2020

HABITAT RESTORATION PLANNING IN THE HARRISON SALMON STRONGHOLD

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Sts'ailes and Sq'éwlets Fisheries

3/31/2020

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Acknowledgements

Funding for this project was provided by DFO's Coastal Restoration Fund. This work was made possible by the partnerships under the "Heart of the Fraser" salmon restoration program organized by the Fraser Valley Watersheds Coalition and led by Natashia Cox, Associate Program Director. Public consultations and coordination of local stewardship partners associated with the Williams, Bateson and Duncan Sloughs was led by Dave Moore, Fisheries General Manager for Sts'ailes-Sq'éwlets and Coordinator for the Harrison Salmon Stronghold.

Tyne Roberts, Project Biologist for Hemmera provided invaluable support for restoration programming on the Phillips Sloughs. Stephanie Cavaghan, Project Biologist provided invaluable leadership in project reporting and mapping for Bateson and Duncan Sloughs. District of Kent's Engineer Mick Thiessen provided invaluable policy and program insights as well as mapping data relating to their drainage Program. Trevor Welton, Senior Manager and Biologist for Hemmera provided oversight and planning for restoration work on Nancy and William Phillips Sloughs. Mike Pearson of Pearson Ecological led field studies of the Sq'éwlets sloughs and wetlands. He was assisted by Sts'ailes Fisheries Technician Kade Charlie and students Petra Wykpis, Roxanne Snook, as well as Isaac Pennier and Jared Hall from Sq'ewlets. Morgan Richie and Burt Charlie undertook field archaeological studies and reporting with support from Sq'éwlets Lands and Resources Manager James Leon. Kim Charlie, Sts'ailes Fisheries Manager provided logistical support for all related activities. Kelsey Charlie provided policy guidance for the duration of the project.

COVER PHOTO: ZoAnn Morten provides Stream Keepers training to a group of students from Sts'ailes-Sq'éwlets.

PREAMBLE[1]

The decline of Chum and Chinook salmon in southern BC have been linked by COSEWIC to a coincident decline in south-coast resident Orca populations. Productive Harrison River chum and chinook stocks represent more than 60% of Lower Fraser populations and as such represent one aspect their recovery planning.

The lower Fraser River has earned the title "Heart of the Fraser", and the Harrison's rich biological diversity was designated a Pacific salmon Stronghold. Salmon restoration programming in this area aims to improve freshwater juvenile salmon productivity and survival. Juvenile salmon migrating from Harrison River spawning grounds depend upon the nutrient rich slough and wetland habitats enroute to the ocean in order to reach critical size and weight to survive the saltwater challenge - one of the most critical life stages of these salmon.

Improving salmon populations is one tool in recovery planning for the South Coast Orca. Greater salmon wild salmon returns also improves First Nation food, social and ceremonial fisheries, particularly for the local communities of *Sts'ailes* and *Sq'éwlets* First Nations, while benefiting commercial and recreational fisheries throughout the Pacific northwest.

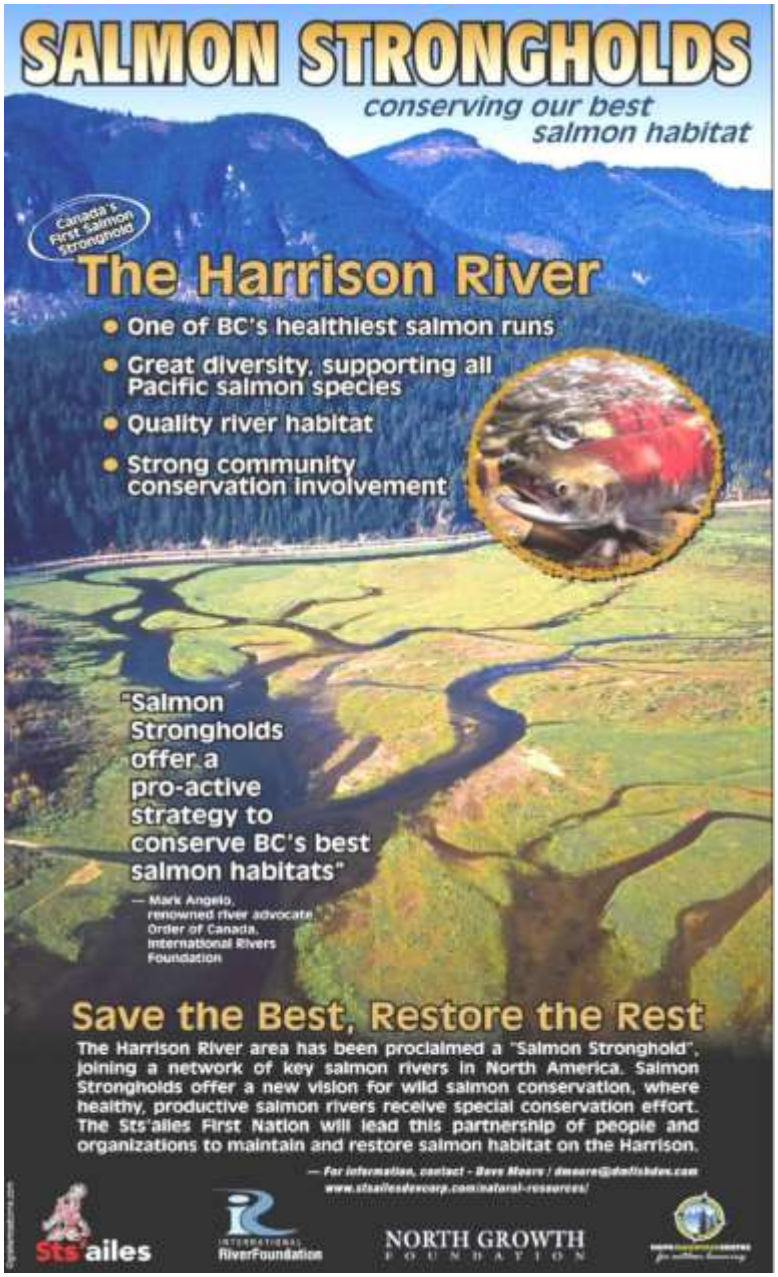


Figure 1. The Harrison River was designated as Canada's first Pacific salmon stronghold in 2010 and represents a rich biological refuge for Pacific Salmon

[1] Moore d. and N. Cox, 2020

2 INTRODUCTION/SCOPE OF WORK

In 2019 Sts'ailes-Sq'éwlets Fisheries were engaged as a Partner with the Fraser Valley Watershed's Coalition to complete the first year of a three-year program of work on the 'Heart of the Fraser' with the Coastal Restoration Fund (CRF). The purpose of the program is to restore chinook and chum salmon habitat in the Harrison River and renown Chehalis River estuary, with a particular focus on formerly productive slough and wetland habitats at risk highlighted in Harrison Salmon Stronghold. The work plan includes:

- Provide the basis for local, community and TEK to inform conceptual designs for restoration of local salmon habitats;
- Identify specific and relevant information for restoration of William and Nancy Phillips, Bateson/Duncan Sloughs - informing conceptual designs;
- Provide a conceptual plan that outlines key values associated with restoration of these sloughs;
    - incorporating Sts'ailes FN TEK in the design plan for the Phillips Sloughs; and
    - Local Municipal values/flood risk consideration in Bateson/Duncan Slough plans.

2.1 COMMUNITY ENGAGEMENT – *LIVING WITH THE HARRISON SALMON STRONGHOLD*

The Harrison River is a unique Canadian environment and an irreplaceable national treasure. It is also internationally significant, designated as both an Important Bird Area and a North American Pacific Salmon Stronghold. The strategic plan is a blueprint to safeguard the ecological diversity of the Harrison Salmon Stronghold. It acknowledges Harrison River salmon as a keystone species in the watershed's ecology; it promotes stewardship of the land, water and natural resources, and ecologically sustainable lifestyles to maintain the Stronghold's natural attributes.

