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Drought monitoring partnerships project

PACIFIC SALMON FOUNDATION

First Nations Fisheries Council of British Columbia

Fisheries and Oceans Canada / Pêches et Océans Canada

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Objectives

- Our work within Provincial Drought management context
- How we developed this monitoring approach
- Expanding monitoring through partnerships
- Mitigation needs in monitored watersheds

Drought planning

- Our program is built on recommendations from 2023 drought
- Response is key but year round planning
- Consideration of aquatic ecosystems integral

Aim is continuous Improvement.

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What`s New: Drought vs. Water Scarcity

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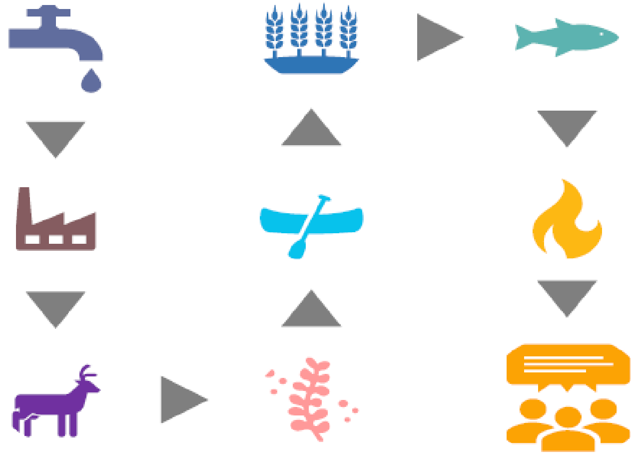
Drought

- **Drought** is a **climate** condition measured relative to the long-term past.
- Important **frame of reference** for measuring water scarcity (normal vs. abnormal state).
- **May or may not** lead to water scarcity.

Water Scarcity



- **Water scarcity** is a lack of available water to meet human or ecological needs.
- Defined and triggered by **local conditions**, **values**, **interests** and **risks**.
- May occur in the **presence or absence** of drought.

Water scarcity impacts

Industry

- Loss of water for hydropower, oil and gas production, and wastewater treatment
- Impacts on tourism, including for recreational activities
- Impacts vegetation growth and timber supply

Agriculture

- Loss of water for milking/livestock watering
- Loss of water for forage irrigation
- Loss of water for crop/food production

