

The Chilliwack River Watershed: A Backgrounder



By the Fraser Valley Regional District
For the Chilliwack River Watershed Strategy

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Acronyms

ALR	Agricultural Land Reserve
ASU	Area Support Unit
BC	British Columbia
CWH	Coastal Western Hemlock
COSEWIC	Convention on the Status of Endangered Wildlife in Canada
DFO	Department of Fisheries and Oceans Canada
FA	Forest Act
FRPA	Forest and Range Practices Act
FVRD	Fraser Valley Regional District
MH	Mountain Hemlock
OPSEE	Operator Special Engineering Equipment
SARA	Species at Risk Act
THLB	Timber Harvesting Land Base
TSA	Timber Supply Area
WFSP	Watershed-based Fish Sustainability Planning
WMA	Wildlife Management Area

1.0 Introduction

The Chilliwack River Watershed has been shaped by natural processes as well as human activities. Earlier than 10,000 years ago the Chilliwack River Valley was covered or partially covered in massive glaciers and lakes on several occasions. This geological activity carved the landscape that is known today. Now the Chilliwack River winds its way down the Valley from the northern Cascade Mountains through Chilliwack Lake and eventually drains into the mighty Fraser River (Figure 1). After the glaciers retreated, a variety of plants and animals colonized the area and formed rich ecosystems that sustained First Nations populations for thousands of years. Europeans settled in the area when gold was discovered in the Fraser Valley in the 1800's, and the Valley began another transformation into its present state.

Through all these changes, the Chilliwack River Watershed has maintained its high biological and cultural values while becoming a place of high recreational, economic, and historic value for local residents and visitors alike. However, the various natural and human activities in the Valley, and outside pressures, are threatening the River and the values it supports. In 2005, the Chilliwack-Vedder River returned to British Columbia's Endangered Rivers List in fifth spot.¹ Effective planning of the land uses and activities in the Valley and cooperation between all parties with an interest in the Valley are needed to ensure the Chilliwack River and its numerous values are maintained indefinitely.

In 2003, the Chilliwack River Valley was selected as a pilot project for Watershed-based Fish Sustainability Planning (WFSP). Fisheries and Oceans Canada (DFO) and the Province of British Columbia jointly developed WFSP and together produced the Guidebook for Watershed-based Fish Sustainability Planning (2000).² The intent of WFSP is to guide and encourage local initiatives and partnerships in protecting and restoring fish habitat and populations on a watershed basis. Sixteen candidate rivers were assessed as potential showcase pilots for the initiative, with the Chilliwack River being highlighted in the top three. The Chilliwack River was chosen as a pilot for the program due to its high level of biological productivity, increased pressures on its resources, and the opportunity for the involvement of multi-jurisdictional and multi-faceted interests.

In 2004, a project team of representatives from land and water government agencies came together to begin to develop a strategy for the future of the Chilliwack River Watershed. **The purpose of the Chilliwack River Watershed Strategy is to provide a common understanding of watershed values, based on sound science and local knowledge, to assist in decision making that will promote and improve the sustainability³ of the Chilliwack River Watershed.** The project will increase public awareness and identify stewardship and enhancement opportunities. The project will not directly result in new regulation or land and resource allocations or designations. Rather, it will strive to fit within the framework of existing legislation and examine opportunities to enhance and make existing processes more efficient.

This background document represents the first step in the planning process for the Chilliwack River Watershed. The document reviews the natural and cultural resources of

the Watershed as well as the various land and resource uses in the Valley. Following the completion of this document and other background materials, the process will identify issues and alternatives in the Chilliwack River Watershed. These components will then be synthesized into a Watershed Strategy, which will identify priorities for watershed restoration and other activities, and recommend actions for achieving objectives and coordinating ongoing activities.

2.0 Regional Context & Study Area

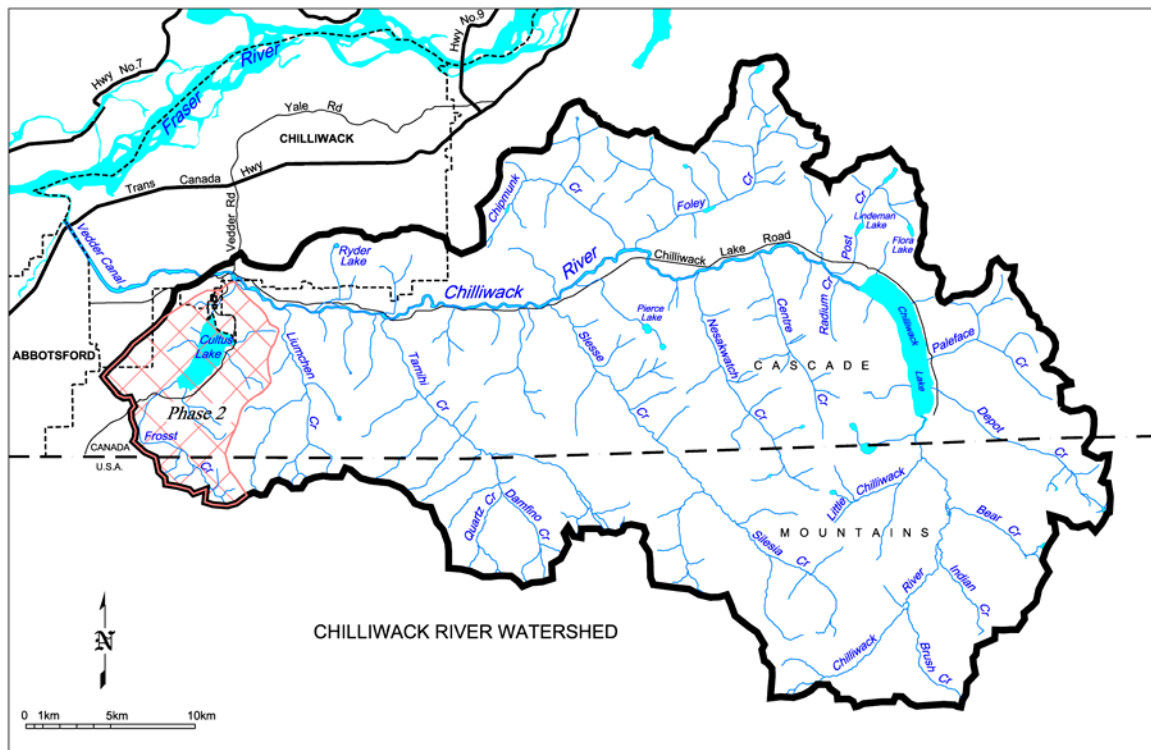
The Chilliwack River Watershed is located within 100 kilometers of the Greater Vancouver area to the southeast of the City of Chilliwack in British Columbia (B.C.) (Figure 1). Due to its proximity to major urban centers in the Greater Vancouver region, the Chilliwack River Valley is easily accessible to millions of people who are attracted to the area's high quality recreational opportunities. A large proportion of the Chilliwack River Watershed lies within Washington State in the United States. The border separating the northern and southern portions of the Chilliwack River Watershed was defined by the Oregon Treaty in 1846.

Figure 1 Regional context for the Chilliwack River Watershed.



This study will focus on the Canadian portion of the Watershed that lies upstream of Vedder Crossing (Figure 2).⁴ It is recognized that activities south of the border will significantly affect the Canadian portion of the Watershed and efforts will be made to coordinate with work being completed by the United States Forest Service.

Figure 2 Study area for the Chilliwack River Watershed Strategy



3.0 Natural and Cultural Resources

Climate

The climatic regime in the Chilliwack River Valley is largely determined by its elevation and eastern and western proximity to the Fraser lowlands and Cascade Mountains, respectively. The basin lies within the transition zone from a maritime climate (warm, wet winters) to a continental climate (cold, snow-dominated winters).⁵ The eastern valley bottom is characterized by warm, dry summers and moist, cool winters with moderate winter snowfall.⁶ The western portion of the Valley bottom is similar, but receives very little winter snowfall and generally has higher winter temperatures. Higher elevations are characterized by short, cool, and moist summers and long, cold winters with heavy and persistent snowfall. Winds in the area are generally moist maritime winds from the Pacific coast and Fraser lowlands. Average daily temperatures reach lows of 1.4 degrees Celsius in December and highs of 17.5 degrees Celsius in August. Precipitation can be as high as 215.5 millimeters per month in the winter months and as low as 53.9 millimeters in the summer months.⁷

Bedrock Geology

The Chilliwack River Valley is part of the northwesterly Cascade Mountain system and is characterized by highly varied rock types and age structures. Deposits along the Valley bottom can be defined as primarily glacial, fluvial, and glacio-fluvial in origin along its length.

