

1. BACKGROUND, VISION AND HEALTHY WATERSHEDS

1.1 Background

Water and our watershed is important. It is important to how we live, work, and play. It is important to our societal, cultural and spiritual wellbeing.

Living Water Smart BC says that “Rivers and lakes require certain amounts of water at different times of the year to protect natural ecosystem functions like cleaning river beds and fish rearing. In areas where there is a lot of human demand for water, there is competition among users and environmental needs. The protection of aquatic habitat is essential to maintaining biodiversity in the province.”

Healthy watersheds have become a focus of many communities as they embrace policies and plans that reflect a new relationship to water that ensures ecosystem health and a reliable and safe water supply for human use including a thriving economy. The Cowichan Valley is one such community. First Nations, federal, provincial and local governments, local interest groups and residents have together committed to collaboratively restore the Cowichan River watershed and important ecosystem services such as fisheries. Within this context, Cowichan Tribes and Fisheries and Oceans Canada began work on the Cowichan Watershed Health and Chinook Initiative... as an opportunity to locally implement the Federal Wild Salmon Policy. Other partners, such as the Cowichan Valley Regional District, the Cowichan Watershed Board and the Cowichan Stewardship Roundtable have key roles in the success of this initiative.

We see this initiative providing opportunity to collectively help manage local water resources affecting biological communities and empower the citizens of Quw’utsun’ - the Cowichan Valley - to work together in the restoration of the river and its fisheries... toward a shared vision for watershed health.

1.2 Watershed Vision Statement

Watershed health is a common vision in many of the planning processes and current initiatives in the Cowichan River watershed. These include:

- *A healthy and biologically rich Cowichan Watershed reflecting the wisdom, stewardship and vision of its informed citizens, organizations and community institutions working closely together. (CSRT, ToR 2014)*
- *Watershed health reflected by sustainable salmon and steelhead stocks (CWB, Salmon Target, 2010)*
- *Secure long-term viability of naturally spawning (wild) populations of salmonids and shellfish in the Cowichan Recovery Plan Area (Cowichan Recovery Plan, LGL, 2005)*
- *The Cowichan Basin community conserves and manages water to ensure reliable supplies for human use, thriving ecosystems and a healthy economy (CBWMP, 2007)*
- *Water makes life on earth possible for our 291,000 watersheds, for us, for our grandparents and parents, for our children and grandchildren. Water moves us, water powers us, water nourishes our spirit, water nourishes our bodies, water is our playground (Prov. BC, Living Water Smart Policy, 2008)*

Each statement above relates directly to watershed and ecosystem health and their conservation. There is a need for collective focus on watershed and ecosystem health, on the collaborative conservation and management of water quantity and quality in order to sustain watershed residents, flora and fauna. Given the specific focus of this initiative and the diverse interests involved in Chinook recovery and watershed health, a common vision statement is suggested.

VISION - A healthy and biologically rich Cowichan Watershed reflecting the wisdom, stewardship and vision of its informed citizens, organizations and community institutions working closely together. (CSRT, ToR 2014)

For a broader futuristic view of the watershed see the [Link to 2020 Watershed Vision from the Eye of an Eagle](#)



1.3 Healthy Watersheds and Potential Indicators

Healthy watershed ecosystems contribute directly and indirectly to our human well-being and quality of life. Ecosystem services have been grouped into four broad categories:

- provisioning, capturing water and food;
- regulating, as influenced by local climate;
- supporting, as in watershed nutrient cycles, pollination and seed dispersal; and
- cultural, as First Nations social and ceremonial, as well as communal well-being (Ayers, 2005).

Of particular interest in this report is one ecosystem keystone that encompasses many of the attributes of a health riverine ecosystem... the production of chinook salmon. The productivity of chinook salmon in the south coastal area of BC is dependent on a wide range of factors, both natural and human related, in both marine and fresh-water environments. These factors may be large-scale ecosystem changes such as caused by climate change and ocean variability or at a different scale they can be localized disturbances within watersheds. In this report we focus on a [framework](#) to identify watershed pressures, inherent in the landscape and human activities, and the extent to which they may be affecting salmon productivity¹ (and in the end...abundance).

