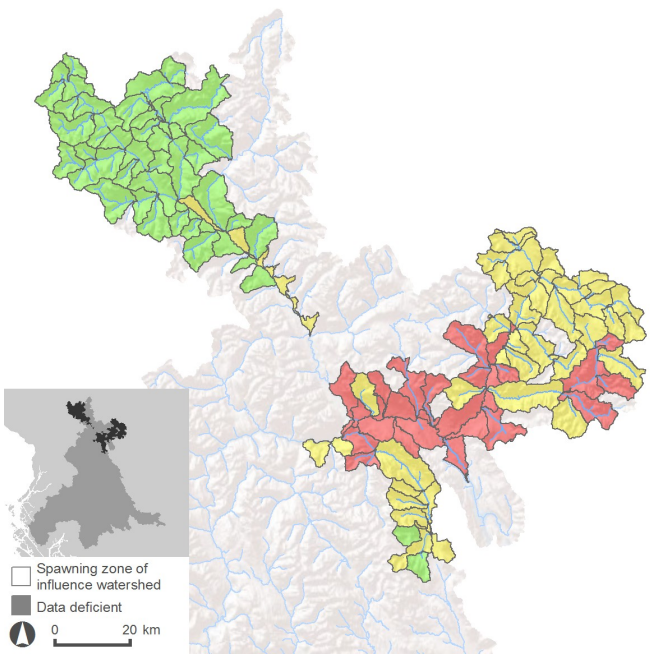




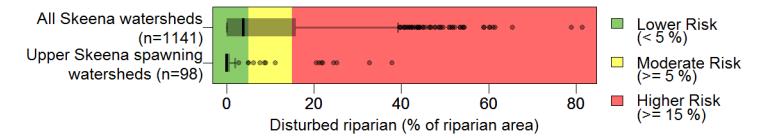
Vegetation Quality

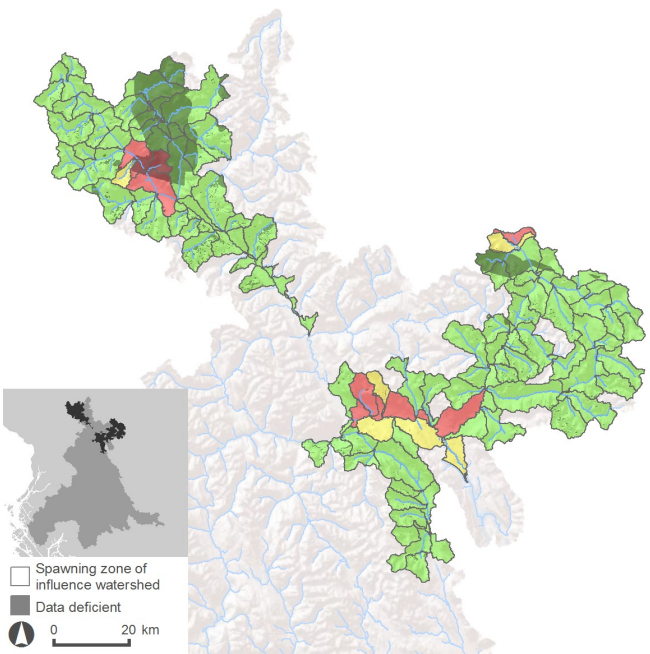
Insect and disease defoliation





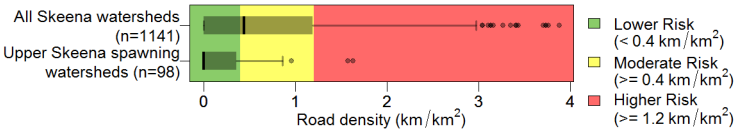
Riparian disturbance

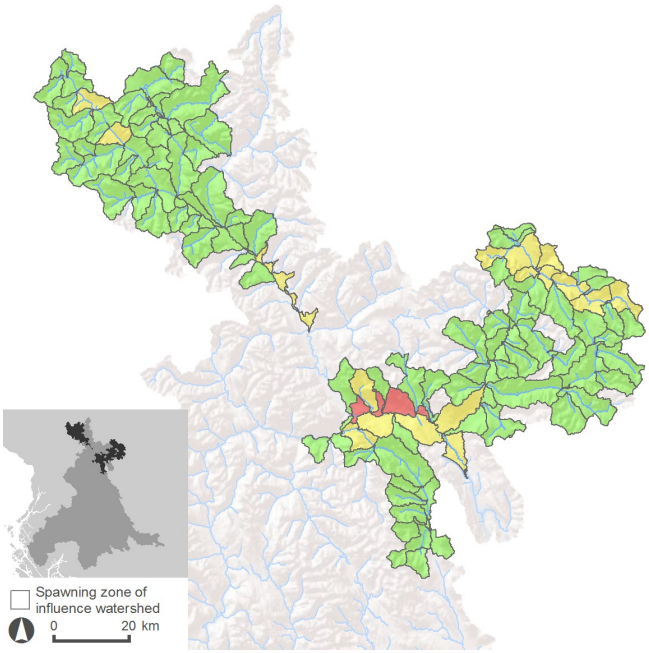




Surface Erosion

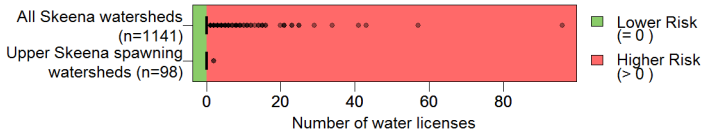
Road development

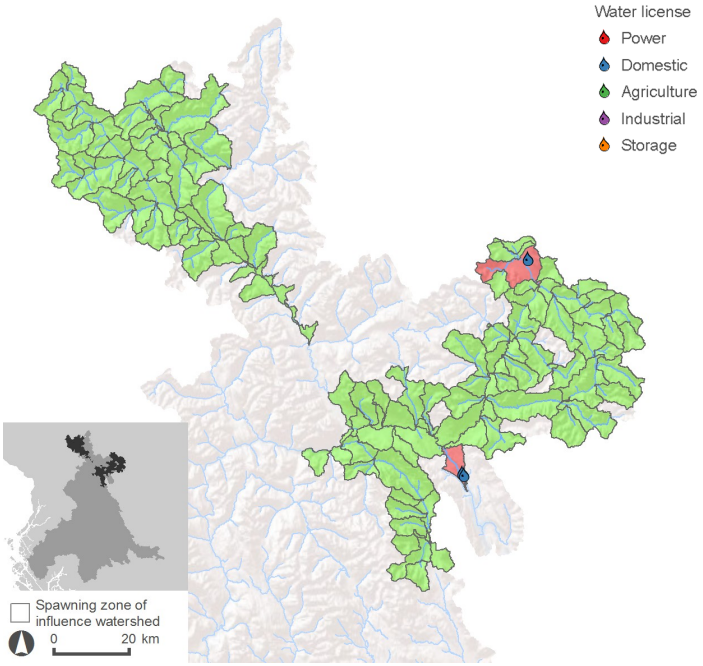




Water Quantity

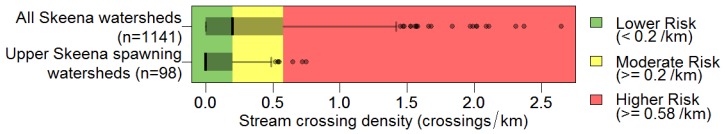
Number of water licenses

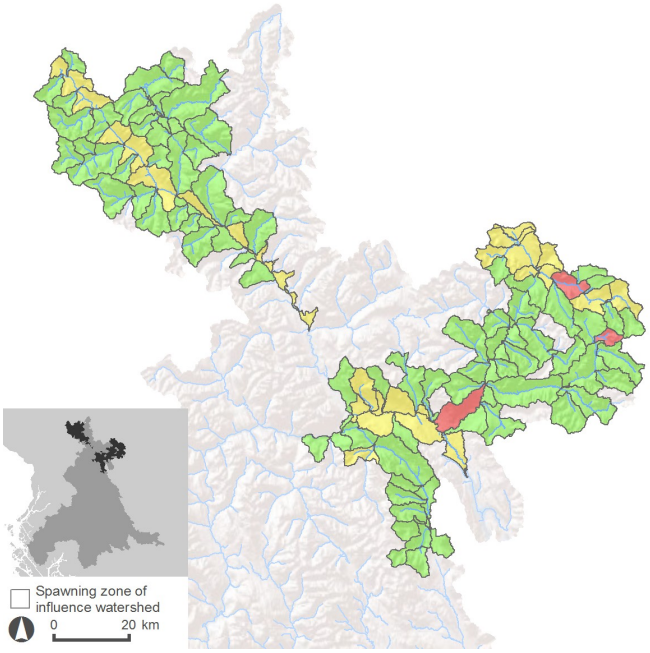




Fish Passage/Habitat Connectivity

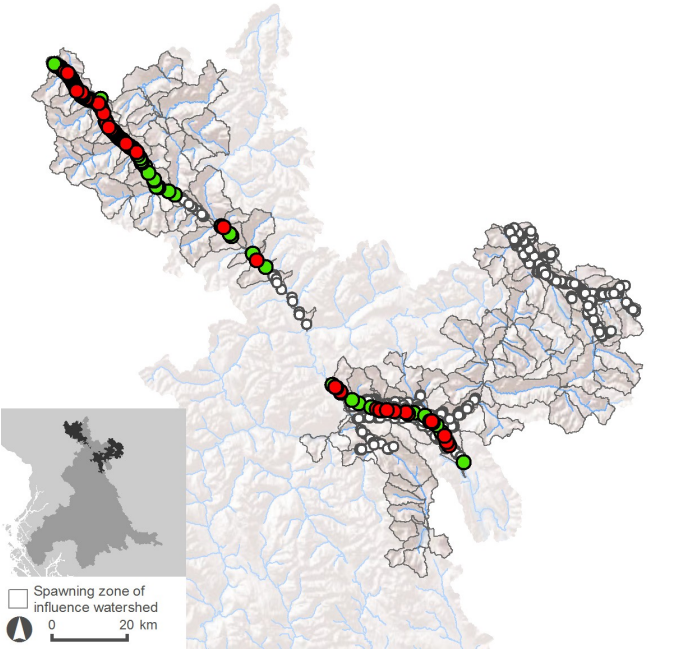
Stream crossing density





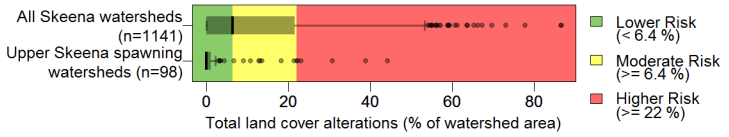
Culvert passability

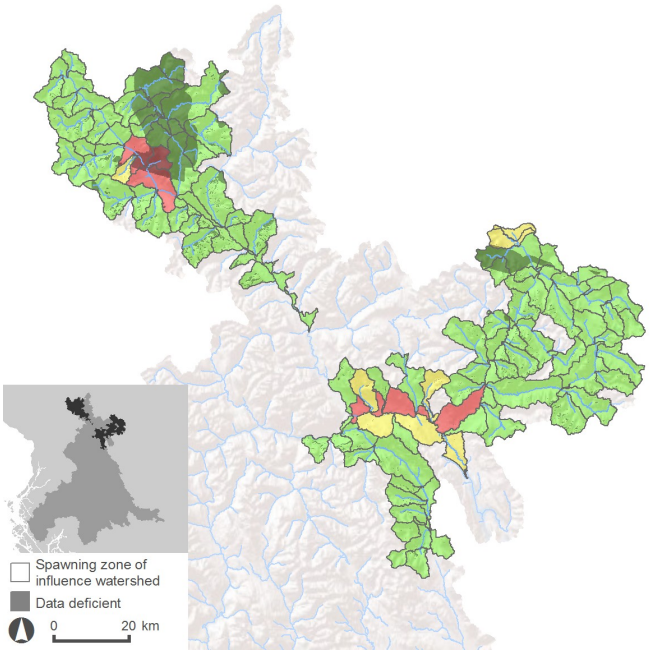
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



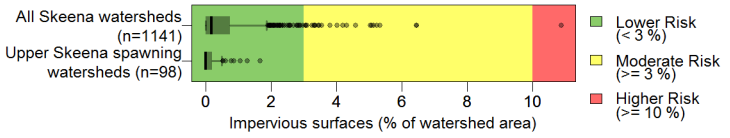
Human Development Footprint

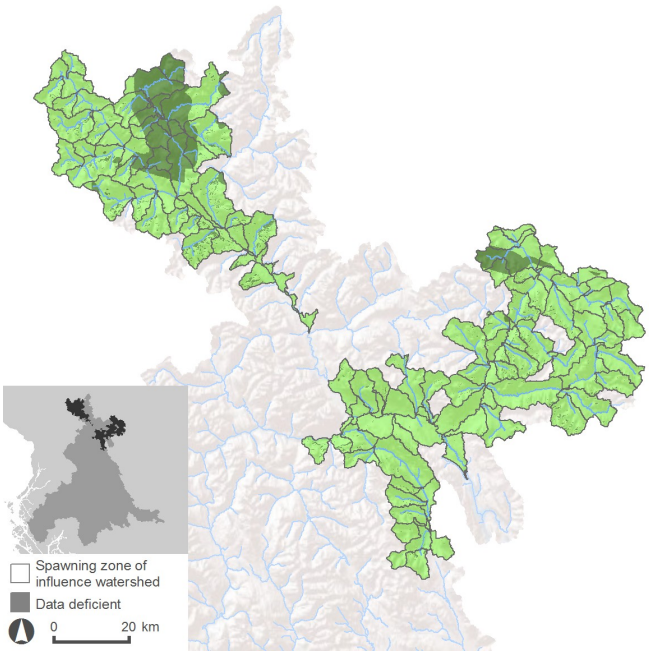
Total land cover alteration



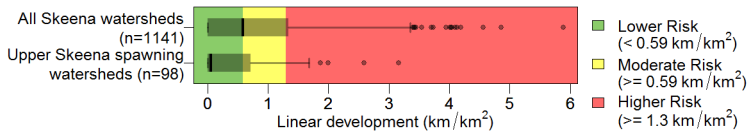


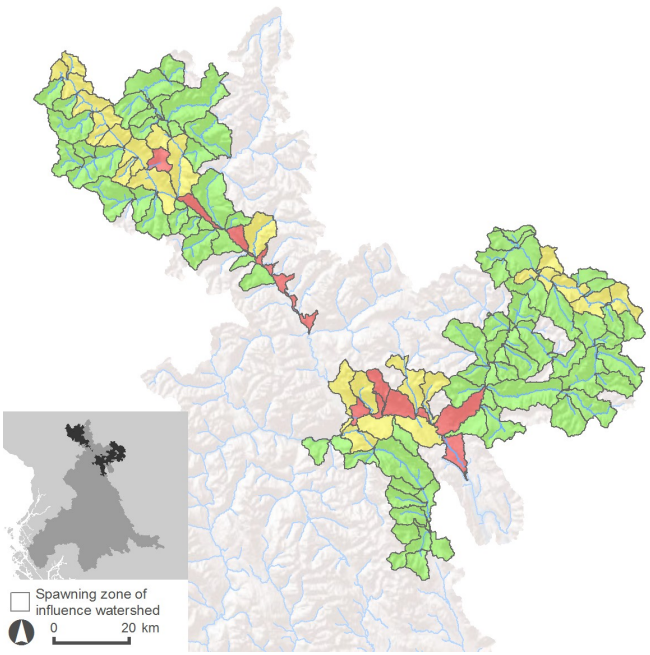
Impervious surfaces



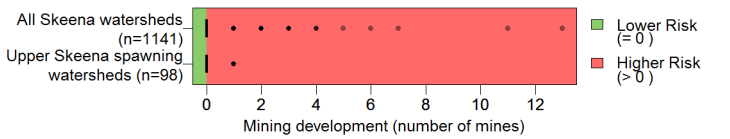


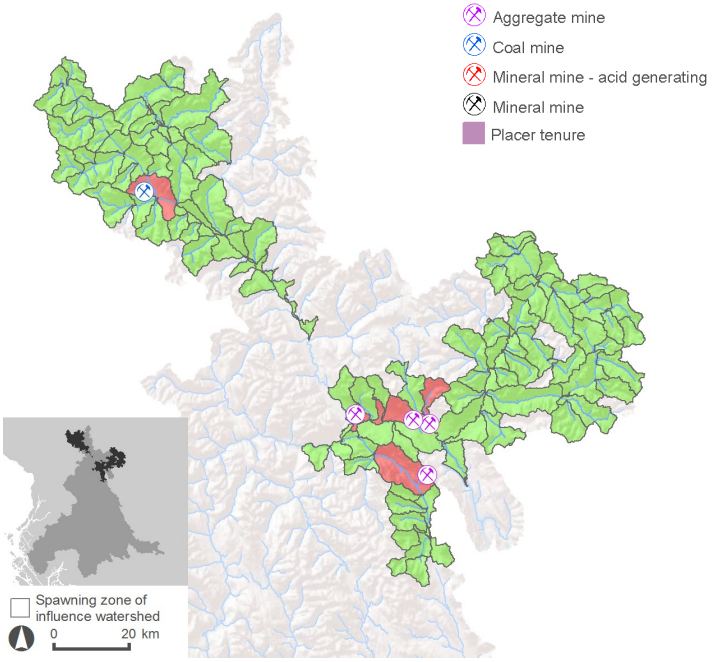
Linear development





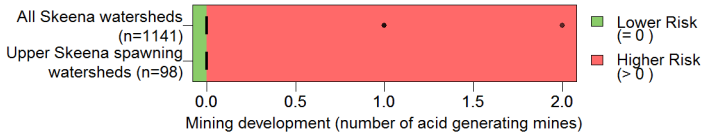
Mining development (total number of mines)

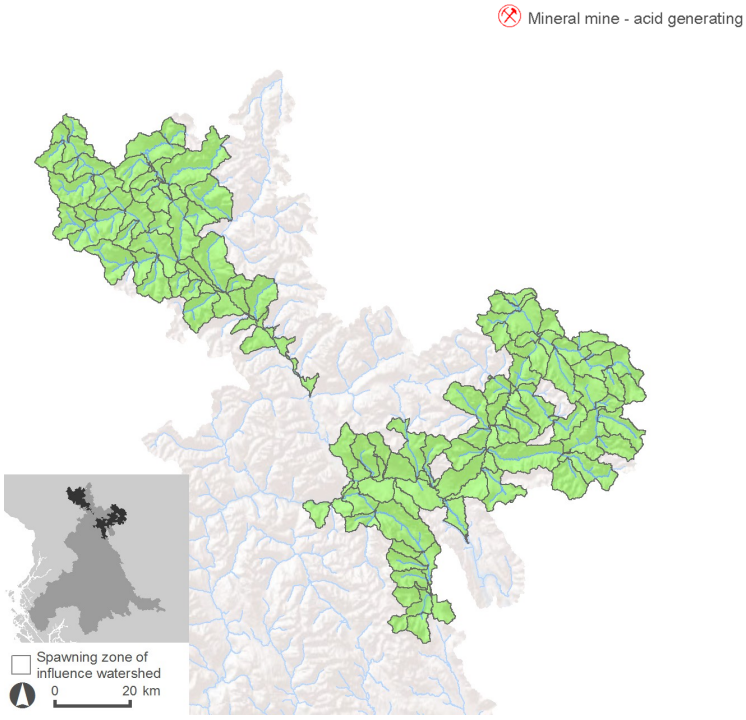




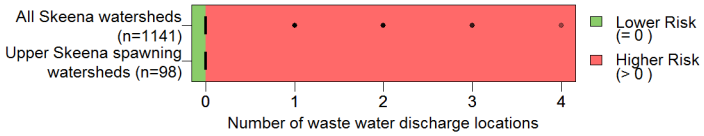
Water Quality

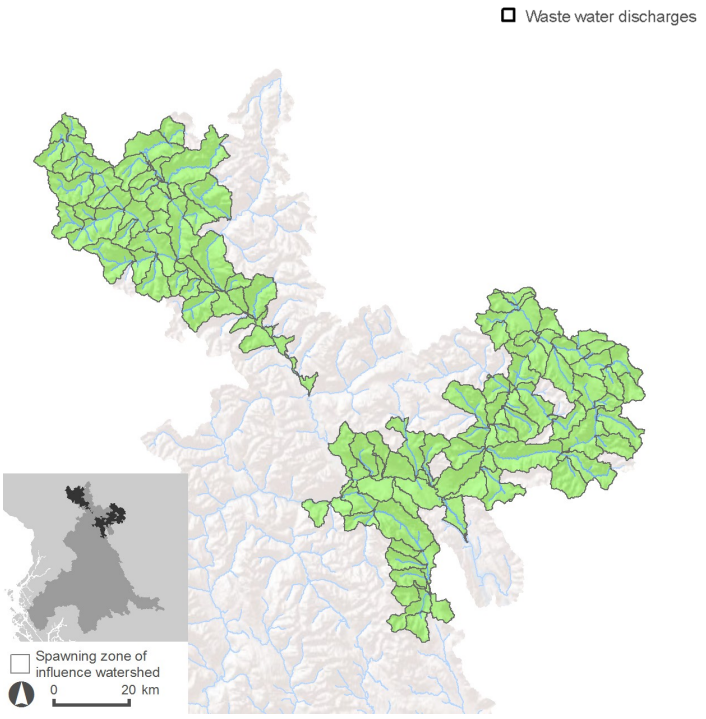
Mining development (acid generating mines)





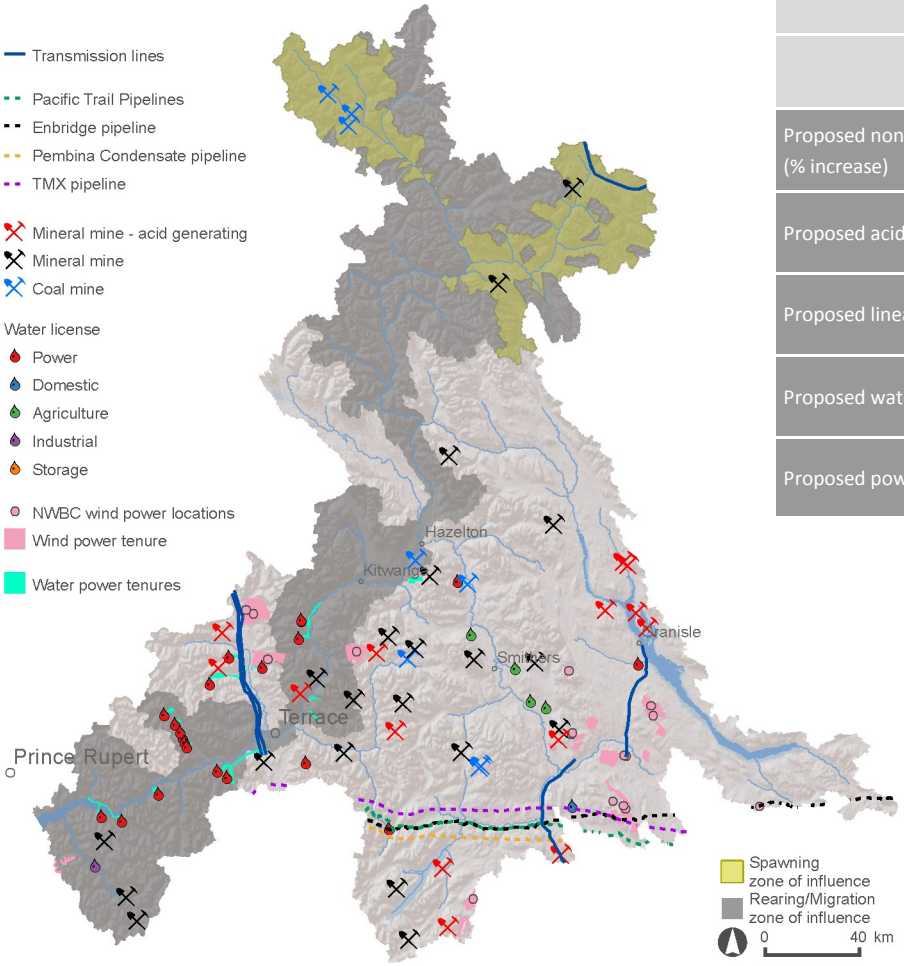
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Upper Skeena Chinook CU summary

	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	9 (17%)	4 (80%)
Proposed acid generating mines (% increase)	1 (50%)	0 (NA)
Proposed linear development (% increase)	0.004 km/km^2 (0.8%)	0.008 km/km^2 (2%)
Proposed water licenses (% increase)	18 (12%)	0 (0%)
Proposed power tenures	116 km^2	0 km^2

Skeena Salmon: Chinook
Conservation Unit (CU)
Zymoetz

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

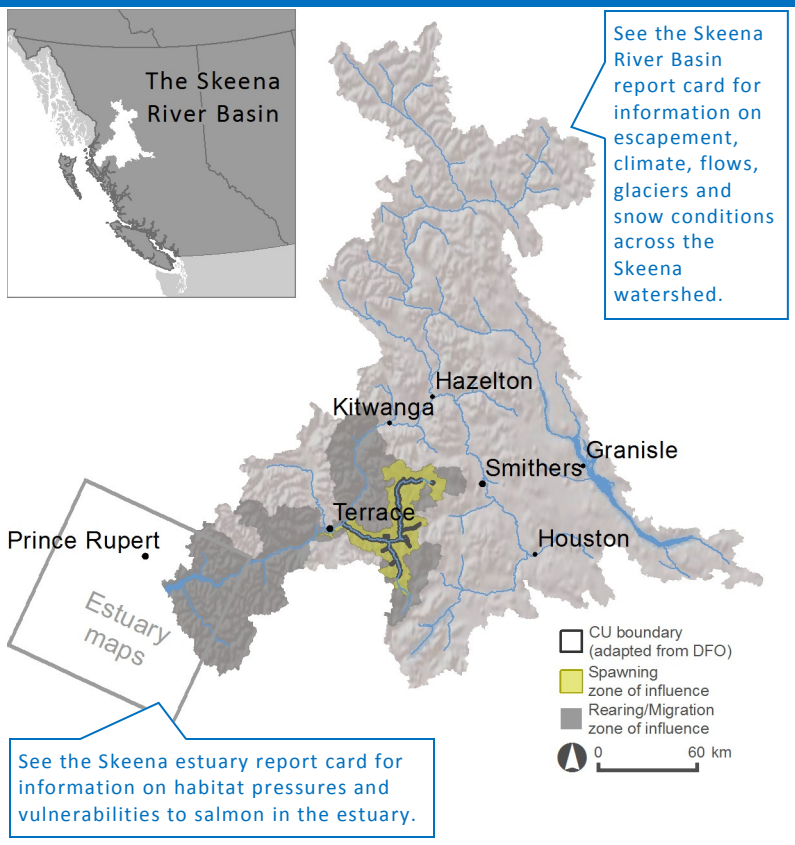
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Zymoetz River forms a wandering gravel bed channel for about 6 km then is confined within the lower canyon for 3 km and in the upper canyon for 2 km. There is a 10 km stretch of unconfined river between the canyons. The river then widens out again to a multi-channel, wandering reach for about 20 km up to the Clore River confluence. Upstream of there, the river is confined by numerous bedrock obstructions. Zymoetz is a flashy system subject to extreme discharges and channel changes.
* Zymoetz cuts through the Hazelton Mountains and tributaries supporting Chinook are for the most part coldwater, moderately steep gradient (2-5%), and relatively short.
* The mainstem floodplain has come undone a few times due to large flood events affecting logging, road construction, a gas pipeline corridor, and a hydro transmission line. These events and surrounding development have caused channel instability, massive bank erosion, avulsions, rapid meander bend migration, large amounts of bedload mobilization, and loss of riparian function. Adverse effects have declined but many still remain.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

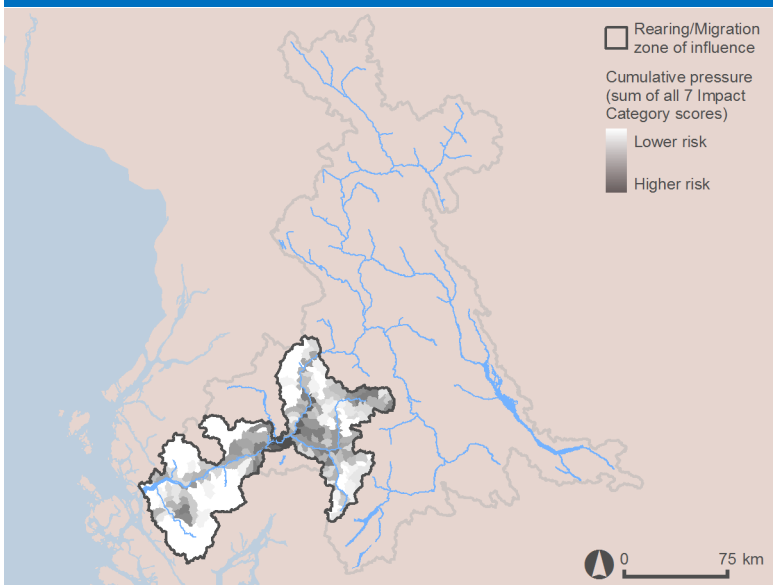
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

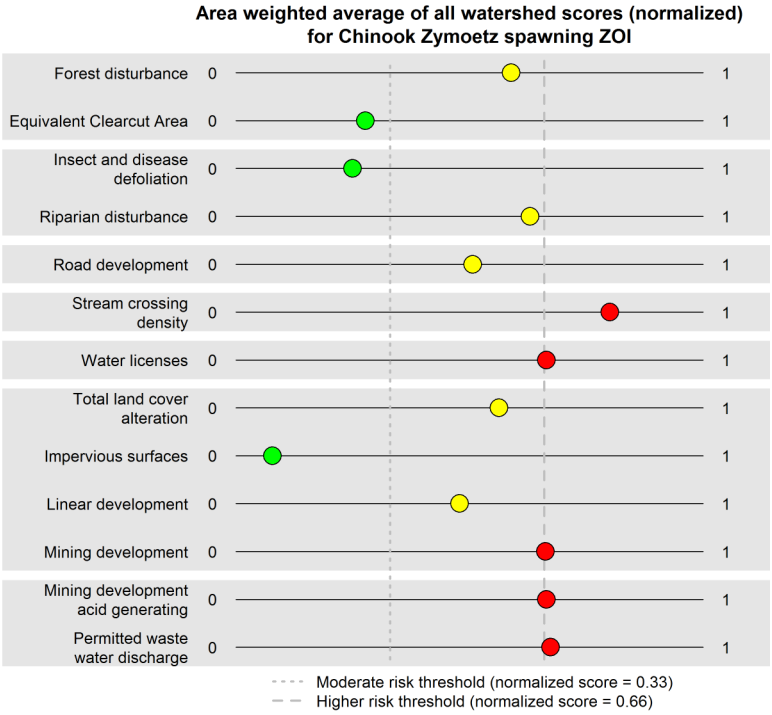
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

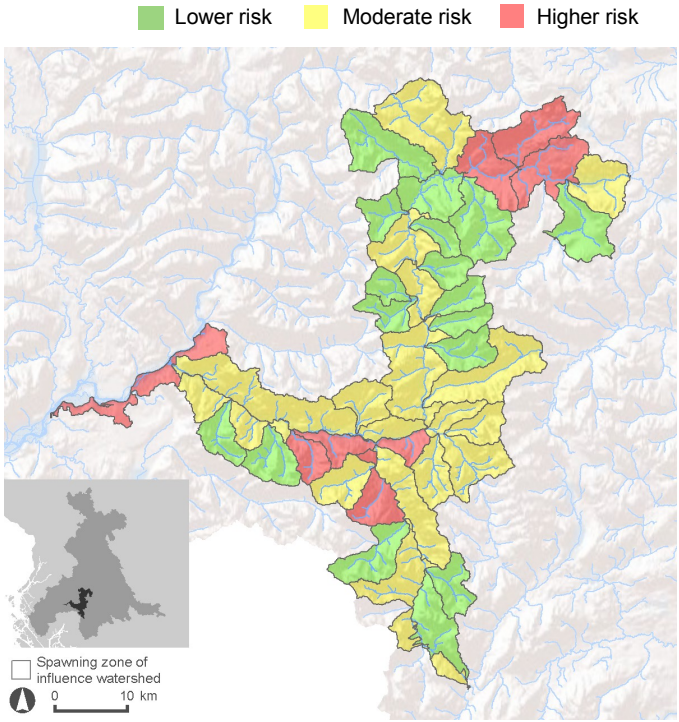
Cumulative pressure—rearing/migration



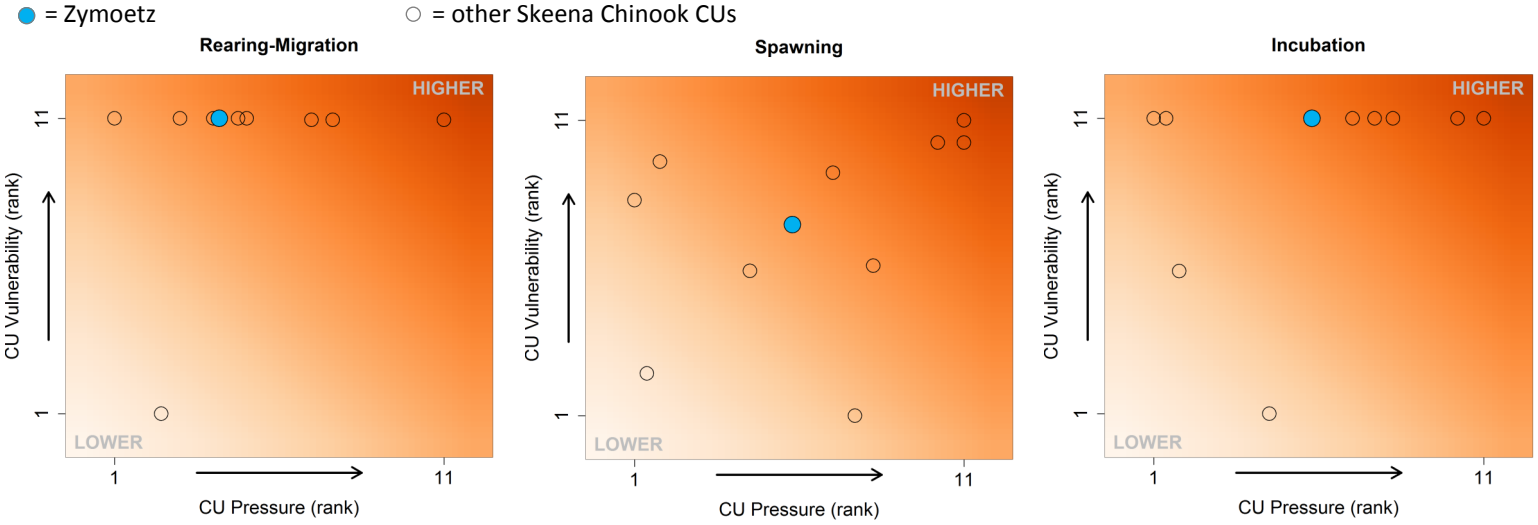
Summary of pressure indicators—spawning



Cumulative pressure—spawning

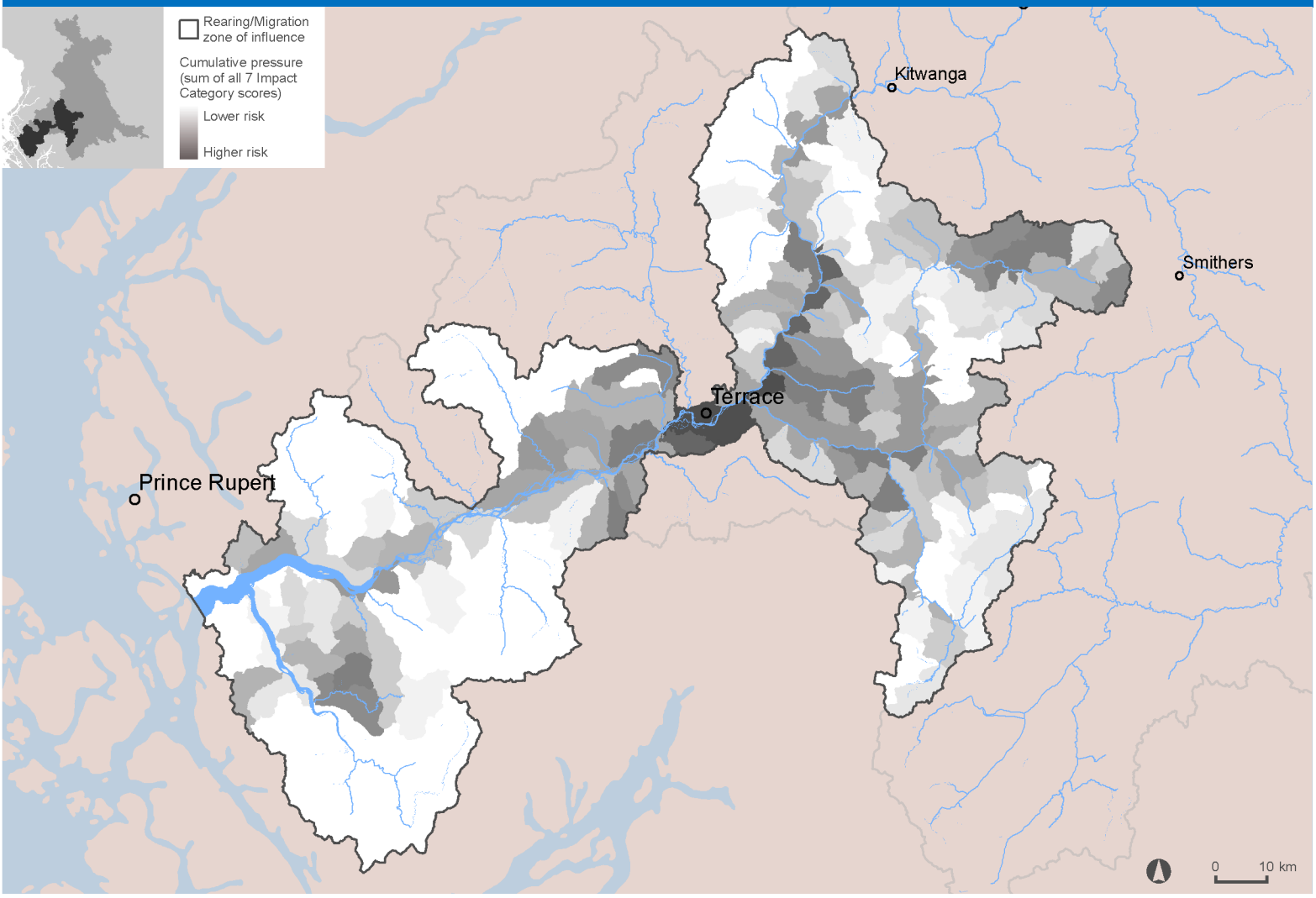


Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation



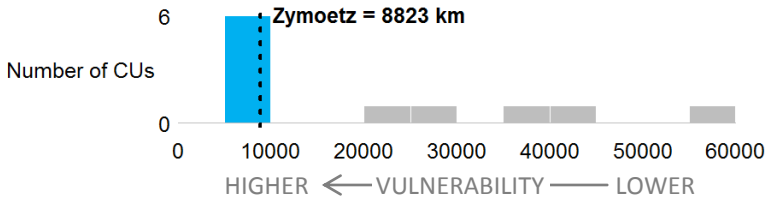
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

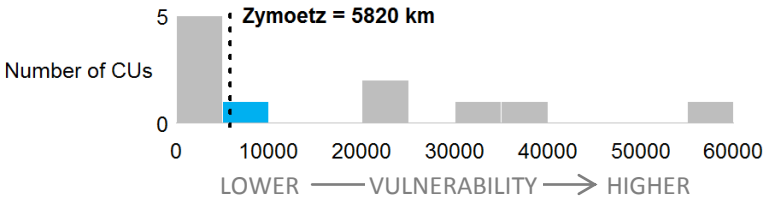


Rearing/Migration period vulnerability

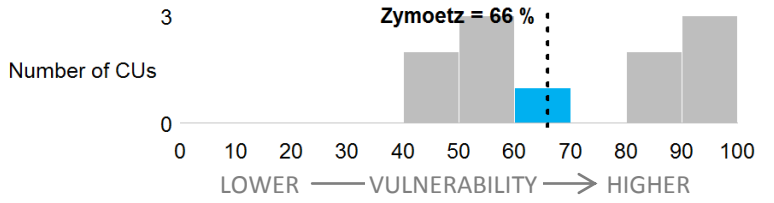
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



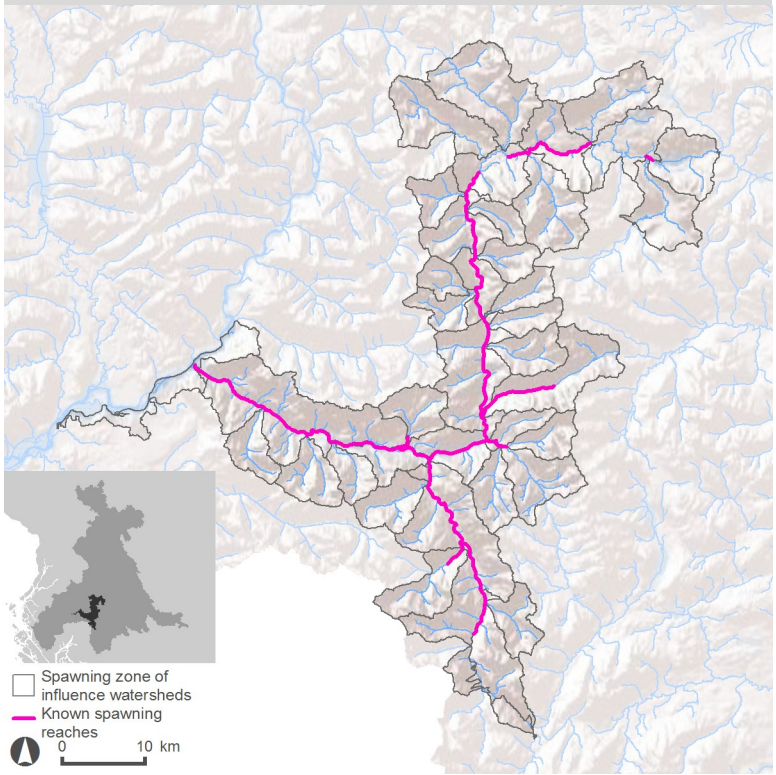
Flow sensitive accessible habitat (%) (all seasons)



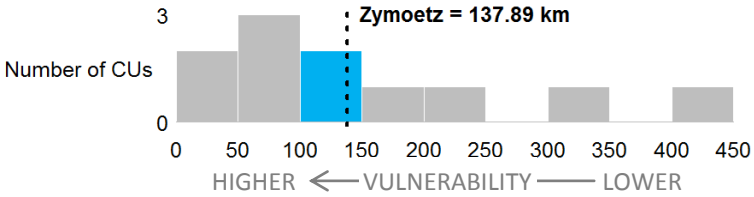
Spawning & incubation vulnerability

Spawning period vulnerability

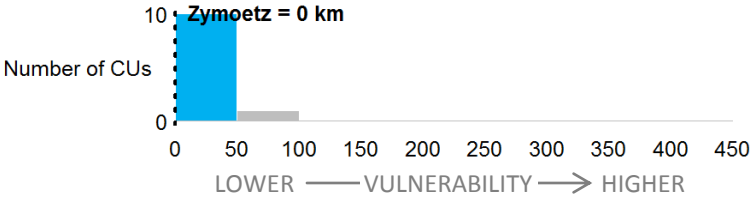
Spawning locations



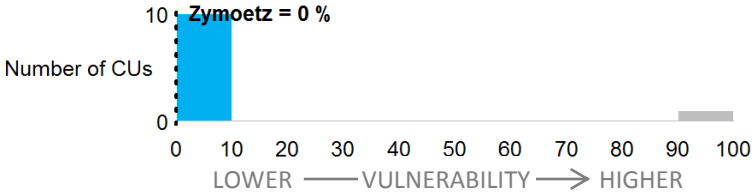
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

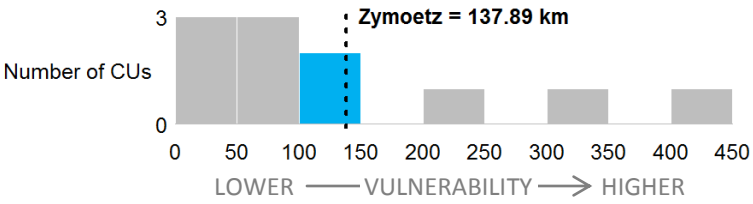


Spawning reaches summer flow sensitive - spawn timing (%)

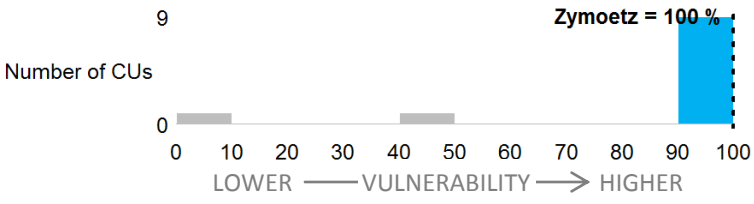


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



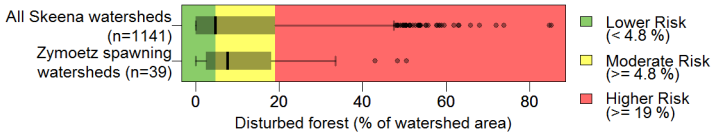
Spawning reaches winter flow sensitive - incubation timing (%)

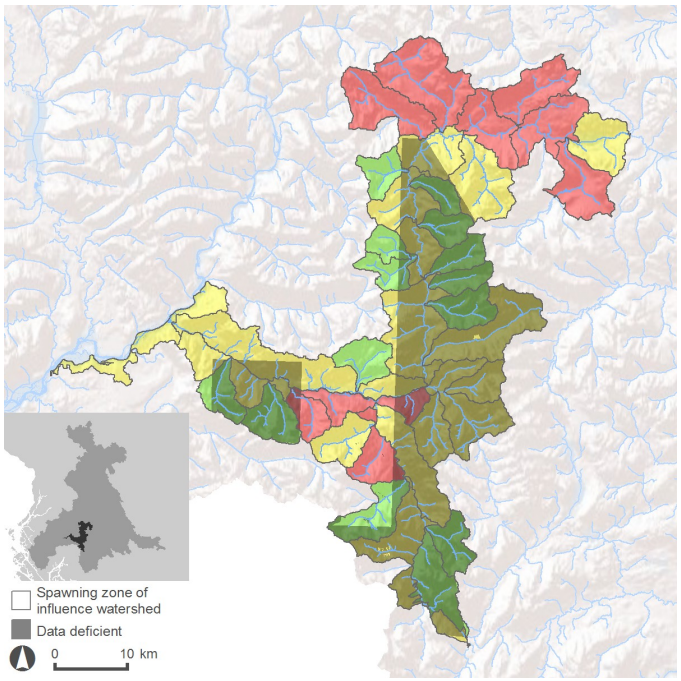


Spawning pressure

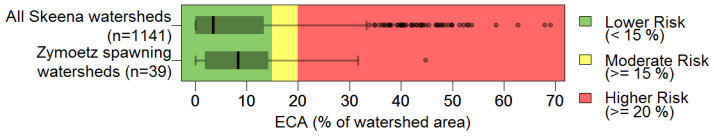
Hydrologic Processes

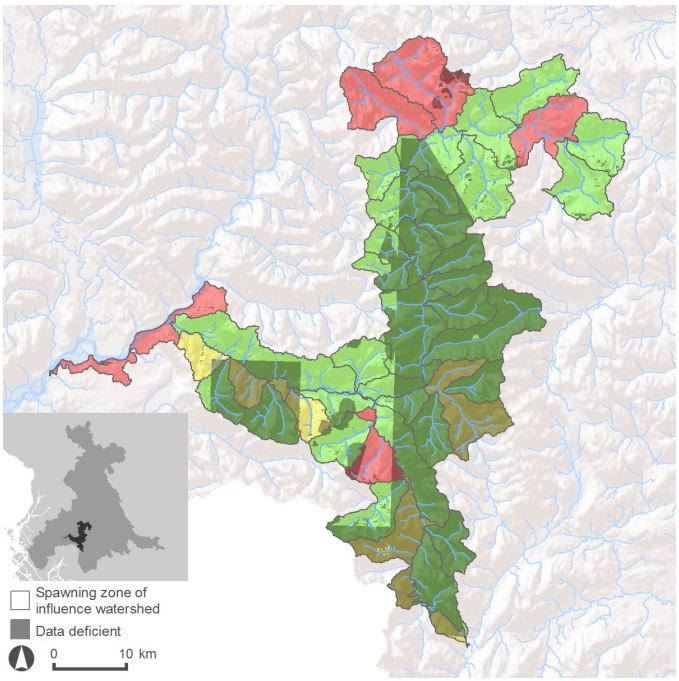
Forest disturbance





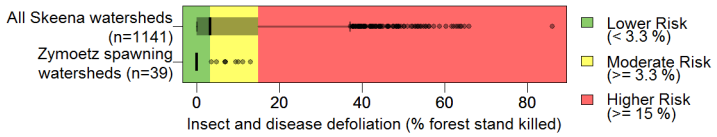
Equivalent Clear-cut Area

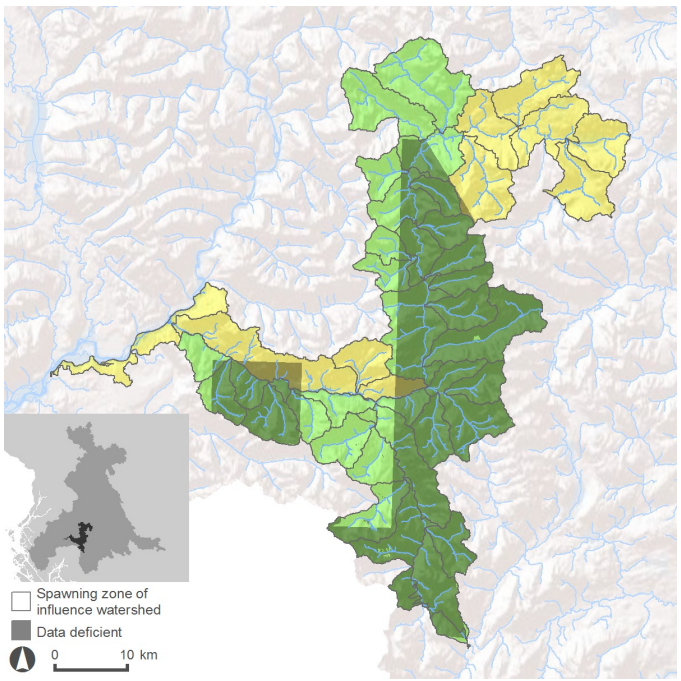




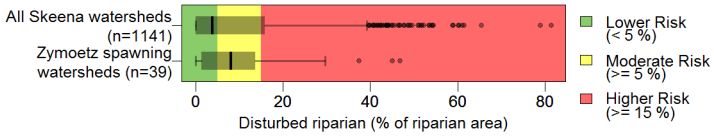
Vegetation Quality

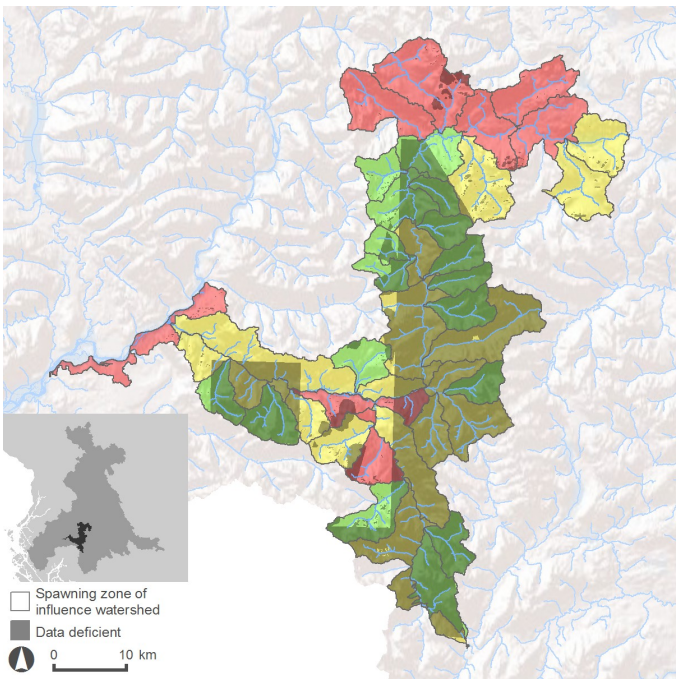
Insect and disease defoliation





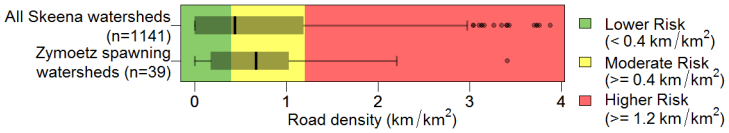
Riparian disturbance

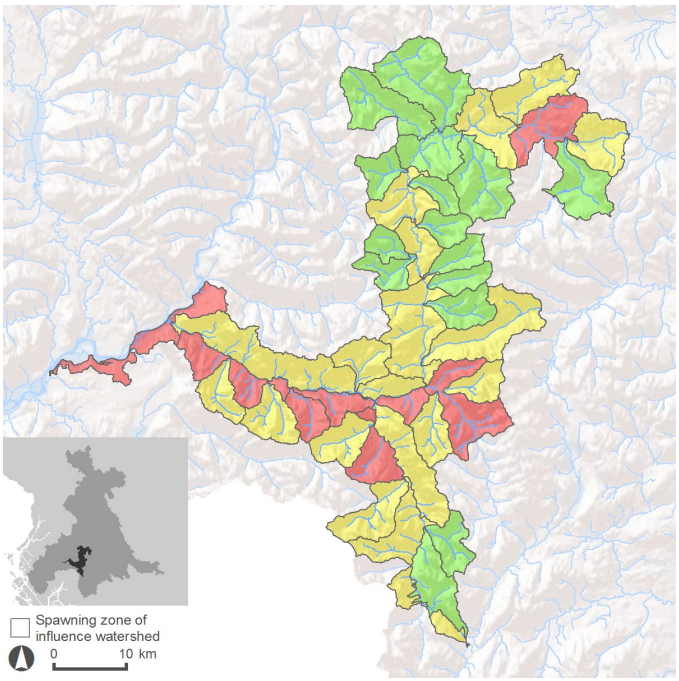




Surface Erosion

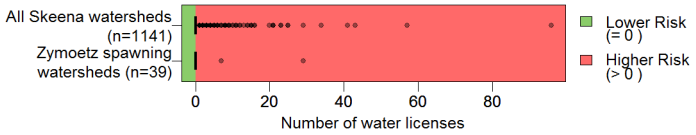
Road development

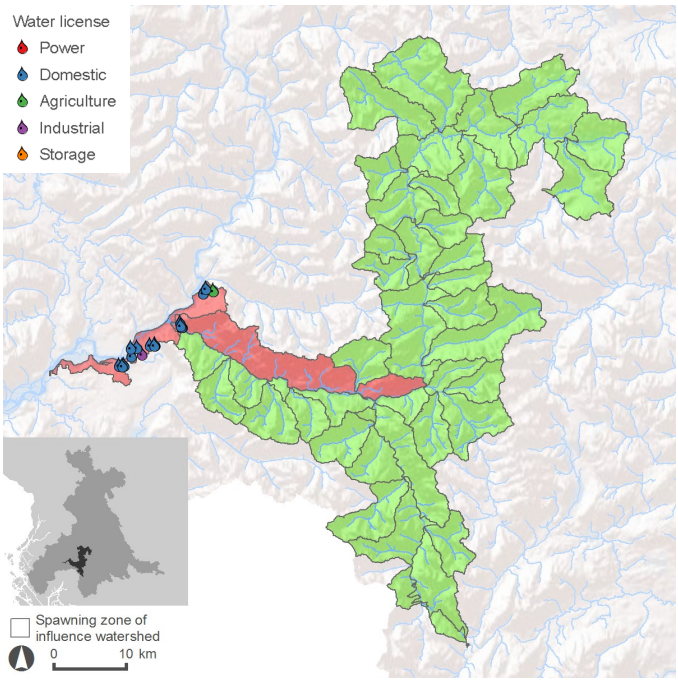




Water Quantity

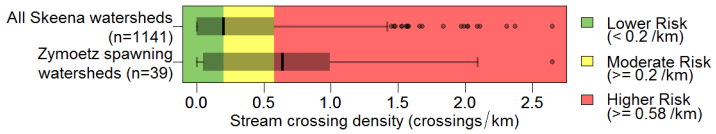
Number of water licenses

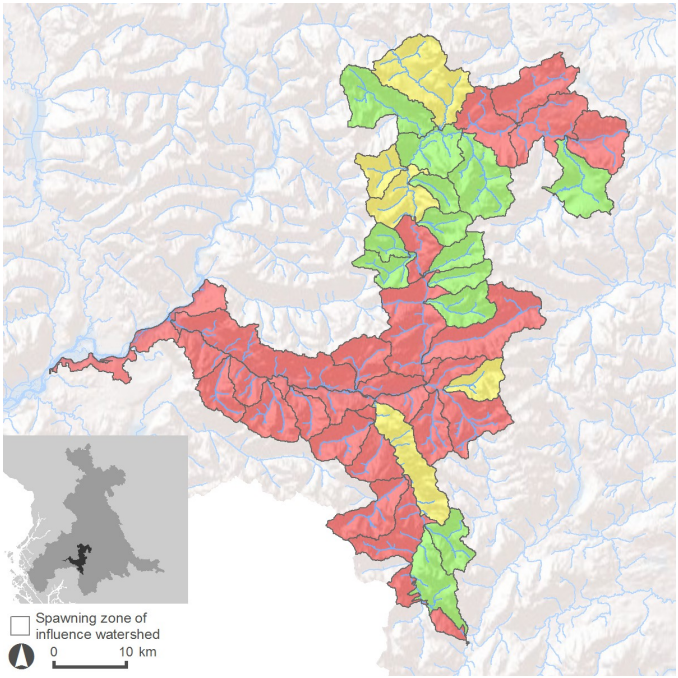




Fish Passage/Habitat Connectivity

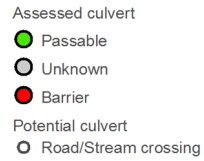
Stream crossing density

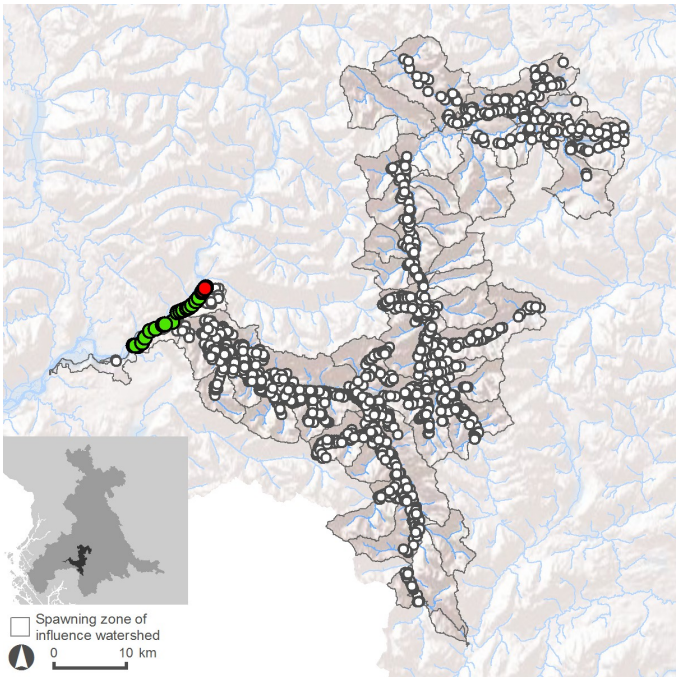




Culvert passability

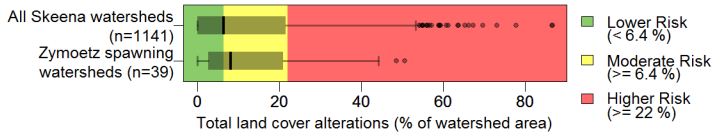
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

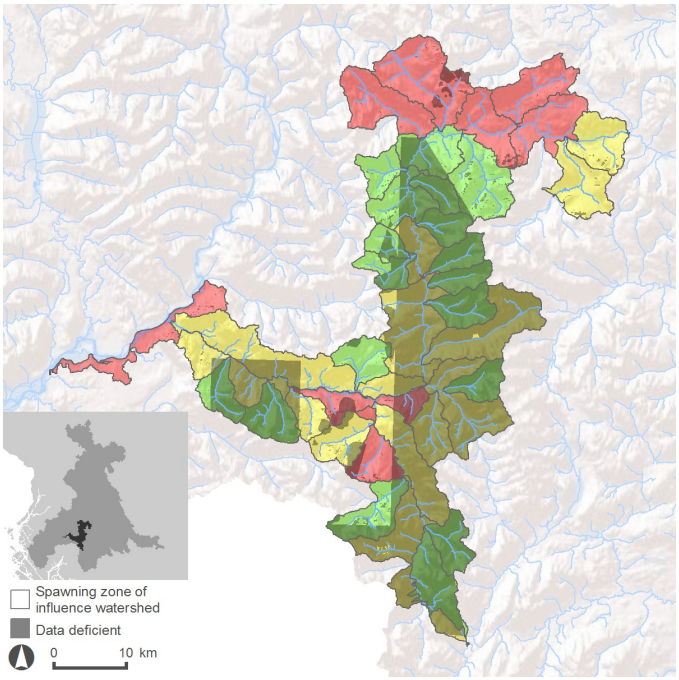




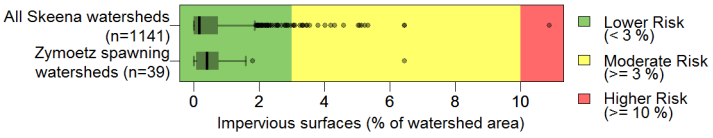
Human Development Footprint

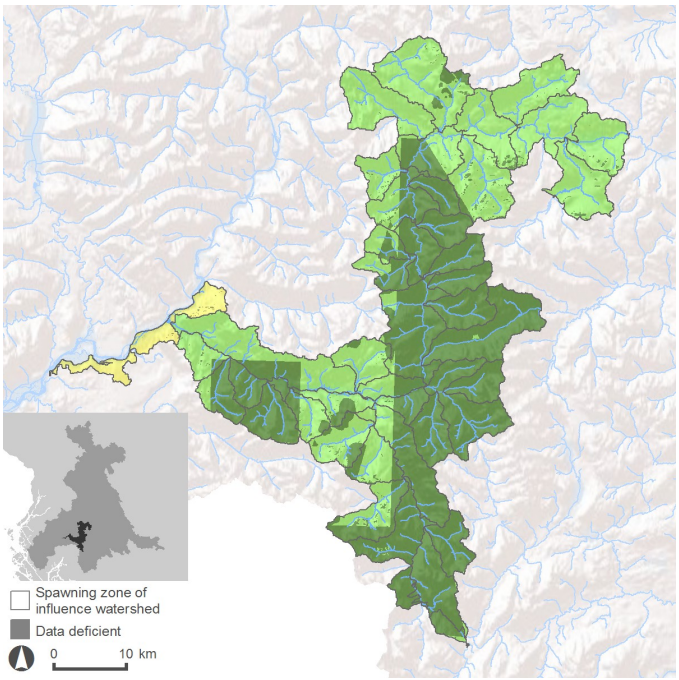
Total land cover alteration



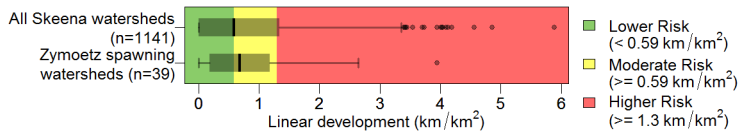


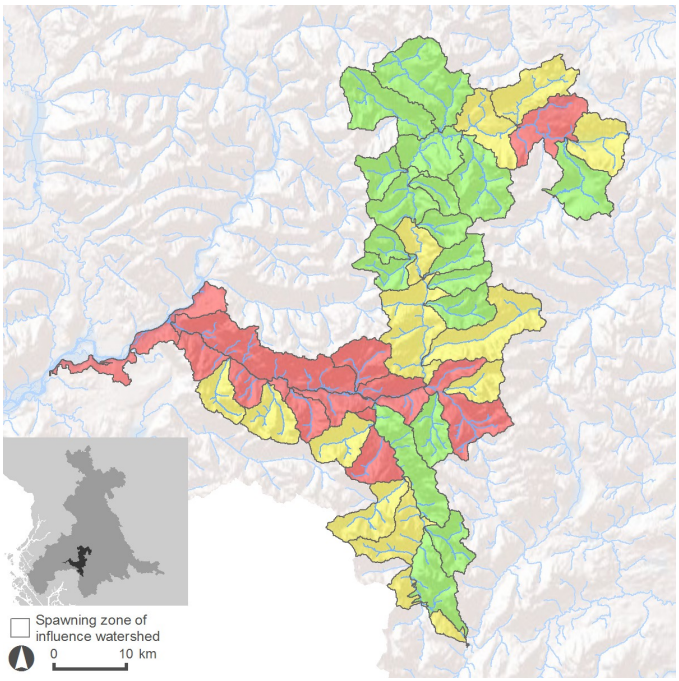
Impervious surfaces



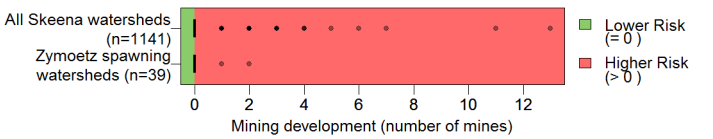


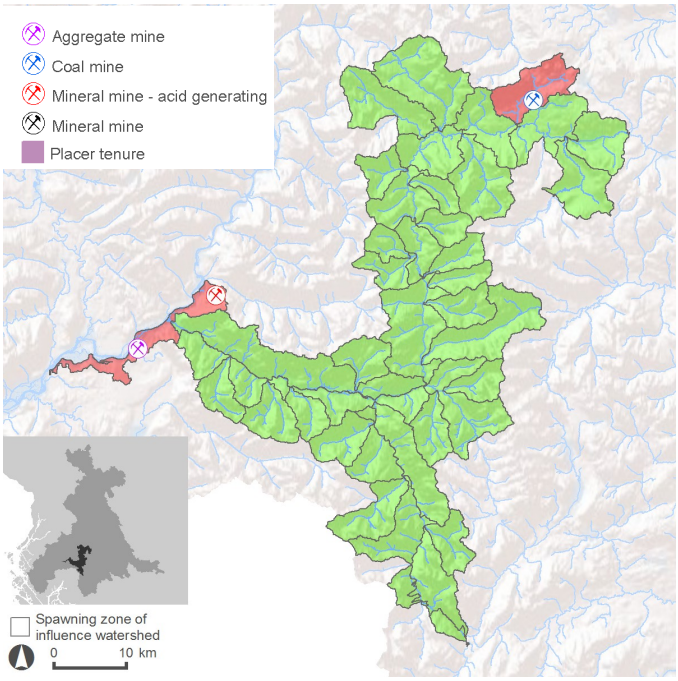
Linear development





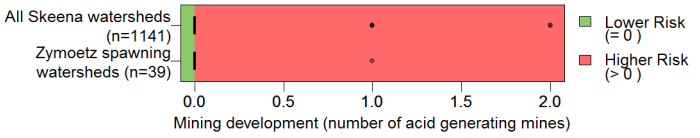
Mining development (total number of mines)

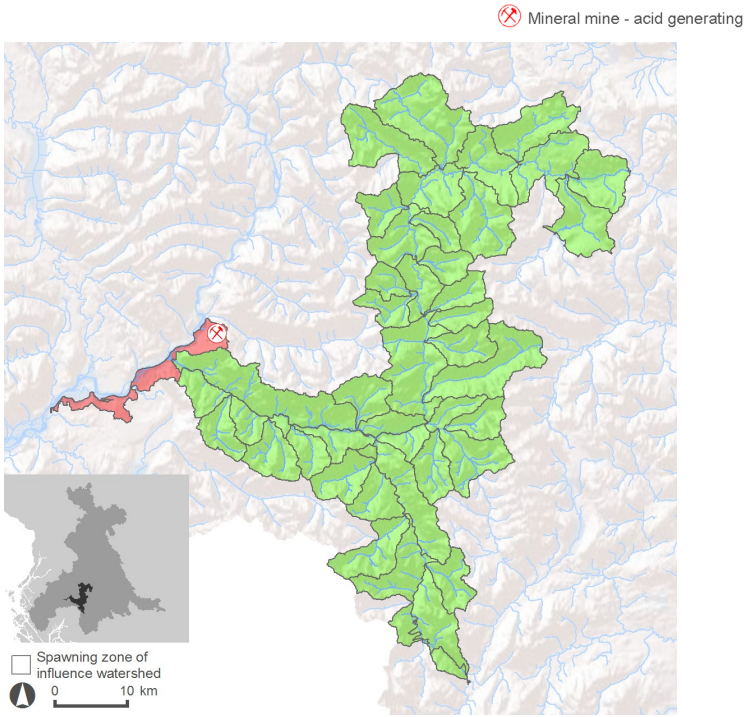




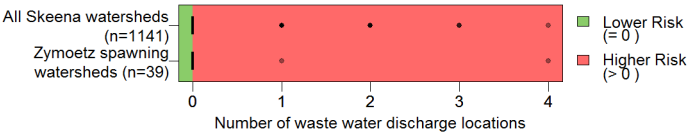
Water Quality

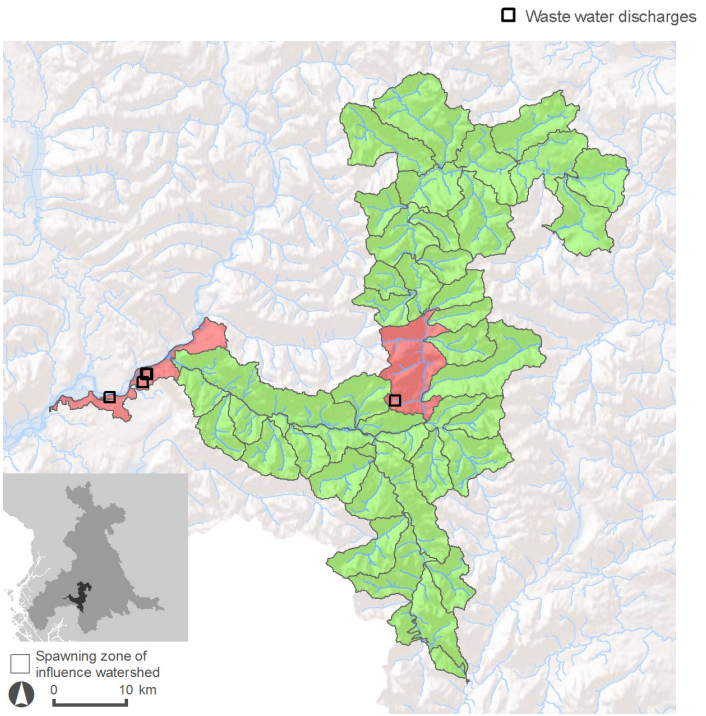
Mining development (acid generating mines)





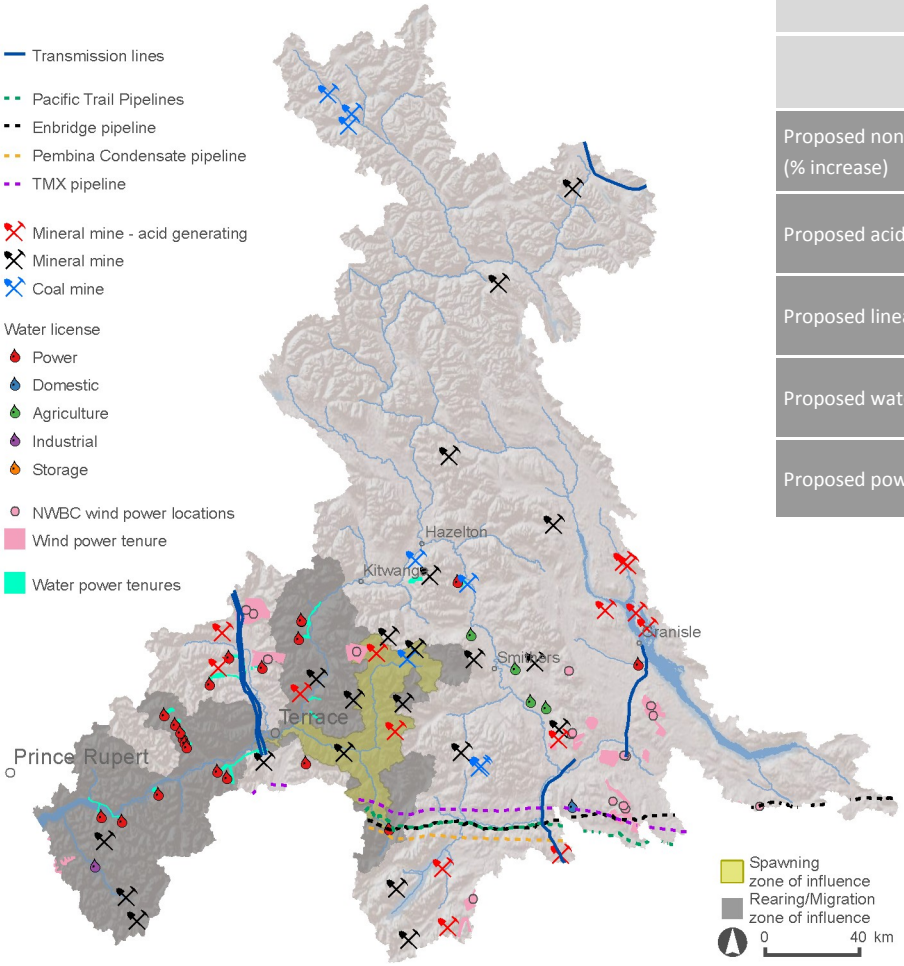
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Zymoetz Chinook CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	8 (18%)	3 (100%)
Proposed acid generating mines (% increase)	3 (150%)	2 (200%)
Proposed linear development (% increase)	0.01 km/km^2 (2%)	0.02 km/km^2 (2%)
Proposed water licenses (% increase)	20 (17%)	2 (6%)
Proposed power tenures	155 km^2	39 km^2

Skeena Salmon: Chum
Conservation Unit (CU)
Lower Skeena

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

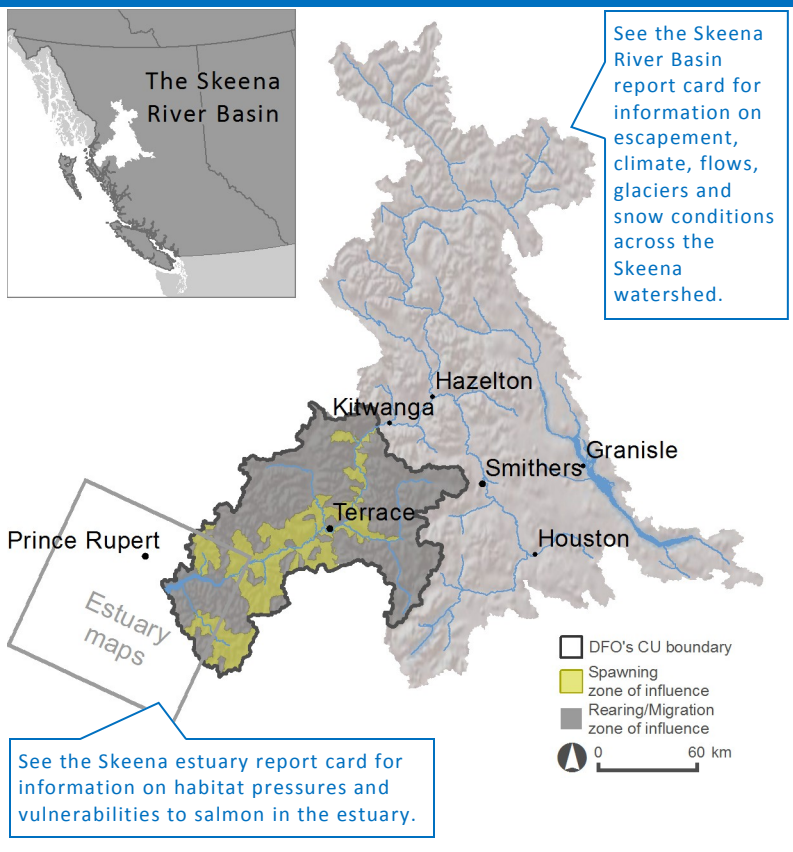
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* This CU contains a large number of chum spawning locations in streams of various sizes and types with diverse water quality and flow levels.
* Chum salmon life history emphasizes marine habitat; entering freshwater only for spawning, egg incubation, & alevin development. Fry emerge early in the spring and migrate to the Skeena estuary immediately upon hatching. There is little specific information available on juvenile residency in the estuary and near-shore marine waters.
* Habitat for this CU is characterized by large river channels and the presence of upwelling groundwater.
* The main spawning grounds (located in the mainstem above the tidal range, from Sparkling Creek to Lower Lake Creek) are considered in good condition
* Winter low flows can dewater and freeze eggs, especially those laid in side and back channels that dry up.
* Tributaries supporting Lower Skeena chum may have large scale precipitation events causing high flows, erosion, scouring, & siltation.
* Enhancement includes broodstock capture for Kitsumkalum Hatchery & fry release at Andesite Side Channel and lower Kitsumkalum R. (mid-late 1980s).
* Early marine survival is the most critical period influencing adult returns and is correlated with climatic-generated variations in the abundance and distribution of predator and prey communities.
* Impacts to freshwater habitat include loss of side-channels due to linear development (Highway 16 & CN Rail line). Tributary spawning has been impacted by dyke construction with scouring of suitable gravels.
* Future threats include changing freshwater/ocean conditions linked to global climate change as well as changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

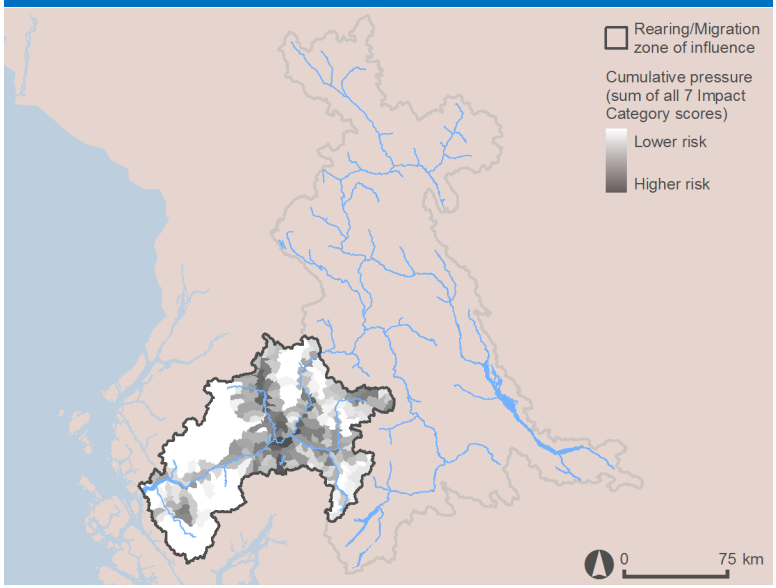
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

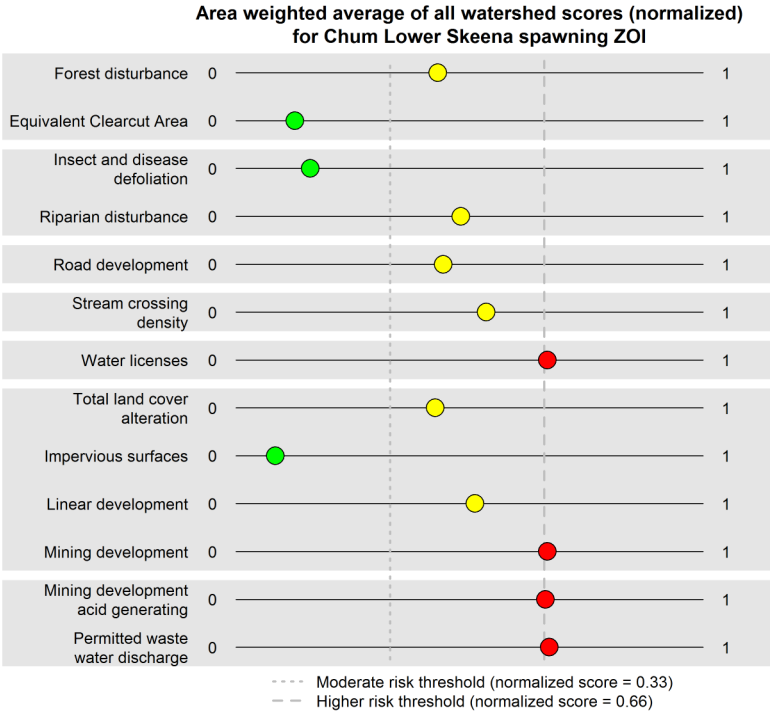
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

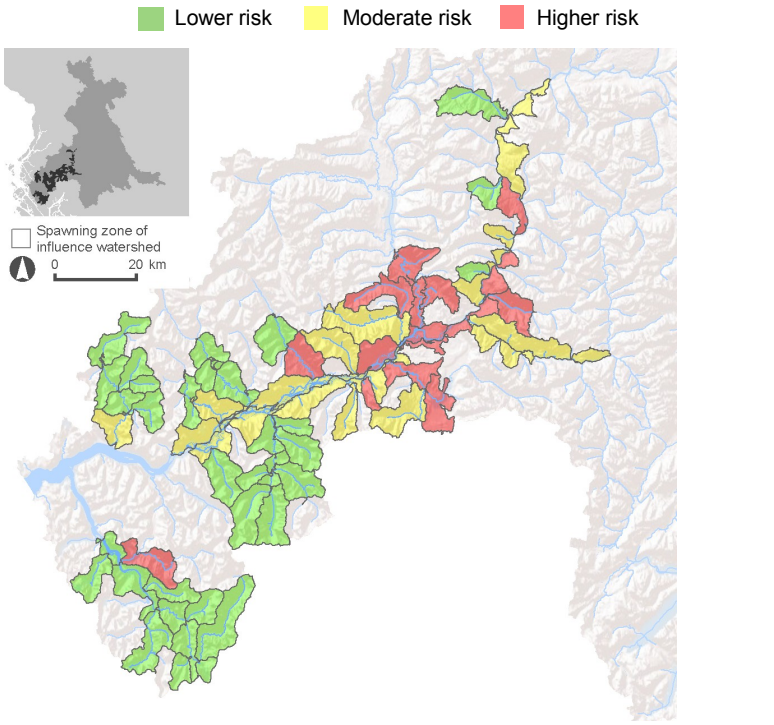
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