The upland areas in the northwest and central portions of the Watershed are characterized by Pennsylvanian and Permian deposits in the Chilliwack group, which are primarily metamorphic and sedimentary volcanic in origin. A small portion of this area in the extreme northwest is Mesozoic serpentine, phyllite, and gneiss.

The upland areas to the east of Cultus Lake and portions of the central area of the Watershed are dominated by Triassic and Jurassic deposits in the Cultus formation and are characterized by sandstone. These bedrock types have a stratified layered pattern and are prone to erosion. Age classes in these layers are also highly varied, indicating a long history of faulting and folding activity.⁸

The area to the west of Chilliwack Lake is primarily Mesozoic or older and is defined by deposits of serpentine, phyllite, and gneiss. A smaller portion of this area to the northeast of Chilliwack Lake is dominated by quartz and diorite of the upper Cretaceous period.

The Chilliwack Lake drainage is primarily defined as Tertiary deposits of quartz and sandstone from the Skagit formation. The eastern portions of the uplands are primarily granitic with gneiss and sedimentary volcanic rock and bedrock types that are slow to erode in this side of the Valley.

Surficial Geology

The Watershed is characterized by four distinct areas along where surficial deposits are similar in material and structure.⁹ These deposits vary in the time of deposition and the type of deposition, whether from ice during periods of glaciation or by water during periods where a large glacial lake covered most of the Valley. Almost all landslide activity within the Chilliwack River Valley occurs in areas of glacio-lacustrine sedimentation.

The first distinct area, which lies from Vedder Crossing east to Tamihi Creek, is characterized by young soil and fluvial deposits. Bedrock exposure is common along the south valley wall and till, silts, and fluvial sands are common in the northern portion of the Valley. Alluvial fans are common at creek mouths throughout this stretch of the Valley and the Chilliwack River itself is braided, leaving behind sandy benches and boulders. A thick layer of till up to 100 meters in depth underlies these deposits.

The stretch of valley between Tamihi Creek and Allison Pools is composed of glacio-lacustrine silts that are exposed high up the valley walls and overlain with glacio-fluvial sands, gravels, and tills. The Chilliwack River meanders in this portion of the Valley, often undercutting and exposing unstable younger silts. Fresh alluvium is present within the River channel and in many places alluvial fans overly terraces at various elevations where creeks flow downstream from the valley slopes.

Allison Pool to Slesse Creek is also composed primarily of glacio-lacustrine silts overlain with glacio-fluvial sands and gravels. Rock exposure is localized along the valley wall

and river bank with alluvial and colluvial fans commonly attributed to tributary creeks. Proglacial outwash is exposed at the Slesse Park slide.

The Valley from Slesse Creek to Chilliwack Lake is generally composed of flat terraces of glacio-fluvial sands and gravel left from an outwash plain developed from a glacial lake. Valley walls are characterized by outcrops of bedrock with colluvial and alluvial fans at the confluence of most creeks entering the River. Unexposed glacio-fluvial sediments underlie the whole of this area.

Topography

The Chilliwack River Valley is a glaciated u-shape with a flat floor bounded by steep sloping uplands and glacial peaks. The valley floor itself rises in elevation from 40 meters above sea level at Vedder Crossing to over 610 meters above sea level at Chilliwack Lake.¹⁰ Valley walls range in height from 700 meters above sea level to more than 2,985 meters. Over 50% of the Watershed is more than 1,500 meters above sea level.

Watershed and Drainage

The Chilliwack River is the largest drainage in the Northwest Cascades. It has a catchment of over 1,215 square kilometers from its origins at Ruth Mountain above Chilliwack Lake in Washington State to its confluence with Sweltzer Creek, at which point it becomes the Vedder River. Twenty-seven percent of the Watershed drains into Chilliwack Lake, with the other 63% drains from steep tributary creeks into the Chilliwack River.¹¹

The Chilliwack River system historically ran through Sardis and the City of Chilliwack past several First Nation communities in a channel adjacent to today's Chilliwack River Road.¹² A debris jam in 1875 diverted the River and early settlers further confined the River to run into what is now the Vedder River. This change in the River effectively cut off access to the fisheries resource that once supported First Nation communities to the north.

Sources of water flow include snowmelt in the spring and summer months and intense rainfall throughout the winter. Average daily discharge is 10.4 cubic meters per second (cms) with maximum daily discharge reaching 325.8 cms during peak flow events, which commonly occur in May, June, and December to February.¹³

Principle tributaries to the Chilliwack River include Sweltzer Creek, Liumchen Creek, Tamihi Creek, Slesse Creek, Nesakwatch Creek, and Centre Creek from the southern slopes. Ryder Creek, Chipmunk Creek, and Foley Creek drain into the Chilliwack from the northern slopes. Slope conditions are controlled largely by bedrock outcrops and glacial outwash deposits. In the upstream portions of the Chilliwack River, there is very little bed movement or sediment transport and the River is fast flowing. River banks are generally stable and do not contribute significant amounts of sediment to stream flow.¹⁴ When the River approaches Slesse Creek, there is a marked change in morphology due to

increased inputs of water and sediment from this tributary. The width of the River, which is narrow in the upstream portions of the Watershed, flattens and widens from approximately 20 meters to 40 meters at this confluence.¹⁵ Water flow also slows to accommodate this widening of the channel. Erosion and undercutting is common in this reach of the River and contributes to slope failure at areas of exposed glacio-lacustrine terraces.

The Tamihi Rapids are a result of a narrowing of the river channel and a drop in elevation. There is little erosional activity in this short segment of the river system due to the size of substrate materials along the banks. As the River passes through Ryder Creek toward Vedder Crossing it resumes a braided and wandering character, which is prone to frequent channel changes and sediment deposition. Sediment sources in the Chilliwack River system are primarily from bank erosion, landslide activity, and terrace deposits from tributary creeks.¹⁶

Groundwater conditions in the Chilliwack River Watershed are generally complex. There are two significant aquifers in the valley bottom and several perched aquifers in the Ryder uplands.¹⁷ A large aquifer lies beneath the floodplain of the Chilliwack River from just East of Slesse Park to Cultus Lake to Vedder Crossing. This aquifer has moderate productivity, moderate demand, and high vulnerability due to high permeability of the surface soils.¹⁸ Surface wells in this floodplain aquifer are generally shallow, with an average depth of 10 meters.¹⁹ A second, smaller aquifer lies at the junction of Slesse Creek and the Chilliwack River.²⁰ This aquifer also has moderate productivity and demand, but low vulnerability.

Ecological Communities

The Watershed is characterized by several ecological communities based on differences in elevation and slope aspect, as well as climatic conditions. The two primary ecological zones found within the Valley are the Coastal Western Hemlock zone and the Mountain Hemlock zone.

The Coastal Western Hemlock (CWH) zone is one of the most productive forest types in the Province.²¹ This zone primarily contains coniferous forests, or “temperate rainforests,” composed of Western hemlock and Western red cedar. Other species include amabilis fir and yellow cedar in wetter areas, and Douglas fir, grand fir, Western white pine, and bigleaf maple in drier areas. Red alder, black cottonwood, lodgepole pine, and Sitka spruce grow in disturbed areas, along rivers, on very dry sites, and on floodplains, respectively. Snags and large woody debris are common in mature forests, and mosses and lichens dominate the tree canopy. The CWH probably encompasses the greatest biological diversity and abundance of any zone in B.C., supporting a variety of wildlife from coastal-nesting birds to salmon.