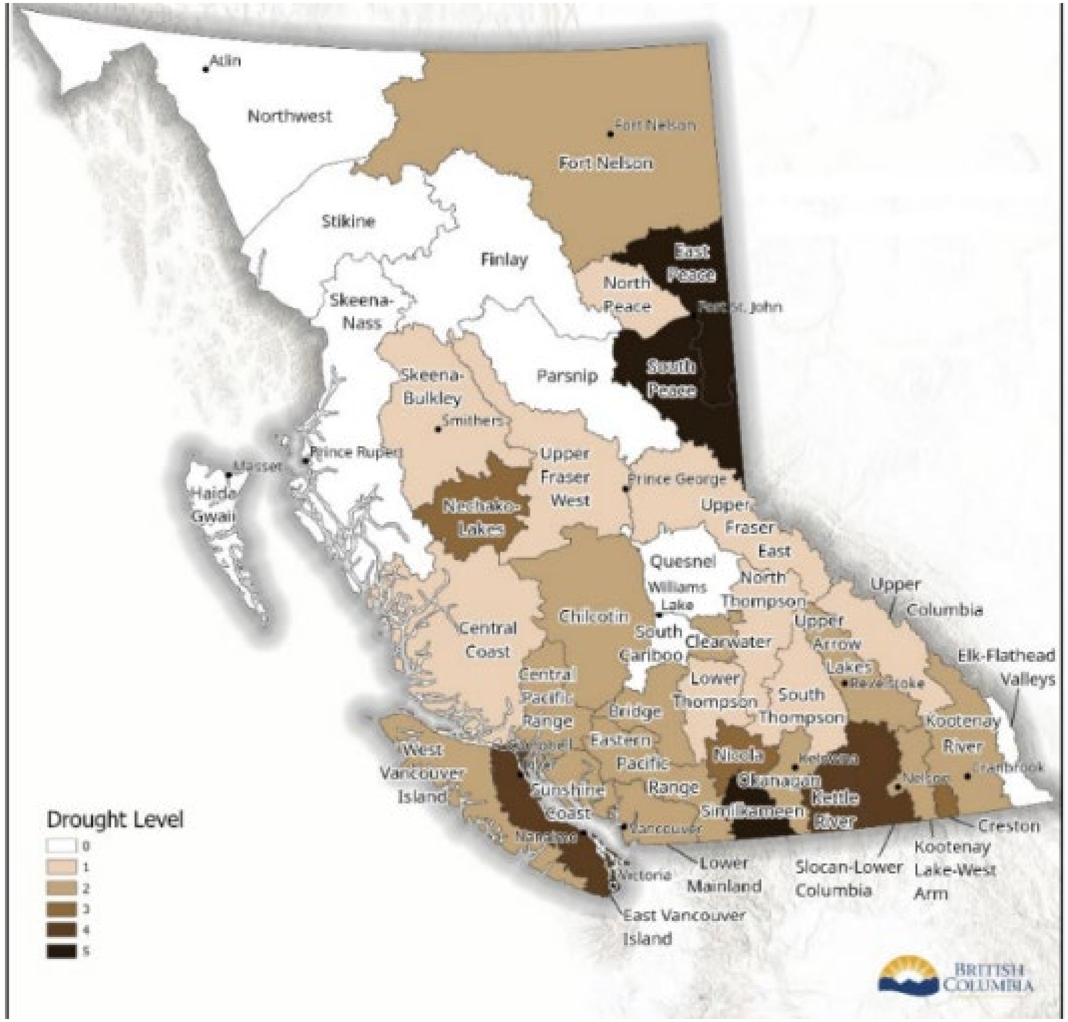
Community

- Loss of water for drinking and sanitation
- Increased concentration of contaminants
- Loss of water supply for essential services (fire suppression, water supply system function, etc.)

Environmental

- Loss of stream flows to support fish populations
- Loss of water to support healthy ecosystem function
- Loss of water supply to meet First Nations cultural needs

Provincial drought management



Drought levels	
Describe	Do not describe
Meteorological/hydrological dryness	Ecosystem, social or economic impacts
Relative frequency (rarity) of dryness	Whether specific response actions should be taken
Current conditions on the assessment date	Outlooks or forecasts
Broad conditions and trends at the drought basin scale	Localized conditions on small tributaries or specific systems

Goal for monitoring: Assess and manage water scarcity risks and impacts on aquatic ecosystems

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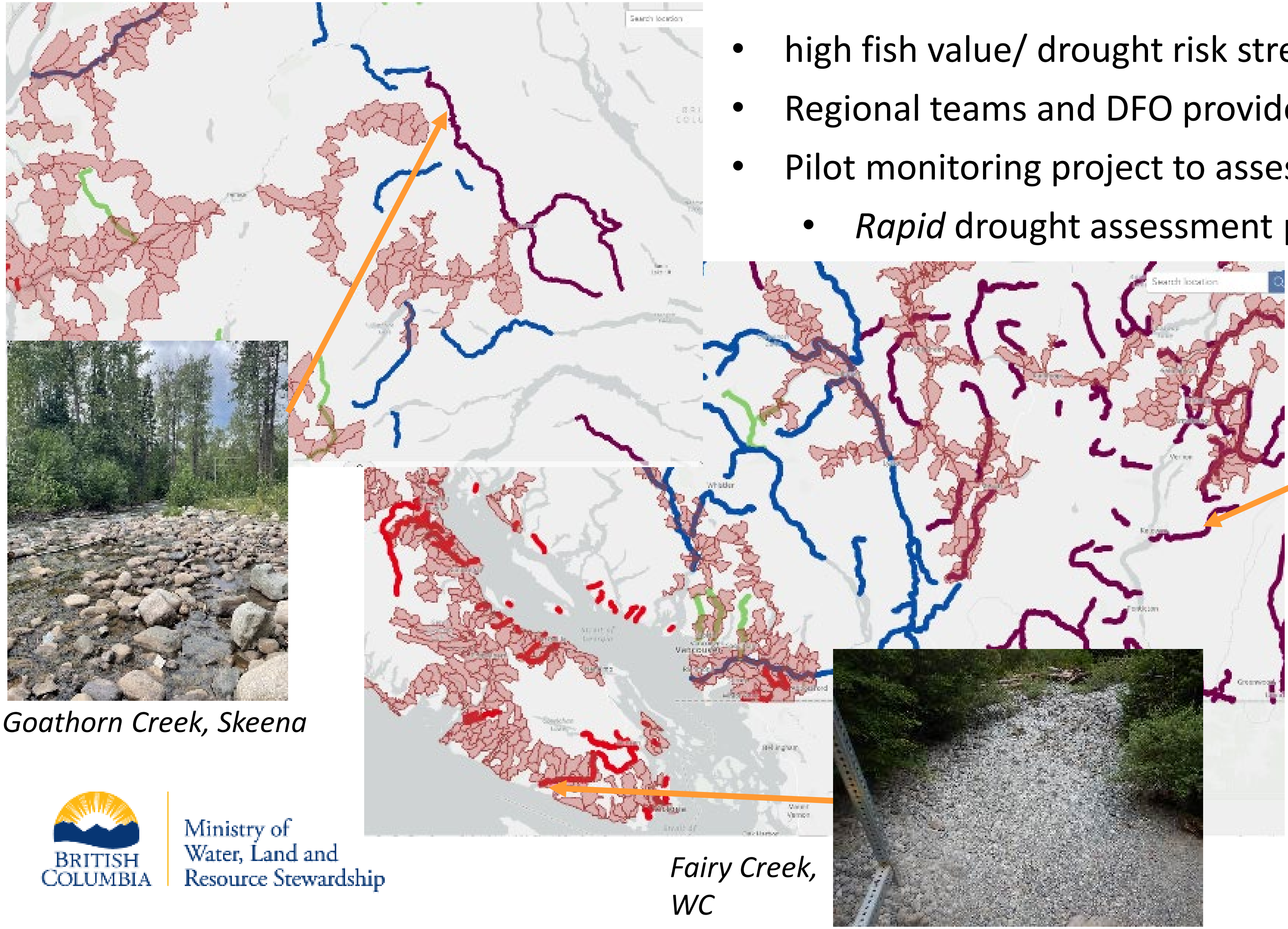
Monitoring pilot