The spirit of this strategy reflects on the ever-important connections between salmon and the residents of the valley. Habitat stewardship planning (2014-2019) has focused on creating a suite of tools and a supporting network of local expertise for community-led stewardship. Work to date includes:

- Organization of a Stronghold Council and strategic plan for coordination and oversight of Harrison Salmon Stronghold stewardship;
- Mobilization of a network of local stewardship groups, their skilled specialists, and community leaders/businesses/landowners around the objectives of the strategic plan;
- Collection of high-resolution LIDAR imagery of the Harrison Watershed as the base for their planning and reporting;
- Creation of a habitat activities map in a partnership with the Community Mapping Network over-laid with both completed and proposed priority restoration projects and including progress-tracking icons (interactive) with each restoration initiative; and,
- An assessment of mainstem and tributary habitats with associated limiting factors, including the development of priority restoration project priorities (the Plan) worth more than $10 million.

The supporting studies of Harrison River habitats are to be used as a guide for future investment and programming; to direct willing proponent partnerships (communities, industry, governments and NGOs)

and engage funders, regulators and experts with those who are living with the Harrison Salmon Stronghold.

Figure 2. Harrison Salmon Stronghold Council

Harrison Salmon Stronghold habitat programming background reports available through Sts'ailes-Sq'éwlets Fisheries and/or the Fraser Valley Watersheds Coalition:

- Harrison River Restoration and Stewardship Atlas 2016 www.cmnmaps.ca/harrison
- Harrison Tributary Assessment, Hemmera 2017
- Phase 2 Habitat Programming, Hemmera 2018
- Phase 3 Habitat Programming, Hemmera 2019
- Harrison Mainstem Mapping, Hemmera 2019
- Lake Errock Catchment Habitat Assessment, Hemmera 2019
- Fish, Amphibian and Habitat Surveys Restoration Opportunities at Sq'ewlets, Pearson 2020

2.2 RIPARIAN SALMON HABITATS AT RISK

Harrison River has faced significant impacts from historic channelization, deforestation, log booming, and diking. While lingering impacts remain from these historic activities, a recent assessment of salmon habitats points to more significant degraded riparian conditions and a loss of connectivity and function.

A five-year assessment of Harrison River's salmon habitats (Hemmara 2015-2020) is a key component of the Harrison Salmon Stronghold Strategy. Riparian habitats at risk included small streams, sloughs and wetlands in particular. Impacts were associated with private property development, diking/ditching and road/railway construction, although decreased spawning activity was also cited as a factor in slough spawning habitats plagued by infilling. Primary impacts included isolation of habitats by roads and dikes, steam flow disturbance by culverts and ditching, and blocking of sloughs and wetlands by silts and invasive vegetation. In some cases primary impacts were compounded by hypertrophication.

A total of 20 salmon habitat sites were the subject of high-level assessment and restoration project design planning (Hemmera 2018; 2019), with an estimated $17.4 million for targeted restoration work associated with 10 key habitat types (Fig. 3). One of these sites were prioritized for implementation in 2019/20, and three others were identified for more detailed planning.

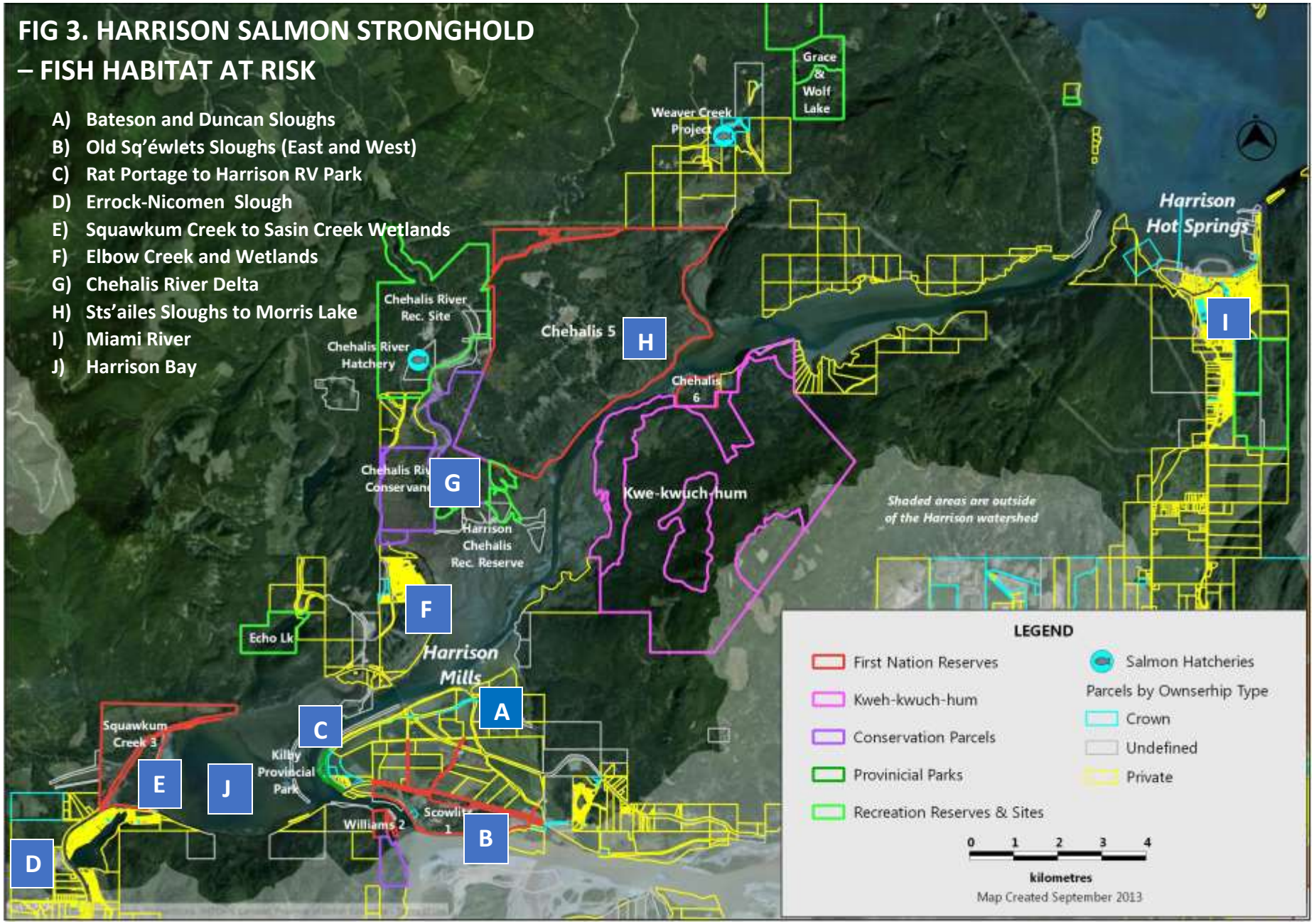


FIG 3. HARRISON SALMON STRONGHOLD – FISH HABITAT AT RISK
A) Bateson and Duncan Sloughs
B) Old Sq'éwlets Sloughs (East and West)
C) Rat Portage to Harrison RV Park
D) Errock-Nicomen Slough
E) Squawkum Creek to Sasin Creek Wetlands
F) Elbow Creek and Wetlands
G) Chehalis River Delta
H) Sts'ailes Sloughs to Morris Lake
I) Miami River
J) Harrison Bay
Grace & Wolf Lake
Weaver Creek Project
Harrison Hot Springs
Chehalis River Rec. Site
Chehalis River Hatchery
Chehalis 5
Chehalis 6
Kwe-kwuch-hum
Harrison Chehalis Rec. Reserve
Echo Lk
Harrison Mills
Squawkum Creek 3
Kilby Provincial Park
Williams 2
Scowlitz 1
Shaded areas are outside of the Harrison watershed
LEGEND
First Nation Reserves
Kweh-kwuch-hum
Conservation Parcels
Provinicial Parks
Recreation Reserves & Sites
Salmon Hatcheries
Parcels by Ownserhip Type
Crown
Undefined
Private
0 1 2 3 4
kilometres
Map Created September 2013

3 HARRISON RIVER HABITAT RESTORATION PRIORITIES

Choosing which sites to restore and when to do them is a challenge driven by a combination of available funding, opportunity, and benefits analysis. A ranking system was generated in 2017 following a rigorous high-level assessment and benefits analysis (Hemmera 2017) that ranked ecological and economic benefits to inform priority-setting. Opportunity is driven by a combination of landowner support and logistical practicalities. But in the end, a high ranking salmon habitat restoration project with local support is only possible to execute if there is available funding. Table 1 summarizes the rankings used to inform project planning. It was used as the basis for proposals to the Coastal Restoration Fund.