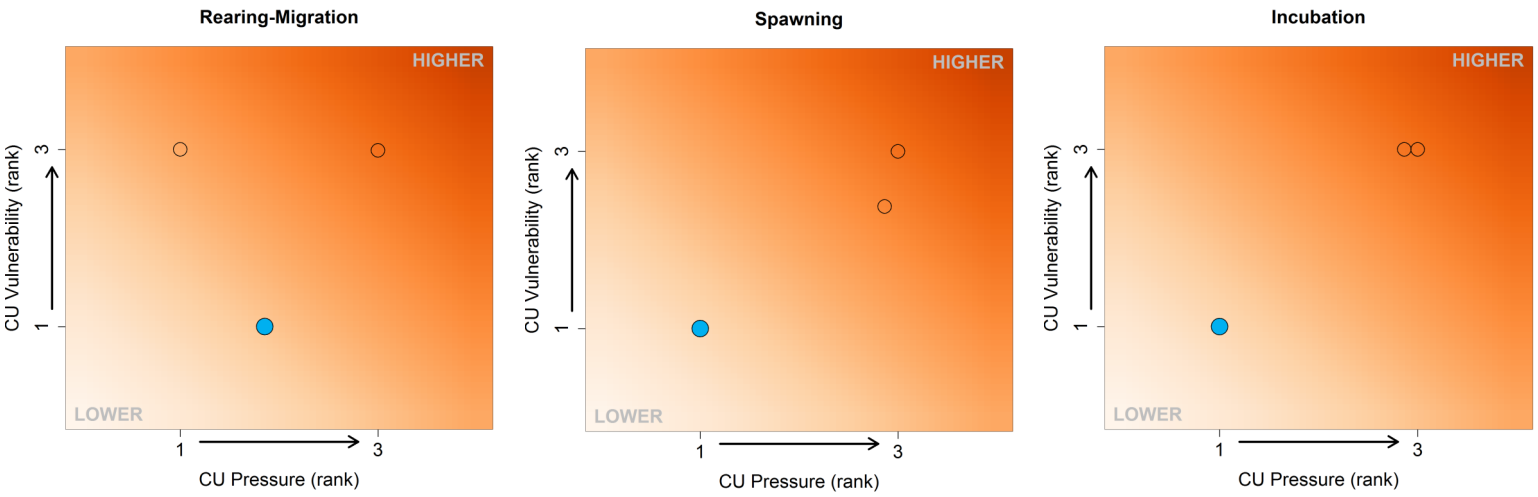


Cumulative pressure—spawning



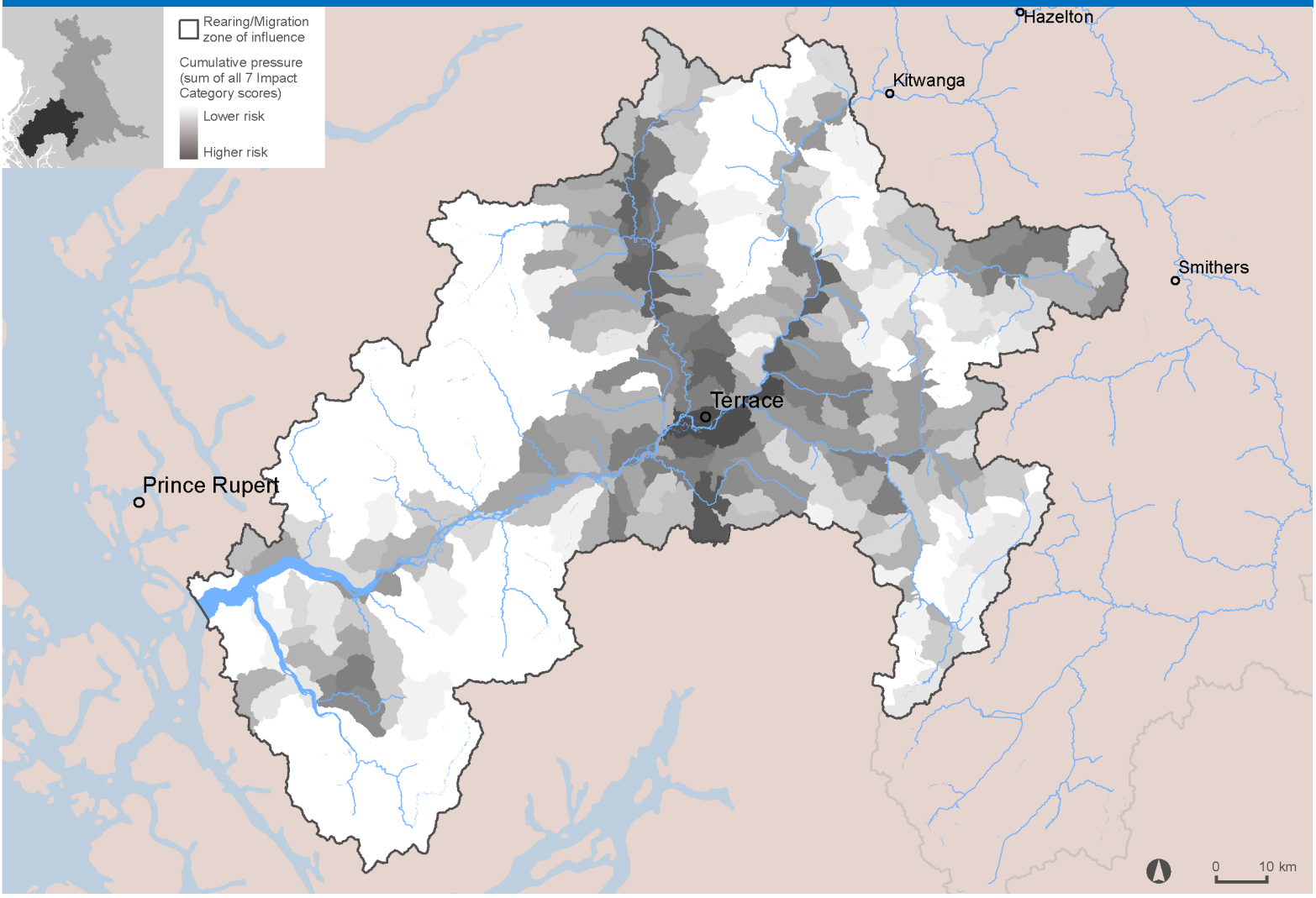
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Lower Skeena ○ = other Skeena Chum CUs



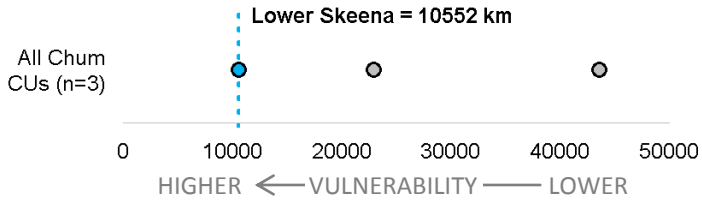
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

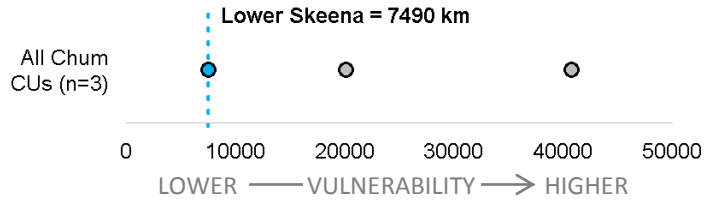


Rearing/Migration period vulnerability

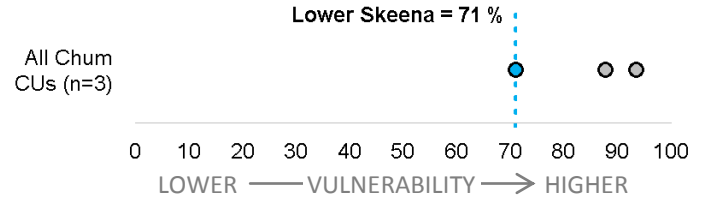
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



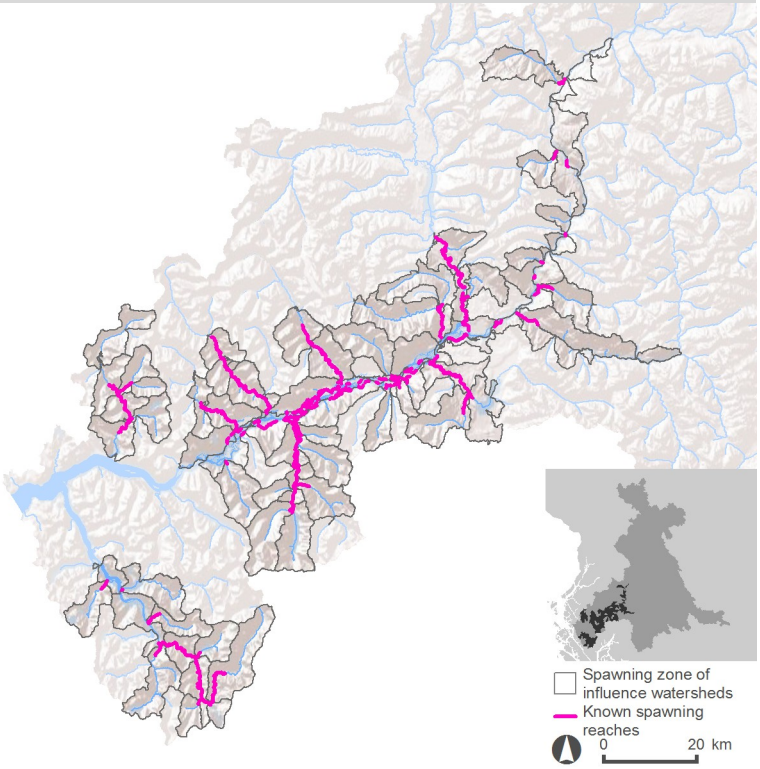
Flow sensitive accessible habitat (%) (all seasons)



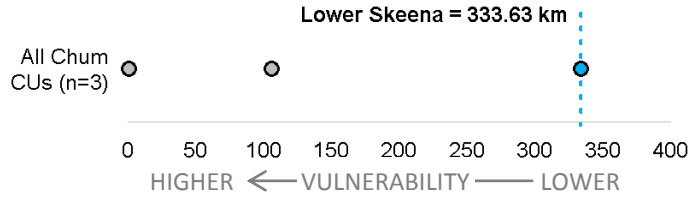
Spawning & incubation vulnerability

Spawning period vulnerability

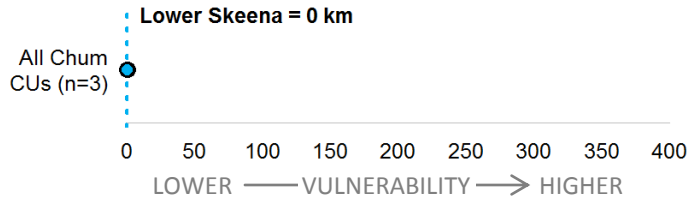
Spawning locations



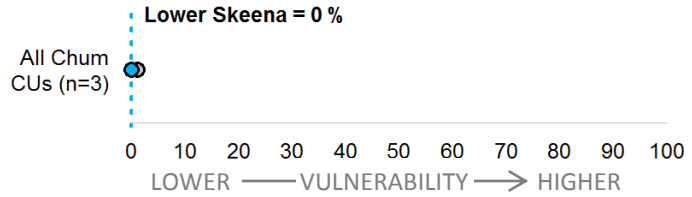
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)



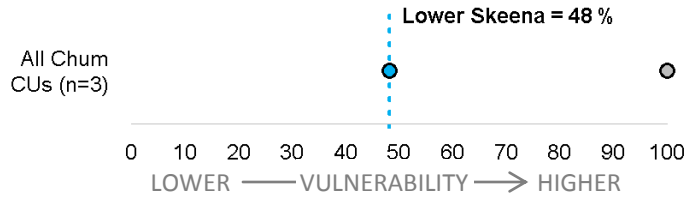
Spawning reaches summer flow sensitive - spawn timing (%)



Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)

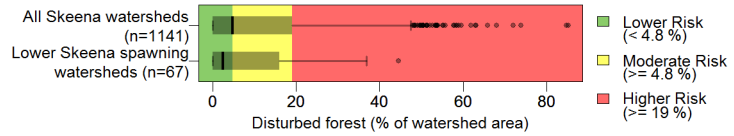
Spawning reaches winter flow sensitive - incubation timing (%)

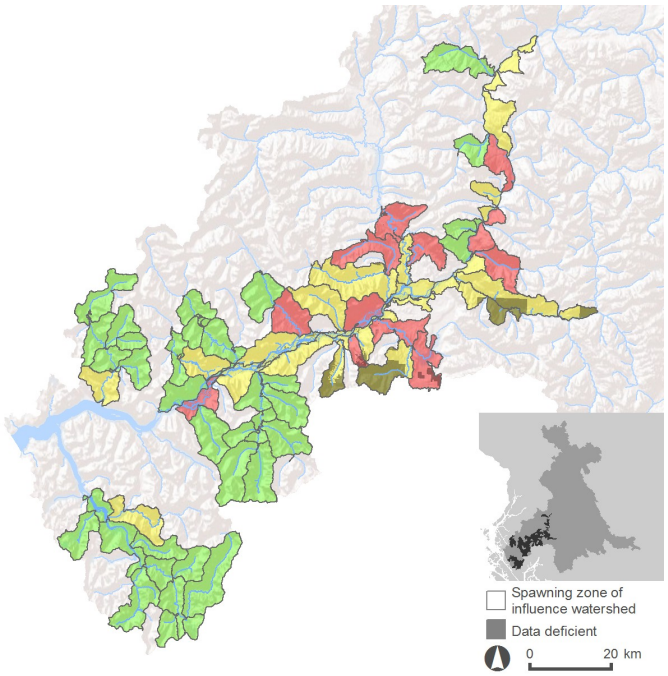


Spawning pressure

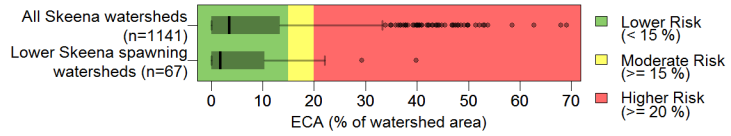
Hydrologic Processes

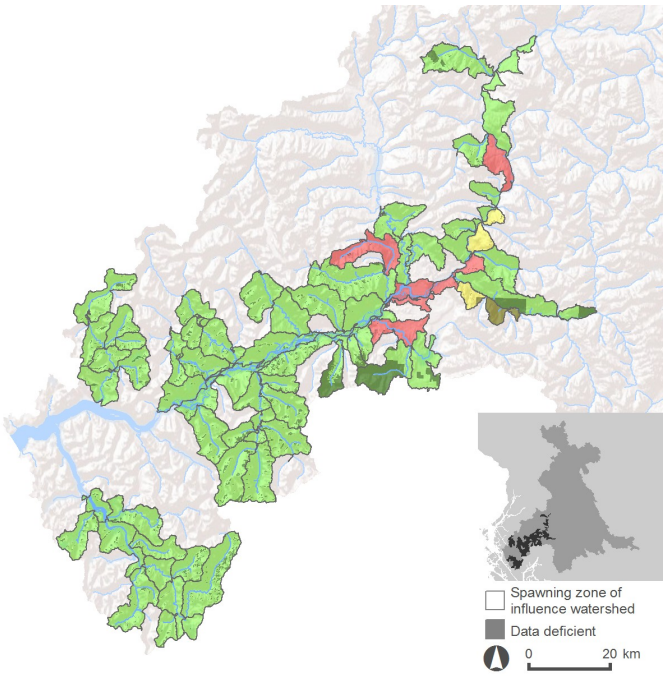
Forest disturbance





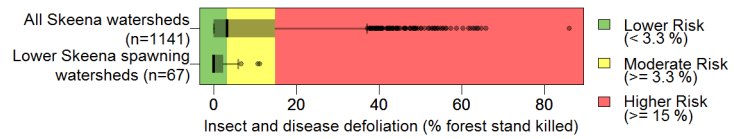
Equivalent Clear-cut Area

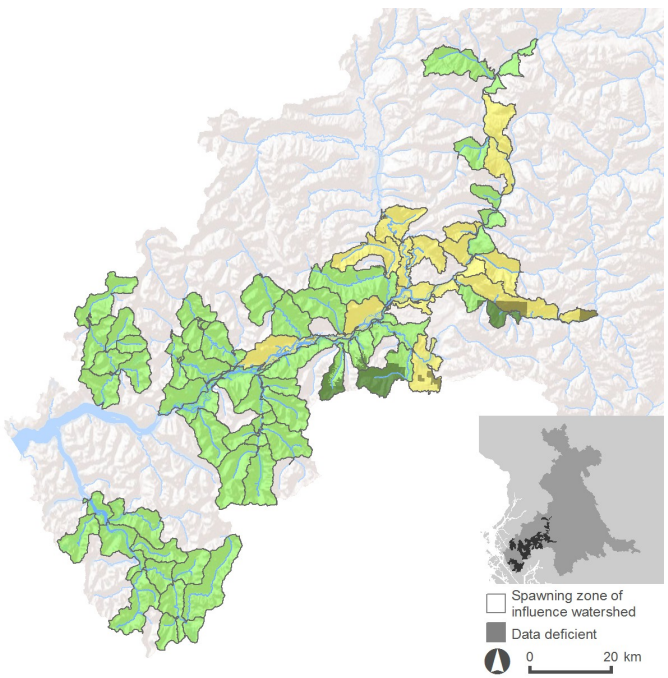




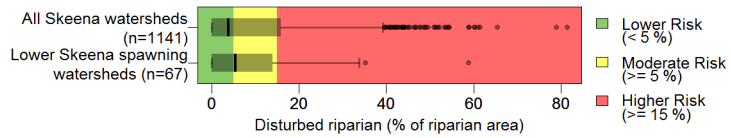
Vegetation Quality

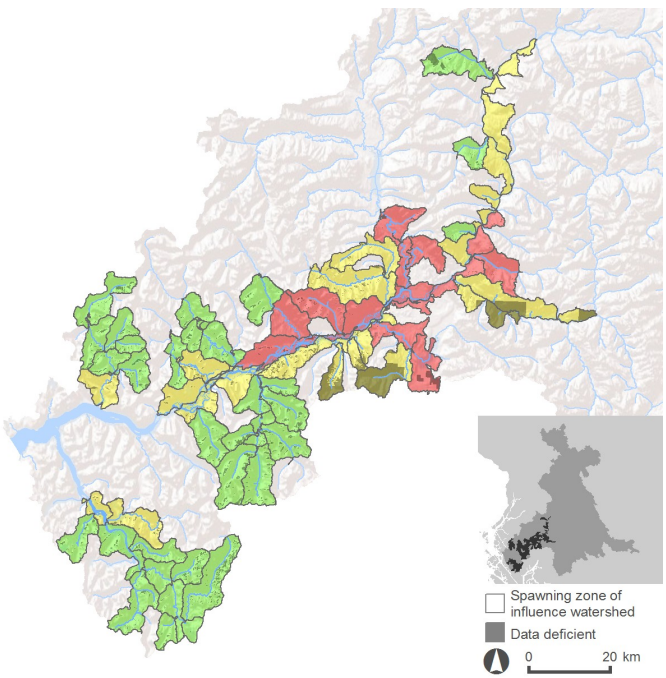
Insect and disease defoliation





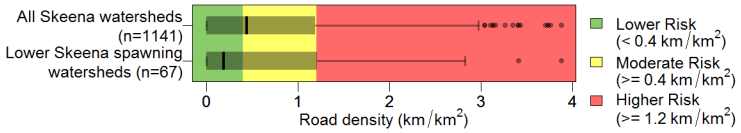
Riparian disturbance

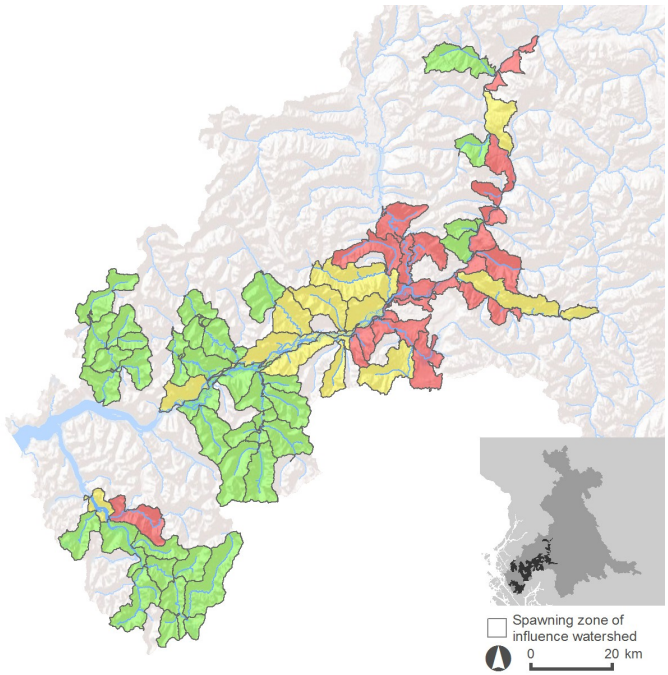




Surface Erosion

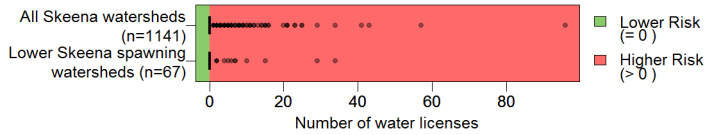
Road development

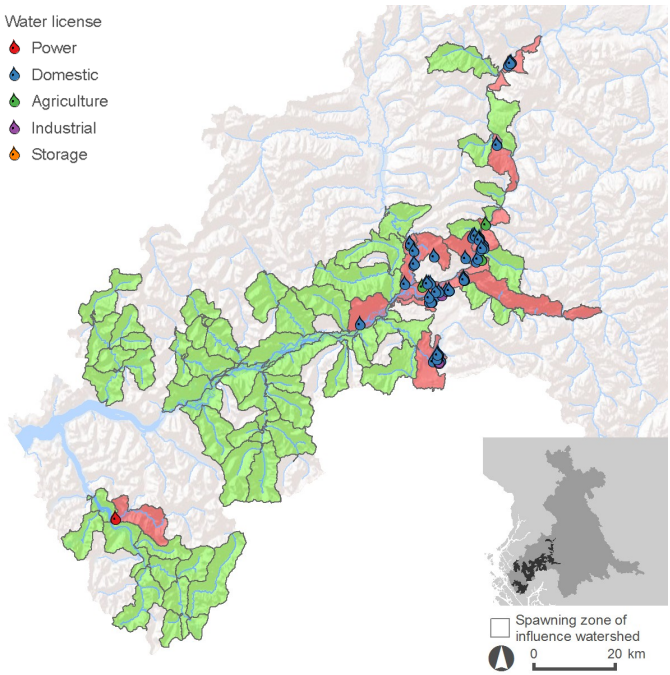




Water Quantity

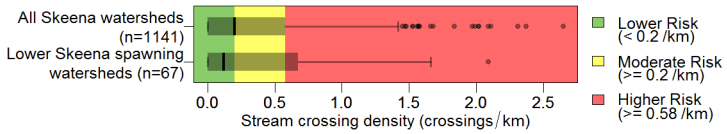
Number of water licenses

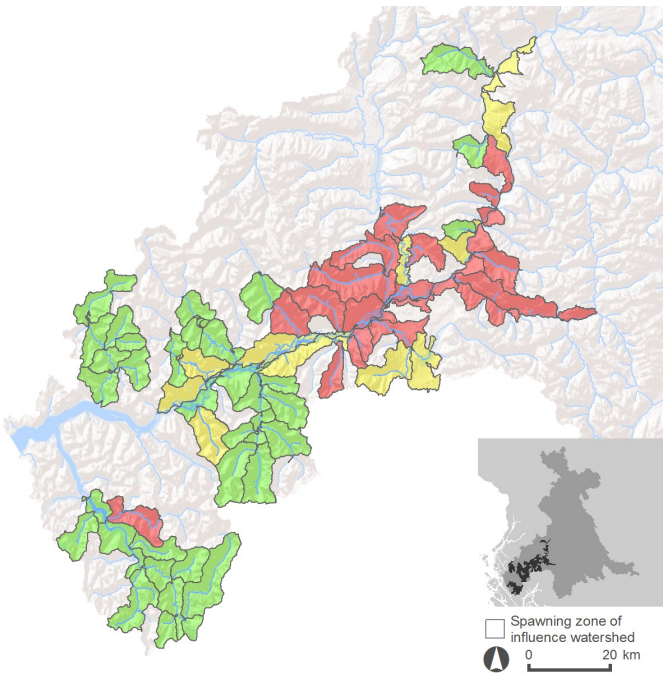




Fish Passage/Habitat Connectivity

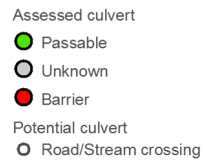
Stream crossing density

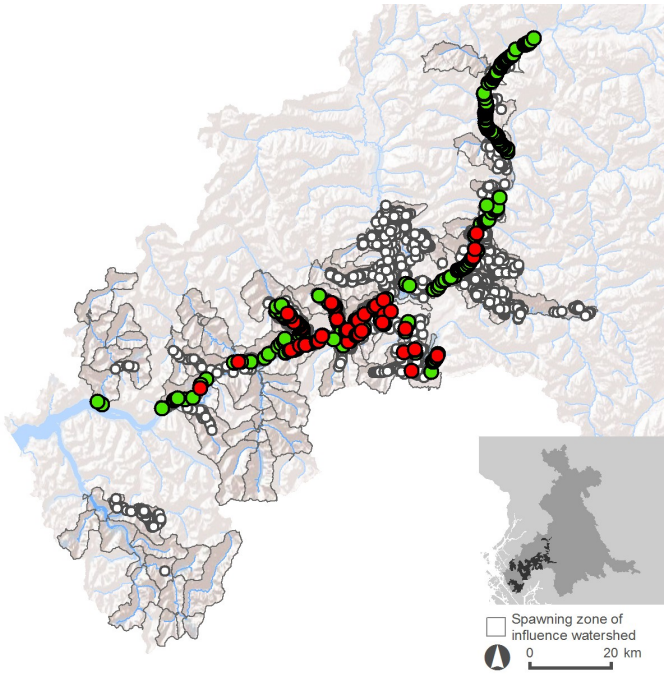




Culvert passability

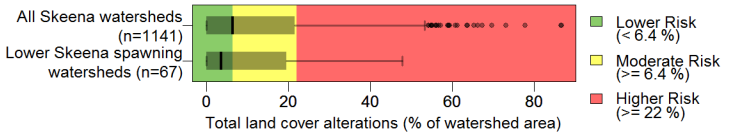
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

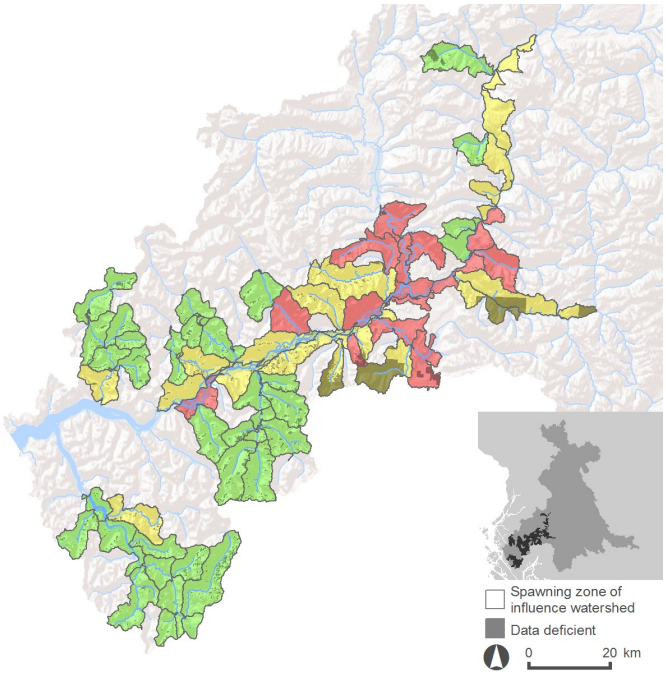




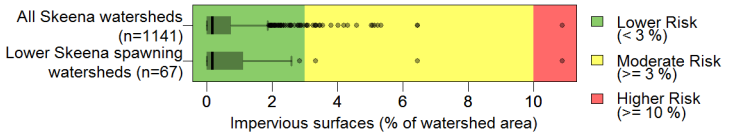
Human Development Footprint

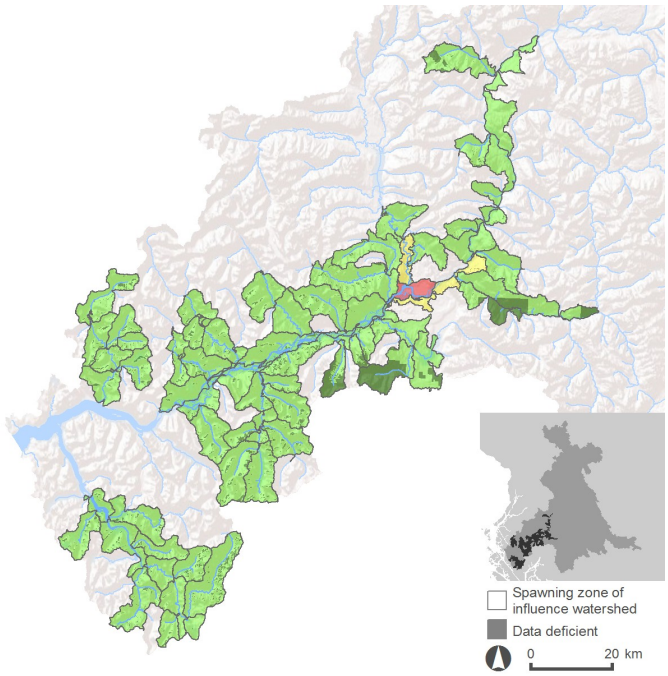
Total land cover alteration



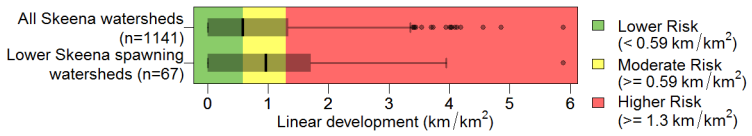


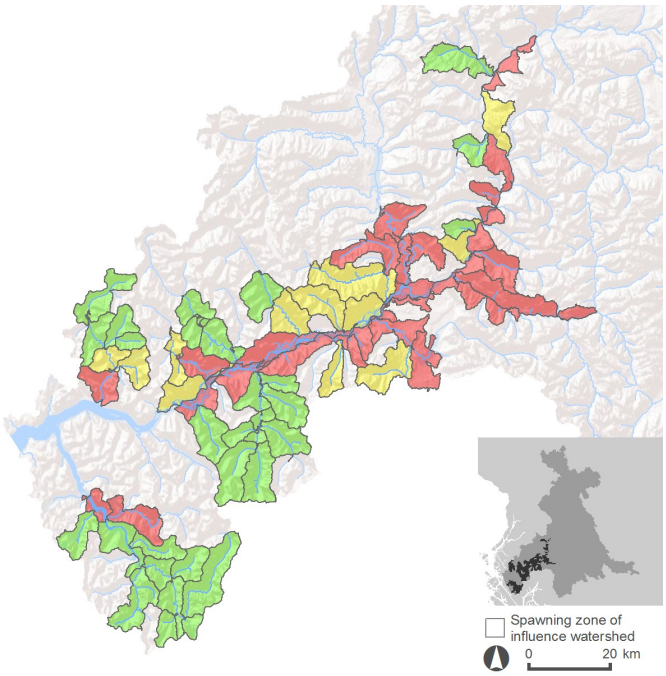
Impervious surfaces



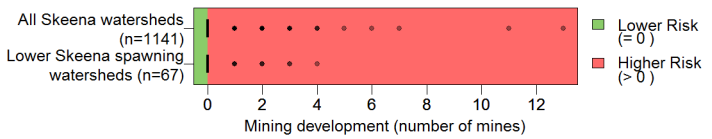


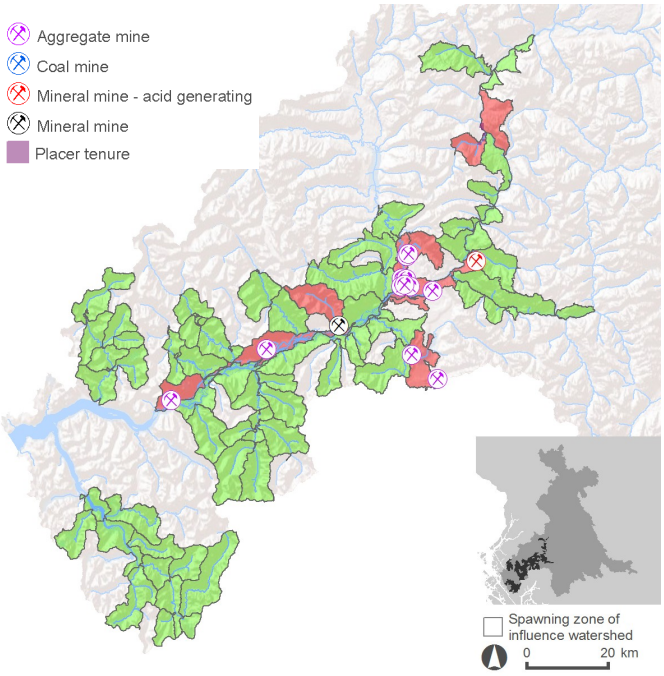
Linear development





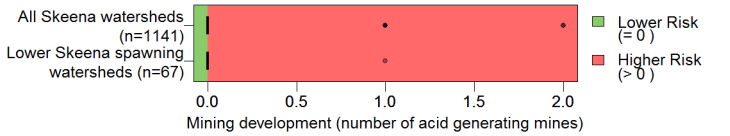
Mining development (total number of mines)

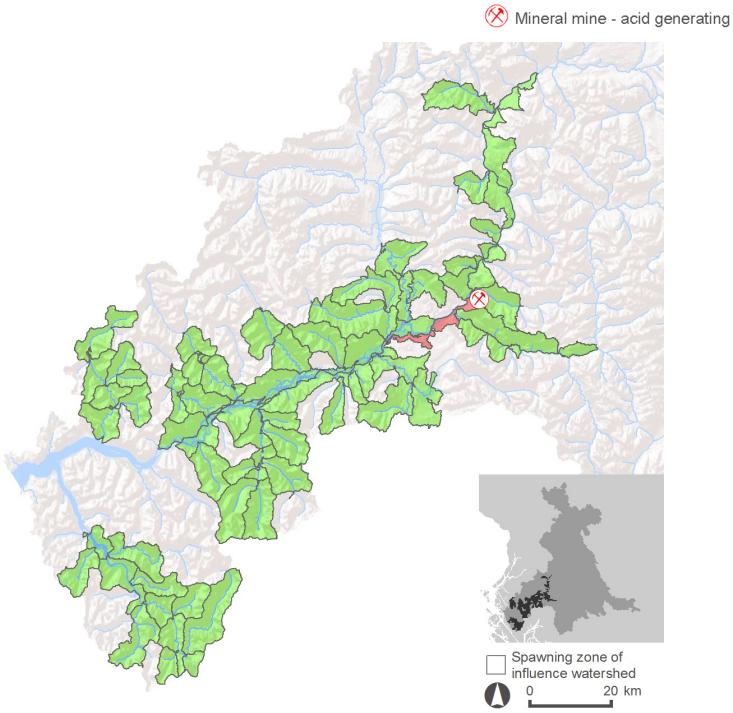




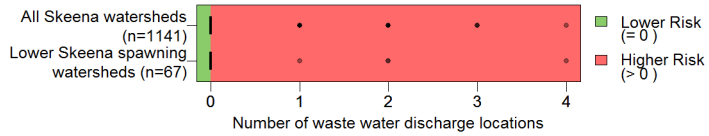
Water Quality

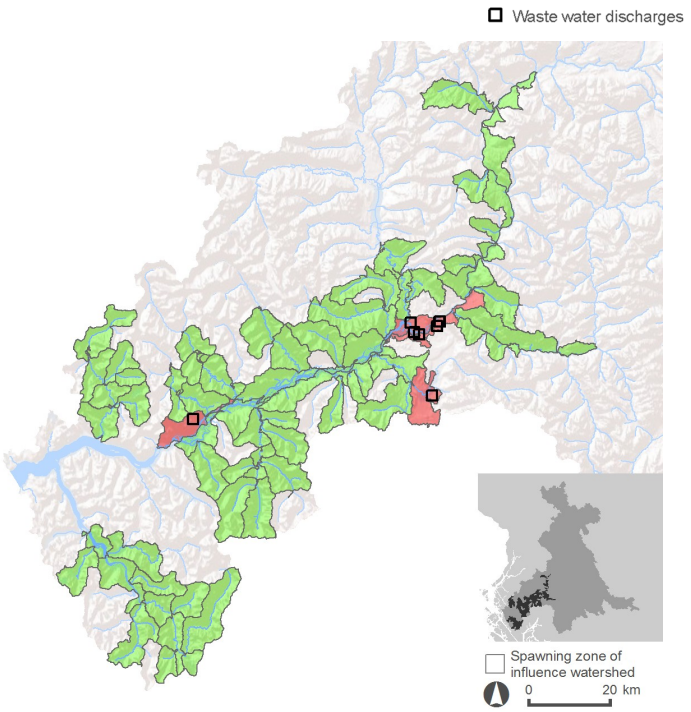
Mining development (acid generating mines)





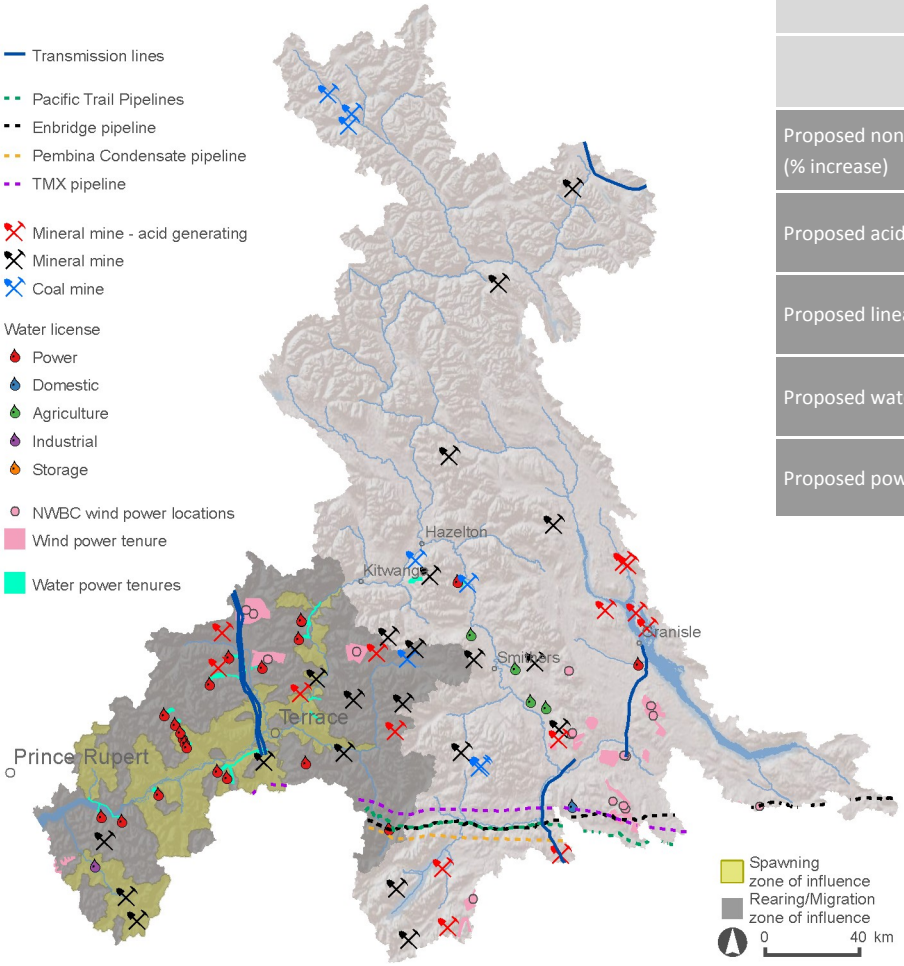
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Lower Skeena Chum CU summary

	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	9 (12%)	4 (20%)
Proposed acid generating mines (% increase)	5 (250%)	0 (0%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.01 km/km^2 (1%)
Proposed water licenses (% increase)	27 (13%)	7 (6%)
Proposed power tenures	315 km^2	32 km^2

Skeena Salmon: Chum

Conservation Unit (CU)

Middle Skeena

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

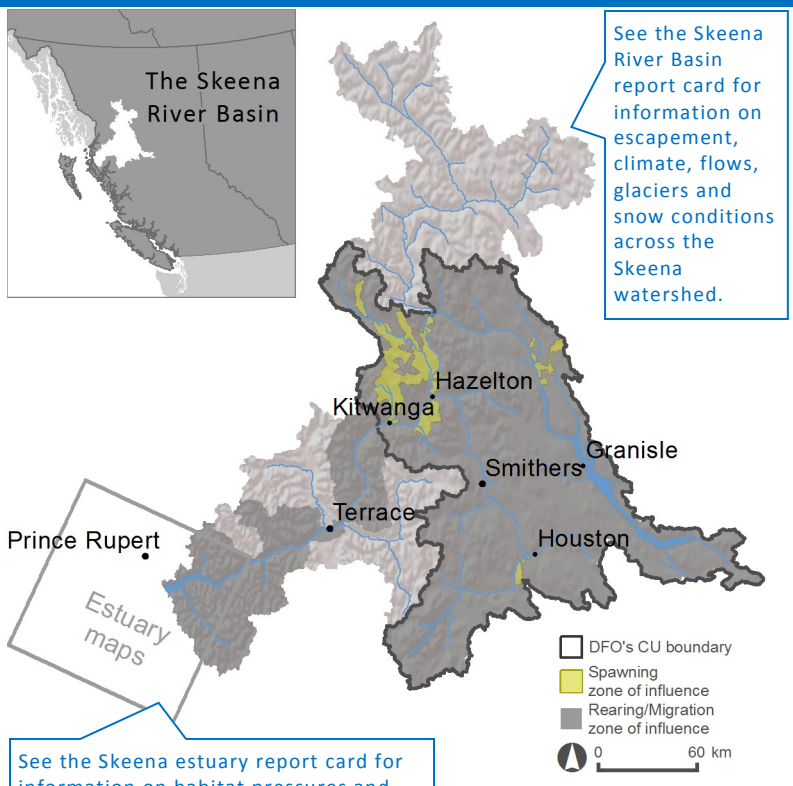
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Chum salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, & alevin development. Fry emerge early in the spring and migrate to the Skeena estuary immediately upon hatching. There is little specific information available on juvenile use of the estuary and near-shore marine waters.
* Spawning occurs in streams of various sizes and types possessing different hydrological regimes, including the presence of upwelling groundwater, and varied water quality and flow levels.
* The Skeena River heads northward through the CU as a generally entrenched single thread stream, that more than doubles its elevation by the Babine confluence. The main chum spawning populations are considered to be in good condition and are located in the low relief, Kitwanga and Kispiox valley-bottoms as well as a few Skeena mainstem and side and backchannels.
* Winter low flows can dewater and freeze eggs, especially those laid in side and back channels that dry up.
* Spawning sites for this CU may have large scale precipitation events causing high flows, erosion, scouring, and siltation.
* Due to depressed chum abundance levels, the Kitwancool Channel was excavated in 1985 with expected benefits to chum. The channel is 300m long & 5 m wide with adequate groundwater flows and reasonable oxygen levels. There were problems acquiring broodstock and no adult chum returned to spawn. The channel was abandoned in 1989.
* The early marine stage of the life cycle is the most critical period influencing adult returns, with marine growth and survival correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
* Future threats include changing freshwater and ocean conditions linked to global climate change, as well as changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

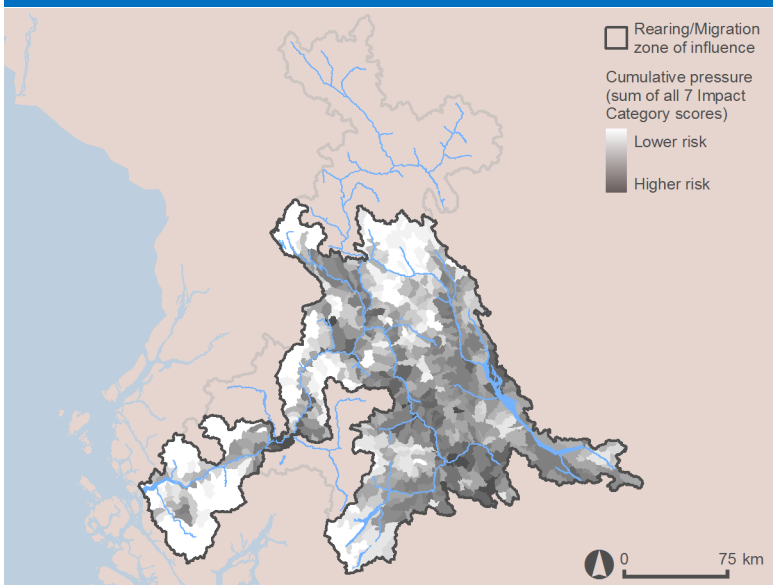
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

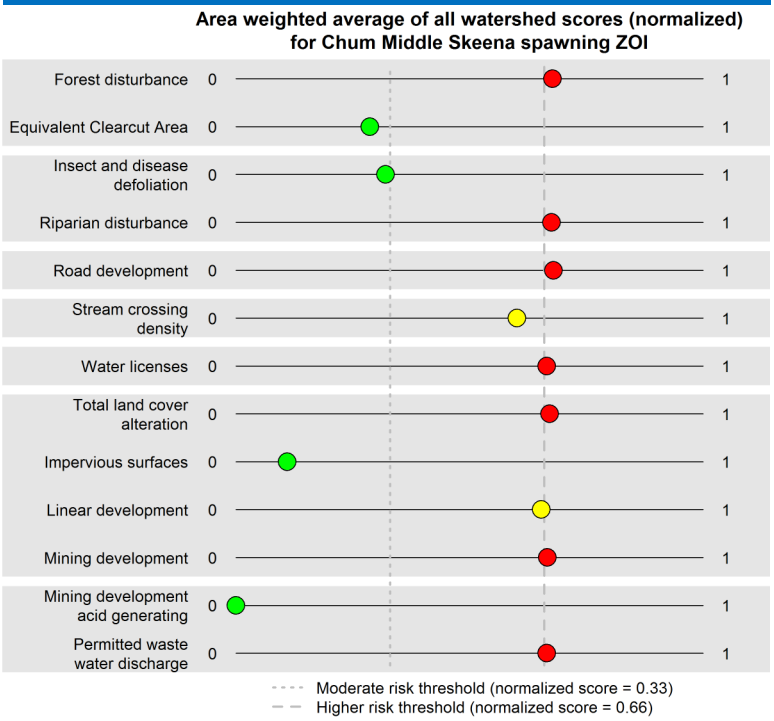
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

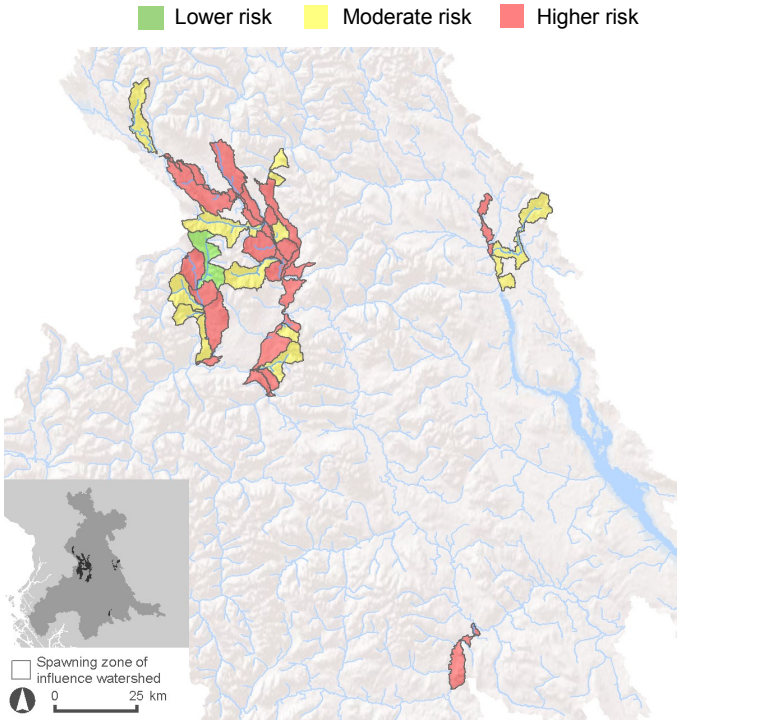
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

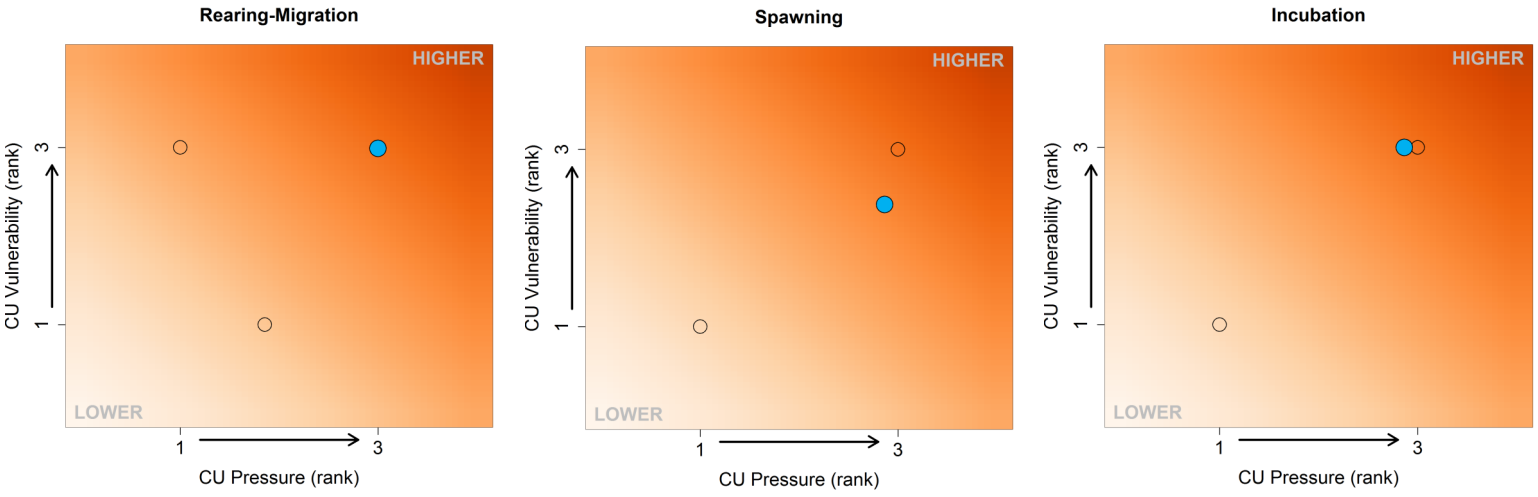


Cumulative pressure—spawning



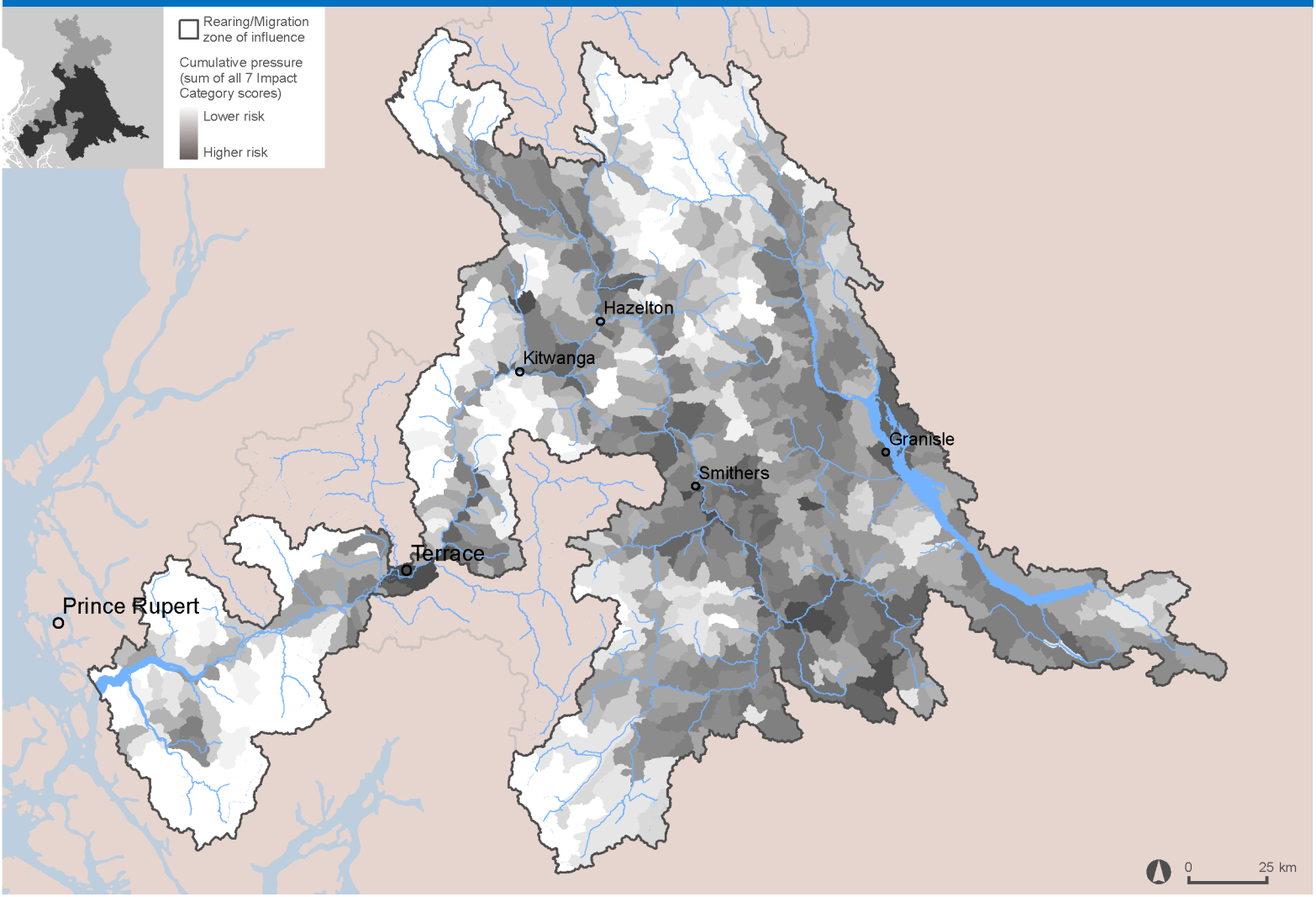
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Middle Skeena ○ = other Skeena Chum CUs



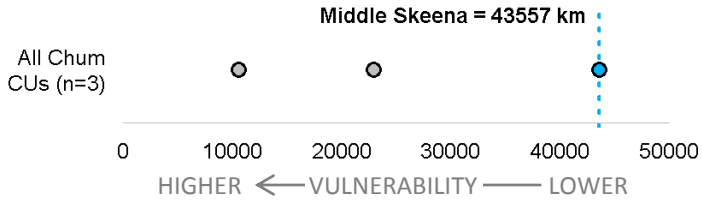
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

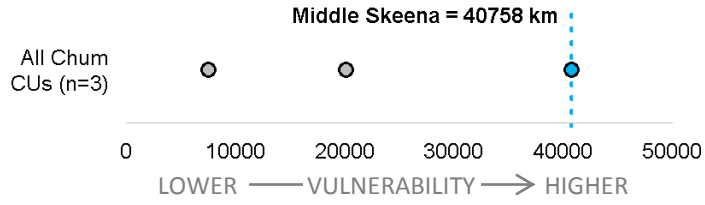


Rearing/Migration period vulnerability

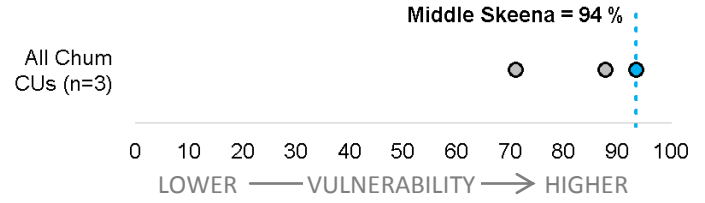
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



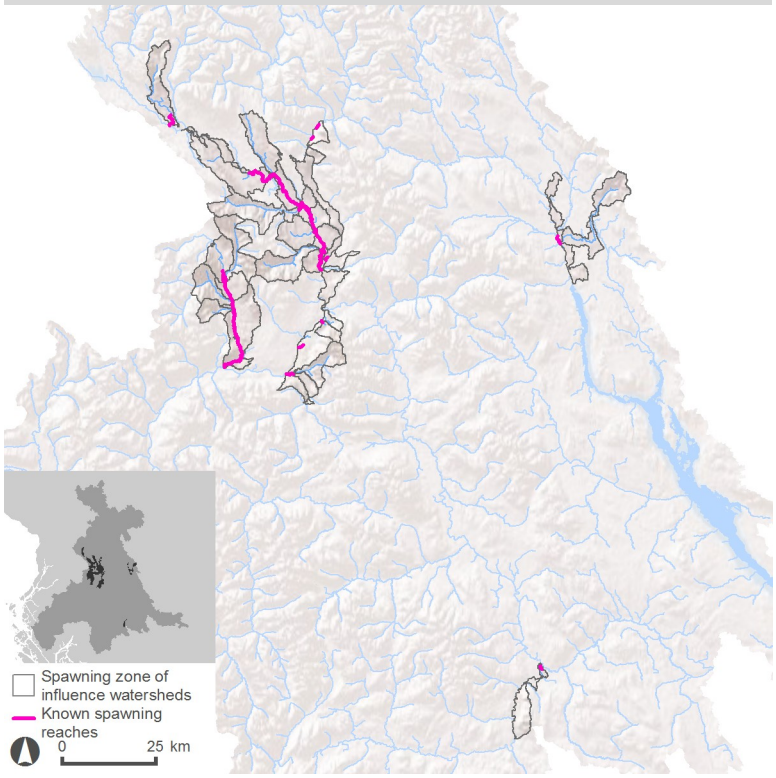
Flow sensitive accessible habitat (%) (all seasons)



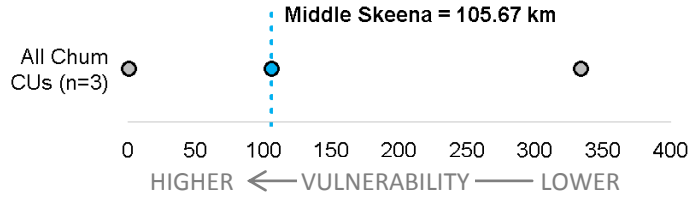
Spawning & incubation vulnerability

Spawning period vulnerability

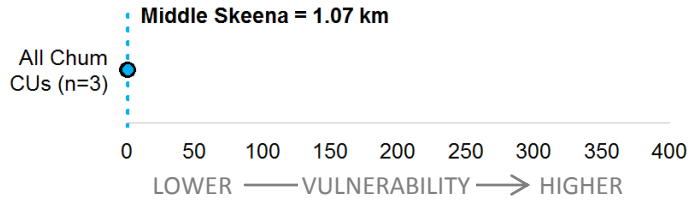
Spawning locations



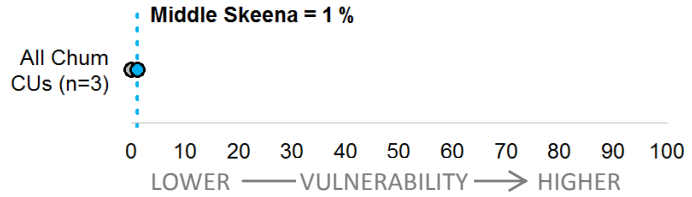
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

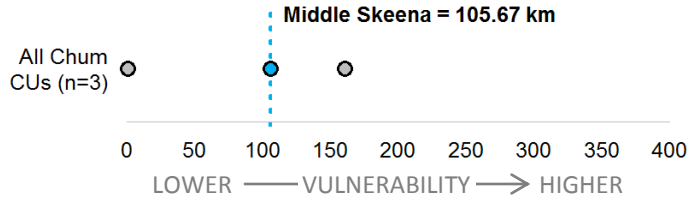


Spawning reaches summer flow sensitive - spawn timing (%)

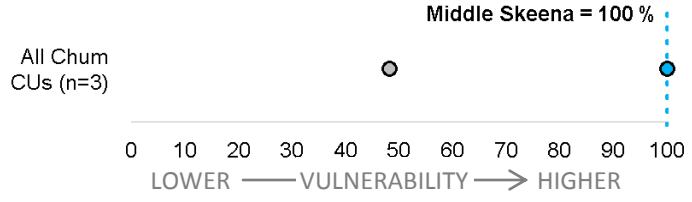


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



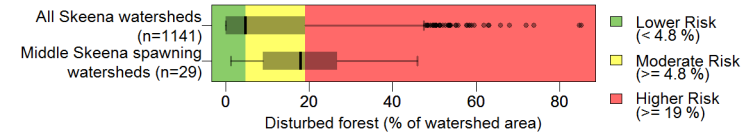
Spawning reaches winter flow sensitive - incubation timing (%)

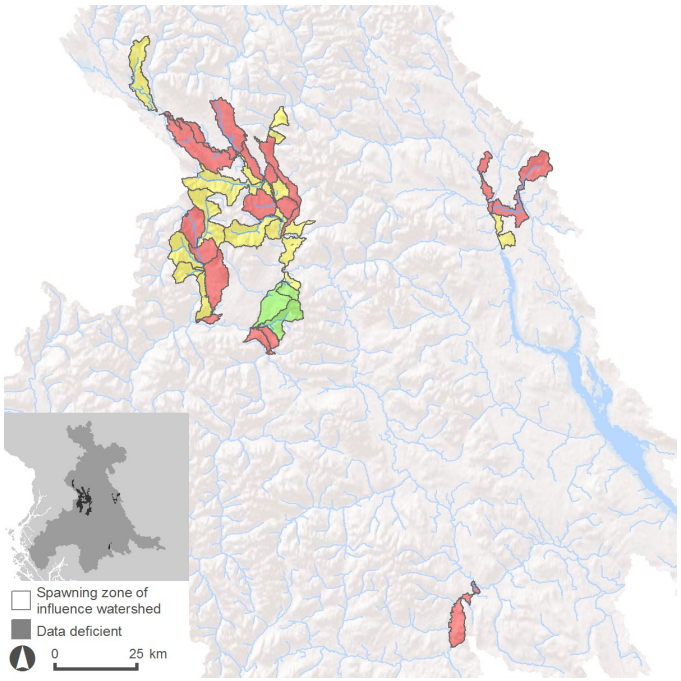


Spawning pressure

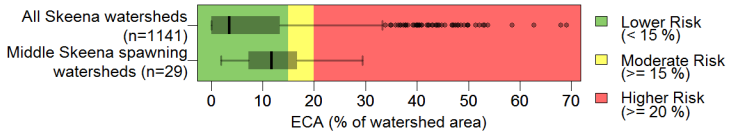
Hydrologic Processes

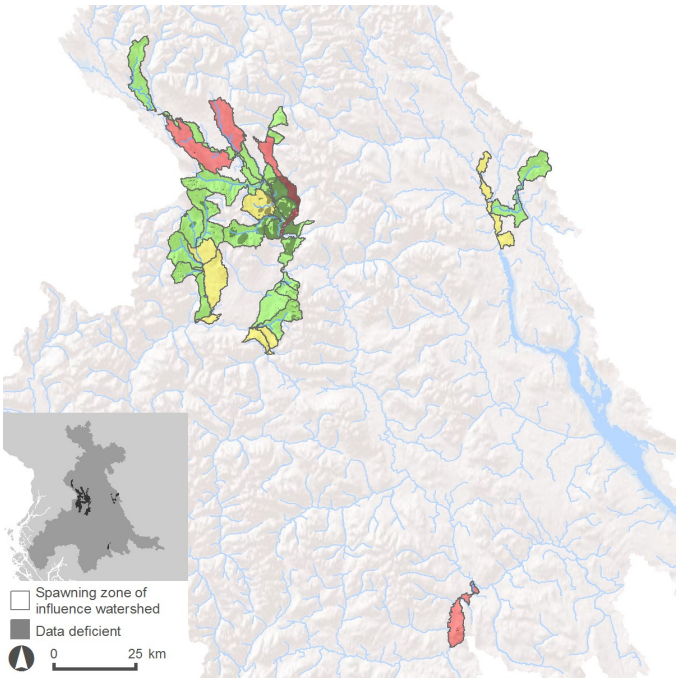
Forest disturbance





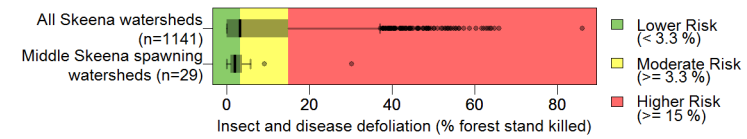
Equivalent Clear-cut Area

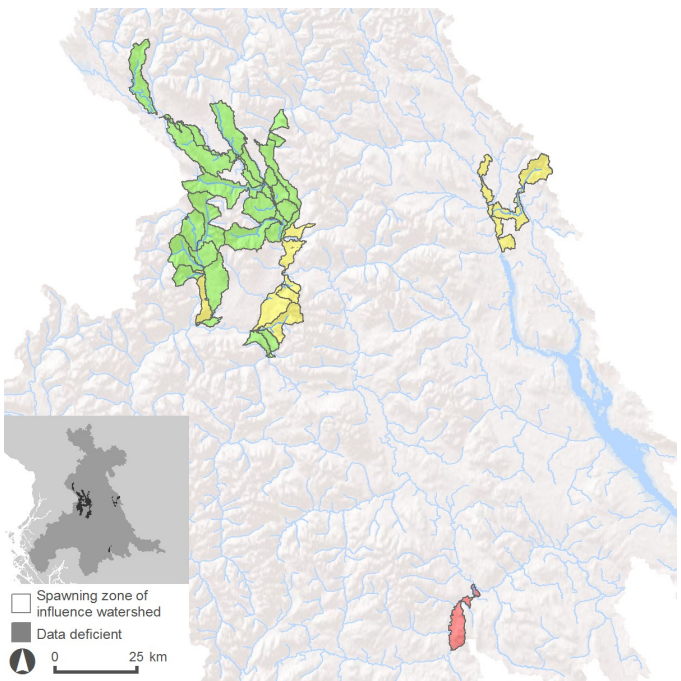




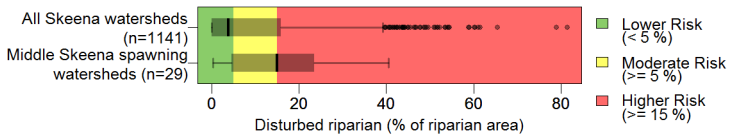
Vegetation Quality

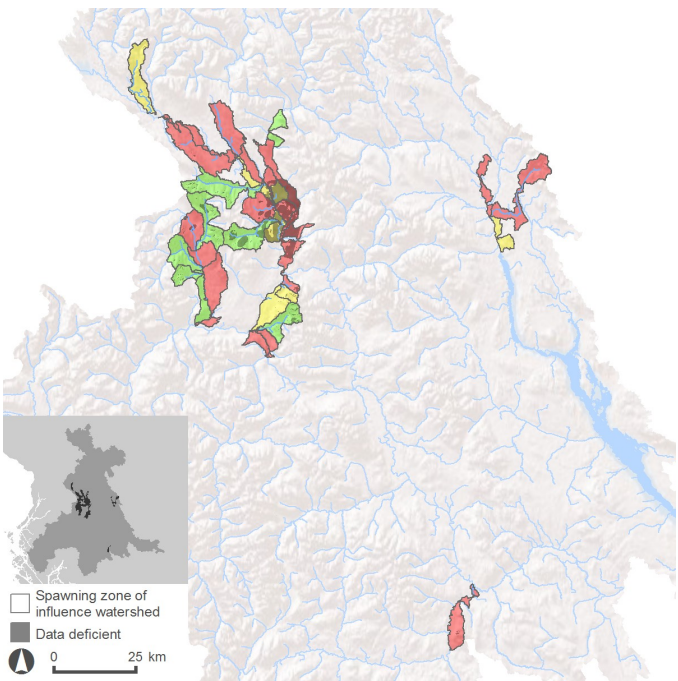
Insect and disease defoliation





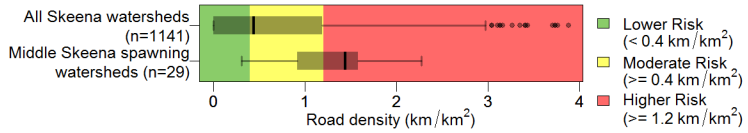
Riparian disturbance

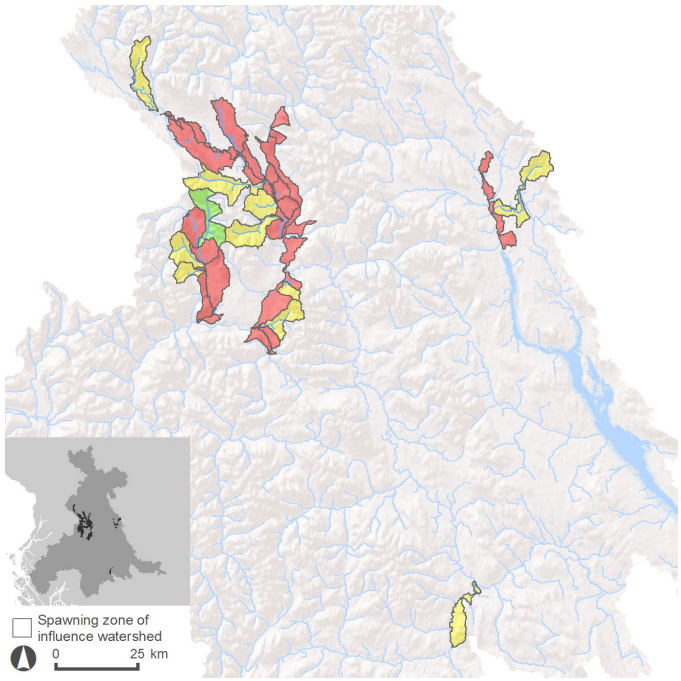




Surface Erosion

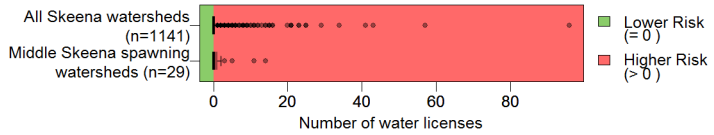
Road development

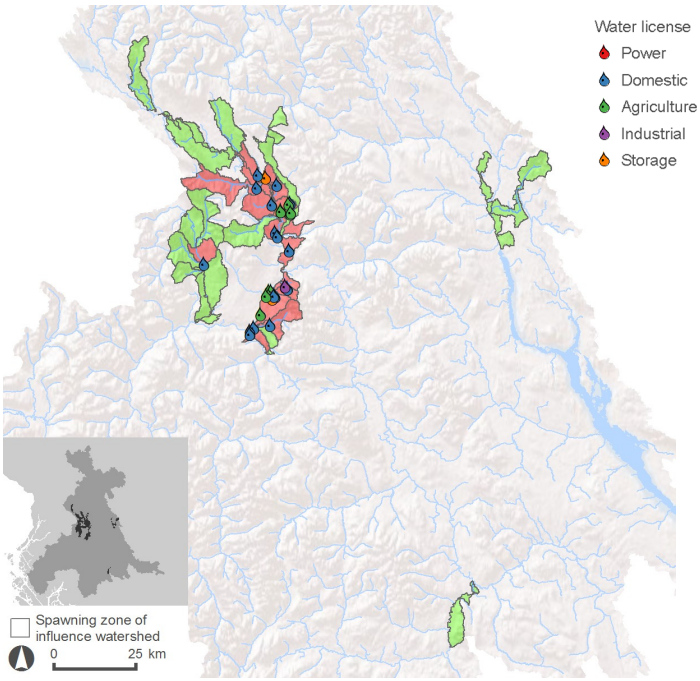




Water Quantity

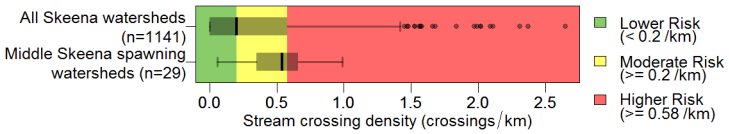
Number of water licenses

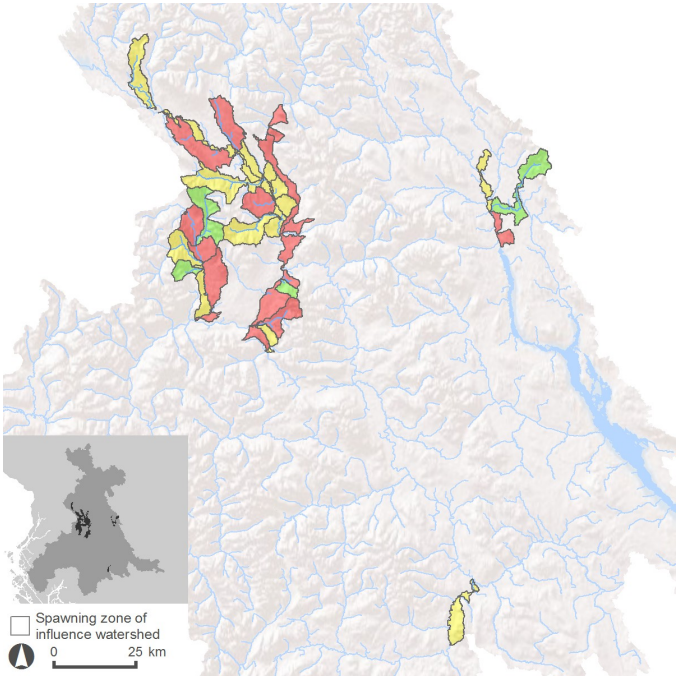




Fish Passage/Habitat Connectivity

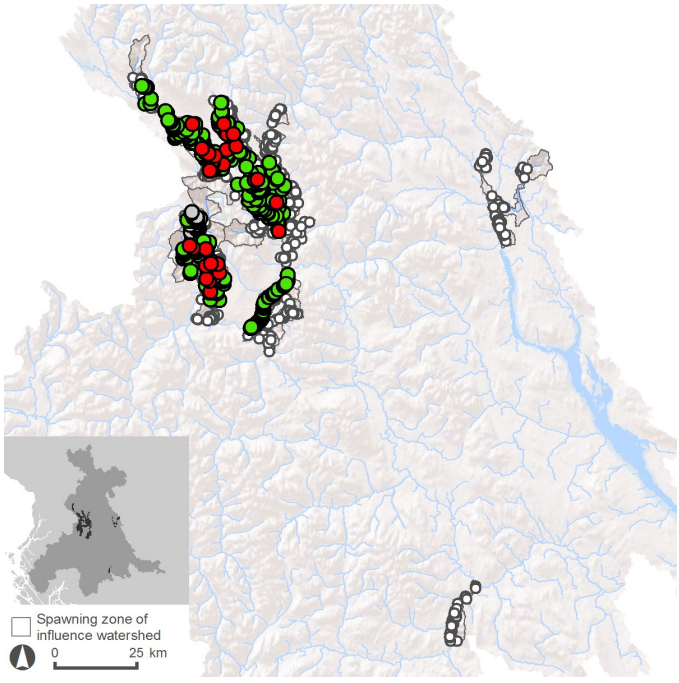
Stream crossing density





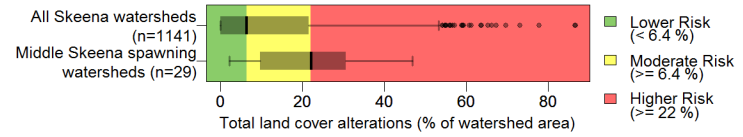
Culvert passability

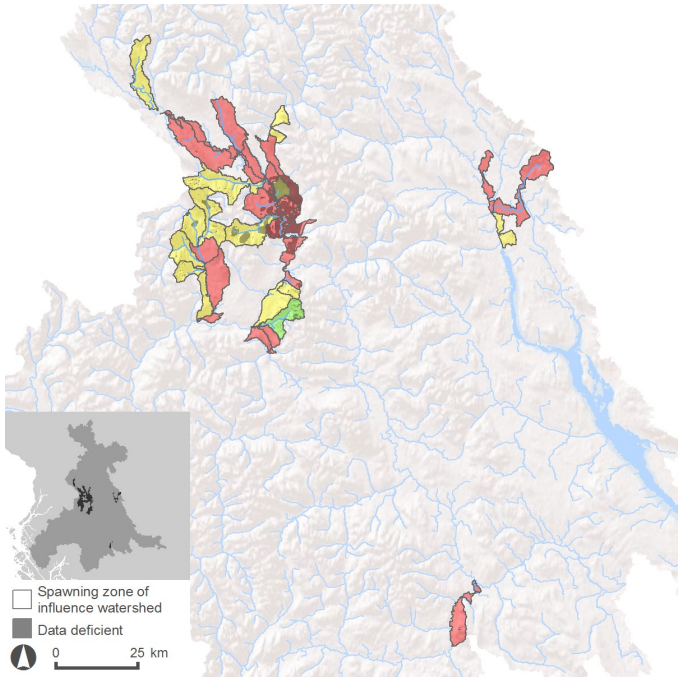
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



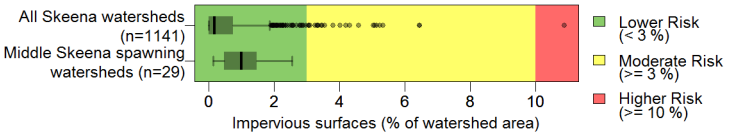
Human Development Footprint

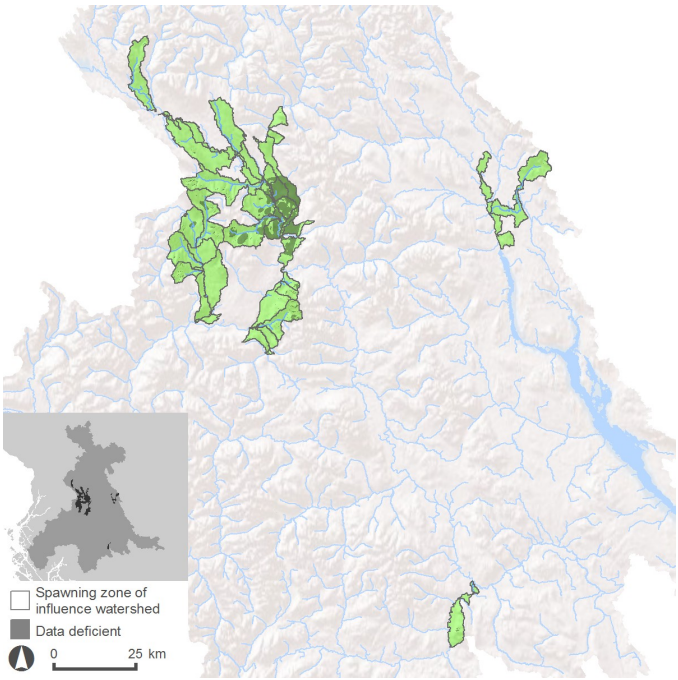
Total land cover alteration



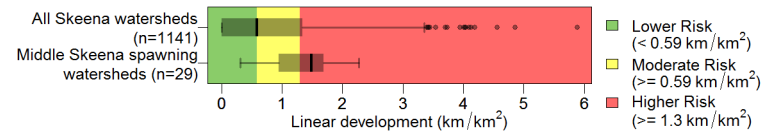


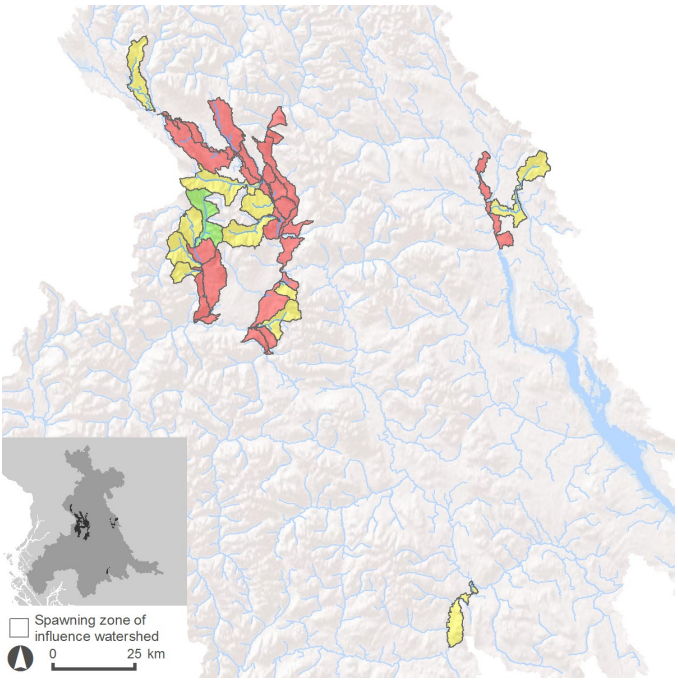
Impervious surfaces



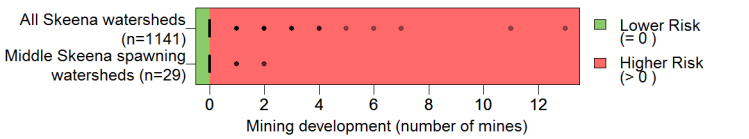


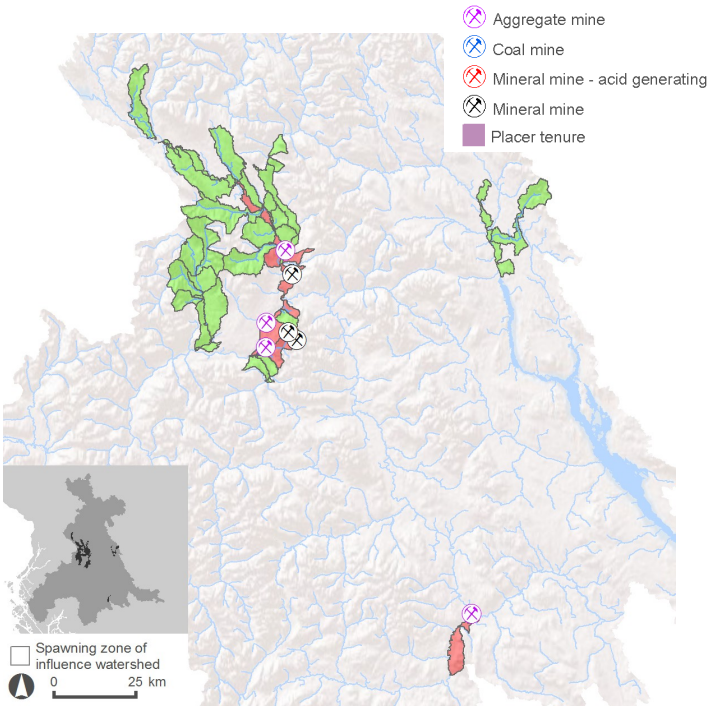
Linear development





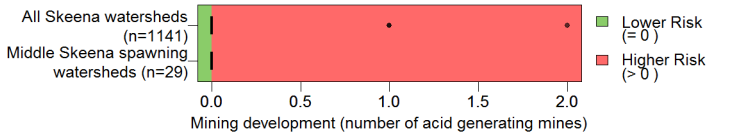
Mining development (total number of mines)

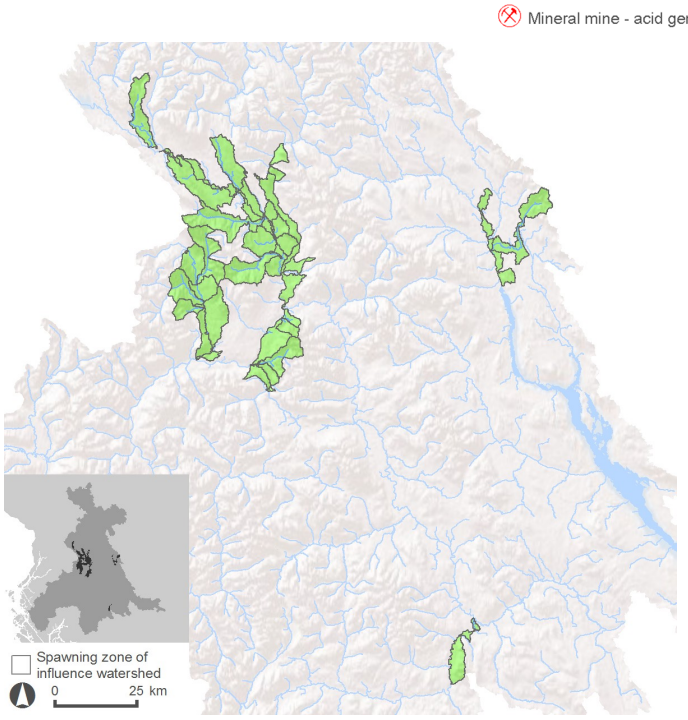




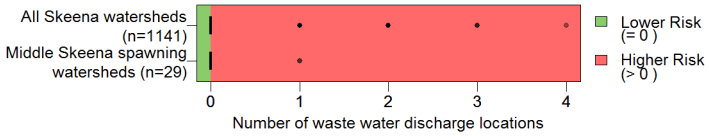
Water Quality

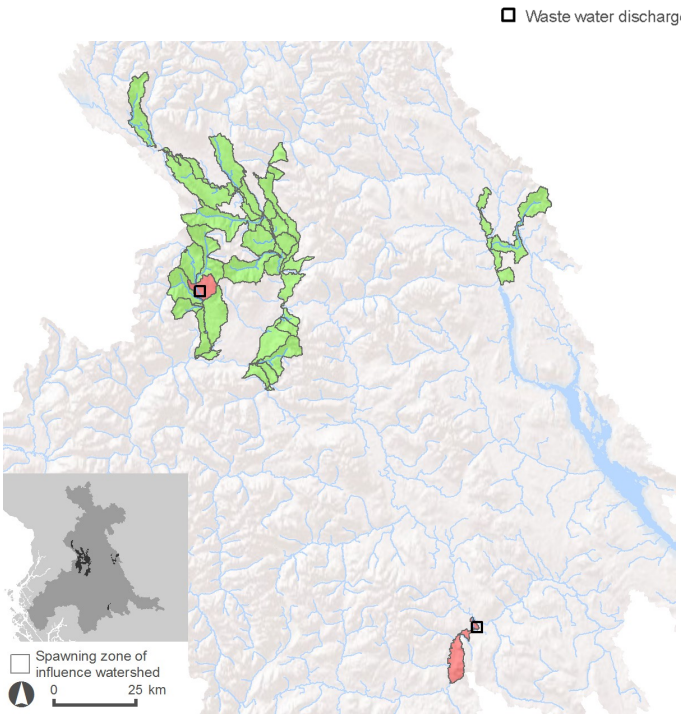
Mining development (acid generating mines)





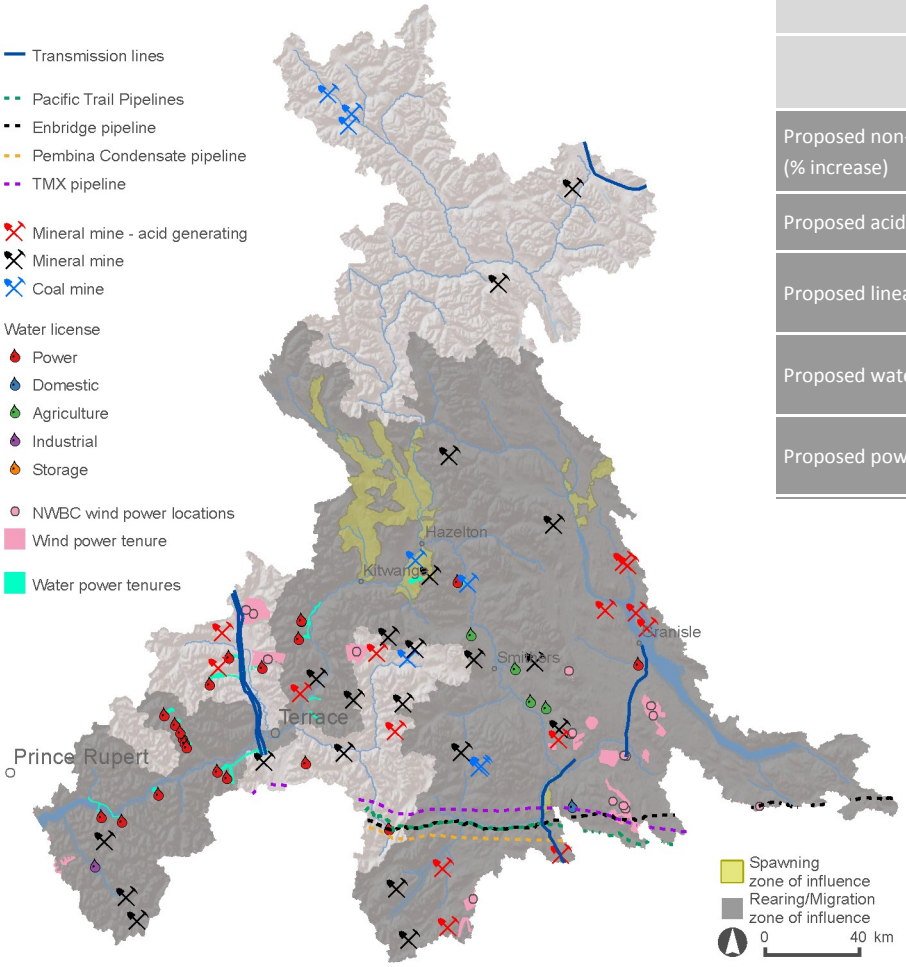
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Middle Skeena Chum CU summary

	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	16 (16%)	2 (29%)
Proposed acid generating mines (% increase)	11 (157%)	0 (NA)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.01 km/km^2 (1%)
Proposed water licenses (% increase)	26 (3%)	0 (0%)
Proposed power tenures	342 km^2	7 km^2

Skeena Salmon: Chum
Conservation Unit (CU)
Upper Skeena

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

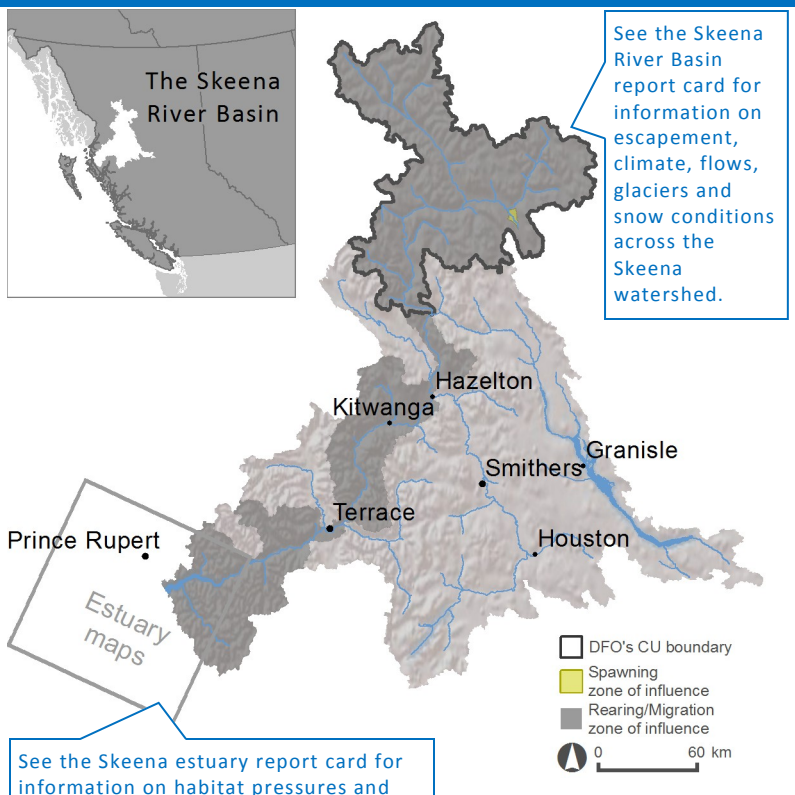
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* This CU supports one spawning population in Bear River, downstream of Sapolio Lake and Triple Creek.
* There are no known chum spawning records or DNA samples collected for this population.
* Williams et al. (1985) reported low densities of chum salmon fry caught in their upper and lower IPTs and beach seines. Shirvell and Anderson (1990) reported one chum spawner in the upper Bear River, September 9, 1990 with good visibility conditions.
* There are no known habitat issues.