Healthy watersheds and the factors affecting their health have been described in many watershed-planning processes (Portland, 2005; NOAA, 2009; Conservation Ontario, 2003). Many of these processes use general state indicators, such as forest cover, surface water and ground water to describe watershed health. The Wild Salmon Policy (WSP, DFO, 2005) includes a broader Watershed Status Report Card method to identify at risk watersheds that may impact the status of salmonid habitat within the Conservation Units (CUs described in the [Wild Salmon Policy](#) (DFO, 2005)).

¹ We define salmon productivity as the number of adult recruits that are, on average, produced by the spawning parents.

This report endeavors to go deeper in using a local-scale model² to provide a [framework](#) and scientific foundation for describing pressure and resulting state indicators of watershed health. We use this framework to describe the state indicators from the perspective of their influence on salmon productivity.

Both natural landscape and human activity pressures affect watershed health. Natural landscape level pressures include: the climate of the watershed area, including the amount of precipitation and hydrology; the shape and steepness or physiography of the region; the type of soils or lithography; the parts of the watershed or morphology; and the types of vegetation and can be significantly influenced by the amount of human activity and development a watershed has experienced. A comprehensive schematic describing these pressures is depicted in our [framework](#), Figure 1 (adapted from Portland, 2005).

For the Cowichan Watershed four general watershed attributes and their respective state indicators are used to assess the impacts of watershed pressures. These attributes are hydrology; physical habitat; water quality; and biological communities. Each attributes has components or metrics that are used to monitor or measure its functionality, and thereby can be used as state indicators of watershed health. One key indicator, Chinook salmon, as monitored throughout its local life cycle and observed within the watersheds or Conservation Units, can be used, in essence, as a ‘roll-up’ indicator of watershed health at a more local-scale.

A more detailed ‘triage’ was conducted to identify linkages between watershed health and Chinook population health in the Cowichan Watershed. This was done by understanding the key watershed pressures caused by both human-influences and landscape factors affecting watershed health and salmon production, quantifying the current status of Chinook stocks using an expanded version of the *Wild Salmon Policy Conservation Unit* (CU) stock status methodology, identifying the critical habitat and critical limiting factors to production using quantitative field data (if available) and an iterative qualitative expert process referred to as a **Risk Assessment Procedure** (as outlined [here](#), (Pearsall et al, *in progress*)).

Once the *Risk Assessment Procedure* identified and described the risks associated within the watershed, watershed Action Plans were then developed to address *critical limiting factors* to production of Chinook in the watershed. As the Risk Assessment is aimed at a cross-jurisdictional level, governments and stakeholders have forum to develop integrated strategic plans and explore governance models for watershed management.

² The process is based on work described in the U.S. *Portland Watershed Management Plan* (2005)