Habitat Restoration Site	Ecological Benefits (Pounds of Adult Salmonids)	Ranking	Economic Benefits ($/ m²)	Ranking
Bateson Slough N.	373,590	5	1,096	14
Bateson Slough S.	576,553	3	1,062	15
E. Sq'éwlets Slough	240,623	7	1,816	3
E. Sq'éwlets Slough Ext.	41,438	19	1,718	12
Ed Leon Side Channel	112,038	12	1,789	7
Harrison Mills N. Option 1	139,919	10	477	18
Harrison Mills N. Option 2	82,700	14	623	17
Hatchery Flats Channels	346,029	6	1,841	2
HR Bridge E.	85,841	13	1,805	6
HR Bridge W.	43,920	18	1,787	8
Kilby Channel	56,019	16	1,779	9
Lower Chehalis Side Channel	190,620	8	1,815	5
Lower Conner Creek	162,547	9	355	19
Morris Creek	8,245,333	1	1,875	1
Morris Creek Side Channel	377,429	4	1,770	11
Unnamed Slough	55,529	17	980	16
Upper Chehalis Side Channel	139,686	11	1,779	10
Upper Connor Creek	56,370	15	301	20
West Sq'éwlets Slough	932,775	2	1,509	13
William Philips Pond	16,724	20	1,815	4

Table 1. Summary of Habitat Restoration Site Rankings on the Harrison River

3.1 PROPOSED HABITAT RESTORATION SITES SUMMARY

A) Bateson and Duncan Sloughs

On the east bank of the Harrison River spanning the first 3 kilometers upstream from its confluence with the Fraser River is a 600 hectare triangular floodplain defined by historic Bateson and Duncan Sloughs Approximately 7.5 km of foreshore diking built following the 1948 flood along the banks of the Harrison and Fraser Rivers offers protection to the farmlands and residential homes it protects from floodwaters.

Before the diking, Sts'ailes-Sq'éwlets would use the braided channels between the Harrison and Fraser River here as a canoe shortcut to the Fraser River. According to TEK, both Bateson and Duncan sloughs were once important chinook (fall) and chum spawning habitat. Coho and pink salmon would also be found in these slough, particularly between October to February. In modern times these habitats are limited to juvenile salmon rearing, utilized by coho over-winter and chinook between April and June.

Inside the dikes today a network of more than 10 kilometers of ditches and wetlands drain the nearly-level floodplain to form at least three primary slough channels. The Sloughs and drainage ditches comprise nearly 10 kilometers of watercourses, standing wetlands, and two main channels that all converge at a single flood-control pump in the northwest corner at an RV park. Poor drainage, perched culverts and filled-in stream channels currently provide limited seasonal habitat for salmon juveniles. A small slough/wetland upstream of the dike and water intake was also identified where grass cultivation has encroached on the Harrison River margin.

Situational Analysis:

- Landowners obstructing fisheries access due to historic conflicts with regulators
- Much of the agricultural/rural properties north of highway 7 and encompassing the lower reaches of Bateson and Duncan Sloughs fall under a single land owner and are currently for sale, further limiting restoration planning
- A large portion of the agricultural/rural properties south of highway 7 and encompassing the upper reaches of Bateson and Duncan Sloughs fall under the ownership of long-time owners
- Drainage program restricted by lack of landowner support with limited maintenance over the last 20 years
- Baseline fisheries assessment completed with high-level restoration plans (Hemmera, 2018)
- Detailed restoration planning impractical
- High level planning with District of Kent and local partners supportive

B) Old Sq'éwlets Sloughs (East and West)

Along the Fraser River, below dikes and the CPR mainline are two distinct sloughs exist that are remnants of a time when the Fraser River flowed over the flood planes at the confluence of the Harrison River. Partially isolated by dikes, access road and accumulated river deposits, these sloughs represent more than 1 linear kilometer of sloughs and wetlands spanning Sq'éwlets Reserve, private and Crown lands. A precipitous drop separates the west slough from the Fraser river during low water. A small flow source into East Sq'éwlets slough breaches the CPR berm south of its intersection with the dike,

providing some surface flows controlled by a flap gate. Traditional Ecological Knowledge suggests that water quality degraded significantly with the dike and railway and was primary cause of primary community moving west to Squawkum Creek IR 3.

Situational Analysis

- Support from Sq'éwlets for conducting fisheries studies
- Outside of drainage program area but inside dike
- Fisheries baseline study complete (Hemmera, 2018) and detailed restoration program under development (Person Ecological, 2020)
- Sq'éwlets has planned boat launch/landing improvements on this site for its cultural and economic fisheries – the adjacent Baetson slough offers potential on-site mitigation for any potential fish impacts from the development
- Sq'éwlets Council have aspirations to develop regulations for the conservation and use of fish and wildlife and their habitats at the Harrison Mouth

C) Rat Portage to Harrison RV Park

Pinched between the outside of Bateson-Duncan Slough dikes and the Harrison River are a series of sloughs with varying lengths and connectivity, subject to river flows. The disconnection between these wetland and the adjacent river and Bateson-Duncan slough complex has a suspected impact on flows, complexity and function for salmon. The most easily accessible sites identified for restoration work are adjacent to the historic Rat Portage Mill site and south of the Highway 7 Bridge.

Situational analysis

- A mix of Crown and private lands includes Kilby Historical Park, disputed private property (private development vs Sq'éwlets)
- Landowners obstructing fisheries access due to historic conflicts with regulators
- Fisheries baseline study completed 2018 and high-level restoration plan drafted for 2 sites (Hemmera 2018)

D) Lake Errock-Nicomen Slough

According to traditional ecological knowledge of Sts'ailes and Sq'éwlets the Harrison River once flowed through Lake Errock to the Fraser River, diverting to its current location east of Lake Errock and Harrison Hills only in the last few hundred years. It left behind a complex of sloughs, ponds, a mix of small streams and wetlands west of Lake Errock.

This area now represents a hight of land that with surface flows in either direction depending on water levels, connecting Nicomen Slough to the Harrison Watershed. The site of these connecting waterways are subject to decreasing agricultural holdings, significant residential development, and an adjacent gravel pit mine. The loss of riparian vegetation and colonization of invasive species, siltation, loss of connectivity (culvers and infilling), and degrading water quality have impacted salmon habitats.

Situational Analysis

- Private lands includes a mix of small homes (some seasonal) and agricultural, a community park, and gravel pit, surrounded on hillsides by crown forested land
- Active environmental NGO presence (ACES) in the area but highly polarized environmental vs development politics is problematic
- Changing geomorphology, ancient fishing grounds, including Sq'éwlets fish trap in area highlighted in TEK studies
- Fisheries baseline studies completed (Hemmera, 2018)
- Regional District of Mission

E) Squawkum to Sasin Creek and Wetlands

Squawkum Creek is represented by a single channel flowing east out of Lake Errock, but at least 2 other unamed creek feeds a complex of groundwater-fed sloughs and 3 groundwater channels adjacent to Sq'éwlets spanning the foreshore of Harrison Bay more than 1 km between Squawkum and Sasin Creeks. "*The name "Squakum" is derived from the Halkomelem name for early Harrison run of Spring Salmon, that generally arrive around March. The series of spring-fed creek-sloughs on the western shore of Harrison Bay—between Squakum Creek, and Highway #7—are also historically important spawning areas for salmon, including chum, coho, pink, and late-run chinook, which could last from October to February. Bell Creek, that enters Harrison Bay, also had a lot of Chinook salmon (Pawk), which were caught with gaff hooks and spears*". [2]

In modern times at least one of the unnamed streams may be obstructed under certain flows by a culvert, and both streams are seasonally dry. Both streams are high energy with limited complexity and stable spawning habitats are only present at the lakeshore. Immediately upslope from this wetland, Sq'éwlets has developed a Band office, sports complex and soccer fields. In combination, the complex of streams, ponds wetlands and sloughs represent a biologically diverse and productive salmon habitat. Silt deposition, invasive vegetation and the loss of gravel-clearing spawning activity have led to the decline of these habitats like many of the other sloughs and wetlands of the Harrison River.