The Mountain Hemlock (MH) ecological zone generally occurs above the CHW zone from 900 to 1,800 meters above sea level in the southern part of the Province.²² At the lower end of the elevation range, mountain hemlock, amabilis fir, and sometimes yellow cedar are present. Western hemlock and Western red cedar are less common but

ecologically important. Occurrences of Douglas fir and Western white pine are not uncommon. There is commonly a dense shrub layer below the tree canopy composed of species including oval-leaved blueberry, Alaska blueberry, black huckleberry, false azalea, white flowered rhododendron, and skunk cabbage and Indian hellebore in wetter areas. The forest floor is generally covered in a thick mat of mosses and lichens. Despite the sometimes harsh environment, a variety of wildlife occurs in the MH zone, including black and grizzly bears, Roosevelt elk, black-tailed deer, mountain goats, and a variety of birds.

Old growth forest is primarily contained within Chilliwack Lake Provincial Park and the Liumchen Ecological Reserve. A record grand fir, which is recorded as being over 71.3 meters tall with a circumference of 6.35 meters, is located south of Chilliwack Lake. Small patches of old growth also exist throughout the Watershed. Put together, these patches of old growth forests ranging in age from 141 to over 250 years make up 8% of the forest cover in the Watershed.²³ The majority (36%) of forest cover within the Watershed is within the 60 year age class or under. Approximately 20% of the forest cover in the Chilliwack River Watershed falls within the 61 to 140 year age class. This arrangement of forest age classes within the Chilliwack River Watershed reflects the area's fire history and previous timber extraction and forest management activities.

Plant Diversity & Rarity

The Chilliwack River Watershed is rich in botanical diversity due to the variety of habitat types and differences in ecological communities and elevation. There are also several rare plant communities and species within the Chilliwack River Watershed. Cliff paintbrush is a red-listed species of wildflower associated with alpine meadows found on Mount Lindeman and Mount Cheam. Tall bugbane is another red-listed species thought only to occur in this area.²⁴ Tall bugbane is recognized and protected as an endangered species under the federal *Species at Risk Act* (SARA). It is found in association with several of the Watersheds' creek drainages. The phantom orchid is another red-listed species listed as threatened under SARA. Phantom orchid is a white saprophyte. Both the phantom orchid and tall bugbane are subject to recovery planning under Species at Risk legislation.

The remainder of significant plants found within the Watershed are blue-listed within the Province of British Columbia. Cascade parsley fern is another species referenced to alpine meadows found on Mount Lindeman, Slesse Mountain, and Welch Peak. Short-fruited smelowskia, also known as alpine false candytuft, is found in two locations within the Watershed, including Mount Cheam and Mount McFarlane. This wildflower of the mustard family is specifically adapted to rocky taluses and cliff ridges. Alpine anemone is another blue-listed species found in the alpine areas of the Watershed. Well adapted to the harsh conditions of wind and drought common at higher elevations, this species is found on Mount McGuire and Church Mountain. Western mannagrass is a streamside grass species known to be common within the Watershed.²⁵ Kruckeberg's holly fern and adulterated spleenwort have also been indicated as sensitive species within the Watershed.

Wildlife Diversity & Rarity

There are over 40 mammals, 20 reptiles and amphibians, and 130 bird species recorded for the Chilliwack River Watershed.²⁶ Large mammals of significance include predators such as members of the endangered North Cascades grizzly bear population, black bear, cougar, and coyote. Large ungulates include Roosevelt elk, black-tailed deer, and mountain goat. Although not commonly seen in the area, the Watershed provides important habitat for many of these larger mammals, which require travel corridors, extensive areas, and a variety of ecological features to fulfill lifecycle and foraging requirements. The Ministry of Forests manages several areas within the Watershed as deer winter range and goat winter range. There is also a Wildlife Management Area (WMA) in the Watershed to protect key habitat for North Cascades grizzly bear.

Other species of significance within the Watershed include several species listed as endangered or threatened within the Province. There are a number of recorded sites for red-listed mountain beaver in the Chilliwack River Watershed, particularly along Nursery, Tamihi, Little Tamihi, Foley, and Chipmunk creeks.²⁷ The Ministry of Forests has designated several of these sites as Wildlife Management Areas. Common beaver also occurs in the Watershed, where it has both positive and negative impacts on fisheries values within the Chilliwack River system.

Other red-listed species include Pacific giant salamander, Oregon forestsnail, marbled murrelet, Pacific watershrew, long-tailed weasel, red-legged frog, and Keen's long-eared bat. There are also two special management zones for spotted owl within the Watershed. Blue-listed species recorded for the Watershed include tailed frog, green-backed heron, great blue heron, turkey vulture, black-chinned hummingbird, Hutton's vireo, shrew mole, Trowbridge's shrew, Townsend's big-eared bat, painted turtle, and rough-legged hawk. Bald eagle, osprey, and screech owl are also listed as featured species.²⁸

Fish

The Chilliwack River system supports a wide variety of fish species, including cutthroat trout, rainbow trout, Rocky Mountain whitefish, Dolly Varden char, bull trout, sculpin, and Salish sucker.²⁹ Bull trout is a blue-listed species in British Columbia and is considered vulnerable. The Provincial red-listed Salish sucker has also been listed as endangered by both the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) and federal Species at Risk legislation. This species has been recorded in small numbers within Salwein Creek and Street Creek.³⁰ These two small streams flow into the lower Chilliwack (Vedder) River. Another fish that is exclusive to the Chilliwack River Watershed is the Cultus pygmy sculpin, which is found only in Cultus Lake. This unique fish is listed as threatened under COSEWIC and SARA, but is believed to be relatively abundant (3,000-10,000) within that small lake.³¹

The Chilliwack River system also supports all five species of salmon. Fish runs occur in the spring for chinook, summer for chinook and sockeye, fall and early winter for sockeye, pink, chinook, chum, and coho, and winter and spring for steelhead. Salmon productivity in the Watershed is largely dependent on freshwater habitat conditions,

hatchery production, harvest levels, and ocean habitat conditions. All salmon species have suffered population declines, but some are recovering better than others are.³²

Wild coho salmon have suffered the most significant decline throughout the South Coast, but their numbers have increased in recent years due to improving freshwater and ocean conditions.³³ Large wetlands and off channel ponds have been created throughout the Watershed to improve the productivity of this species. Coho salmon are also produced in high numbers at a hatchery on the Chilliwack River. While most of these hatchery produced coho salmon return to the hatchery to spawn, a small portion (10%) spawn with wild fish stock at natural spawning grounds, thereby increasing the numbers of adult salmon in these streams.³⁴ Continued effort is required to increase wild populations of coho salmon.

Chum salmon experienced lows throughout the 1960's, but returns have improved through increased hatchery production, improving freshwater and ocean habitats, and reduced fisheries pressure.³⁵ During the late 1990's, this species was at a record high, primarily due to higher hatchery production. However, as of 2004, the Chilliwack River hatchery releases small numbers of chum fry each year and most returning spawners to the Watershed are of wild origin.

Chinook salmon within the Chilliwack River system are primarily of hatchery stock composed of both summer return (red fleshed) and fall return (white fleshed) chinook salmon. Both of these salmon are from transplanted stock.³⁶ The summer return fish originate from the upper Fraser River stock and the fall return fish originate from the Harrison River stock. These fish are poorly adapted to the Chilliwack River system and are almost entirely maintained by hatchery production. The Chinook salmon native to the Chilliwack River are spring run and found in the upper portions of the Watershed in critically low numbers. This stock is almost all wild produced fish; however, there is a modest conservation hatchery program underway to recover this population to more sustainable levels.³⁷

Pink salmon return to the River to spawn in every odd-numbered year (e.g., 2003, 2005, 2007, etc.). Pink salmon numbers dropped dramatically in the 1980's and 1990's, but have been improving in the early 2000's, benefiting from a reduced fishery and improved freshwater and ocean conditions.³⁸ Gravel removal from the lower Chilliwack-Vedder River for the purposes of flood control occurs only in even numbered years to avoid harming returning pink salmon. The construction of various spawning channels along the upper Chilliwack River has also helped this species recover to healthy levels over the past decade.

