The Pacific salmon explorer: a data driven look at salmon populations and their habitats

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The Pacific Salmon Explorer

A data driven look at Pacific salmon populations and their habitats

Katrina Connors, E. Jones, L. Honka, K. Kellock, E. Hertz & B. Riddell
Salmon Watersheds Program

1. Synthesize existing scientific information
2. Assess status of salmon stocks and their habitats
3. Make information broadly available

192 Salmon Conservation Units (CUs)
Collaborations & Partnerships

1. Collate and expand baseline scientific information

2. Assess status of salmon populations and their habitats

3. Make information broadly available
For each CU within a region:
- number of returning adult salmon
- estimates of freshwater production
- age composition data
- productivity (recruits-per-spawner)
- harvest (in-river and marine)
- run timing
Population Assessments

- **High**
- **Low**

**Extent of management intervention**

- **Lower Benchmark**
  - **Red Status Zone**
  - **Amber Status Zone**

- **Higher Benchmark**
  - **Green Status Zone**

**Abundance**

- **Low**
- **High**
Population Assessments

**Historic Spawners**

- Spawners (000s)
- Return year
- 25th percentile
- 75th percentile

**Stock Recruitment**

- Spawners (000s)
- Recruits (000s)
- $S_{gen1}$
- $S_{MSY}$
Population Assessments

North and Central Coast - Biological Status

sockeye CUs

Biological Status
- Poor
- Fair
- Good
- Data Deficient
Habitat Assessments
Habitat Assessments

1. Forest Disturbance
2. Road Development
3. Water Licenses
4. Riparian Disturbance
5. Insect & Disease Defoliation
6. Equivalent Clearcut Area
7. Stream Crossing Density
8. Land Cover Alteration
9. Impervious Surfaces
10. Linear Development
11. Mining Development
12. Wastewater Discharge
Habitat Assessments

Forest disturbance: % of total watershed that has been clearcut, selectively logged, or recently burned
Forest disturbance: % of total watershed that has been clearcut, selectively logged, or recently burned

Forest Disturbance
- High Risk (≥ 10%)
- Moderate Risk (≥ 3%)
- Low Risk (< 3%)
Habitat Assessments

Cumulative Pressures

- Poor
- Fair
- Good
Population & Habitat Assessments

Population Assessments

Habitat Assessments

Biological Status
- Poor
- Fair
- Good
- Data Deficient

Cumulative Pressures
- Poor
- Fair
- Good
Salmon in British Columbia

Pacific salmon are integral to the coastal ecosystems, economies, and communities of British Columbia (BC), Canada. The watersheds of BC support five species of Pacific salmon (sockeye, pink, Chinook, coho, and chum) and provide spawning and rearing habitat for over 400 genetically and geographically distinct populations of wild salmon, called Conservation Units.

This tool summarizes the best available information for all salmon Conservation Units on BC’s North and Central Coast. For each salmon-bearing watershed, we provide a snapshot of the current status of individual salmon Conservation Units and assessments of current pressures on their habitat. The Pacific Salmon Explorer is a living tool, and the information is updated on an ongoing basis as new data become available.

Open-access platforms like the Pacific Salmon Explorer provide the public with timely information on the status of Conservation Units and provide the basis for the monitoring and assessment of salmon. Evidence-based decision-making requires timely and reliable data, and by providing standardized information for all salmon Conservation Units, this tool can

salmonexplorer.ca
Pacific Salmon Explorer

Provides free public access to salmon-related datasets

salmonexplorer.ca
Print summary reports describing the status of each Conservation Unit and key habitat and population information.
Scaling up to the Salish Sea

+ 142 Salmon Conservation Units (CUs)
Take Home Messages

1) It’s important to know what we don’t know

2) Evidence-based decision-making requires access to best available information

3) Access to timely and relevant information can empower local communities
Acknowledgements

Illustrations
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Cumulative Pressures

**Two-Level Roll-Up Rule Set** (for individual FWA assessment watersheds)

- Level 1: Indicators -> Impact Categories

![Diagram of Cumulative Pressures]

- IMPACT CATEGORIES:
  - Hydrologic Processes
  - Surface Erosion
  - Fish Passage & Habitat Connectivity
  - Vegetation Quality
  - Water Quantity
  - Water Quality
  - Human Development Footprint

- PRESSURE INDICATORS:
  - Forest Disturbance
  - Equivalent Clearcut Area
  - Road Development
  - Stream Crossing Density
  - Insect & Disease Defoliation
  - Riparian Disturbance
  - Water Licenses
  - Wastewater Discharges
  - Total Land Cover Alteration
  - Linear Development
  - Mining Development
  - Impervious Surfaces
Cumulative Pressures

**Two-Level Roll-Up Rule Set** (for individual FWA assessment watersheds)

- Level 1: Indicators ➔ Impact Categories
- Level 2: Impact Categories ➔ Final cumulative pressure rating

Cumulative rating: High Risk
Biological + Habitat Status

Actions informed by your objectives...

Objective A: maintain biological diversity?
Objective B: maintain abundance of CUs targeted by fisheries?
Objective C: maintain abundance of culturally important CUs?
Objective D: focus on recovery of high-risk CUs (red-red)?

Protect CUs with good biological status and low risk of habitat degradation?

Focus on CUs at higher risk of habitat degradation but unknown biological status?

Priority CUs for recovery efforts?

Increased monitoring or more detailed habitat assessments?

Objective A: maintain biological diversity?

Objective B: maintain abundance of CUs targeted by fisheries?

Objective C: maintain abundance of culturally important CUs?

Objective D: focus on recovery of high-risk CUs (red-red)?
Conceptual Model

**IMPACTS ON WATER QUALITY**
- Wastewater Discharges
- Ocean Dumping
- Dredging
- Marine Forestry
- Climate Change
- Nutrients
- Toxic Contaminants
- Phyttoplankton
- Abiotic Conditions

**IMPACTS ON SALMON HABITAT & LOWER FOOD WEB**
- Invasive Species
- Hatchery Releases
- Shoreline & Nearshore Development
- Marine Vessel Traffic
- Intertidal Wetlands
- Zooplankton
- Eelgrass & Kelp

**DIRECT IMPACTS ON SALMON POPULATIONS**
- Harvest
- Predators
- Disease

Legend:
- Orange: Pressure
- Purple: Ecosystem Component
Skeena Estuary Assessment

Skeena River Estuary
Population Assessments

Historic Spawners

![Graph showing historic spawner population assessments with 25th and 75th percentiles indicated.]
Historic Spawners

Average spawner abundance over most recent generation

Spawners (000s)

Return year

75th percentile

25th percentile

Population Assessments
Stock Recruitment

Population Assessments
Stock Recruitment

$S_{\text{MSY}}$ – spawner abundance predicted to produce maximum sustained yield

$S_{\text{gen1}}$ – spawner abundance that will result in recovery to $S_{\text{MSY}}$ in one generation
Stock Recruitment

Population Assessments

Average spawner abundance over most recent generation