Situational Analysis

- All of Squawkum Creek and wetlands east of the CPR railway are contained in Sq'éwlets IR#3 with an additional 300 m upstream of the railway privately owned
- Baseline fisheries assessments completed (Hemmerea, 2019) and high level restoration plans were drafted that propose to expand groundwater fed sloughs
- Spawning gravel augmentation for coho initiated by Fraser Valley watershed Coalition in 2019
- Sq'éwlets Community and Council are generally supportive of fisheries work that improve stewardship and productivity of salmon habitats in this area
- Regional District of Mission

[2] Richie, M. and J. Leon, 2018. Harrison River Fishery And Habitat Enhancement: The TEk And Archaeological Perspective.

F) Elbow Creek and Wetlands

Pretty Estates is located on the west bank of the Harrison River adjacent to the southern edge Chehalis River delta. Elbow Creek flows south and east from Elbow Lake approximately 3 kilometers upstream. Elbow Creek flood mitigation works, owned and operated by the Fraser Valley Regional District, consists of a sediment basin located within the head point of a low dam near the apex of the Elbow Creek alluvial fan, the Elbow Creek floodway and setback dykes on the north side of Elbow Creek beginning approximately 200 metres west of Morris Valley Road through to the Harrison River.

The historic fishway near Elbow lake is made inaccessible by the flood control structures downstream and a private power generating station operated by the Resort. Approximately 500m of Elbow Creek channel flows directly through a treed corridor bisecting the Harrison Resort Golf Course before entering the Harrison River adjacent to a wildlife viewing platform owned by the Resort. Evidence of an on-site aquifer and successful drilling for hot springs are being considered as part of future site development plans. The Resort was transferred into foreign ownership in 2018 and proposals for expansion of hotel, creation of Asian-inspired bathing springs, and a planned condominium development may alter the current configuration of stream and adjacent wetlands.

- New owners have submitted development plans and initiated community consultations including an apparent openness to enhance salmon stream habitats
- There is room for additional meander channels and spawning platforms and additional flows from aquifers could benefit the natural stream from year-round flows if water quality is manageable
- The resort places high value on eco-tourists, particularly as the historic base for the annual Fraser Valley Bald Eagle Festival

G) Chehalis River Delta

This area is defined by the lower reaches of Chehalis river downstream of the Canyon located approximately 3 kilometers from its confluence with the Harrison River. A rare flood event in 2004 in the Chehalis River created a new channel to the north of the former channel that flooded portions of IR #5 and threatened the Community graveyard. It is believed that this process has been occurring for thousands of years, refreshing the adjacent wetlands, streams and sloughs since the last ice age.

A protective dyke was built to control the northward channel migration that restricted the lower 1.2 kilometers of Chehalis river effectively limiting channel to 1/3 of its historic alluvial fan. While necessary for the safety of the Sts'ailes Community, the result places the surviving Chehalis River delta in a special category of risk, concentrating dynamic channel processes to the south and relegating the ancient slough complexes to the north to a permanency that is inconsistent with the form and function of this type of ecosystem.

Situational Analysis

- Largely encompassed by protected areas including Chehalis Conservancy (Nature Conservancy), DFO's Chehalis River Salmon Hatchery, and Provincial Park (Chehalis Campground), and Sts'ailes IR#5

- Restricted foot traffic only from the south via campground via angler access trail constructed by Sts'ailes in partnership with BC Federation of Driftfishers in 2009
- Closest private properties include Sasquatch Crossing Eco Lodge on south bank (formerly Pretty Estates "Fenn" hunting lodge now owned by Sts'ailes, and Lhawathet Lalem (Sts'ailes Healing Lodge) on the north bank
- New channelization resulted in a loss of pools and complexity, increased slope and speed of the channel, but this is expected to stabilize and re-complex over time
- Old channel continues to flow from outlet of fish hatchery withing old streambed, but is currently void of riparian vegetation and low flow volumes may limit habitat quality
- Baseline fisheries assessment conducted (Hemmara 2018) and high level restoration site plan proposed

H) Sts'ailes Sloughs to Morris Lake

These are the ancient fluvial fans from Chehalis River spanning north of the current Chehalis River to Weaver Creek forming more than 1,000 hectares of wetlands and tributary sloughs adjacent to highly productive Harrison riffle spawning beds. Collectively this area represents a diversity of salmon habitats for all life stages of salmon. All 6 Oncorhynchus species share these habitats in such variety that some life stages of salmon are present here year-round and at least one species of adult are here every month of the year. The sloughs represent an important spawning area off the Harrison mainstem for chum and coho in particular, and are known to be utilized by juvenile chinook and coho between April and June.

Sts'ailes IR#5, the main village of occupation, is central to this habitat, encompassing more than 20% of the salmon stronghold, including much of the Chehalis Flats to Weaver-Morris Wetlands, and more than a dozen sloughs covering nearly 6 kilometers on the west bank of the Harrison River. The sloughs are the remnants of post-glacial channels of the Chehalis River that undulated north and south across this floodplain, creating the dynamic alluvial fans and remnant sloughs that support rich spawning and rearing habitats sought out by colonizing Pacific salmon. Like similar habitats in the Harrison River, silt deposition, invasive vegetation and the loss of gravel-clearing spawning activity have led to the decline of these habitats.

Situational Analysis

- Restoration/maintenance programs targeting the primary sloughs have occurred with both private and public partners since mid-1970s but most intense in scope since 2009
- The permanent loss of Chehalis River influence will mean that the Sts'ailes sloughs as far north as Morris Lake will require re-dredging and complexing at roughly 25-year intervals – this period of function may be increased with higher concentrations of chum salmon in particular that historically cleaned the sloughs but have decreased in abundance with their commercial abundance and depressed survival experienced since roughly 2006
- Fisheries baseline studies have been completed (Thomas, 2008; Hemmera 2017) and at least 2 high level restoration plans have been proposed

I) Miami River

Miami River is a slough habitat draining several kilometers of farmlands, flowing north and west into its outlet in Harrison Lake just 1 kilometer east of the Harrison River mouth. According to habitat investigations in the 1990's "A sluice-gate and pump-station at the mouth of the river artificially maintained high water levels in the river for recreational purposes, restricting anadromous passage. In the early 1990s the Village of Harrison Hot Springs constructed a new flood-box, which lowered water levels by 1m and allowed spawning for the first time in many years."[3] Its flows appear to be a combination of groundwater and surface run-off from Harrison Hot Springs and mixed agricultural/sub-urban valley to the east.

Housing development and dykes along its lower reaches has diminished much of the riparian corridor and substantial agricultural activity upstream likely contributes to the silt and nutrient loads in the lower reaches. Silt accretion and invasive plants (aquatic and riparian) along the waterway, as well as low flows and loss of riparian habitats have combined to cause hypertrophication in some areas and an over-all drop in habitat suitability for salmon.

Situational Analysis

- Miami River Stream Keepers provide a community focal point for restoration and public education of the riparian corridor in the lower watershed
- Agricultural landowners upstream of the town of Harrison Hot Springs are obstructing fisheries access due to historic conflicts with regulators
- A task group organized by the City of Harrison Hot Springs and led by the Miami River Streamkeepers is building a program of public education and stewardship but has been unable to engage upstream agricultural land owners in salmon stewardship and restoration work
- A 2019 appeal to local governments by the Task Group has had little effect, but has brought attention to the habitat management problems
- Miami river is suited to projects that would reduce silt deposition, expose/improve groundwater flows, restore riparian vegetation and re-complexing of habitats

J) Harrison Bay

Harrison Bay spans more than 300 hectares, forming a large shallow pool with myriad sandy bays, margin sloughs, beaches and wetlands defining its nearly 10 kilometer shoreline. It receives it's primary flows from the backwaters of Harrison River, with limited flow from several small tributary streams and groundwater. Today the bay is becoming shallower and probably warmer than ever before in history, as it has become a settling basin from water-borne deposits, compounded by the effects of man-made structures – 2 bridges, several wing dams for log booming at the mouth of the Bay, and a rock jetty created to protect the adjacent log booming ground.

There has been no comprehensive fisheries assessment of Harrison Bay, however its shallow habitats form a significant refuge and food powerhouse for juvenile salmon emigrating from the Harrison and Lillooet Rivers upstream that will only improve from these natural processes. In the fullness of time it

[3] Thorpe, Susan, 2010. Harrison River Watershed Habitat Status Report for DFO.

will eventually fill in with river deposits that will be followed by water plants, grasslands and natural vegetative succession that take hold where water flows are weakest. However, unlike the negative impacts of this process on spawning sloughs, the future will transform this bay into a network of streams, ponds, sloughs and wetlands, interspersed by shrub and tree growth.