The Chilliwack River supports a significant number of sockeye salmon migrants returning to Chilliwack Lake between June and August.³⁹ Chilliwack Lake sockeye salmon have recently experienced their highest return on record (30,000), due to good freshwater conditions and low harvest rates.⁴⁰ Another sockeye stock within the Chilliwack River Watershed is the Cultus Lake sockeye. Cultus Lake sockeye salmon are considered endangered and at risk of extinction by COSEWIC. Excessive fishing

mortality over past decades and high adult pre-spawn mortality in freshwater have contributed to this decline.⁴¹ Freshwater threats include a gauntlet of industrial and residential development in the Fraser Valley that emigrating smolts and returning adults must pass through, high recreational use, high water temperatures, and potentially high predation levels.⁴² Improvements in both fishing pressures and pre-spawn mortality are hopeful signs that this population can be recovered over the coming years. A recovery plan is under development and many of the surviving sockeye are being held in conservation hatcheries in an attempt to preserve and recover this population of salmon.

Wild steelhead populations, although stronger in this watershed than in others throughout the Georgia Basin, are not as abundant as in the past. Poor ocean conditions for all Georgia Basin stocks have contributed to this decrease in spawning returns.⁴³ However, improved freshwater conditions, consistent hatchery production, and restrictions on harvesting of wild steelhead in the Chilliwack River have prevented this population from experiencing declines as dramatic as other nearby stocks.⁴⁴

The condition of salmon and other fish species in the River is an important indicator of watershed health. Salmon productivity in the Watershed is largely dependent on freshwater habitat conditions, hatchery production, harvest levels, and ocean habitat conditions. After dramatic habitat losses in the late nineteenth and early twentieth centuries, freshwater habitat conditions within the Chilliwack River Watershed began to stabilize over the past twenty years as fire damaged and logged forests have begun to recover.⁴⁵ Active fish habitat restoration programs in the Watershed begun in the early 1980's and continuing today have accelerated the recovery of damaged fish habitats. Many of the fish populations in the Chilliwack River are now moving in a positive direction; however, there is still concern over the status of some species (e.g., Salish sucker, Cultus Lake sockeye salmon, wild coho salmon, and native spring chinook salmon).⁴⁶ Further efforts are needed to recover lost and damaged fish habitat within the Watershed that support these populations.

Natural Processes

Physical Processes

The Chilliwack River Valley is subject to a variety of natural physical and ecological processes. Due to its geological history, the Valley is naturally predisposed to floods, bank erosion, and geotechnical hazards such as slope failures, debris flows, and debris floods.⁴⁷ Many of these activities are exacerbated by human activities on the landscape.

Flooding is a significant process in the Chilliwack River Watershed. The largest flood recorded in the Chilliwack River Watershed occurred in December 1917, although other records suggest that larger floods may have occurred in 1815 and 1856.⁴⁸ During the 1917 flood, the maximum daily flow increased to almost 800 cms. More recently, major floods have occurred in December of 1975 and 1980, January of 1984, and November of 1989 and 1990. Major flood events typically correspond to periods of above average precipitation. However, the magnitude of flood events does not necessarily correspond to the level of precipitation, which indicates that other factors, such as snow pack and freezing levels, are important as well.

Erosion of river banks and valley walls is an integral part of the dynamics of any river system. It is estimated that the average erosion rate is 5 meters per year for alluvial terraces from Slesse Park to Tamihi Bridge, and 0.3 meters per year for valley walls. As their banks erode, rivers can migrate laterally across the valley floor. From Bell Acres to Baker Trails, the Chilliwack River may migrate laterally at an average rate of 5 meters per year. However, a lateral migration of up to 200 meters, or a change in the course of the Chilliwack River by 650 meters or more during a single event, is more descriptive of the bank erosion hazard than average rates.

Potentially destructive debris flows and debris floods originate from channels on valley slopes above the River, especially between Slesse Park and Vedder Crossing on the north side of the Valley.⁴⁹ While debris flows occur elsewhere in the basin, they are generally of less significance. Due to the localized distribution of these channelized hazards, they generally only pose risk to individuals and not entire populations in the Chilliwack River Valley.

Slumps, slides, and debris flows are widespread in areas with glacio-lacustrine silts. Slumps are usually shallow (e.g., up to 20 meters deep), but can be extensive in length.⁵⁰ Serious landslides in the Valley include Slesse Creek, Ranger Run, Correction Camp, Anderson Run, Slesse Park, Allison Run, Chilliwack Campground, Willow Run, and Tolmie Slide.⁵¹ These landslides are often called clayslides because they usually contain clay, but other materials, such as sand, gravel, silt, and bedrock are also common. Debris avalanches are independent of channel location and may occur at any location along the Valley with the glacio-lacustrine sequence.⁵² They may be precipitated by some type of soil disturbance and are invariably shallow.

Recent restoration projects coordinated by the Chilliwack River Action Committee have helped to mitigate some of the negative impacts of these clayslides on fish habitat. In particular, river bank stabilization works were completed on the Slesse Park Clay slide in 1999 and 2000, which greatly reduced the siltation entering the River from this clay slide. Starting in 2001, the Action Committee began to develop plans to stabilize the Tolmie Clay Slide. This work, nearly complete as of 2005, involved installing sixteen groynes constructed of large rocks, boulders, and large woody debris. The design of engineering works undertaken to stabilize the slide takes fish habitat into consideration by creating pools and providing shelter.

Ecological Processes

Ecological processes such as fire also influence landscapes with the Chilliwack River Valley. Forests in the Chilliwack River Watershed are generally not fire dependent due to the high level of moisture in the system. Although wildfires regularly occur every few years in the Watershed, they are tend to be limited in their extent of land disturbance. Wildfires are typically under 200 hectares in size and frequently under 100 hectares in size. Fire activity is most prevalent along the valley floor and along tributary slopes.

Several significant fires have occurred in the Valley since the early 1900's. The largest of these fire events occurred in 1938 due to a rail accident along the historical rail line in the Valley.⁵³ This fire extended the length of the Valley from Liumchen Creek to the outlet of Chilliwack Lake, destroying over 8,000 hectares of timber.⁵⁴ Disturbance was generally confined to the floodplain forests of the Chilliwack River and the reaches of Slesse Creek and Nesakwatch Creek.

Smaller fires have occurred since; mostly in the upper reaches of the Watershed.⁵⁵ In 1946, 306 hectares were disturbed on the eastern slopes of Chilliwack Lake and at the border above Slesse Creek. Reaches above Chipmunk Creek and Young Creek were also subject to fire disturbance in 1958, with a total burnt area of 875 hectares. In 1961, smaller fires occurred in the Depot Creek drainage with a disturbance area of 214 hectares.

Archeological and Cultural Values

The Chilliwack River Valley lies within the traditional territory of the Sto:lo ('People of the River') as defined by the Stó:lō Nation and Stó:lō Tribal Council.⁵⁶ The Chilliwack River Valley is the homeland of the Ch-ihl-kway-uhk (Chilliwack) Tribe. The Nlaka'pamux First Nation has also noted that a portion of their traditional territory extends into the boundaries of the Chilliwack River drainage.⁵⁷

Archaeological evidence of human settlement in the Chilliwack Valley extends back 5,000 thousand years.⁵⁸ Sto:lo oral history establishes their occupation of the valley since time immemorial. Some common types of archaeological sites documented in the valley include settlement sites (e.g., housepits), burial sites (e.g., burial mounds), and resource extraction and processing sites (e.g., culturally modified trees, lithic scatters, roasting pits). Oral history and ethnographic evidence document the locations of travel routes and traditional and spiritual use areas located throughout the watershed.