- high fish value/ drought risk streams
- Regional teams and DFO provided input on gaps
- Pilot monitoring project to assess habitat impacts in ‘blind spots’
    - *Rapid* drought assessment protocol



Goathorn Creek, Skeena

Fairy Creek, WC

Trinity Creek, TOR

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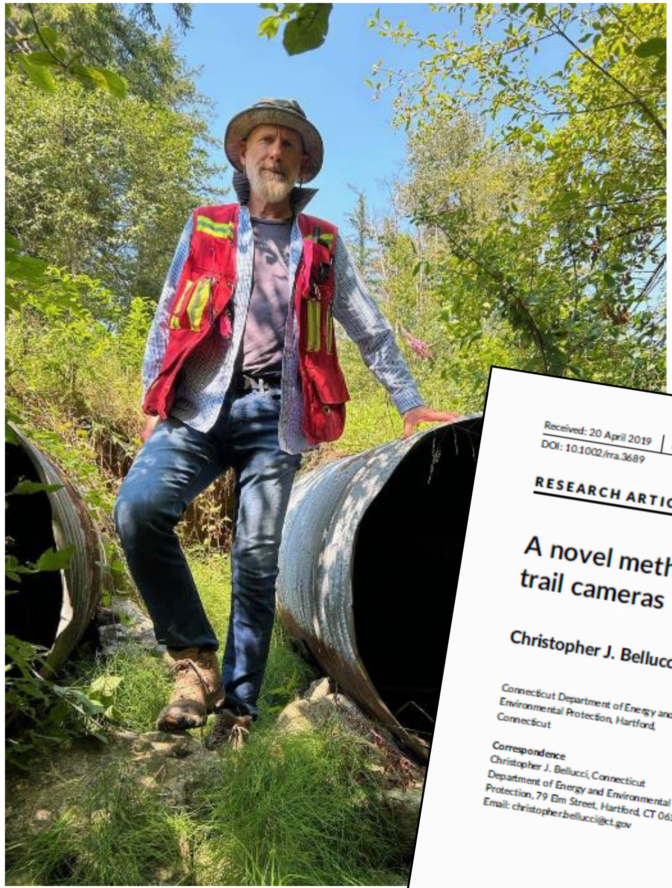
Developing monitoring approaches

- **Acknowledgements**
- ***DFO** provided funding for field work
- ***PSF** Marc Porter field work (staff time)
- ***WLRS** Lars Rees Hansen (staff time)

- PSF and WLRS are leading the collaborative monitoring roll-out
- FNFC and DFO continue to advise and support



Received: 20 April 2019 | Revised: 24 June 2020 | Accepted: 29 June 2020
DOI: 10.1002/rra.3689

RESEARCH ARTICLE

WILEY

A novel method to evaluate stream connectivity using trail cameras

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Abstract

Stream connectivity is important for the ecological health of the stream and downstream waters. In this study, we use the term stream connectivity to mean hydrologically connected pools and riffles that link stream habitat along a longitudinal continuum (upstream to downstream), while also recognizing the lateral dimension (connection to flood plain) and vertical connection to groundwater. There are thousands of man-made structures (i.e. dams, culverts, surface and groundwater withdrawal locations) in Connecticut which negatively impact stream connectivity and can result in aquatic habitat fragmentation. Cost-effective techniques are needed to assess human alteration to streams in order to prioritize management actions to restore stream connectivity. We developed a method to characterize stream connectivity using commercially available trail cameras that cost less than approximately $500 per deployment. We developed a six-category system to describe the variations in stream connectivity observed using the trail camera images. We then used the categorical data to calculate metrics that quantify stream connectivity. To pilot this approach, we evaluated reference locations with minimal anthropogenic influence on stream connectivity in comparison with stream reaches likely to be impacted by nearby groundwater wells. We found that metrics derived from trail camera images were useful to quantify stream ...

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Developing monitoring approaches

Characteristics of a rapid drought stream assessment:

1. Well designed protocol that provides consistency/ repeatability/ defensibility
2. Scalable, capable of being executed by volunteers, technicians, biologists, etc.

Understanding "causal factors" are important to determining (management) response