Location



CU overview of habitat vulnerabilities & pressures

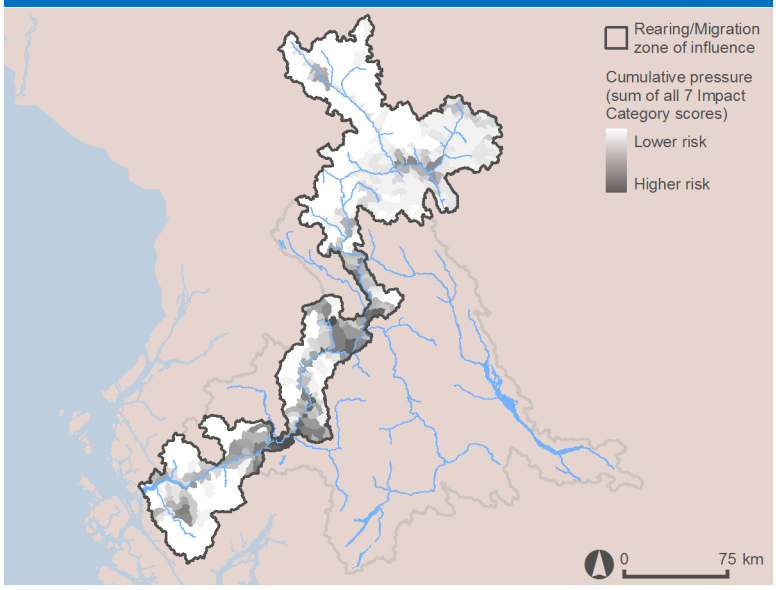
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

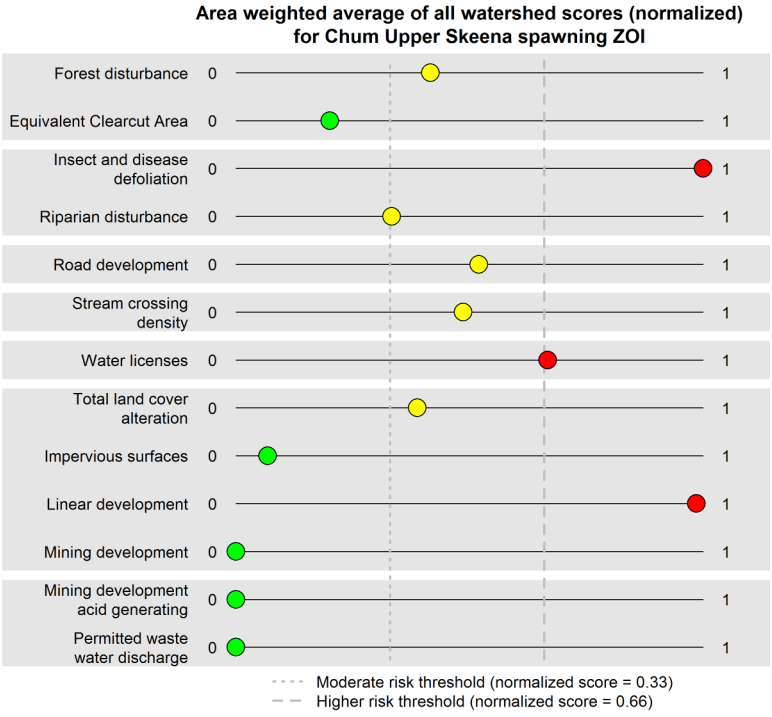
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

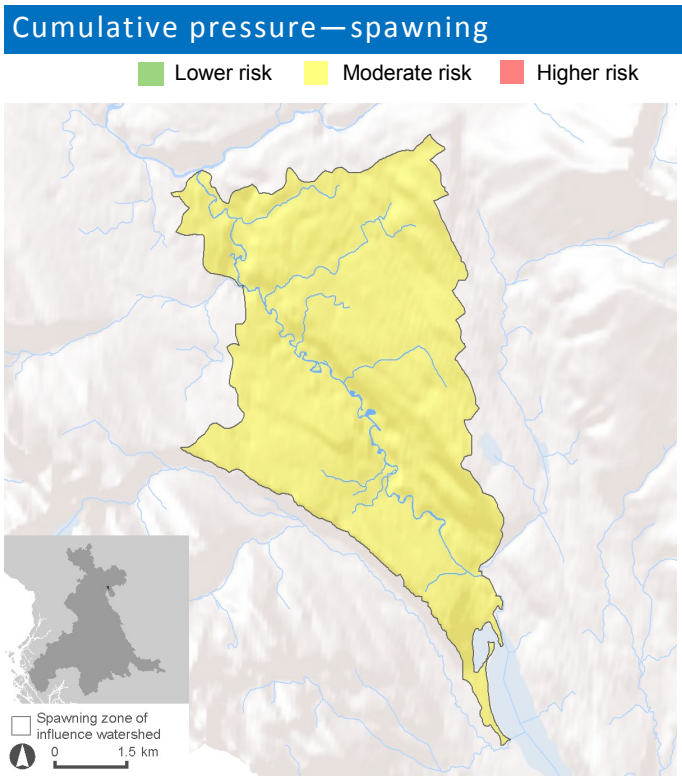
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

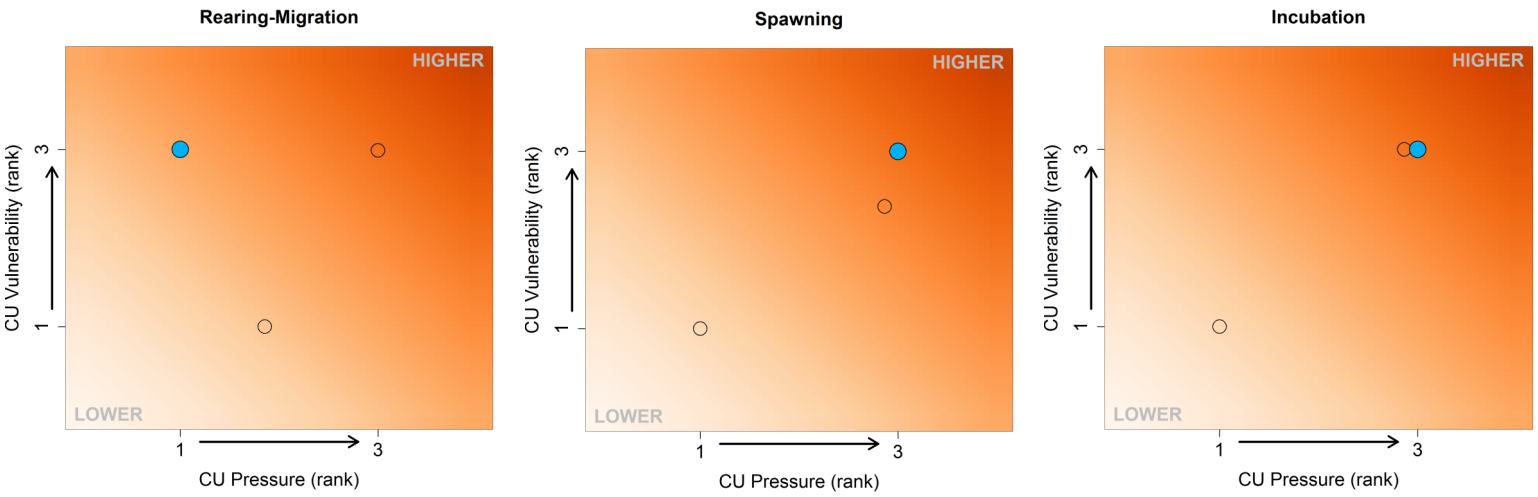


Cumulative pressure—spawning



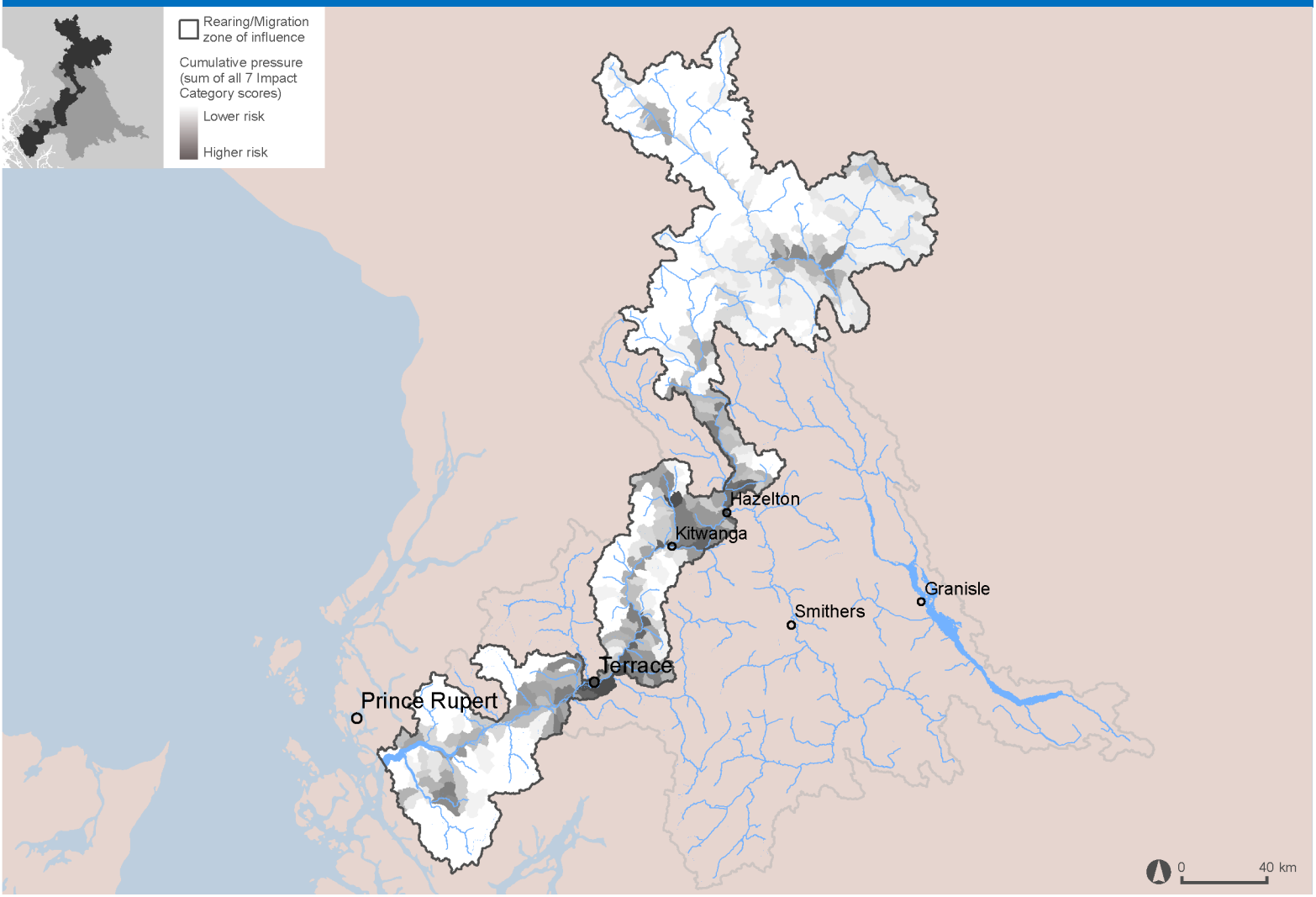
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Upper Skeena ○ = other Skeena Chum CUs



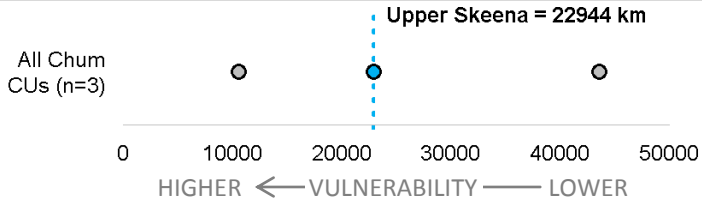
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

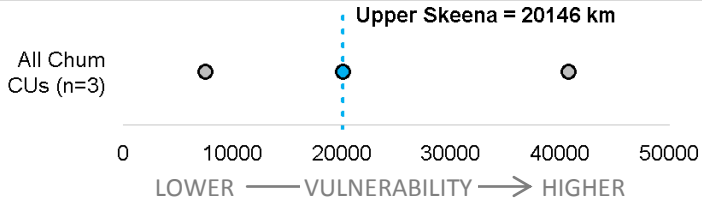


Rearing/Migration period vulnerability

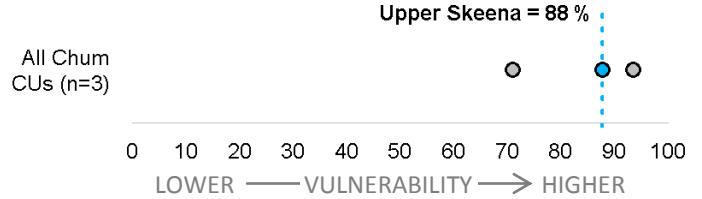
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



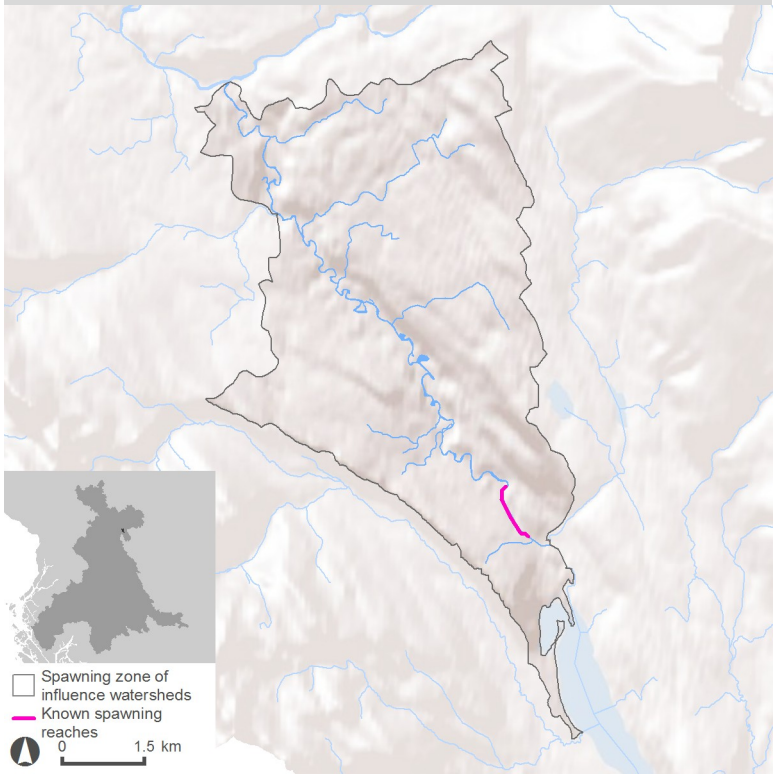
Flow sensitive accessible habitat (%) (all seasons)



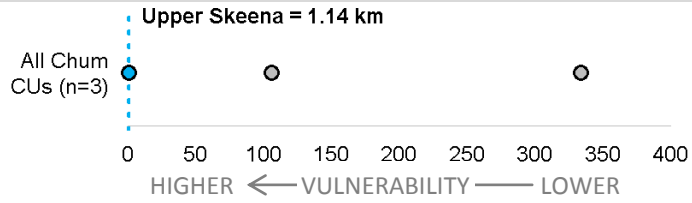
Spawning & incubation vulnerability

Spawning period vulnerability

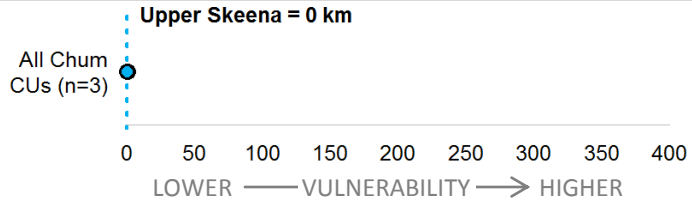
Spawning locations



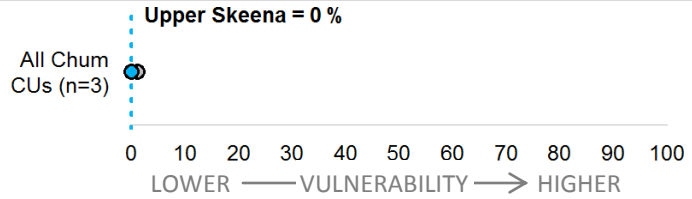
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

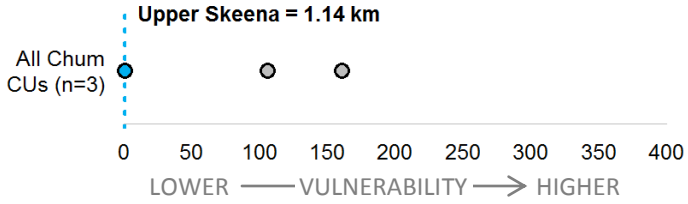


Spawning reaches summer flow sensitive - spawn timing (%)

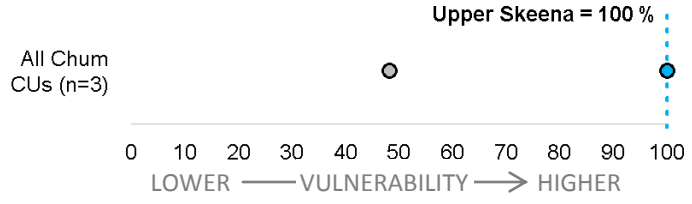


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



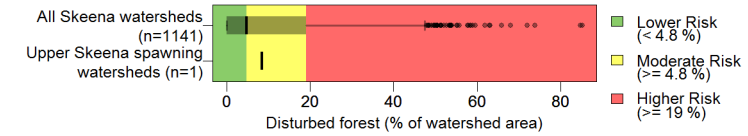
Spawning reaches winter flow sensitive - incubation timing (%)

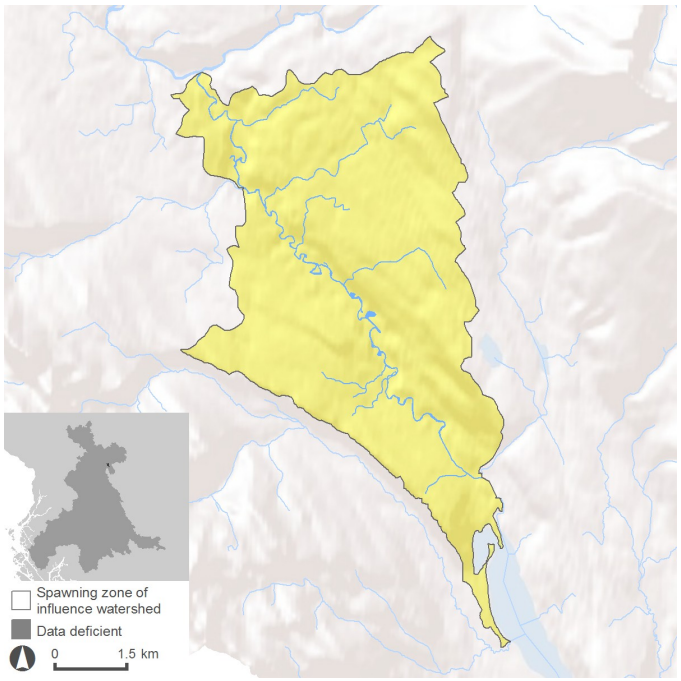


Spawning pressure

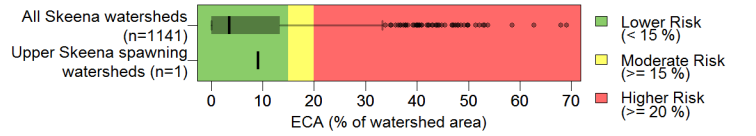
Hydrologic Processes

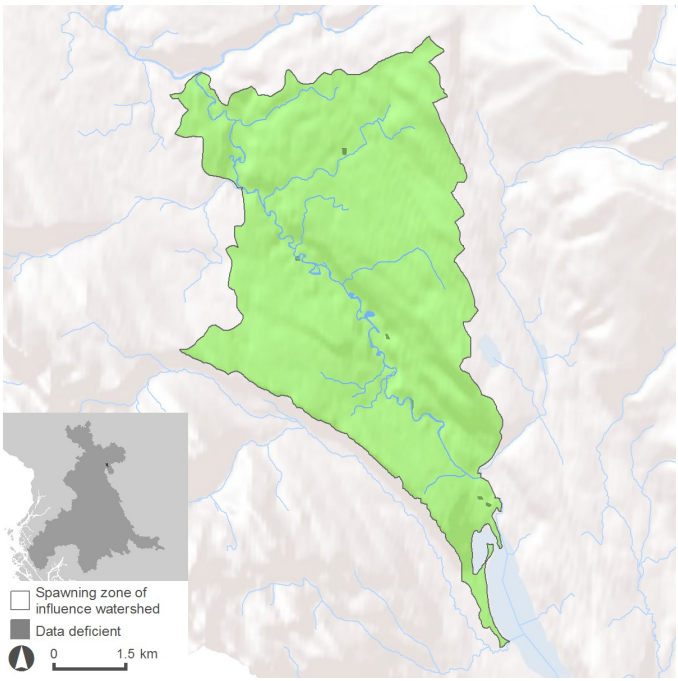
Forest disturbance





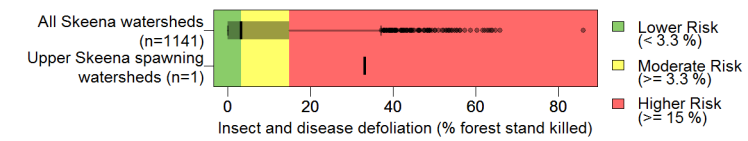
Equivalent Clear-cut Area

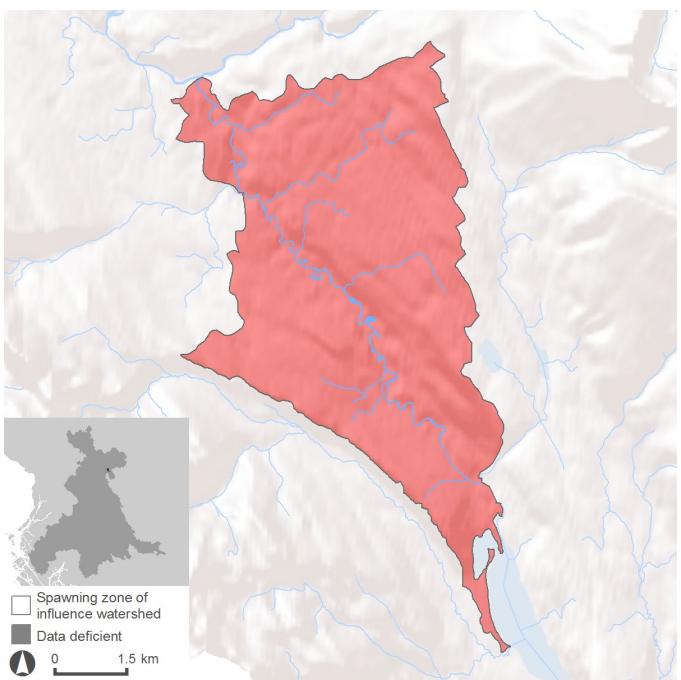




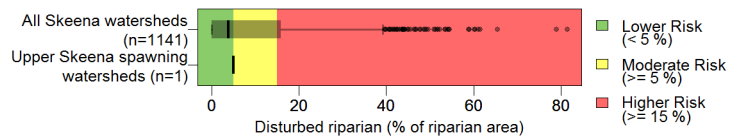
Vegetation Quality

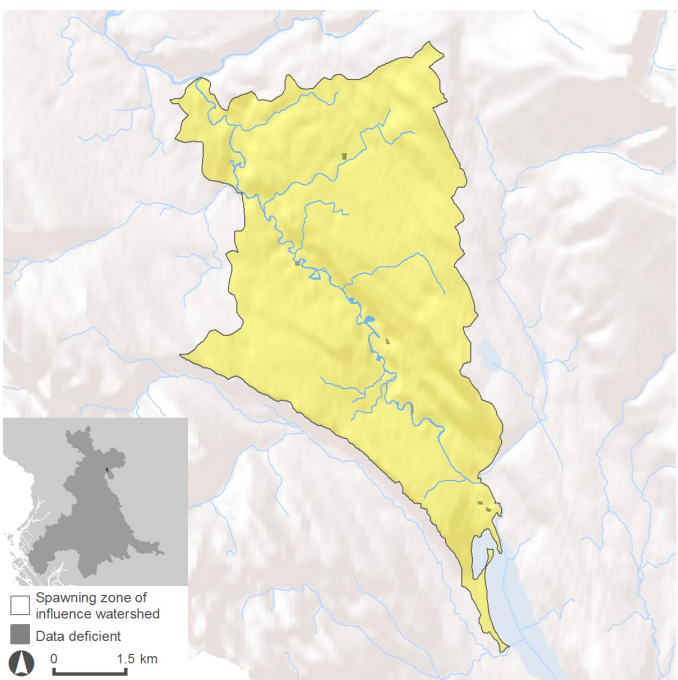
Insect and disease defoliation





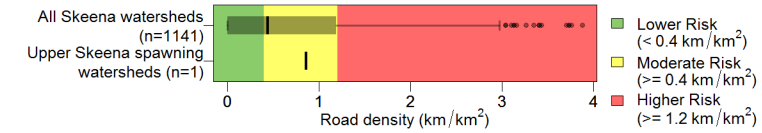
Riparian disturbance

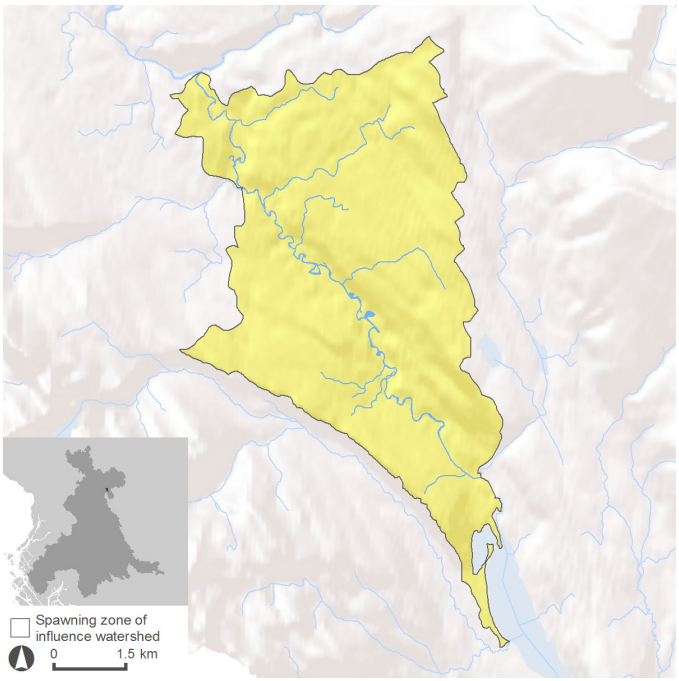




Surface Erosion

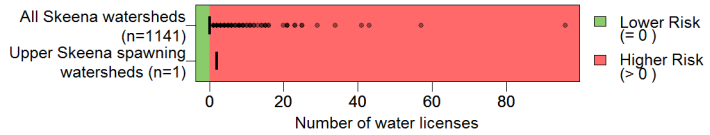
Road development

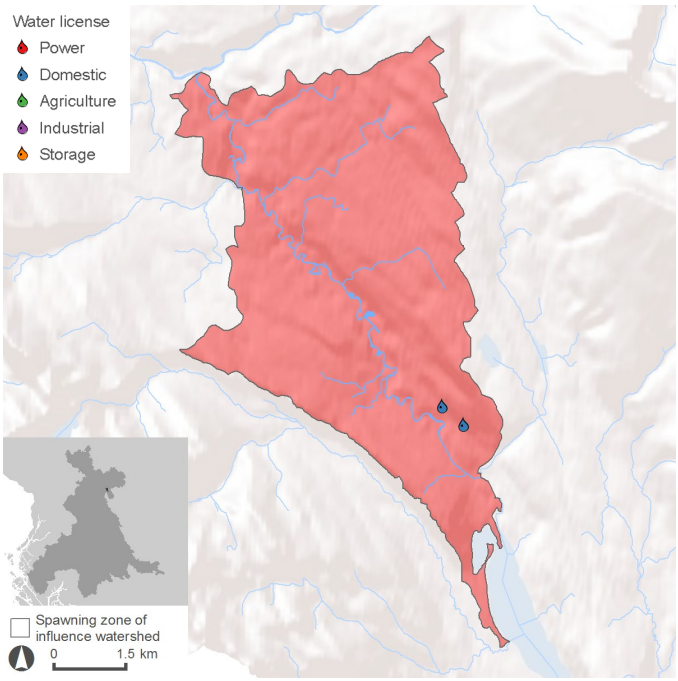




Water Quantity

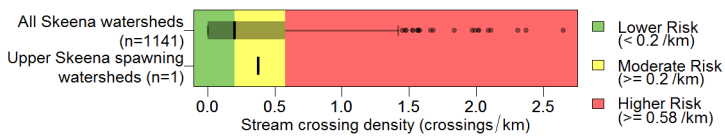
Number of water licenses

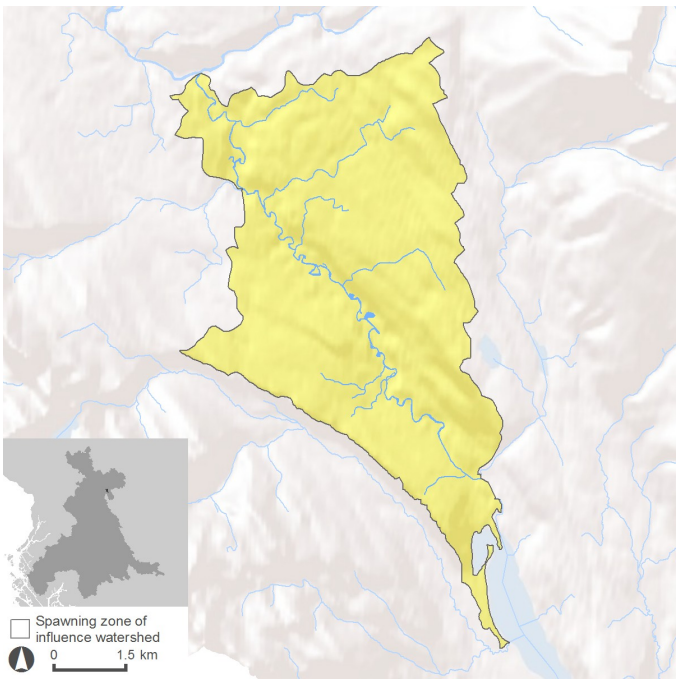




Fish Passage/Habitat Connectivity

Stream crossing density



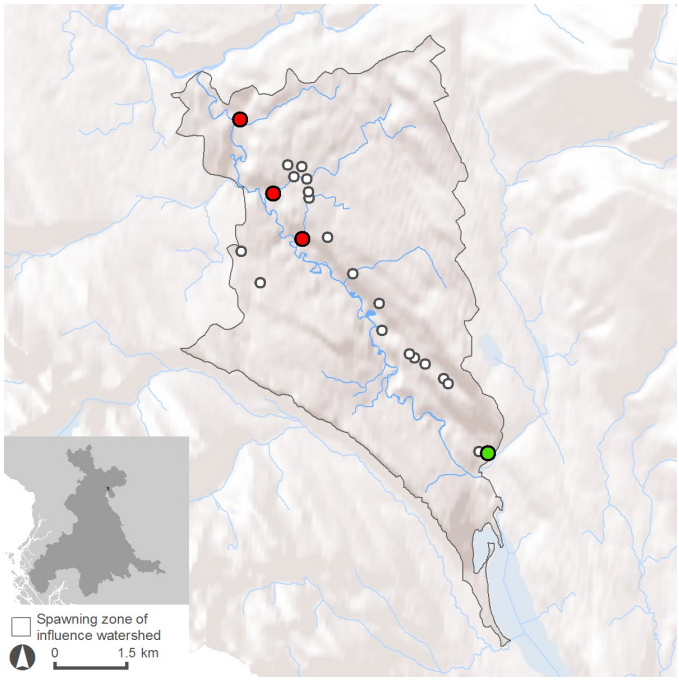


Culvert passability

Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

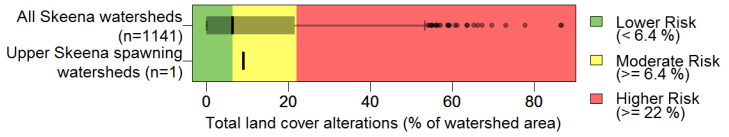
Assessed culvert
- Passable
- Unknown
- Barrier

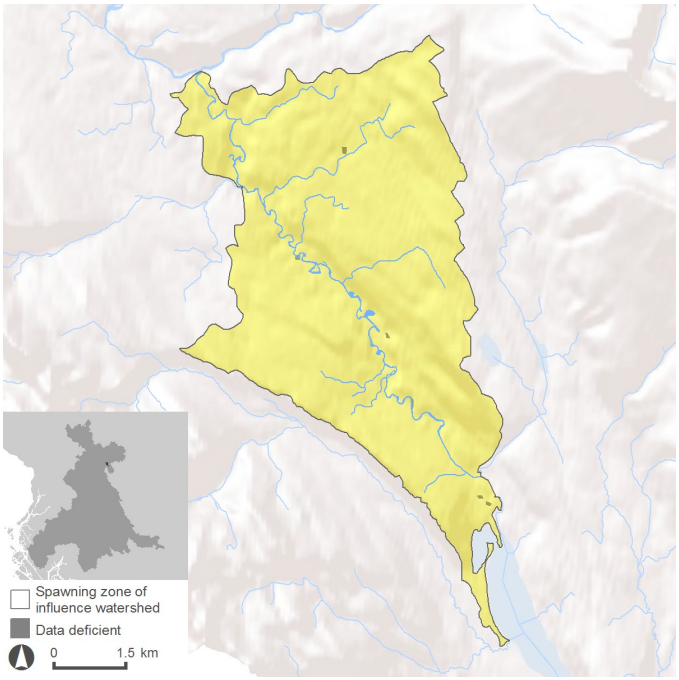
Potential culvert
- Road/Stream crossing



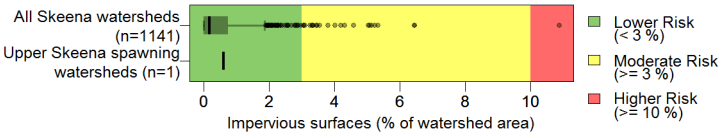
Human Development Footprint

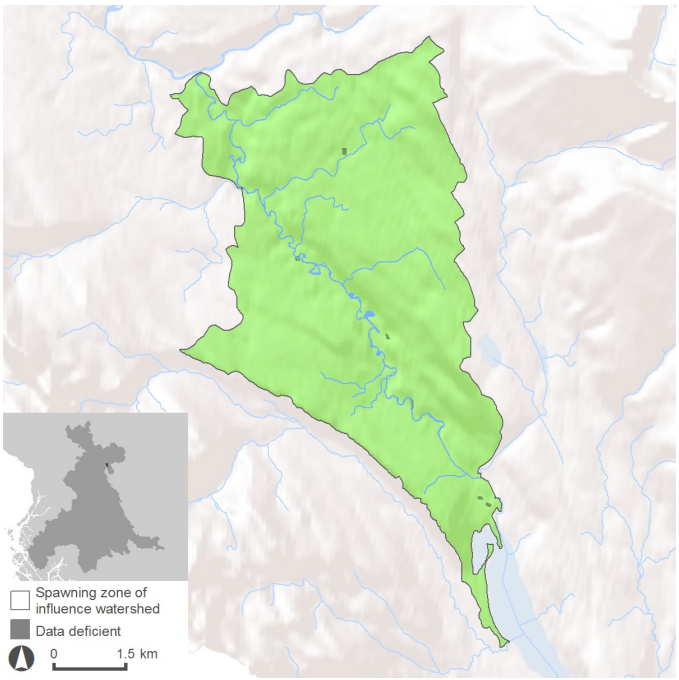
Total land cover alteration



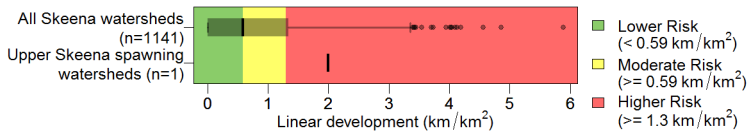


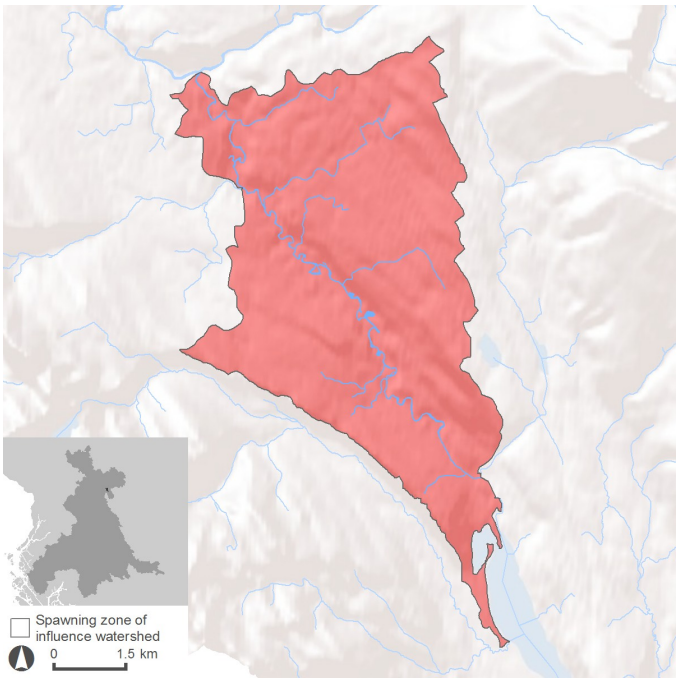
Impervious surfaces



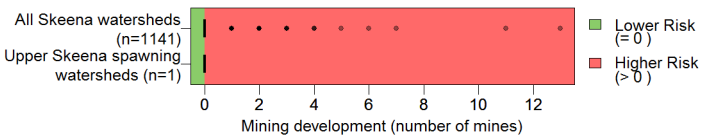


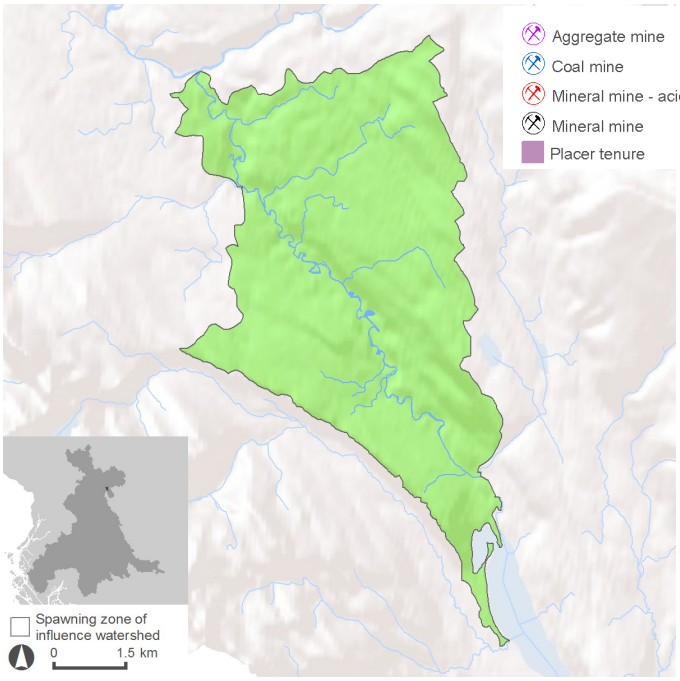
Linear development





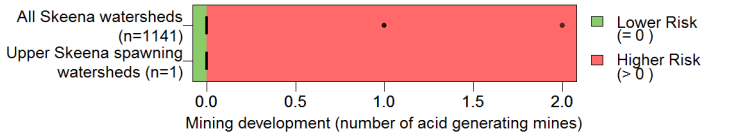
Mining development (total number of mines)

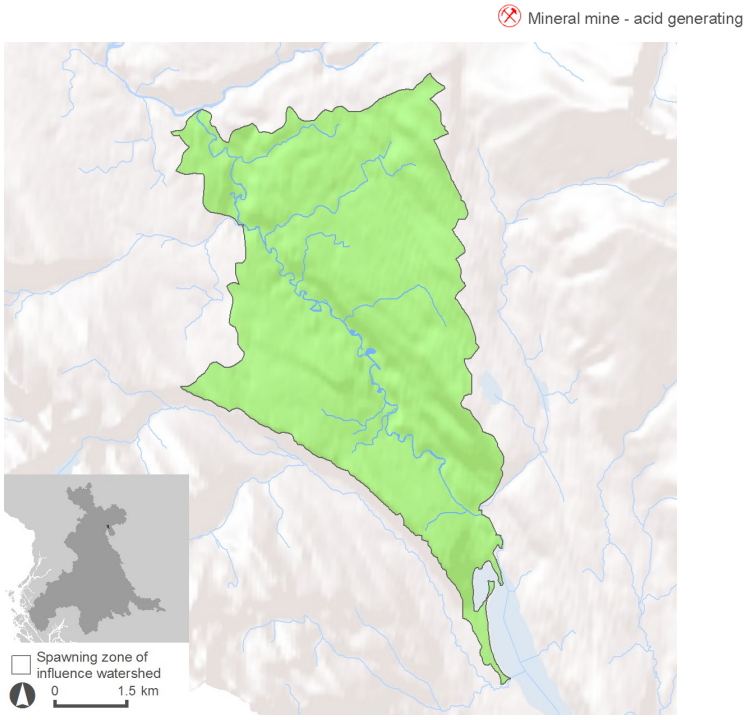




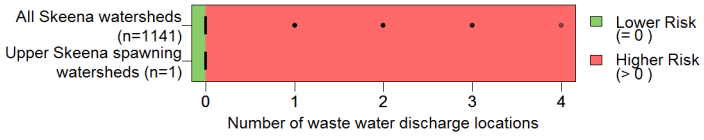
Water Quality

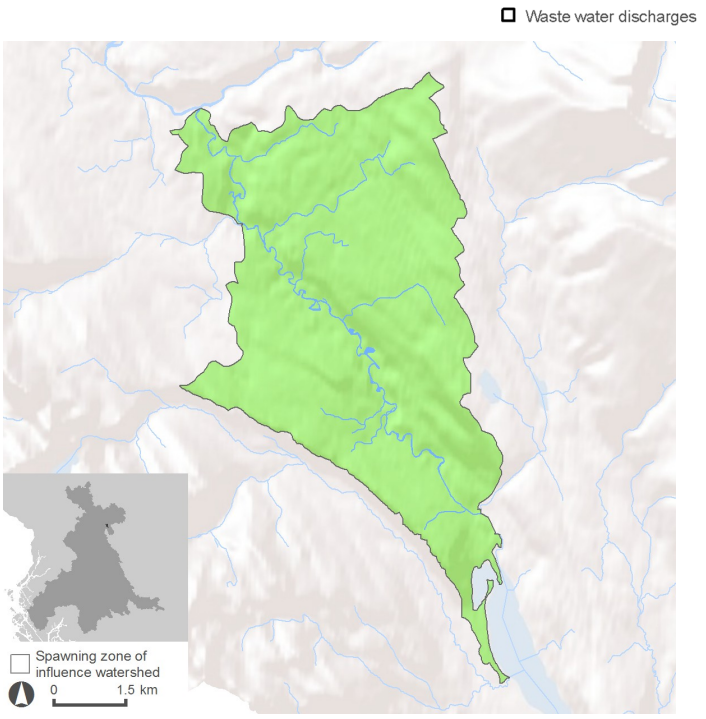
Mining development (acid generating mines)





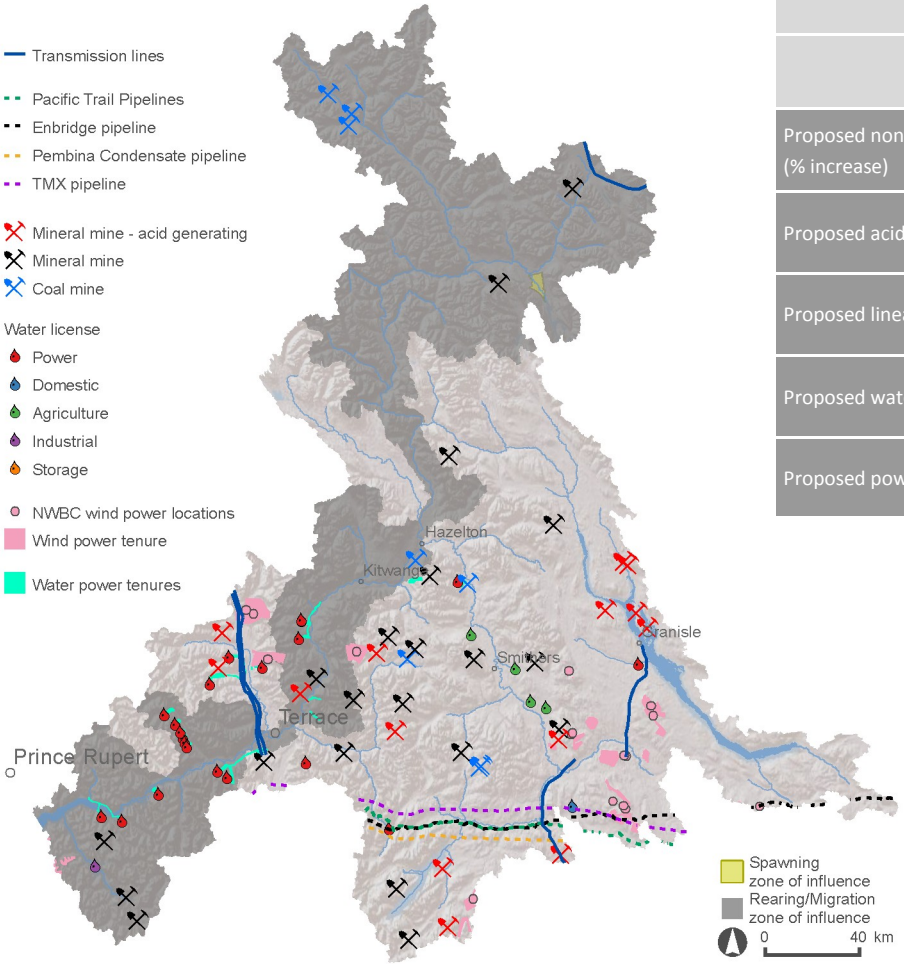
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Upper Skeena Chum CU summary

	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	9 (17%)	0 (NA)
Proposed acid generating mines (% increase)	1 (50%)	0 (NA)
Proposed linear development (% increase)	0.004 km/km^2 (0.8%)	0 km/km^2 (0%)
Proposed water licenses (% increase)	18 (12%)	0 (0%)
Proposed power tenures	116 km^2	0 km^2

Skeena Salmon: Coho
Conservation Unit (CU)
Lower Skeena

Version 1.0 Jan 2014

Introduction

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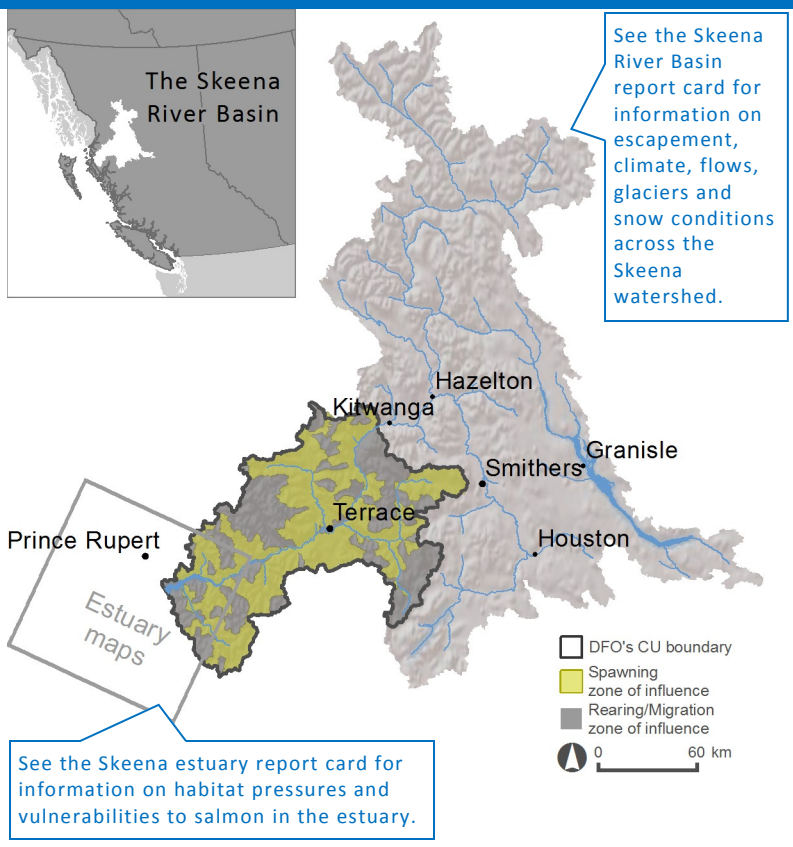
Narrative

* Coho salmon life history emphasizes freshwater habitat with significance placed on rearing habitat quality and quantity.
* This CU is characterized by the Skeena River valley cutting through the Coast Mountains with approximately 50% of tributary valley draining remnant glaciers;
* Tributaries supporting Lower Skeena coho have frequent large scale precipitation events that can cause erosion, scouring, and siltation.
* Logging and related road development is the most widespread land use activity that has adversely affected coho habitat, particularly in the Zymoetz, Lakelse, Kalum, and Zymacord.
* Linear developments such as railroad, highway, and road corridors have resulted in considerable damage to coho habitat especially cutting off side channel and back channel habitat along the lower Skeena River.

Location



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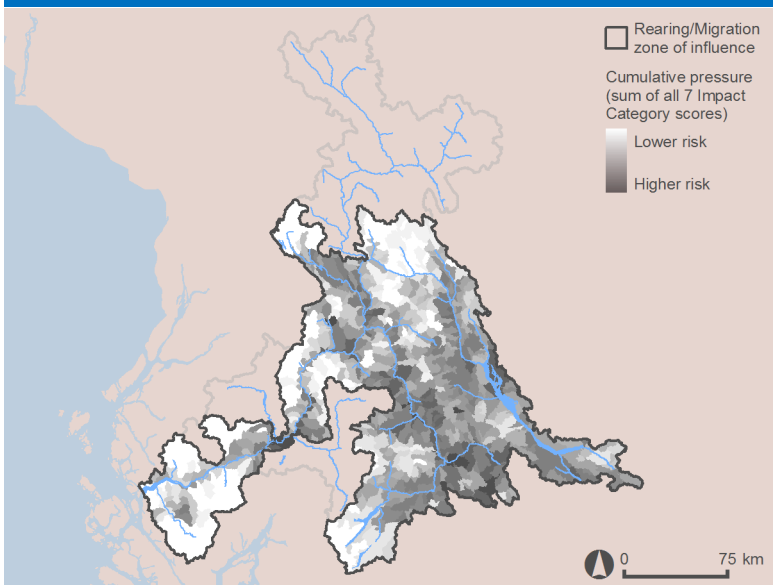
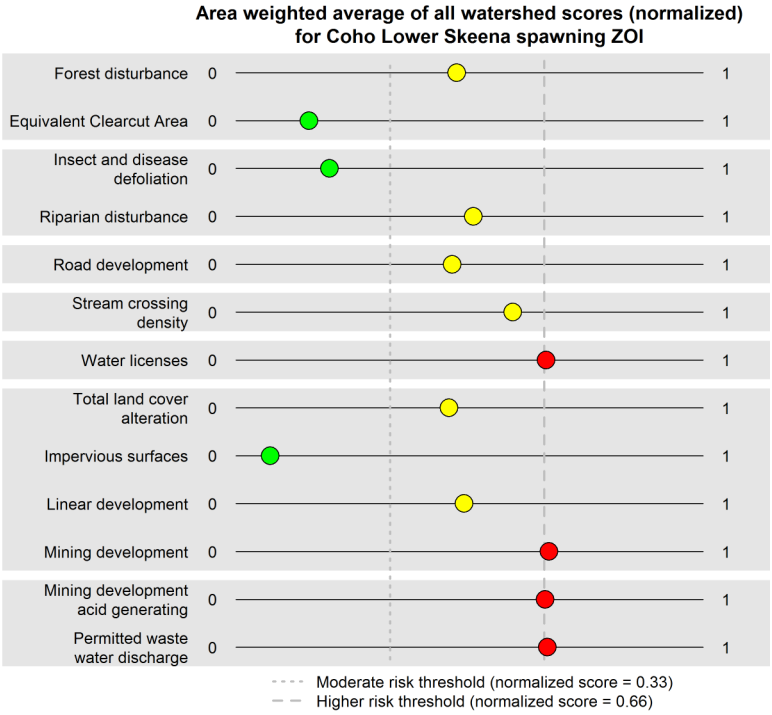
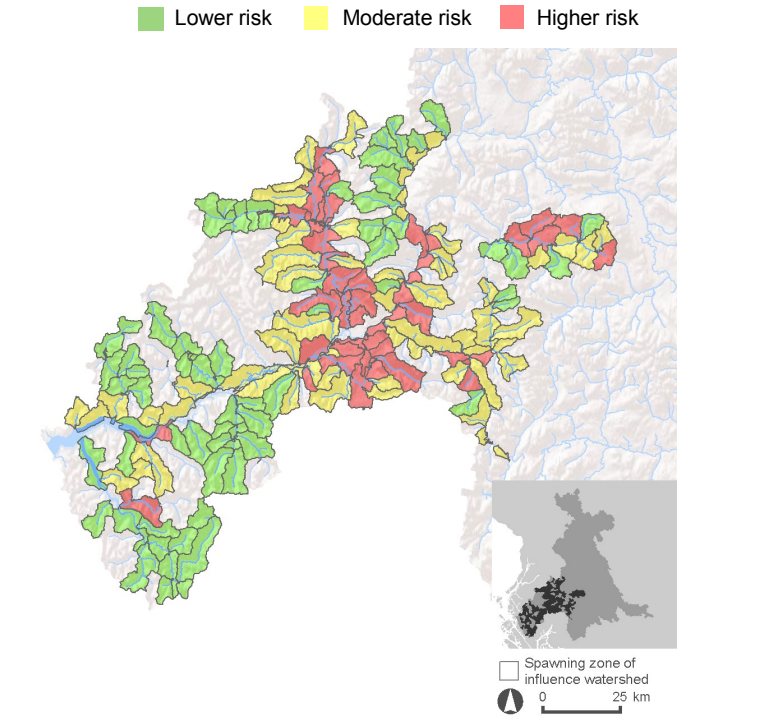
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

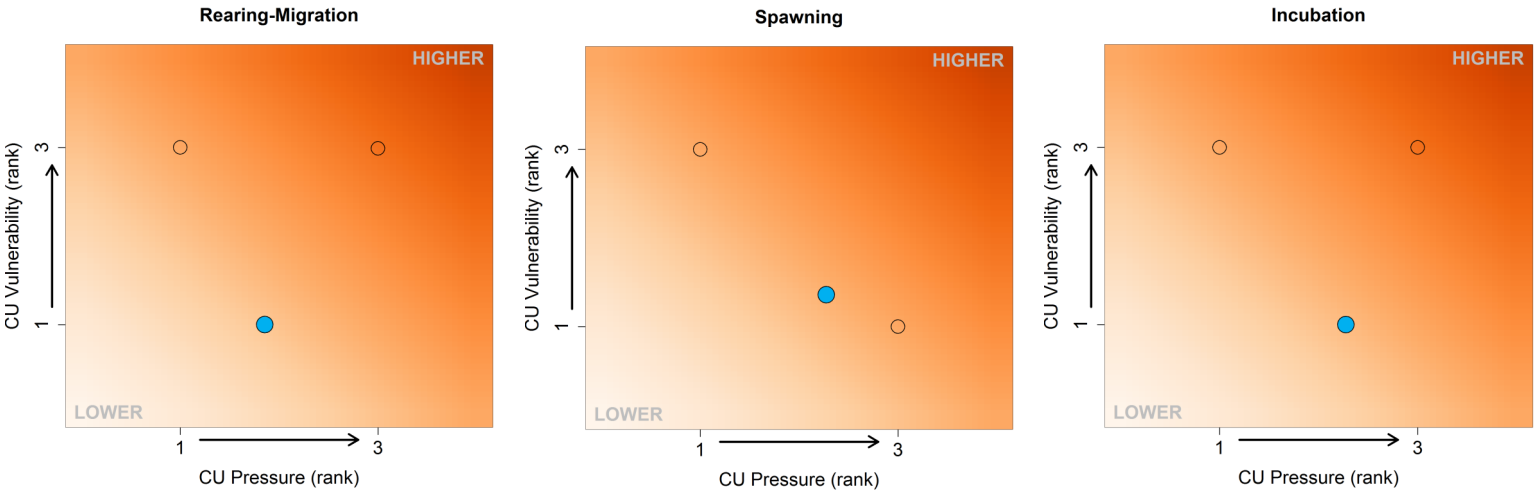


Cumulative pressure—spawning



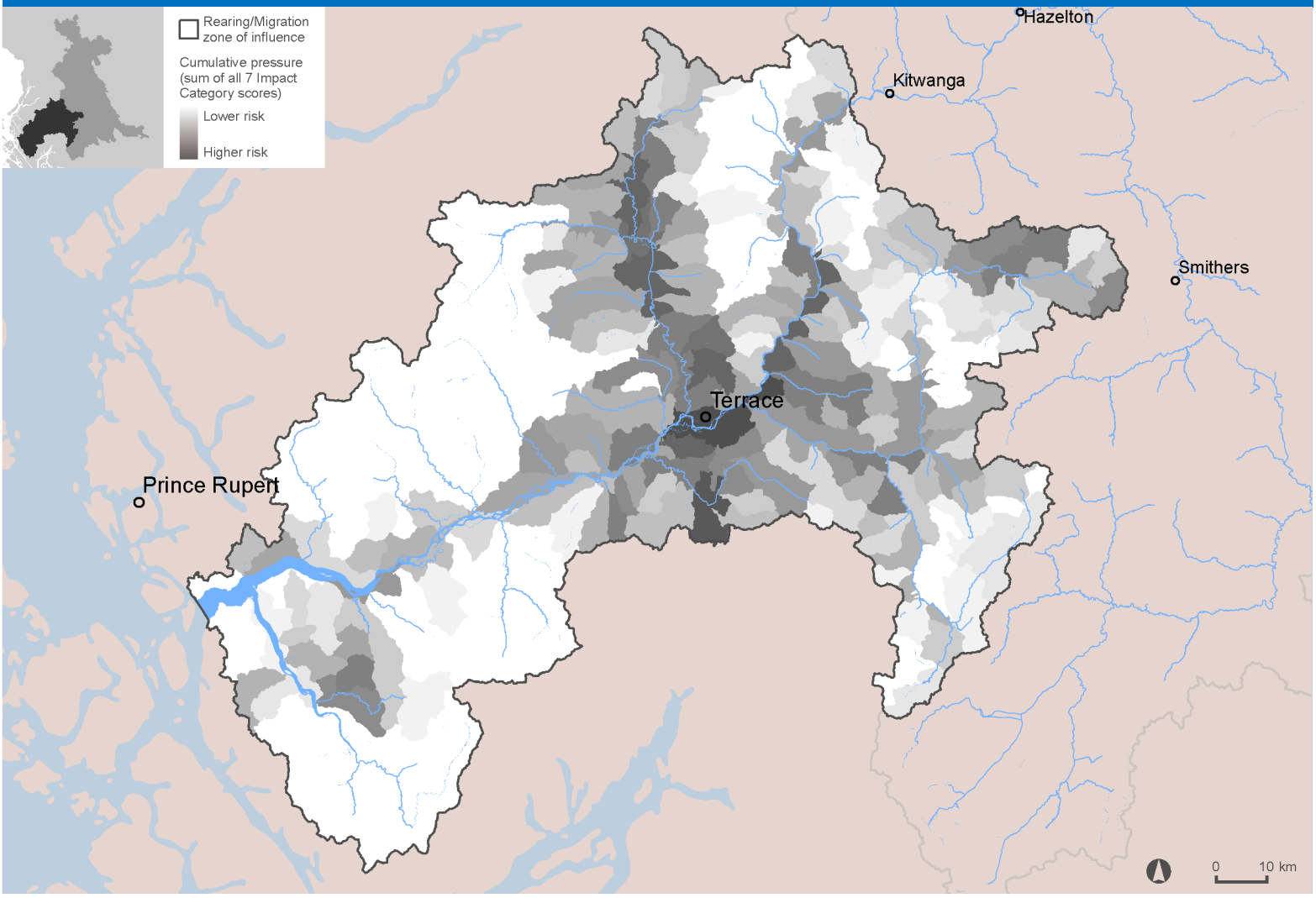
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Lower Skeena ○ = other Skeena coho CUs



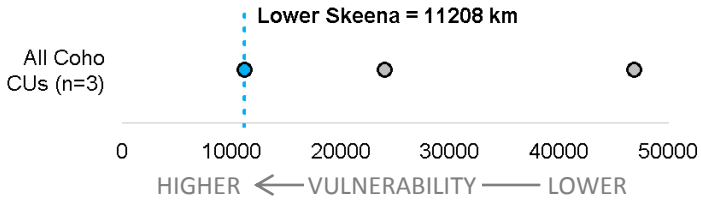
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

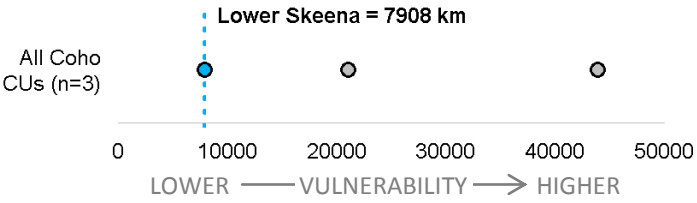


Rearing/Migration period vulnerability

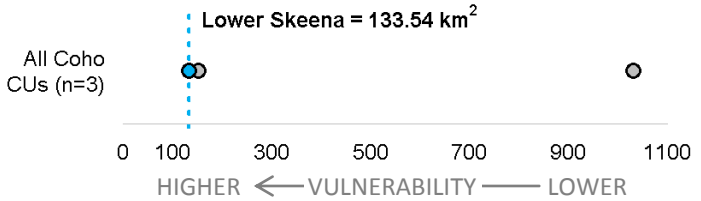
Fish accessible habitat (km)



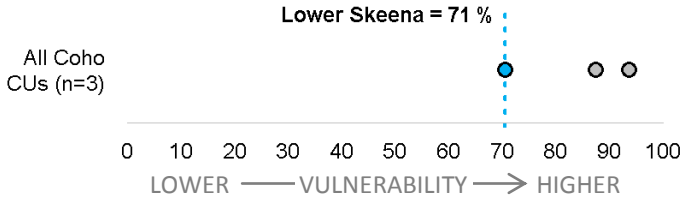
Flow sensitive accessible habitat (km) (all seasons)



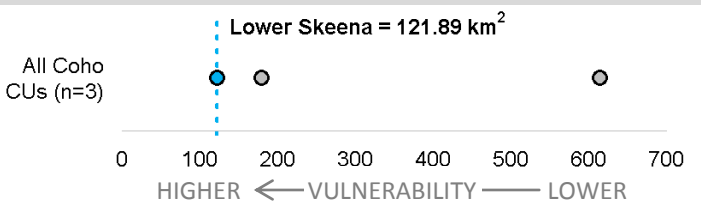
Lake area (km^2)



Flow sensitive accessible habitat (%) (all seasons)



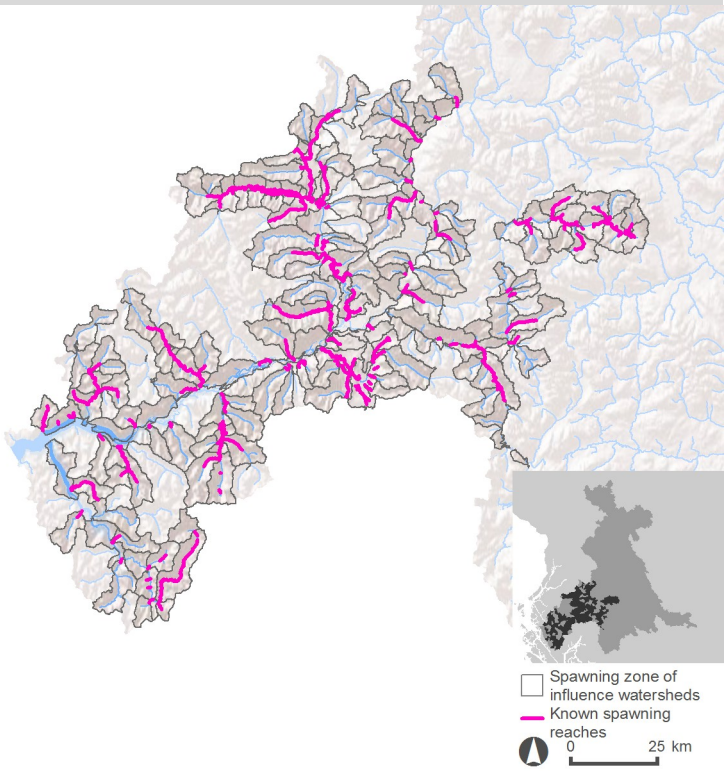
Wetland area (km^2)



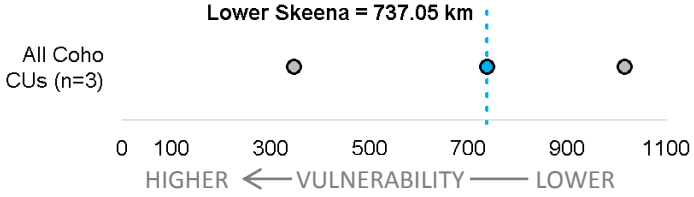
Spawning & incubation vulnerability

Spawning period vulnerability

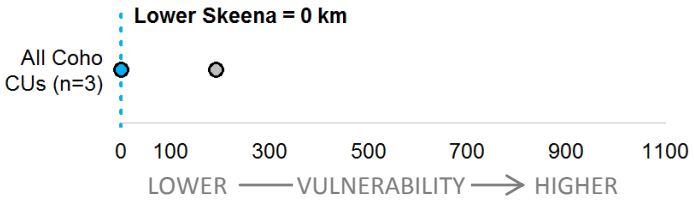
Spawning locations



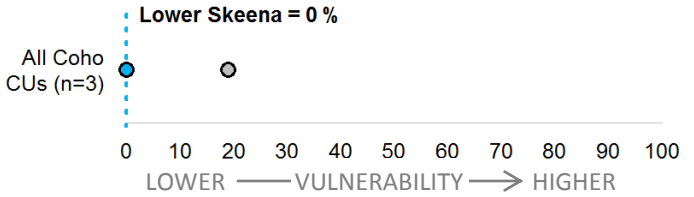
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

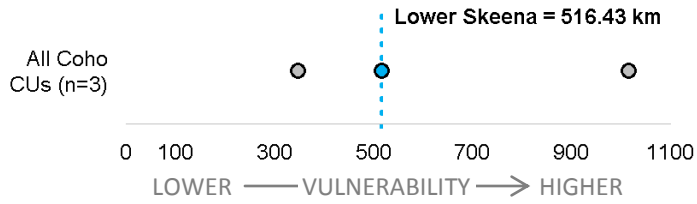


Spawning reaches summer flow sensitive - spawn timing (%)

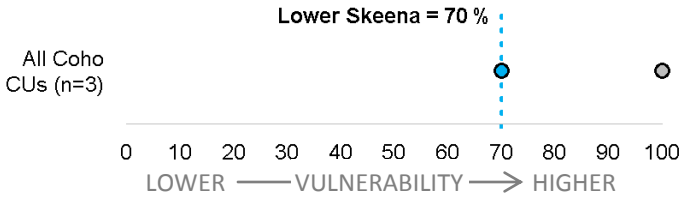


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



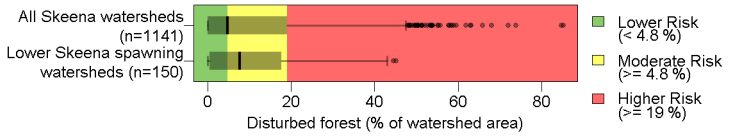
Spawning reaches winter flow sensitive - incubation timing (%)

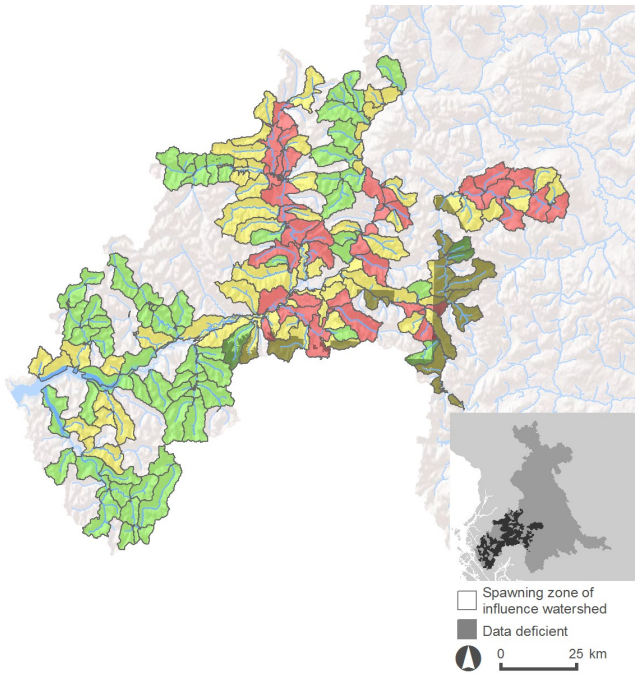


Spawning pressure

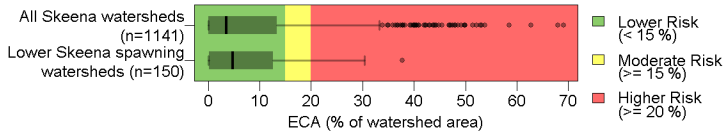
Hydrologic Processes

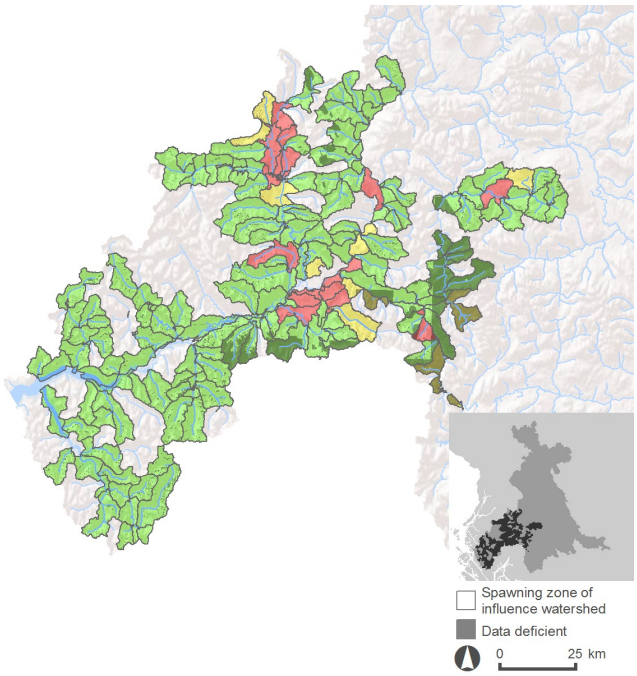
Forest disturbance





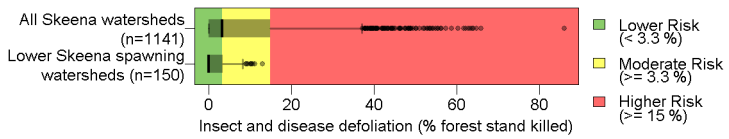
Equivalent Clear-cut Area

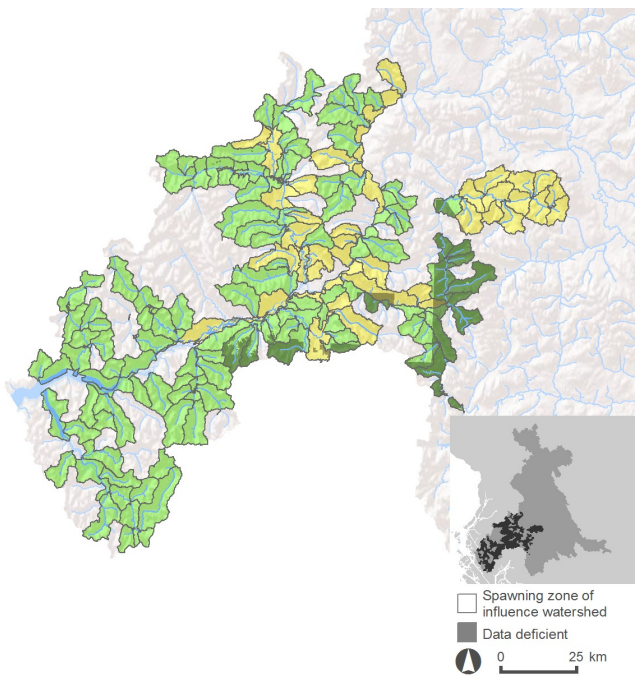




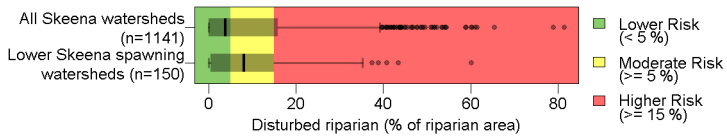
Vegetation Quality

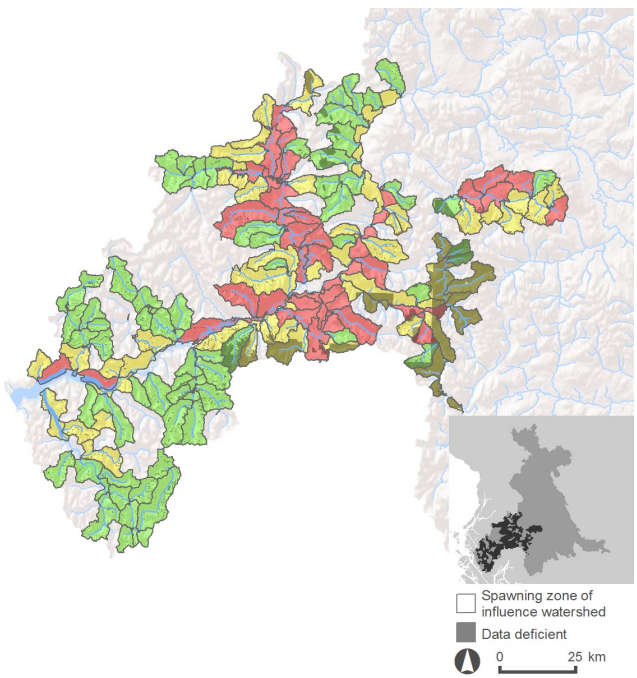
Insect and disease defoliation





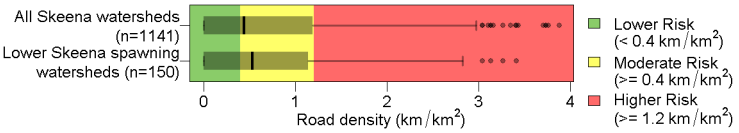
Riparian disturbance

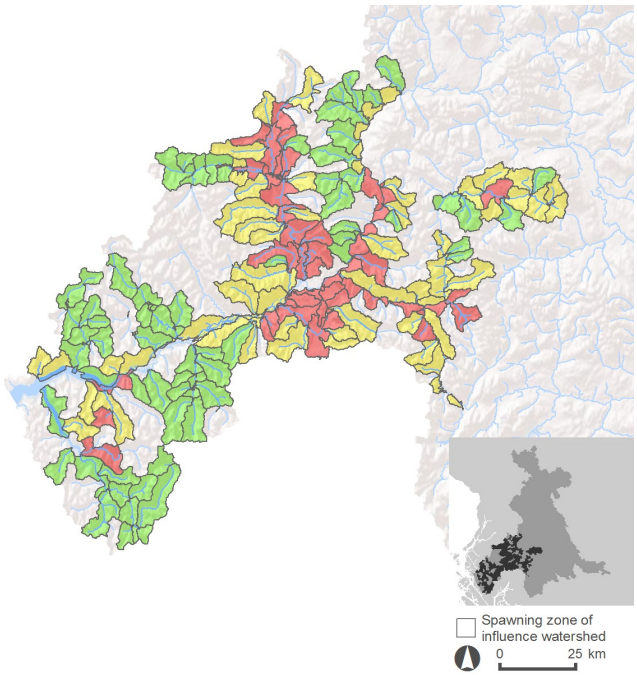




Surface Erosion

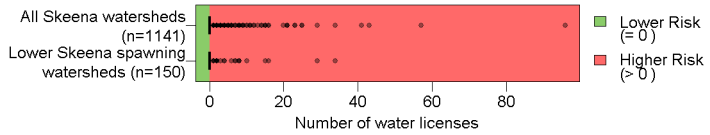
Road development

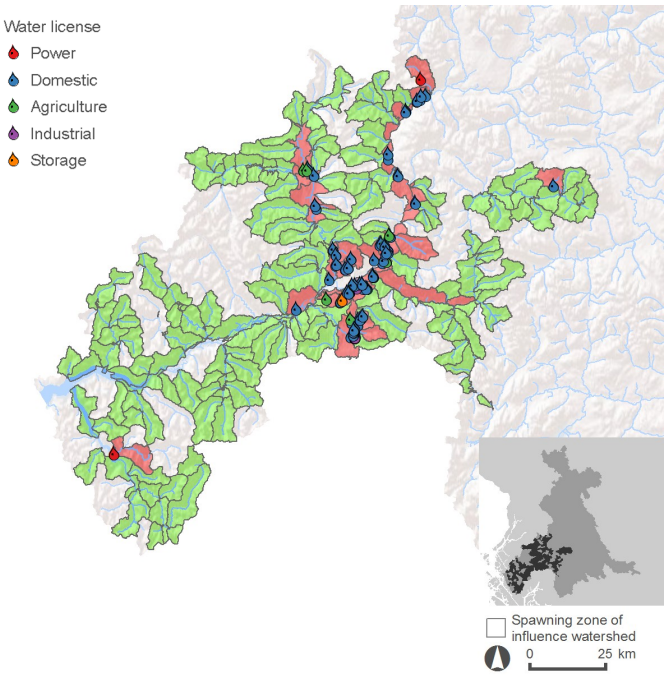




Water Quantity

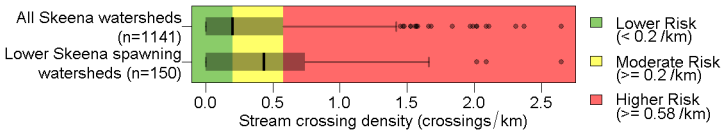
Number of water licenses

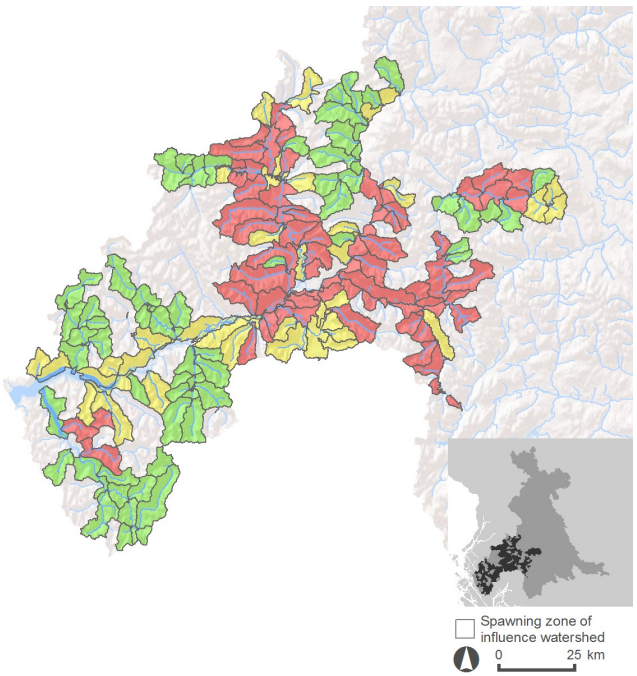




Fish Passage/Habitat Connectivity

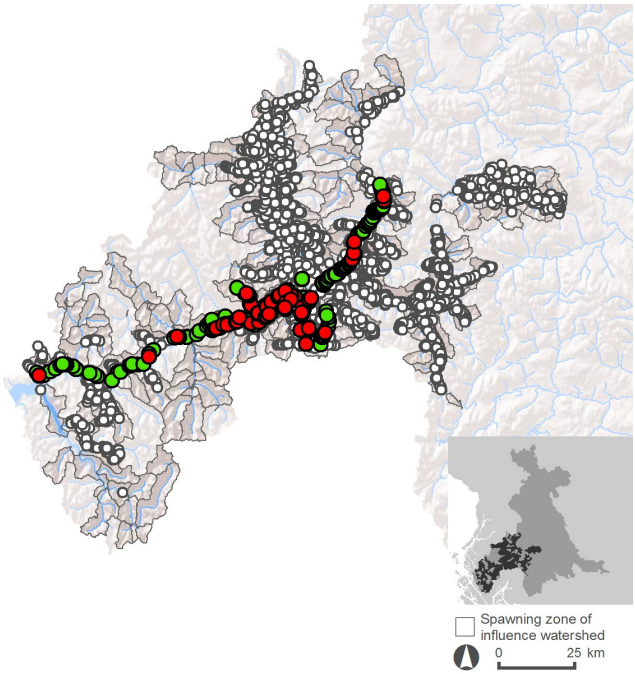
Stream crossing density





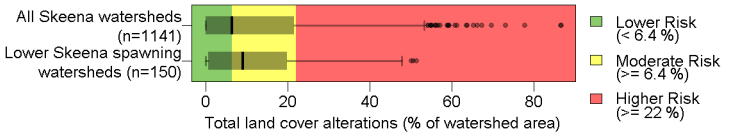
Culvert passability

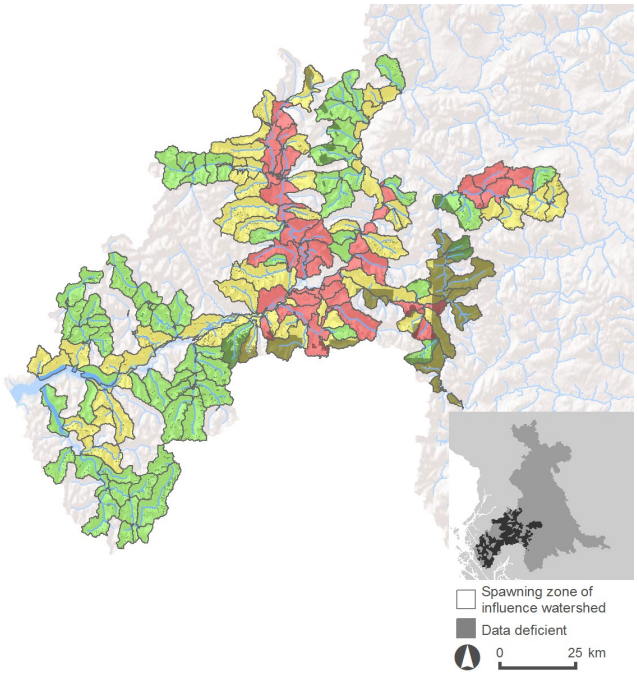
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