There are 60 documented archaeological sites within the Chilliwack River watershed.⁵⁹ While the majority of these sites are of Aboriginal origin, the remains of historic, non-Aboriginal sites are also accounted for (e.g., the Lindeman Lodge at Chilliwack Lake). The aboriginal sites include remnants of houses, burials, stone tools, and features associated with resource processing.⁶⁰ The territorial boundaries of the Sto:lo are delineated in part by watershed boundaries and are based on cultural landscape features such as place names, village locations, and Transformation sites.⁶¹ Within the Valley, there are at least 12 documented settlement sites with Halq'emeylem place-names.⁶² Extensive trail systems have been found along the entire length of Chilliwack River, Chilliwack Lake, and most major tributaries.⁶³ Chilliwack River is considered a significant cultural landscape feature, or 'Transformer site,' as are a number of peaks within the watershed, including Mount McGuire, Mount Slesse, and the Cheam Range.⁶⁴ Transformer sites are places that hold a human or animal spirit transformed into some other form, such as stone, and are often associated with a moral lesson.⁶⁵

4.0 Overview of Land and Resource Use

The oldest continuing land use in the Chilliwack Valley consists of aboriginal traditional uses. These uses were to sustain life and community, with activities including food harvests and hunting, medicinal gathering, forestry, fishing, spiritual uses, and settlement. Since the 19th century, newcomers, initially Europeans relocated from Eastern Canada or the United States and later directly from Europe, Asia, and Latin America, have utilized the resources of the Chilliwack River Valley.⁶⁶ Gold was found in the Fraser Canyon area near Yale in 1858. Gold seekers used the Chilliwack River Valley as a travel route over the Cascades. Since the discovery of gold in the Fraser Canyon, a variety of land uses have appeared in the Chilliwack River Watershed, including expanded human settlement, agriculture, parks and recreation, transportation and access, military and defense, and resource extraction. Fishing, hunting, recreation, mining, forestry, and hydro-eclectic generation are common uses of the natural resources in the Valley. Each of these land and resource uses are described in more detail below.

Settlement

There is a long record of human settlement in the Chilliwack River Valley as documented by archaeology, ethnography, and Sto:lo - Ch-ihl-kway-uhk oral history.⁶⁷ Evidence of settlement and use of the valley includes remnant housepit depressions, lithic scatters, culturally modified trees, and numerous spiritual use areas that are still in use today. A portion of Soowahlie Reserve I.R. 14, the only Reserve land-base established within the watershed, lies at the junction of Sweltzer Creek and the Chilliwack River. All other Ch-ihl-kway-uhk Tribe reserves were established in the Fraser Valley west of Vedder Crossing. The Soowahlie Reserve is approximately 3.84 square kilometers (1,100 acres) in size and about 230 band members live on the reserve.⁶⁸ Access to the community is from the south side of the River over Vedder Bridge. The community is primarily comprised of single family dwellings and some administrative buildings, but forestry and aggregate extraction also take place on reserve lands. The precontact roots of this settlement are established in the remains of the old village of Th'ewali.⁶⁹

European settlement began in the 1900's and was generally dependent on resource extraction industries. Gold was discovered in 1909 south of the British Columbian border at Red Mountain.⁷⁰ Local packers settled in the area below Slesse Creek and used packhorses to transfer materials from the mountain to the Valley. Railroad logging, and later truck logging, was the dominant economic activity in the Chilliwack River Watershed. The Campbell River Timber Company operated in the Valley from 1924 to 1928 and was followed by B and K Logging and Vedder Logging throughout the 1930's and 40's.⁷¹ Permanent settlement in the Chilliwack River Valley occurred largely after World War II.

Development within the Chilliwack River Valley portion of the Watershed falls under the jurisdiction of the City of Chilliwack, the Fraser Valley Regional District, and the Soowahlie First Nation. The City of Chilliwack has jurisdiction over that portion of the Watershed encompassing the Ryder Creek uplands and Ryder Lake. This area is primarily semi-rural residential and agricultural in nature.⁷² The community of Ryder

Lake is accessed from the northern slopes of the Cascade ranges and is not easily reachable from the Chilliwack River Valley. The population within this portion of the Watershed is approximately 300, with growth projected to several thousand as the area transitions from rural toward mixed density urban residential. The Soowahlie First Nation control development on their reserve lands, and the rest of the Watershed is contained within the boundaries of Electoral Area E, which is under the jurisdiction of the Fraser Valley Regional District.

Small lot residential development has dominated private land holdings in the Chilliwack River Valley due to soil limitations for agriculture in the area.⁷³ Today, most settlement within the Chilliwack River Valley is contained within four hamlets containing semi-rural lots or recreational strata developments. These hamlets are Baker Trails/McFaul Road, Edwards Road/Williamsburg, Bell Acres, and Slesse Park. Interest in the development of Bell Acres and the Slesse Park areas for seasonal recreational cottages began in the early 1960's. In Bell Acres, the first residential home was built in 1968. The Valley was slowly developed throughout the 1970's and early 1980's, but accelerated growth has occurred over the past 15 years to include additional developments at Williamsburg and Bell Acres and along Baker Trail and McFaul Road. Two trailer parks have also been developed. Chilliwack River Estates is a 77 unit rental park and Baker Trail Village is a 157 lot strata development. A recreational subdivision was started at Post Creek by the Province in 1969, but has never fully developed.⁷⁴

Commercial developments along Chilliwack Lake Road include a restaurant, convenience stores, a private campground, a scrap yard, a nursery, and a greenhouse. The Chilliwack Fish and Game Protected Association's clubhouse has been the main community hall since the 1960s.⁷⁵ There is also a volunteer fire hall that dually acts as a community centre.⁷⁶ Electricity and phone services are provided as far as the development at Post Creek and the last service station is located at Slesse Park.⁷⁷

In total, approximately 2,000 individuals reside within the Chilliwack River Valley and the Valley is now essentially developed to its capacity. Existing settlement clusters are developed to capacity and there is very little room for expansion of these development areas, due to a number of constraints. Only certain types of development are allowed to occur on lands designated within the Agricultural Land Reserve (ALR). The instability of the escarpment and clay banks above many of the residential hamlets threatens residents and provides a constraint to further development. There is a designated limited use zone within Electoral Area E to limit development in these areas. Residential and recreational communities within the Chilliwack River Valley are also constrained by flood hazards, difficult terrain, surface erosion, and the sensitivity of shallow ground water aquifers in the area. New development and removal of vegetation or tree cutting are subject to a development permit process to assess these concerns before new development is approved. Protection of water quality and provision of adequate septic and sewage facilities are concerns. Transportation is another constraint to further development in the Chilliwack River Valley. Chilliwack Lake Road is occasionally blocked by flooding, damaged due to erosion of the river bank, or covered in gravel slumps from adjacent quarry operations.⁷⁸ Development of alternative transportation corridors is not feasible

due to terrain characteristics. Limited future development will likely consist of infilling of vacant lots or subdivision of larger agricultural parcels.

Institutional

Several Crown land parcels under the jurisdiction of Land and Water British Columbia have been leased to Correctional Services for the development of minimum security prisons at Mount Thurston, Centre Creek, Pierce Creek, and Ford Mountain.⁷⁹ Three of these facilities, Pierce Creek, Mount Thurston, and Centre Creek have since closed. The only center that remains open is Ford Mountain Correctional Centre. This is a medium security centre that houses up to 110 adult offenders.⁸⁰

Canadian Forces Base Area Support Unit (ASU) operates several training facilities in the Chilliwack River Valley.⁸¹ Before the closure of the Canadian Forces Base Chilliwack in 1998, lands set aside for training of military personnel were more extensive. During World War II, the majority of lands within the Chilliwack River Valley were designated for training.⁸² Currently, there are six facilities in varying degrees of operation.⁸³ OPSEE Area 19 is a former heavy equipment training facility found to the south of the Chilliwack River off of Liumchen Creek Forestry Access Road. This facility is 364 hectares (644 acres) in size and is now used for dismounted and field training. Larsons Bench and Chipmunk Creek are used as a bivouac and rappel site in the vicinity of the Chipmunk Caves. The former Pierce Creek prison facility is now used as a centre for field training, as are areas of Slesse Creek. A site off of Slesse Creek Road is used for demolition training. The General Vokes Range Complex off of Chilliwack Lake Road is used for small arms and grenade and small charge training.

Agricultural

Agricultural production is limited in the Chilliwack River Valley due to soil constraints and hazards.⁸⁴ Only 800 hectares of land in the Valley are within the Agricultural Land Reserve (ALR). Two large and several smaller farms operate in the Chilliwack River Valley. Intensive agricultural production is not considered an appropriate use.