Data collection methods for rapid assessments

*Real-time data transfers

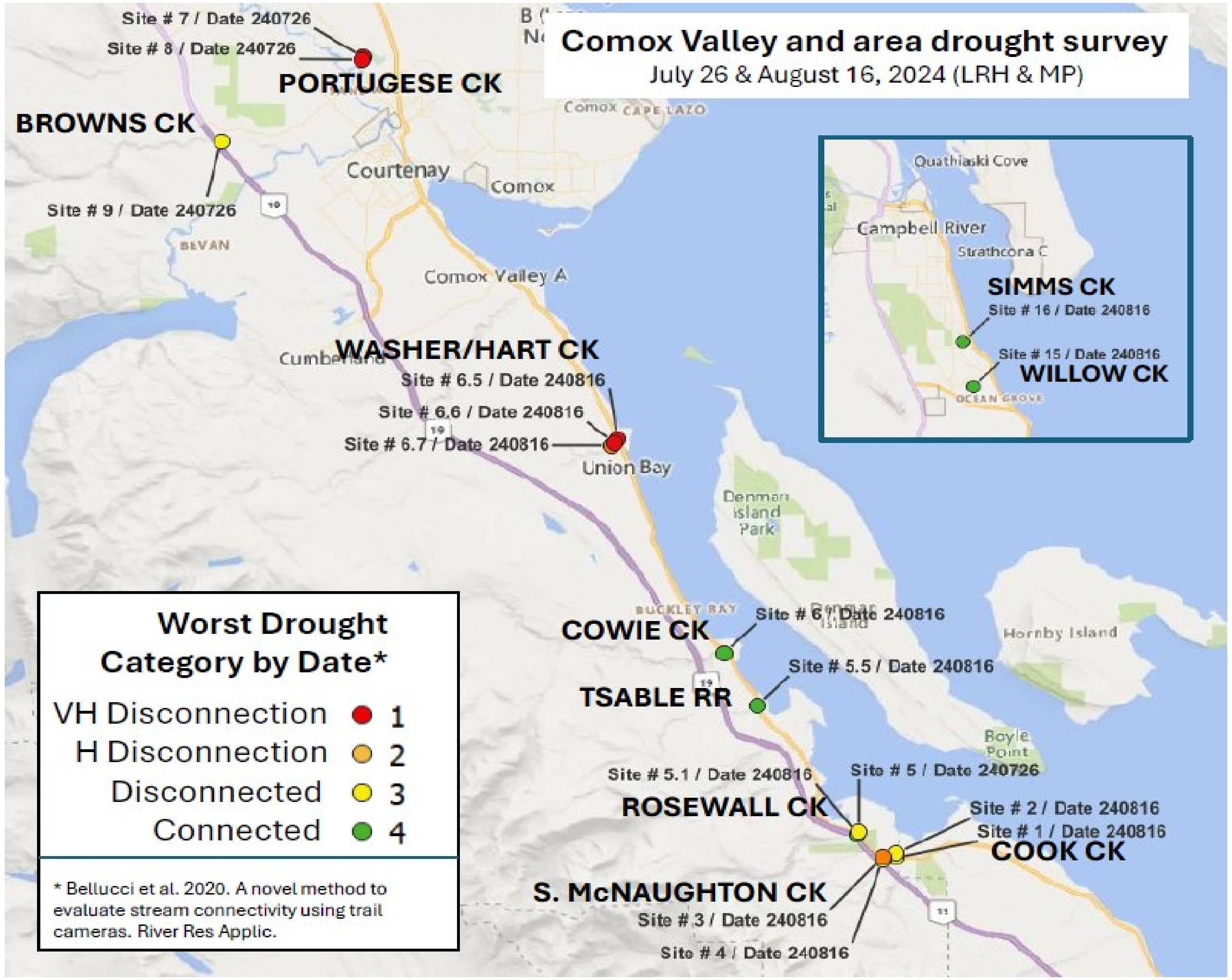
https://www.spypoint.com/en

*
Traditional, hands-on…

*Greater spatial coverage

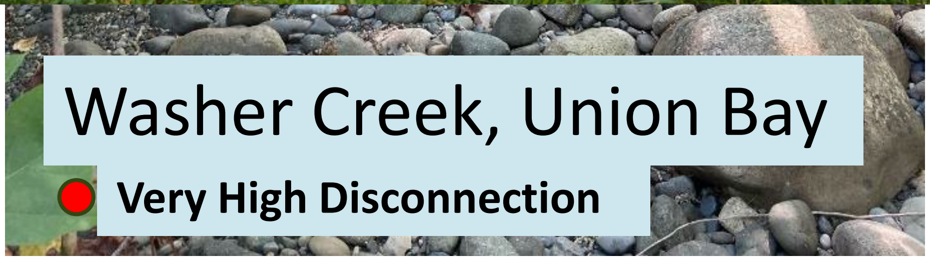
https://www.dji.com/ca

2024 monitoring outcomes



Portuguese Creek, Comox Valley

Very High Disconnection



Washer Creek, Union Bay

Very High Disconnection

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Drought planning (again!)

- Cross-ministry after-action report
- External partner feedback
- Clear mandate for our work on aquatic habitat (salmon priority)

Aim is continuous Improvement.