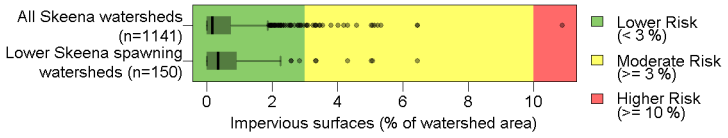
Human Development Footprint

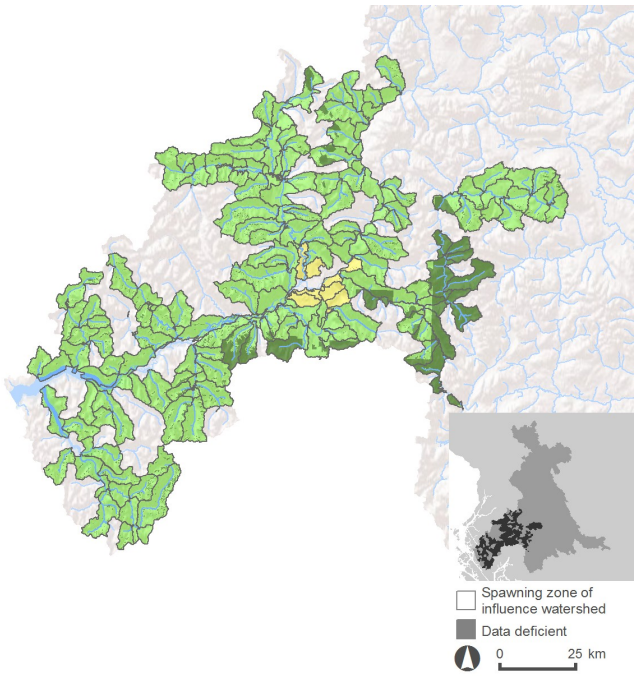
Total land cover alteration



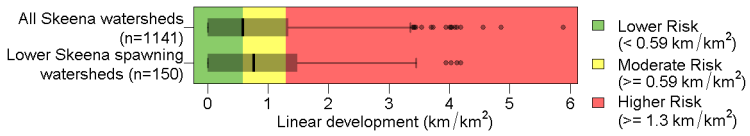


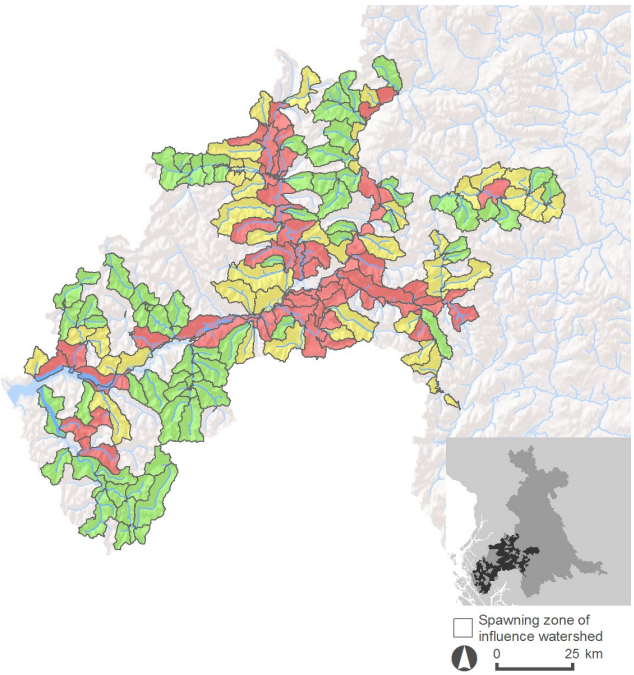
Impervious surfaces



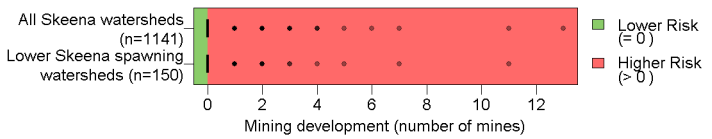


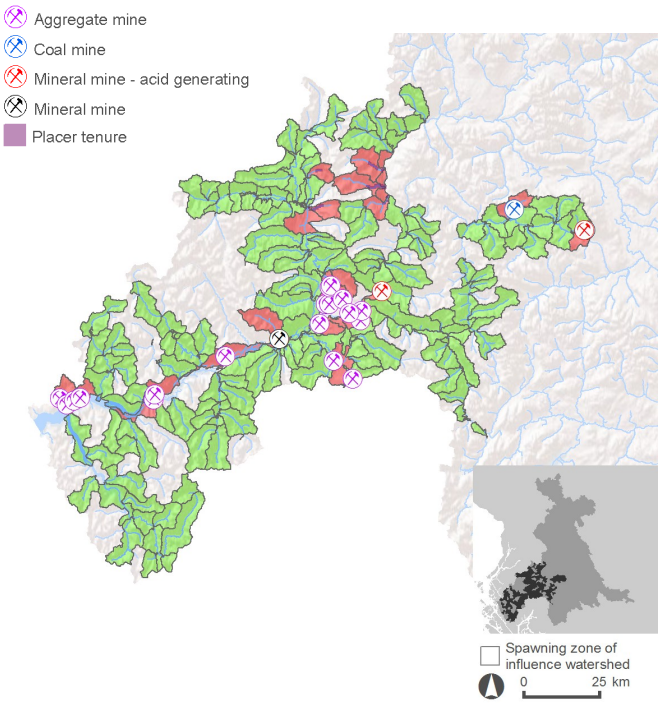
Linear development





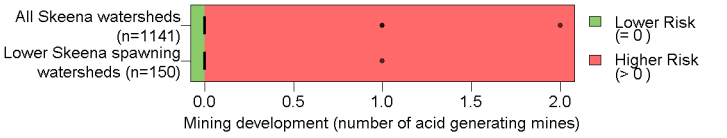
Mining development (total number of mines)

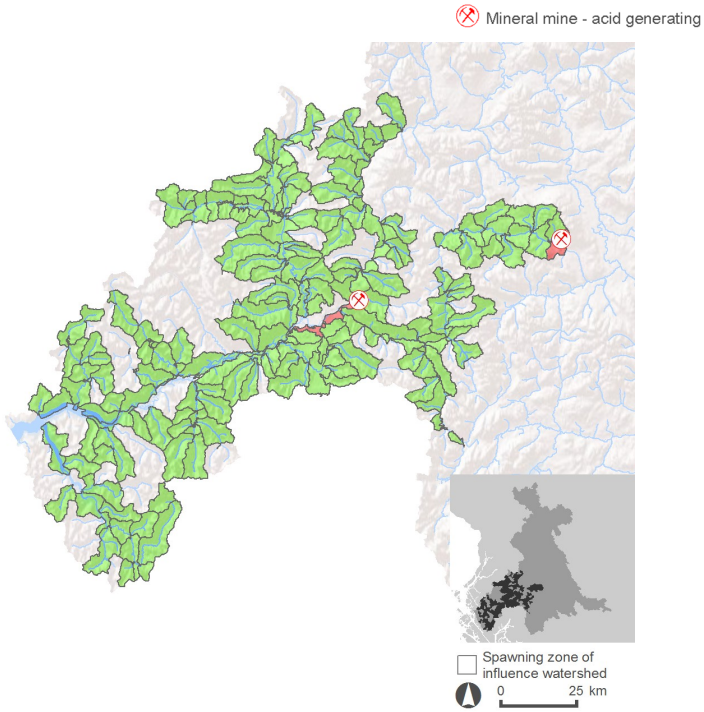




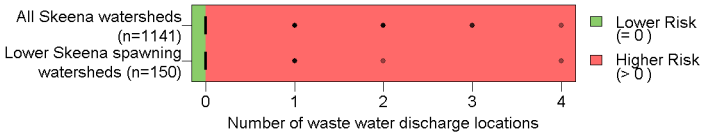
Water Quality

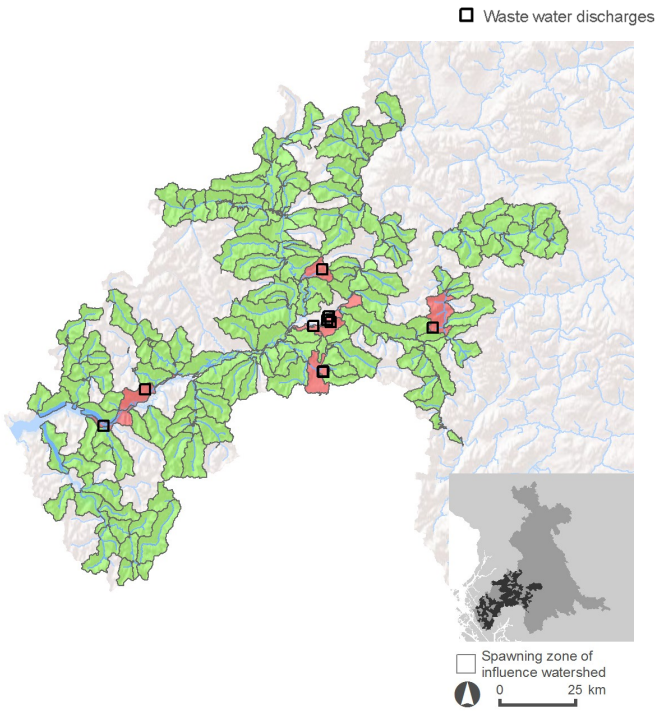
Mining development (acid generating mines)





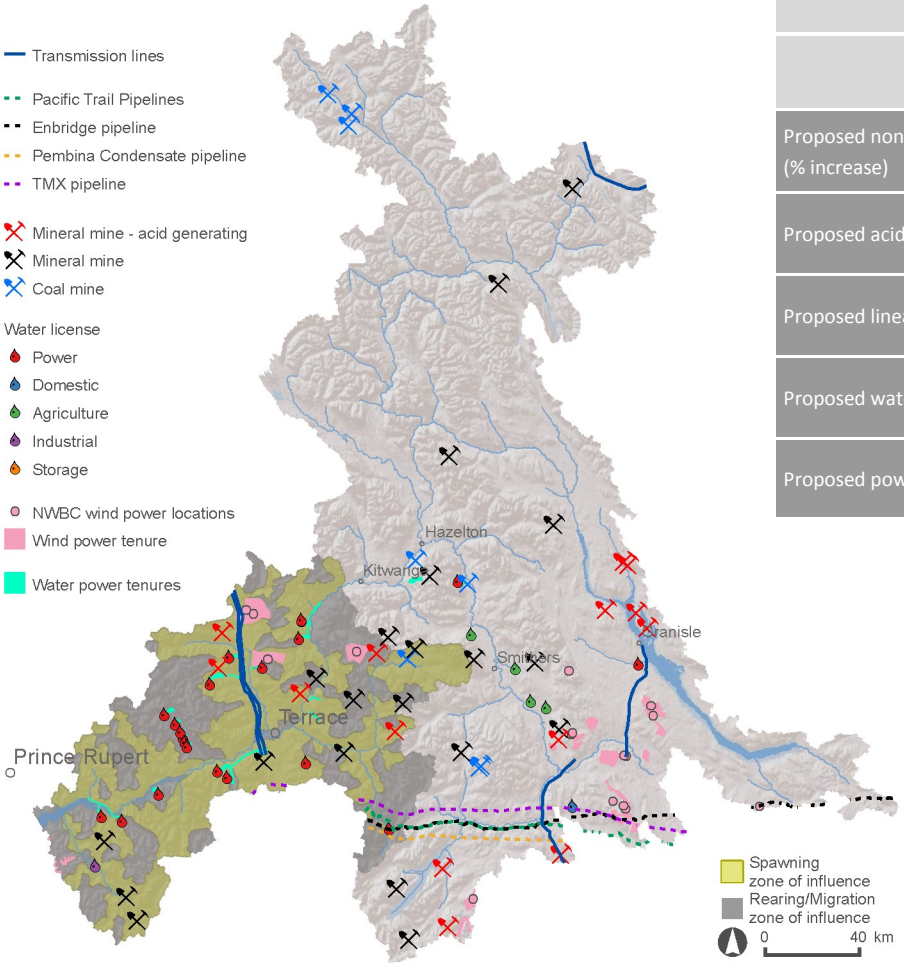
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Lower Skeena Coho CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	9 (12%)	7 (13%)
Proposed acid generating mines (% increase)	5 (250%)	4 (200%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.02 km/km^2 (2%)
Proposed water licenses (% increase)	27 (13%)	16 (9%)
Proposed power tenures	315 km^2	180 km^2

Skeena Salmon: Coho

Conservation Unit (CU)

Middle Skeena

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

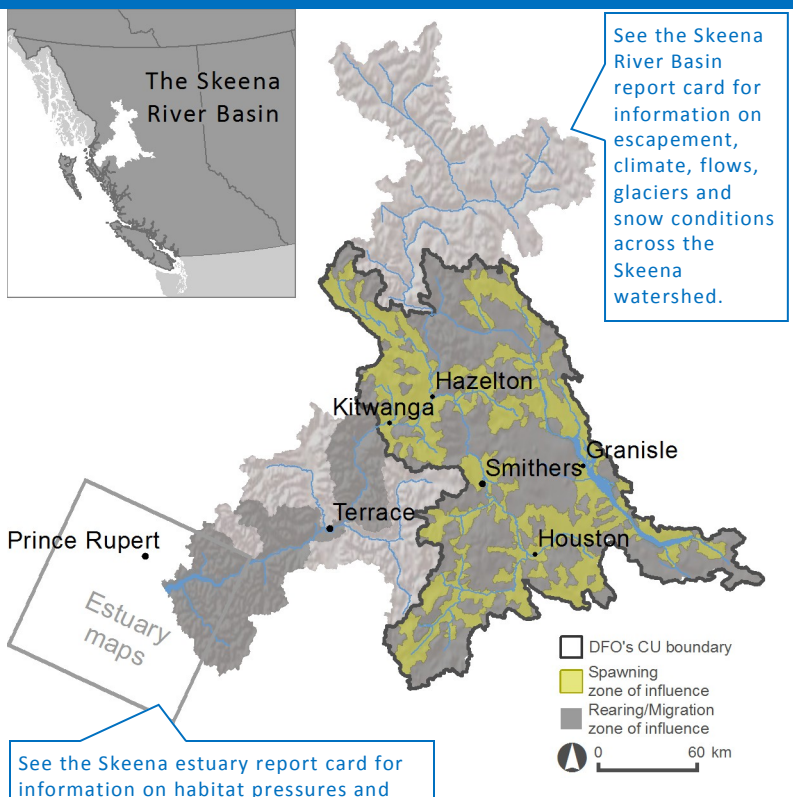
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Coho salmon life history emphasizes freshwater habitat with significance placed on rearing habitat quality and quantity.
* Spawning and rearing habitat within this CU is characterized by low gradients at a mix of elevations, often found adjacent to wetland complexes frequently impounded by beavers. Large elevational differences exist from Kitwanga into the higher elevation interior spawning and rearing locations.
* Logging and related road development is the most widespread, valley-bottom land use activity that has adversely affected high-value coho habitat; however, generally coho habitat appears to be underutilized, perhaps as a result of high long-term exploitation rates.
* Linear developments such as rail and road corridors have resulted in considerable impacts to high-value coho spawning and rearing habitat especially cutting off side and back channel and riparian habitats or generally obstructing fish passage.
* Considerable impacts are present from agriculture in the upper Bulkley and lower Kispiox.
* Access to habitat is a big issue especially at low water level conditions. Upstream development or natural disturbance may cause erosion resulting in sediment deposition on tributary fans exacerbating low water issues.
* Increased stream temperatures linked to global warming may be forcing coho juveniles to rear in Babine and Morice lakes and mainstems.
* Future threats include: changing freshwater and ocean conditions linked to global climate change, could be expressed in poor freshwater and marine survival rates; ongoing forestry development in Morice & Babine subbasins creating additional cumulative impacts; lack of habitat management activities in the upper Bulkley & Morice drainages.

Location



CU overview of habitat vulnerabilities & pressures

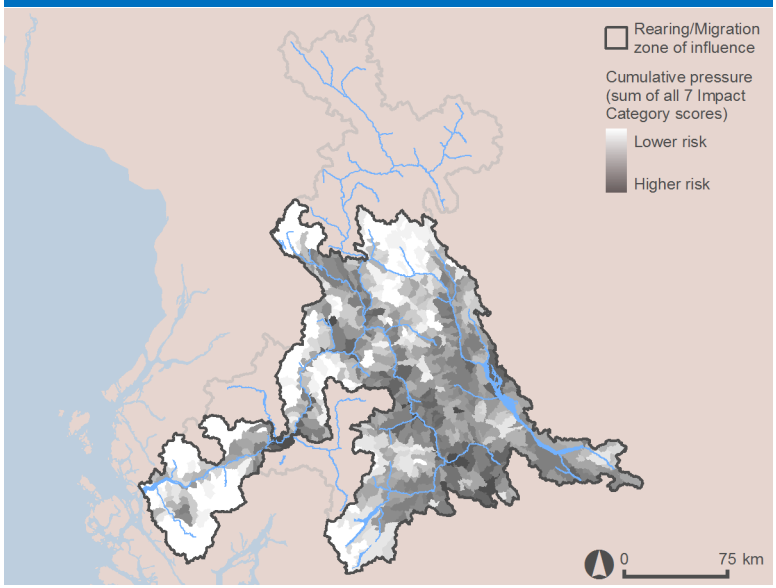
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

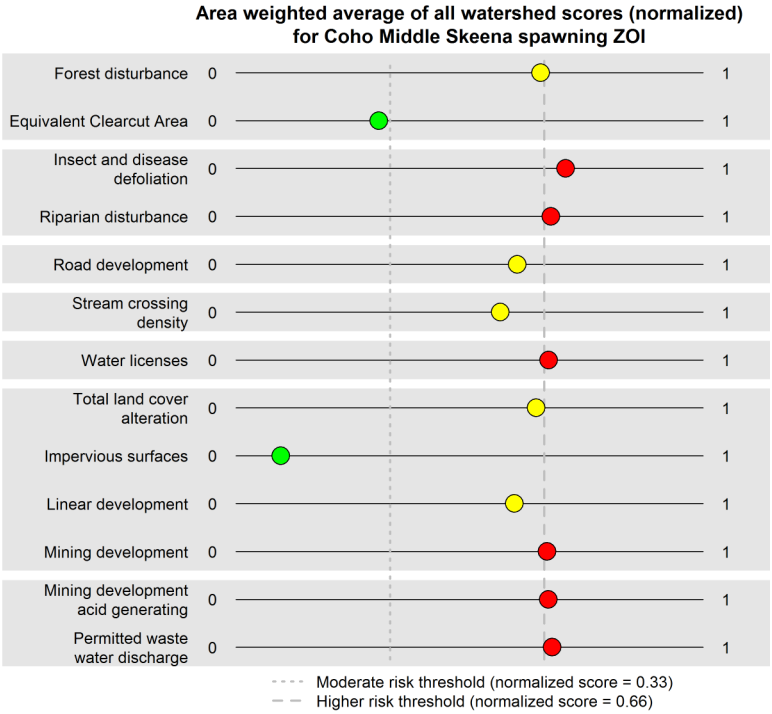
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

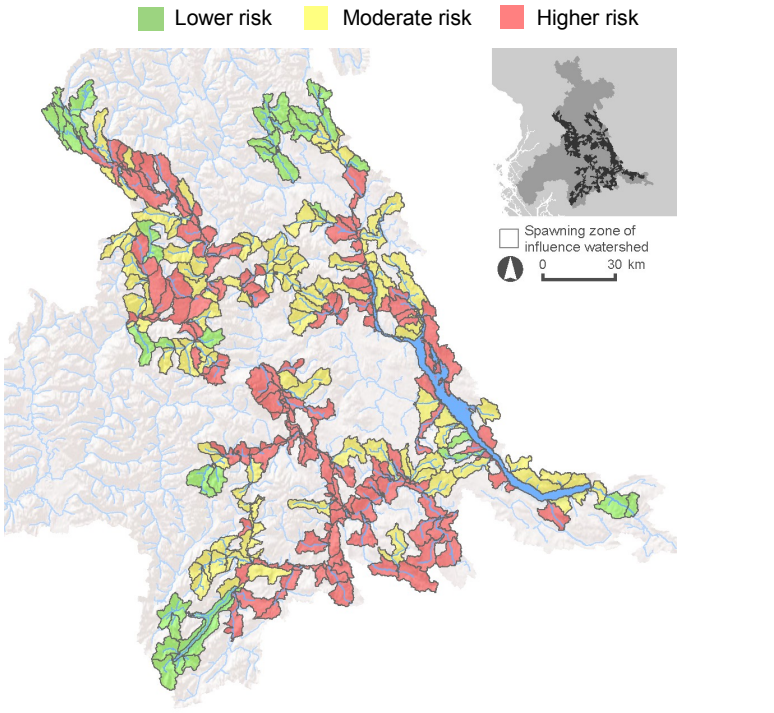
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

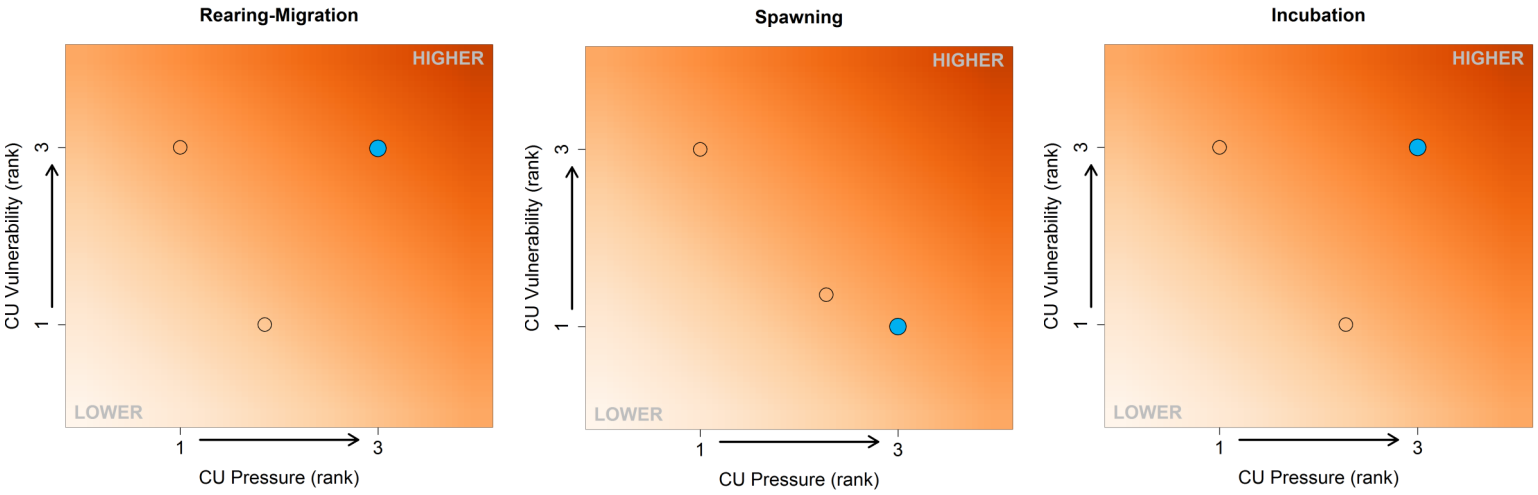


Cumulative pressure—spawning



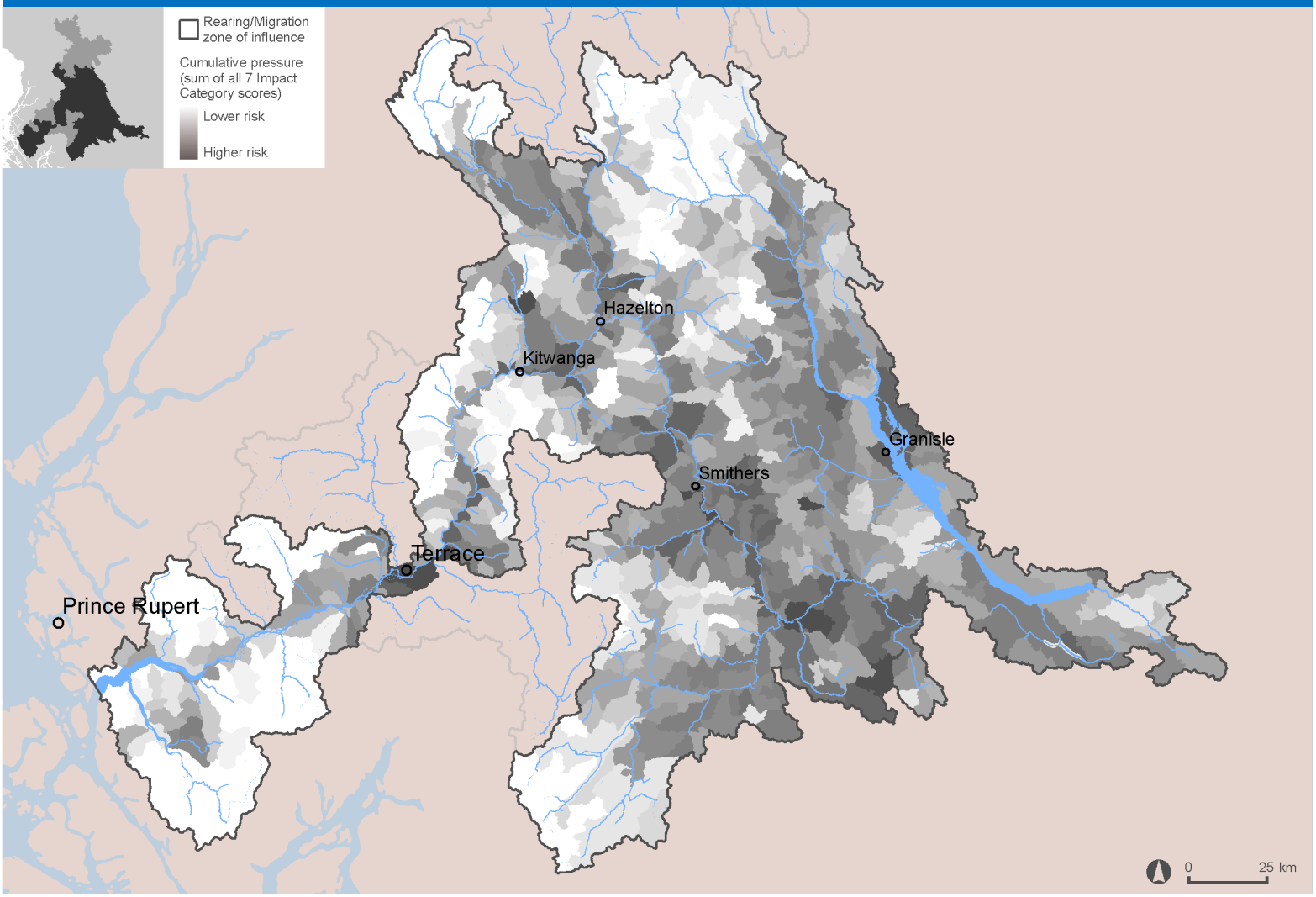
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Middle Skeena ○ = other Skeena coho CUs



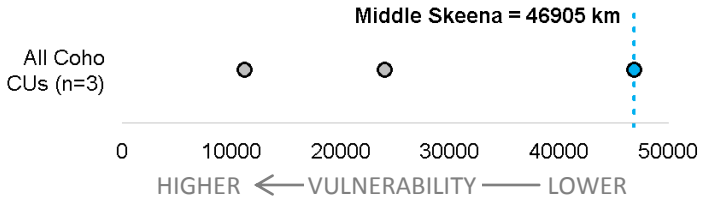
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

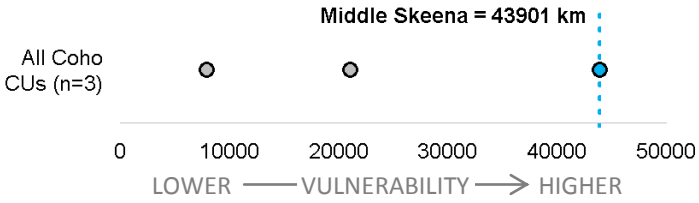


Rearing/Migration period vulnerability

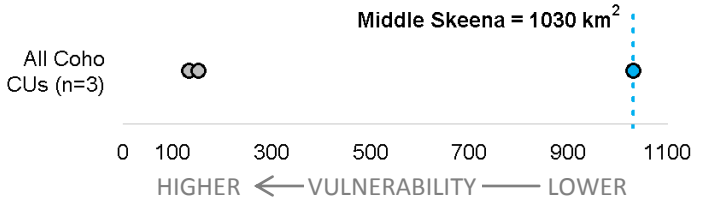
Fish accessible habitat (km)



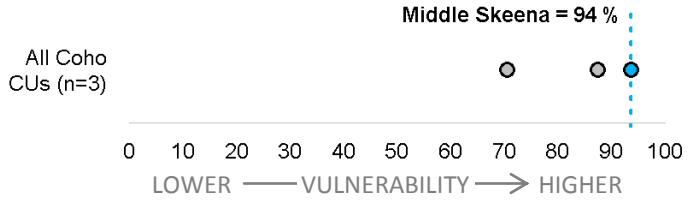
Flow sensitive accessible habitat (km) (all seasons)



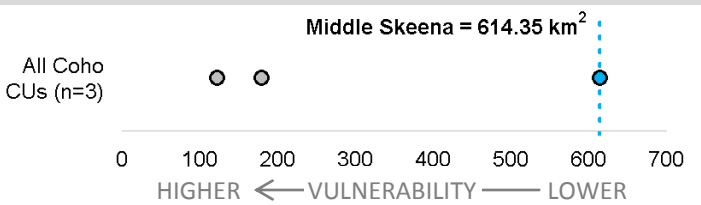
Lake area (km^2)



Flow sensitive accessible habitat (%) (all seasons)



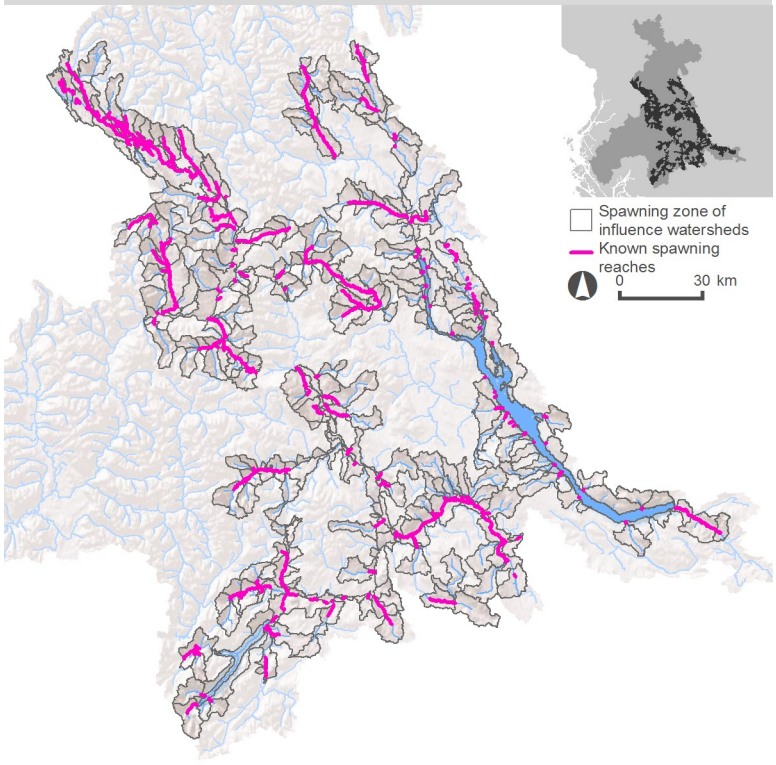
Wetland area (km^2)



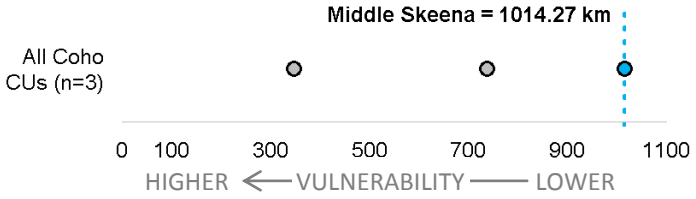
Spawning & incubation vulnerability

Spawning period vulnerability

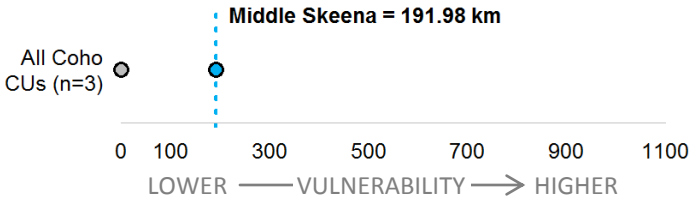
Spawning locations



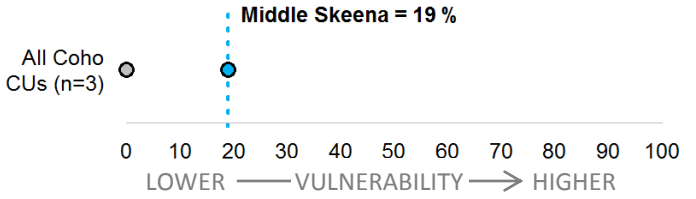
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

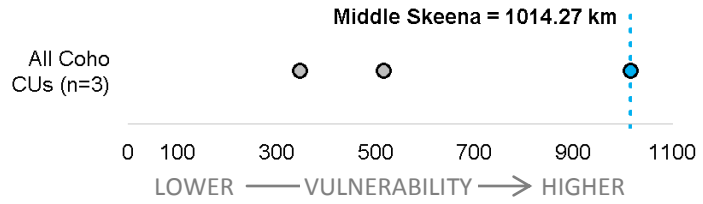


Spawning reaches summer flow sensitive - spawn timing (%)

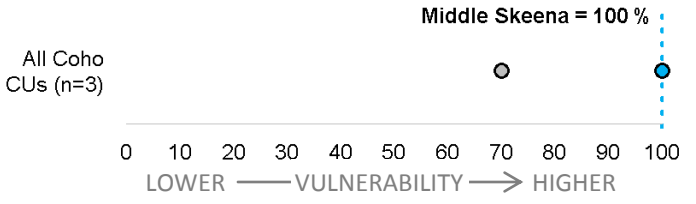


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



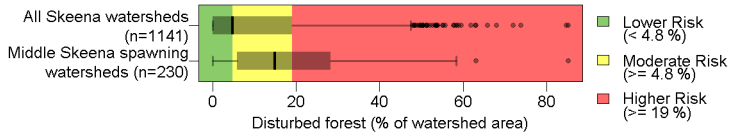
Spawning reaches winter flow sensitive - incubation timing (%)

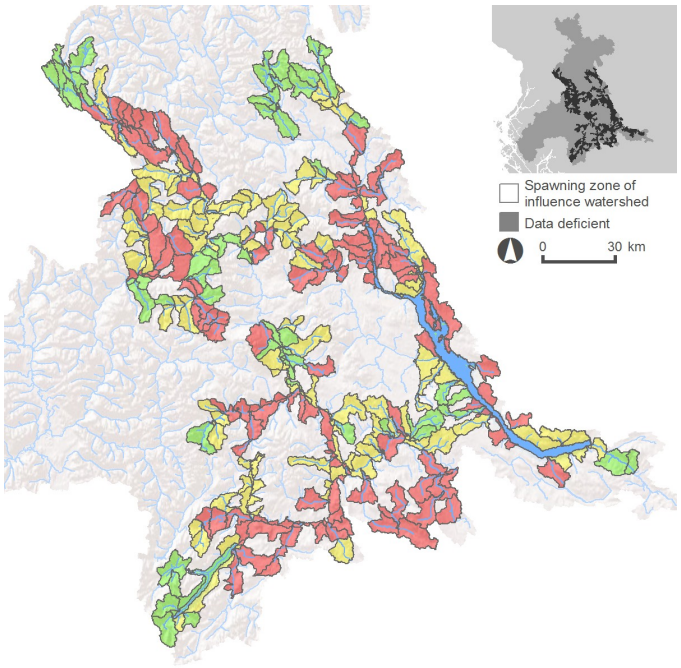


Spawning pressure

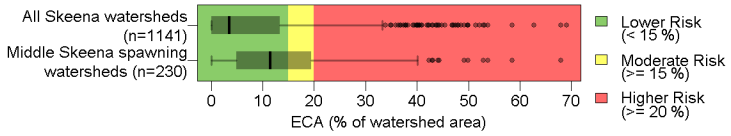
Hydrologic Processes

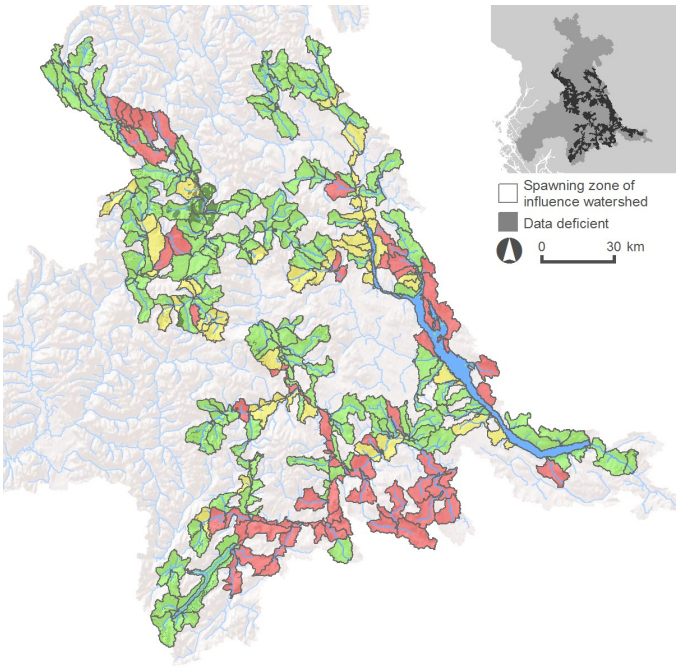
Forest disturbance





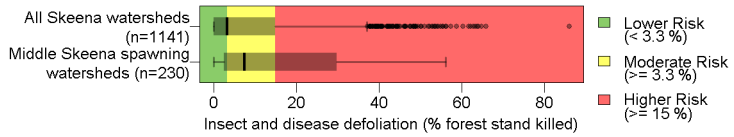
Equivalent Clear-cut Area

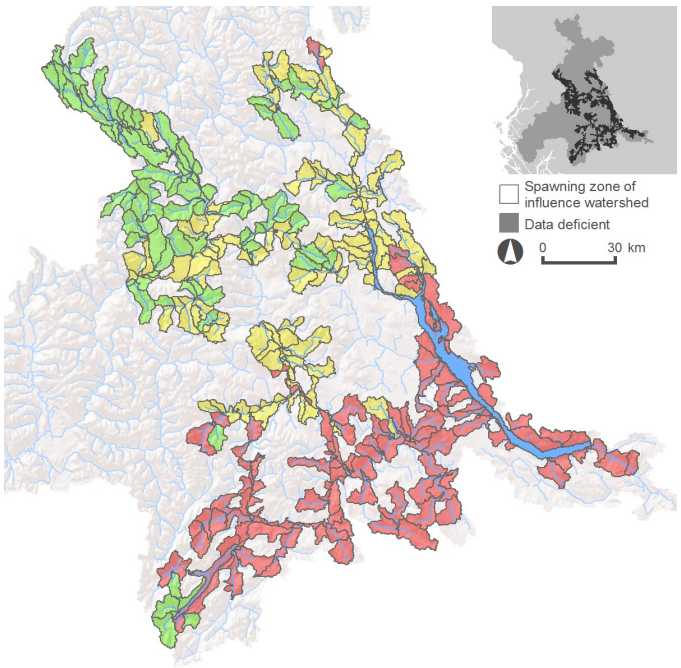




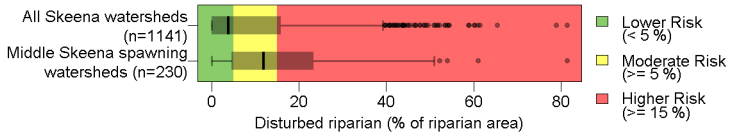
Vegetation Quality

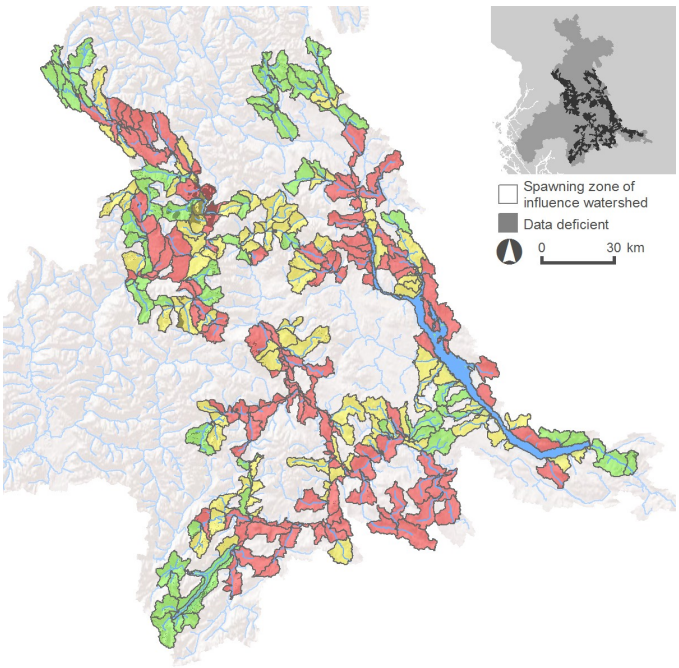
Insect and disease defoliation





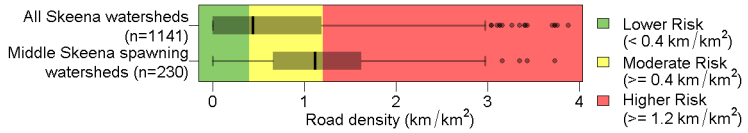
Riparian disturbance

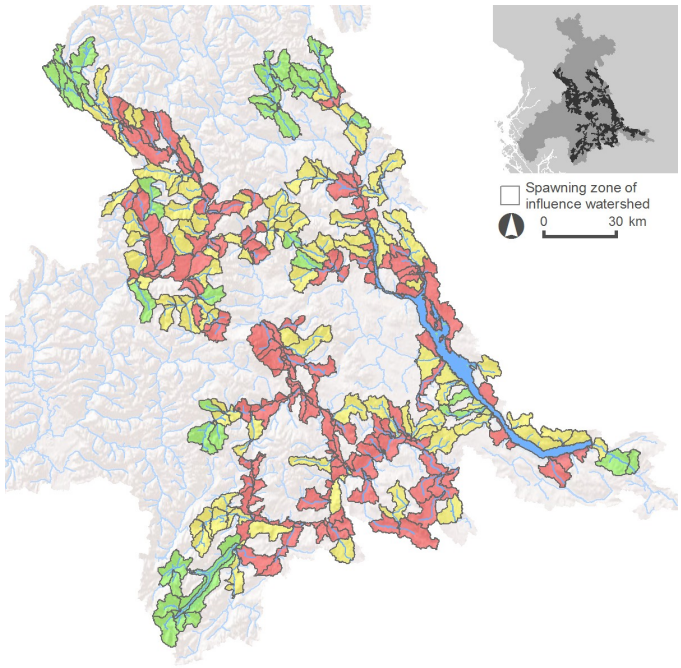




Surface Erosion

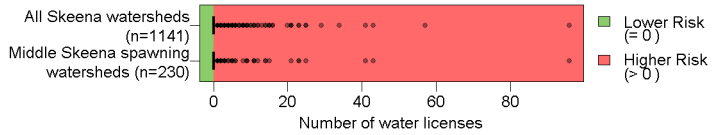
Road development

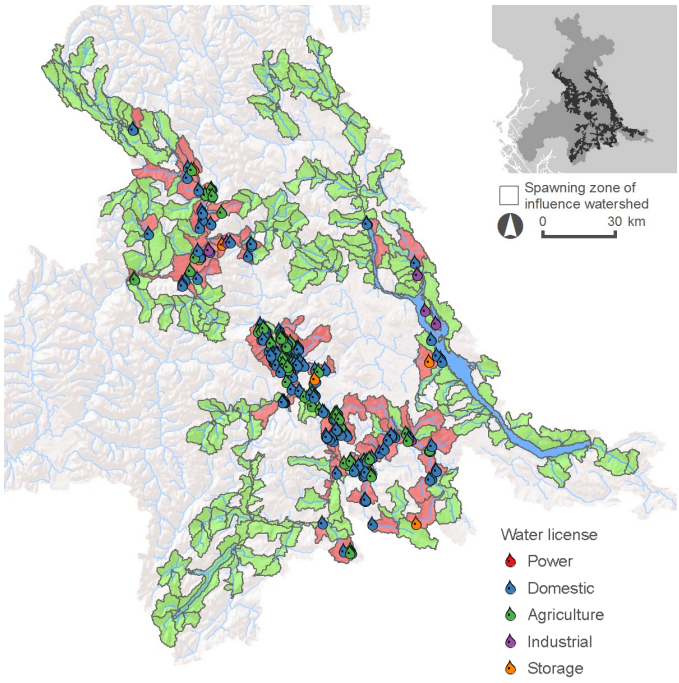




Water Quantity

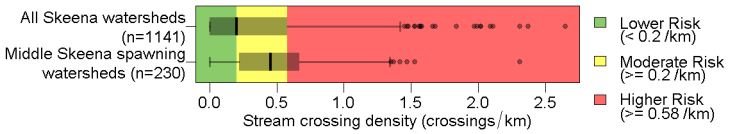
Number of water licenses

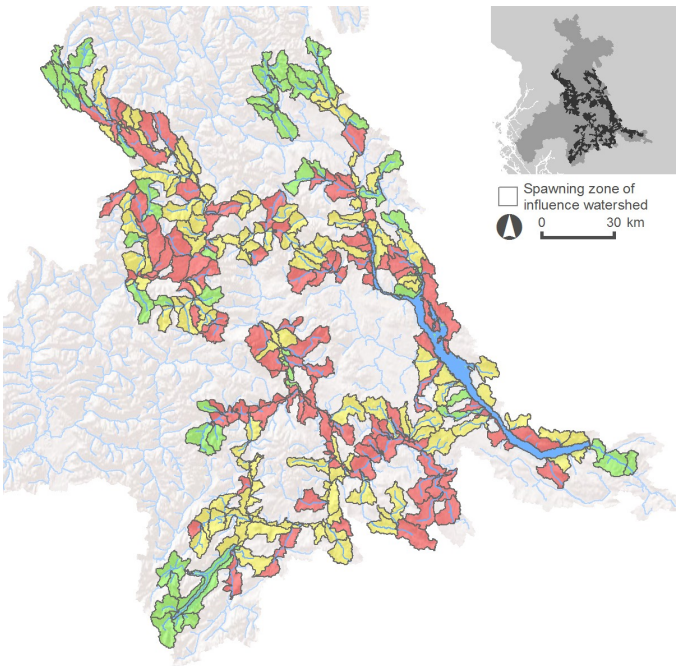




Fish Passage/Habitat Connectivity

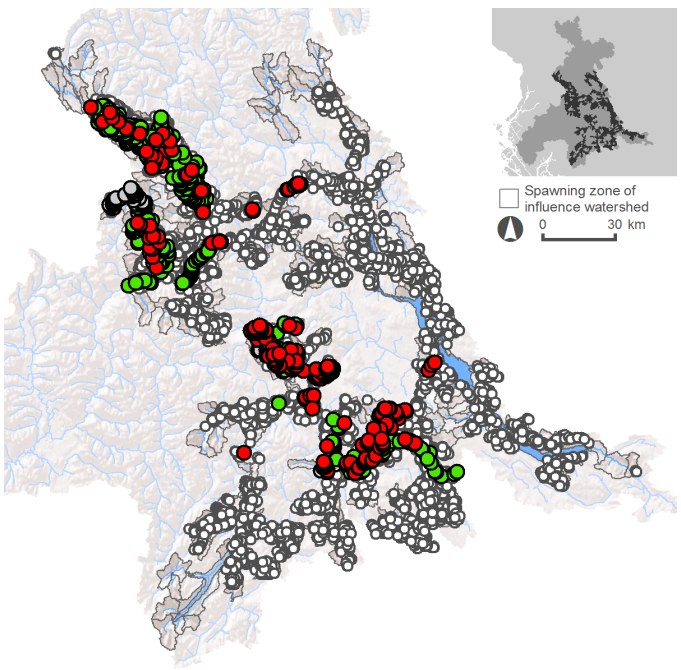
Stream crossing density





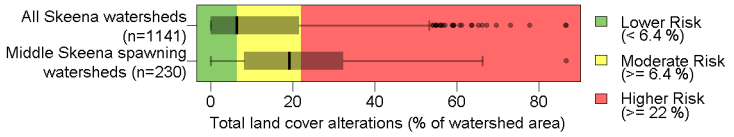
Culvert passability

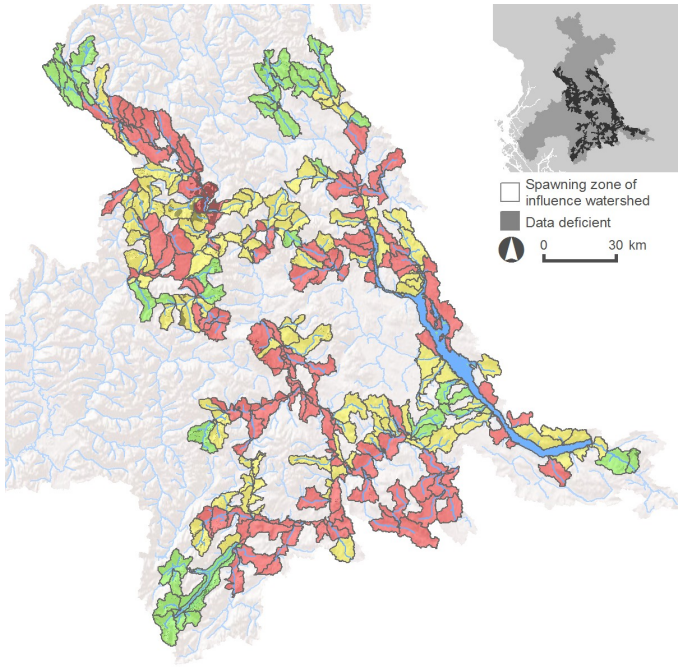
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



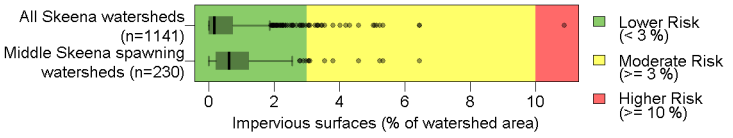
Human Development Footprint

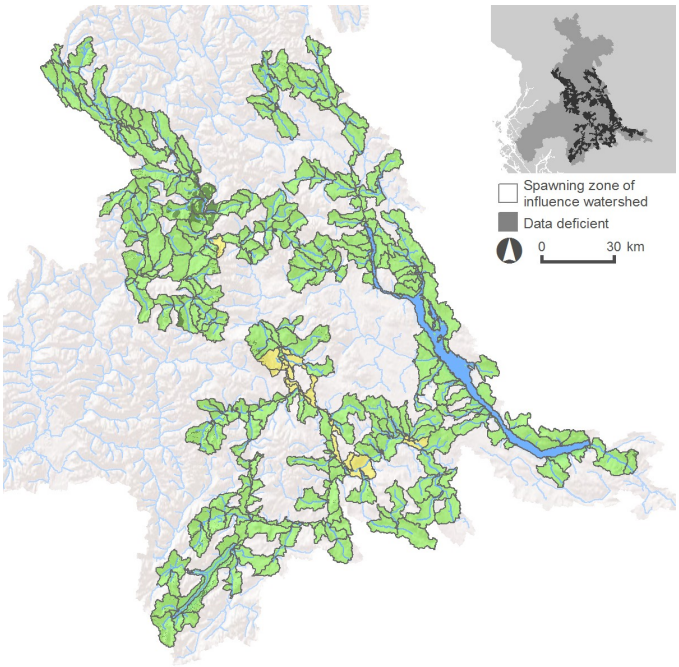
Total land cover alteration



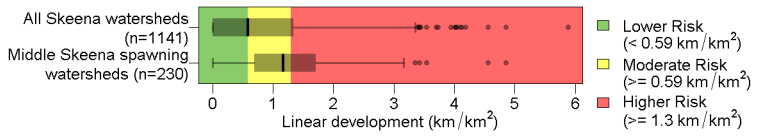


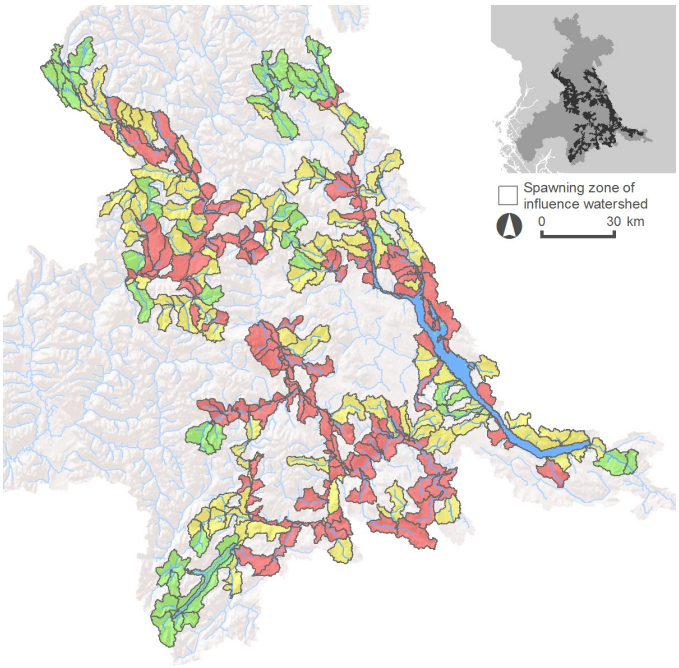
Impervious surfaces



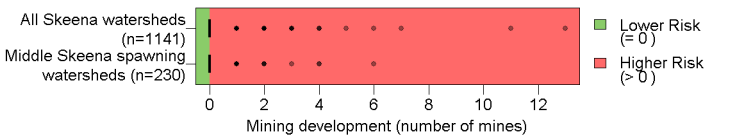


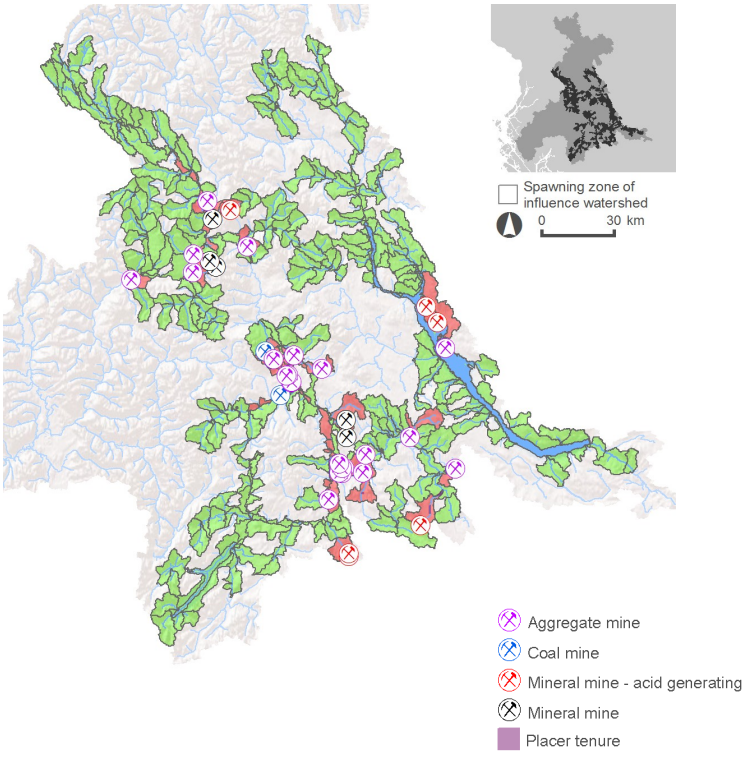
Linear development





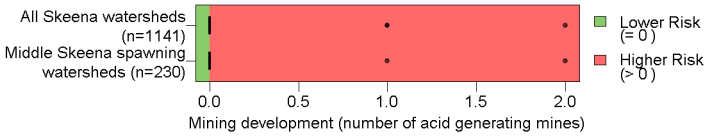
Mining development (total number of mines)

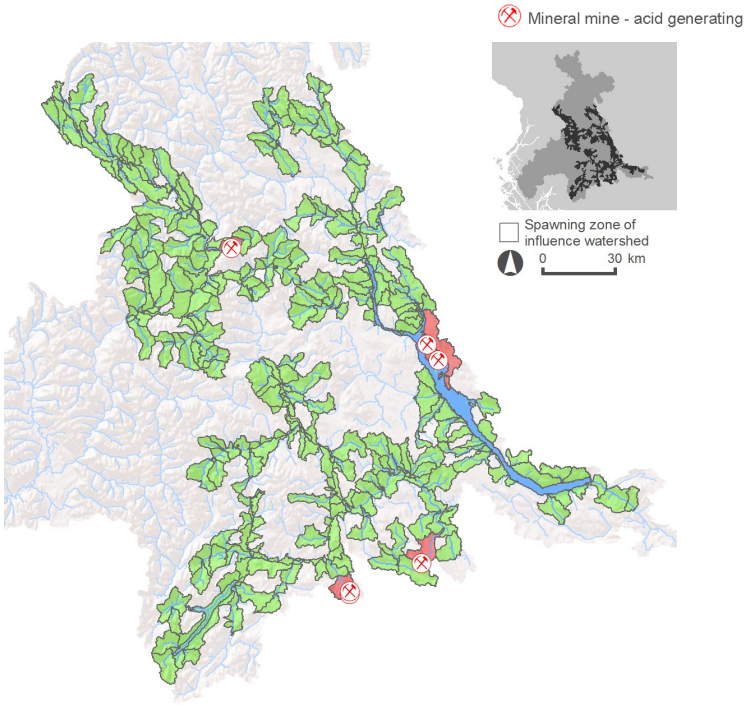




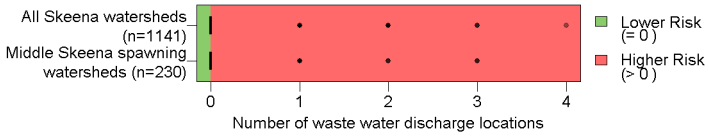
Water Quality

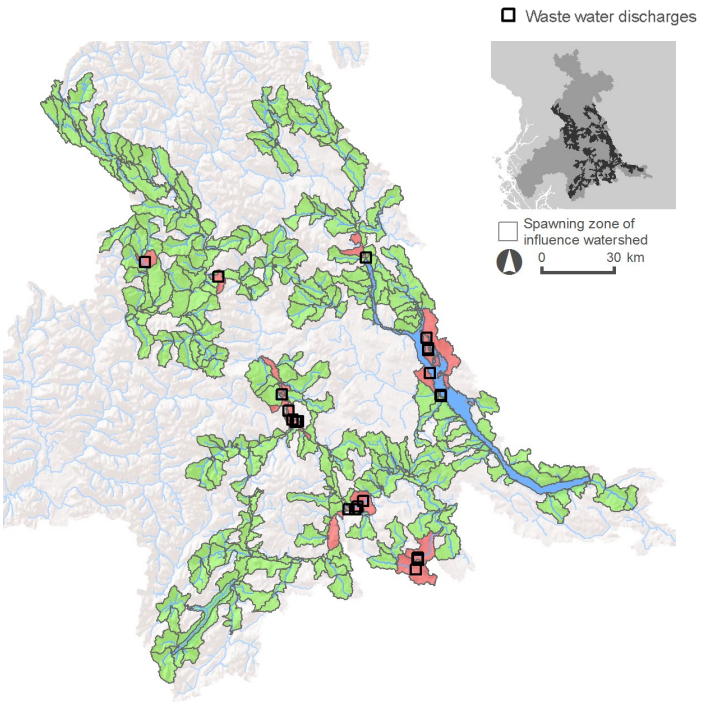
Mining development (acid generating mines)





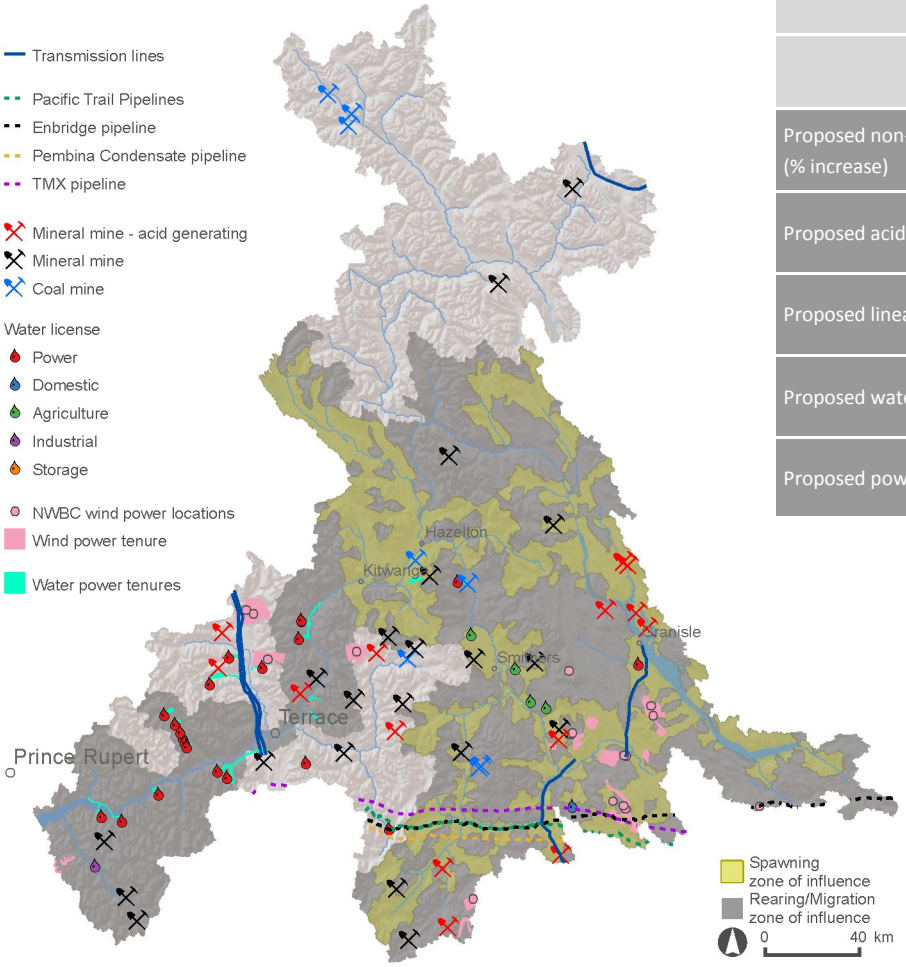
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Middle Skeena Coho CU summary		
	Rearing/	Spawning
Proposed non-acid generating mines (% increase)	16 (16%)	4 (9%)
Proposed acid generating mines (% increase)	11 (157%)	7 (117%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.03 km/km^2 (2%)
Proposed water licenses (% increase)	26 (3%)	3 (0.6%)
Proposed power tenures	342 km^2	111 km^2

Skeena Salmon: Coho
Conservation Unit (CU)
Upper Skeena

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

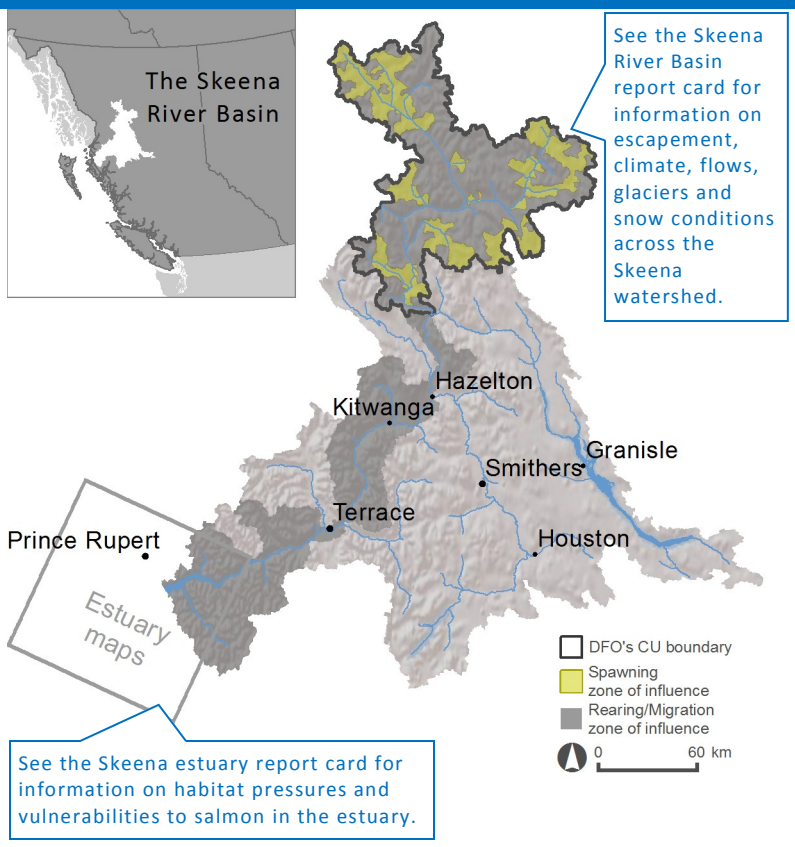
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Coho salmon life history emphasizes freshwater habitat with significance placed on rearing habitat quality and quantity.
* Spawning and rearing habitat within this CU is characterized as low-gradient at a mix of relative elevations often adjacent to wetland complexes frequently impounded by beavers. Much of Upper Skeena coho habitat is at relatively high elevations. Most spawning and rearing habitats have never been surveyed.
* Linear developments such as the road corridor in the upper Sustut and rail corridor in the upper Skeena have resulted in considerable impacts to high-value coho spawning and rearing habitat.
* Access to habitat can a big issue especially due to low water level conditions.
* Future threats include changing freshwater and ocean conditions linked to global climate change, which could be expressed in poor freshwater and marine survival rates.