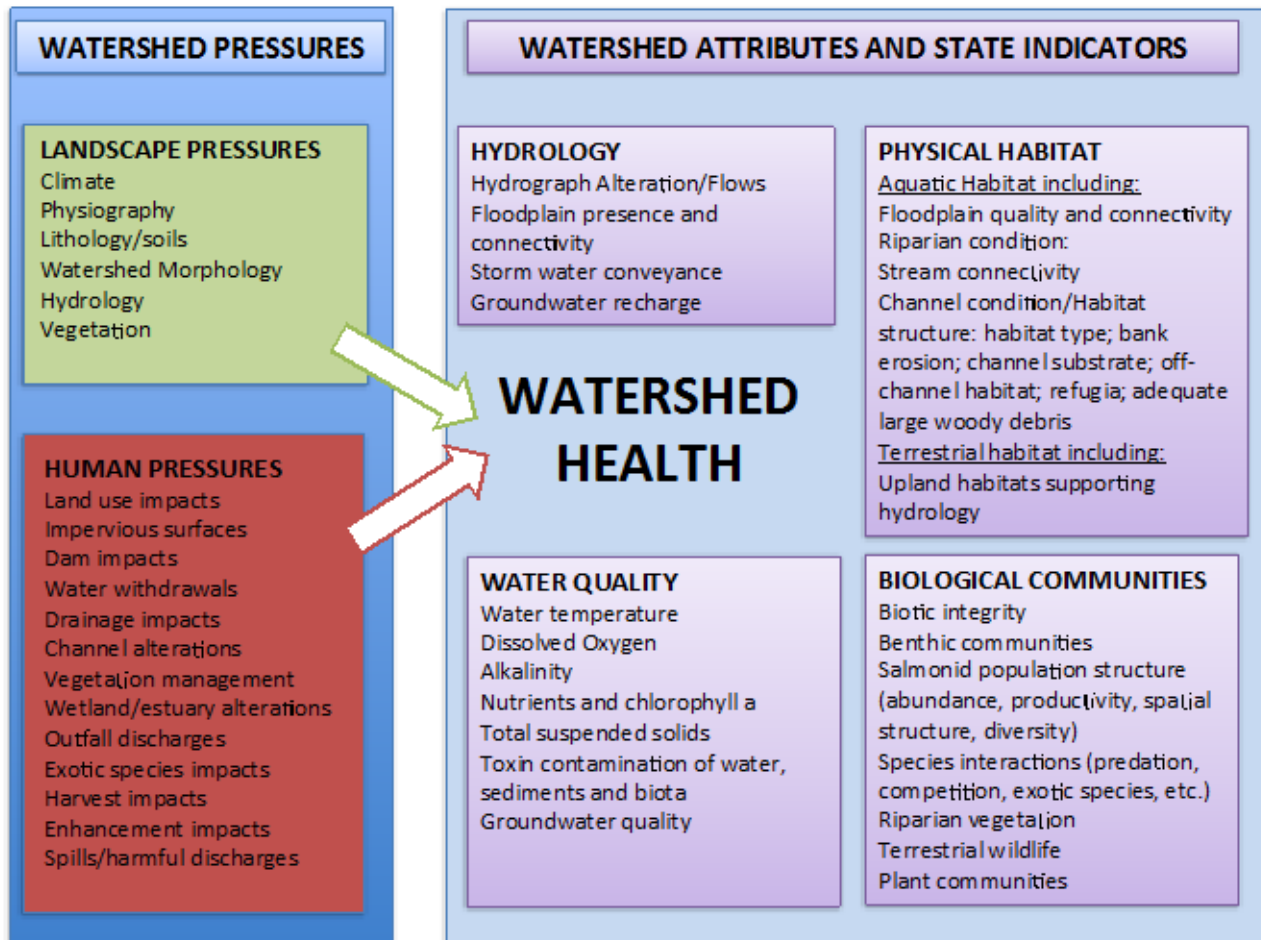


Figure 1: Framework for Watershed Health (adapted from Portland, 2005)

1.4 Using Salmon as an Indicator of Watershed Health

The Cowichan River ecosystem and its riverine flora and fauna support a First Nation fishery, regionally significant commercial and recreational fisheries and nature-based tourism opportunities. In the Cowichan River, Chinook salmon stocks are in serious decline, with citizen groups recently applying to list the runs under the federal *Species at Risk Act*. The trend in fish returns to the Cowichan River has declined significantly over the past 100 years as a result of multiple cumulative impacts to the river itself and its watershed, as well as the estuary, the Strait of Georgia and open ocean environments. As a result local ecology, dependent culture, local food systems and livelihoods are more and more at-risk. To the Cowichan First Nations people, the importance of these fish cannot be understated:

“Every year the *Quw’utsun*’ people were assured great riches as the spawning salmon returned to the Cowichan, Koksilah, and other rivers and streams. The harvest and sharing of fish was carefully managed by our Elders through the use of fish weirs, a gift from the First Ancestor *Syalutsa*. The weirs ensured abundant food for our people to eat, while allowing enough fish to reach the spawning beds to ensure future returns. Other resources were equally managed with an eye to future abundance.

For millennia the Cowichan Tribes have depended upon the salmon in the Salish Sea returning to the Fraser River and the many rivers on Vancouver Island. The *s-tth'aqwi* (Chinook) fed our people since time immemorial. Our winter villages were built on the banks of the Cowichan and Koksilah Rivers, and our many sustainable and selective harvest weirs supplied fish to us throughout the season. The salmon were healthy, resilient and thrived in the watershed.