British Columbia
Drought and Water Scarcity
Operations Plan

Updated April 2026

Prepared by the Ministry of Water, Land and Resource Stewardship

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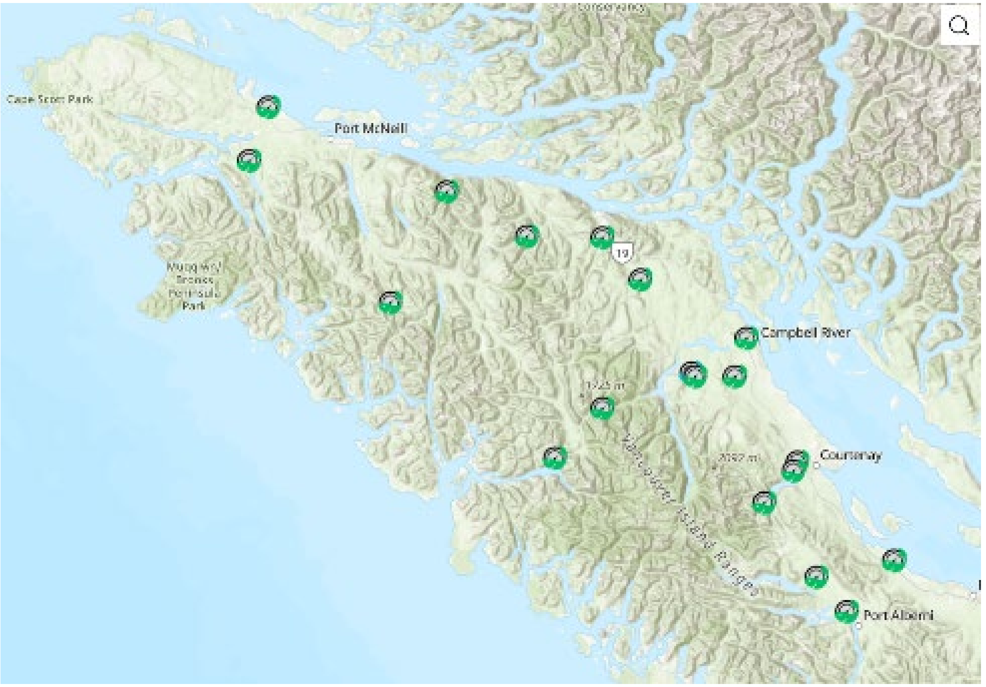
Monitoring risks to aquatic ecosystems



Goal for monitoring: Understand connectivity patterns and ecosystem function in relation to gauged flows and assigned drought levels

From: Bellucci et al. 2020

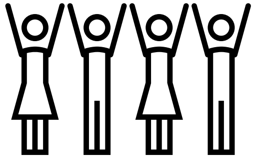
Assessing risk of impacts to salmonids

Flow Conditions	Stream flow likely to support the proper functioning of aquatic ecosystem and meet environmental flow needs to sustain fish populations.
	Stream flow considered sub-optimal for the proper functioning of aquatic ecosystem. Potential for significant or irreversible harm to the aquatic ecosystem.
	Stream flow considered marginal to support the short-term health and proper functioning of the aquatic ecosystem. High likelihood of significant or irreversible harm to the aquatic ecosystem.
Stream Temperatures	Water temperatures support most fish populations present and their ecological needs (e.g. rearing, spawning, migration).
	Water temperatures within ranges considered sub-optimal for ecological needs (e.g. rearing, spawning, migration) of some species. Prolonged exposure (>1 week) increases risk to fish populations.
	Water temperatures within ranges which contribute to sub-lethal effects on fish populations (e.g. reduced growth, delayed migration). Increased risk to fish populations even for short-term exposure (<1 week).
	Water temperatures above a critical threshold considered high risk for mortality, at any duration of exposure, for most fish populations present.

Category	Flows	
	Risk (juvenile rearing)	
1	**Low Risk**	>20% LT MAD
2	**Sub-Optimal**	11-20% LT MAD
3	**Mortality Risk**	≤10% LTMAD

Category	Temperatures	
	Risk (Adult Migratory and juv rearing)	
1	**No Risk**	<16
2	**Sub-Optimal**	16 - 19.99
3	**Sub-lethal effects**	20 - 23
4	**Mortality Risk**	> 23

Fish Habitat	Continuously connected flows likely to support ecological needs (e.g. rearing, spawning, migration) of fish populations present. Riffle and pool habitat widely available although some riffles may be lower.
	Fish habitat reduced due to sporadic flow disconnection; minimal water depth over riffles, some isolated pools and dewatered side channels.
	Available fish habitat eliminated or significantly reduced due to dry riffles, widespread disconnected flow, and many isolated pools in stream channels.
	No flow or dry streambed.



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Connectivity categories

Received: 20 April 2019 | Revised: 24 June 2020 | Accepted: 29 June 2020

TABLE 1 Six categories used to describe stream connectivity using digital trail camera images

Category number	Description	Stream connectivity	Significance to aquatic organisms
1	No water. Dry streambed	Disconnected	Mortality
2	Some pools of standing water, but no flow. Riffles and pools entirely disconnected	Disconnected	Some life history functions reduced by limited access to all habitat. Mortality unless refugia are available. Potential higher mortality due to predation
3	Minimal flow. Some pools and riffles disconnected. Some habitat types not accessible to organisms	Disconnected	Minimal flow supports some aquatic organisms, but prevents some life history functions of larger organisms due to limited access to all habitat types. Potential higher mortality due to predation
4	Flows with well-connected pools and riffles. All habitat types accessible to organisms, though flow does not have to be connected through entire bankfull width	Connected	Flows available to support access to all habitat types to fulfill life history requirements for the aquatic community. Connected flows allows access to riffles for spawning and pools for rearing and growth
5	Flow fills stream channel at or just below bankfull discharge	Connected	Flows provide sediment transport and deposition and shape natural morphological channel design
6	Flows above bankfull discharge and into floodplain	Connected	Flows that connect floodplain with river for nutrient and sediment exchange, and allows organisms to access floodplain habitat

recognized as an important driver of stream ecosystem function (Hynes 1975; Vannote, Minshall, & Cummins, 1980). Maintaining natural patterns of longitudinal and lateral connectivity is essential to the viability of many riverine species (Bunn and Arthington, 2002). Many aquatic species need to move between habitat patches in the entire stream network in order to survive, reproduce and sustain their spawn in September–November and prefer riffle areas to build redds (Whitworth, Berrien & Keller, 1988). A year class could be lost if a stream becomes disconnected during this period and brook trout cannot access the riffles to spawn.