Location



CU overview of habitat vulnerabilities & pressures

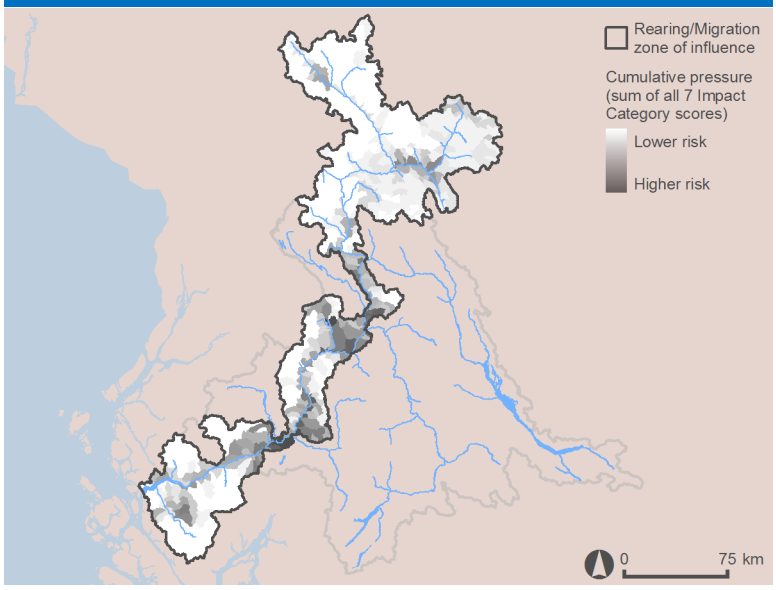
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

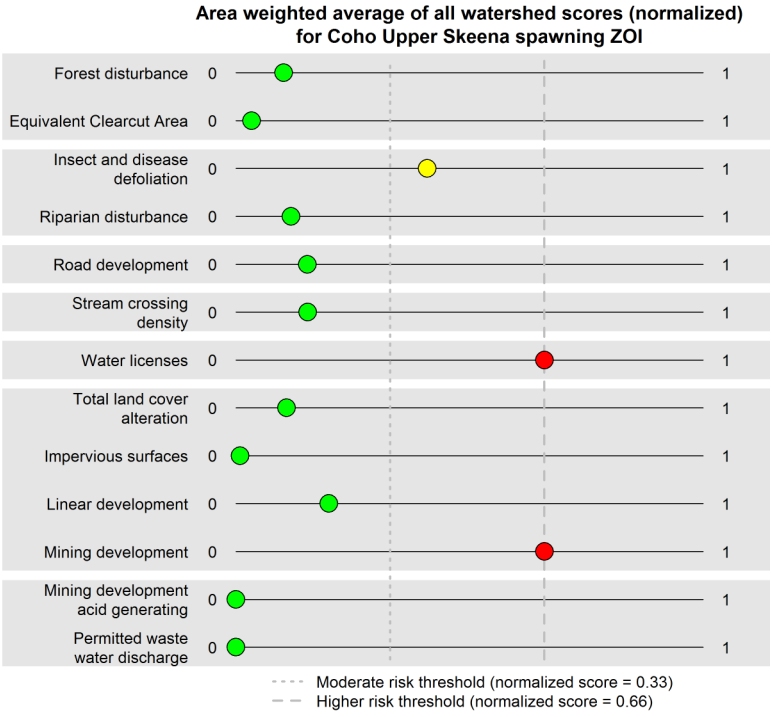
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

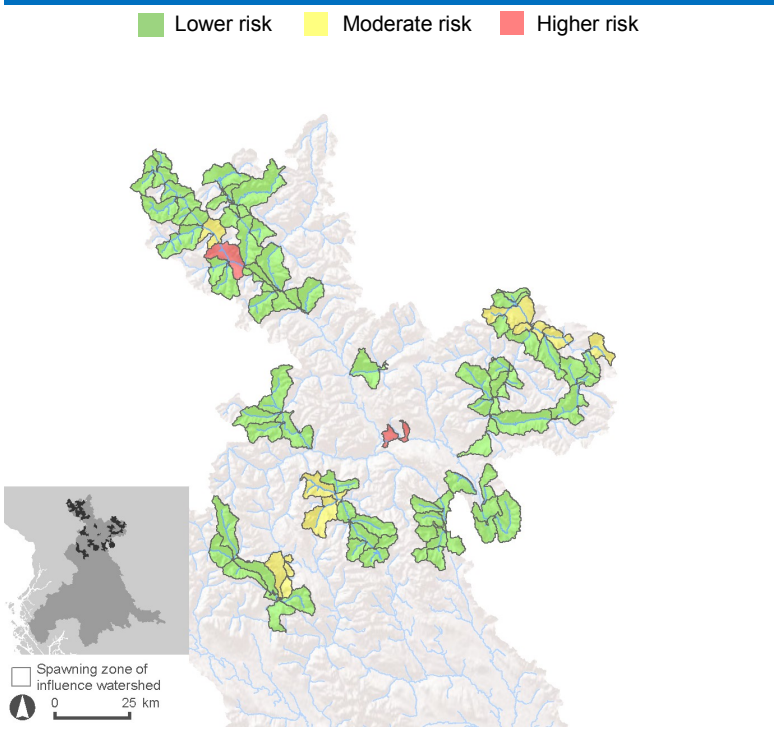
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

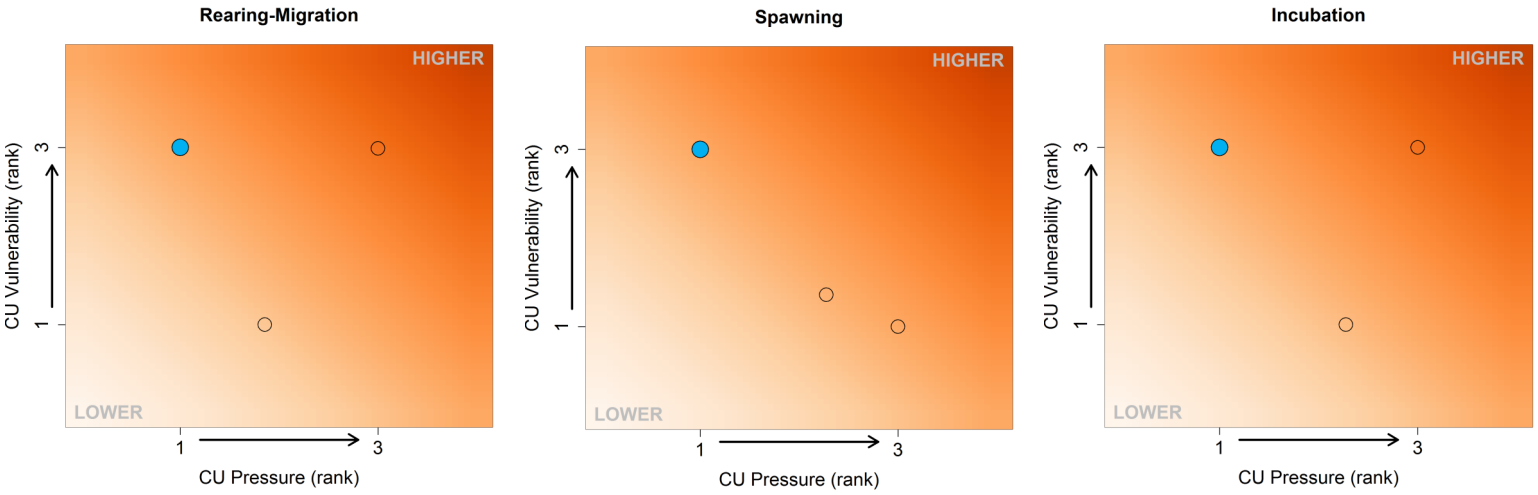


Cumulative pressure—spawning



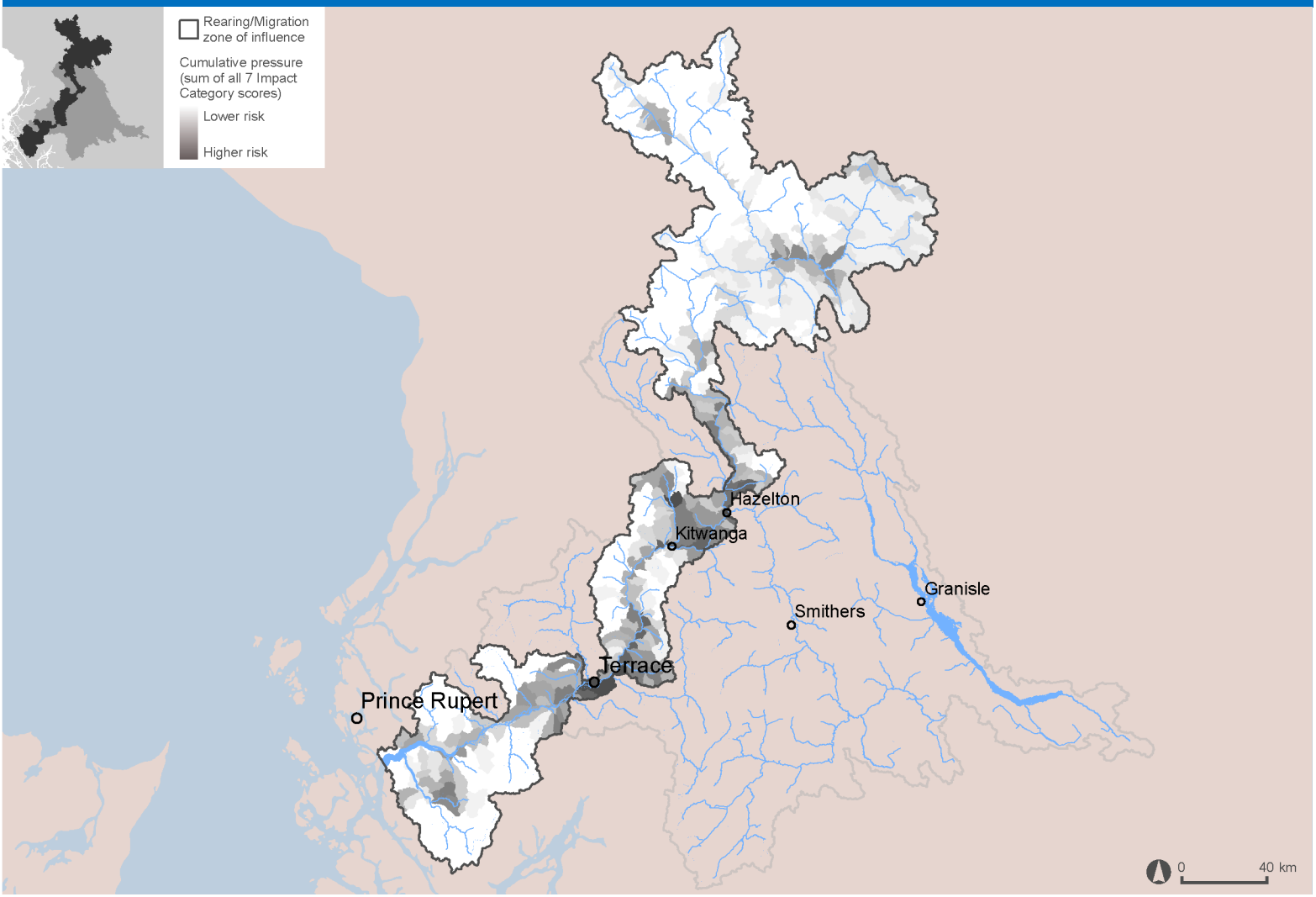
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Upper Skeena ○ = other Skeena coho CUs



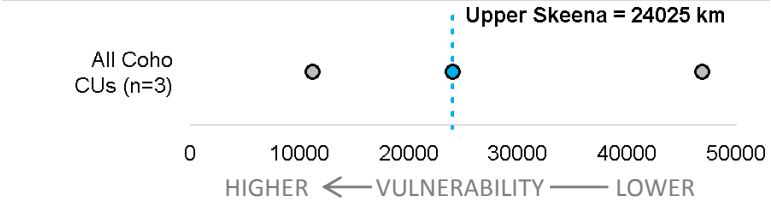
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

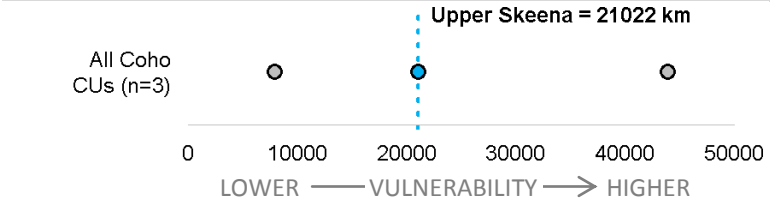


Rearing/Migration period vulnerability

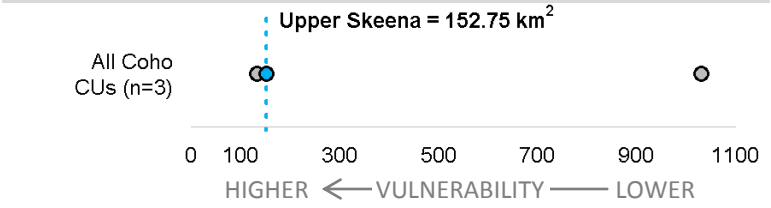
Fish accessible habitat (km)



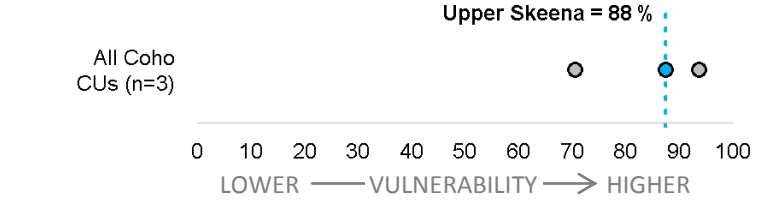
Flow sensitive accessible habitat (km) (all seasons)



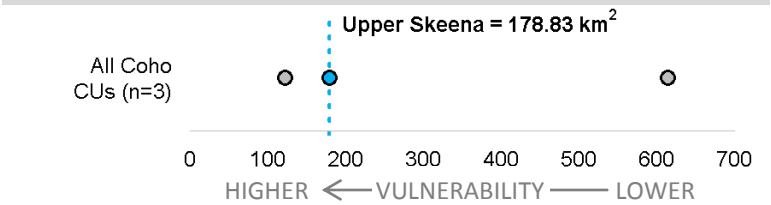
Lake area (km^2)



Flow sensitive accessible habitat (%) (all seasons)



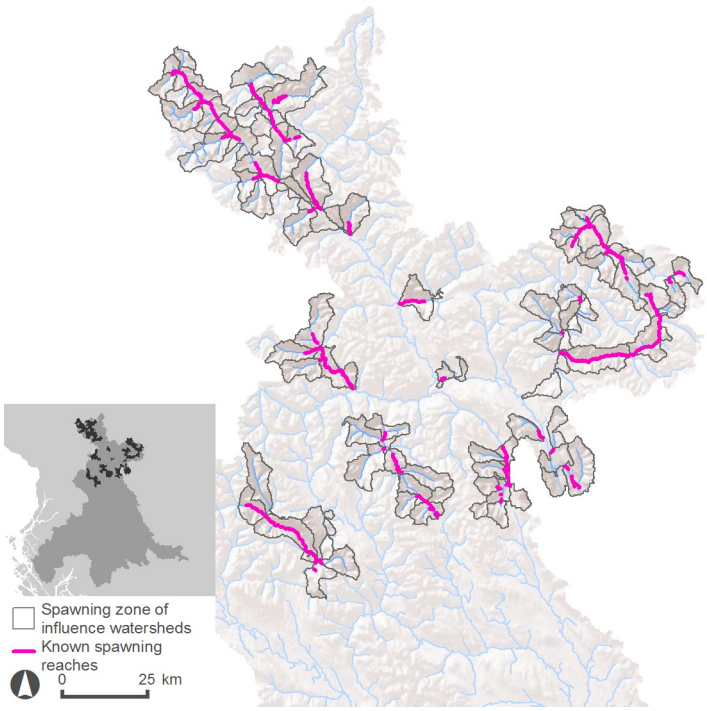
Wetland area (km^2)



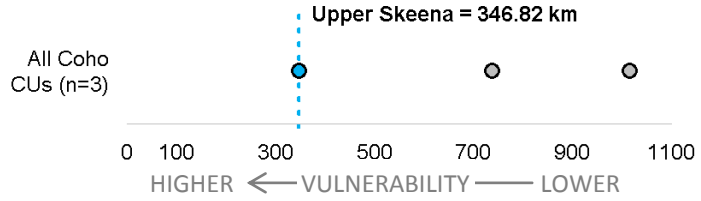
Spawning & incubation vulnerability

Spawning period vulnerability

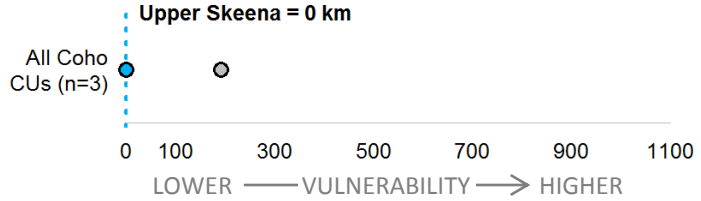
Spawning locations



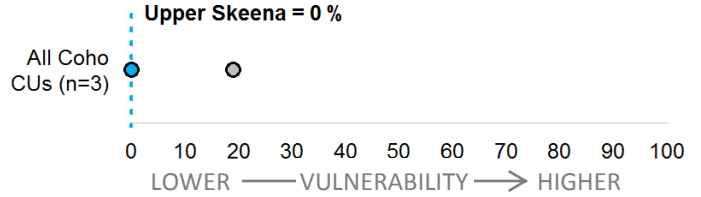
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

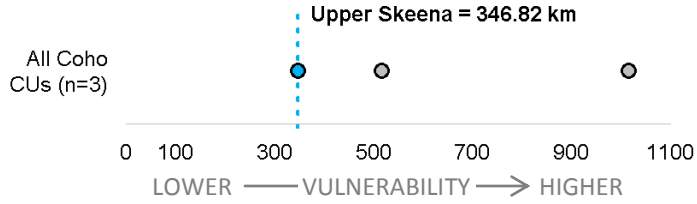


Spawning reaches summer flow sensitive - spawn timing (%)

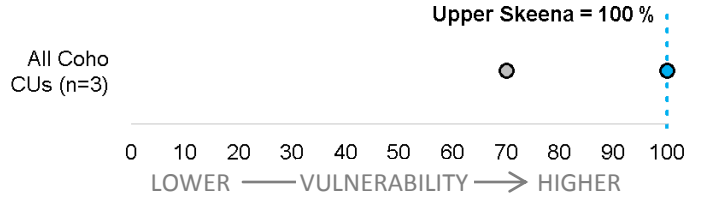


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



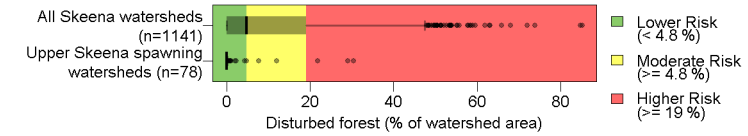
Spawning reaches winter flow sensitive - incubation timing (%)

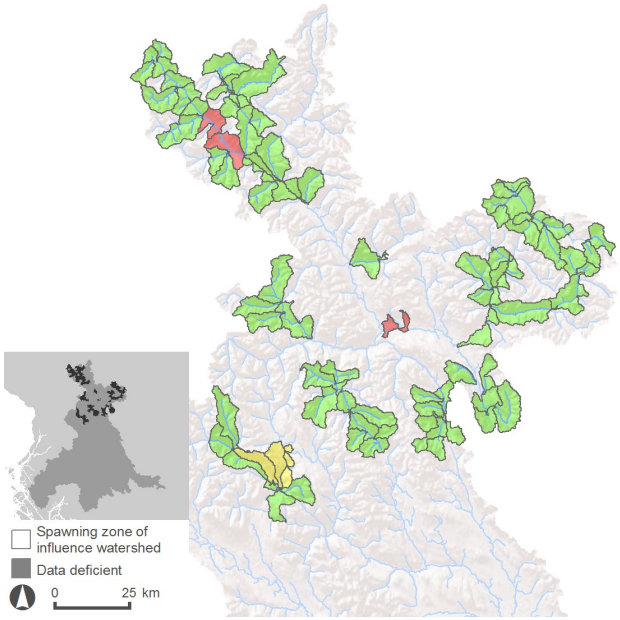


Spawning pressure

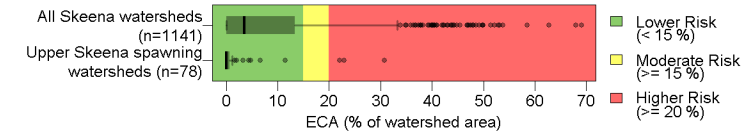
Hydrologic Processes

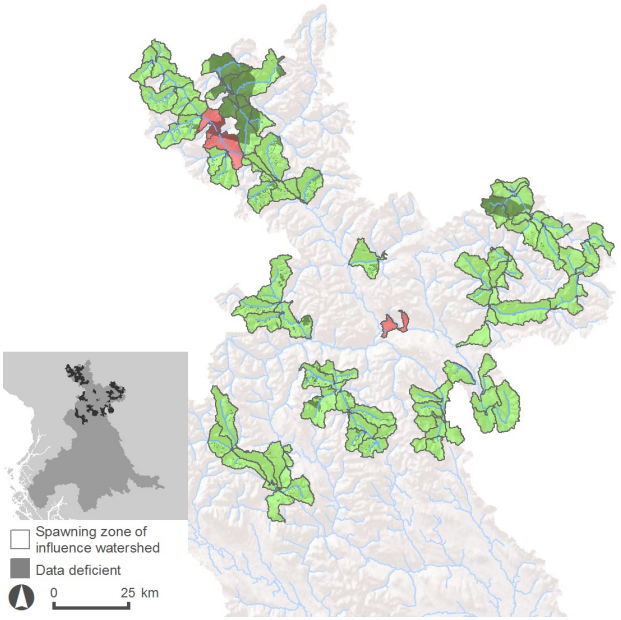
Forest disturbance





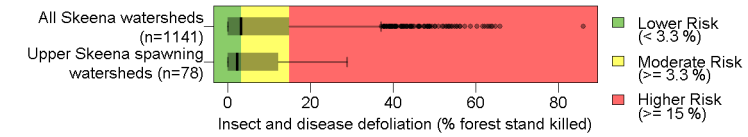
Equivalent Clear-cut Area

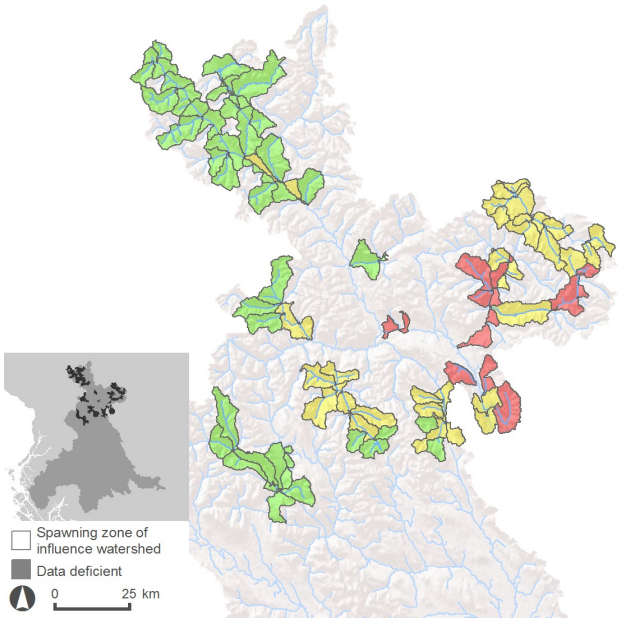




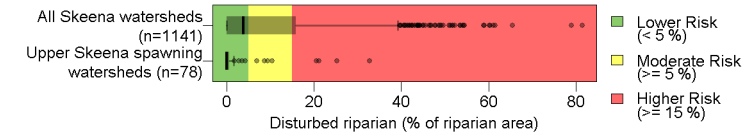
Vegetation Quality

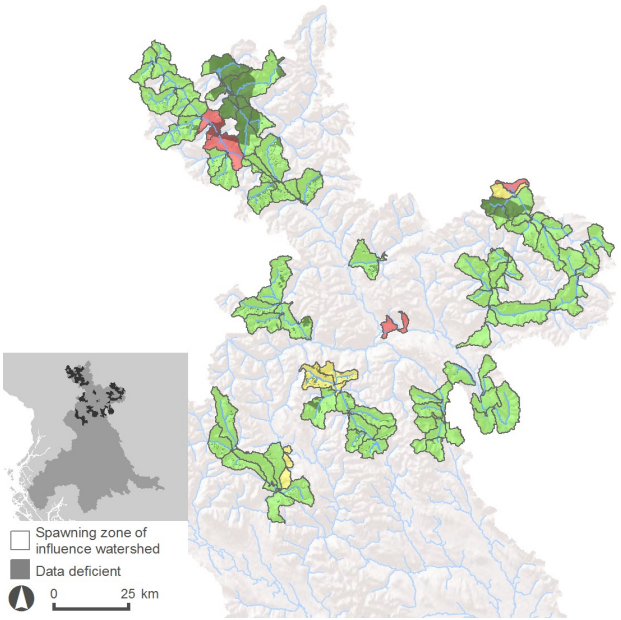
Insect and disease defoliation





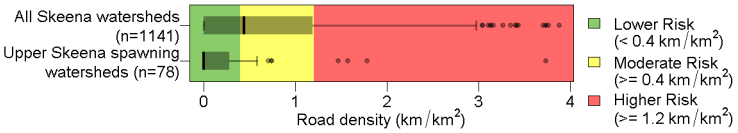
Riparian disturbance

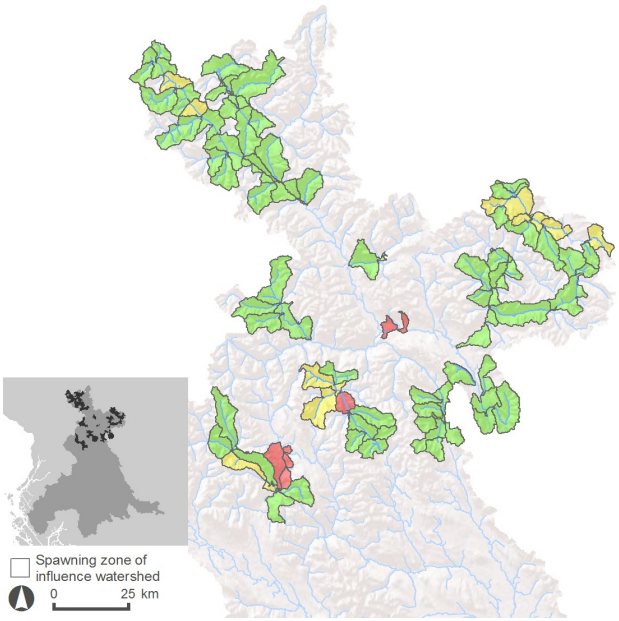




Surface Erosion

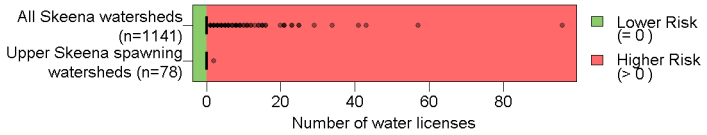
Road development

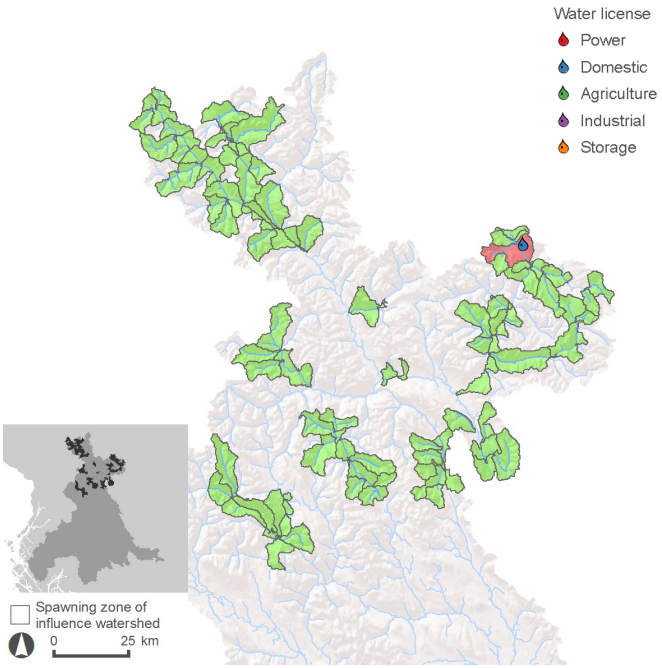




Water Quantity

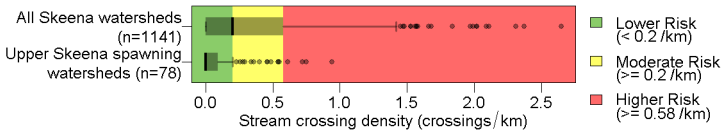
Number of water licenses

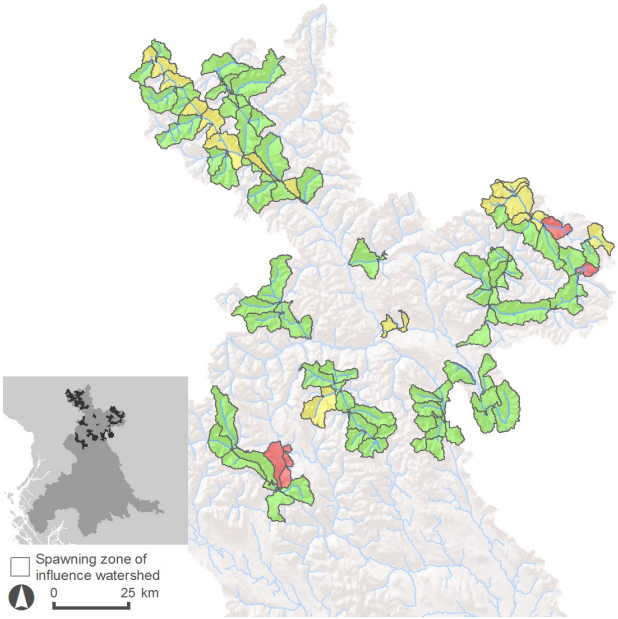




Fish Passage/Habitat Connectivity

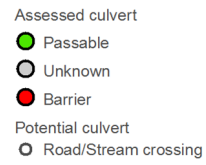
Stream crossing density

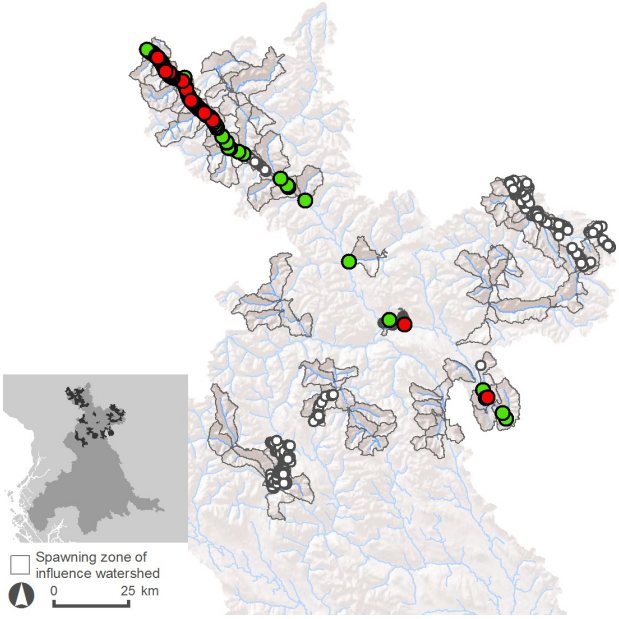




Culvert passability

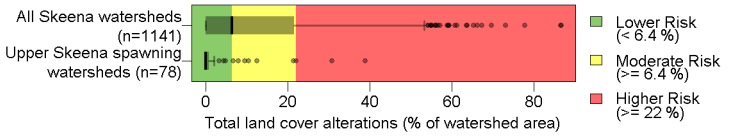
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

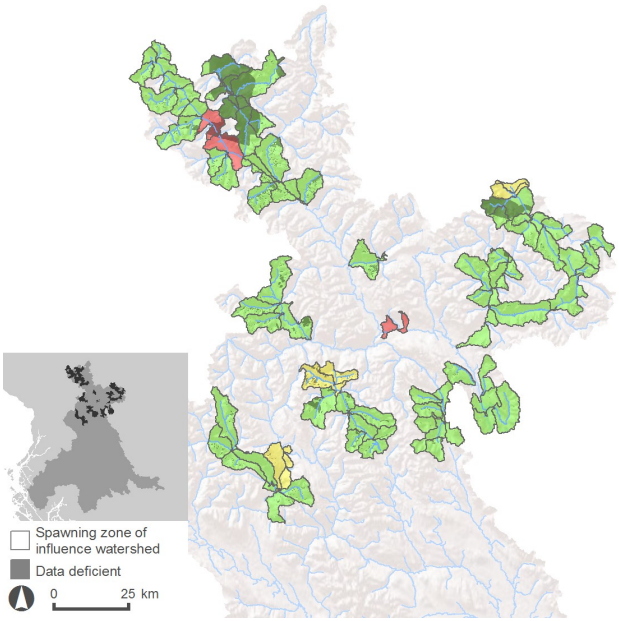




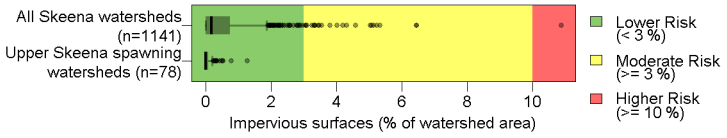
Human Development Footprint

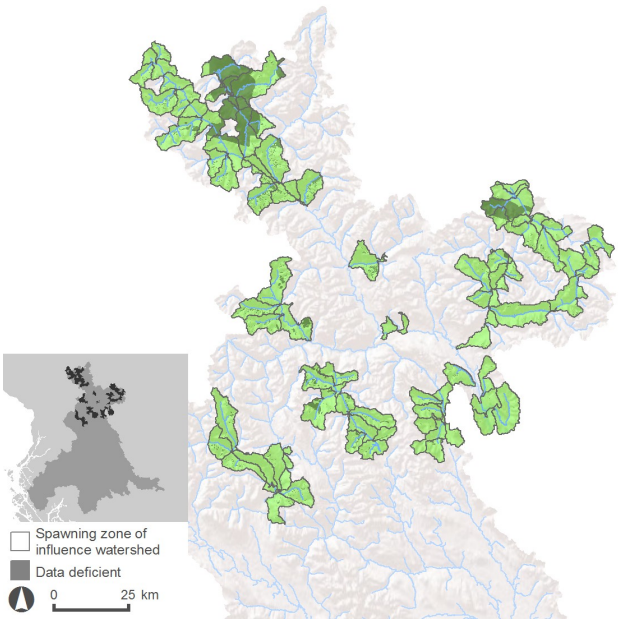
Total land cover alteration



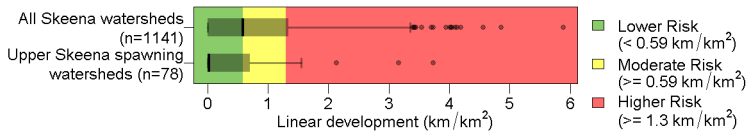


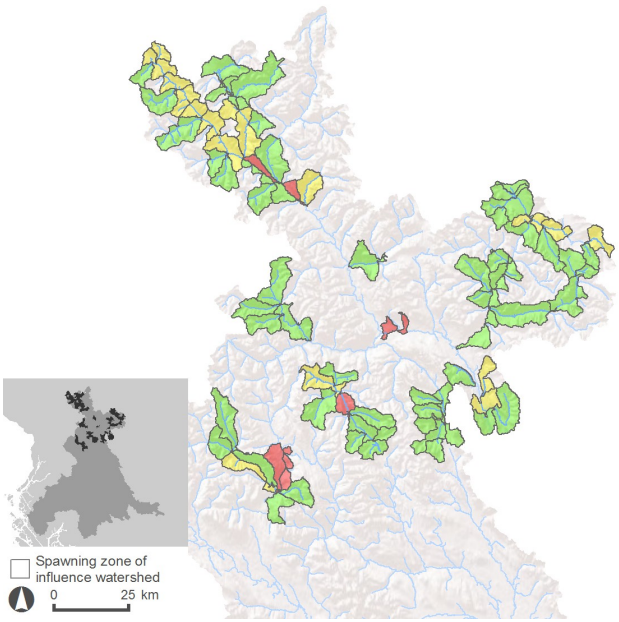
Impervious surfaces



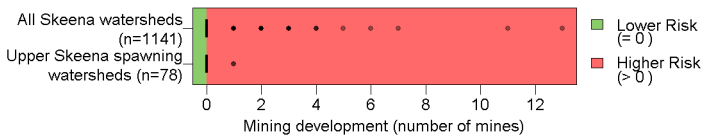


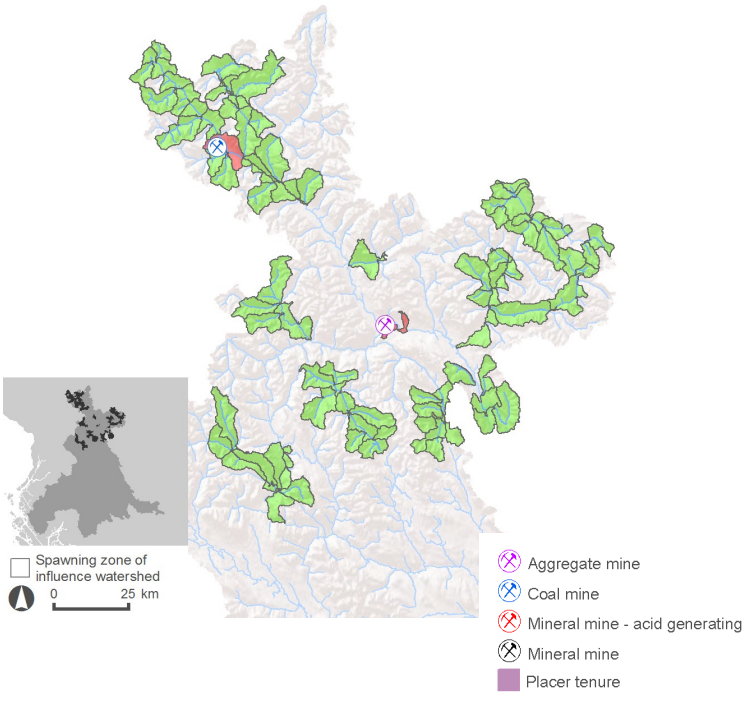
Linear development





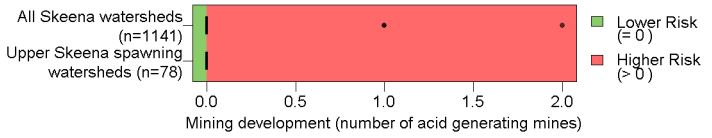
Mining development (total number of mines)

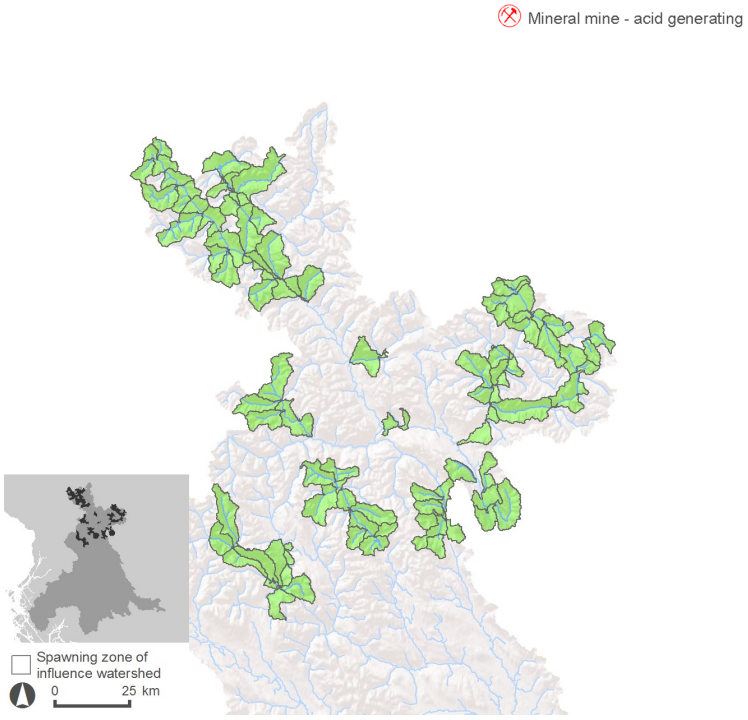




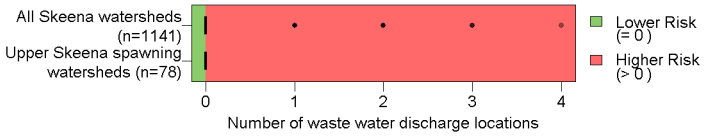
Water Quality

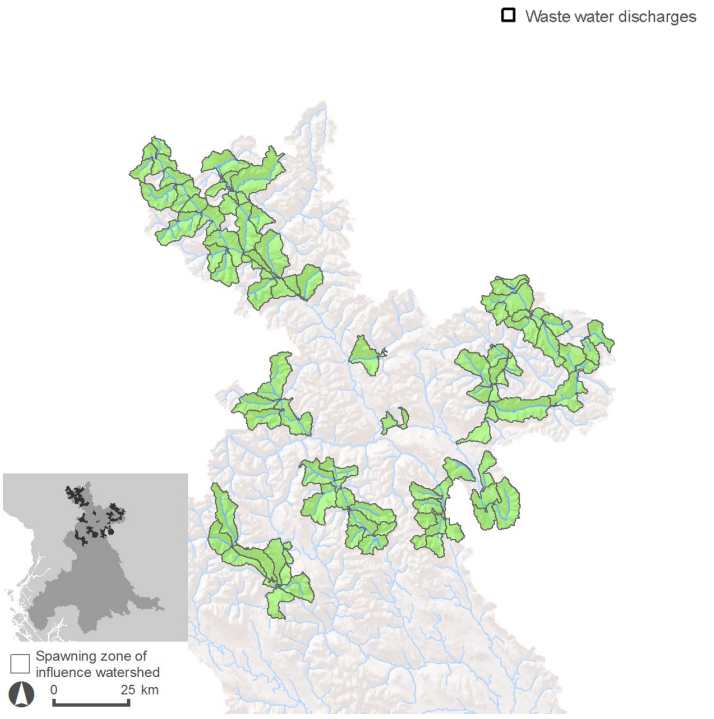
Mining development (acid generating mines)





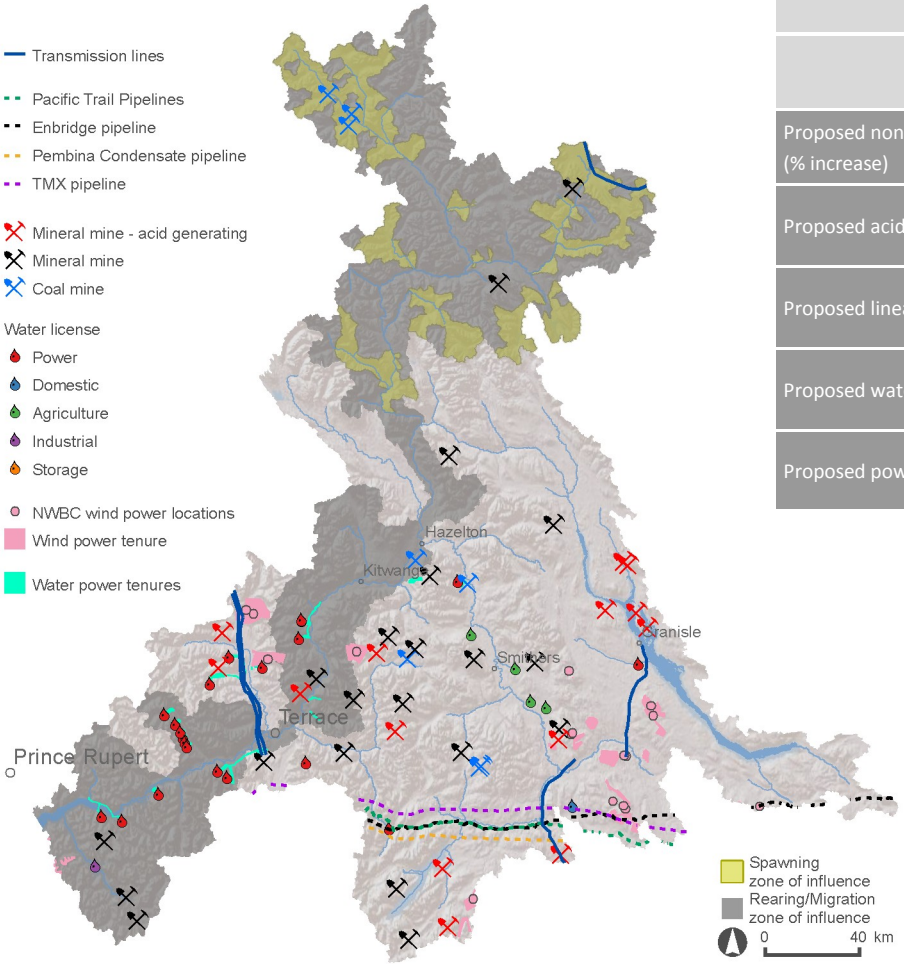
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Upper Skeena Coho CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	9 (17%)	3 (150%)
Proposed acid generating mines (% increase)	1 (50%)	0 (NA)
Proposed linear development (% increase)	0.004 km/km^2 (0.8%)	0.007 km/km^2 (2%)
Proposed water licenses (% increase)	18 (12%)	0 (0%)
Proposed power tenures	116 km^2	0 km^2

Skeena Salmon: Pink
Conservation Unit (CU)
Lower Skeena (odd)

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

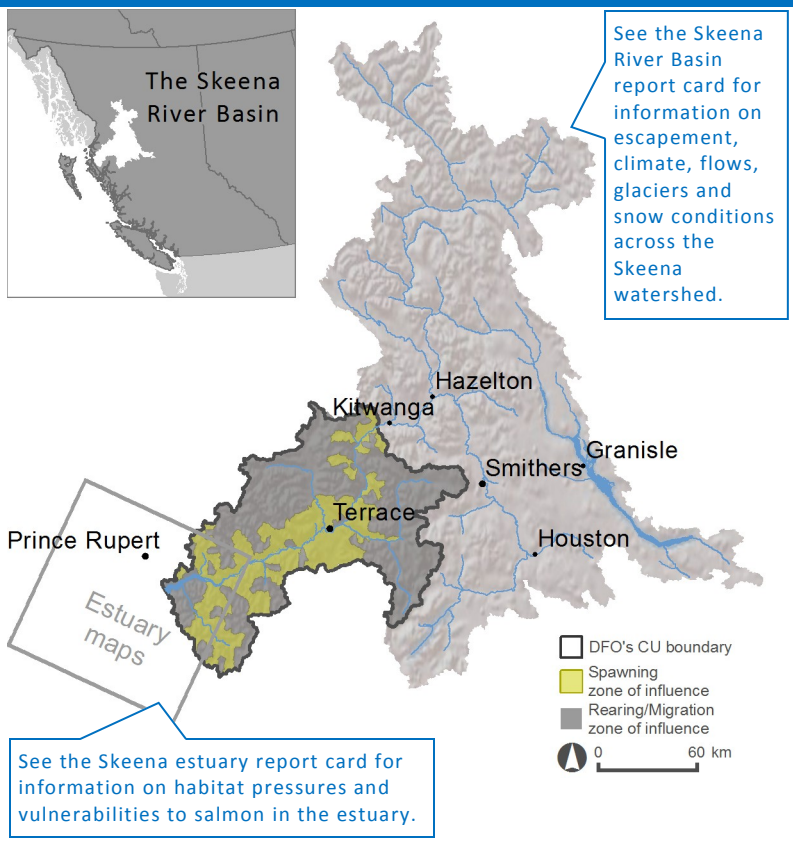
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* The pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
* This CU is characterized by the Skeena River valley cutting through the Coast Mountains with approximately 50% of tributary valley draining remnant glaciers.
* Pink abundance somewhat reflects climate and ocean regime shifts in 1977, 1989, and 1998 and their subsequent production.
* Major shift in spawning habitat occurred in 1954 when mainstem Cedarvale vicinity spawners moved to Skeena West.
* Winter low flows can dewater and freeze eggs, especially those laid in side and back channels that dry.
* Tributaries supporting Lower Skeena pink have many large scale precipitation events that can cause erosion, scouring, and siltation.
* The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
* Mature pink salmon bring massive amounts of marine nutrients into LSK pink odd-year freshwater and riparian ecosystems.
* The majority of spawning habitat is in good condition.

Location



CU overview of habitat vulnerabilities & pressures

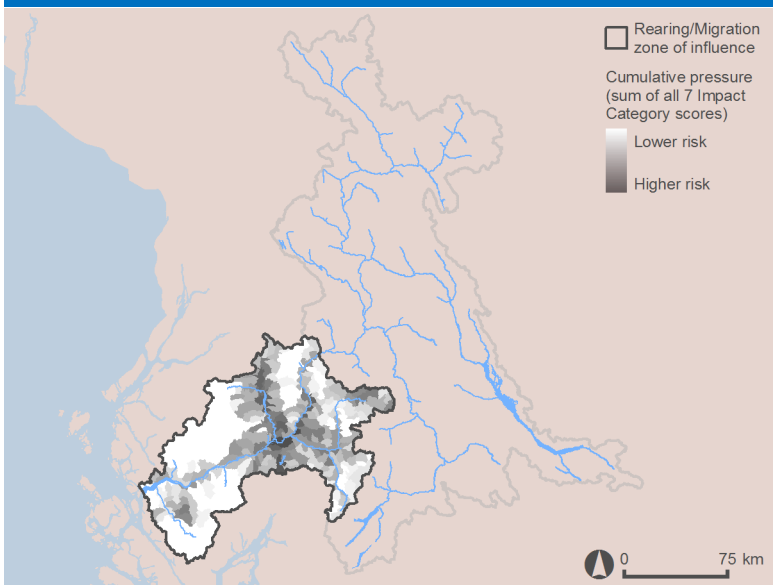
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

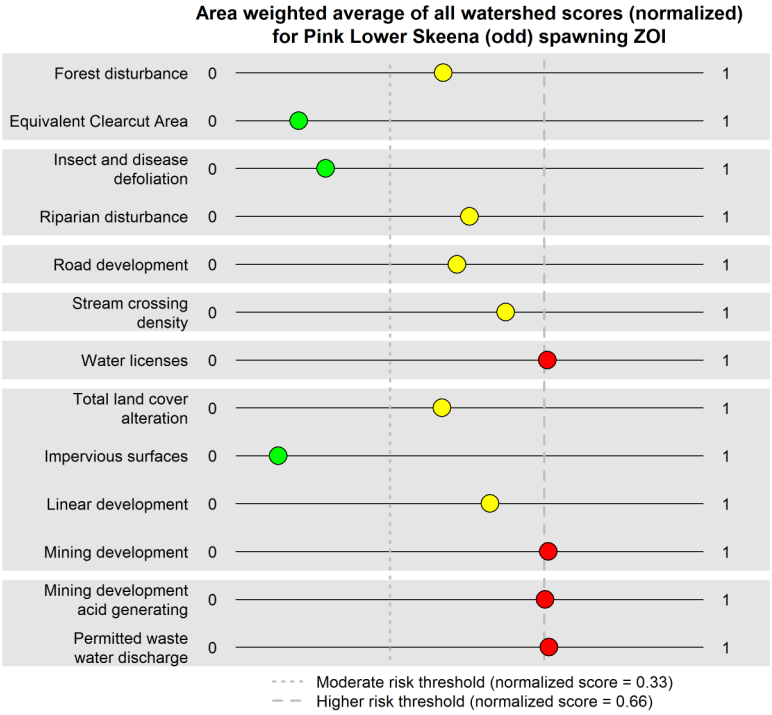
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

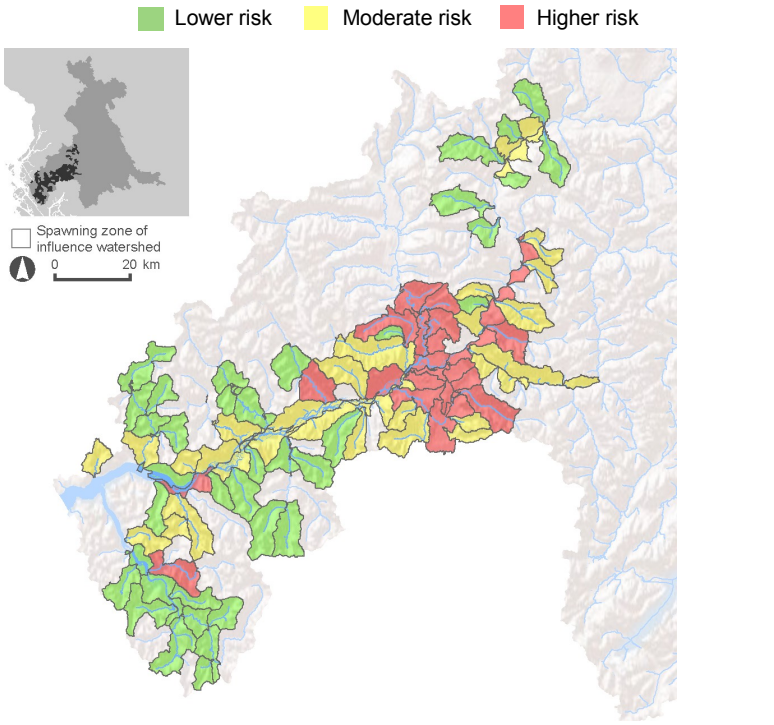
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

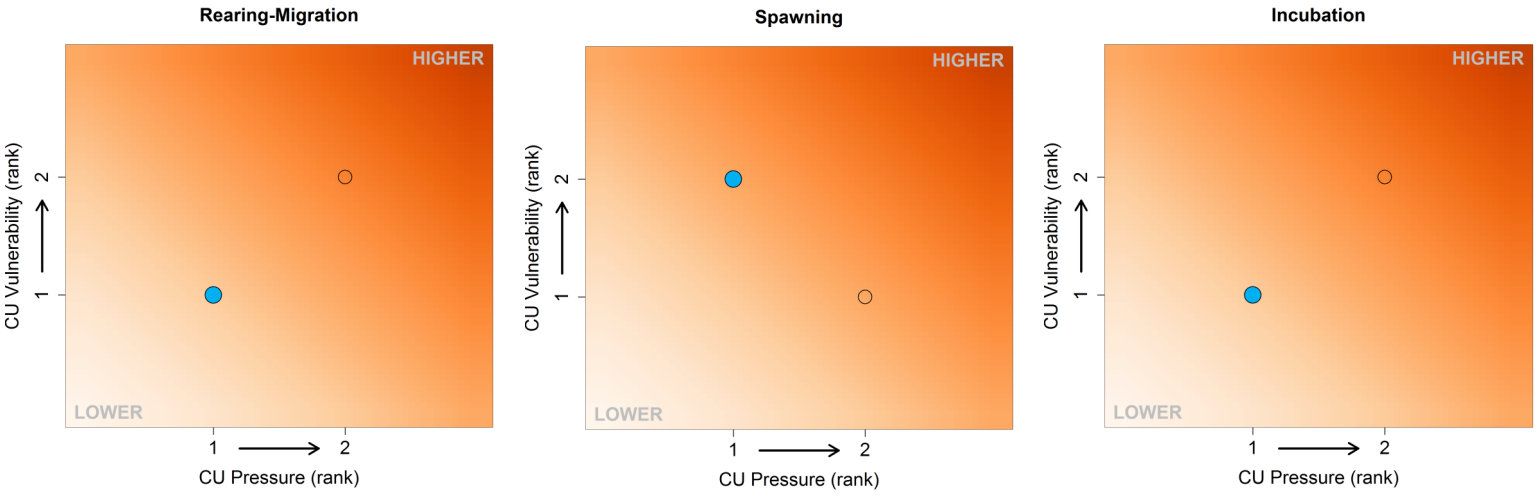


Cumulative pressure—spawning



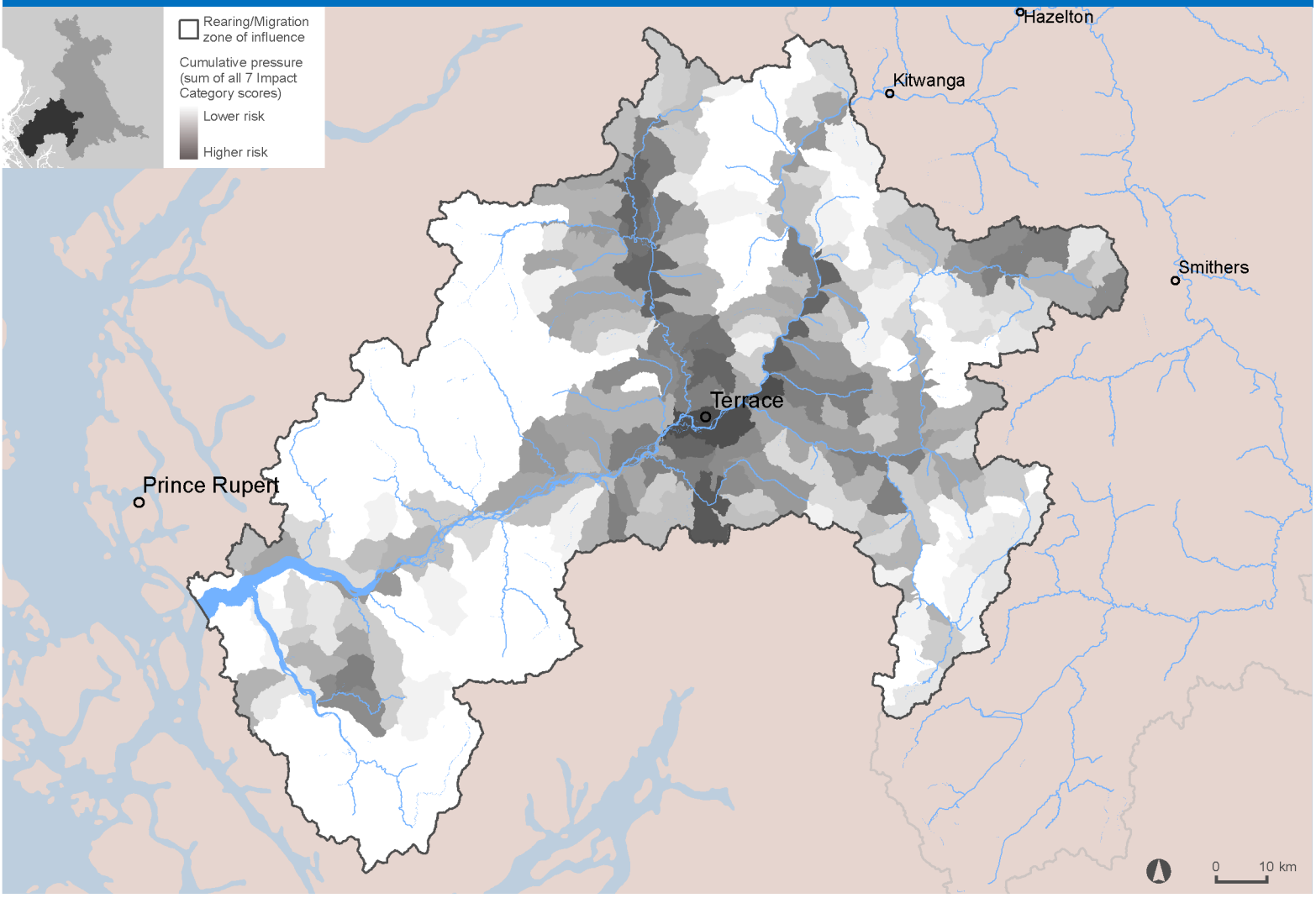
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Lower Skeena (odd) ○ = other odd-year Skeena Pink CUs



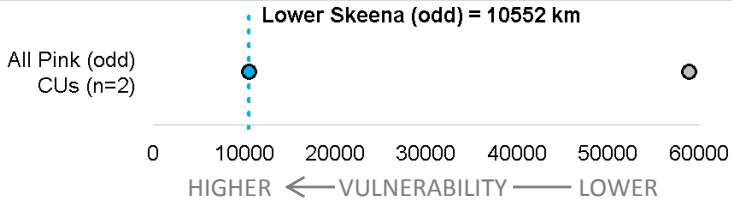
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

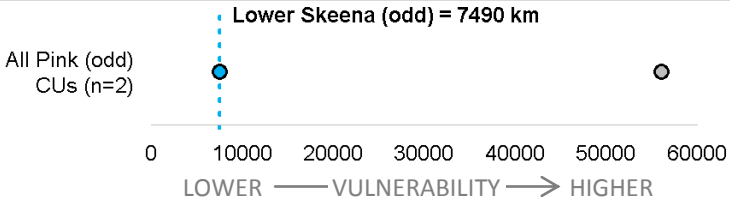


Rearing/Migration period vulnerability

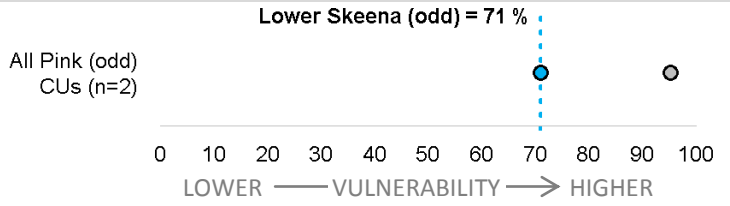
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



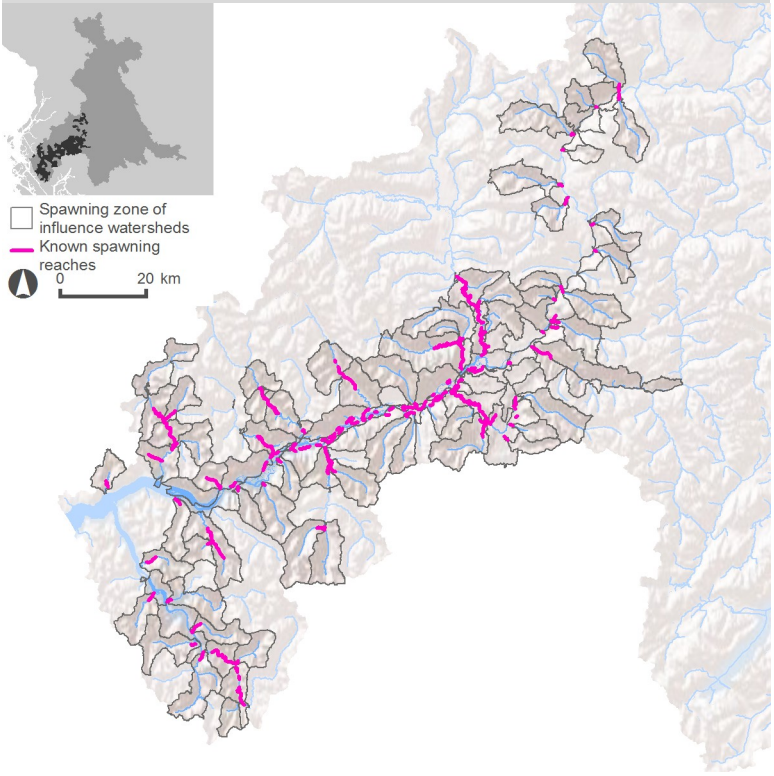
Flow sensitive accessible habitat (%) (all seasons)



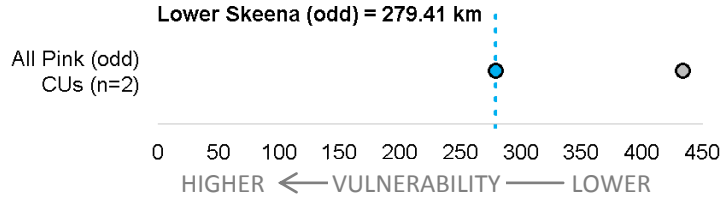
Spawning & incubation vulnerability

Spawning period vulnerability

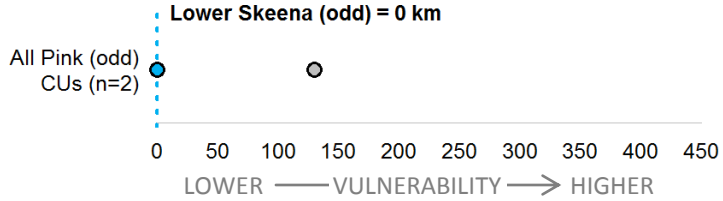
Spawning locations



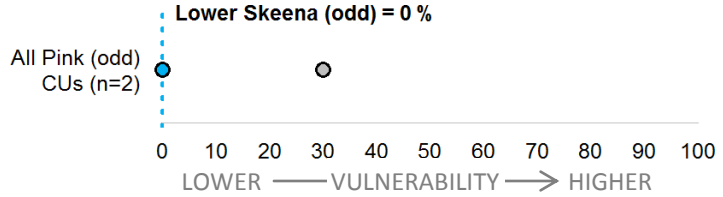
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

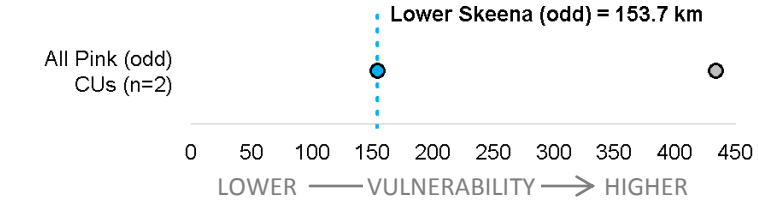


Spawning reaches summer flow sensitive - spawn timing (%)

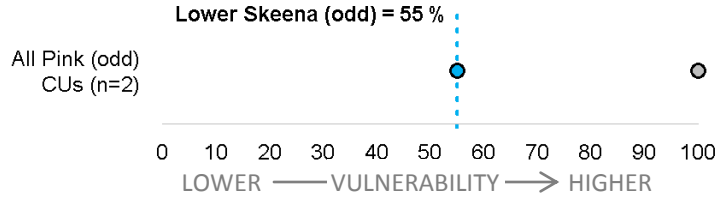


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



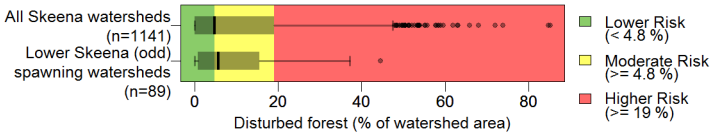
Spawning reaches winter flow sensitive - incubation timing (%)

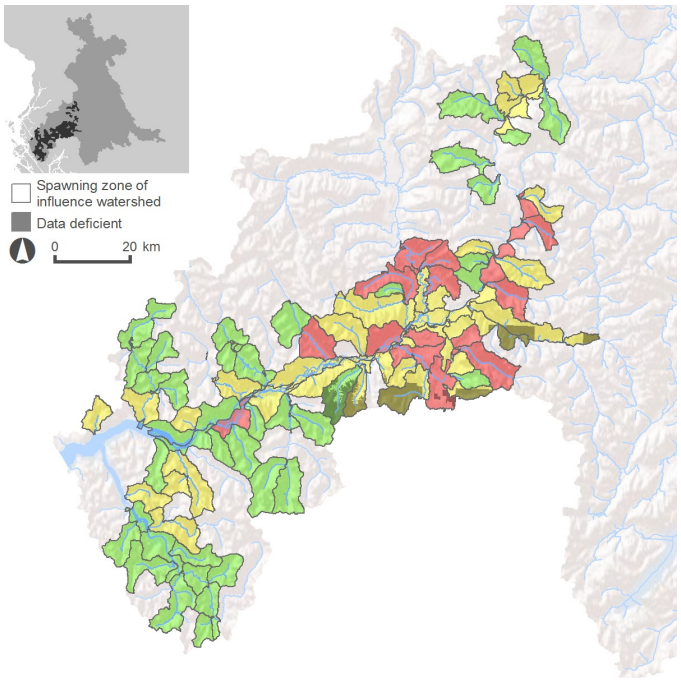


Spawning pressure

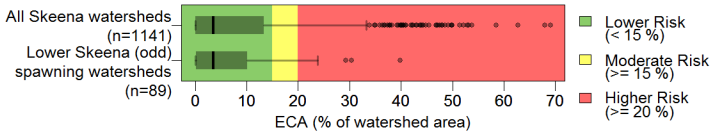
Hydrologic Processes

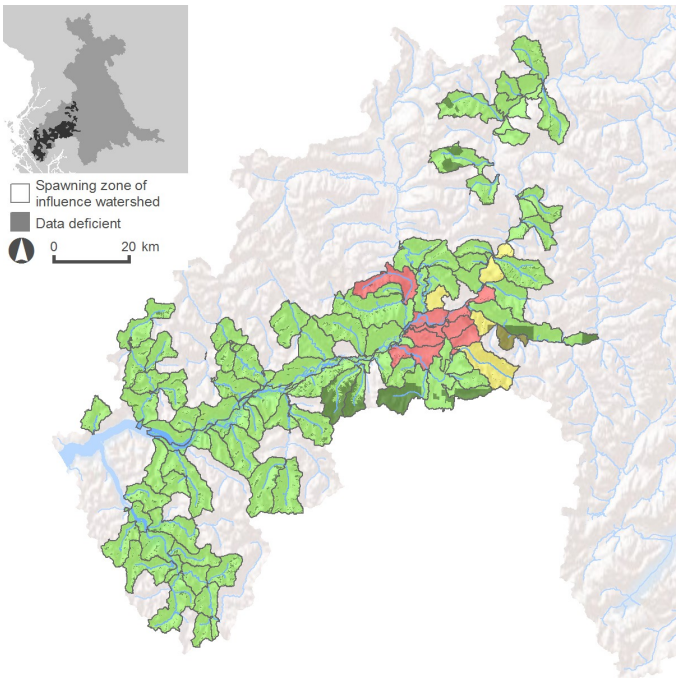
Forest disturbance





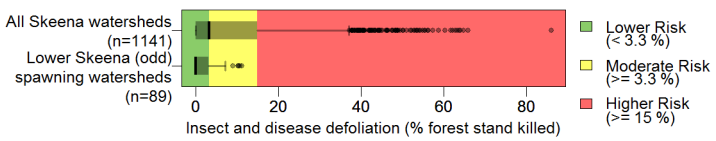
Equivalent Clear-cut Area

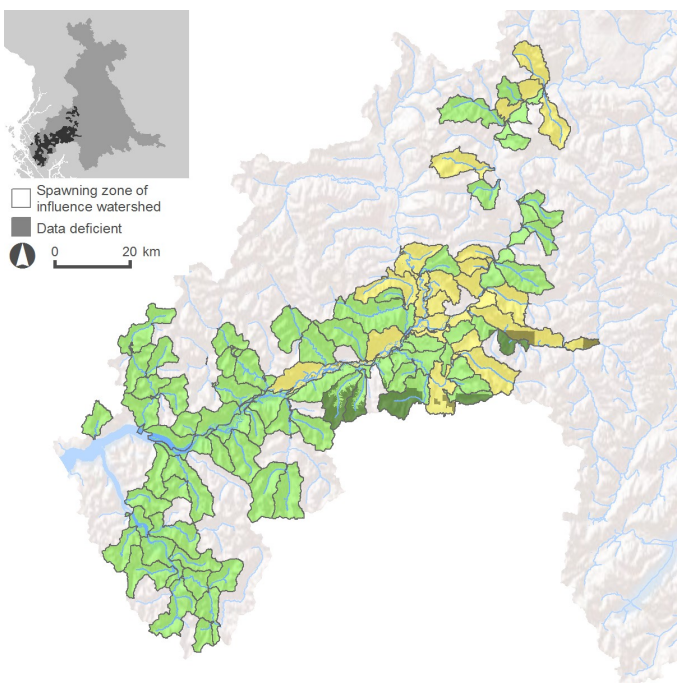




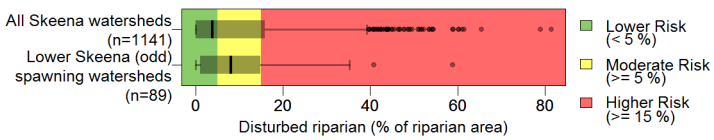
Vegetation Quality

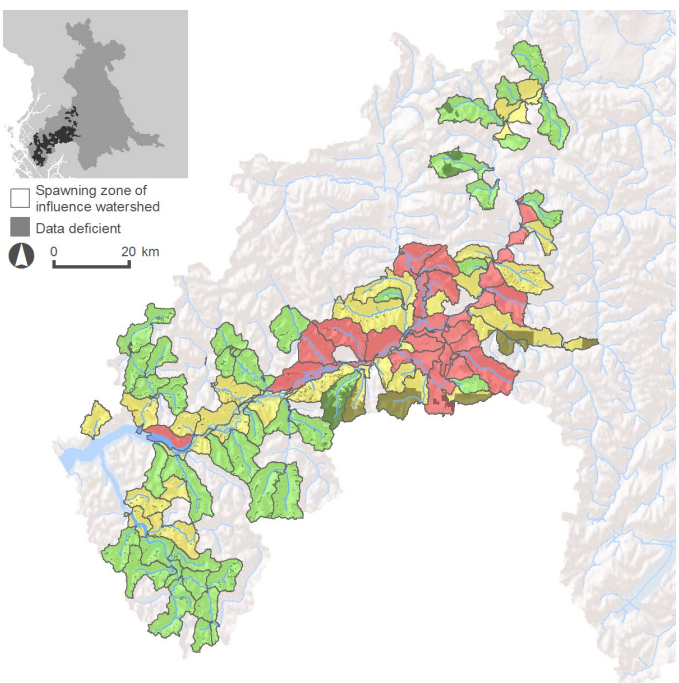
Insect and disease defoliation





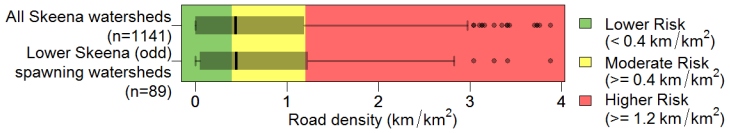
Riparian disturbance

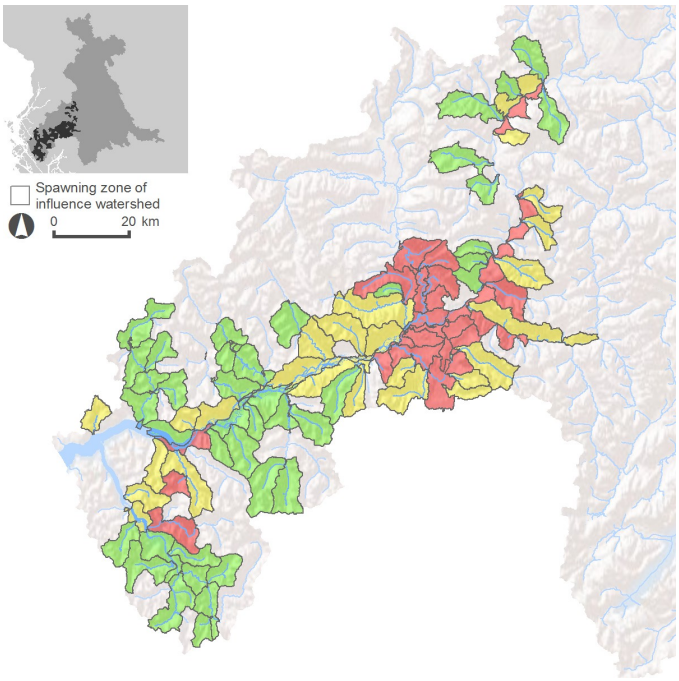




Surface Erosion

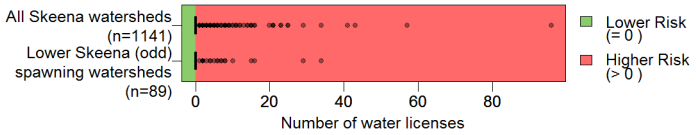
Road development

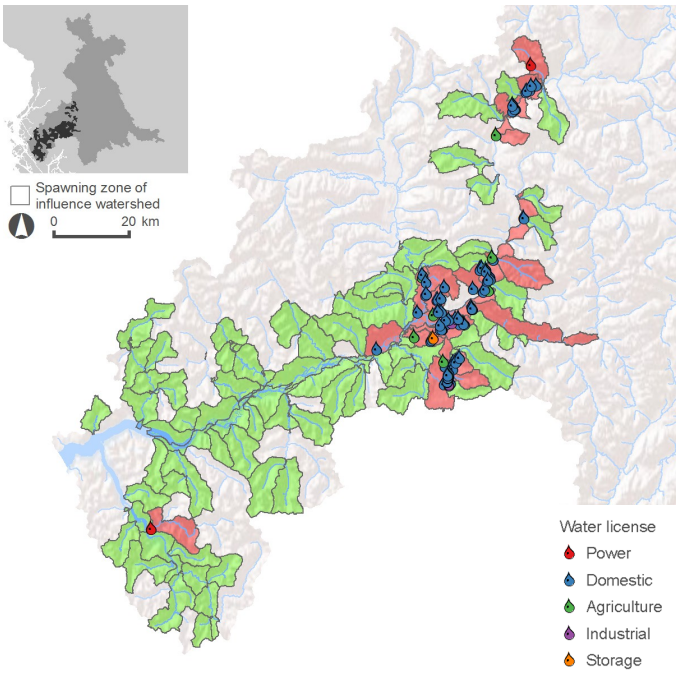




Water Quantity

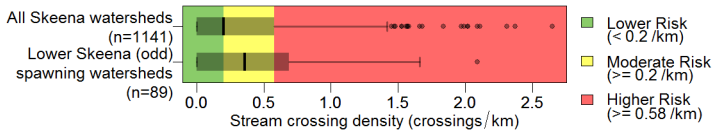
Number of water licenses

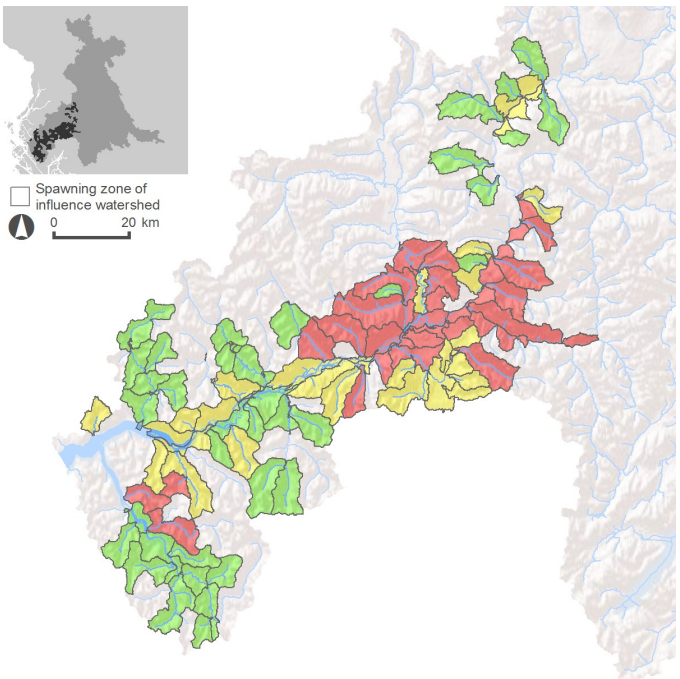




Fish Passage/Habitat Connectivity

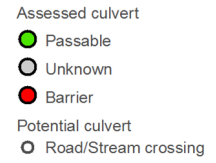
Stream crossing density

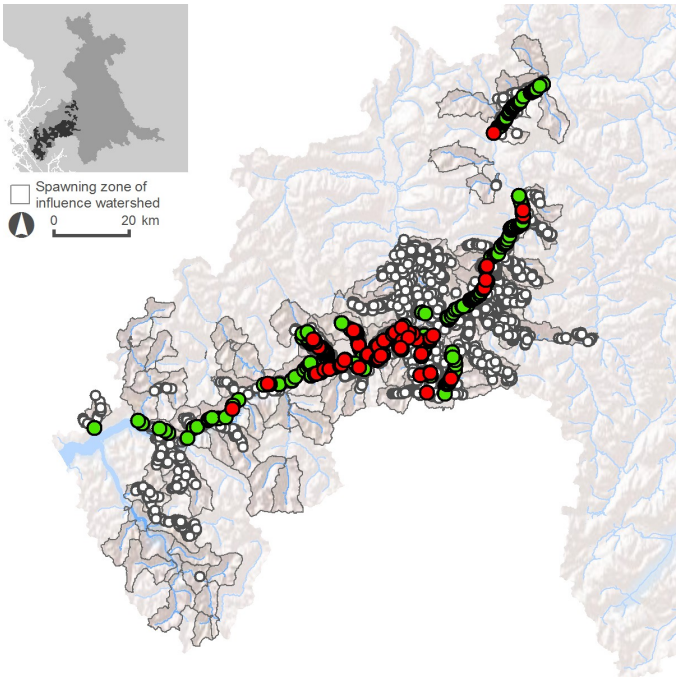




Culvert passability

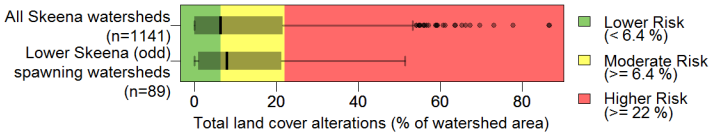
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

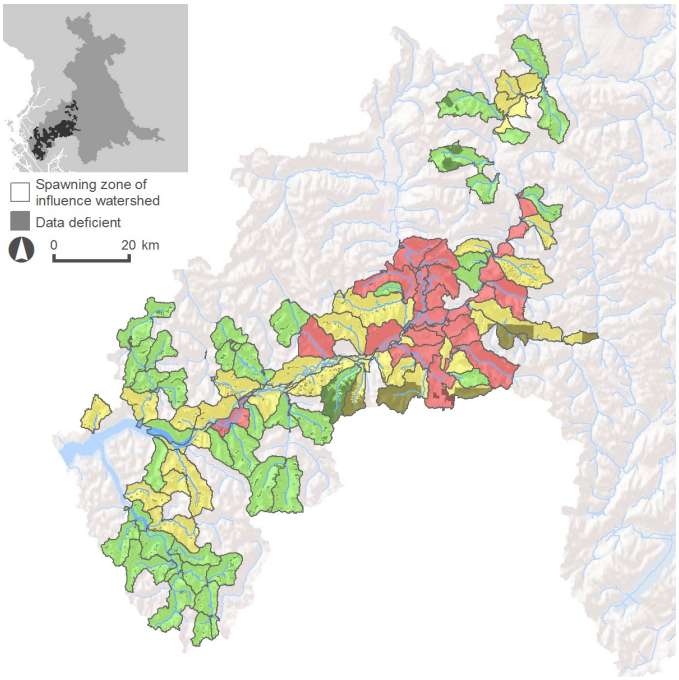




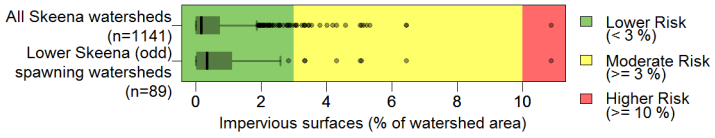
Human Development Footprint

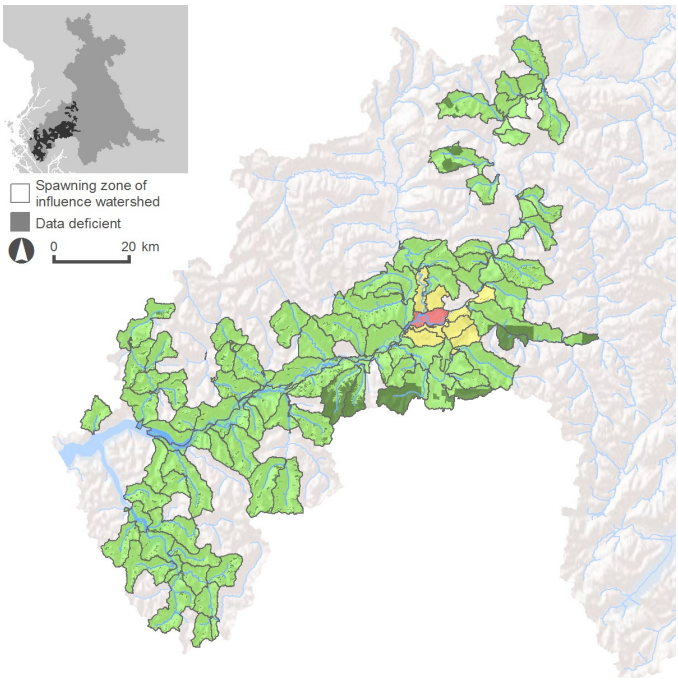
Total land cover alteration



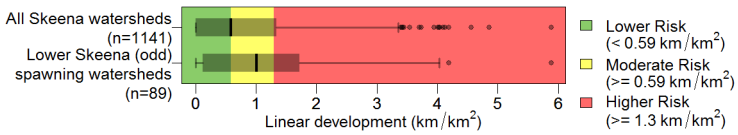


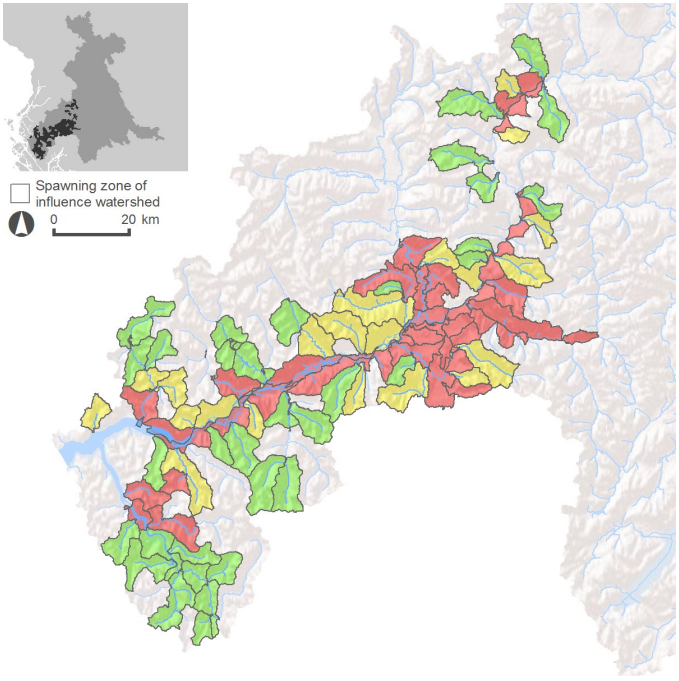
Impervious surfaces



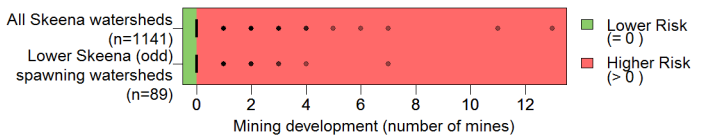


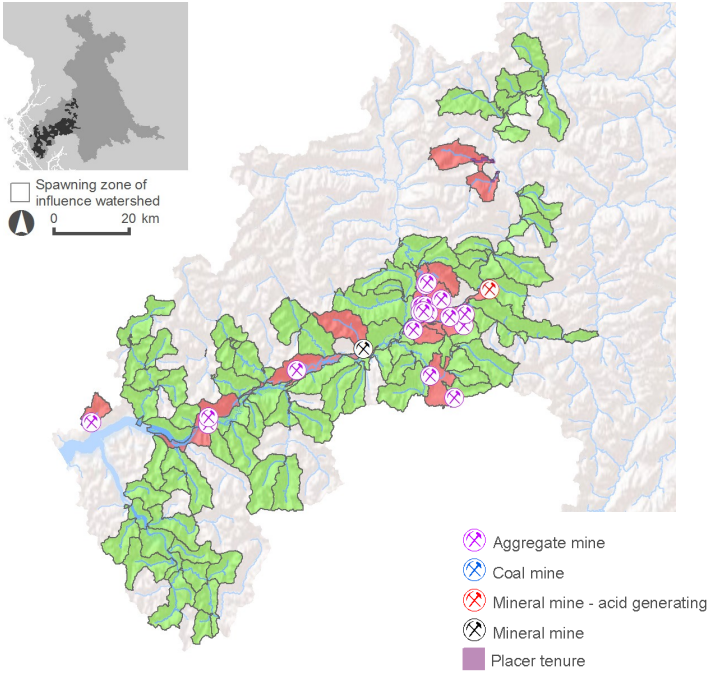
Linear development





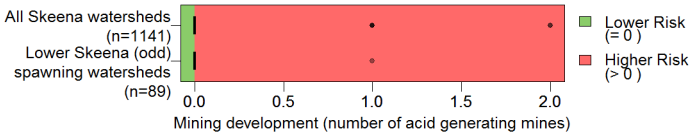
Mining development (total number of mines)

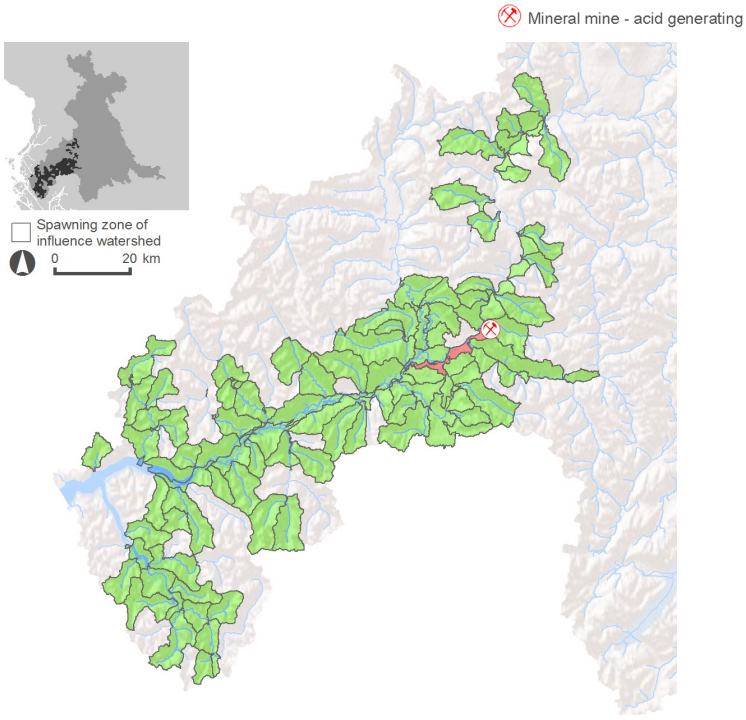




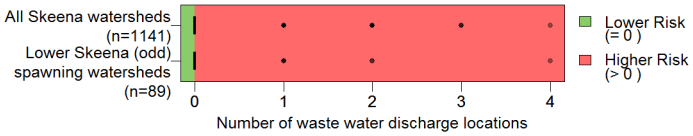
Water Quality

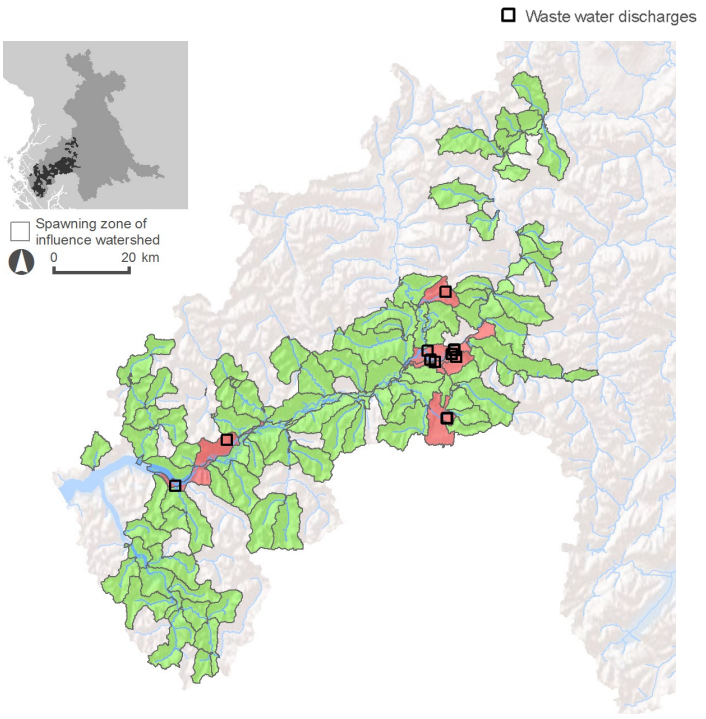
Mining development (acid generating mines)





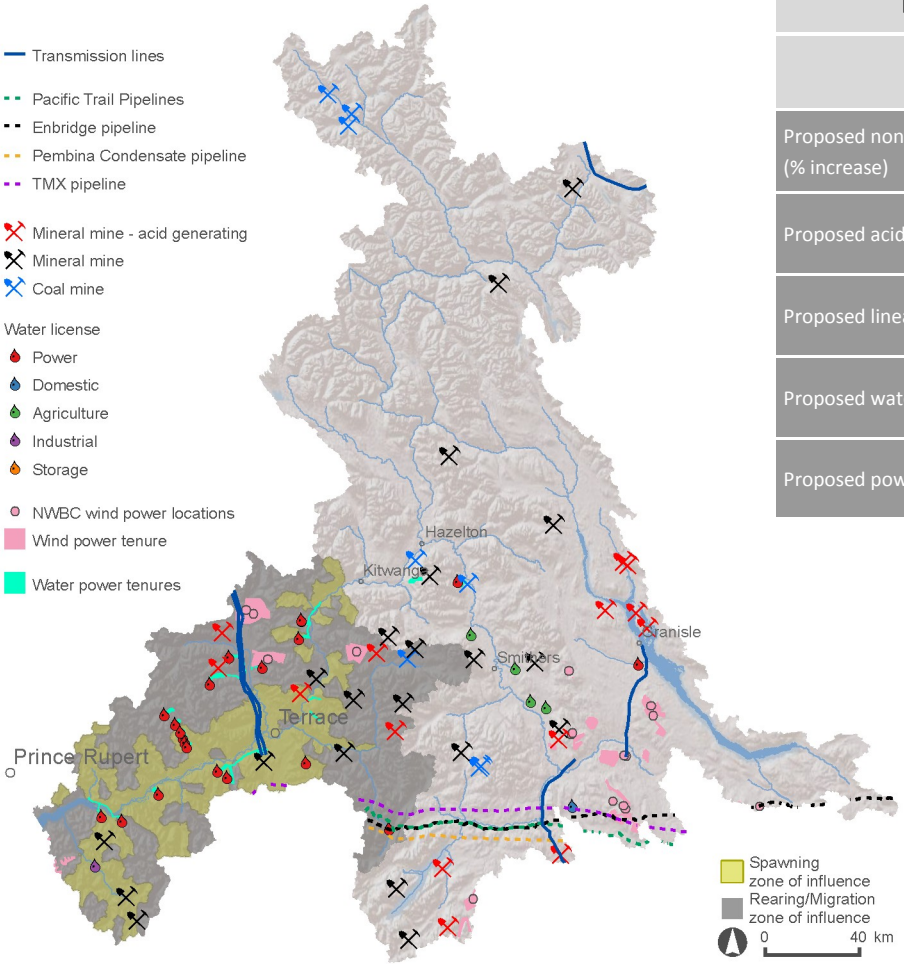
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Lower Skeena (odd) Pink CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	9 (12%)	3 (9%)
Proposed acid generating mines (% increase)	5 (250%)	1 (100%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.01 km/km^2 (1%)
Proposed water licenses (% increase)	27 (13%)	14 (8%)
Proposed power tenures	315 km^2	60 km^2

Skeena Salmon: Pink
Conservation Unit (CU)
Middle-Upper Skeena (odd)

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

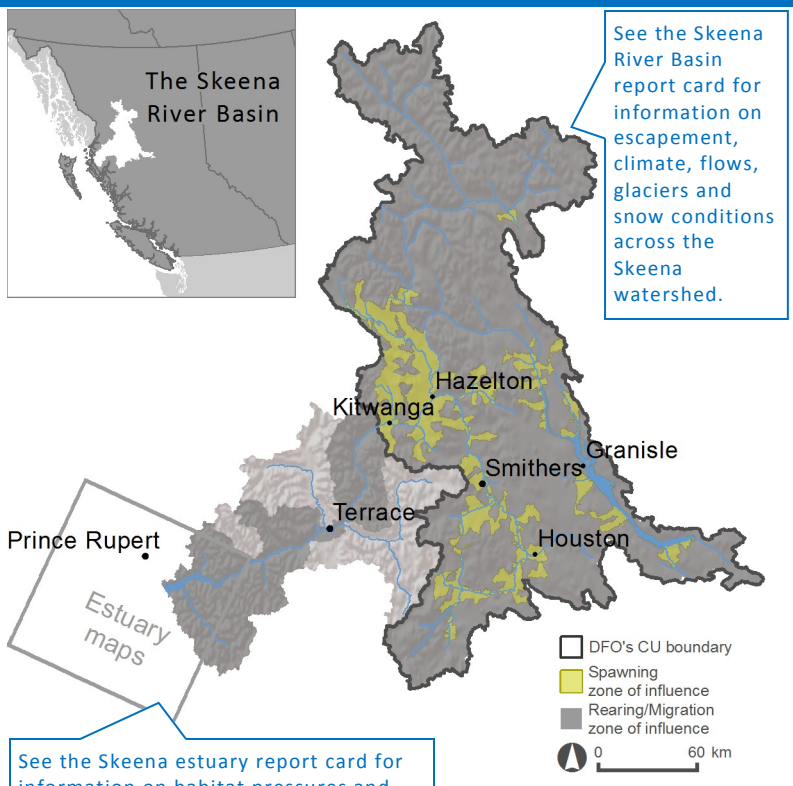
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
* Major shift in spawning habitat distribution occurred in Morice and Babine systems. Between 1950 and 1990, odd-year pink escapements have increased by a factor of thirteen in Babine River and minor upstream colonization in the Morrison, Pinkut, Fulton, Nine-mile, Twain, and Pierre systems. The odd-year Morice pink run has been expanding since construction of the Moricetown Canyon fishway in 1951 and was augmented with the removal of key rocks by blasting at Hagwilget Canyon in 1959. Pink salmon have not colonized many tributaries including the Nanika River.
* Winter low flows can freeze pink eggs, especially those laid in heavily utilized side and back channels that dry up. Large scale precipitation events can cause flooding, erosion, and siltation.
* The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
* Mature pink salmon bring massive amounts of marine nutrients into the mid and upper Skeena freshwater and riparian ecosystems;
* The majority of spawning habitat is in good condition.