Situational Analysis

- Harrison Bay is Bay is on the cusp of the Regional District jurisdictions of the District of Kent and the District of Mission but covered on 3 sides with Sq'éwlets Reserve lands representing one of the most significant local jurisdiction influences
- Harrison Bay is outside of the Harrison-Chehalis Wildlife Management Area

3.2 RESTORATION PRIORITIES FOR 2019/20

The multi-year program of work funded by DFO's Coastal Restoration Program has enabled the partners in FVWC's 'Heart of the Fraser' program to immediately undertake a project where opportunity availed, while planning more difficult projects in the area that ranked higher.

WILLIAM AND NANCY PHILLIPS SLOUGHS

Sts'ailes are leaders in salmon habitat restoration in the valley and were eager to add the Phillips sloughs to the several sloughs restored over the last decade. Although ranking #20/20 on the ecological scale, it ranked #4/20 on the economic scale due to their high productive capacity for chum salmon. Local fisheries for chum are popular for FSC as well as supporting economic and recreational fisheries in the local area as well as along their sough-coast migration routes. William and Nancy Phillips Sloughs are at the southern end of the Sts'ailes Slough complex.

BATESON AND DUNCAN SLOUGH

Bateson Slough (and sister Duncan Slough) are located in the lower Harrison River, where habitat pressures are greatest, and restoration projects would have the greatest benefit for both ecological and economic benefits. However, because they are located inside protective dikes and have a history of landowner conflicts between fisheries and agriculture, it make this area especially challenging and suited to consultation and planning before any work can be contemplated.

SQ'ÉWLETS SLOUGHS AND MARSHES

Sq'éwlets Sloughs located at the confluence of the Harrison and Fraser Rivers and the adjacent Harrison Bay at Squawkum Creek share many of the attributes of the Bateson/Duncan Sloughs, but are located on Sq'éwlets Reserve lands and enjoy similar support by the Band for restoration as do the sloughs at Sts'ailes. Three Sq'éwlets Sloughs and wetlands were chosen for baseline fisheries assessment and immediate project planning so that with final detailed designing on site pre-implementation, they will be shovel ready when future funding comes available.

4 HABITAT RESTORATION AND PLANNING

A program of work for 2019/20 was conceived as part of the 'Heart of the Fraser' initiative of the Fraser Valley Watershed's Coalition. Shovel-ready projects were implemented on Nancy and William Phillips Sloughs in the upper reaches of the Harrison River and detailed planning commenced for Bateson and Duncan sloughs and Sq'éwlets sloughs and wetlands in the lower Harrison River.

Restoration project planning for both was undertaken in three tracks:

i. Detailed planning, permitting and archaeological assessments for Nancy and William Phillips Sloughs;
ii. Broad public consultations to assess and build public and regulator support for Bateson and Duncan Slough restoration; and,
iii. Baseline assessment and project planning for Sq'éwlets Sloughs and wetlands

4.1 WILLIAM AND NANCY PHILLIPS SLOUGHS

William and Nancy Phillips Sloughs were the next priorities set by Sts'ailes in a 10 year restoration program directed at the Sts'ailes Slough complex.[4] Closely associated by geography and community history, these two sloughs are situated immediately north of one of Sts'ailes' oldest restoration projects, Billy Harrison Slough (Circa 1978).

Restoration of Phillips sloughs is estimated to produce 1,624 adults over the next 20 years with an economic benefit valued at $4,795,230 (Hemmera, 2017). Sts'ailes places a high value on the slough complexes and each of 9 sloughs retains family names associated with pre-contact occupation and use (salmon traps and smoke houses) and community stewardship connections persist in modern times.

PLANNING AND ARCHAEOLOGICAL ASSESSMENT

Restoration of the two Phillips sloughs has been discussed at Sts'ailes for decades. Fisheries TEK is richest around the ancient village sites associated with the sloughs where family ties to individual sloughs exist to modern times. Therefore detailed planning began with a review of modern history – the construction of neighbouring Billy Harrison slough (circa 1975). Extensive excavation and gravel washing left borrow pits adjacent to William Phillips and access roads to its headwaters, 250 meters form its confluence with the Harrison. The community priority was to clean out accumulated silts to natural gravels, reconnect remnant pools in the old borrow pits, and re-complex habitats following natural geography of the site.

Prior to commencing work, Sts'ailes conducted systematic archaeological investigations to determine the potential risks to heritage sites, features, and materials with assistance from the UBC archaeology field school. Assessments included subsurface shovel testing, excavation, mapping, and recording the distribution of culturally important plants. Samples collected and radiocarbon dates have recently revealed that the plank house site was first constructed over 1,500 years ago, and the pithouse, which is near the back of the site in association with the ancient village, was lived in ~250 years ago.

[4] William Charlie, CAO; Kelsey Charlie, Sts'ailes Development Corporation President; Boyd Peters, Sts'ailes Rights and Title Department; Kim Charlie, Fisheries Manager

Archaeological monitoring was conducted by Sts'ailes during restoration and field guidance during construction ensured that any construction impacts are mitigated to the greatest possible extent. Maps and a final report were prepared on the results[5].

COMMUNITY, LOCAL AND TEK ENGAGEMENT

A riparian restoration committee was struck involving Sts'ailes Departments of Land Code, Rights and Title, as well as Sts'ailes Fisheries and Project Biologist from Hemmera. The committee focused on coordination of spring riparian replanting with three other riparian restoration initiatives to build a more robust combination of spring and fall plantings, an ongoing maintenance program, and utilization of locally sourced plants. An elders advisory group was organized by Sts'ailes to provide local guidance.

An organized community effort sought to restore ecological form and function associated with the slough environments, and to incorporate traditional use practices in keeping with historic use and occupancy patterns. They coordinated the following projects for improved efficiencies, survival and biodiversity from restoration work:

- Mitigation activities related to restoration of William and Nancy Phillips Sloughs;
- Compensation/mitigation for Sts'ailes construction of a community boast launch;
- A Community wild edible plant orchard project; and,
- An MoT bridge construction project across the Chehalis River.

The collaboration resulted in an extended riparian planting and maintenance program spanning 18-24 months, complimenting the immediate mitigation needs resulting from slough excavation work. The advisory committee provided input into the choice of locations and species that included wild edible plants indigenous to these slough environments. These were also consistent with plants cultivate by the community here for millennia. A follow up watering program was conceived with their assistance and labour crews were organized with help from fisheries workers and knowledge holders. A contribution of funding for riparian plants, including edible plants, complimented the project budget.

FISHERIES ASSESSMENT AND REGULATORY ENGAGEMENT

Hemmera drafted a restoration plan[6] following field visits and consultation with the Sts'ailes fisheries workers and manager. A number of site visits prior to work informed plans to avoid sensitive cultural areas, and mapped out best access and egress for heavy machinery that saved time and money.

Hemmera sought and received permits from the Province for Changes in-and-about a Stream under the Water Sustainability Act and received a letter of notification from DFO with conditions and best practices for construction. This has also been the practice with other restoration projects preceding this one. A Fisheries Act Authorization was determined unnecessary by DFO. An archaeological overview assessment was conducted and monitoring was provided by Sts'ailes Heritage Consulting during excavation work.

An authorization was also provided by Sts'ailes Council, and work was authorized through the Sts'ailes Land Code Department with conditions including certification of imported rock used in habitat

[5] Report on Subsurface Testing in Preparation for Slough Enhancement of Nancy Phillips & William Phillips Sloughs, Conducted August & September 2019.
[6] Hemmera, October 2019

complexing and soils used in riparian restoration. A detailed as-built report was provided post construction by Hemmera.

4.2 BATESON AND DUNCAN SLOUGHS

Restoration benefits from Bateson Slough amount to nearly 50,000 m^2 of salmon habitat with an estimated gain of 70,000 adults with an economic value of nearly $15 million over 20 years (Hemmera 2017). The combined restoration costs are estimated at nearly $2.5 million. This project is strongly supported by Sq'éwlets and Sts'ailes. This high-valued project ranked #1/20 in the restoration priorities.

PLANNING AND ARCHAEOLOGICAL ASSESSMENT

A traditional knowledge study was undertaken in 2018 of the Sq'éwlets occupation and fisheries in this area (Richie et al 2019). This information has been used to inform restoration planning and prioritization of this site. Maps with known archaeological sites and sites suspected of high cultural significance/locations of historic occupation have been identified and considered in designing restoration sites.