Biological communities can be negatively impacted by changes to natural flow components such as the magnitude, frequency, duration

How this data is applied

Example of short-term benefits…

1. Triage fish salvage efforts
2. Emergency mitigation
3. Better manage water withdrawals during drought emergencies (*WSA* orders)
4. Angling closures (*Fisheries Act*)

Example of long-term benefits…

Can help understand context:

1. Period, duration, and magnitude
2. (Seasonally/annually) change and trend
3. Spatial and temporal comparisons

Can help support decisions:

1. Management/planning (e.g. forestry)
2. Recovery/restoration
3. Future water withdrawal allocations/ permitting conditions

Expanding monitoring efforts

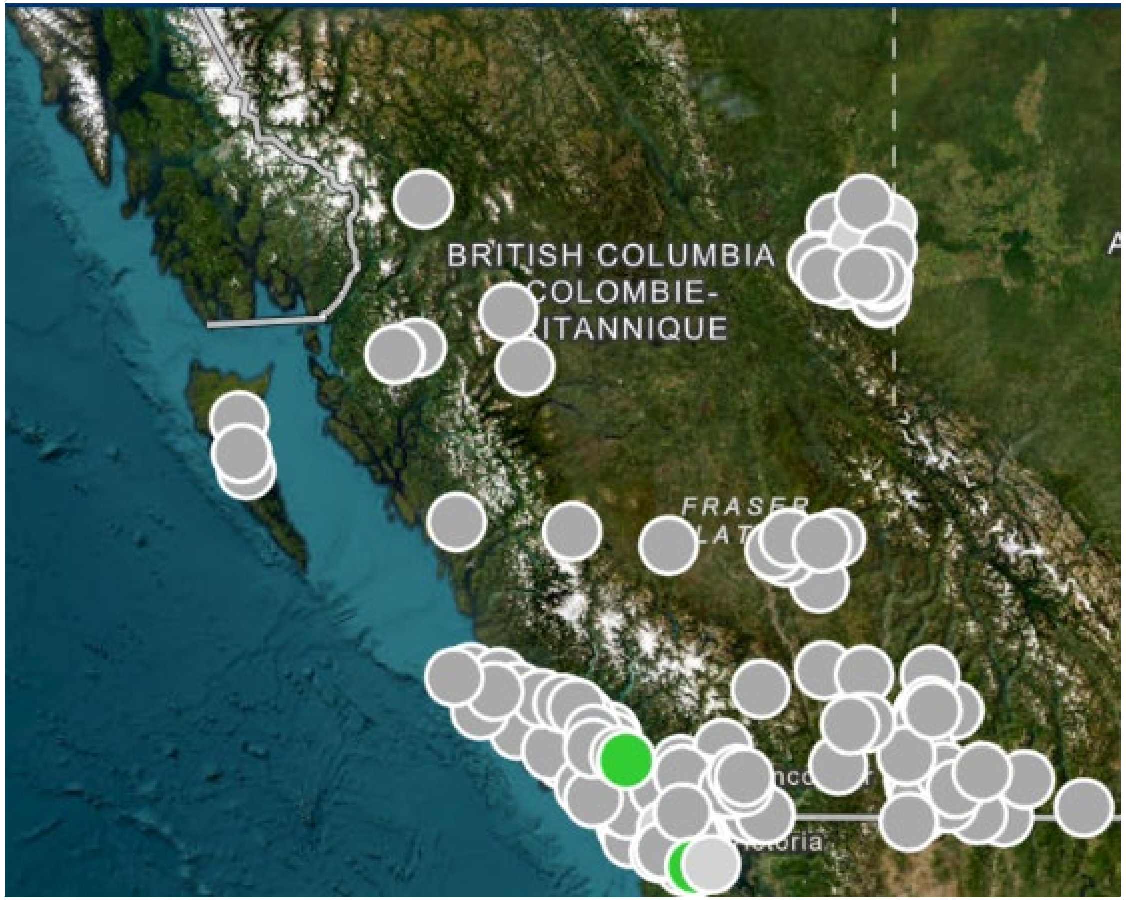

Figure 1. Map of the community hydrometric stations currently involved in the Community Flow Monitoring Network.