Location



CU overview of habitat vulnerabilities & pressures

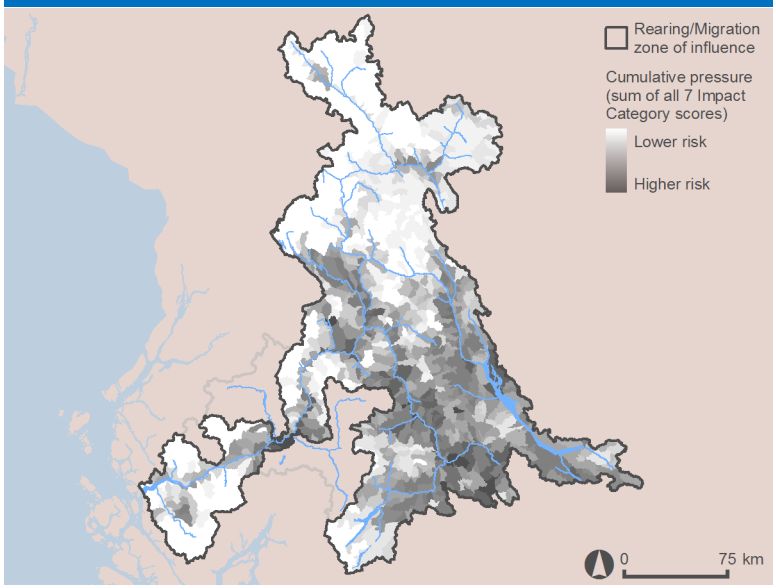
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

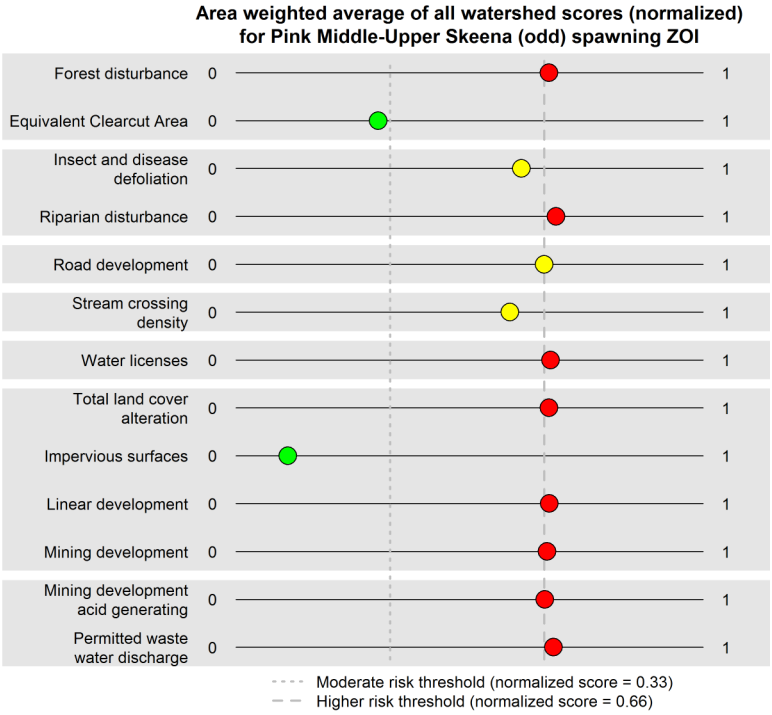
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

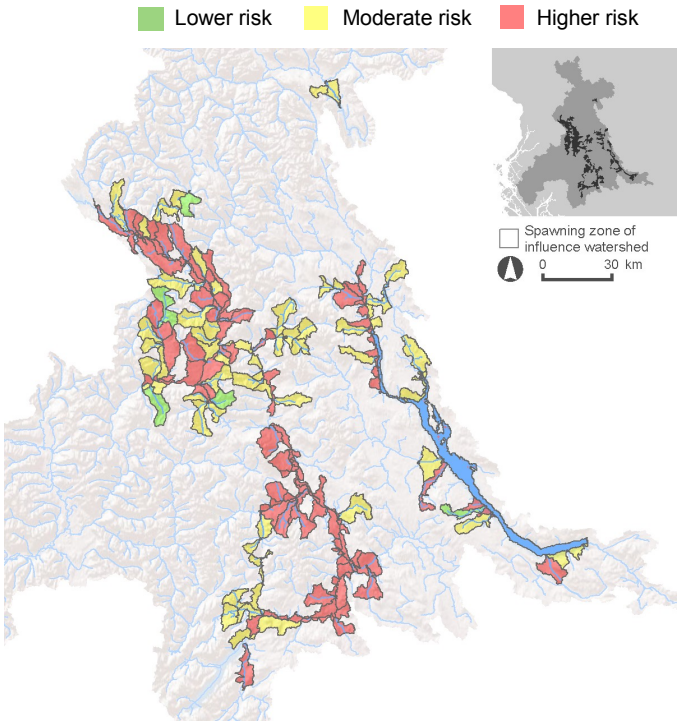
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

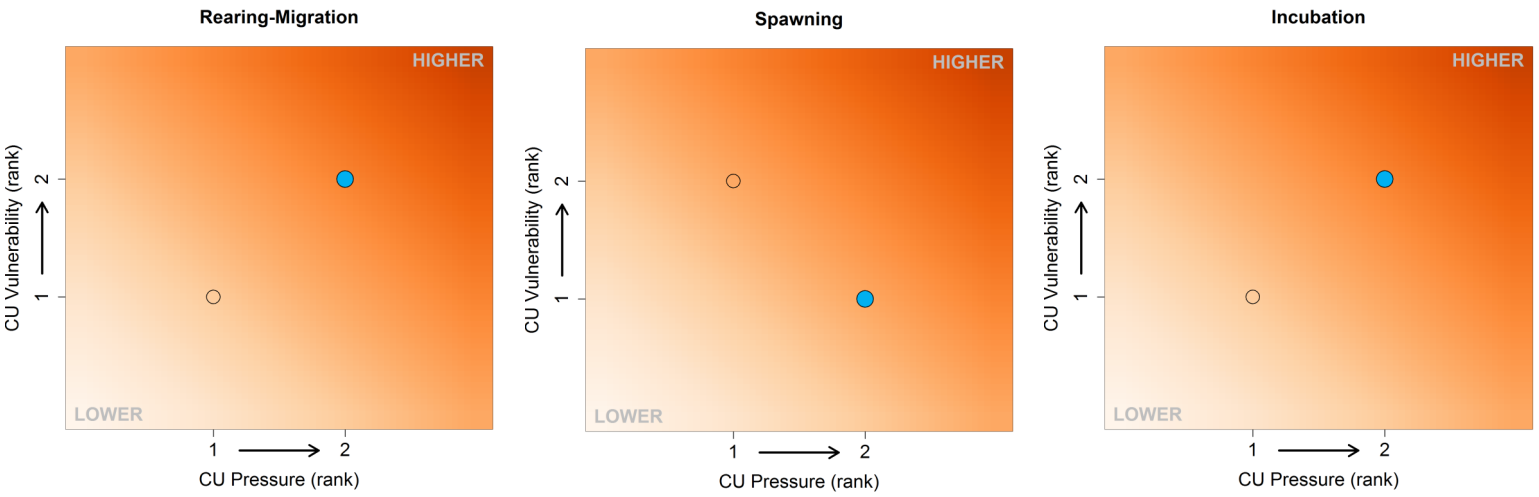


Cumulative pressure—spawning



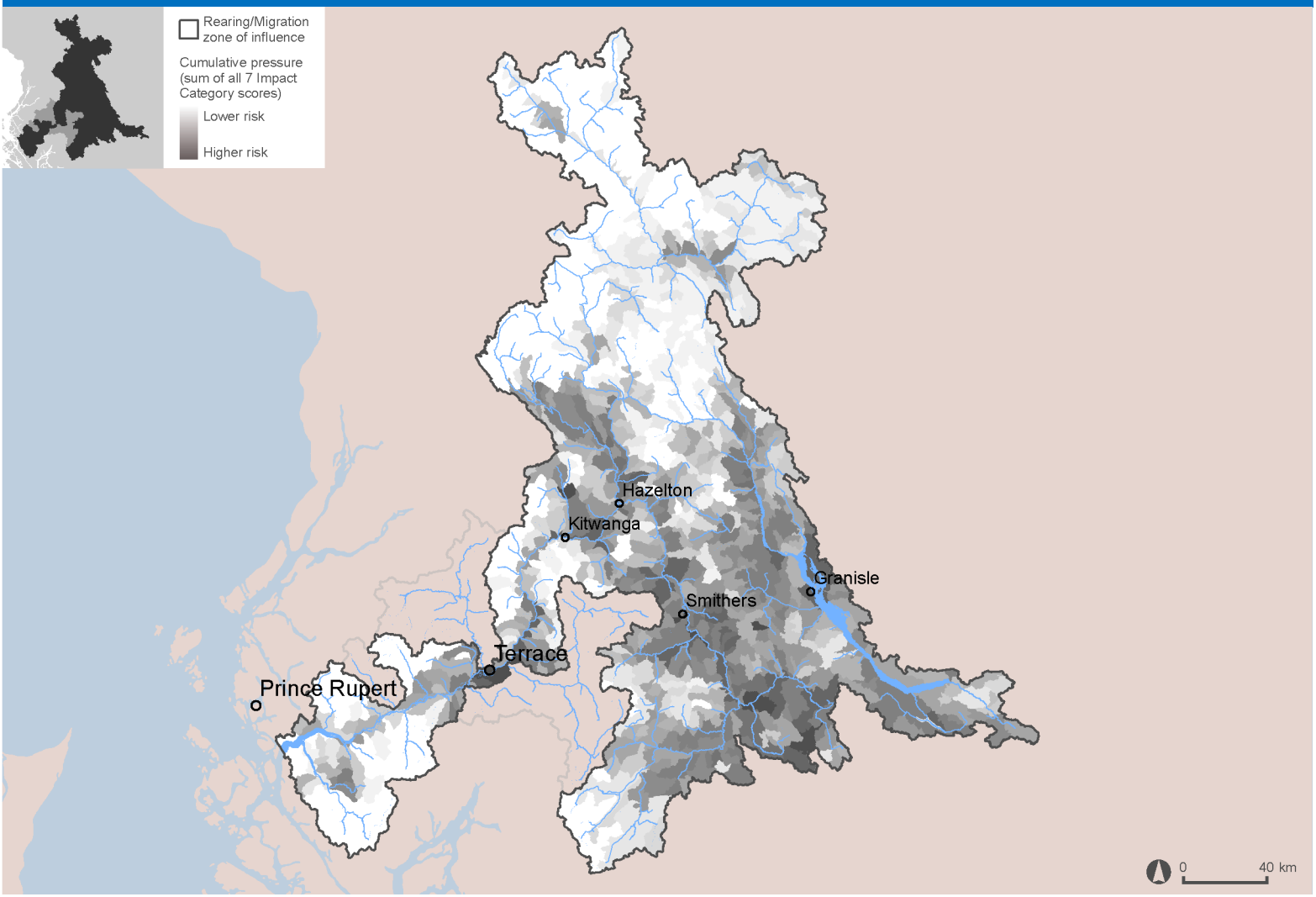
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Middle-Upper Skeena (odd) ○ = other odd-year Skeena Pink CUs



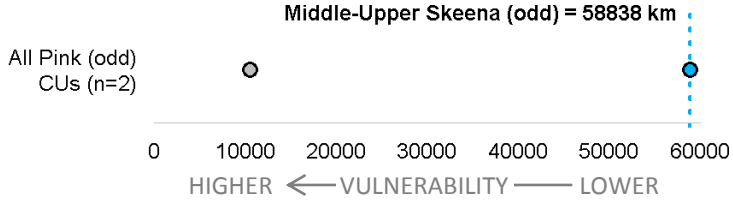
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

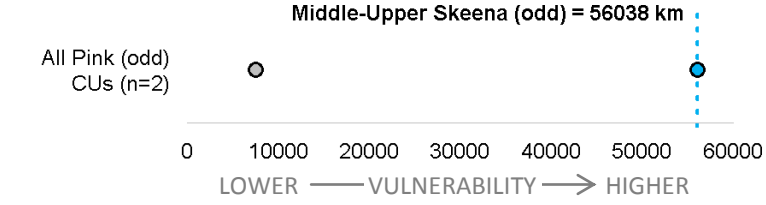


Rearing/Migration period vulnerability

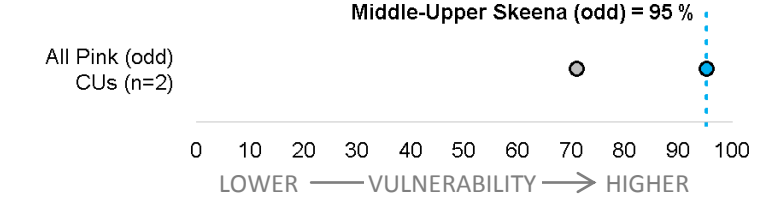
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



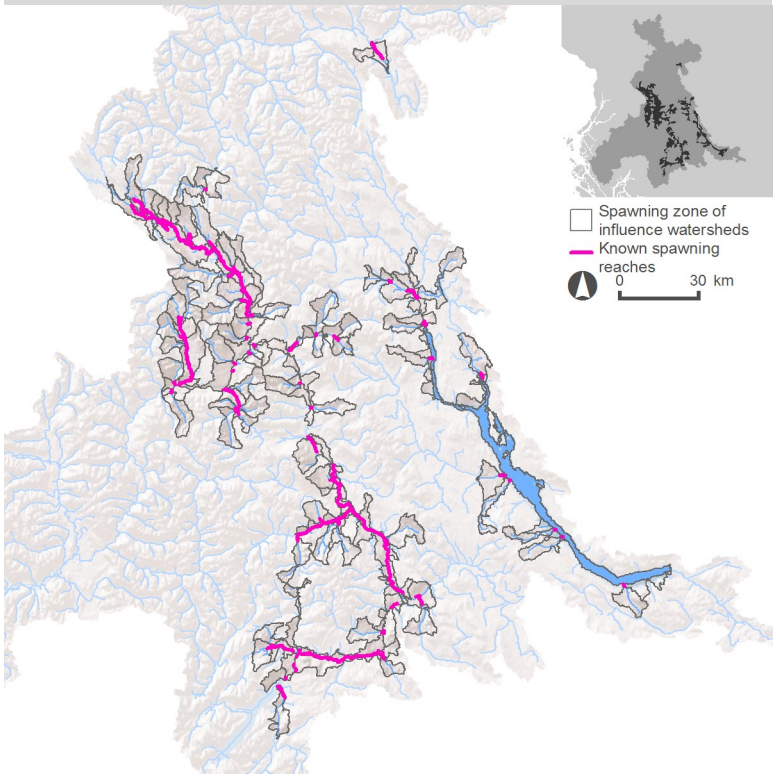
Flow sensitive accessible habitat (%) (all seasons)



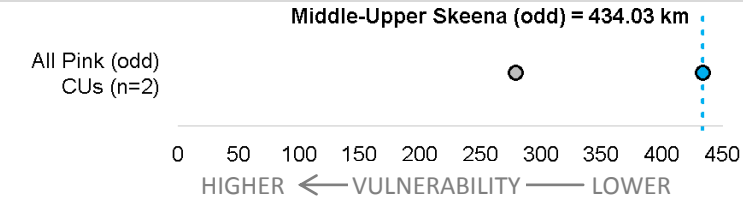
Spawning & incubation vulnerability

Spawning period vulnerability

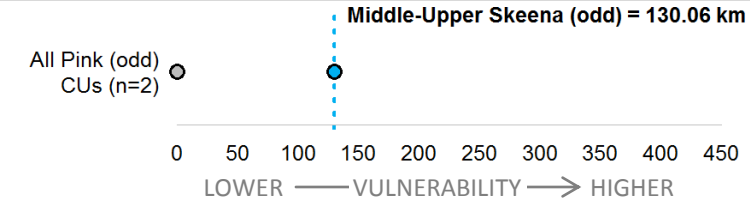
Spawning locations



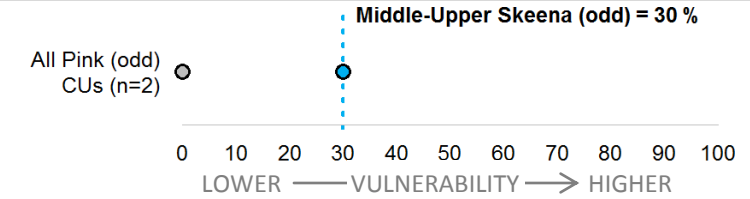
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

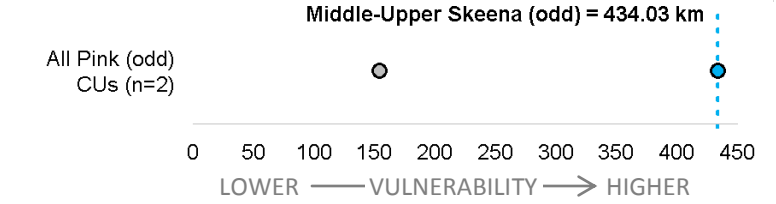


Spawning reaches summer flow sensitive - spawn timing (%)

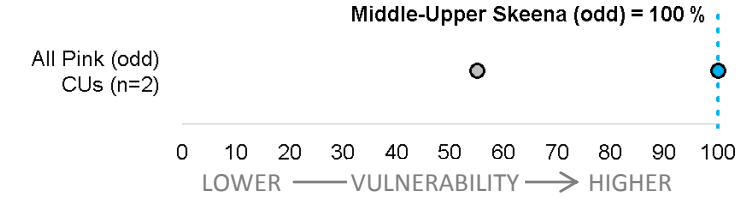


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



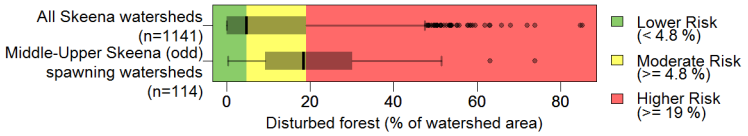
Spawning reaches winter flow sensitive - incubation timing (%)

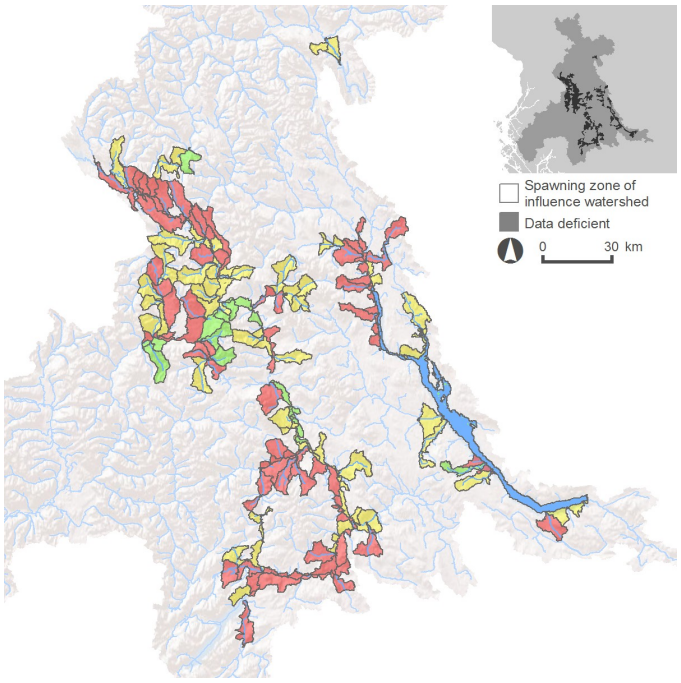


Spawning pressure

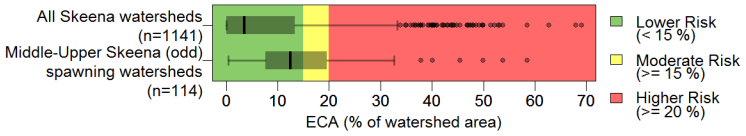
Hydrologic Processes

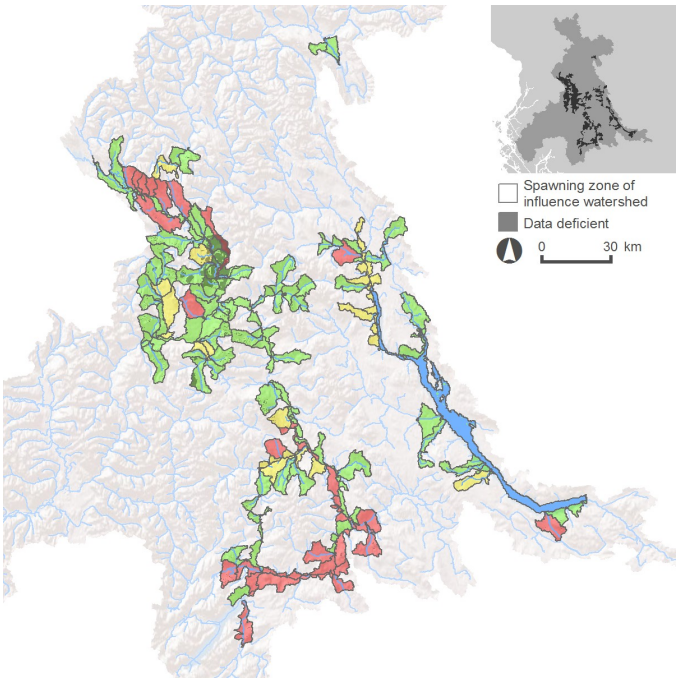
Forest disturbance





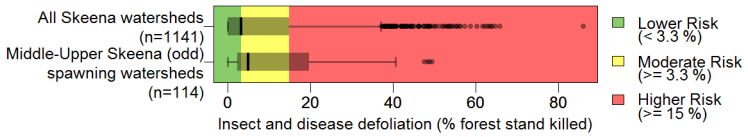
Equivalent Clear-cut Area

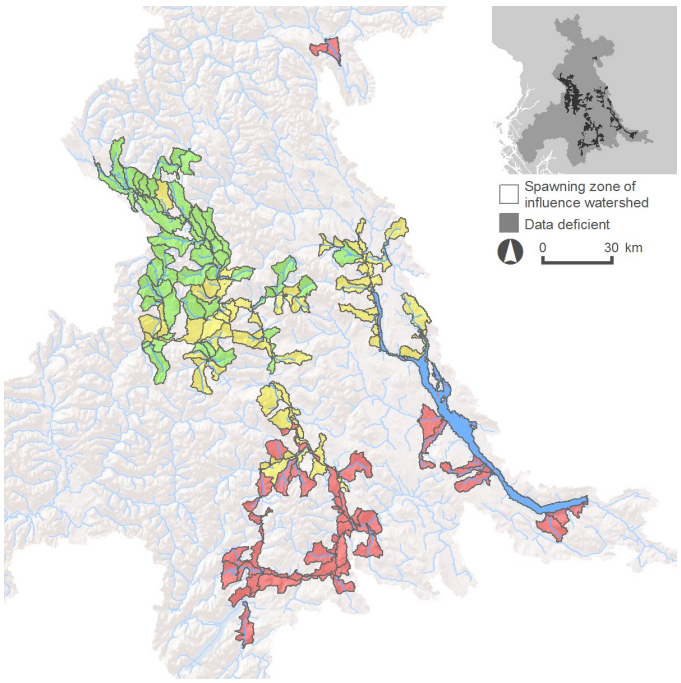




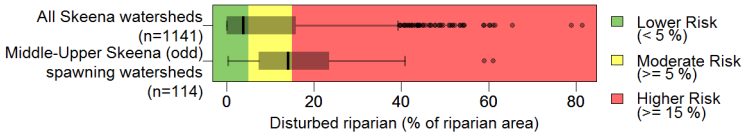
Vegetation Quality

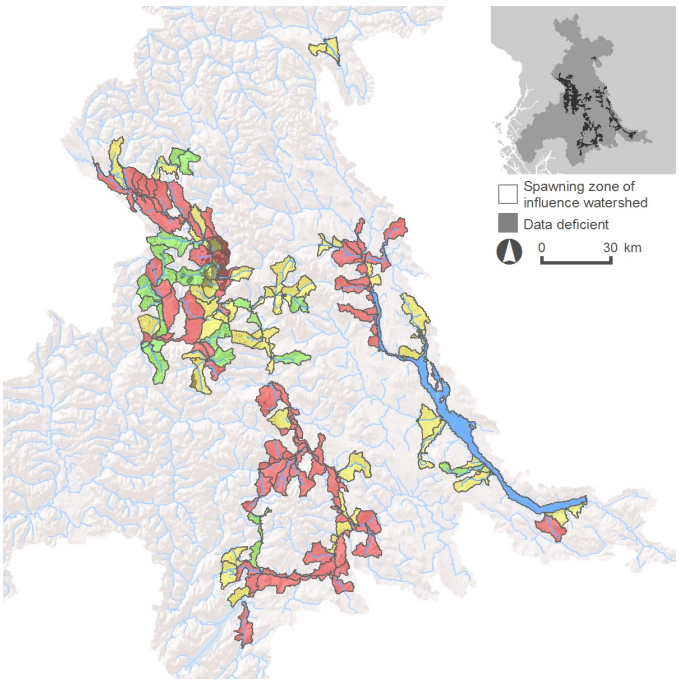
Insect and disease defoliation





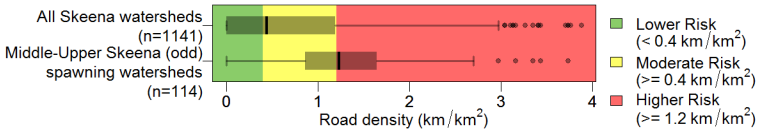
Riparian disturbance

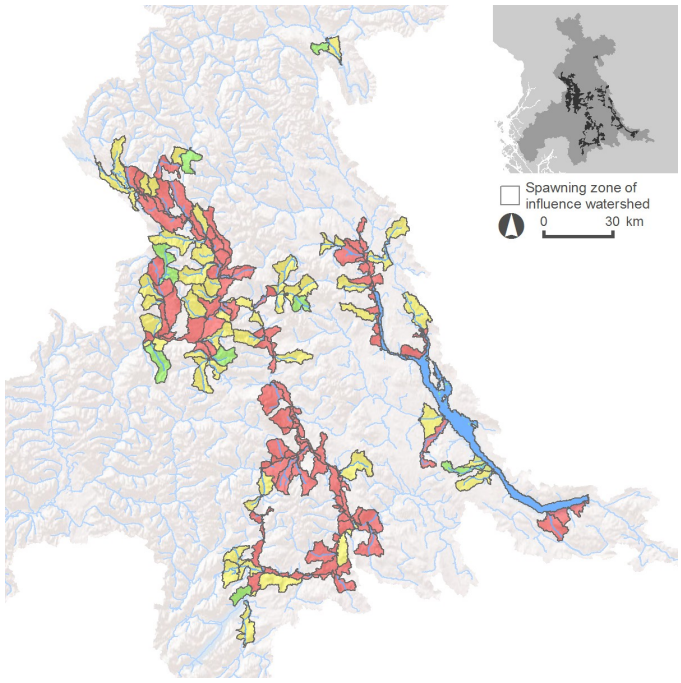




Surface Erosion

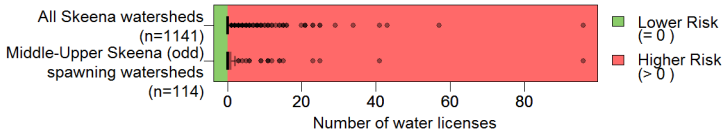
Road development

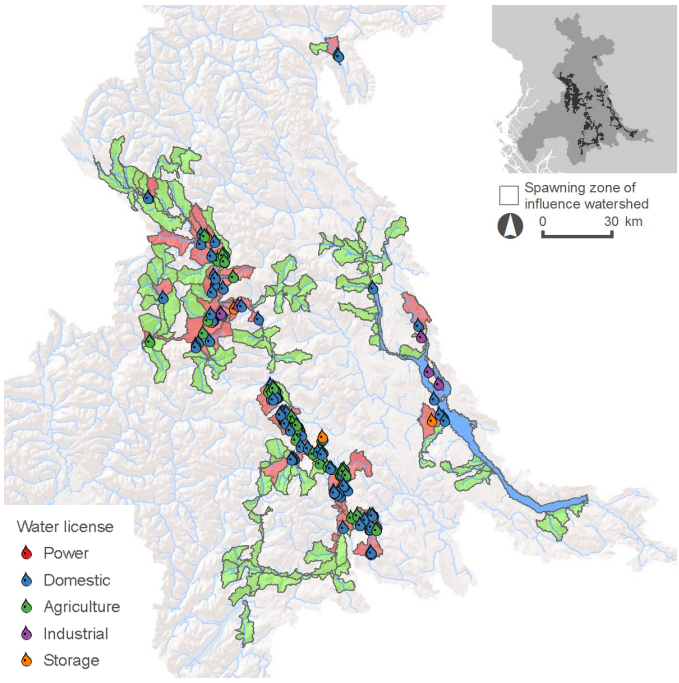




Water Quantity

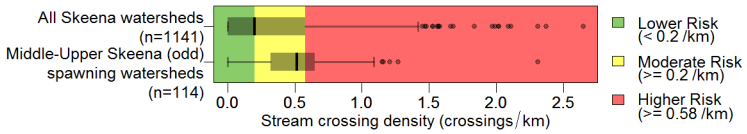
Number of water licenses

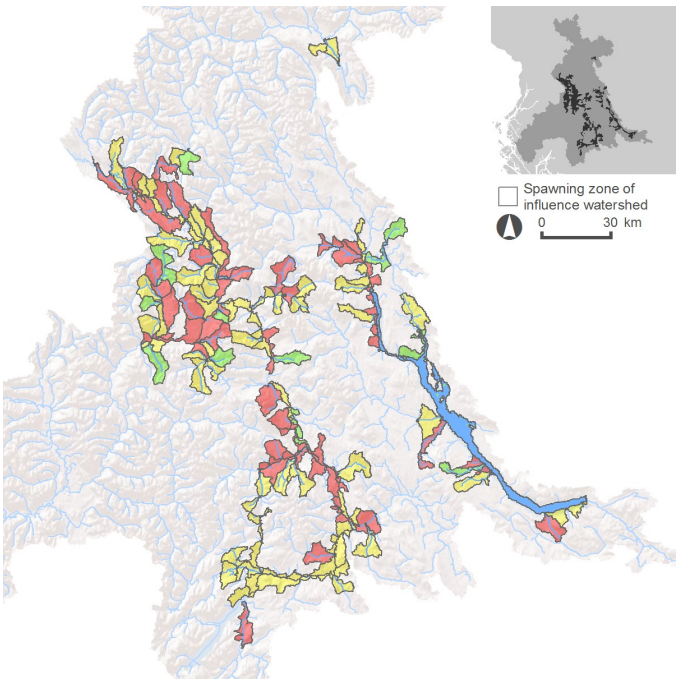




Fish Passage/Habitat Connectivity

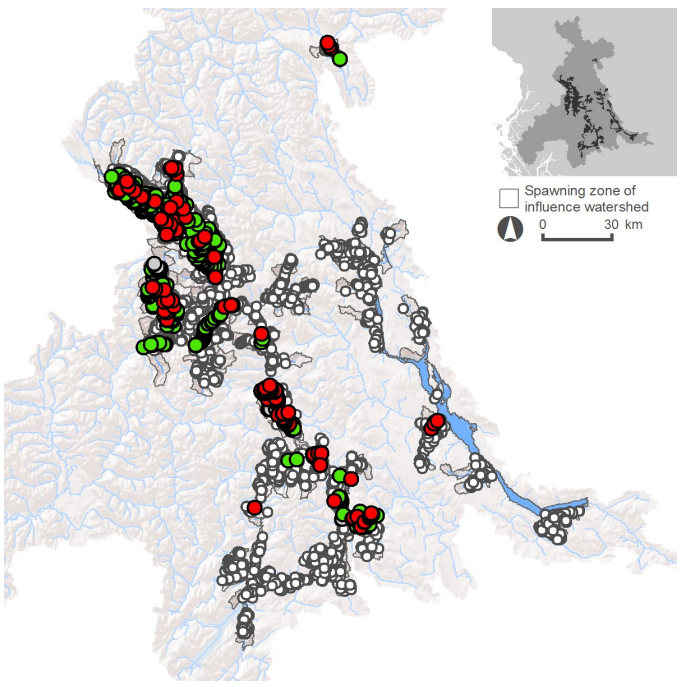
Stream crossing density





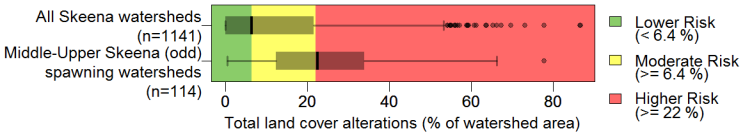
Culvert passability

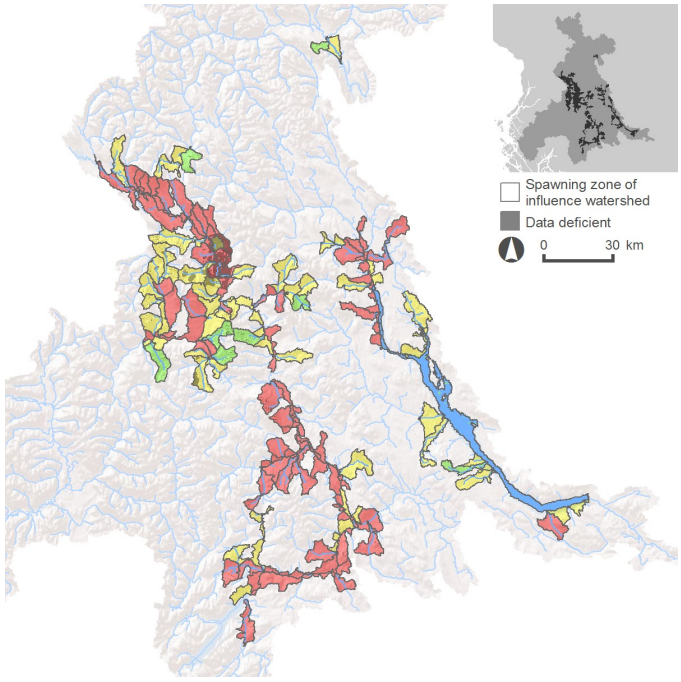
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



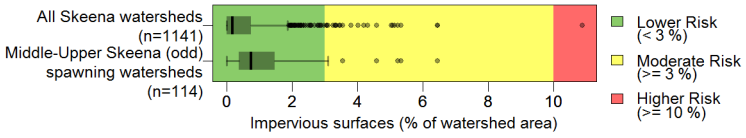
Human Development Footprint

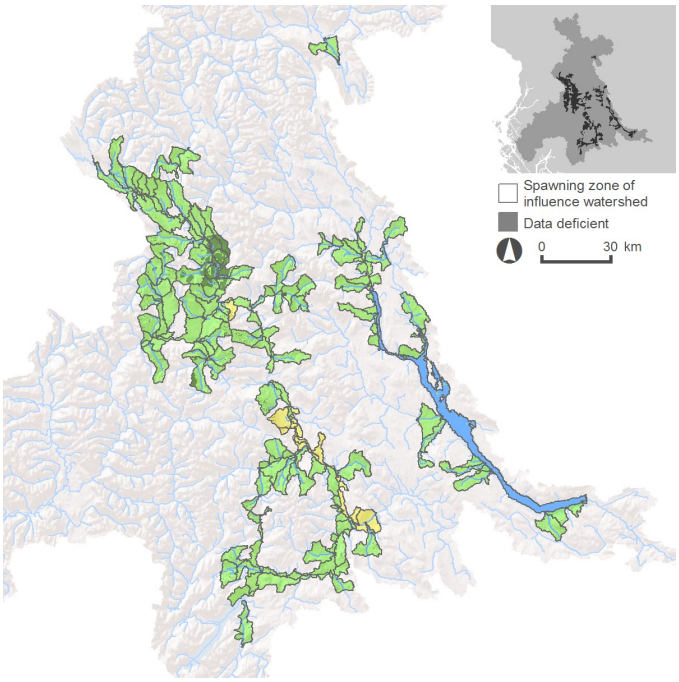
Total land cover alteration



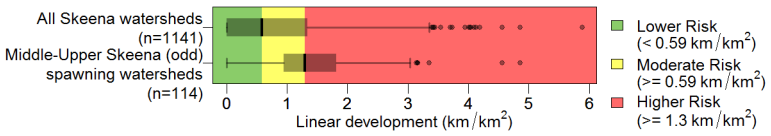


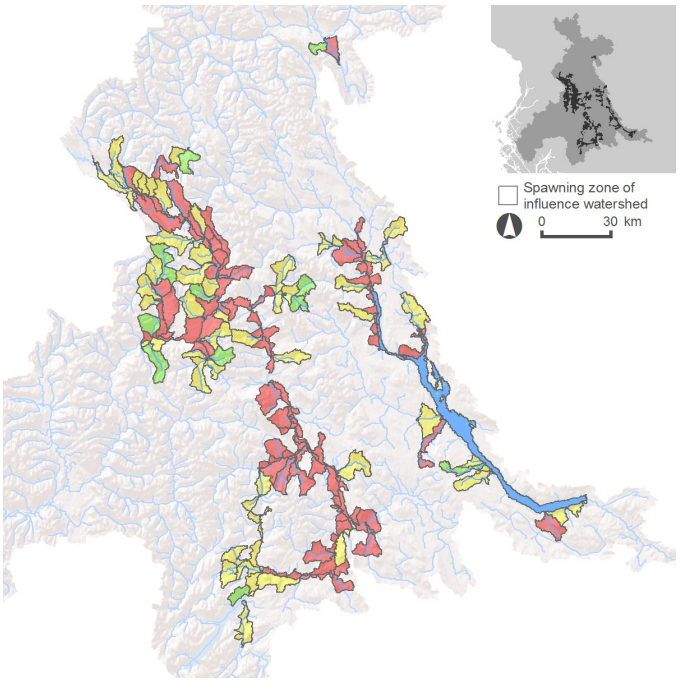
Impervious surfaces



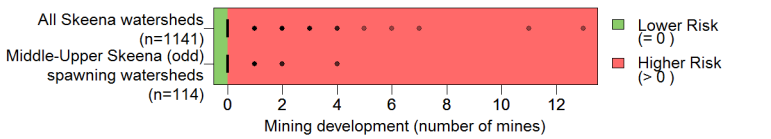


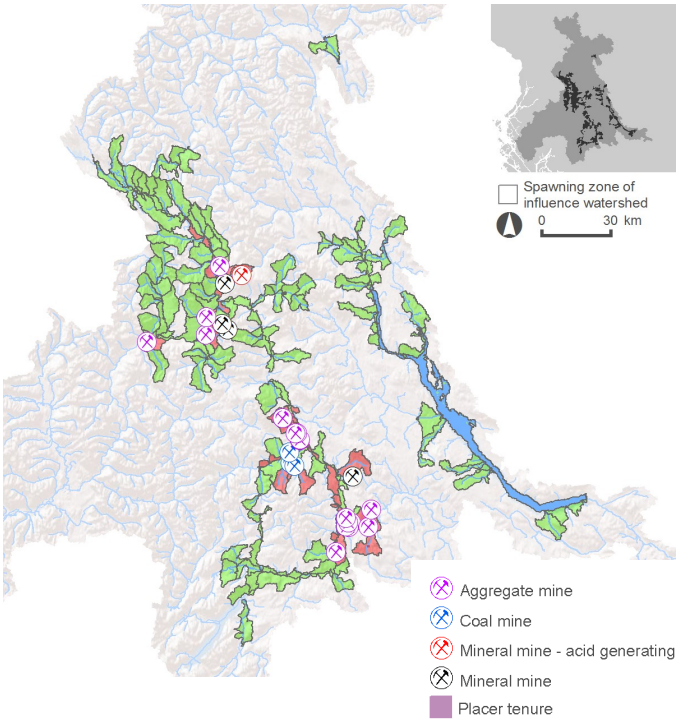
Linear development





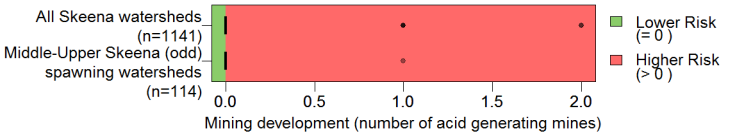
Mining development (total number of mines)

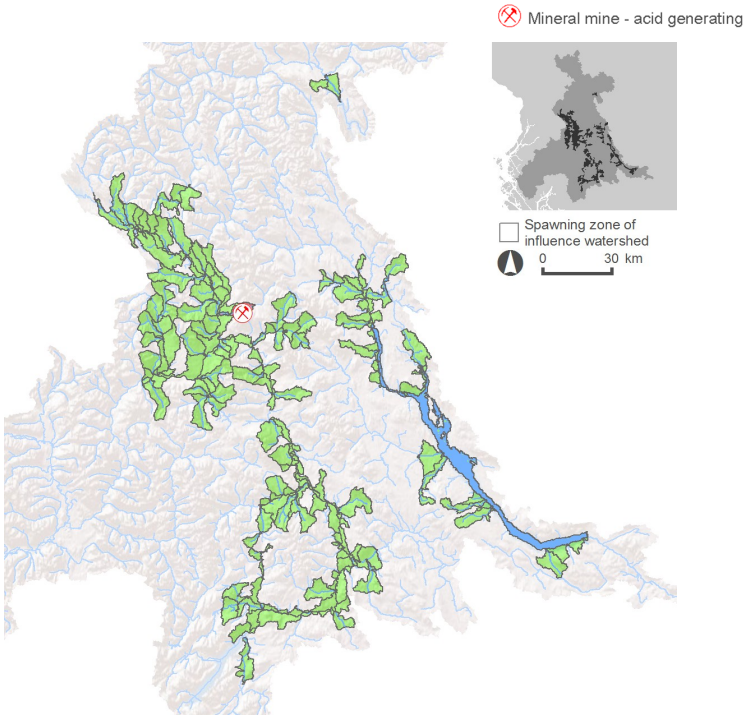




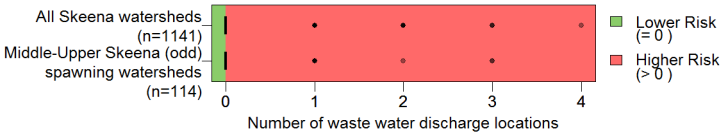
Water Quality

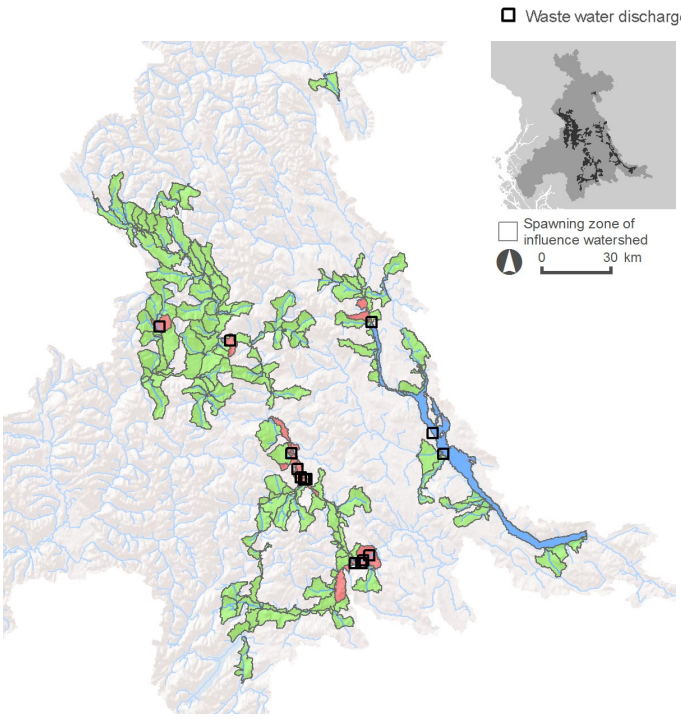
Mining development (acid generating mines)





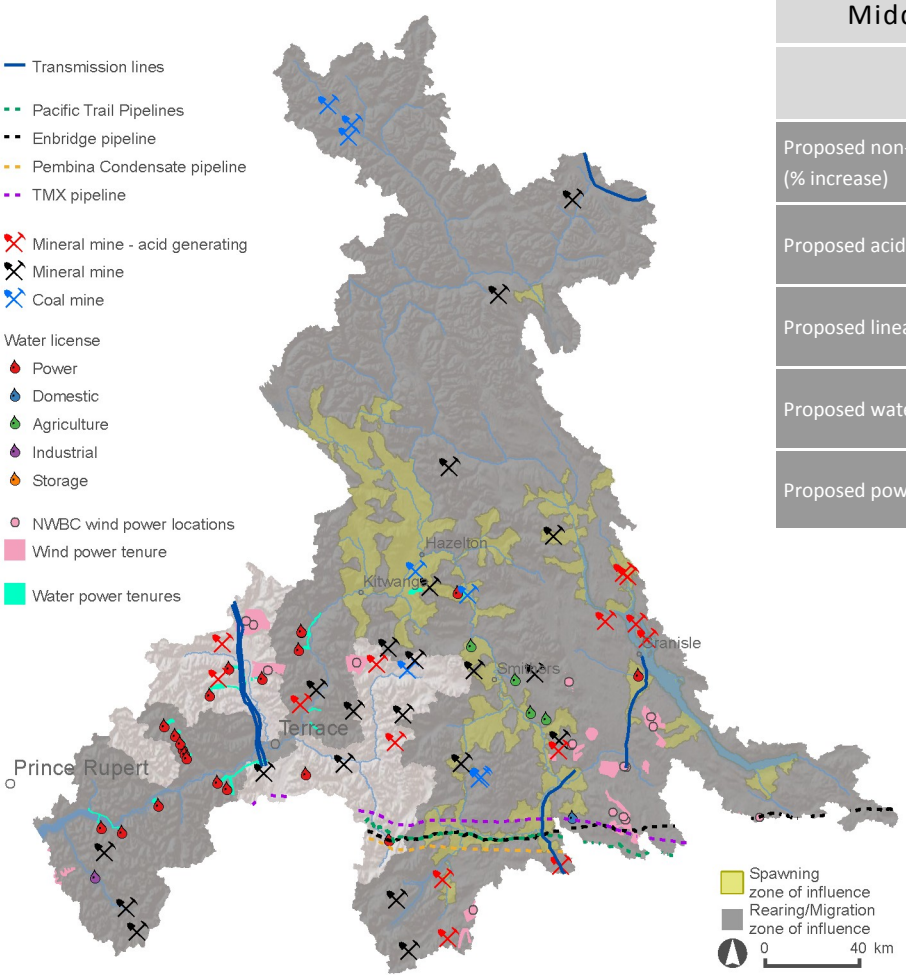
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Middle-Upper Skeena (odd) Pink CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	20 (19%)	3 (11%)
Proposed acid generating mines (% increase)	11 (157%)	2 (200%)
Proposed linear development (% increase)	0.01 km/km^2 (2%)	0.03 km/km^2 (2%)
Proposed water licenses (% increase)	26 (3%)	3 (0.9%)
Proposed power tenures	342 km^2	32 km^2

Skeena Salmon: Pink
Conservation Unit (CU)
Middle-Upper Skeena (even)

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

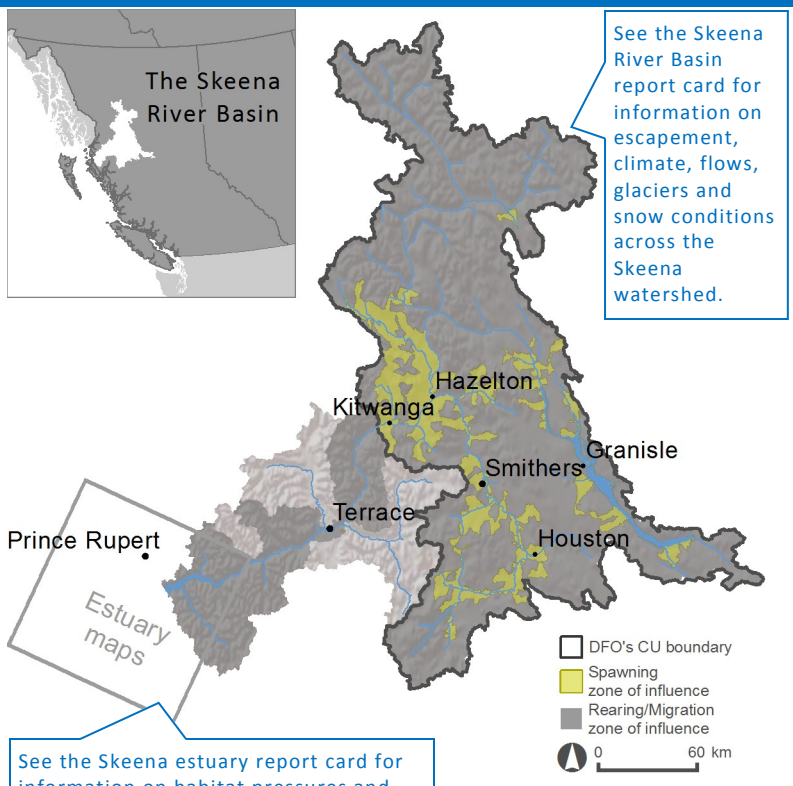
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
* Moderate shift in spawning habitat occurred in the Babine systems. Between 1950 and 1990, even-year pink escapements have increased by a factor of seventeen in Babine River with small amounts of upstream colonization in the Morrison, Pinkut, Fulton, Nine-mile, Twain, and Pierre systems. It wasn't until the 1980s that the even-year Morice pink run began rapidly expanding habitat and abundance, particularly into Morice River, Reach 2.
* The principal limiting factor with egg-to-fry survival is dewatered and frozen pink eggs caused by winter low flows drying up heavily utilized side-channels areas. Siltation and scouring are infrequent problems usually related to major rain-on-snow events.
* The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
* Even-year pink salmon bring massive amounts of marine nutrients into the upper Skeena freshwater and riparian ecosystems.
* The majority of spawning habitat is in good to excellent condition.

Location



CU overview of habitat vulnerabilities & pressures

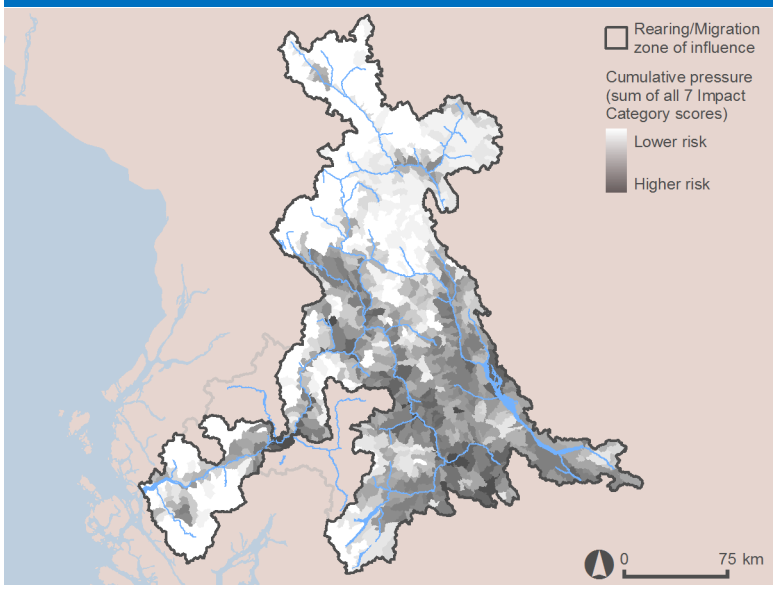
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

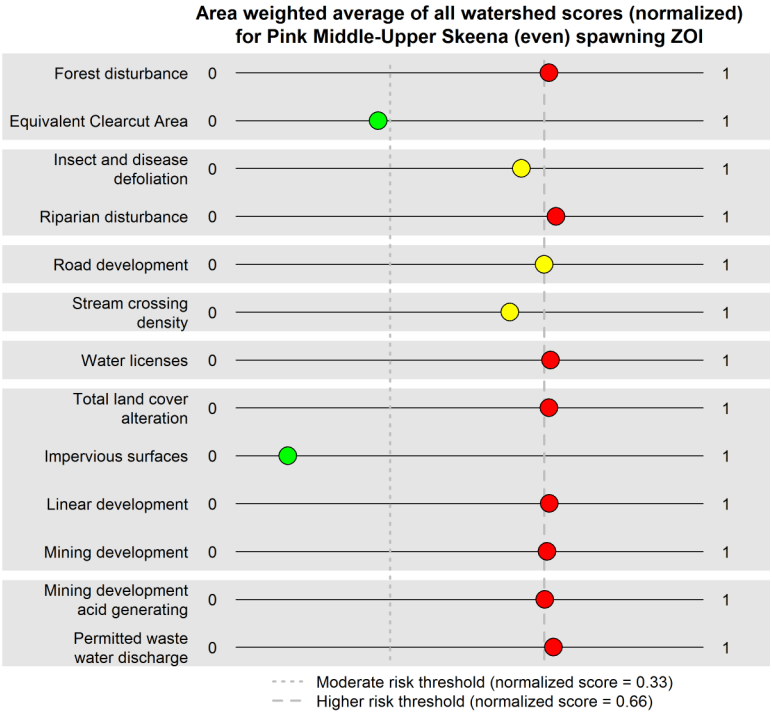
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

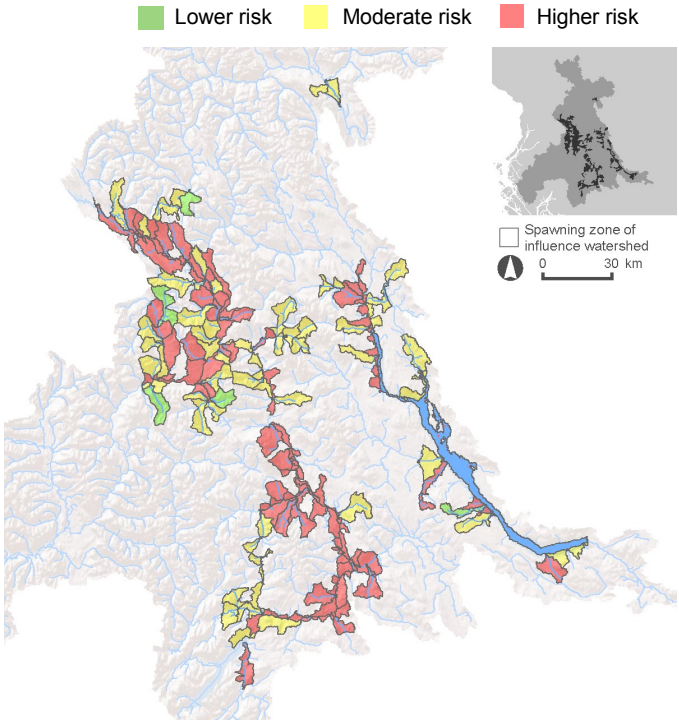
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

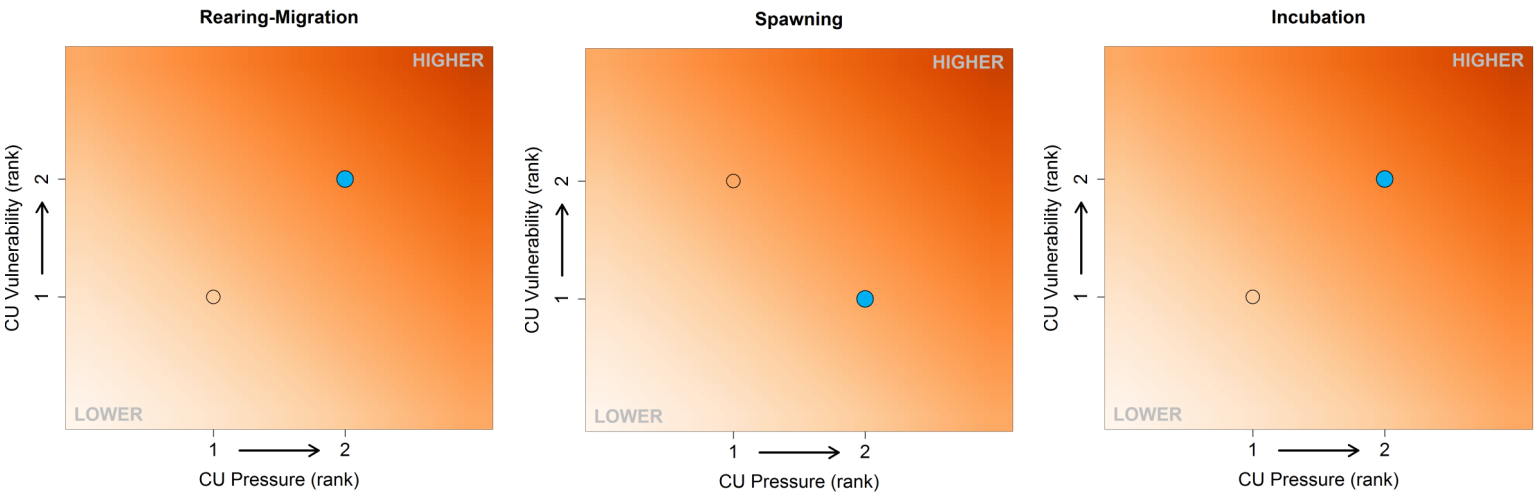


Cumulative pressure—spawning



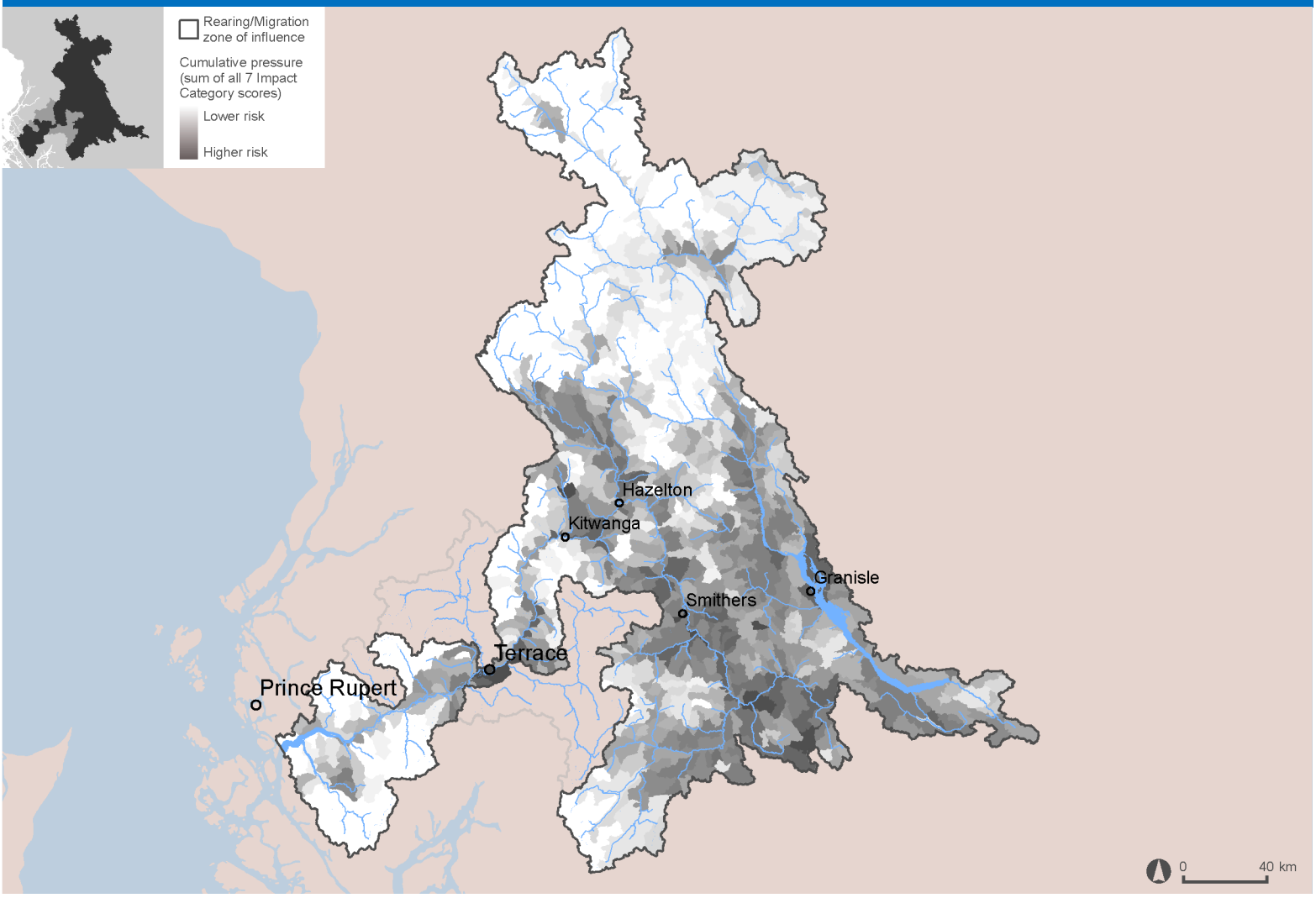
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Middle-Upper Skeena (even) ○ = other even-year Skeena Pink CUs



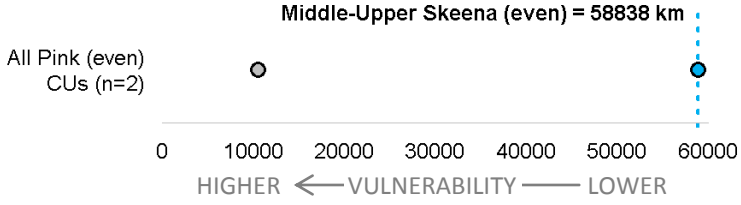
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

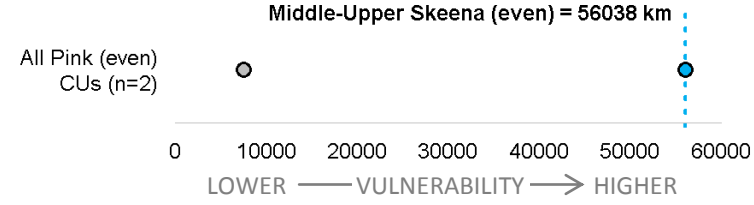


Rearing/Migration period vulnerability

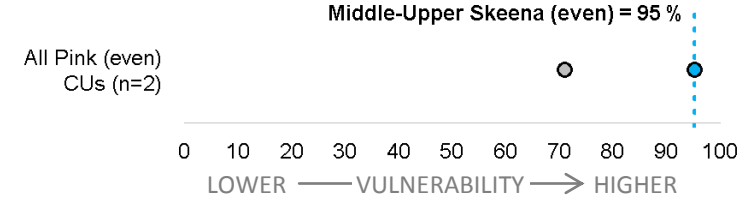
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



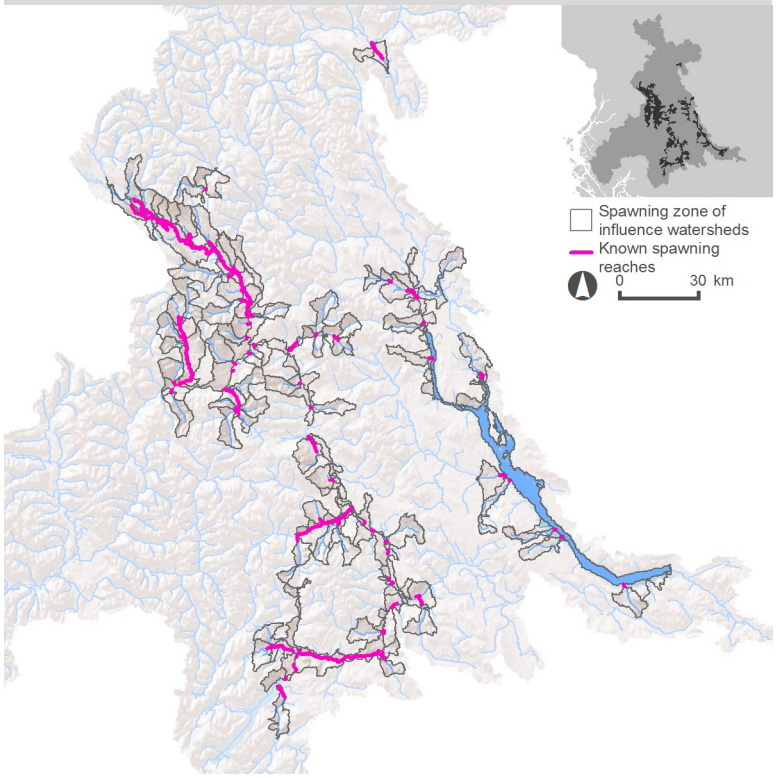
Flow sensitive accessible habitat (%) (all seasons)



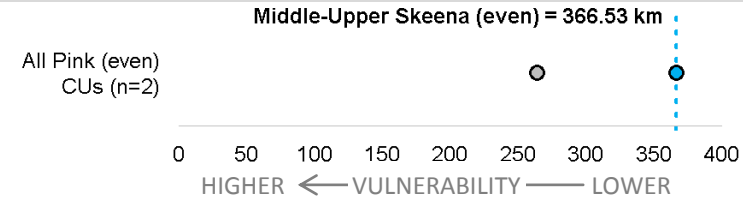
Spawning & incubation vulnerability

Spawning period vulnerability

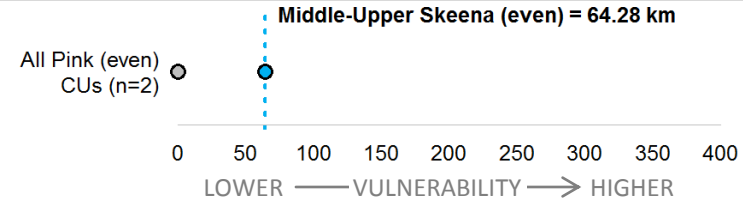
Spawning locations



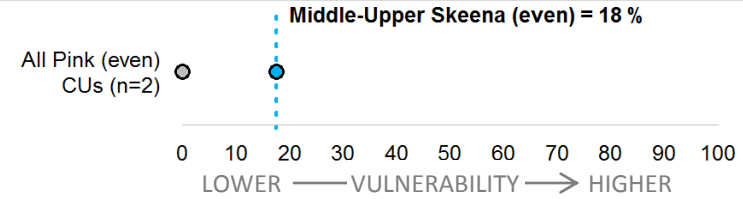
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

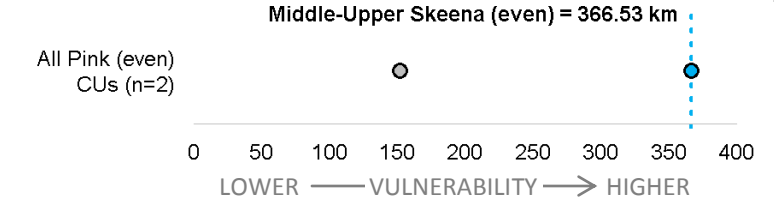


Spawning reaches summer flow sensitive - spawn timing (%)

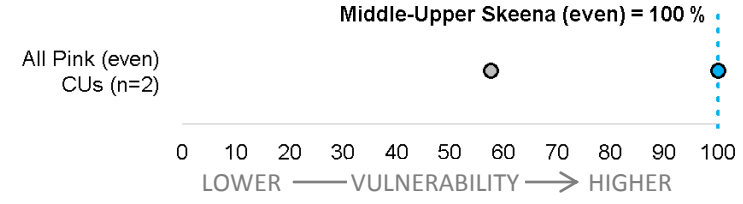


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



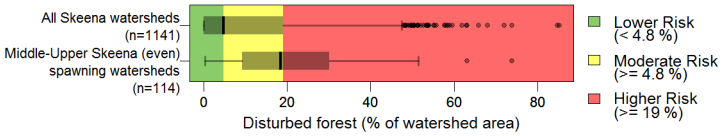
Spawning reaches winter flow sensitive - incubation timing (%)

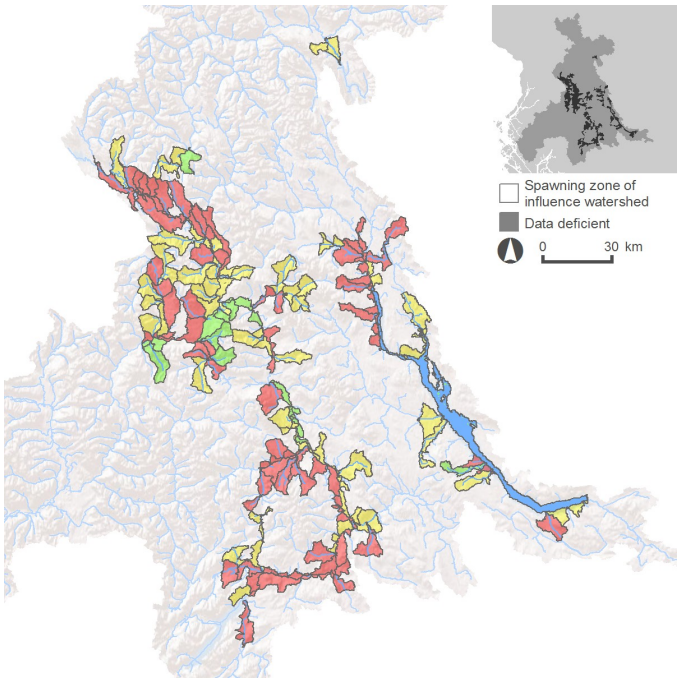


Spawning pressure

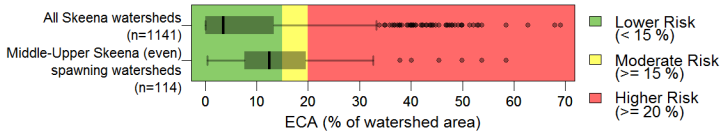
Hydrologic Processes

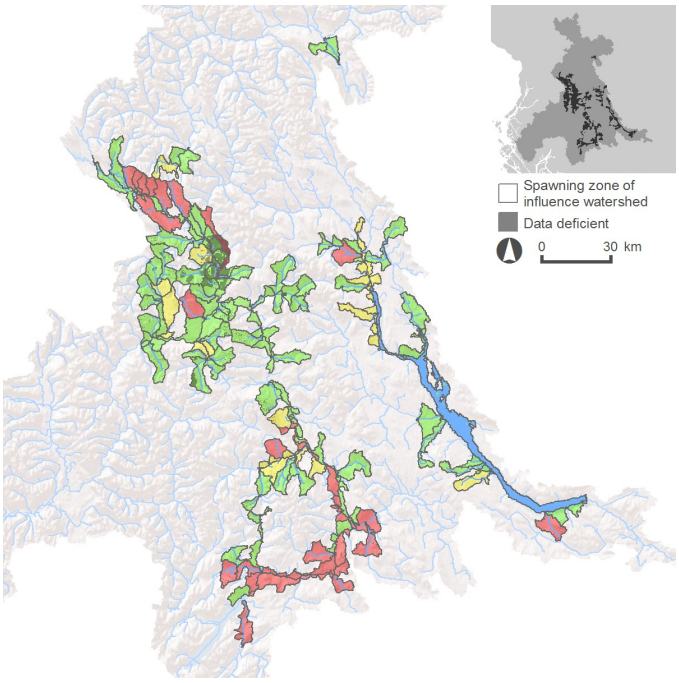
Forest disturbance





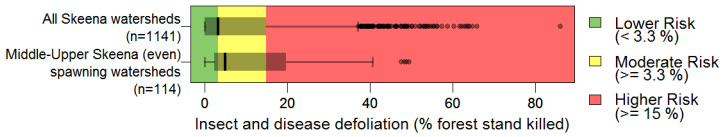
Equivalent Clear-cut Area

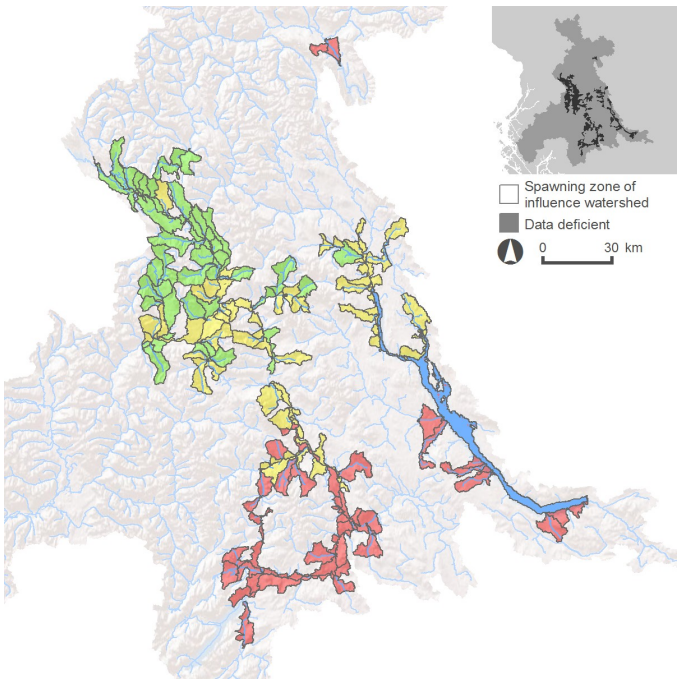




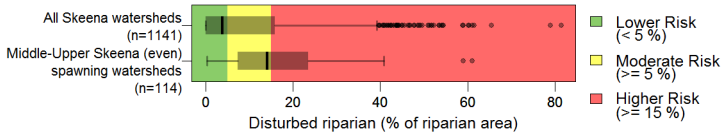
Vegetation Quality

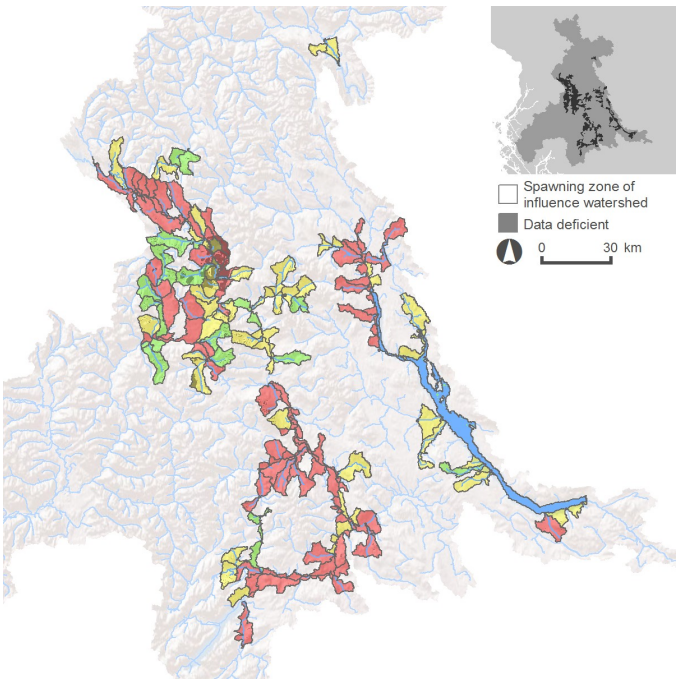
Insect and disease defoliation





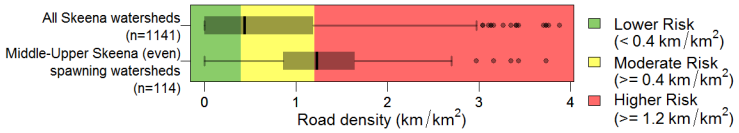
Riparian disturbance

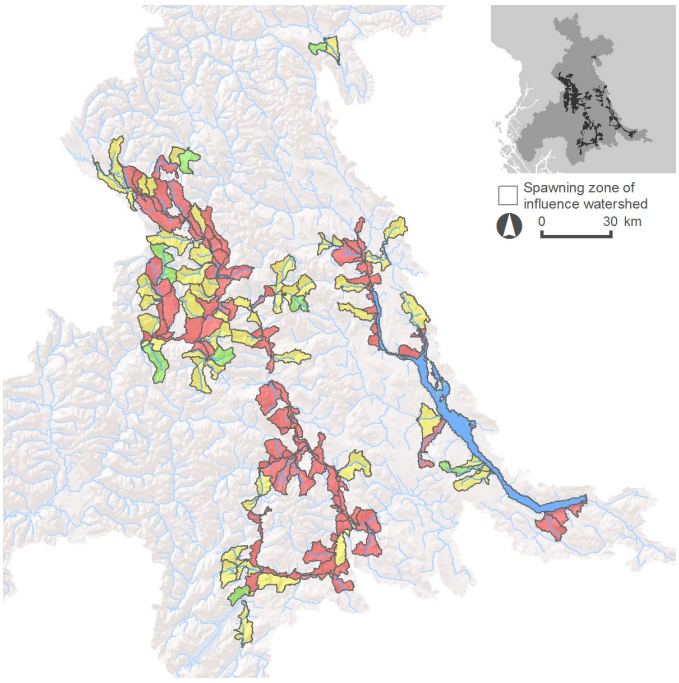




Surface Erosion

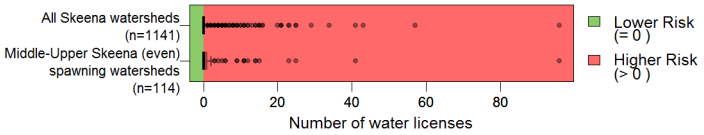
Road development

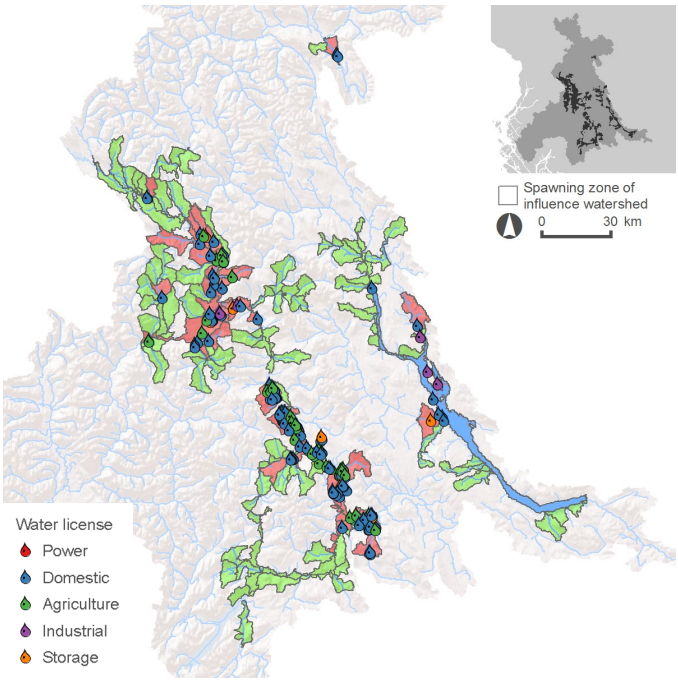




Water Quantity

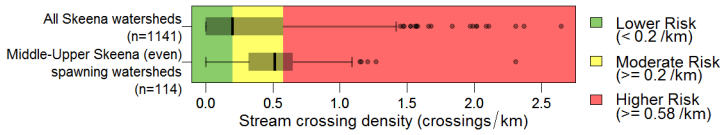
Number of water licenses

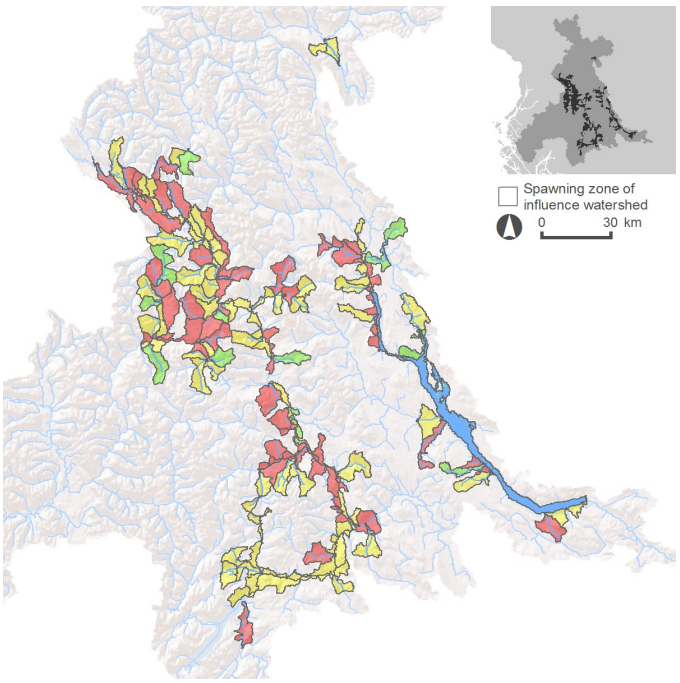




Fish Passage/Habitat Connectivity

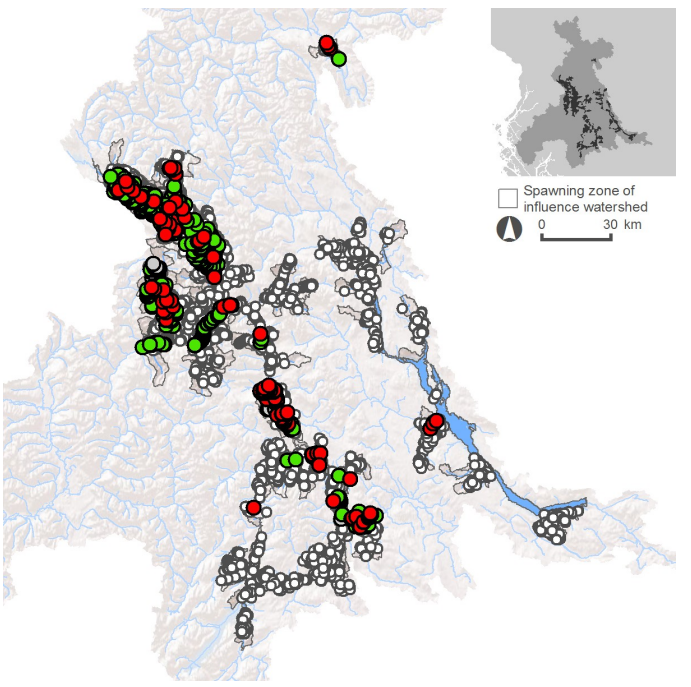
Stream crossing density





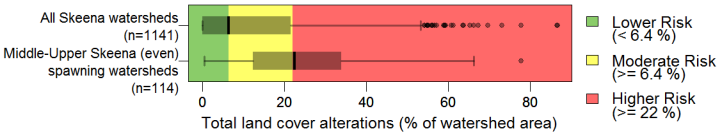
Culvert passability

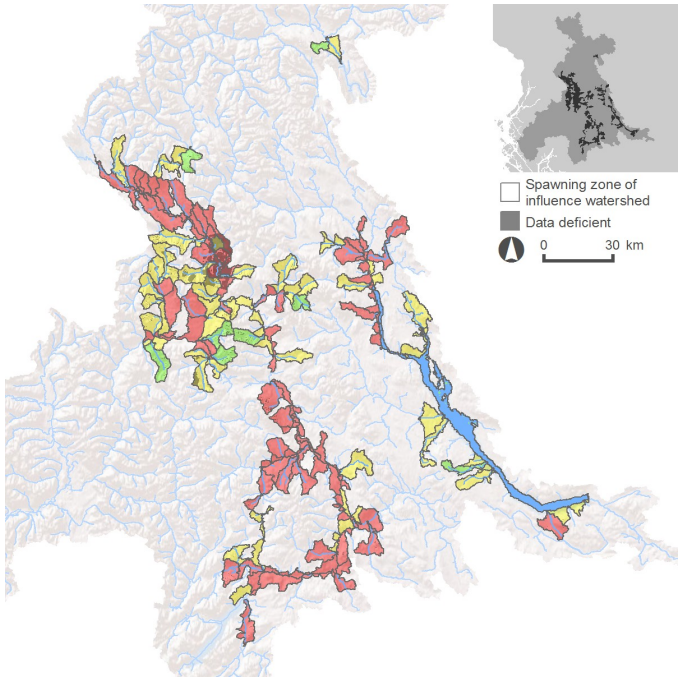
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