Parks and Protected Areas

Several parks have been established in the Watershed.⁸⁵ Chilliwack Lake Provincial Park surrounds Chilliwack Lake and provides a day use area as well as 160 overnight camping sites. Chilliwack River Provincial Park provides day use facilities, but is relatively undeveloped. Thompson Park, which is adjacent to Chilliwack River Provincial Park, was recently donated to the Fraser Valley Regional District by the Chilliwack River Ratepayers Association. This Regional Park acts as a gateway to the Valley as a recreational corridor and provides the public with natural and cultural heritage interpretation facilities. Cultus Lake Provincial Park is located to the southwest of the Chilliwack River Valley and provides 296 campsites. This park likely contributes to day visitation within the Chilliwack River Valley, as well as overflow traffic when capacity is exceeded.

Three Provincial Ecological Reserves have been designated to protect and conserve unique natural heritage values within or bordering the Watershed. These include the Katherine Tye Ecological Reserve southeast of Vedder Crossing, the Liumchen Ecological Reserve in the headwaters of the Liumchen Creek system, and the Chilliwack River Ecological Reserve found at the inlet of Chilliwack Lake.⁸⁶ These sites provide for low impact uses, such as nature appreciation and hiking, but prohibit consumptive uses.

Recreation

The Chilliwack River Watershed supports among the highest volume of recreational use of any other watershed in the Province. Its close proximity to the largest urban population in the Province makes it a primary and secondary destination for millions of recreational users on an annual basis. Based on traffic monitoring, it is estimated that approximately 1.5 million users or more visited the Chilliwack River Valley in 2005 (e.g., from Vedder Crossing to Chilliwack Lake).⁸⁷ Similar numbers or more are expected for the lower portion of the Watershed surrounding Cultus Lake.

The Watershed hosts a variety of outdoor activity, with the primary emphasis being on angling and water based sports, such as whitewater rafting and kayaking. The Chilliwack River, at the junction with Tamihi Creek, acts as a training centre for the Canadian National Kayak Team. In addition, Chilliwack Lake is used for sport boating, for both pleasure and angling purposes. Swimming and tubing in the River and Lake are also popular activities.

Land based activities include paragliding, hiking, mountaineering, rock climbing, mountain biking, camping, caving, horseback riding, and wildlife viewing in the summer months. Motorized all-terrain vehicles, dirt bikes, and four wheelers are also common in localized areas.⁸⁸ Winter activities include angling, snowmobiling, and cross country skiing. Snowmobile use in the Valley has increased exponentially in recent years.

The Ministry of Forests manages several forest recreation sites in the Valley, including Tamihi Creek, Allison Pool, Thurston Meadows, Chipmunk Peninsula, Camp Foley, and Riverside.⁸⁹ These sites are generally rustic and provide basic sanitary facilities, fire rings, and/or boat launches. There is a user maintained site with four campsites at a site named Rapids. Managed forestry trails include the Elk Thurston Trail, Pierce Creek Trail, Ford Mountain Trail, Mount Cheam Trail, and William's Peak. Centennial Trail, Liumchen Creek, Post Creek, Greendrop, Radium Lake, and the Upper Chilliwack River Trail are unregulated trail systems that are user maintained. Unregulated trails have also been developed at Mount McGuire, William's Peak, Mount Mercer, and Mount Laughington.

Access and Transportation

The Chilliwack River Valley has been a transportation route since the last ice age. Extensive trail systems have been found along the entire length of Chilliwack River, Chilliwack Lake, and most major tributaries.⁹⁰ These routes were used for transportation

of goods and materials from village sites, as well as for trading and visiting with other surrounding tribes in the interior, the coast, and south of the currently existing border.

In the 1920's, the primary means of transportation within the Chilliwack River Valley was via logging road, horse trail, or railroad.⁹¹ A rail line developed for transporting logging materials out of the Valley stretched from 6.4 kilometers west of Chilliwack Lake to the Columbia Valley. A rail accident in 1938 caused the logging companies to abandon the rail line and develop routes for truck access. Roads were rudimentary and not well maintained, and settlement at this time was scattered and limited to camps related to logging activity and mining activity south of Slesse Creek at Red Mountain. The Red Mountain Mine operated until 1942 and materials were packed in by horse to a homestead in the Bell Acres area.

The transportation network in the Chilliwack River Valley today is primarily focused on Chilliwack Lake Road to the north of the River and the Tamihi-Liumchen Forest Service Road, which runs south of the River until Tamihi crossing where it joins Chilliwack Lake Road. The road network has been significantly improved over the past few years due to heavy traffic and increased recreational use in the Valley. However, these main transportation corridors are prone to washout and flooding and road closures are not uncommon. Several residential road networks and forest service roads provide access to the residential hamlets and recreational sites along the length of the Valley.

Fisheries Resource Use

The Chilliwack Watershed is an important resource for both the freshwater and marine fishery. The River had a long history of aboriginal fishing for salmon, and possibly, to a lesser degree, steelhead.⁹² However, there has not been an aboriginal fishery on the Chilliwack-Vedder River since 1967.⁹³ Presently, salmon stocks from this river contribute significantly to the commercial and aboriginal fisheries in areas downstream of the Watershed (e.g., Fraser River, coastal marine areas).⁹⁴ In addition, Chilliwack River and Chilliwack Lake are heavily used by the freshwater sport fishery. There are no commercial fishing operations in the Watershed, although commercial guiding is pursued.

Chilliwack River hosts the largest recreational steelhead and salmon fishery in the Province. The major fisheries are the coho, chum, and chinook runs in the fall and winter months and the steelhead fishery in late winter and early spring. These fisheries contribute to over 90,000 angling days per year.⁹⁵ Regulations stipulate the daily limit and type, either wild or hatchery stock, that can be taken from the system.⁹⁶ For example, anglers currently must hold a valid stamp to keep a single hatchery steelhead. Wild coho and steelhead must be released. In addition, anglers are only permitted on the river system from the confluence of Slesse Creek to the Fraser River and no fishing is allowed above Vedder Crossing between May 1 and June 30. The fishing regulations change regularly and anglers must keep up to date with the current regulations.

Angling opportunities in the Watershed are within a day trip of the largest population centre in the Province. An angler survey in 1998 discovered that over 62% of anglers

were from the Greater Vancouver Regional District, 35% were from the Fraser Valley, and just over 1% were from out of country.⁹⁷ Most anglers were return visitors (87%) and upwards of 60% of anglers stayed overnight in the area or for more than one night.

A further recreational fishery survey conducted in 2004 indicated that angling activity is significantly higher in the months of October and November north of Vedder Crossing.⁹⁸ Over 80% of angling effort went toward coho, with significantly less effort toward chinook and chum. Effort increased during the weekends and remained constant during the week. Only a small percentage of the catch retained were unmarked fish.

Most of the fish caught by the recreational fishery are produced by the Chilliwack River Hatchery, which was built in 1981 just upstream from Slesse Creek. The hatchery produces six million salmon smolts annually of five salmon species, including three chinook stocks, coho, chum, pink, and steelhead.⁹⁹ Adult salmon are caught for brood stock from the River or the fish ladder at the Hatchery and eggs are incubated on site. As of 2005, targets for the number of juveniles released from the hatchery were approximately as follows:¹⁰⁰

Red chinook	410,000
White chinook	1,200,000
Spring chinook	NA
Coho	1,200,000
Chum	1,100,100
Steelhead	120,000
Pink	NA

The Chilliwack River Hatchery has substantially built up these stocks over the last two decades in the Chilliwack River. The Cultus Lake Salmon Research Laboratory southwest of the Chilliwack River Valley on Sweltzer Creek is also of importance to the recovery of endangered Cultus Lake sockeye populations and a number of research projects.

Forestry Resource Use

The majority of land within the Chilliwack River Valley on the Canadian side of the border is retained as Provincial Crown Forest. This land is under the management of the Ministry of Forests in accordance with the *Forest and Range Practices Act* (FRPA) and the *Forest Act* (FA). The headwaters of Slesse Creek, Tamihi Creek, Liumchen Creek, and the Chilliwack River are located south of the border and are generally protected within the boundaries of North Cascades National Park or the Mount Baker Wilderness Area where logging is not permitted. The upper portions of Tamihi Creek and Liumchen Creek are located with the Mount Baker-Snoqualmie National Forest and are not under immediate threat of logging due to a stop on timber harvesting to protect Northern spotted owl habitat.