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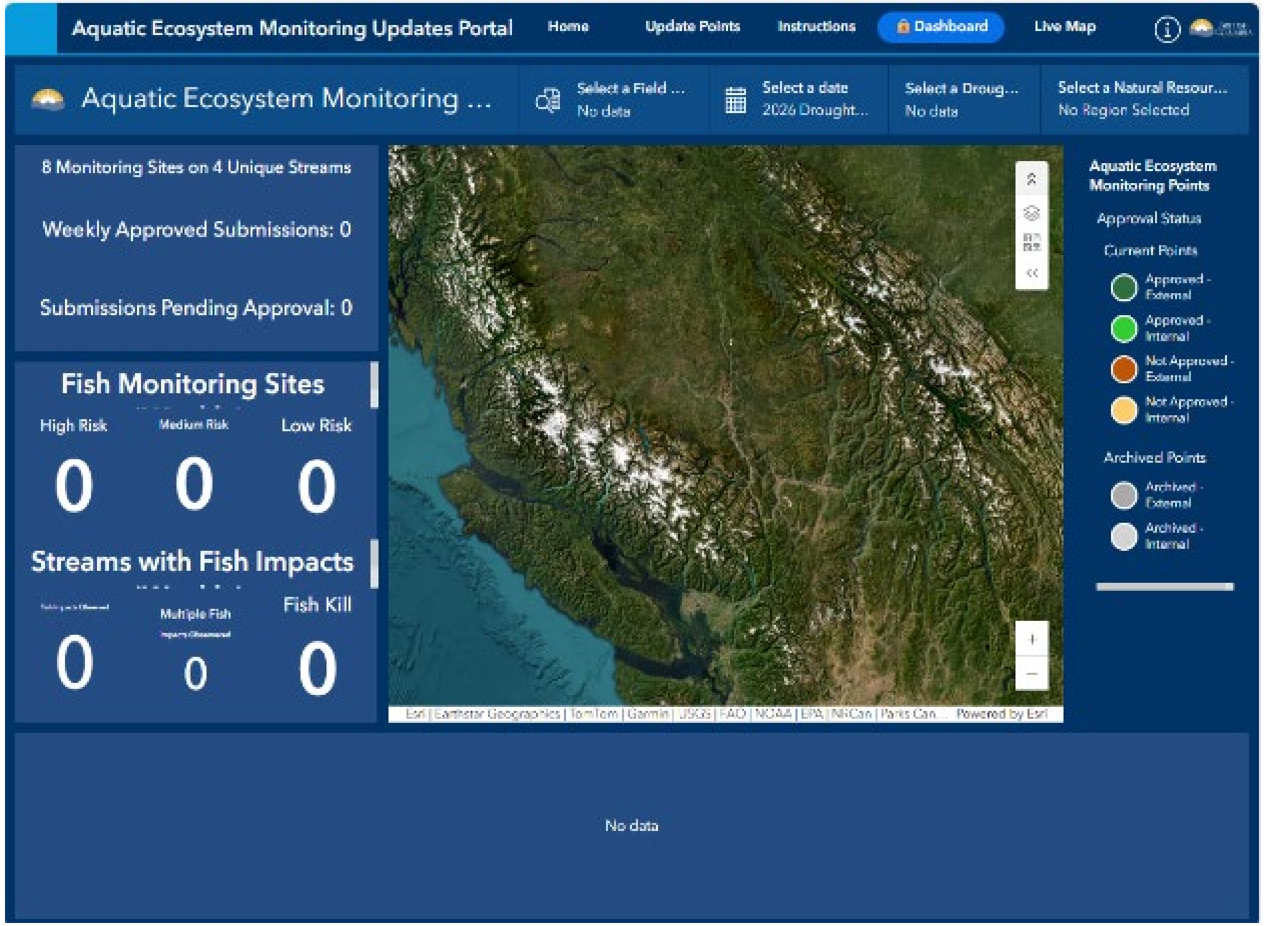
REGIONAL DISTRICT OF NANAIMO

How can partners help?

Participation is intentionally flexible to build on what partners value and already do. Depending on capacity and interest, contributions could include:

- Visual or measured observations of fish and aquatic habitat
- Stream flow connectivity and signs of water scarcity (e.g., dry reaches, isolated pools)
- Water temperature and basic water chemistry (where available)
- Observations of stranded or stressed fish, migration barriers, and available refuge habitat

How do we help?



- We'll provide clear protocols, technical guidance, and Survey123 reporting tool to support consistent data sharing.
- A shared hosting portal where data can be viewed and exported.
- Training sessions and technical support in contributing data.
- Access to resources, contacts and emergency/ project support through the SEAS table

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Mitigating impacts to aquatic ecosystems