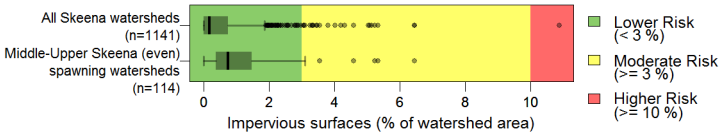
Human Development Footprint

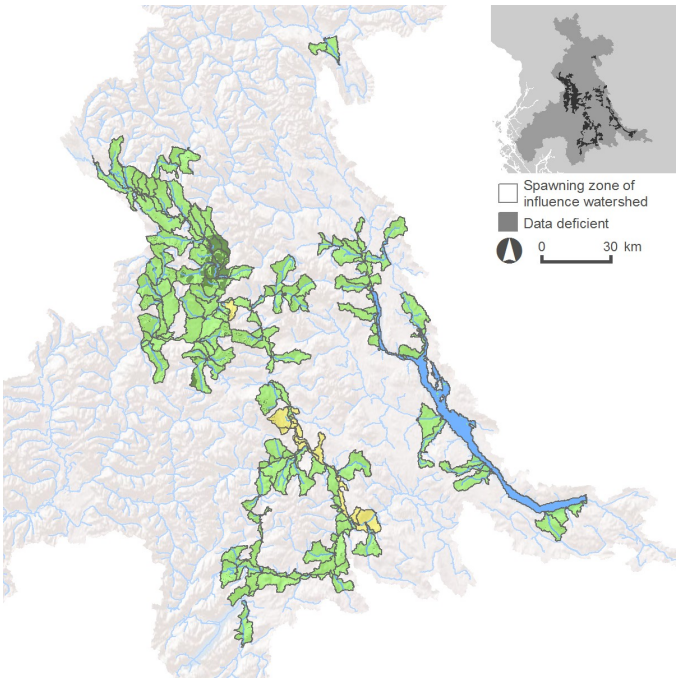
Total land cover alteration



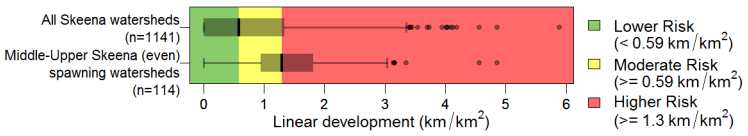


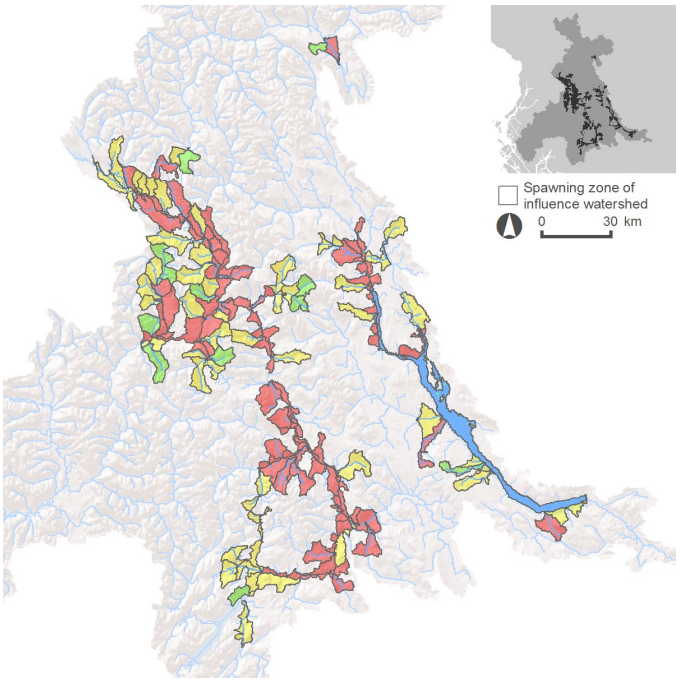
Impervious surfaces



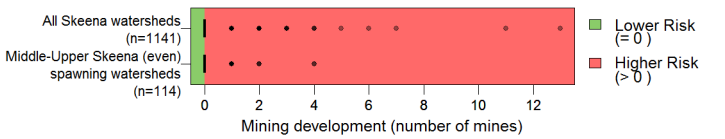


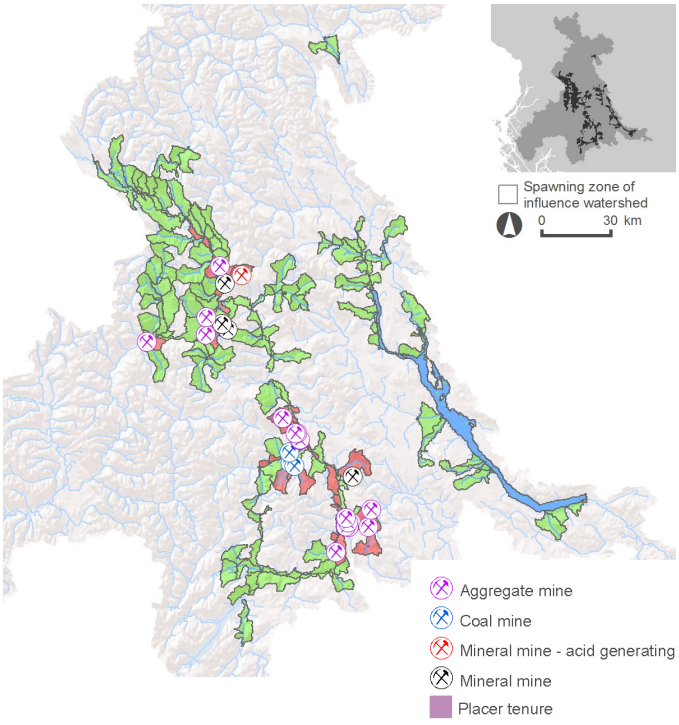
Linear development





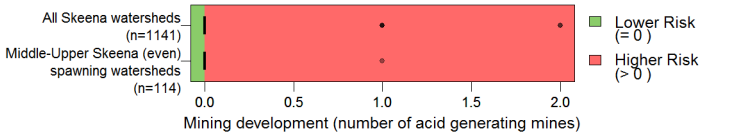
Mining development (total number of mines)

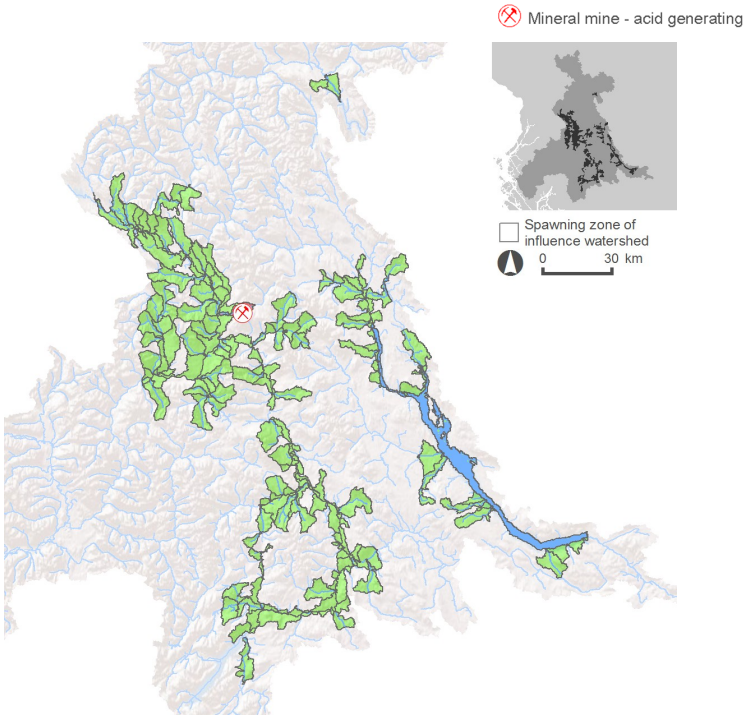




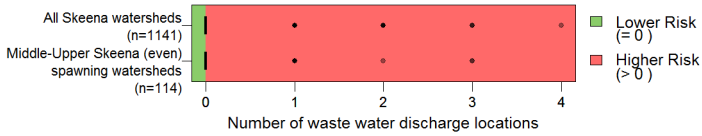
Water Quality

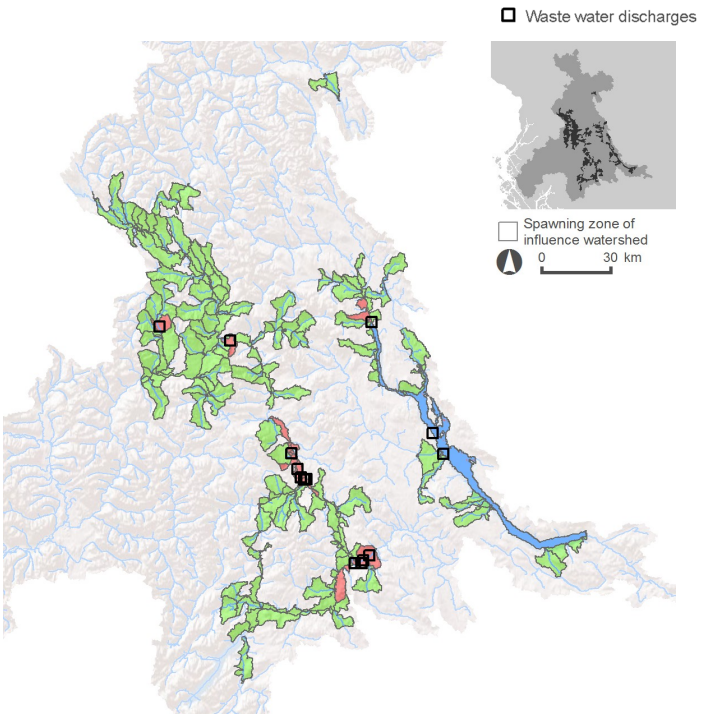
Mining development (acid generating mines)





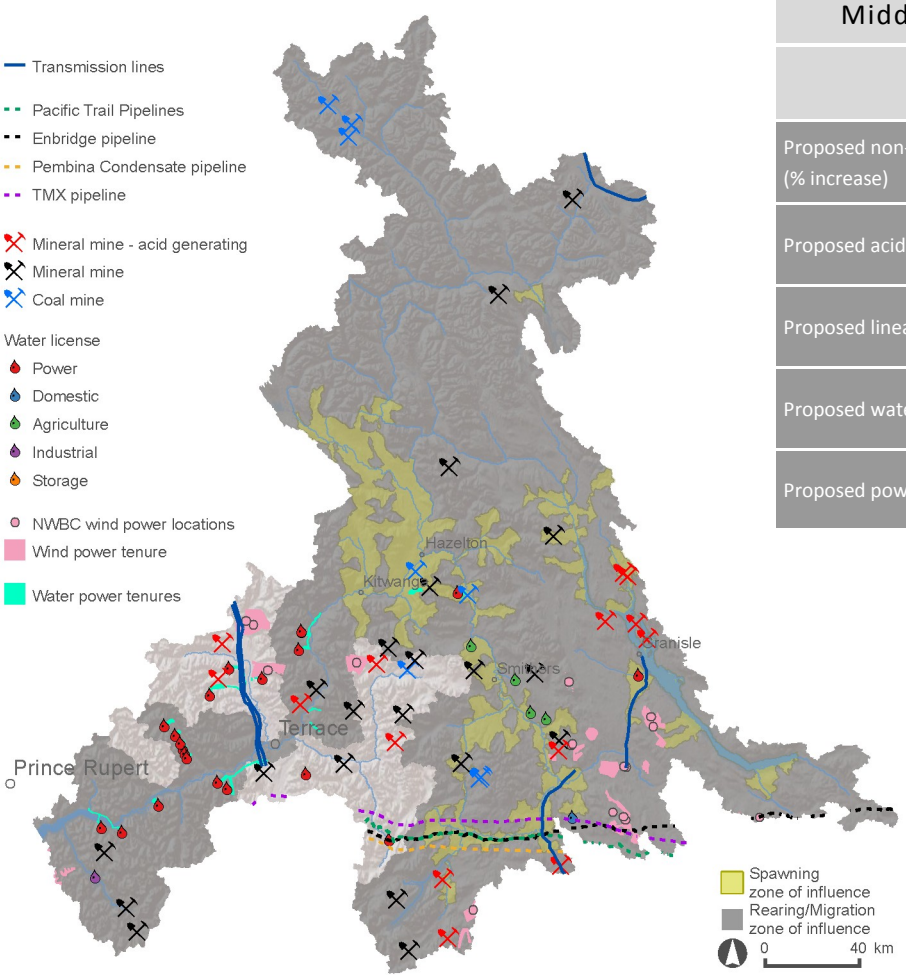
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Middle-Upper Skeena (even) Pink CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	20 (19%)	3 (11%)
Proposed acid generating mines (% increase)	11 (157%)	2 (200%)
Proposed linear development (% increase)	0.01 km/km^2 (2%)	0.03 km/km^2 (2%)
Proposed water licenses (% increase)	26 (3%)	3 (0.9%)
Proposed power tenures	342 km^2	32 km^2

Skeena Salmon: Pink
Conservation Unit (CU)
Nass-Skeena Estuary (even)

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

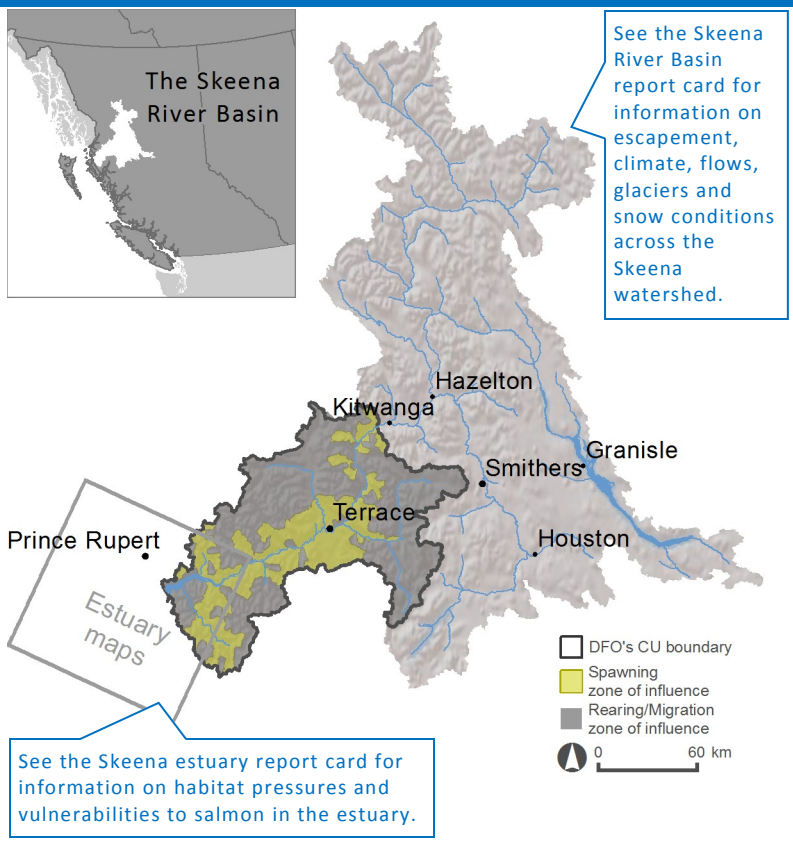
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* The pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
* This CU is characterized by coastal fjords and the Nass and Skeena rivers cutting through the Coast Mountains with approximately 50% of tributary valleys draining glaciers and icefields.
* Winter low flows can dewater channels and freeze pink eggs. On some coastal streams, heavy precipitation causes erosion and siltation adversely effecting incubation.
* The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
* At the northeast Pacific scale, pink abundance reflects climate and ocean regime shifts in 1977, 1989, and 1998 and their subsequent production.
* Mature pink salmon bring massive amounts of marine nutrients into the freshwater and riparian ecosystems.
* The majority of spawning habitat is in good to excellent condition.

Location



CU overview of habitat vulnerabilities & pressures

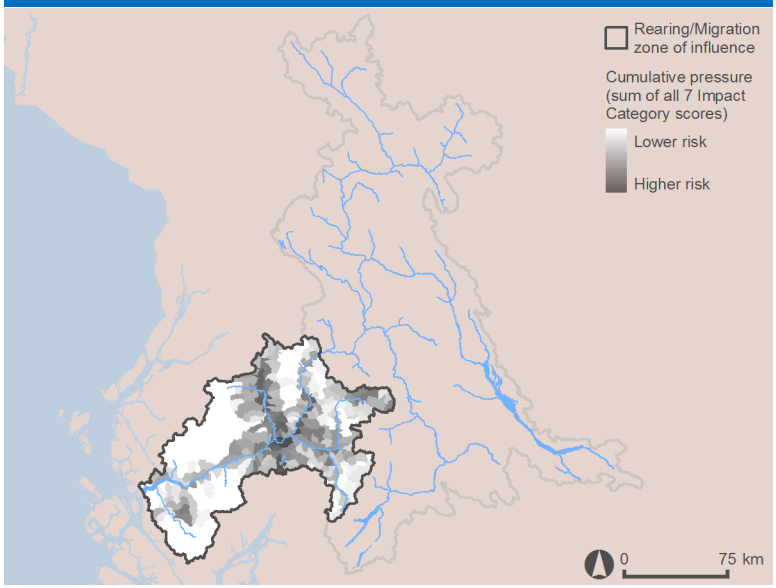
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

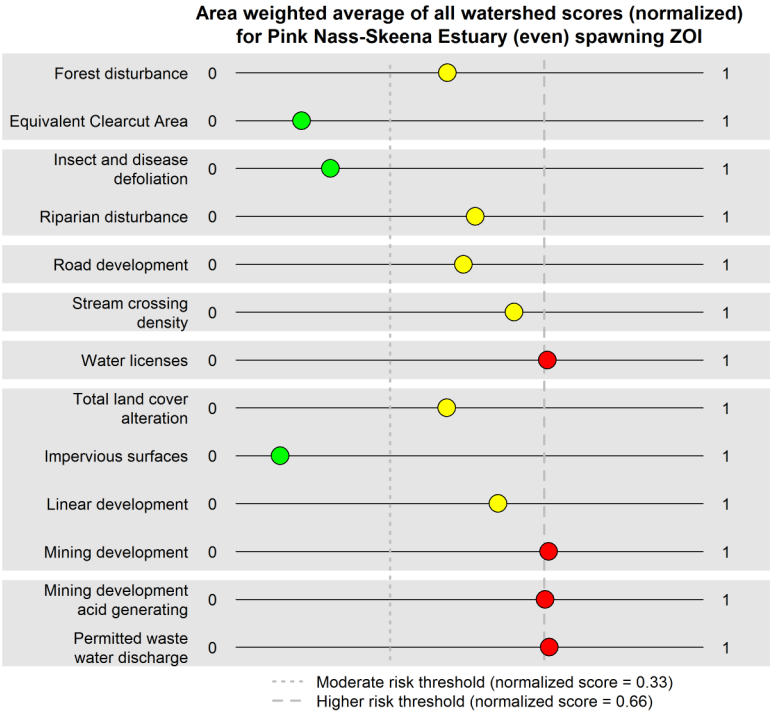
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

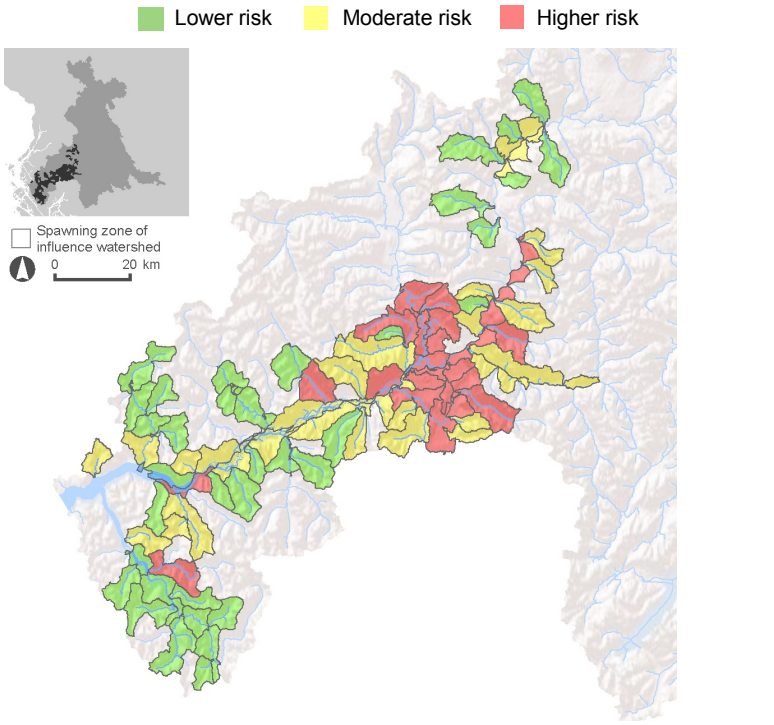
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

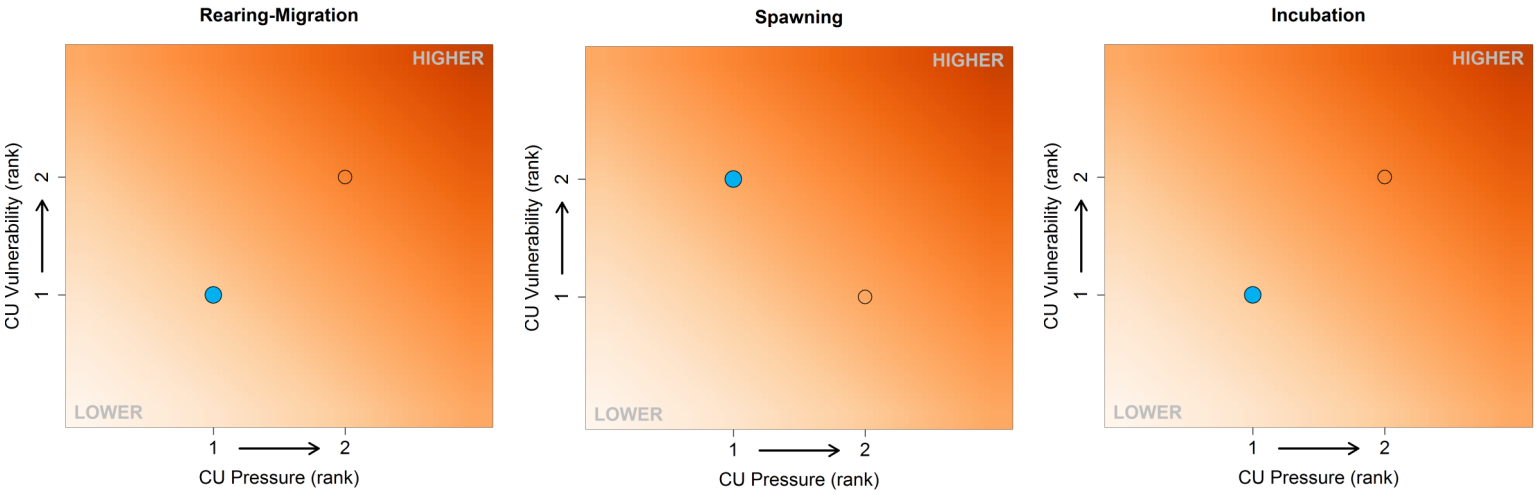


Cumulative pressure—spawning



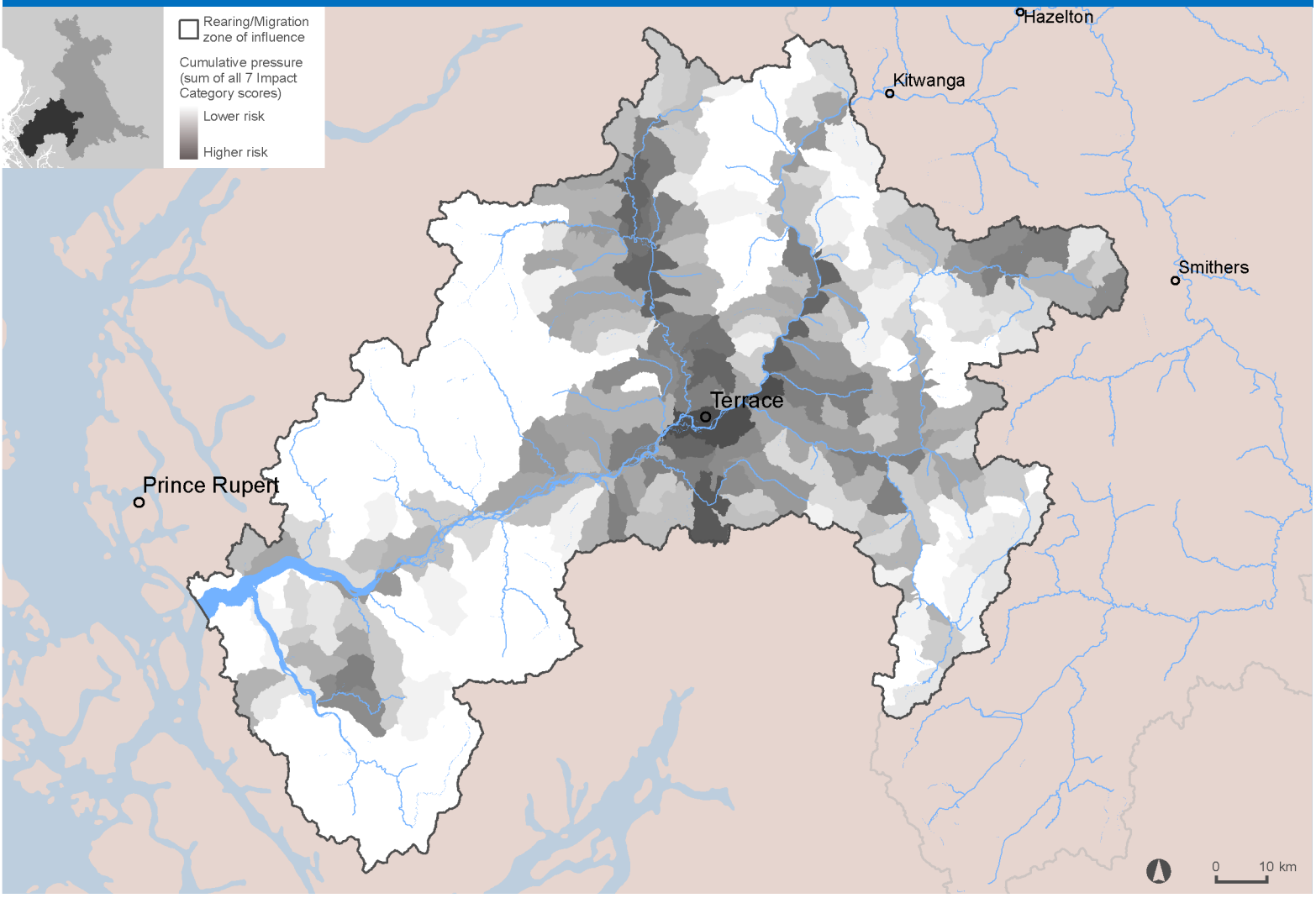
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Nass-Skeena Estuary (even) ○ = other even-year Skeena Pink CUs



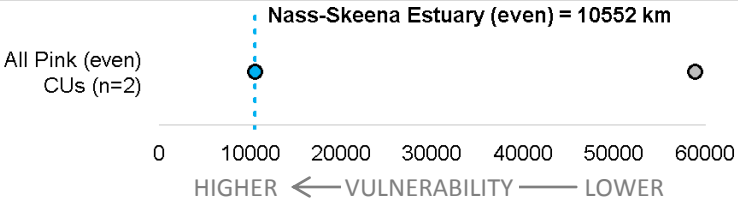
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

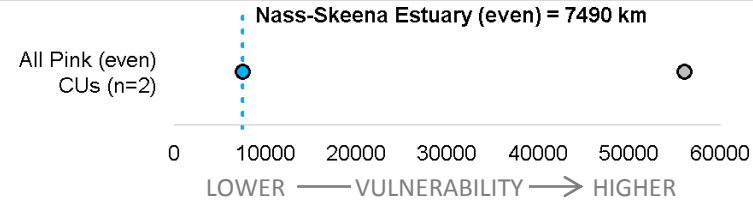


Rearing/Migration period vulnerability

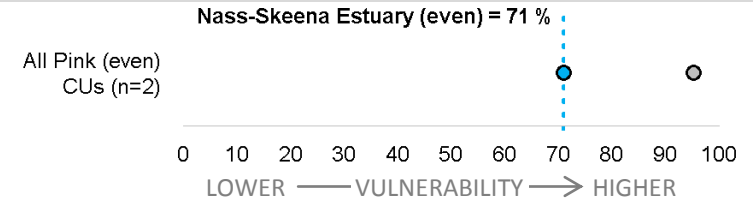
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



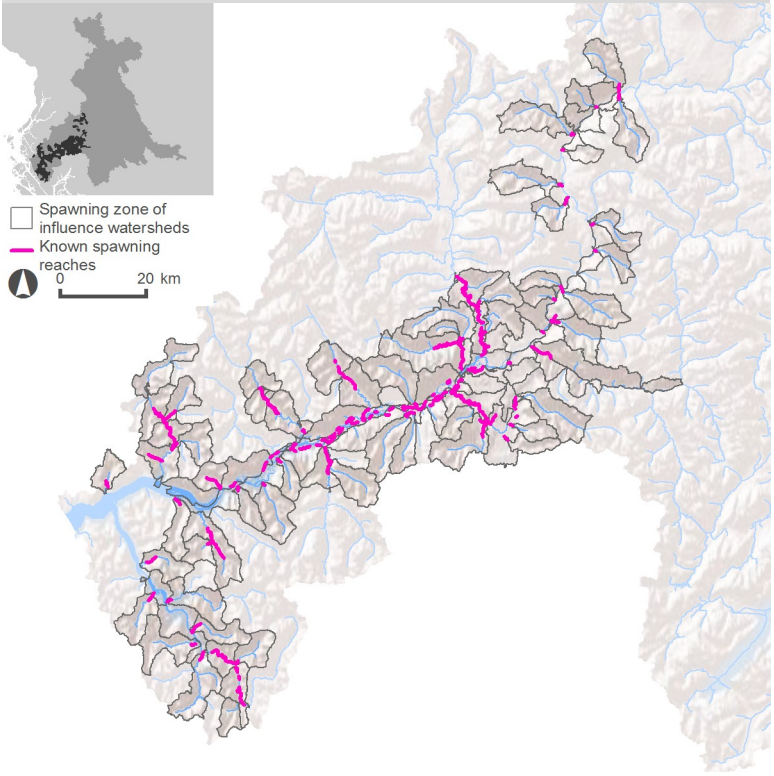
Flow sensitive accessible habitat (%) (all seasons)



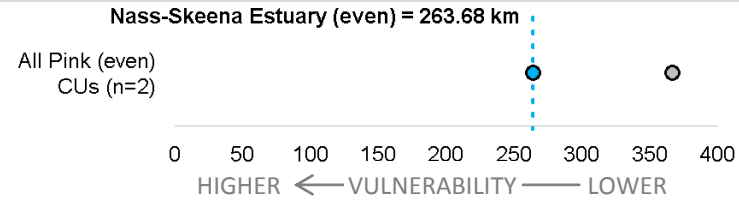
Spawning & incubation vulnerability

Spawning period vulnerability

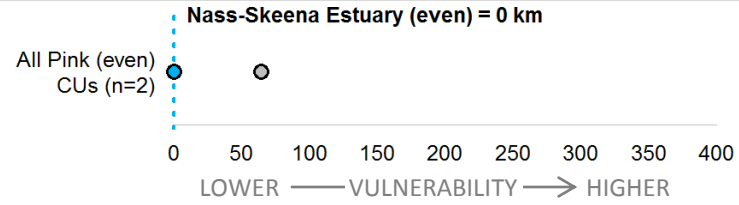
Spawning locations



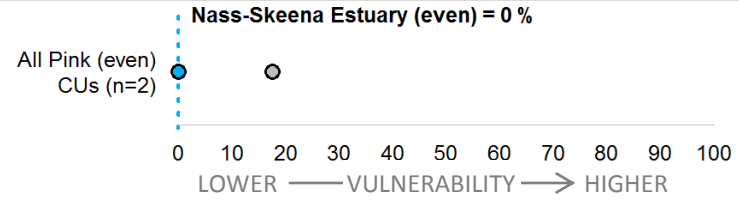
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

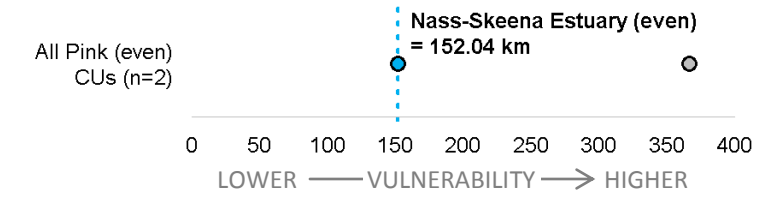


Spawning reaches summer flow sensitive - spawn timing (%)

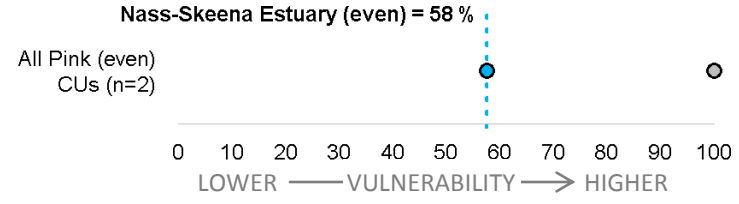


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



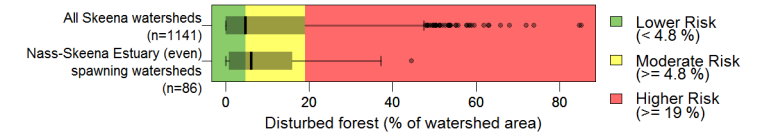
Spawning reaches winter flow sensitive - incubation timing (%)

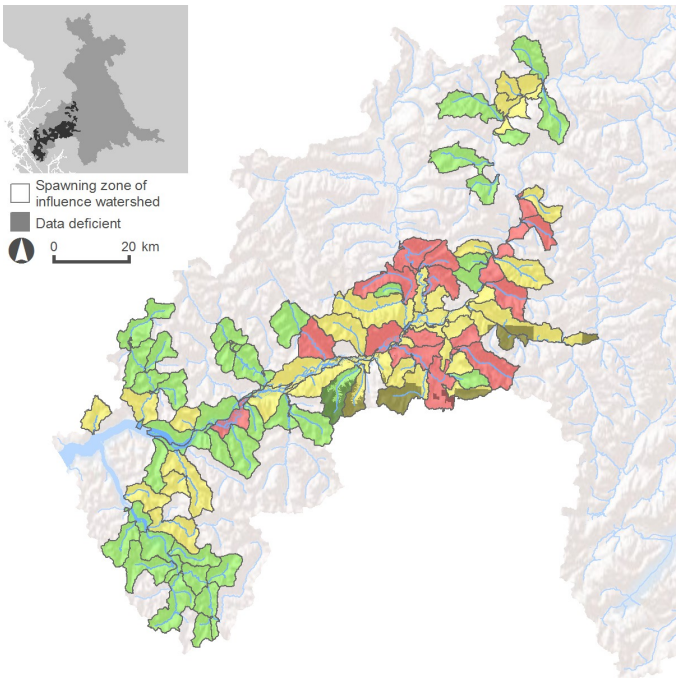


Spawning pressure

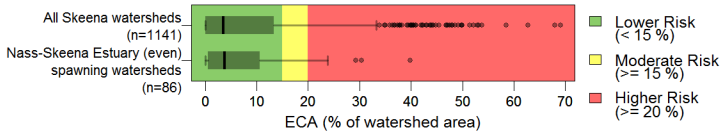
Hydrologic Processes

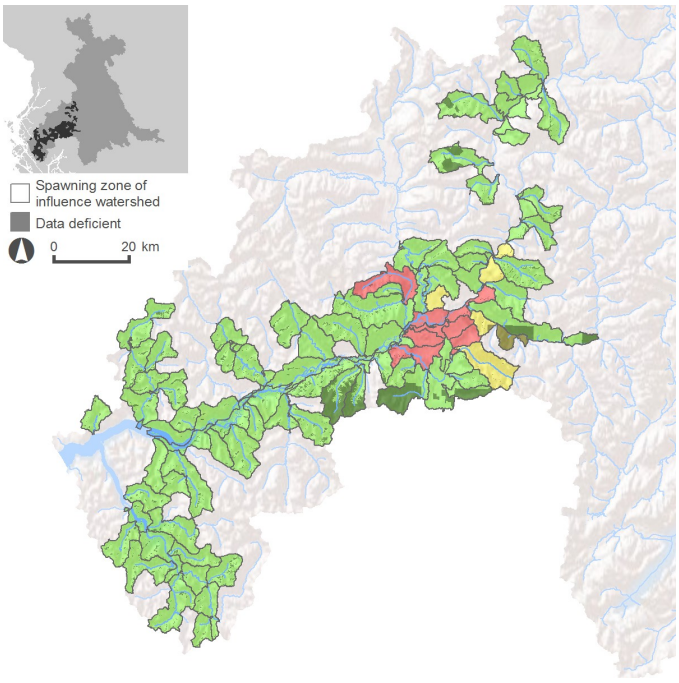
Forest disturbance





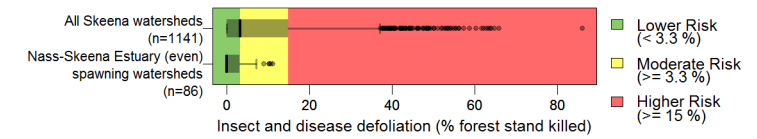
Equivalent Clear-cut Area

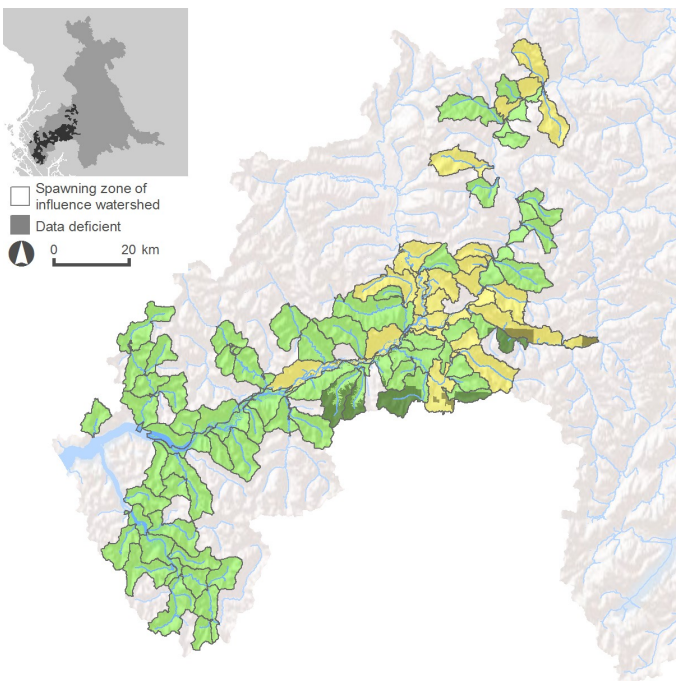




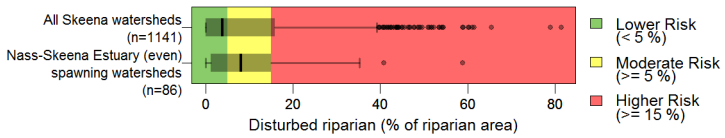
Vegetation Quality

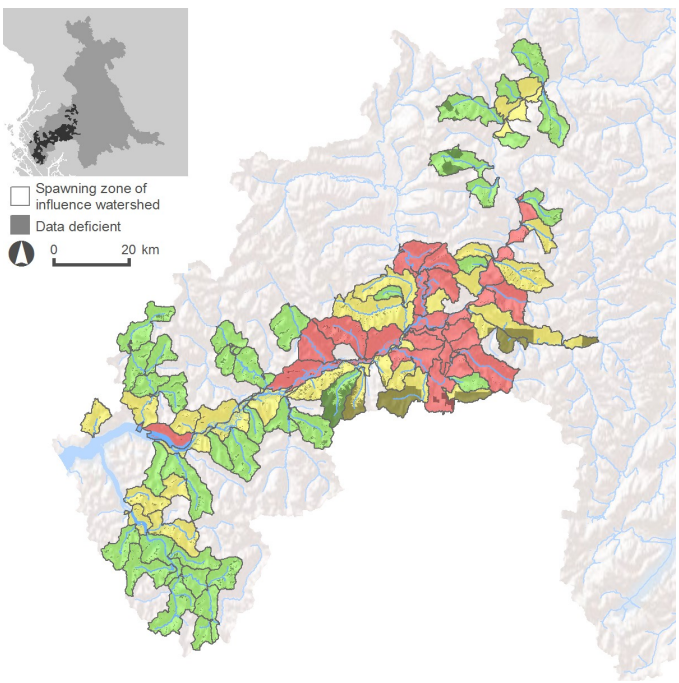
Insect and disease defoliation





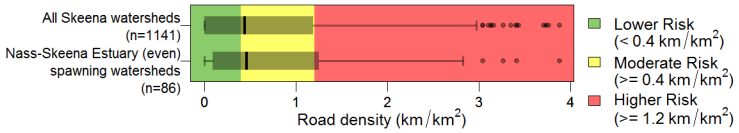
Riparian disturbance

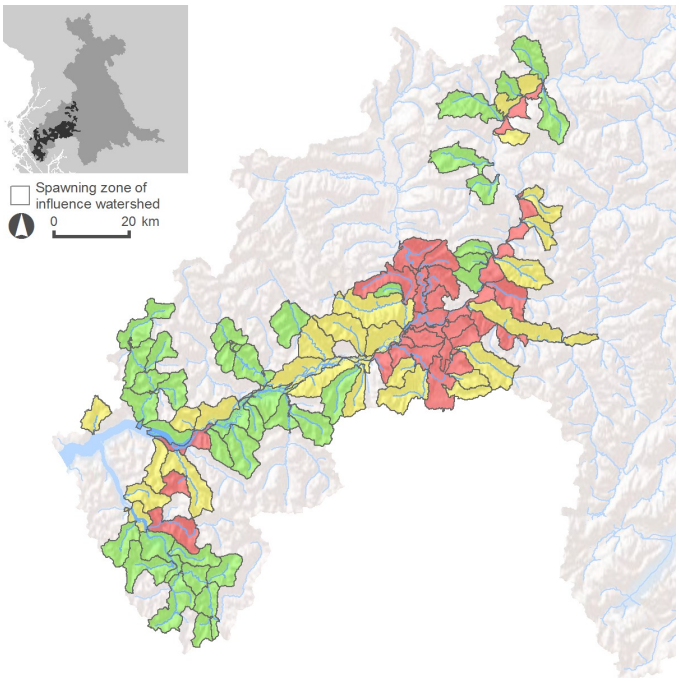




Surface Erosion

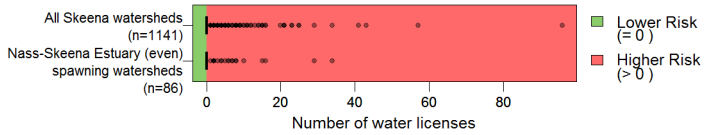
Road development

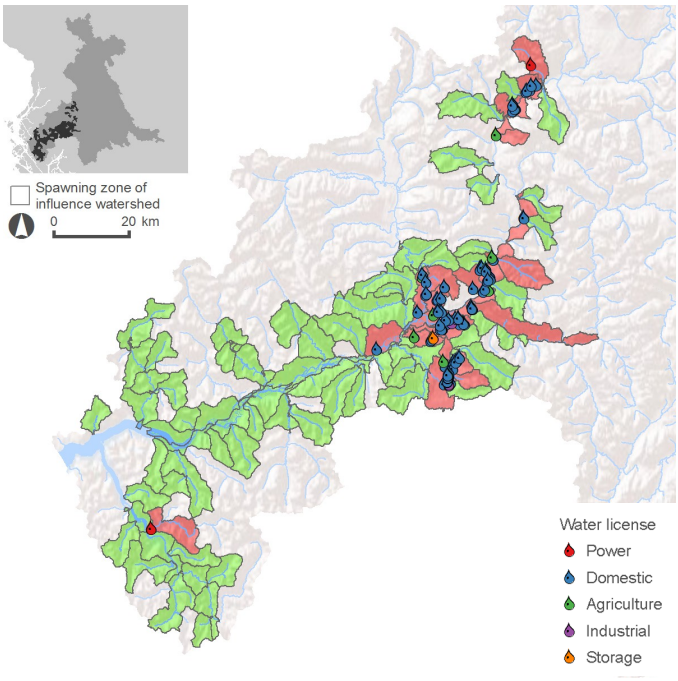




Water Quantity

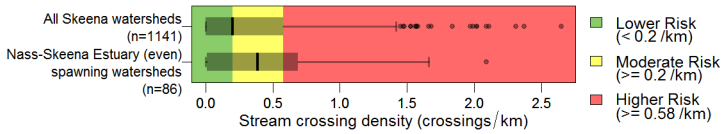
Number of water licenses

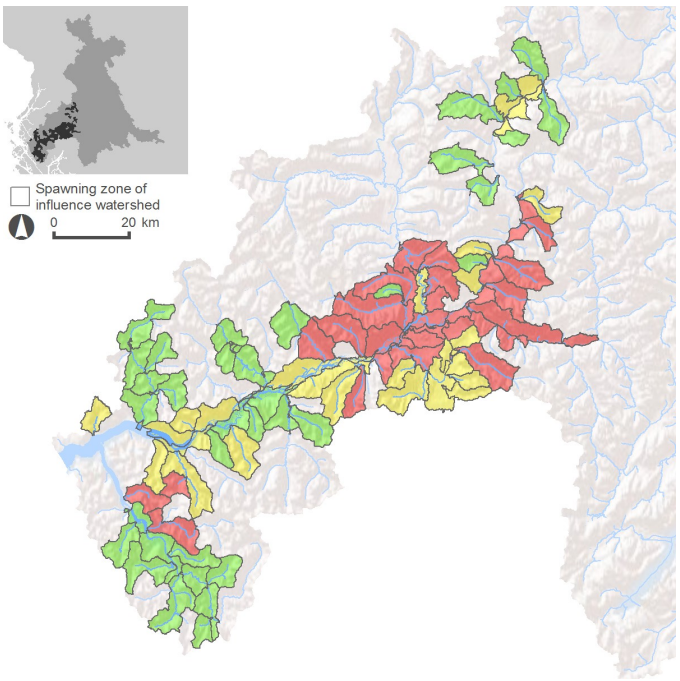




Fish Passage/Habitat Connectivity

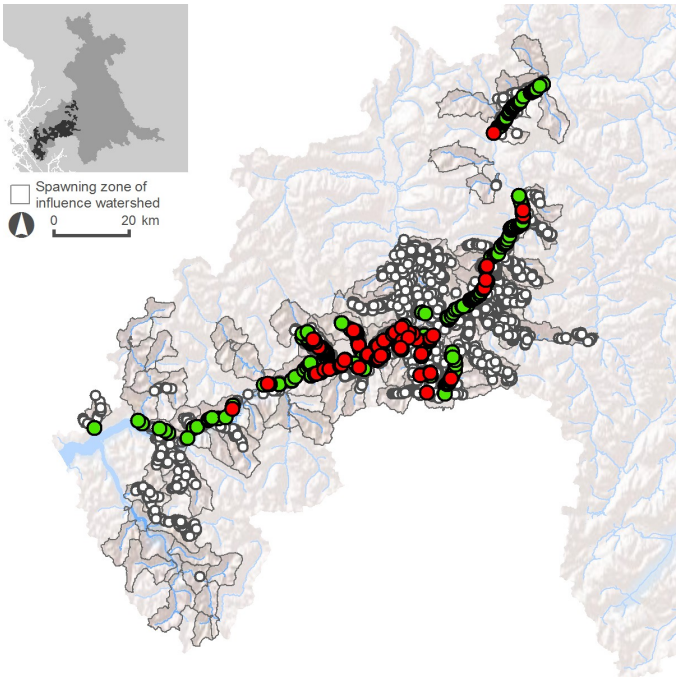
Stream crossing density





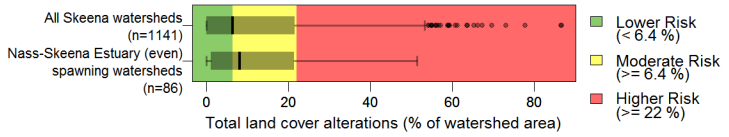
Culvert passability

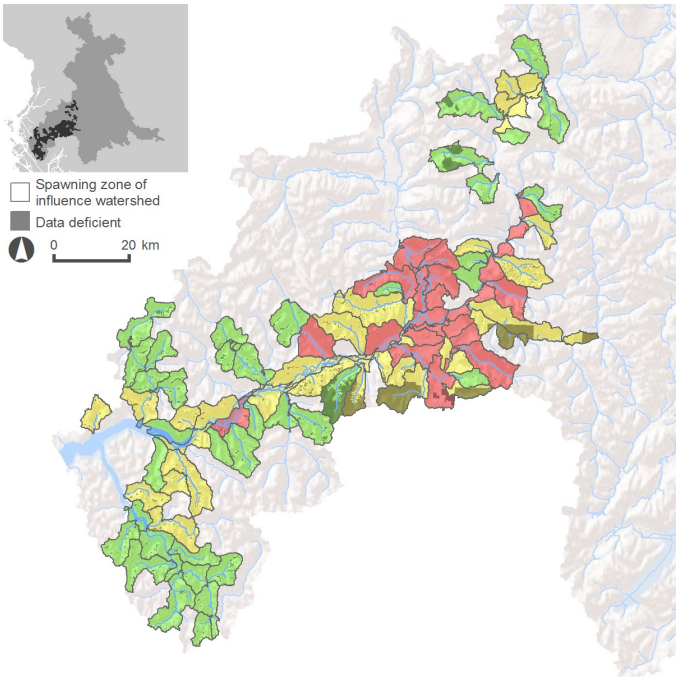
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.



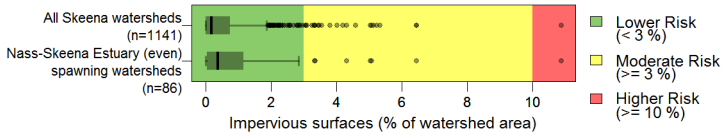
Human Development Footprint

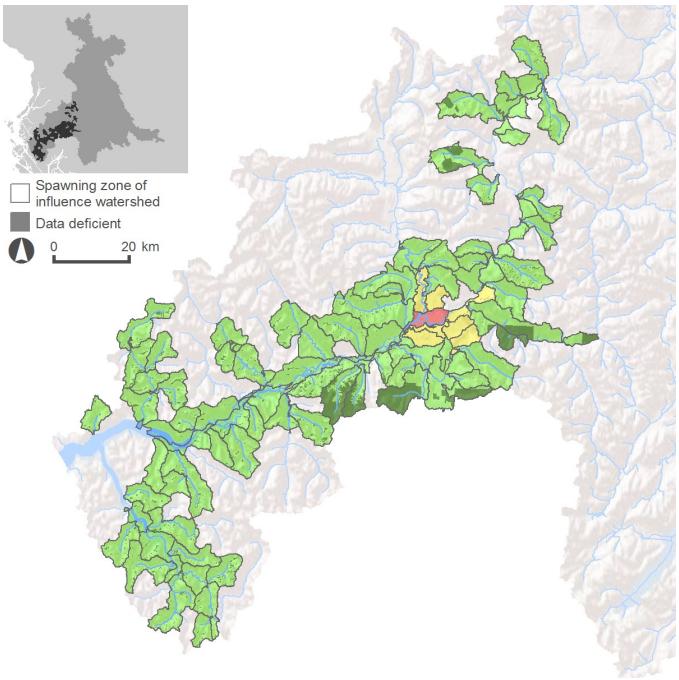
Total land cover alteration



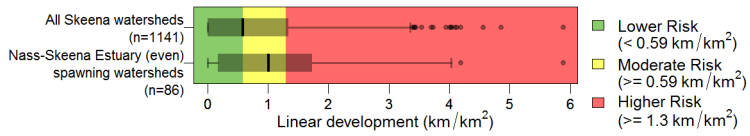


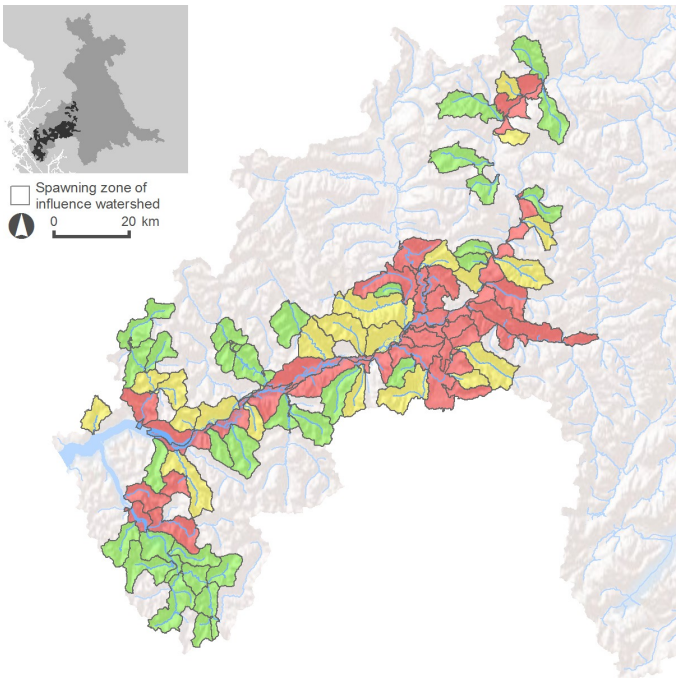
Impervious surfaces



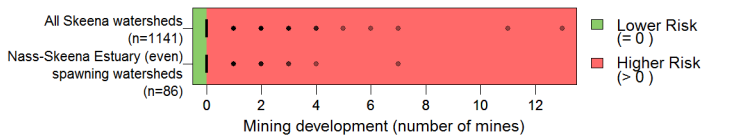


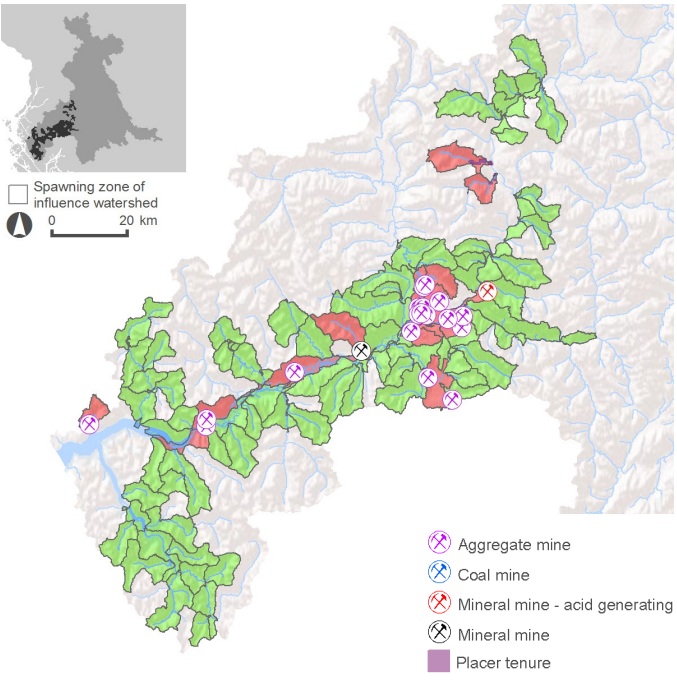
Linear development





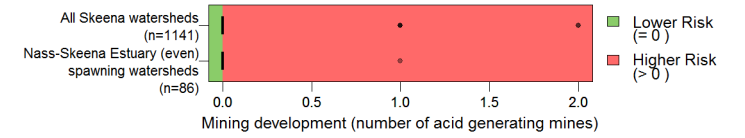
Mining development (total number of mines)

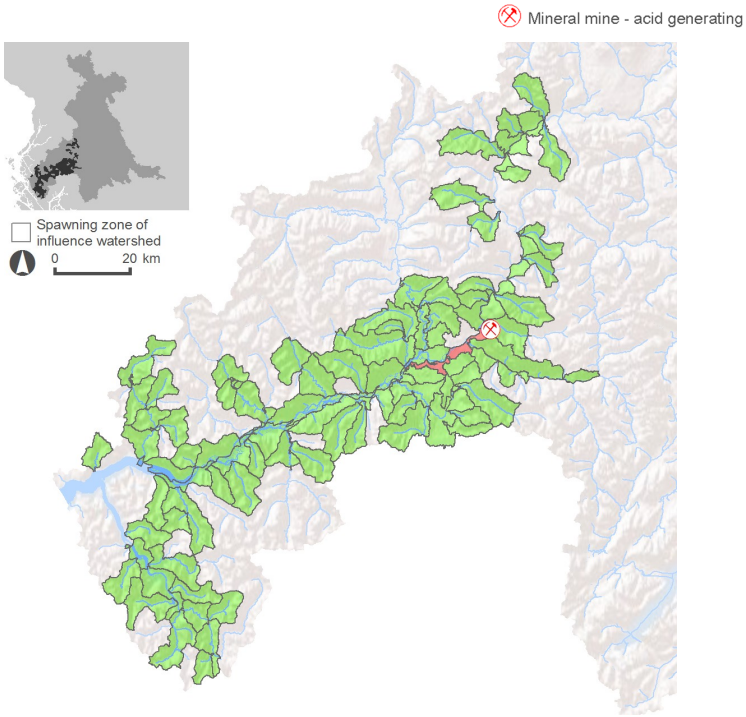




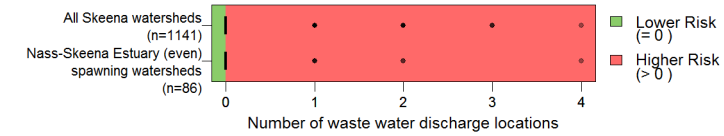
Water Quality

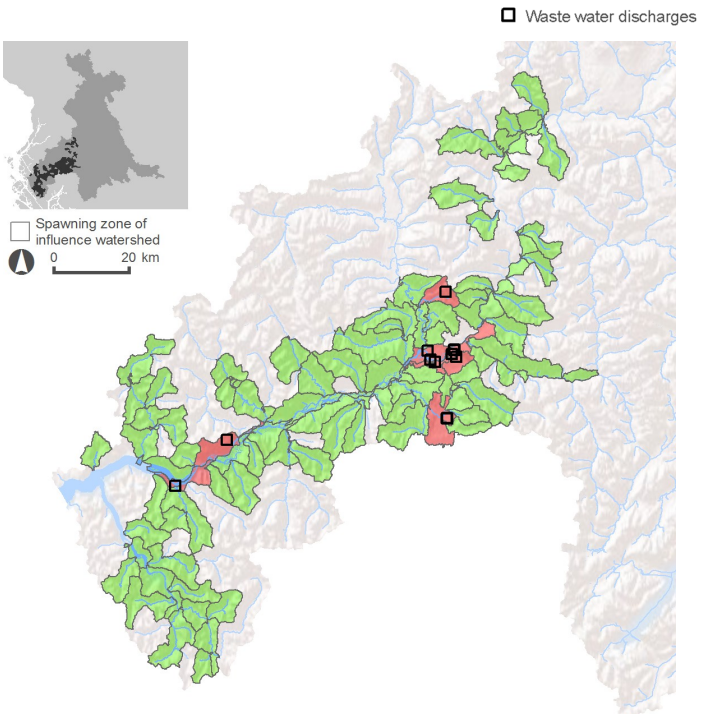
Mining development (acid generating mines)





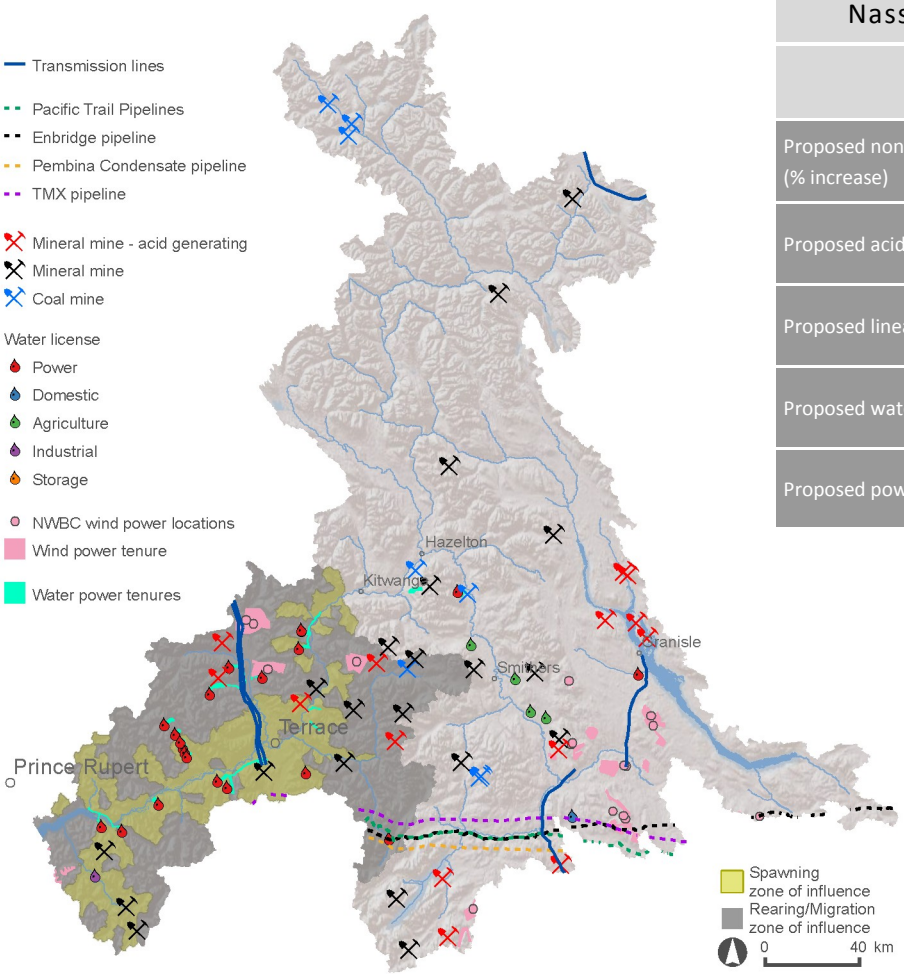
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Nass-Skeena Estuary (even) Pink CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	9 (12%)	3 (9%)
Proposed acid generating mines (% increase)	5 (250%)	1 (100%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.01 km/km^2 (1%)
Proposed water licenses (% increase)	27 (13%)	14 (8%)
Proposed power tenures	315 km^2	60 km^2

Skeena Salmon: River Sockeye

Conservation Unit (CU)

Skeena River

Version 1.0 Jan 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. For an explanation of the indicators shown here, please see the accompanying *Report Card Summaries*. Full methods and results can be found in the main report, *Skeena Salmon Conservation Units Habitat Report Cards: Chinook, coho, pink, chum, and river sockeye* (2014). An online interactive version of this information is available at www.skeenasalmonprogram.ca.

Definitions

Conservation Unit (CU): A group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to re-colonize naturally within an acceptable timeframe.

Pressure indicator: Measurable extent/intensity of natural processes or human activities that can induce changes in habitat condition/state.

Vulnerability indicator: Measures of habitat quantity or quality used to represent the intrinsic habitat vulnerability/sensitivity to watershed disturbances for each life-stage.

Zone of influence (ZOI): Areas adjacent to and upstream/upslope of habitats used by salmon CUs that represent the geographic extent for capture/measurement of pressure and vulnerability indicators.

Status: Condition of habitat relative to a defined indicator benchmark.

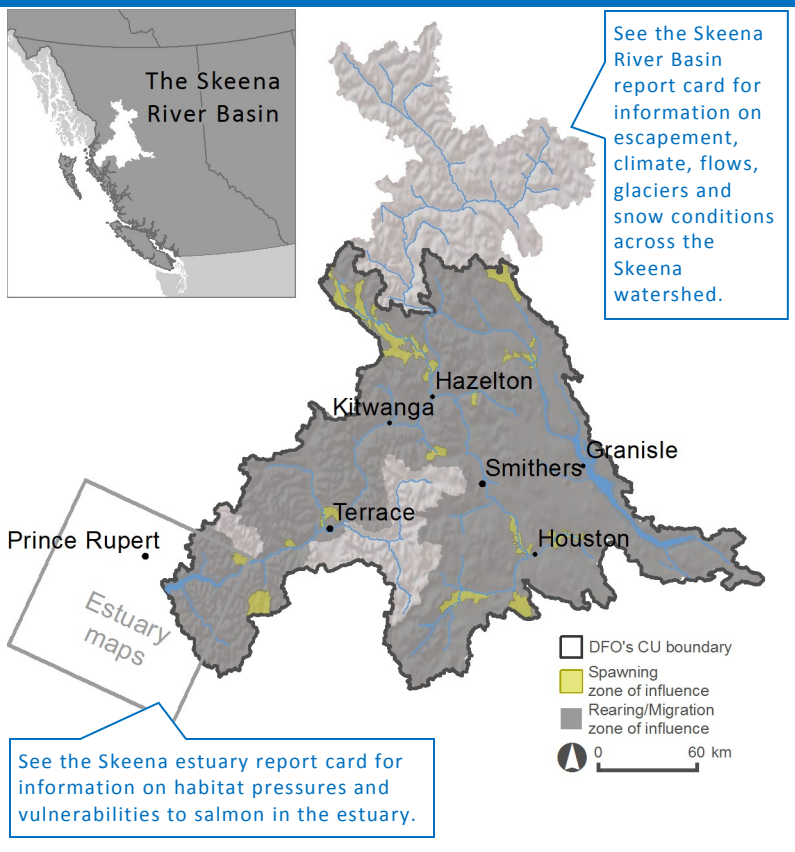
Risk: Risk of adverse effects to salmon habitats within a defined zone of influence. Levels of increasing risk are defined based on the extent/ intensity of impacts relative to defined benchmarks of concern.

Benchmark: A standard (quantified metric) against which habitat condition can be measured or judged, and by which status can be compared over time and space to determine the risk of adverse effects.

Narrative

* Spawning sites are thought to be influenced by groundwater inputs.
* Some spawning sites may be characterized as fall-back sites due to upstream fish passage obstructions such as impassable falls at low or high water levels.
* Many sites are persistent spawning locations distinct to stream-type sockeye spawners.
* Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, as well as changing legislation and diminished resources to support fish habitat management activities by DFO and other agencies.

Location



CU overview of habitat vulnerabilities & pressures

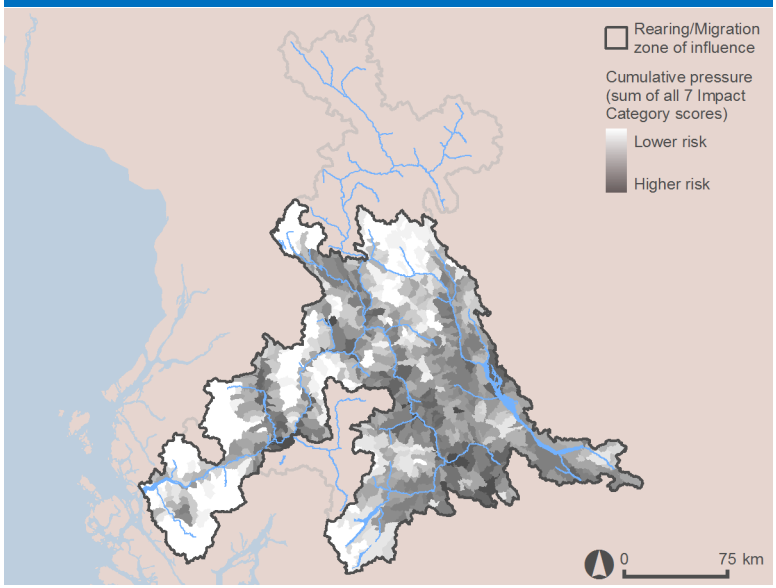
Pressure indicators were grouped into seven relatively independent habitat "impact categories" representing key factors affecting general watershed condition:

- Hydrologic Processes (Forest disturbance; ECA)
- Vegetation Quality (Insect and disease defoliation; Riparian disturbance)
- Surface Erosion (Road development)
- Fish passage/Habitat connectivity (Stream crossing density)
- Water quantity (Water licenses)
- Human development footprint (Total land cover alteration; Impervious surfaces; Linear development; Mining development)
- Water quality (Mining development acid generating; Wastewater discharges)

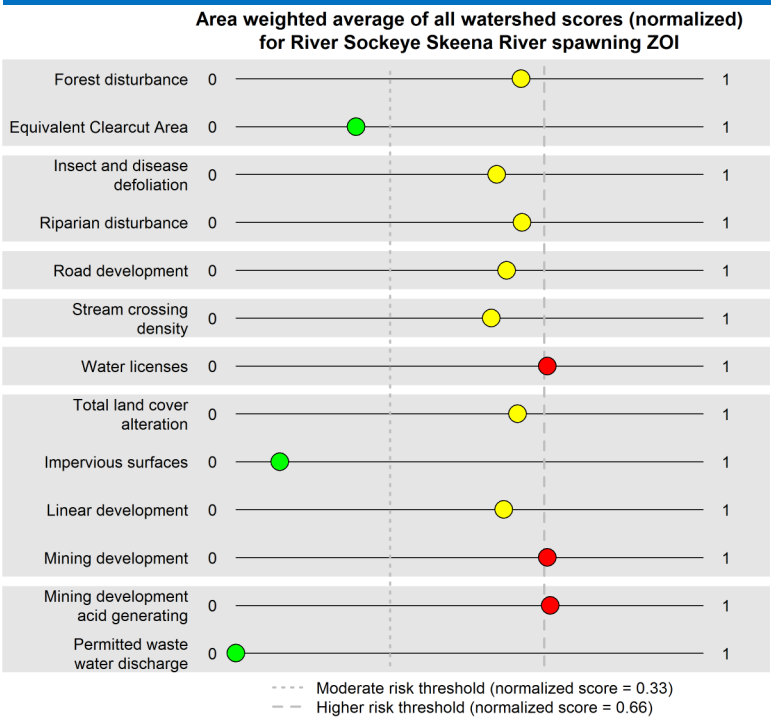
Indicators were also developed reflecting relative vulnerability to habitat pressures within the life stage-specific "zones of influence" defined for each CU:

- Rearing/Migration ZOI: Accessible stream length; Length & percentage of accessible streams considered flow sensitive - all seasons
- Spawning ZOI: Total spawning length; Length & percentage of spawning reaches considered flow sensitive (summer period - spawning, winter period - incubation)

Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning



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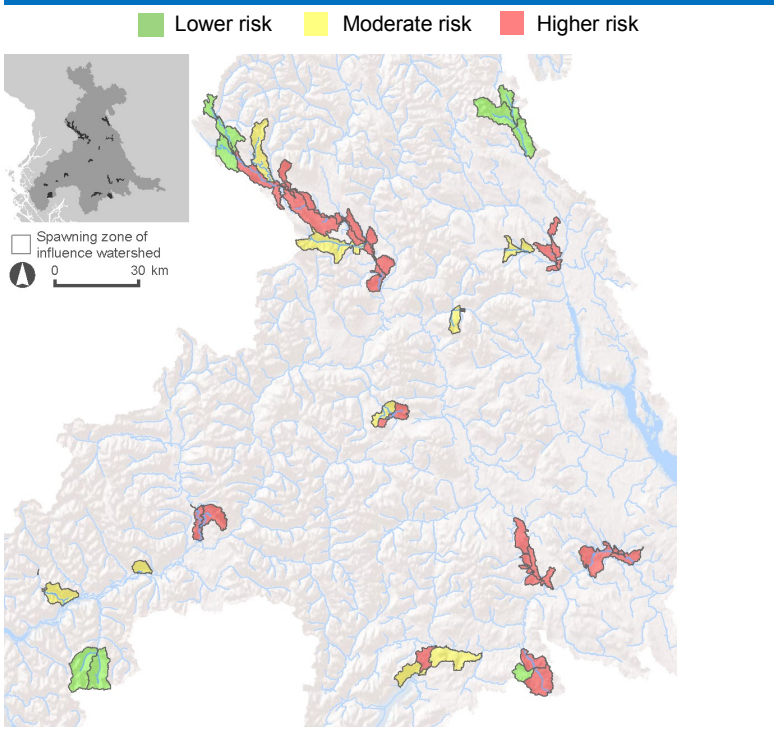
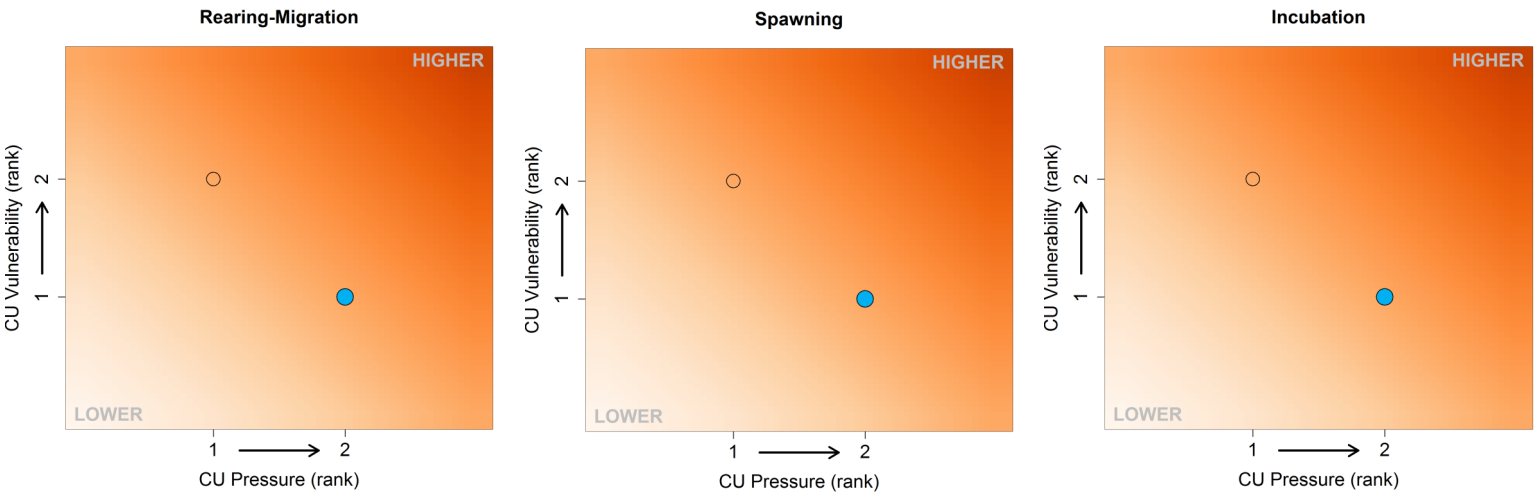


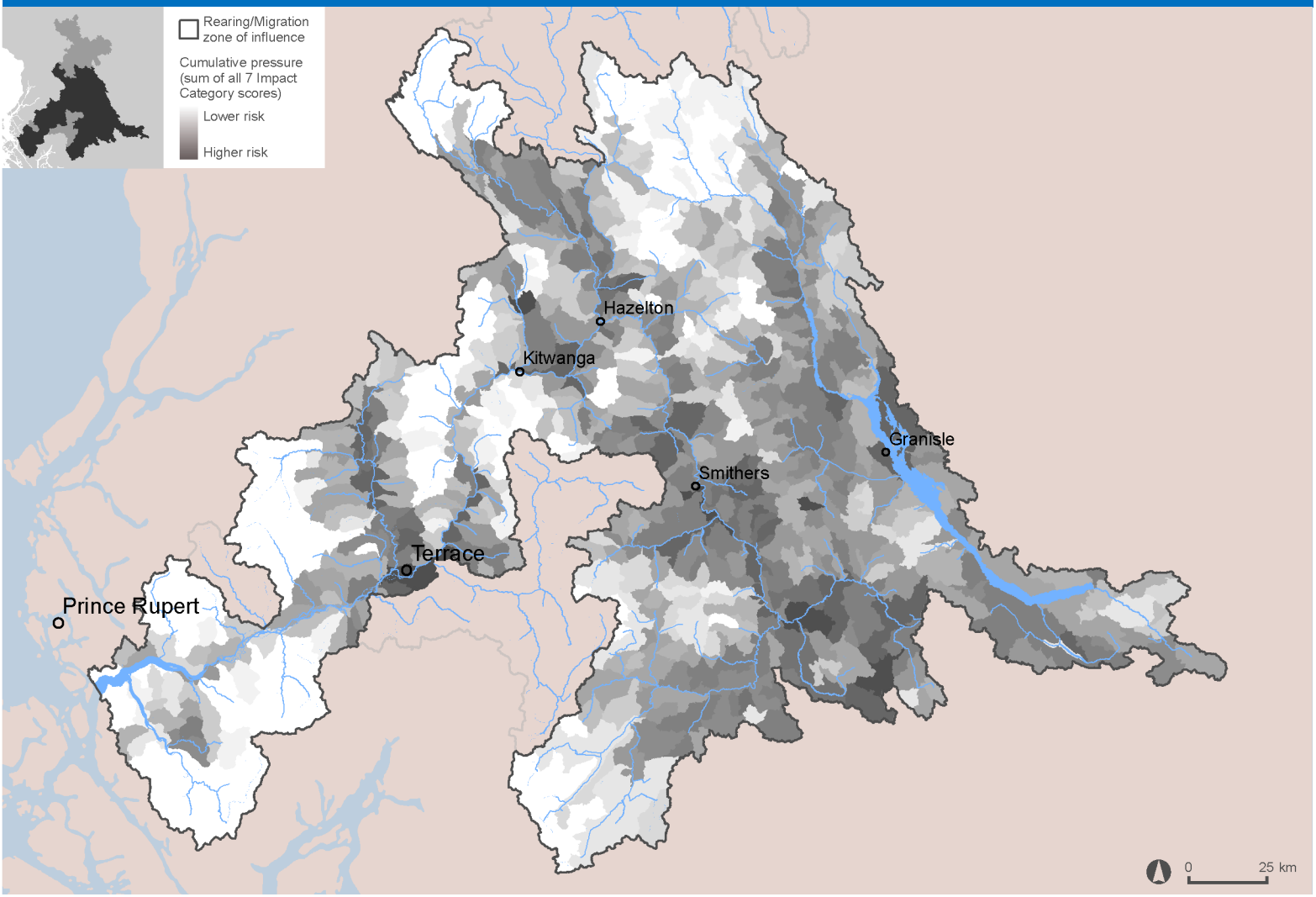
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Skeena River ○ = other Skeena River Sockeye CUs



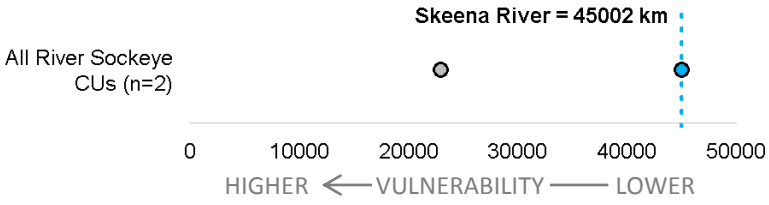
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

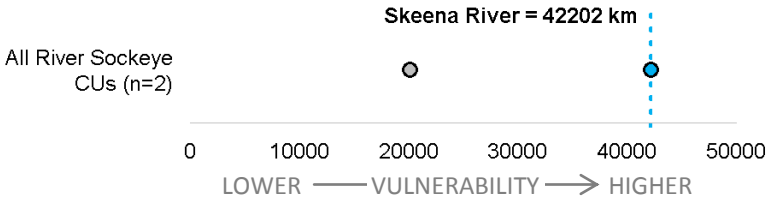


Rearing/Migration period vulnerability

Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)