Within the Chilliwack Landscape Unit, approximately 64% of the total 65,182.9 hectares is contained within Crown forested lands and 34% is within the Timber Harvesting Land

Base (THLB).¹⁰¹ The remaining 13% of the area is defined as non-forested or non-Crown land and contains private land, rock, alpine, or land cover other than productive forest.

The portion of the Watershed within the Province of British Columbia is located within the Chilliwack Supply Block of the Fraser Timber Supply Area (TSA). The Ministry of Forests operates several research sites within the area to evaluate growth and yield from progeny, provenance, and spacing trials on nursery stock. Tenure holders within the Chilliwack River Watershed include BC Timber Sales, Cattermole Timber, International Forest Products, Scott Paper, Northwest Hardwoods, Tamihi Logging, and E.R. Probyn Log Ltd.¹⁰² Under the FRPA and its regulations, all major tenure holders must prepare a forest stewardship plan, which Government must approve, prior to harvesting activities.¹⁰³

Timber resources are of high importance to the area and forestry is the most important economic resource in the Watershed. The value of forestry in the Watershed, as of 1995, was 11.4 million dollars and over 124 direct jobs.¹⁰⁴ This is reduced slightly from 27 million dollars a year and 300 direct jobs in 1989. Forest harvest activities are expected to increase in the future due to most of the forests reaching harvestable maturity after a major fire in the late 1930's.

Forests have always been important to First Nations as well. For example, traditional uses of forests include weaving the bark and roots of cedar trees (and other trees and plants) into baskets, mats, clothing, canoe-bailers, cordage, rope, and nets.¹⁰⁵ Trees were also important for the construction of dwellings and canoes. First Nations now participate in forestry cut allocations in the Chilliwack River Watershed. Ch-ihl-kway-uhk Forestry Limited has recently partnered with Probyn Log Limited for timber harvesting on traditional lands.¹⁰⁶ Through this partnership, Ch-ihl-kway-uhk community members will work with Probyn to manage and operate the First Nations' forestry operations. The two companies will work together to harvest up to 227,000 cubic meters of annual allowable cut forest land and 585 hectares of woodlot area designated under the Ch-ihl-kway-uhk's Forest and Range Agreement with the Provincial government. Forestry is also of great interest to the Soowahlie First Nation as they have been in the area taking care of the natural resources for a long time and most of the elder's have worked extensively in the logging industry.¹⁰⁷ Soowahlie First Nation has entered into its own Joint Venture forestry agreements with three different Logging Companies. They have recently formed a company called Th'ewali Forestry Ltd.¹⁰⁸ Soowahlie is also interested in the start up of value-added forestry activities.

In addition to timber harvesting, other uses of forest resources include berry harvesting, mushroom harvesting, and other botanical forest product use.¹⁰⁹

Wildlife Resource Use

Aboriginal hunting has occurred in the Chilliwack River Valley since time immemorial. Stó:lo hunters typically hunted deer, elk, black bear, and mountain goat, but other animals including hoary marmot (groundhog), beaver, raccoon, wildcat, squirrel, and martin, were also taken in smaller quantities.¹¹⁰ A variety of birds, such as ducks, geese,

eagles, and grouse were also hunted. Wildlife resources were also important to early European settlers. Sport hunting and guiding remains a significant activity within the Watershed. Game includes deer, waterfowl, and grouse.

There are three trapping licenses within or overlapping the boundaries of the Chilliwack River Watershed.¹¹¹ These licenses have been relatively inactive over the past few years.

Non-consumptive uses of wildlife, such as wildlife viewing, are an often overlooked aspect of wildlife resources. Bird watching and wildlife viewing is growing in popularity as an outdoor activity within the area and two local naturalist groups take advantage of the Chilliwack River Valley to undertake this activity.

Hydro-electric Use

Currently, there are no hydro operations in the Chilliwack River Watershed. However, there have been a number of proposals for the development of water power projects within the Chilliwack River Watershed. As of 2003, one water license had been approved on a northern tributary to Chilliwack River.¹¹² In addition, Land and Water British Columbia had received applications for water licenses for power projects on the following tributaries of the Chilliwack River and Chilliwack Lake:

- Tamihi Creek
- Pierce Creek
- Chipmunk Creek
- Nesakwatch Creek
- Centre Creek
- Airplane Creek
- Post Creek
- Paleface Creek

Not all of these applications will necessarily be developed. Proponents of these power projects must complete social and environmental studies before developing a project. In addition, the Fraser Valley Regional District requires properties to be rezoned for water power projects and this process includes a public meeting. Only one proponent who holds an application for Pierce Creek has pursued the appropriate zoning for power projects with the Fraser Valley Regional District.¹¹³ This site has an energy purchase agreement in place, but is still undergoing the process for rezoning the property on which the license is registered. Most of the licenses and proposals have yet to be developed.

Eight of the Ch-ihl-kway-uhk First Nations have entered into a protocol agreement with Badger Power Generation Incorporated to study the feasibility of joint ventures within the Chilliwack River Valley.¹¹⁴ The agreement recognizes the Ch-ihl-kway-uhk First Nations' inherent resource rights and provides for joint working groups that will compile an inventory of feasible projects within the Ch-ihl-kway-uhk traditional territory in and around the Chilliwack River Valley.¹¹⁵ The parties will begin by determining which projects are economically, environmentally, culturally and technically feasible, and then turn their attention to business structures for development projects. Only four of the fifteen tributaries into the Chilliwack River are estimated to generate over 25 megawatts of power.¹¹⁶ Accordingly, both wind and small hydro-electric alternatives will be considered under the agreement.

Mineral and Aggregate Use

There are 22 mineral tenures within the Chilliwack River Watershed with seven registered tenure holders.¹¹⁷ Mineral claims are primarily for the removal of gold, limestone, and volcanic rock, and for the production of a mineral supplement.

Up to 100,000 cubic meters of gravel can be removed from the lower Chilliwack-Vedder River in any single year to protect against floods.¹¹⁸ This gravel is sought after for commercial use and provides a direct economic benefit to the local community. There were four mine permits for sand and gravel quarry operations in the Watershed as of 2004.¹¹⁹ The length of the Chilliwack River is classified as having moderate potential for aggregate, with two areas between Slesse Creek and Nesakwatch Creek and another east of Tamihi Creek being classified as high potential. Several of the southern tributaries to the river system are also classified as having moderate potential for aggregate and sand. The close proximity of the Chilliwack River Valley to major urban growth centers suggests that this area will be under considerable pressure for development of these resources in the future.

5.0 Challenges and Opportunities

At a quick glance, there are a number of challenges faced in the Chilliwack River Watershed. This section is not meant to provide a comprehensive review of all issues in the Watershed. Rather, it provides an overview of key challenges from the perspective of the Fraser Valley Regional District. In addition, this section also notes some of the opportunities that exist within the Watershed to address these challenges.

Residential Development

Development within the Watershed is subject to various natural constraints. The protection of private property is of the utmost concern in the area. Several sub-divisions have historically been developed in areas prone to natural hazards, such as flooding and landslide activity. Steep terrain, active channels, debris fans, and flood hazards make development in the Valley a challenge.

Water Use and Quality

Surface water quality can be degraded by increased sediment inputs from development, forestry, or mining activities. The aquifer underlying the Chilliwack River floodplain is vulnerable to contamination due to a highly porous surface material. Septic systems are one potential source of groundwater pollution.¹²⁰

Domestic extraction wells on the Sardis Aquifer have the potential to reduce the flow of groundwater to important salmon and Salish sucker streams that flow into the lower Chilliwack-Vedder River.¹²¹ An active stream and groundwater monitoring program is being undertaken by the City of Chilliwack to provide data to assist in designing measures for mitigating any demonstrated impacts to fish habitats.