Drought response actions

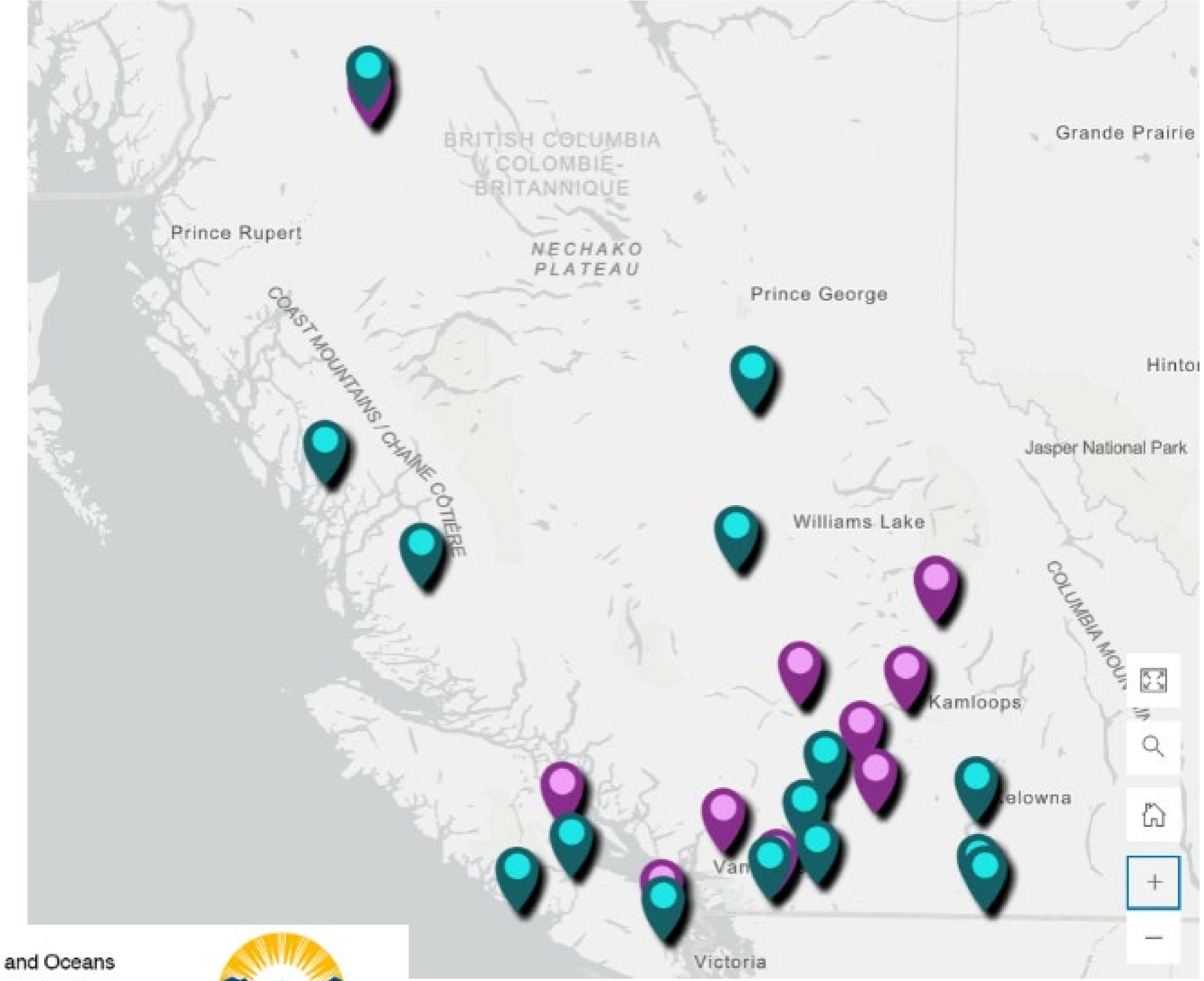
- Emergency responses such as flow releases on regulated systems, flow and groundwater reconnection for isolated pools, beaver dam management
- Regulatory responses such as curtailing licensed water use, angling closures related to temperatures,
- Outreach to licensed water users to maximize conservation efforts, compliance and enforcement of unauthorized water users

Connecting mitigation efforts

Salmon Emergency Action Support

- Drought emergency project funding
- Exploring innovative solutions to drought

- Addressing "all-hazards" – proactive mitigations
- Expanding the use of process-based interventions (BDAs, ELJs) for habitat restoration
- Access to advice, funding navigation, permitting support



https://psf.ca/work/climate/emergency-response/

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Next steps

- ❑ Consolidate data from partners and gov on portals
- ❑ Building monitoring project with partners, incorporate their values and existing efforts
- ❑ Manage incoming data via drought portal and implement emergency mitigation
- ❑ Dataset helps advocate for resilience-building funding and inform watershed restoration priorities

Join us for a training session on using a rapid drought monitoring protocol to collect and report data on how and where water scarcity affects aquatic ecosystems during drought.

Across British Columbia, many groups collect invaluable information on stream conditions, fish presence, and watershed health during low-flow periods. A new project aims to **amplify and connect that fantastic work**, to expand our understanding of how and where drought is affecting aquatic ecosystems — especially salmon habitat — across the province.

The project is led by **the Ministry of Water, Land and Resource Stewardship** and **Pacific Salmon Foundation.** Support from **First Nations Fisheries Council,** and **Fisheries and Oceans Canada**, through the Salmon Emergency Action Support Table (SEAS) informs this collaborative approach to drought monitoring. The SEAS group continues to fund emergency mitigation projects and efforts to build watershed resilience to climate hazards.

For more info on how to collect and report monitoring data, join one of our Microsoft Teams webinars:

Option 1 Date & time:	Monday, June 22, 2026 2:00-3:00pm	Link to register
Option 2 Date & time:	Tuesday June 23, 2026 10:00-11:00am	Link to register

Contact us:

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