Today our Elders long for the taste of Chinook salmon in the late winter/early spring from Shaw Creek in the upper Cowichan watershed, and for the springs and falls to dry them in the smokehouses. We have watched as our salmon runs have declined to unprecedented levels, harvested in a mixed stock fishery and returning to a damaged watershed. For ourselves, for our children, for our grandchildren, we must act now to ensure our salmon brothers and sisters are sustained into the future.” *Cowichan Tribes Chief William Seymour*

In general Pacific salmon have a life cycle that flows through freshwater, estuarine, coastal marine and high seas environments - all of which are susceptible to impacts by human activities. The freshwater environment is where the largest seasonal and in-season changes can occur in the salmon populations with the success of a ‘year class’ typically determined by conditions during the salmonid’s freshwater phase (Waldichuk 1993), with most of the lifetime mortality occurring in freshwater environments during the incubation stage before emergence (Quinn, 2005).

Salmon are highly sensitive to all components of watershed health (hydrology, habitat, water quality and biological communities) and they can be considered a key indicator species, meaning that their abundance, presence or absence is indicative of many other physical, chemical and biological processes in an ecosystem (Portland 2005).

This framework is based on linking watershed health to the productivity (and so abundance) of salmon stocks in a watershed (the proverbial ‘canary in a coalmine’). There are many factors that affect watershed health, salmon abundance and productivity, with some able to be addressed locally – such as monitoring and managing flows and releases from the weir at Cowichan Lake; and others requiring actions more broad in scale – such as regional and global efforts to manage climate change, ocean acidification or general changes in ocean conditions. Many people have little hope that actions in the freshwater environment can help salmon adapt and improve survival rates in the ocean, and thereby management actions will need to be addressed at a provincial, national and/or global scales.

Healthy watersheds increase salmon survival in the ocean. Most of the ocean mortality of young of year Cowichan chinook occurs before the June-July period, or within 1-3 months after entering the estuary and ocean (Beamish et al (2012); Beamish and Sweeting (2012)). The likely causes of mortality includes lack of cover habitat in the estuary and a lack of food in both the estuary and ocean. Bradford (xxxx) and others have shown that a significant portion of the salmon productivity is determined in the freshwater environment. Also, Ruggerone (2010) showed that smolt condition at the time they left the river affected survival in subsequent estuarine and near shore marine environments. Pellet et al (2013, unpublished) supported the theory that larger fatter smolts had a higher survival. A preliminary otolith microchemistry study (Pellet 2015, unpublished) showed that fewer than 15% of the adult return to the

Cowichan is generated from juveniles which entered the marine environment at less than 50mm – the majority of returns to the river are from fish that stayed in the river until they were greater than 50mm.

In summary these references show the linkage between watershed health and overall salmon productivity, including that more robust Chinook are able to survive longer with minimal food and are more successful in hunting for it, and will survive better in current ocean conditions. Improving productivity in the freshwater can not only increase the number of smolts leaving the river, but also increase the health of those smolts, leading to higher ocean survival.

1.5 Goals and Objectives for each Watershed Attribute

The people of the Cowichan Valley see, use and experience the Cowichan and Koksilah Rivers in many ways. In order to manage, protect and conserve necessary components of the rivers bounty, goals and objectives are needed to describe, plan, manage and monitor our efforts toward achieving and maintaining the vision of watershed health. Figure 3 below describes four key goals for each watershed attribute for the Cowichan system.

Goals for Each Watershed Health Attribute



*Normative flow has the magnitude, frequency, duration and timing essential to support salmonids and/or other native species and resources and the formation and maintenance of aquatic habitat.

Figure 3: Four Key Goals for Watershed Health Attributes (adapted from Portland, 2005)

1.6 Linking Watershed Goals to Cowichan Chinook Vision and Goals

Watershed health attributes and goals are linked to specific Chinook goals and objectives. Chinook as an indicator of watershed health provide means to monitor watershed health. For each goal there are detailed strategies, actions, indicators or metrics and targets that are described in [Section 7 \(here\) of this document](#).

The **Vision Statement** for Cowichan Chinook is described as “**A healthy, spatially diverse return, in timing and distribution, of spring-summer and fall timed Chinook adults to the spawning grounds, with enough to support a Cowichan Tribes traditional fishery and other fisheries as abundance permits.**”