Hazard Mitigation

Given the variety of hazards present in the Chilliwack River Valley, effective hazard mitigation is essential to protect human settlements and preserve natural values in the area. Existing hazard mitigation infrastructure includes berms, riprap, orphan dikes, and debris basins. The construction of such infrastructure has tended to be the result of reactive responses to hazard events. A more proactive, orderly approach that identifies a need for improvements to existing infrastructure, or the construction of new infrastructure, is required. In addition, effective protection to existing settlements needs to be provided in a way that minimizes habitat impacts.

Cultural and Heritage Values

The B.C. *Heritage Conservation Act* protects archaeological sites in the province of British Columbia from disturbance. However, a number of the 60 documented aboriginal and non-aboriginal archaeological sites within the Chilliwack River Watershed are threatened or have been adversely impacted by development and users of the Valley. Developing an effective cooperative approach to managing these sites is an ideal objective.

In addition to archaeological sites, there are numerous Stó:lō traditional use sites located throughout the Watershed, including places used for spiritual practices. Many of the spiritual use areas used by the Stó:lō community have, over the last two or three decades, become unusable due to factors including the rising level of development, recreational use, and multiple user conflicts.¹²² Addressing these conflicts is currently the most significant and pressing aspect of heritage management within the Chilliwack River Watershed. There is an opportunity to work with local First Nations to further identify and address these issues.

Educational values are also inherent in many of the archaeological and heritage sites in the Valley. In addition to working towards the effective protection and preservation of archaeological and heritage sites, great opportunity exists for ‘adding value’ to the educational and interpretive possibilities associated with the culture history of the Chilliwack River Valley (e.g., Thompson Park Interpretive Panels).¹²³ Developing a cultural heritage interpretive program for the Chilliwack Valley could be addressed in partnership with local First Nations.

Recreation

The volume of recreational use and variety of activity has caused major concern within the Chilliwack River Watershed. It is thought that the carrying capacity of the Valley for visitation has been exceeded over the past ten years. Multiple user conflicts and conflicts between private property owners and recreational users have increased exponentially. Overuse has led to pollution of waterways, littering, isolation of access points, damage to riparian vegetation, property damage, and increased risk of wildfire.¹²⁴ There has also been an increase in illegal activities (e.g., trespass, alcohol consumption by minors, and vehicle theft), which has led to concerns about public safety.

Recreational activity is largely unregulated and no single agency has jurisdiction to address this issue in isolation. However, inter-agency cooperation has led to some action. The Fraser Valley Regional District has stepped forward to cooperatively develop a recreation corridor management plan to address these concerns.

Wildlife

The activities of common beavers within the Watershed affects fisheries values in the Chilliwack River system. Ponds created upstream of beaver dams are ideal habitat for juvenile coho salmon and cutthroat trout. However, beavers have had a considerable population surge in the developed areas of the Watershed and have blocked culverts and prevented upstream fish passage at several locations. Beaver ponds can also flood out important spawning areas to the detriment of species such as chum salmon. There have been past efforts toward the relocation of beavers from areas where they are having negative effects.¹²⁵ Recent Provincial guidelines require the trapping of problem beavers rather than relocation. The impact of such activities on the beaver population as a whole has not been evaluated.

Fisheries

Freshwater habitat conditions in the Watershed were historically degraded from a loss of floodplain habitats from land development, increased turbidity and siltation of streambeds from landslides and logging road failures, disruption of spawning habitat from in-stream gravel mining, and man made obstructions to fish movement including impassible culverts.¹²⁶ Recent improvements in freshwater conditions have resulted from efforts to slow or reverse some of the habitat losses, improve land and stream management practices, and facilitate the recovery of forest cover in the upper Watershed. In spite of habitat improvements in recent years, there are still a number of stocks of concern, including Cultus Lake sockeye, native spring chinook, coho, and steelhead. Cultus Lake sockeye are considered threatened and efforts to develop a recovery strategy for this species are underway. Steelhead populations, which are threatened provincially, are also the subject of recovery planning.

Hatchery production has resulted in a coincident increase in angling activity, creating crowding and access management issues along the River corridor. There has been increased public pressure to better regulate both recreational use of the River and to increase enforcement activity in the Watershed to prevent further environmental damage to sensitive habitats or fish stocks. There is an opportunity to work with Fisheries and Oceans Canada and other government agencies to explore options to mitigate these concerns.

Forestry

A loss of forests influences the Chilliwack River in several significant ways and it can take many decades for recovery. Increased flood frequency and flow, widened channels, erosion, destabilization of stream side banks, and the loss of large woody debris are all

aggravated by the loss of tree cover.¹²⁷ Stream temperatures also increase as a result and high stream temperatures can incrementally impact aquatic species composition and survival. Long term sediment deposition and movement can take several decades to improve, although the mitigative effects of tree cover are reached when newly planted trees reach a height of nine meters.

Timber harvesting activity is under increasing constraint to meet the requirements of wildlife, species at risk, old-growth, and fish protection. The designation of management zones for the protection of these and other values of the landscape has reduced the available timber harvesting land base significantly. Small companies are finding it difficult under these circumstances to compete with international interests.

In addition, the creation of roads and recreational sites through forestry activities has increased access for recreational use of the Watershed. In many instances the Ministry of Forests has been unable to keep up with the demand and use of recreational sites, causing conflict with residents and other government agencies. There is a long standing mistrust of the forestry industry in regards to the protection of social, cultural, and natural heritage values and it is a challenge to balance the needs of the industry with the needs of other Crown land users.

First Nations are becoming increasingly involved in the forest industry through partnership with private industry. This has provided an opportunity for economic development and employment for several First Nations in the area. Forestry agreements are in place for the Ch-ihl-kway-uhk Forestry Partnership Limited and Th'ewali Forestry Limited.

Significant Fauna and Flora

Several recovery planning processes are underway for Species at Risk within the Chilliwack River Watershed. Issues surrounding the conservation of both significant wildlife and plant species may impact future development and resource activity within the Watershed.

Hydro-electric Power Production

Interest in independent water power projects within the Province is growing and the Chilliwack River Valley is no exception to this interest. While independent water power projects can provide an alternative to energy intensive power projects, there are a number of concerns associated with the construction and operation of water power projects. This concern surrounds the potential impact to visual quality (e.g., power lines), recreational use, fisheries and wildlife values, and cultural resources.

Aggregate and Mineral Development

Although mineral development is restricted to small operations due to hazard constraints, the potential and demand for aggregate and sand extraction will likely grow as population growth proceeds over the next decade. Currently, up to 100,000 cubic meters of gravel

can be removed from the lower Chilliwack-Vedder River in any single year to protect against floods.¹²⁸ This gravel is sought for commercial use and provides a direct economic benefit to the local community. This gravel is also important to salmon that use the lower River for spawning. The responsibility of balancing flood hazards, recreational use, and environmental management in the lower River lies with the Vedder River Management Committee.

Development of any of the 22 mineral tenures in the Chilliwack River Watershed may pose risk to water quality and heritage values. Conflicts between quarry operations in the Chilliwack River Valley and the protection of significant karst formations in the Chipmunk caves area has already been flagged as a concern.

Stewardship Groups

A number of well-established stewardship groups are active in the Chilliwack River Valley portion of the Watershed, including the Chilliwack River Action Committee, the Chilliwack-Vedder Cleanup Coalition, and the Chilliwack Fish and Game Protective Association. These knowledgeable and effective groups play a key role in addressing concerns in the Chilliwack River Valley. For example, the Chilliwack River Action Committee has coordinated a number of restoration and enhancement projects (e.g., Tolmie Slide, Lovely Pond, Ryder Creek, etc). These projects have helped mitigate the damage caused by clayslides in the Valley and have improved fish habitat. The Chilliwack-Vedder Cleanup Coalition holds regular river cleanup parties, during which volunteers remove litter from the River several times each year. The Chilliwack Fish and Game Protective Association supports fish and wildlife conservation programs in the Watershed. Several other groups are active in the lower portion of the Watershed or just outside of the Watershed, including the Fraser Valley Regional Watersheds Coalition, the Chilliwack Vedder Watershed Restoration Society, and the Watershed Alliance of Chilliwack.

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