Bateson and Duncan Slough restoration are being planned to take into account the cultural significance of precontact habitation and drainage patterns. Sq'éwlets ancestors lived in at least six settlements situated from the mouth of Bateson Slough on the east to the Fraser River back-channels near Deroche Slough to the west for millennia[7]. The Bateson Slough channels were used by canoes traditionally by both Sts'ailes and Sq'éwlets to access fishing grounds on the Fraser River. Stories told by elders indicate that the site is so flat that the water flowed in either direction depending upon varying heights of the Harrison and Fraser Rivers. This information serves practical purposes today as engineers and biologists grapple with channel locations, flow direction and groundwater influence.

Detailed archaeological assessments will be completed before any prescribed work in the future. Archaeological monitoring would accompany any construction of fish habitat.

COMMUNITY, LOCAL AND TEK ENGAGEMENT

Sq'éwlets representatives report that this site was once an active village site, but it was abandoned after settlers claimed the arable lands and the railway and dyke were constructed. Downstream on Sq'éwlets IR#1 their drinking water "went sour", causing the main community to move to Squawkum Creek IR#3 decades ago. Sq'éwlets anticipates that improved flows to upland agricultural lands could restore groundwater quality by removing standing water. They have expressed concern about sensitive cultural sites in old village sites around Bateson Slough.

Agricultural landowners (largely dairy farmers and berry growers, with a small number of rural properties) are anxious about any salmon habitat restoration aspirations on Bateson or Duncan Sloughs that could interfere with their historic farming practices or future economic interests. It is unclear of the origins of this conflict, though it prohibits any habitat conservation or restoration work until it is resolved. Consultations with some of the major land owners and a meeting with the District of Kent's Drainage Committee suggested that there was no appetite currently for fisheries work on their lands.

[7] Richie et al, 2018.

A presentation to the District of Kent's Mayor and Council by Sts'ailes and representatives of the Fraser Valley Watershed's Coalition was well received. The Council expressed keen interest in developing complimentary programs linking drainage maintenance with salmon enhancement where the fish and people could live in harmony. Biologists pointed out large areas of standing water sitting on otherwise arable land that could be put to good use to re-water Bateson Slough. The semi-natural channel of Duncan slough has a stable riparian structure and ample groundwater. They pointed out that these streams are not prime spawning habitats, but with functional flows and channel design juvenile salmon productivity could be enhanced significantly.

The seasonal needs of juvenile salmon meant that habitat prescriptions can be specific enough to minimize interference with many historic farm practices. The over-winter needs of juvenile coho salmon already match the semi-natural conditions on Duncan slough, and the early-freshet flow needs by juvenile chinook salmon would improve drainage in adjacent farmland in spring. Construction could even include catchment ponds for fish-holding water during low flows and provide watering sites for livestock. Upgraded culverts would improve flows and fish access/egress between drainage tributaries. District drainage engineers would need to work with local biologists and land owners to design what this might look like on each property. Collectively the parties can likely secure salmon restoration funding support with such a high ranking site. A map was drafted connecting lidar imagery from Harrison Salmon Stronghold mapping with drainage data from the District of Kent. It pointed to 5 tributaries of Bateson Slough and 3 tributaries to Duncan Slough with ditch profiles extending well into grassy meadows requiring better drainage.

Consultations with a task group organized by the City of Harrison Hot Springs to restore salmon habitats in the Miami River illustrated parallels with the experiences on Bateson and Duncan Slough with upstream land owners. Agriculture interests here (like the upper Miami River) are anxious about any salmon habitat restoration plans that could interfere with their historic farming practices or future economic interests. A presentation was made to the *Community to Community Forum* involving the District of Kent, area city representatives, local Chiefs and MLA Laurie Throness, sought political guidance and support for salmon restoration work partnerships with local farming communities. According to MLA Throness, solutions will need to effectively engage willing land owners and find ways to empower them in landscape stewardship. David Zehnder, Co-chair of the Agricultural Land Commission further emphasized the need to overcome the obstacles between agriculture and salmon interests. A meeting with the District of Kent Mayor further confirmed this and was followed by a meeting with the Agassiz-Harrison Mills Drainage Committee (AHMDC) and field trip to Sts'ailes Slough restoration projects. Participants were enthusiastic about ways to empower local land owners to steward waterways to meet the needs of both farming and salmon.

EXPERTS WORKSHOP – DESIGN INSIGHTS

An experts workshop was convened on January 8, 2020 at Sq'éwlets (formerly Scowlitz Indian Band) involving biologists from the Sts'ailes, contractors from Hemmera, as well as project partners from the Fraser Valley Watersheds Coalition, local stewardship groups, and from DFO's Coastal Restoration Fund (CRF). A grant from CRF has been provided by DFO to Sts'ailes and Sq'éwlets to assess salmon habitat restoration potential in Bateson and Duncan Sloughs as reported to the Community-to-Community Forum in November. The following summarizes the notes from that workshop.

Bateson and Duncan Sloughs comprise nearly 10 kilometers of drainage ditches, standing wetlands, and two main channels that all converge at a single flood-control pumphouse that is open to the lower elevation water levels of the Harrison River between August and May each year. Although inside a historic dike and surrounded by active farm lands, experts identified opportunities to improve salmon productivity in this agricultural area by improving natural flows and connecting channels in ways that would compliment farm land management and improve ecosystem function for the benefit of human occupants as well as native flora and fauna. Cleaning out key culverts and dredging some of the most significant drainage channels, particularly in Bateson Slough, would increase the area and the quality of salmon habitats, and would generate attraction flows for juvenile salmon seeking rearing habitats out of the Harrison and adjacent lower Fraser River over the winter and into early spring before the annual freshet. Water recruitment plans would also increase channel capacity for upland drainage.

Suggested restoration work would focus on Bateson Slough in particular, revitalizing its extensive network of ditches and culverts to draw surface water off the adjacent farm lands to compliment the groundwater-influenced flows joining it from Duncan Slough near the outflow gate. Restoration of salmon habitats inside the dike should focus on juvenile chinook use between February and May, when they are seeking open sun-warmed vegetated shallows where they can find food and grow quickly. Large shading trees are not as significant for this kind of habitat and would only compete with space and light needed for farm crops as well. Strategic riparian overstory is best prioritized where good flows and pools provide holding water for fish.

Opening up the stream channel in the old Bateson channel should provide sufficient flow-buffering sinuosity to move large volumes of seasonal flood water while reducing flow speeds to discourage erosion. It should be wide enough to inhibit encroachment of reed canary grasses and deep enough to hold water in the main channel year-round. Its banks should be planted with low shrubs like hardhack and roses that the cattle won’t eat and will outcompete the encroaching reed-canary grass along the immediate channel margins while providing a food source of insects for juvenile salmon. The wide natural channel can serve to absorb flood waters from surrounding farm lands and support livestock when drained. Ephemeral agricultural drainage ditches can be dredged to improve water collecting flows into the main channels while building slopes that are an impediment to small migrant chinook fry at the confluence of primary channels. These fish will need to leave before May however to reach the ocean on time from the annual emigration to sea. Waterways with good surface flows and low overstory like this will be attractive to both coho and chinook in winter and spring, providing a good source for insects as food for young salmon without shading out sunshine salmon fry need to warm the water so they will grow quickly.

Duncan Slough is a natural host for coho use over-winter when they are seeking warm productive groundwater habitats with plenty of existing over-story vegetation for food and channel complexity for cover. This is particularly important during December through May when these habitats offer coho an ice-free refuge from predators and food to grow before they leave for the ocean with the onset of freshet. It may also provide important summer cool water rearing habitat for a new generation of coho seeking refuge from the summer heat, that might otherwise attempt to emigrate prematurely through the pumphouse.

Duncan Slough's mix of surface and groundwater flows coupled with a naturally complex channel are a natural attribute that compliments the seasonal surface flows from Bateson Slough, but the culvert connections adjacent to the flood gate should be checked for optimum fish passage.

There is a need for a more intensive assessment of habitats and fish utilization in both sloughs and at the outlet to confirm habitat suitability and current use, and a ground review of the best current watercourse/drainage maps from the District of Kent would inform proposals for improved drainage and channel connectivity. A better understanding of groundwater elevations in the Bateson channel would also inform any proposals for channel re-dredging. Assessments should include all culverts and channels that may provide drainage flows from adjacent farmlands, and should begin with consultations with land owners and the District of Kent.