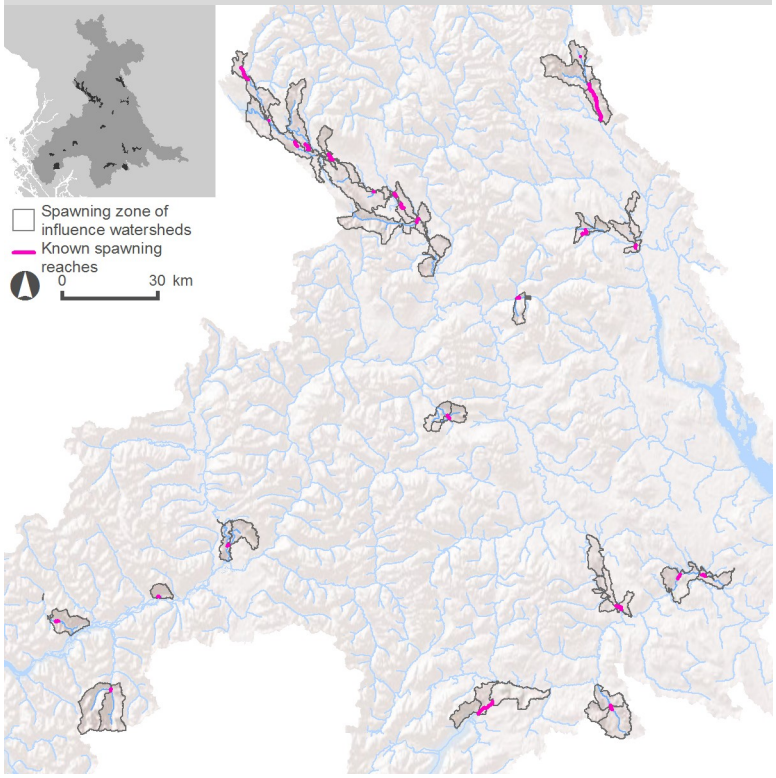


Flow sensitive accessible habitat (%) (all seasons)

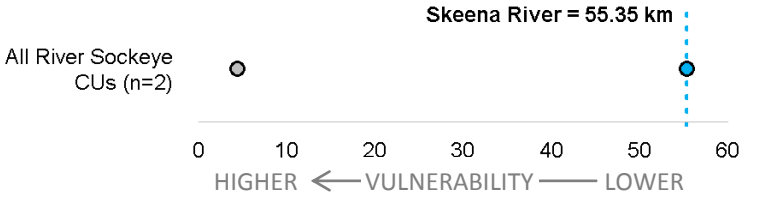
Spawning & incubation vulnerability

Spawning period vulnerability

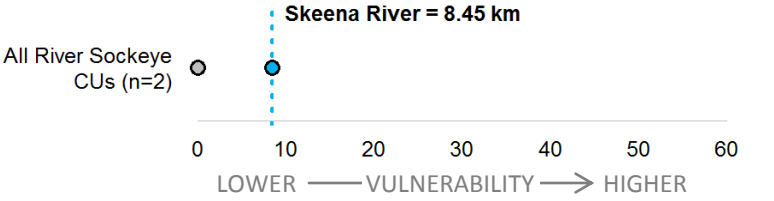
Spawning locations



Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)



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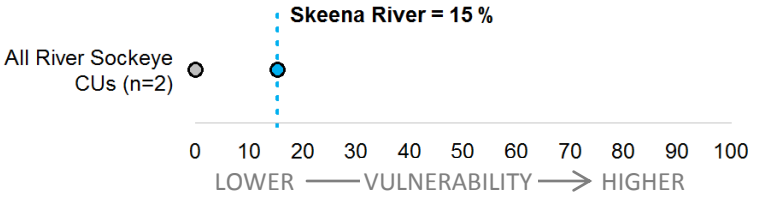
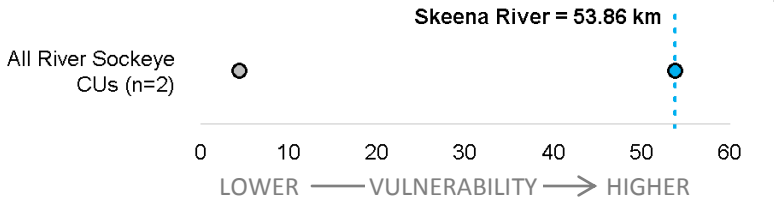
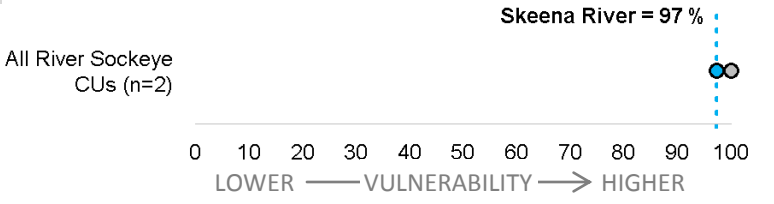


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



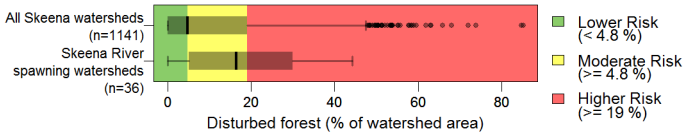
Spawning reaches winter flow sensitive - incubation timing (%)

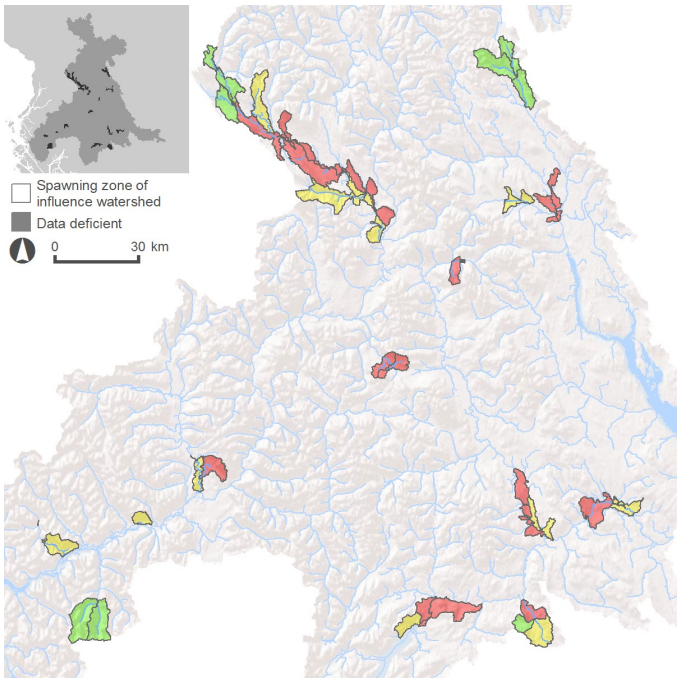


Spawning pressure

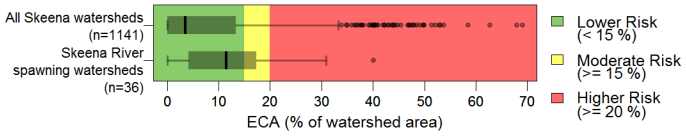
Hydrologic Processes

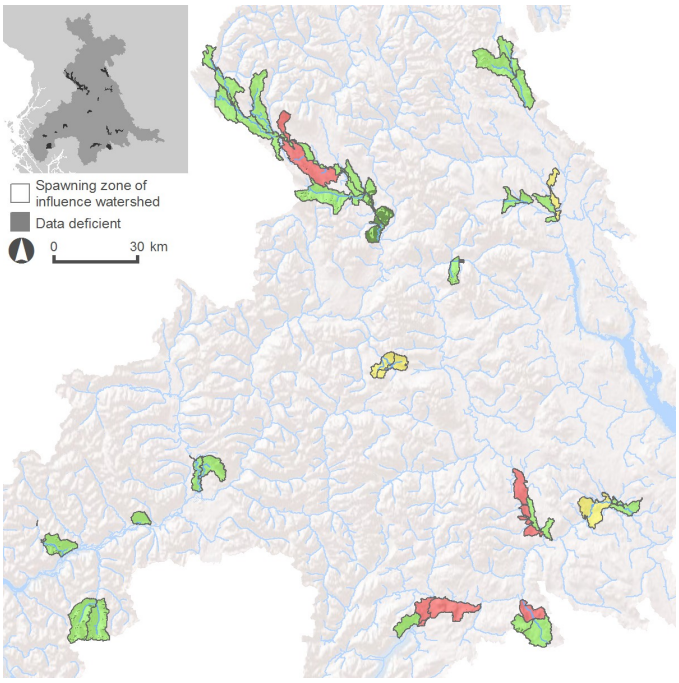
Forest disturbance





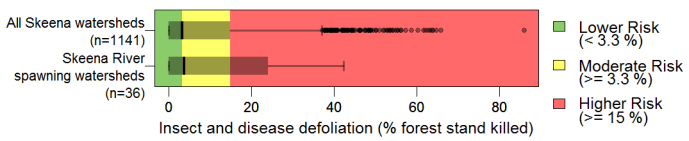
Equivalent Clear-cut Area

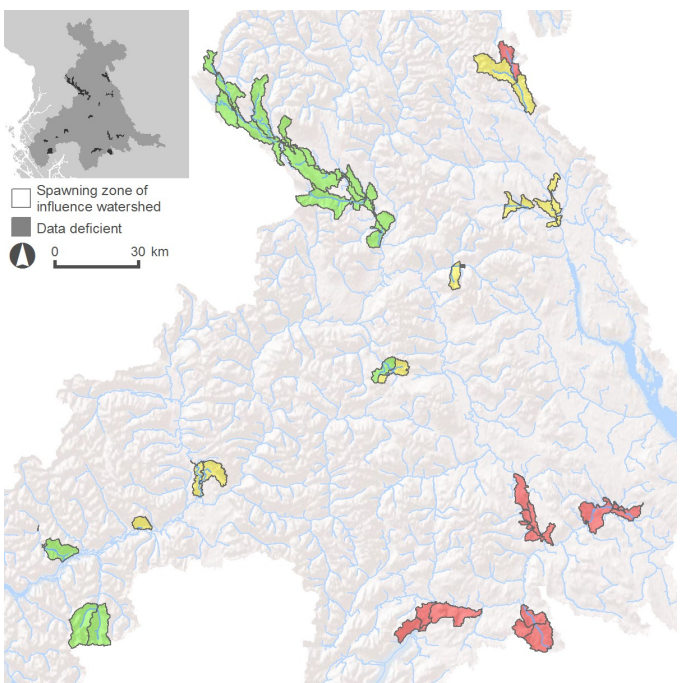




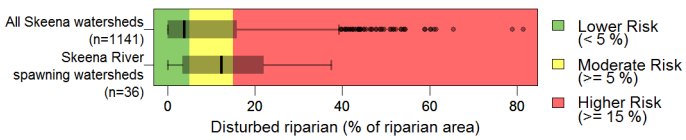
Vegetation Quality

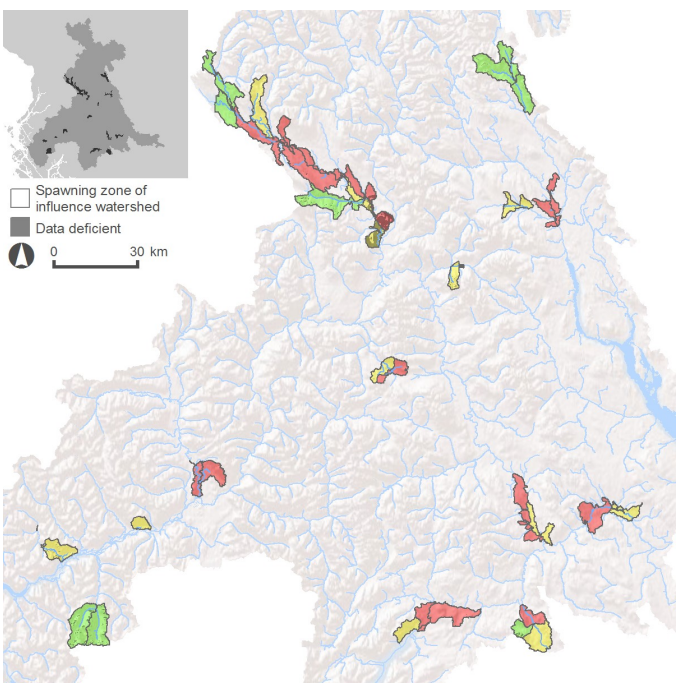
Insect and disease defoliation





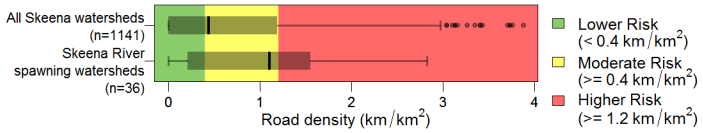
Riparian disturbance

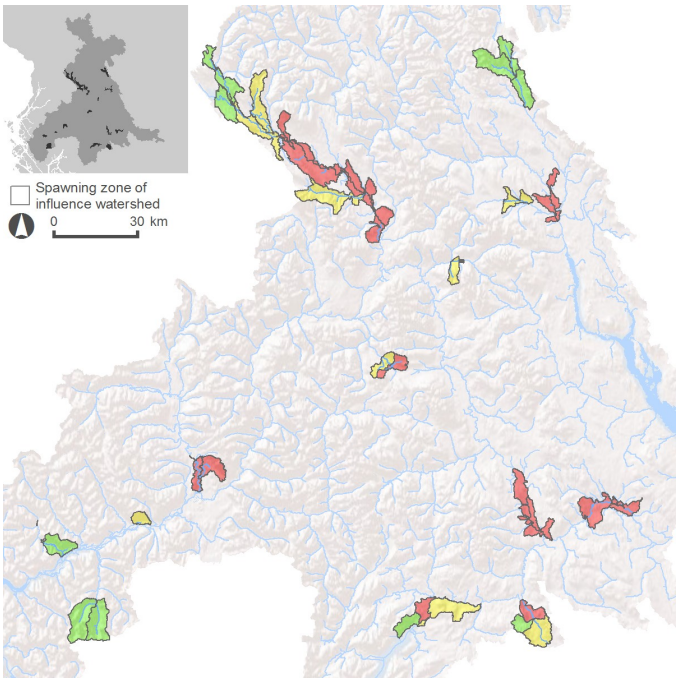




Surface Erosion

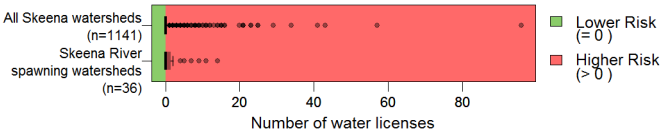
Road development

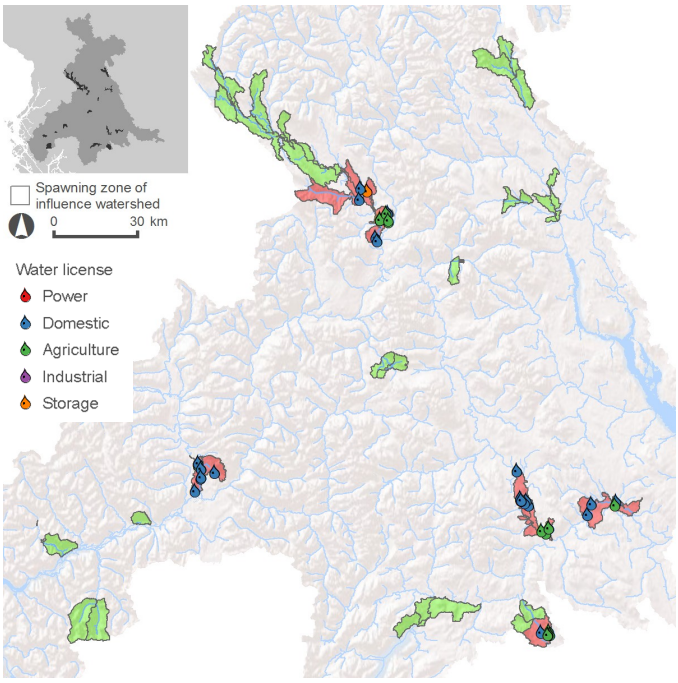




Water Quantity

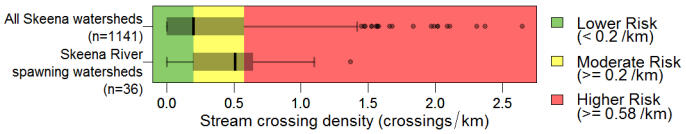
Number of water licenses

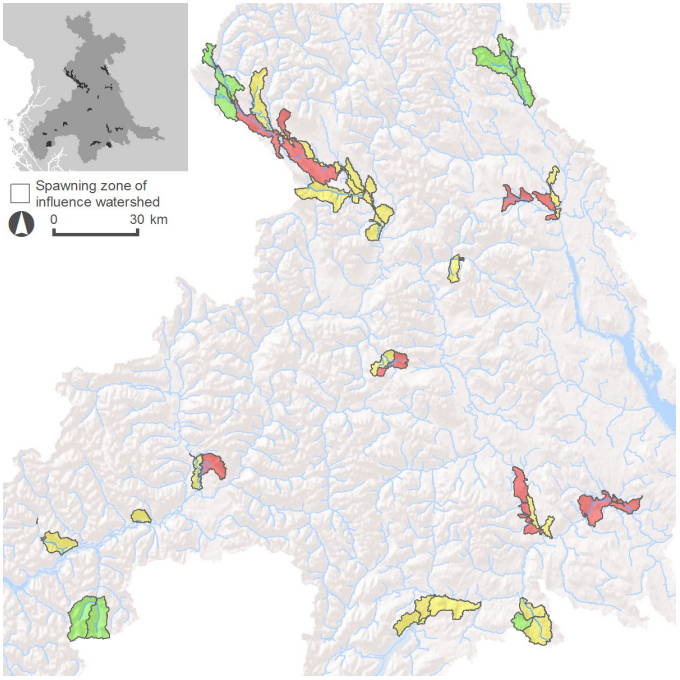




Fish Passage/Habitat Connectivity

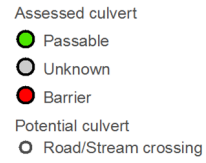
Stream crossing density

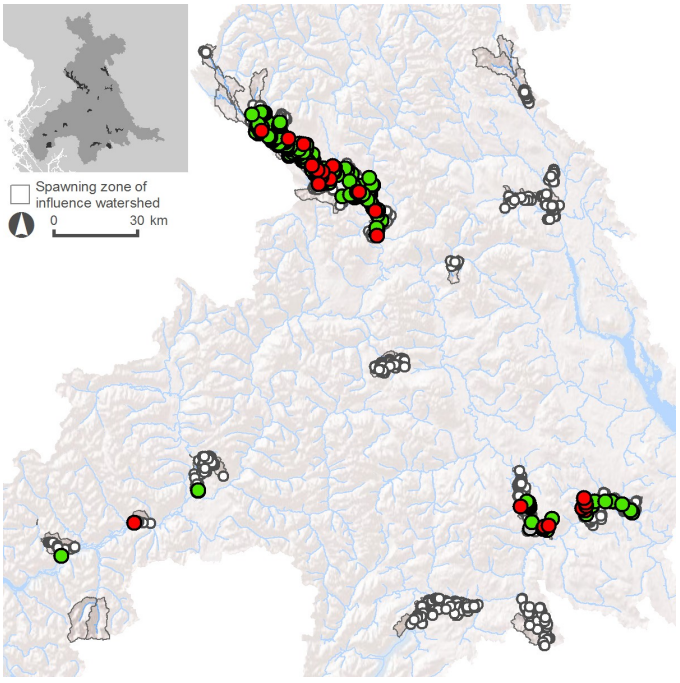




Culvert passability

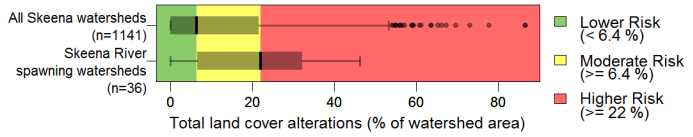
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

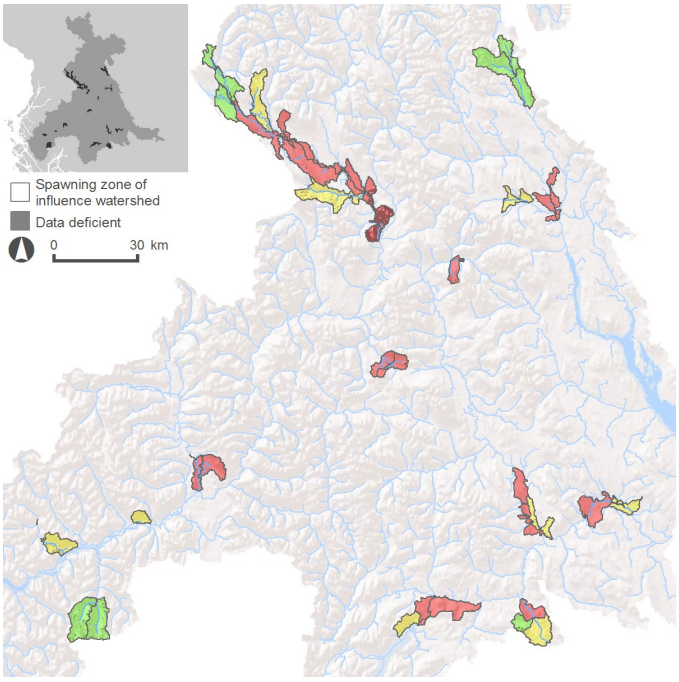




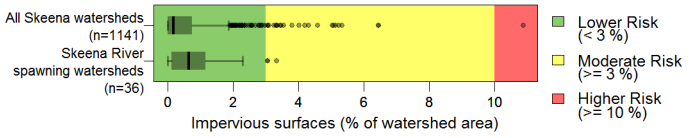
Human Development Footprint

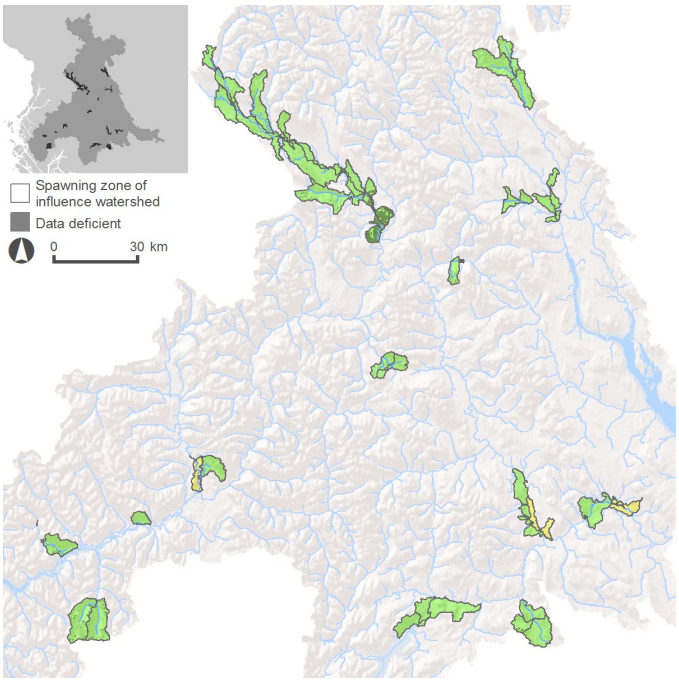
Total land cover alteration



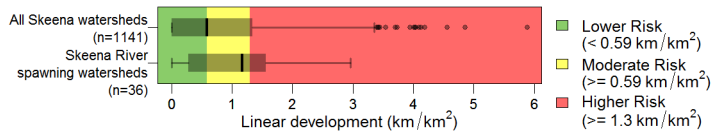


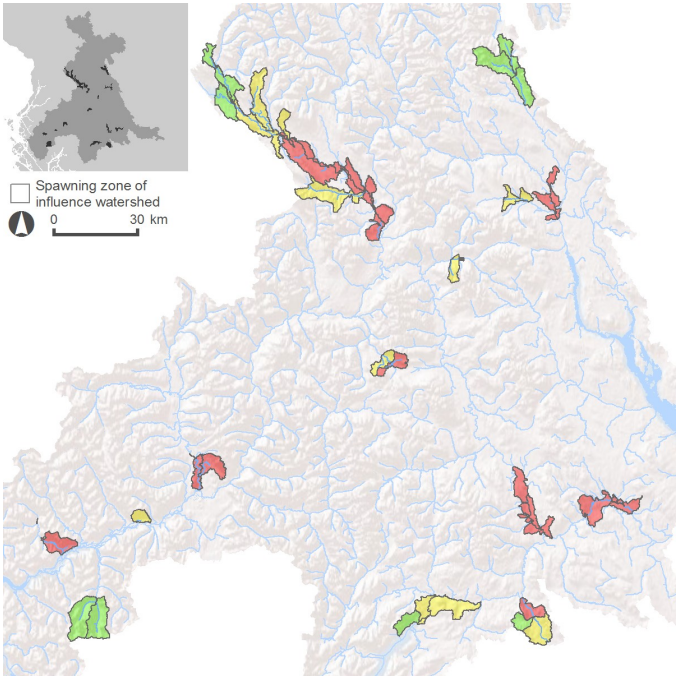
Impervious surfaces



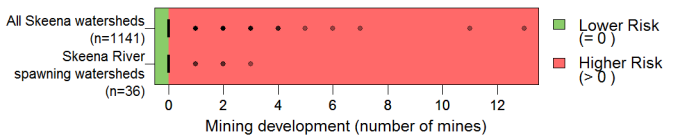


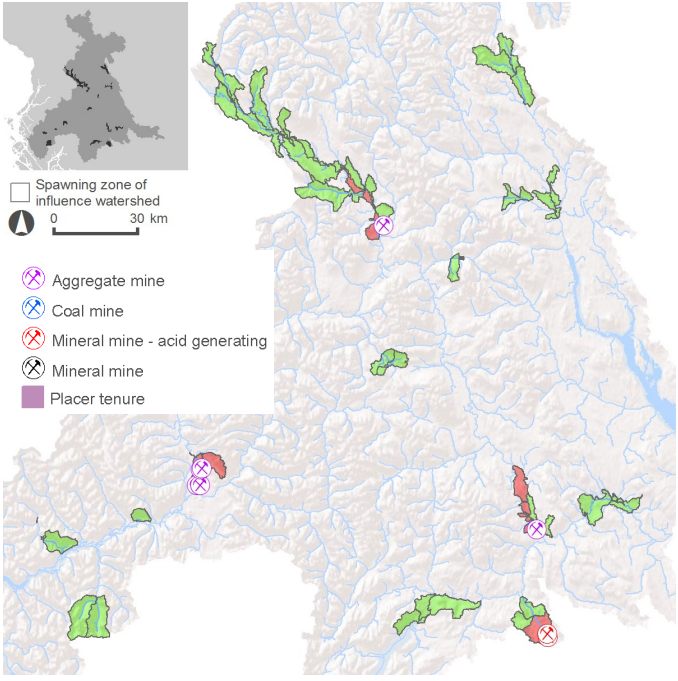
Linear development





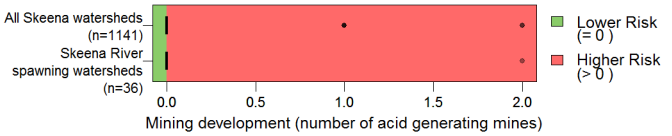
Mining development (total number of mines)

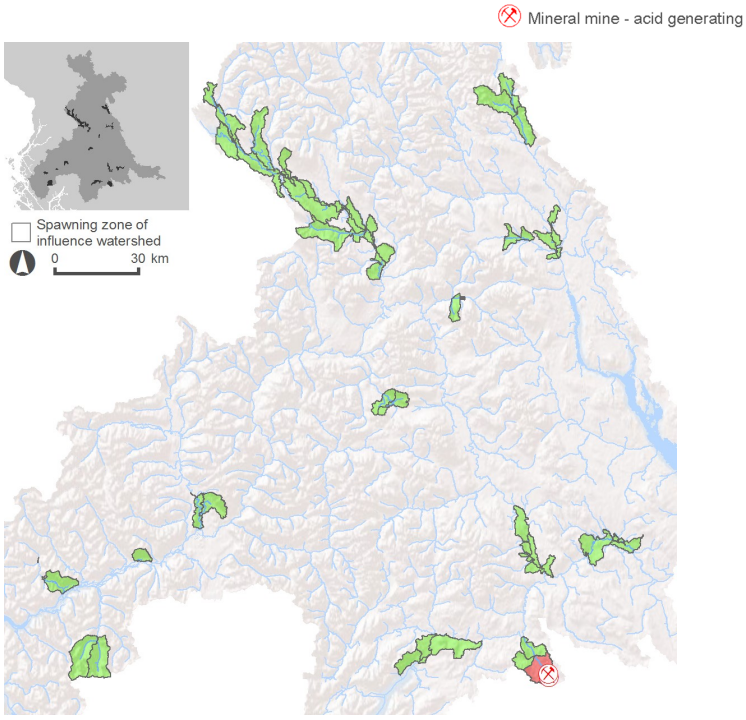




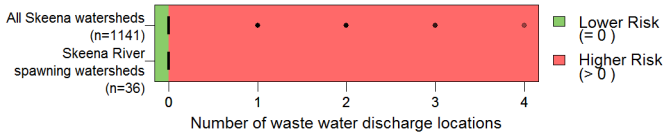
Water Quality

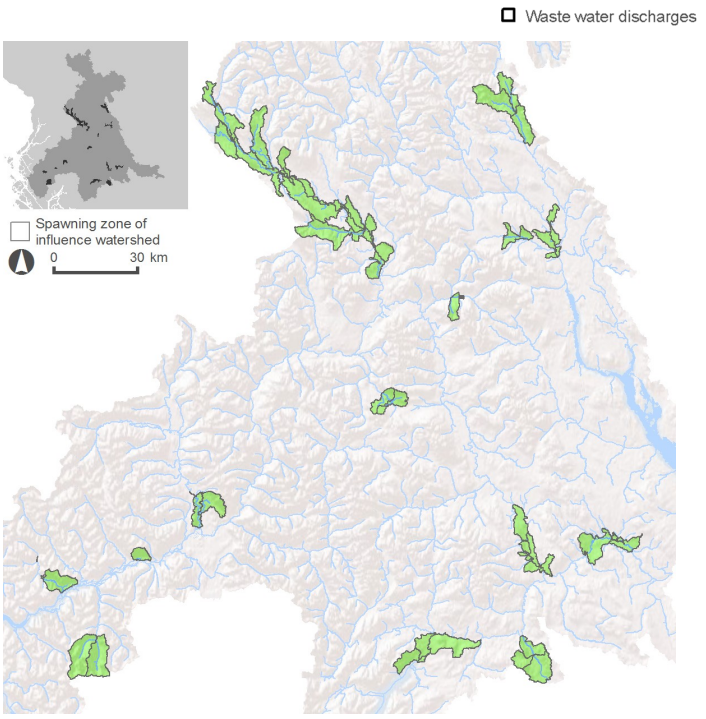
Mining development (acid generating mines)





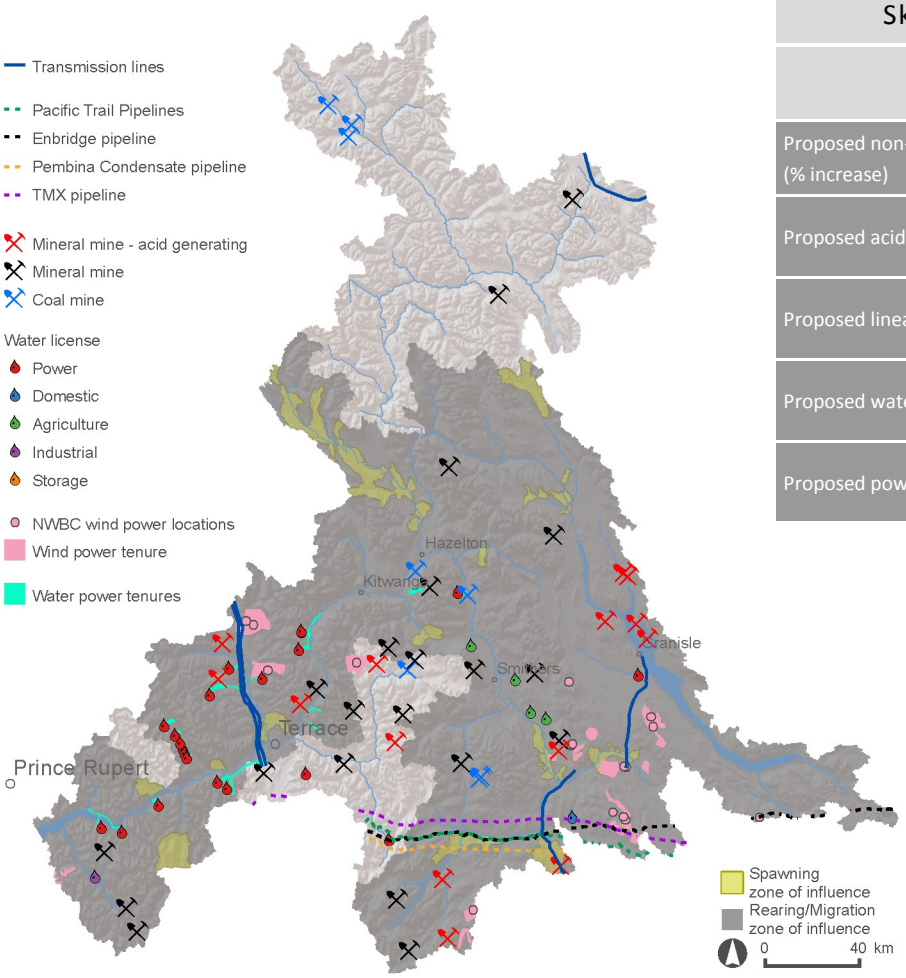
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Skeena River River Sockeye CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	16 (13%)	0 (0%)
Proposed acid generating mines (% increase)	13 (186%)	1 (50%)
Proposed linear development (% increase)	0.02 km/km^2 (2%)	0.05 km/km^2 (4%)
Proposed water licenses (% increase)	31 (3%)	0 (0%)
Proposed power tenures	498 km^2	10 km^2

Skeena Salmon: River Sockeye

Conservation Unit (CU)

Skeena River-High Interior

Version 1.0 Jan 2014

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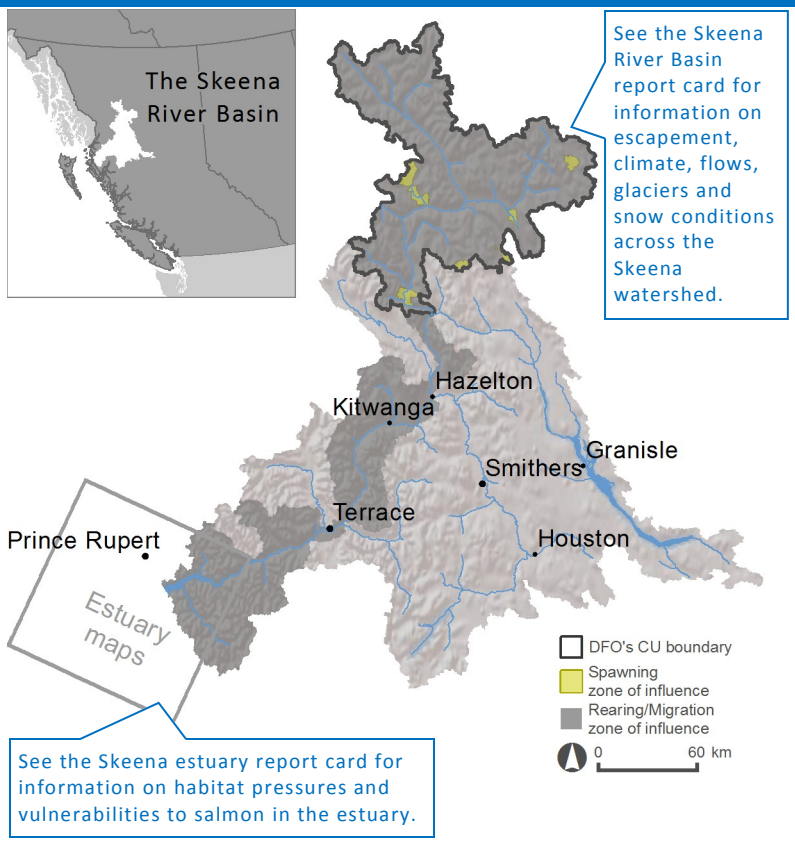

CU overview of habitat vulnerabilities & pressures

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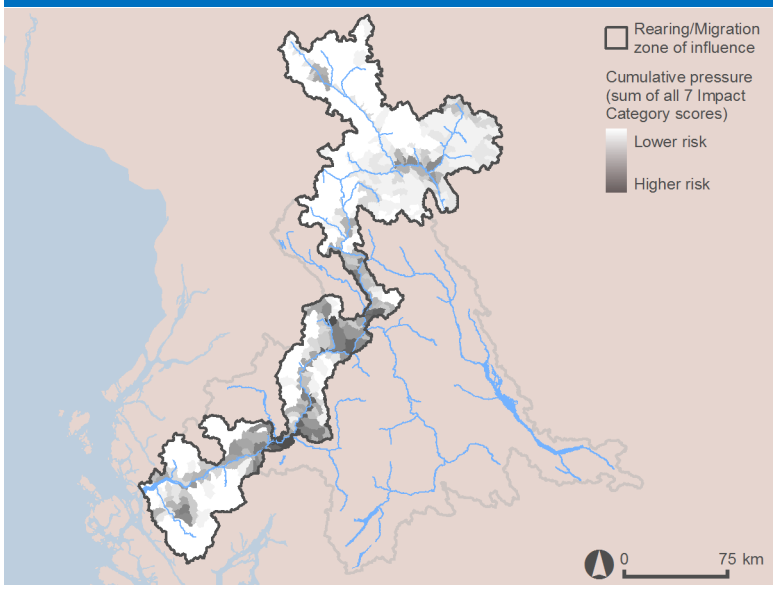
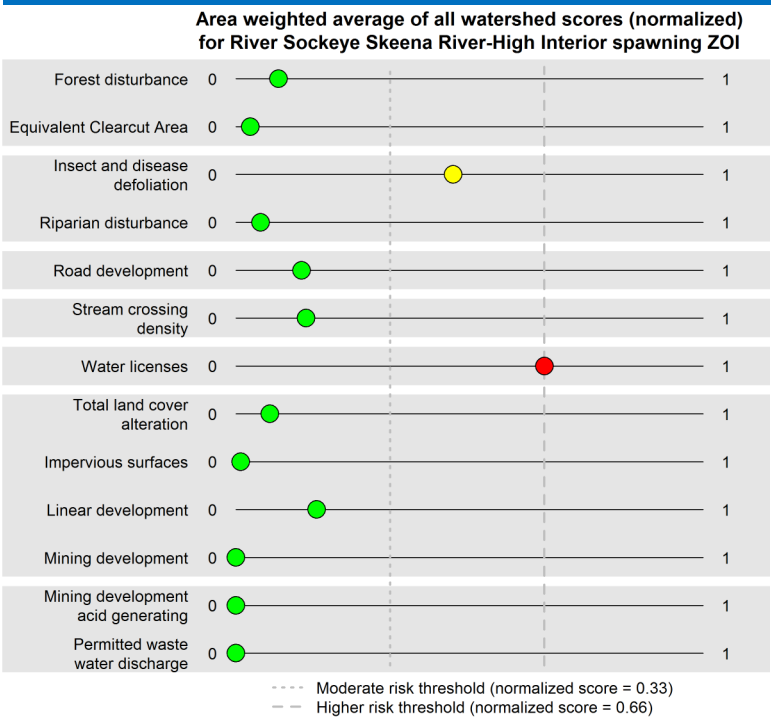
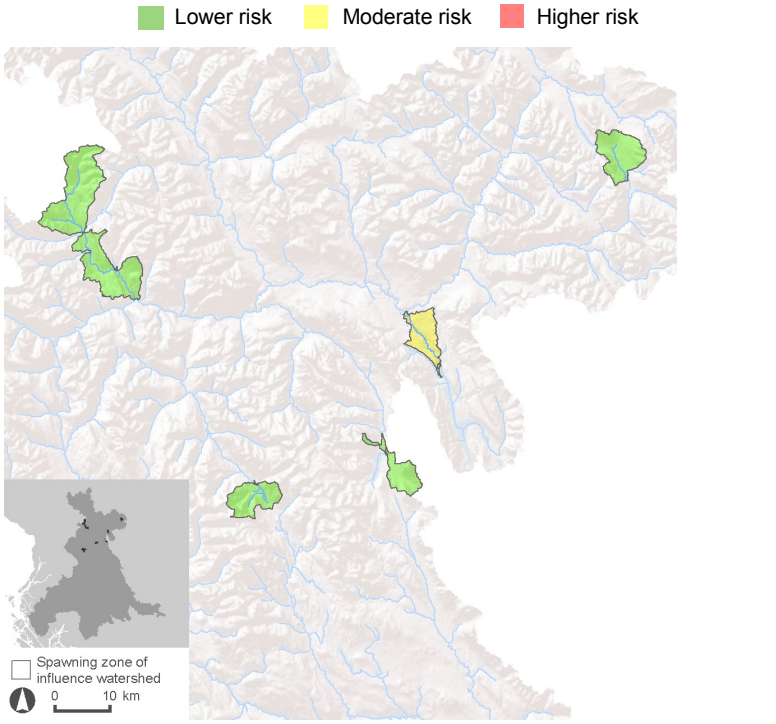
Cumulative pressure—rearing/migration



Summary of pressure indicators—spawning

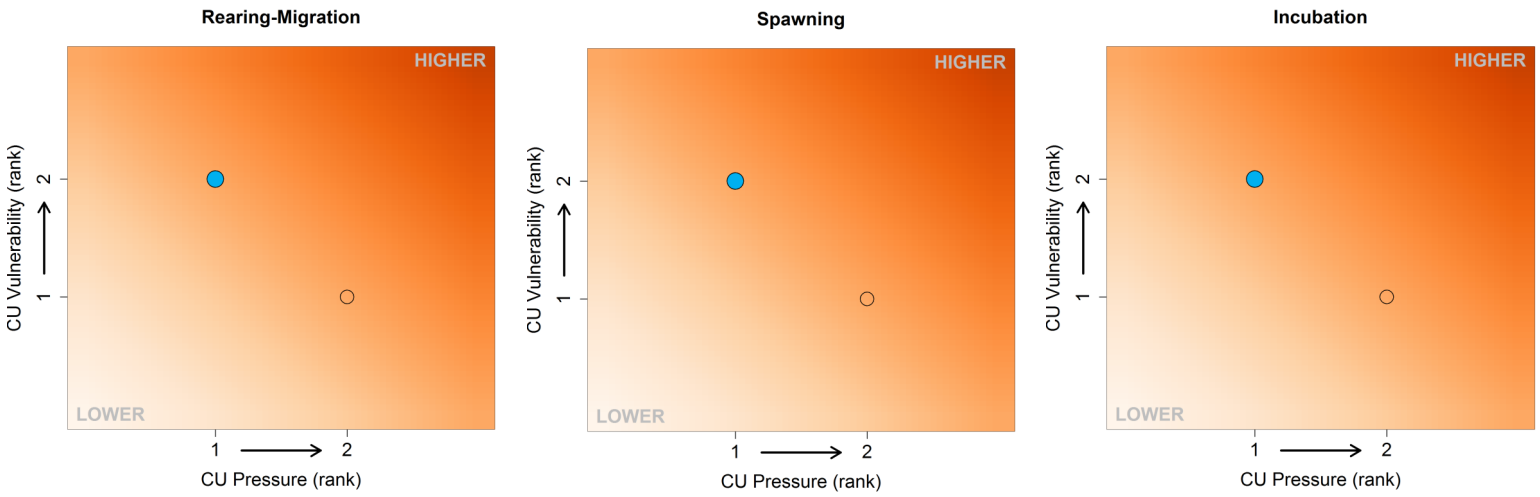


Cumulative pressure—spawning



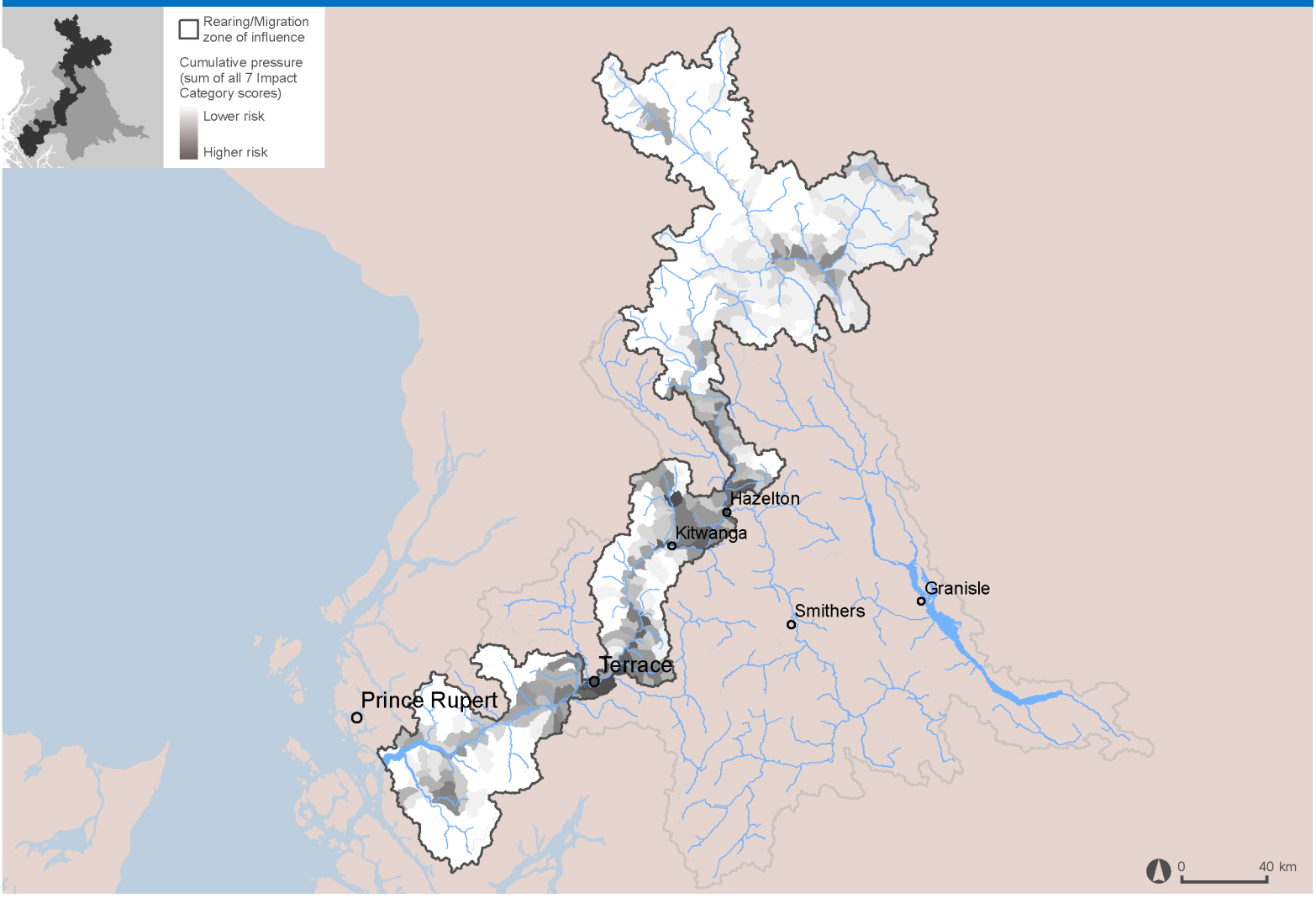
Integrated vulnerability/habitat pressures—rearing/migration, spawning, & incubation

● = Skeena River-High Interior ○ = other Skeena River Sockeye CUs



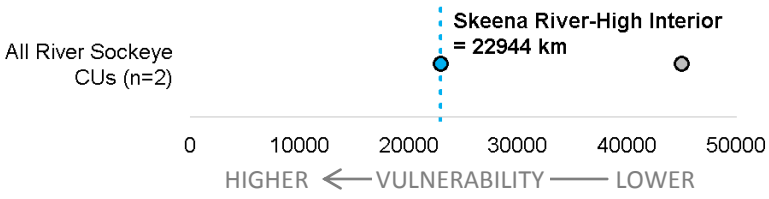
Rearing/Migration vulnerability & pressure

Rearing/Migration period pressures

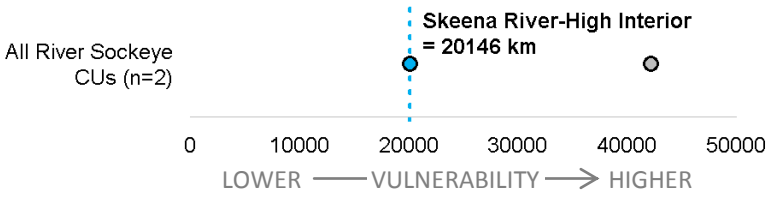


Rearing/Migration period vulnerability

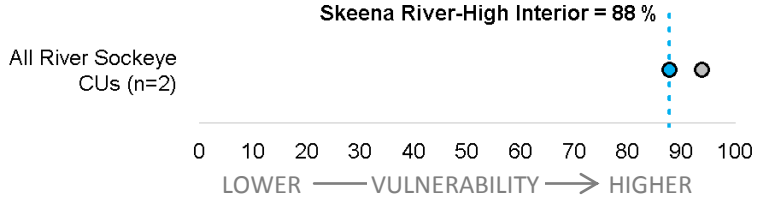
Fish accessible habitat (km)



Flow sensitive accessible habitat (km) (all seasons)



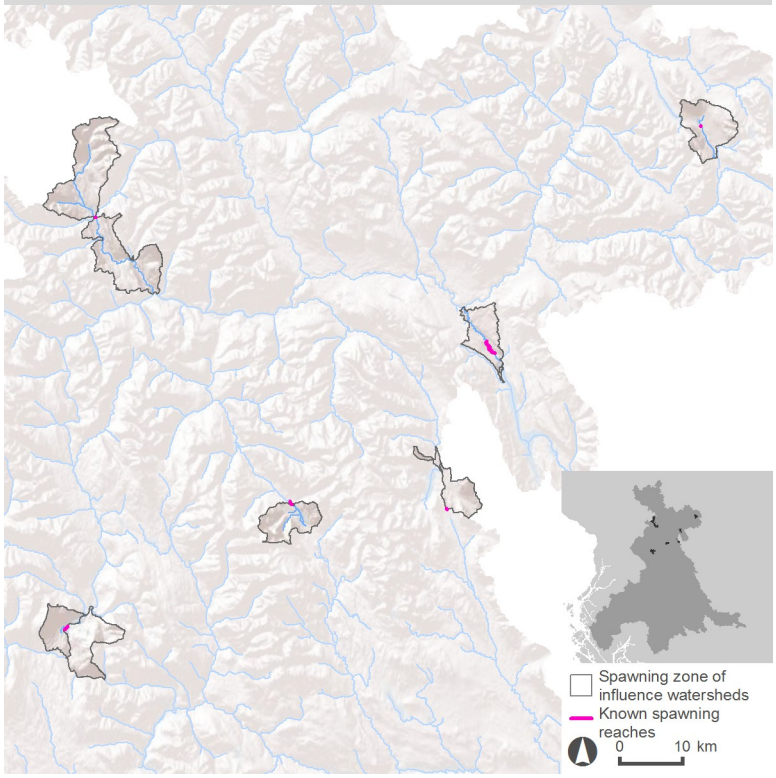
Flow sensitive accessible habitat (%) (all seasons)



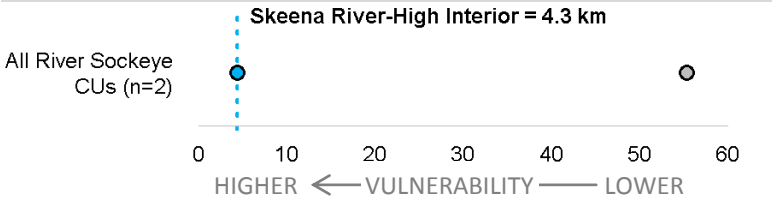
Spawning & incubation vulnerability

Spawning period vulnerability

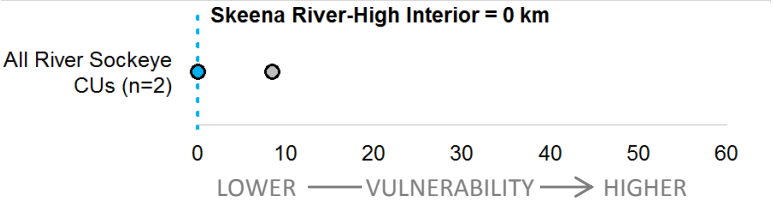
Spawning locations



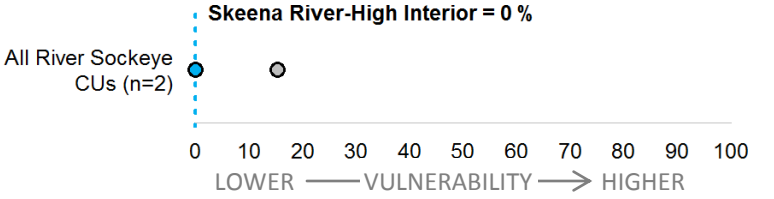
Total spawning length (km)



Spawning reaches summer flow sensitive - spawn timing (km)

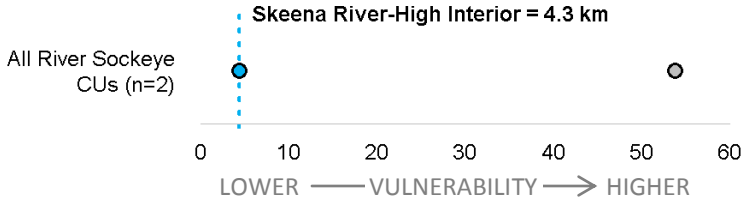


Spawning reaches summer flow sensitive - spawn timing (%)

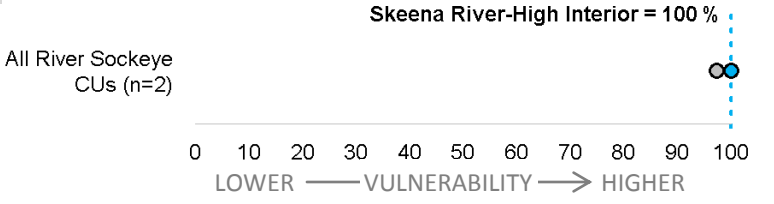


Incubation period vulnerability

Spawning reaches winter flow sensitive - incubation timing (km)



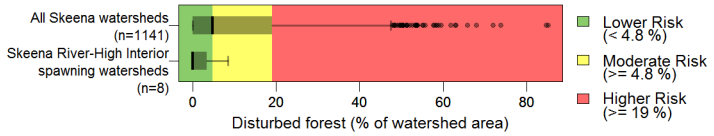
Spawning reaches winter flow sensitive - incubation timing (%)

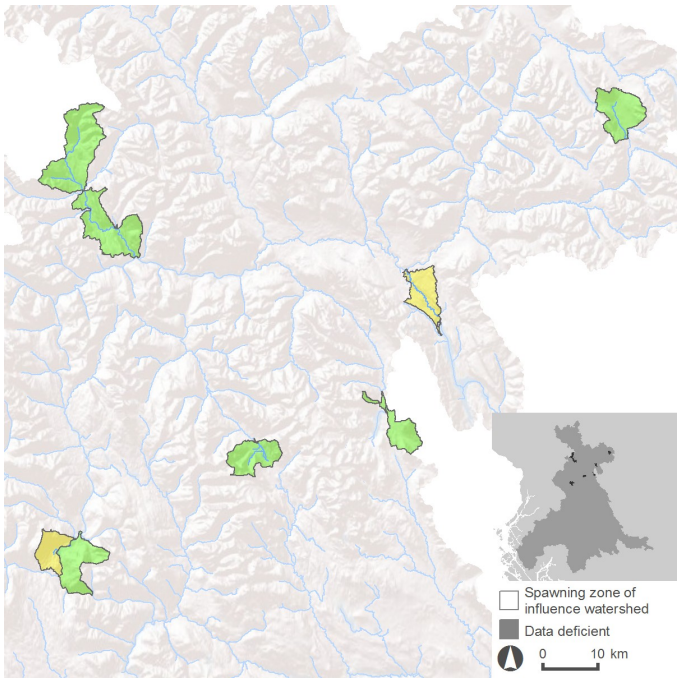


Spawning pressure

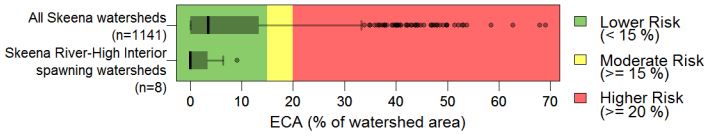
Hydrologic Processes

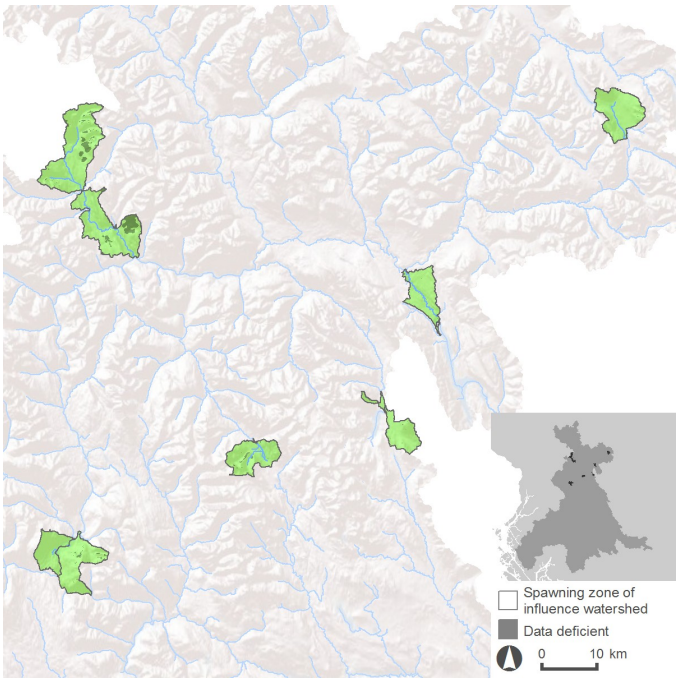
Forest disturbance





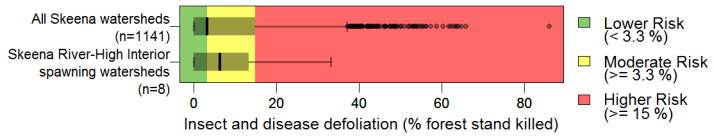
Equivalent Clear-cut Area

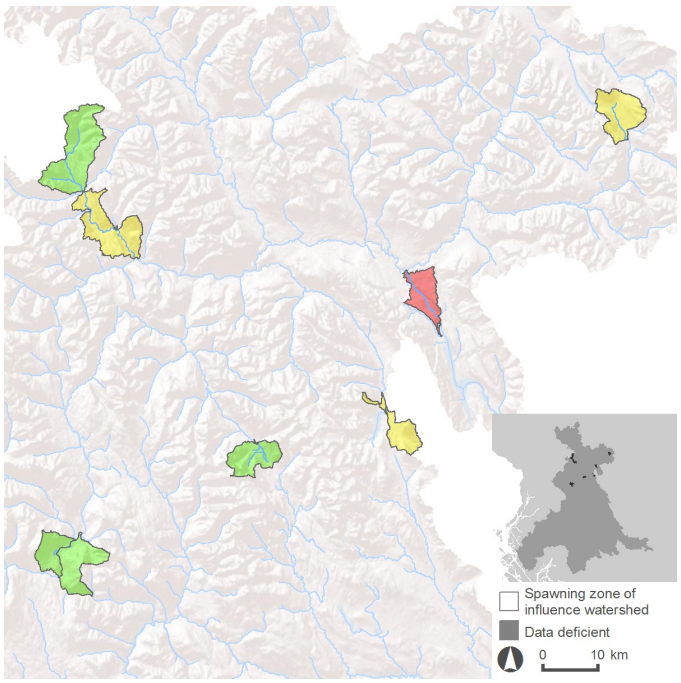




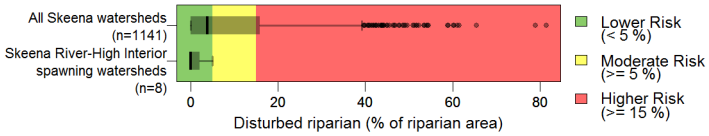
Vegetation Quality

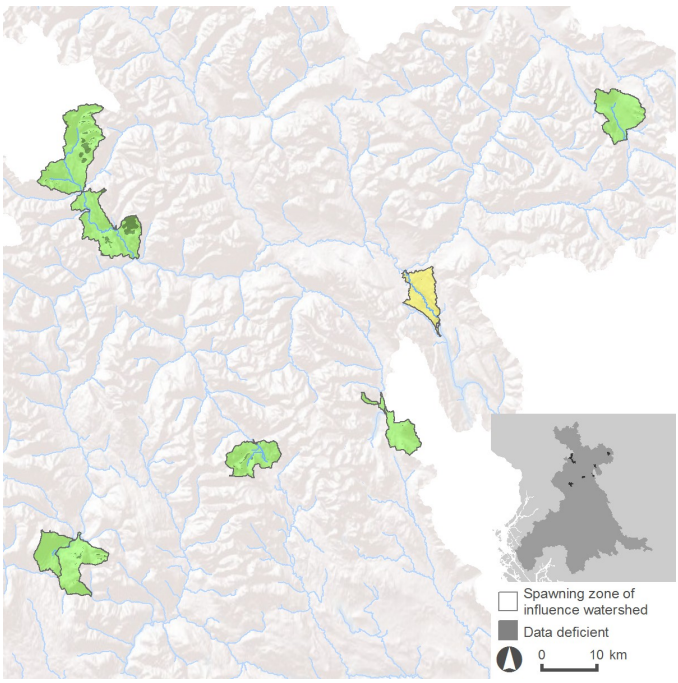
Insect and disease defoliation





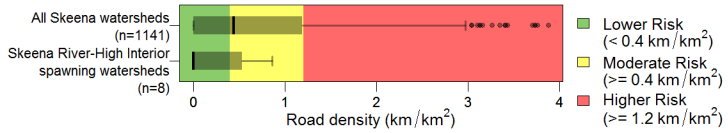
Riparian disturbance

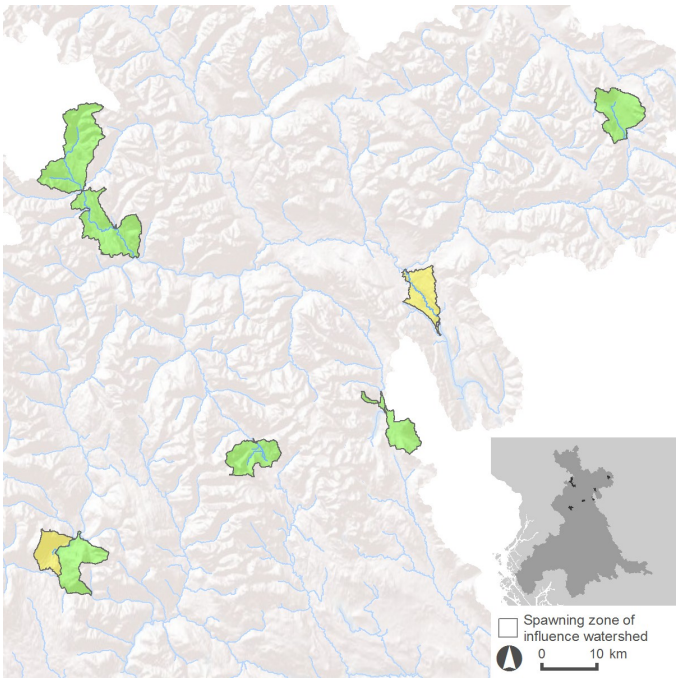




Surface Erosion

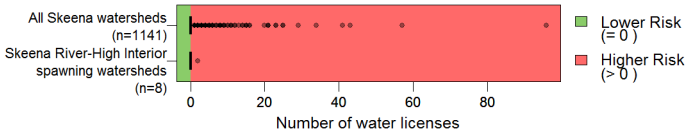
Road development

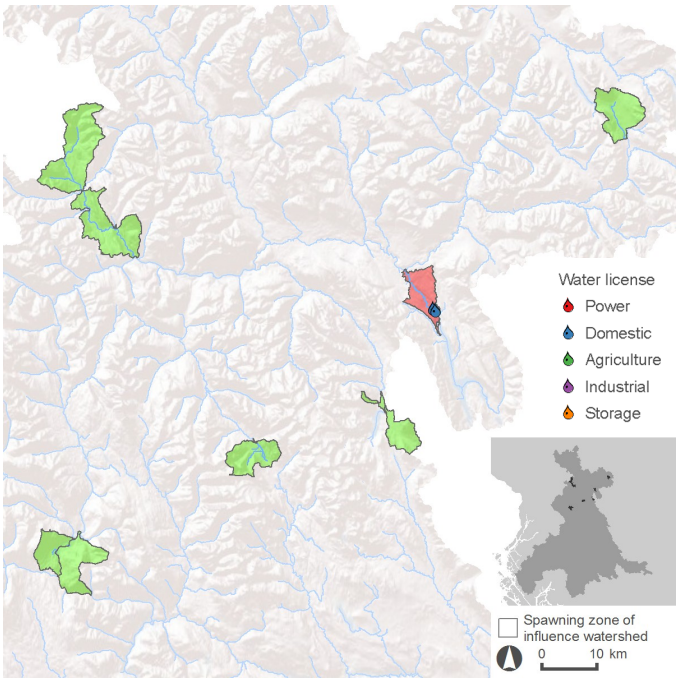




Water Quantity

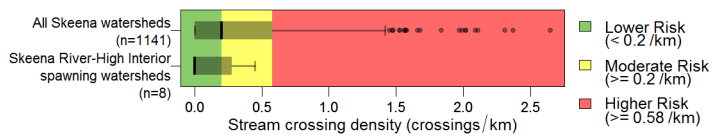
Number of water licenses

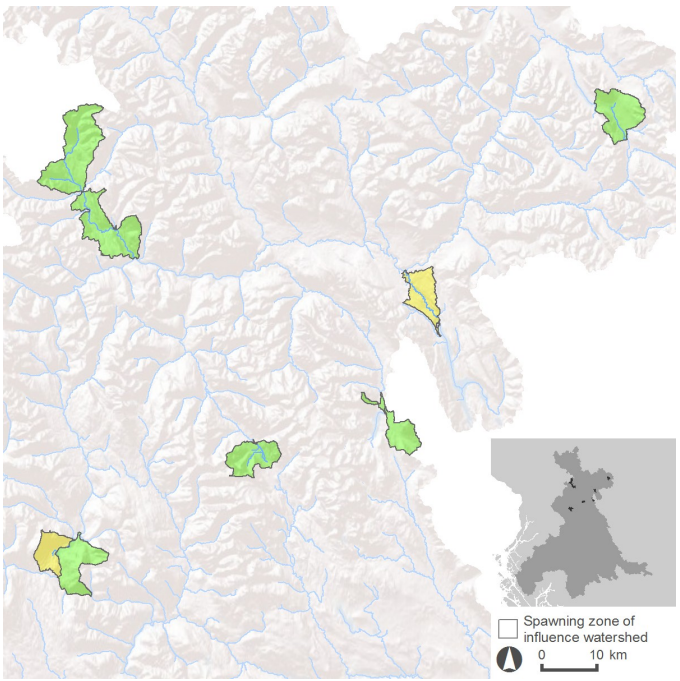




Fish Passage/Habitat Connectivity

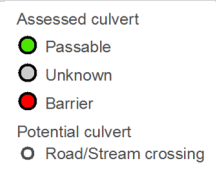
Stream crossing density

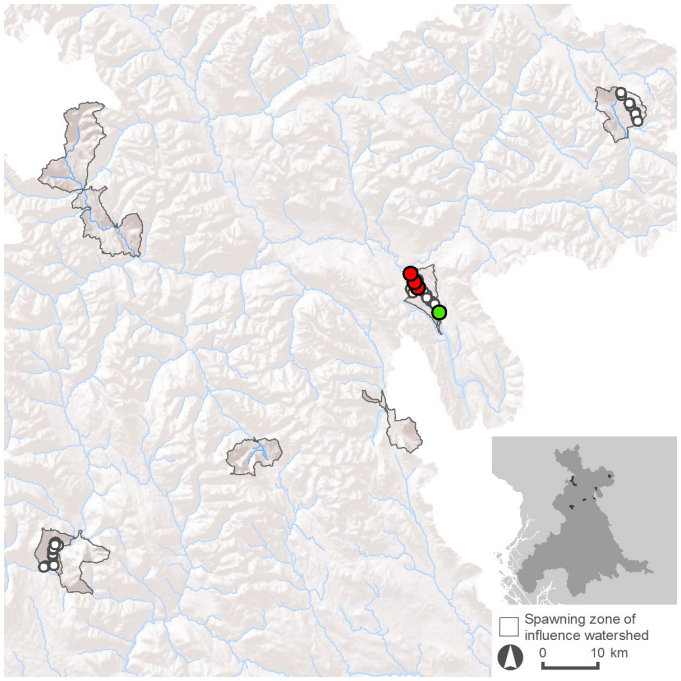




Culvert passability

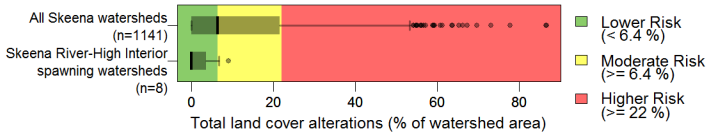
Stream crossings assessed in local Skeena Fish Passage and Culvert Inspection (FPCI) reports.

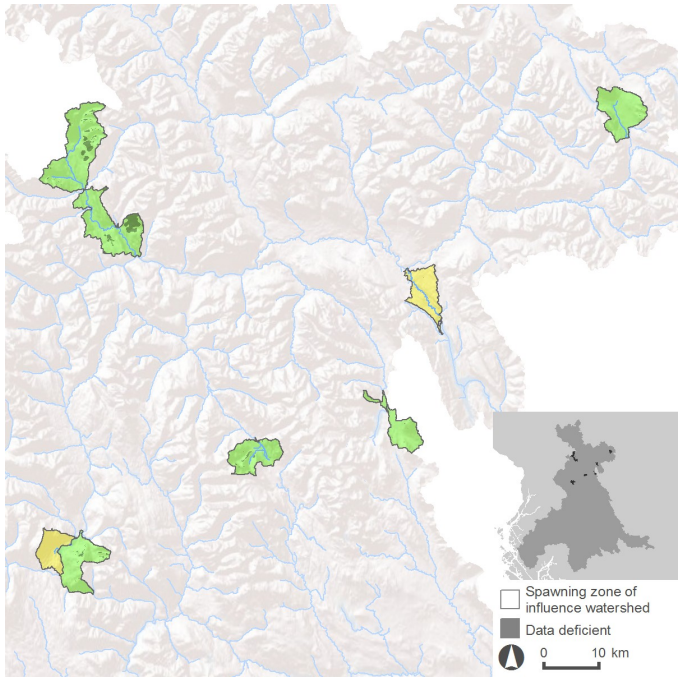




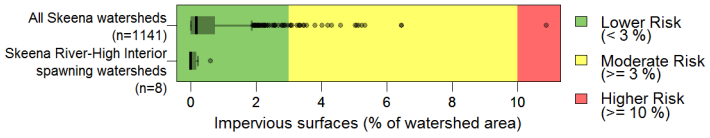
Human Development Footprint

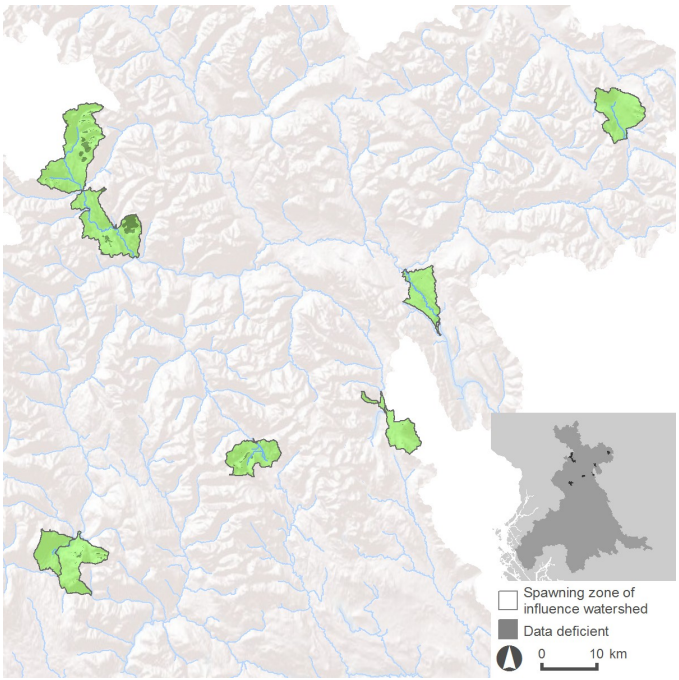
Total land cover alteration



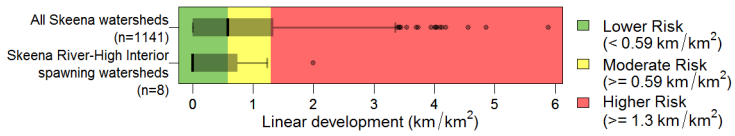


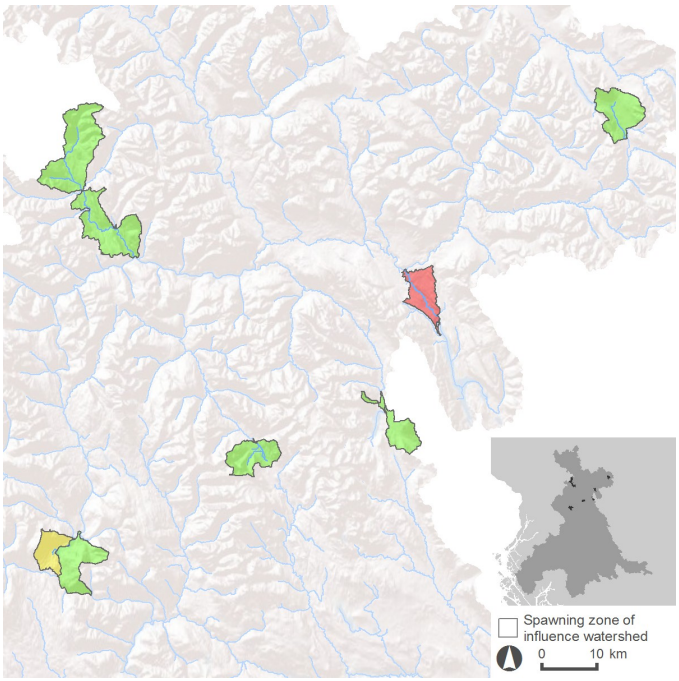
Impervious surfaces



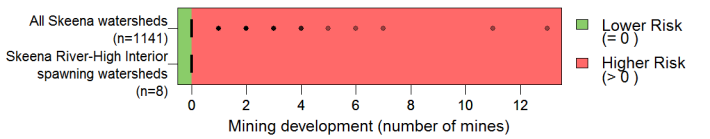


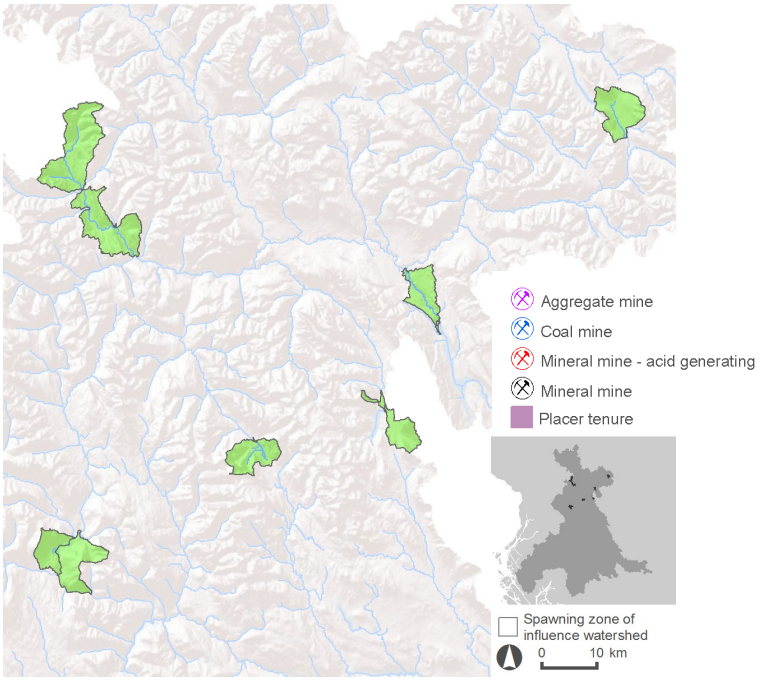
Linear development





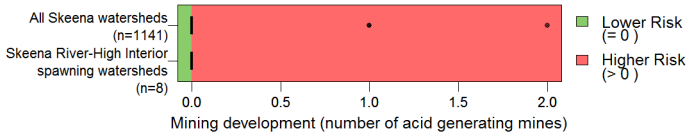
Mining development (total number of mines)

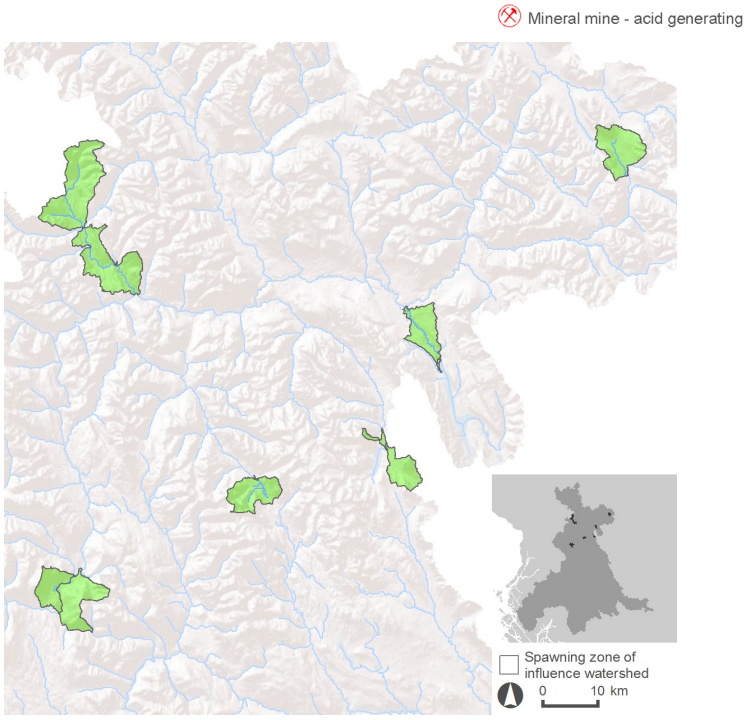




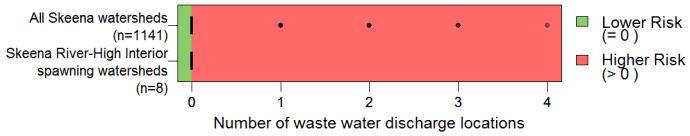
Water Quality

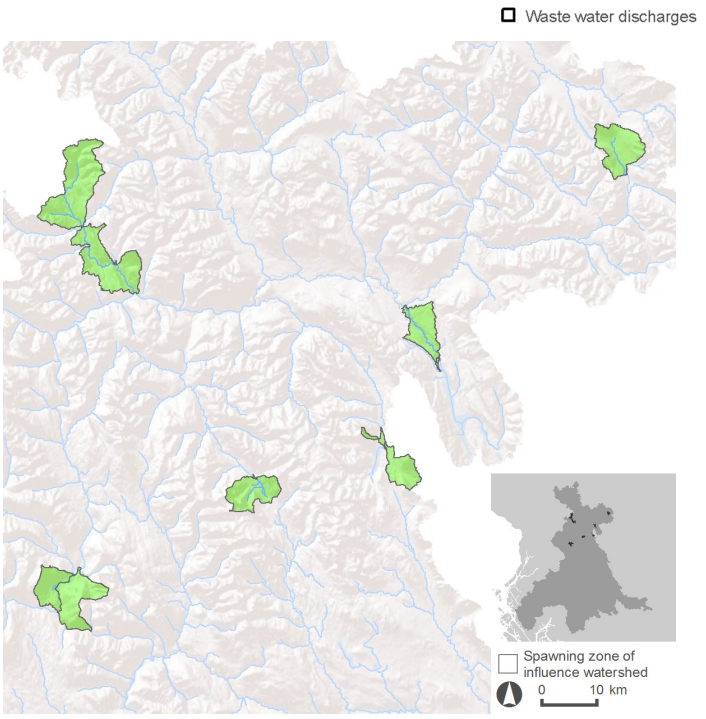
Mining development (acid generating mines)





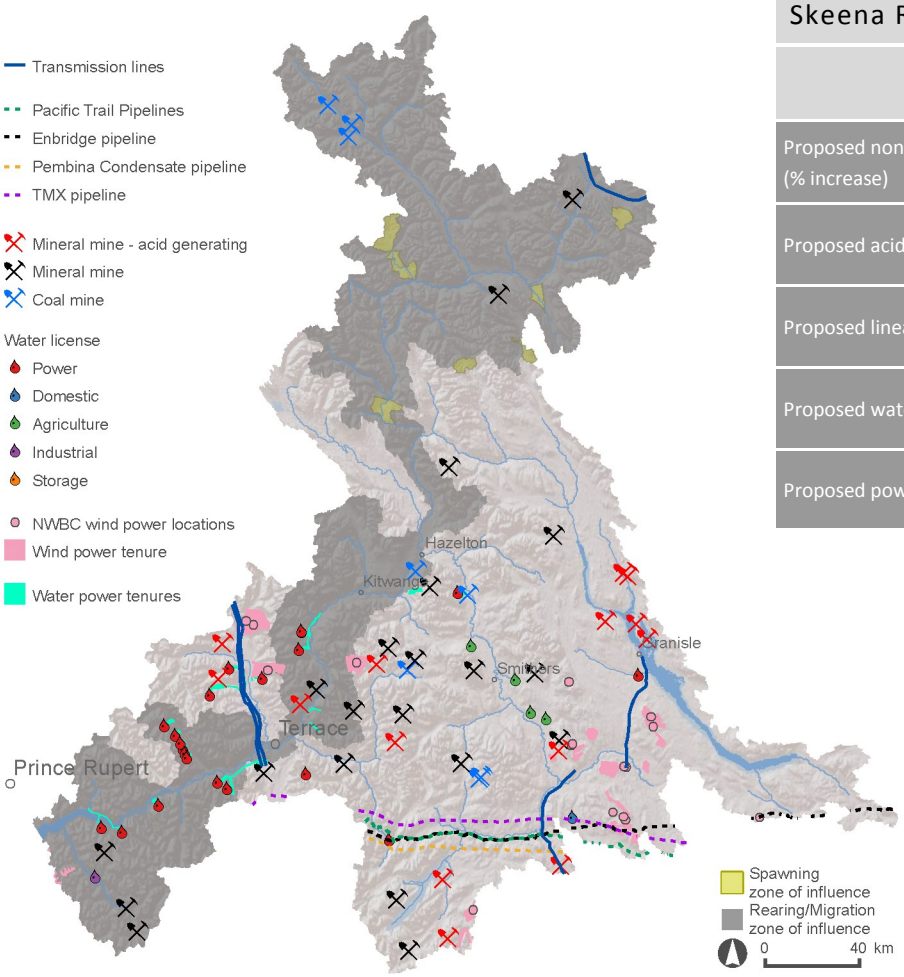
Permitted waste water discharges





Future pressure

Proposed resource development projects (as of 2010)



Skeena River-High Interior River Sockeye CU summary

	Rearing/ Migration	Spawning
Proposed non-acid generating mines (% increase)	9 (17%)	0 (NA)
Proposed acid generating mines (% increase)	1 (50%)	0 (NA)
Proposed linear development (% increase)	0.004 km/km^2 (0.8%)	0 km/km^2 (0%)
Proposed water licenses (% increase)	18 (12%)	0 (0%)
Proposed power tenures	116 km^2	0 km^2