FISHERIES ASSESSMENT AND REGULATORY ENGAGEMENT

Fisheries workers were obstructed by local land owners from crossing key lands and were unable to undertake baseline fisheries assessments in 2019/20. An overview assessment and high-level design work were conducted by Hemmera in 2017, the remaining assessment work of Bateson and Duncan Sloughs undertaken in 2020 was conducted from a desktop.

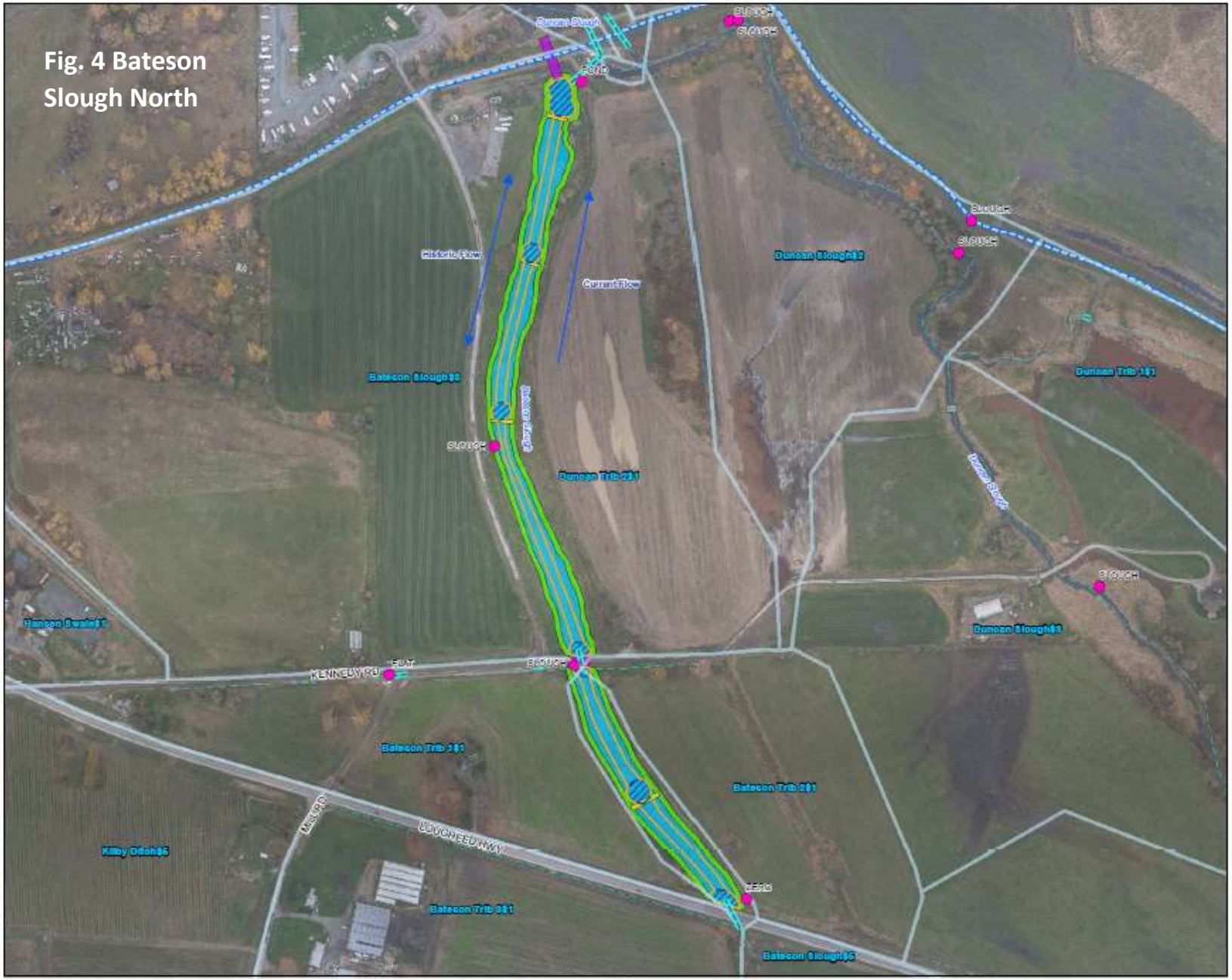
Hemmara reported impairments to fisheries habitats and recommended restoration work to address insufficient flows, disconnected and infilled habitats for salmon. Although the stream channel is still gazetted as fish bearing waters, its low slope and vague boundaries, particularly around the upper slough's reaches, expose it to agricultural encroachment. In many areas, time and erosion have simply reduced the effectiveness of drainage infrastructure. Large sections of the least defined channels have lost riparian cover and flows are impaired by primary succession of grasses and shrubs.

The District of Kent is the responsible diking and drainage authority in this area. This includes upkeep of dikes, pump stations, culverts and ditches. The District engages a committee of landowners (Agassiz-Harrison Mills Drainage Committee) to provide advice on its drainage operations. Standard maintenance and some upgrades to culverts could enhance drainage, but a landowner-driven solution has been proven to create long-term results. The drainage maintenance program, that also includes dike and pumphouse management, could benefit salmon habitats with complimentary prescriptions from stream biologists and landowners.

Any future salmon habitat restoration work would need to be preceded by a more detailed habitat assessment. Work plans would need to receive authorizations from WSA and at least a notice to Fisheries authorization as applied in the Sts'ailes Slough restoration projects. In addition, due to the association of all waterways to the DoK drainage program, any restoration plans would need to secure authorizations from the DoK. As well archaeological assessments and in-situ monitoring should be incorporated into any final restoration plans.

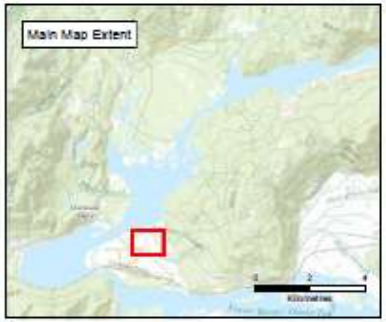
RESTORATION DESIGN PLANNING

Detailed design work was impractical without landowner permission in 2019/20 to access the private properties encompassing Bateson and Duncan Sloughs. However, it did not limit conceptual planning that included development of high-level plans connecting drainage ditches with Bateson slough designs in the spirit of the guidance received in the Experts Workshop.



Harrison Stronghold Restoration Phase 2
Harrison, BC

Conceptual Design
Bateson Slough Phase 1



Legend

- Current Flow
- Historic Flow
- Dyke
- Area of Excavation
- Proposed Pool Construction
- Culvert Replacement
- Existing Channel
- Riparian Planting
- Rock Weir
- Habitat Type
- Culvert
- Stream
- Drainage Area Boundary

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Contains information licensed under the Open Government Licence - British Columbia
- Habitat types, culverts, streams, and drainage area boundaries from the District of Kent
- Aerial Image: Terra Remote, 2016
- Inset Basemap: ESRI World Topographic Map

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1:3,500

0 40 80 120 160 200
Metres

NAD 1983 UTM Zone 10N

Page Size: 11" x 17"

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Hemmera
An Associated Company

Sts'ailes Development Corporation


Fig. 5 Bateson Slough South
Harrison Stronghold Restoration Phase 2
Harrison, BC
Conceptual Design
Bateson Slough Phase 2
Main Map Extent
Legend
Current Flow
Historic Flow
Dyke
Area of Excavation
Proposed Pool Construction
Culvert Replacement
Existing Channel
Riparian Planting
Rock Weir
Habitat Type
Culvert
Stream
Drainage Area Boundary
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NAD 1983 UTM Zone 10N
Page Size: 11" x 17"
104488-01
Production Date: Mar 26, 2020
Figure 2
Hemmera
Sts'ailes Development Corporation
Bateson Trib 2&1
Dunoon Trib 3&1
Dunoon Trib 2&1
Dunoon Slough&3
Bateson Trib 3&1
Current Flow
Historic Flow
Kilby Trib 5&1
Bateson Slough&5
Dunoon Slough&4
Bouwitz Each&1

Detailed maps were generated (Fig. 4 & 5) that combined the conceptual plans from fisheries biologists with the drainage mapping from the District of Kent. Salmon habitat-inspired design integrates the instream structuring for salmon with the nuances of local drainage areas and designated ditches for water recruitment that will make the habitat function. It has been conserved that significant restoration benefits could be achieved just from design collaboration with the existing drainage plan through ditching and where necessary, culvert replacements. It may by possible to undertake complimentary fish habitat treatments in stages with this approach.

4.3 SQ'ÉWLETS SLOUGHS AND MARSHES

Full restoration of the old Sq'éwlets Sloughs (East and West sloughs on Reserve #1) could gain as much as 83,000 m2 from returns of over 120,000 adult salmon in 20 years with an estimated value of more than $23 million. Construction cost would total approximately $3 million. According to the same report, Sq'ewlets ponds on Sq'éwlets IR #3 could gain another 5,500 m2 (Hemmera, 2017), and according to new sites identified through 2020 studies (Pearson et al), the potential here could be significantly higher.

PLANNING AND ARCHAEOLOGICAL ASSESSMENT

According to Pearson, there are multiple opportunities for habitat restoration on both Sq'ewlets 1 and Squawkum Creek 3 Reserves Table 2 lists them in recommended order of priority. Sq'ewlets Slough East and West projects (priorities 1, 2 and 6) have been listed as among the top twenty candidate sites in the Fraser Valley for restoring fish access to floodplain sloughs in the *Resilient Waters* project currently underway with BC Salmon Restoration and Innovation Funding (BCSRIF).

Priority	Restoration Opportunity
1	Breech secondary dike at Fraser River to restore fish access to Sq'ewlets Slough East
2	Improve habitat in Sq'ewlets Slough East by adding complexing and deepening 2 sections that currently go dry.
3	Expansion of springs and ponds in the Sq'ewlets Campground
4	Expansion of floodplain springs in Harrison Bay floodplain adjacent to Squawkum Creek 3 Reserve
5	Excavation of springs and ponds east and north of the Sq'ewlets soccer field
6	Retrofit culvert and flood gate at Sq'ewlets Slough West to allow fish passage from Fraser River
7	Excavate grass filled section of upper Sq'ewlets Slough west
8.	Retrofit culvert and flood gate at Sq'ewlets Marsh to allow fish passage from Fraser River and excavate ponds in canary grass areas of marsh to provide habitat.

Table 2. Restoration Opportunities in Sq'éwlets

COMMUNITY, LOCAL AND TEK ENGAGEMENT

Sq'éwlets TEK interviews in 2018 (Richie, M. and J. Leon, 2018) highlighted significant landscape and waterway changes to their traditional fishing sites within living memory. A combination of natural forces and development pressures have effected salmon productivity and local fisheries. Sq'éwlets is more dependant now on the major salmon fisheries of the Harrison and Fraser Rivers than local streams that figured prominently in local stories.

Sq'éwlets has recently completed a regulation sized soccer field immediately upslope of the Sq'éwlets marshes on IR#3. There are no observed impacts from this construction on adjacent salmon habitats, but it has improved accessibility to the marsh area for future habitat stewardship work considered in the

2017 studies by Hemmera. Sq'éwlets has also initiated planned for possible boat launch/landing improvements on IR#1 sites at the confluence of the Harrison and Fraser Rivers. The adjacent Sq'éwlets Slough restoration projects offers potential on-site mitigation for any potential fish impacts from the development.

FISHERIES ASSESSMENT AND REGULATORY ENGAGEMENT

Sq'éwlets Community authorized a Land Code for environmental regulation of reserve lands in 2018 which has prepared Sq'éwlets for community consultations regarding development and conservation plans. Their Council has aspirations to develop regulations for the conservation and use of fish and wildlife and their habitats at the Harrison Mouth.

Planned restoration projects in association with the dikes will need to consider diking and drainage plans where flow structures breach the dikes. None of the proposed projects will likely need more than a WSA authorization for Changes In and About a Stream and Fisheries Act Notification, though these should be considered on the more extensive projects. Archaeological assessments and in-situ monitoring should be incorporated into any final restoration plans.

5 CONCLUSIONS AND RECOMMENDATIONS

In 2019 Sts'ailes-Sq'éwlets Fisheries were engaged as a Partner with the Fraser Valley Watershed's Coalition to complete the first year of a three-year program of work on the 'Heart of the Fraser' with the Coastal Restoration Fund (CRF). This work is focused on the Harrison Salmon Stronghold.

The results of the program in year 1 (2020) examined ways to restore chinook and chum salmon habitat in the Harrison River and renown Chehalis River estuary, with a particular focus on formerly productive slough and wetland habitats at risk highlighted in Hemmera and Pearson et al since 2017.

The 2019/20 work concludes:

- Local government, community engagement and TEK/archaeological studies has informed conceptual designs and created a foundation of information and supporting relationships for salmon habitat restoration projects in the streams, sloughs and wetlands of the Harrison Valley;
- Sts'ailes undertook restoration of William and Nancy Phillips Sloughs as a demonstration of project design and functionality;
- Local teams created conceptual plans for subsequent restoration work on Bateson and Duncan Sloughs as well as 8 additional Sq'éwlets sites of significant priority to compliment those highlighted by the Harrison Salmon Stronghold since 2017.

5.1 RECOMMENDATIONs

RESTORATION WORK

In addition to the remaining 20 priority habitat sites identified in Hemmera 2018 and 19, at least three additional salmon habitat restoration sites and including projects are ready to implement according to the baseline assessment by Pearson Ecological in 2020.

The highest priority site from these last three is East Sq'éwlets Slough because it is located outside of the dikes and re-excavation of the historic channel is relatively straight forward and immediately implementable in 2020. The site is easily accessible for machinery. Although it is off–reserve, it is on Crown Land and accessible through access roads on Sq'ewlets Reserve #1, making the regulatory approval relatively straight forward. KWL will be conducting a high level engineering assessment and recommended approach for this project.

For the remaining Sq'éwlets sites it is recommended that implementation follow the priorities set out in Pearson 2020, with step-wise planning for the restoration of Bateson and Duncan Slough in partnership with the District of Kent and local land owners. From Pearson 2020:

1. Pursue feasibility study, design and implementation of habitat restoration projects listed in consultation with Sq'éwlets;
2. Feasibility studies should include, installation of piezometers to track seasonal changes in groundwater fluctuations; and,
3. Additional fish sampling to understand seasonal changes in habitat use. Seining of spring pools in mid to late spring, after fry emerge from the gravel to assess extent of juvenile Chinook Salmon use is of particular interest.

LOCAL SALMON RESTORATION TEAM

After 15 years of restoration work, Sts'ailes reports that there are fewer restoration projects each year that are as straightforward as those they found on their Indian Reserve lands. While additional projects have been identified at Sts'ailes, this years program of work has allowed our team to look for good projects more broadly. The really complicated projects we found in greatest jeopardy, are where private lands, buildings, road crossings, and drainage systems need to be considered – off Reserve. If salmon are to persist in these places, the interests of private land-owners, city/regional infrastructure regulators, and salmon must converge.

There is always a need for local salmon advocates, but success comes from understanding and appreciating how to work together with local interests, who in turn need to appreciate and include salmon stewardship in their plans. This is the role for salmon restoration teams – designed and built with local interests in mind. They begin by building a common understanding of the needs of salmon <u>and</u> people in this place or that. Success is not good salmon restoration engineering – success is a well engineered project that is stewarded by private/public interest once the biologist has gone home. If we

need proof of this, we just look around at the ghosts of past projects – who is here to look after them now?

The Fraser Valley Watershed's Coalition and local First Nations have demonstrated leadership in this role. By teaming up salmon biologists with local regulators and private interests, these "Salmon Teams" foster outcomes that include people and salmon. In this way difficult salmon restoration projects are made possible. For all that we learned about salmon restoration this year, that was the most important lesson of all.

HABITAT STEWARDSHIP OUTREACH

Several salmon habitats within the Harrison Salmon Stronghold are considered at significant risk. Those in greatest jeopardy appear in conflict with competing private interests and values, and require an investment in outreach to create awareness, education and brokered solutions.

Those areas we highlighted for this outreach include Harrison Mills (Bateson and Duncan Sloughs), Miami River, and Lake Errock. In addition, a major development is planned at the Sandpiper Resort and Golf Course in the heart of the stronghold adjacent to the renowned Chehalis River delta. Building relationships in these places will create an important foundation for long term stewardship of salmon habitats.