SKEENA SALMON CONSERVATION UNITS

KEY POINTS – POPULATION & HABITAT

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Contents

Ecstall Sockeye CU Population

- Ecstall Sockeye CU escapement has 13 records since 1950. Average escapement from six years of counts in the 1990s was 458 sockeye and from 2 years of counts in the 2000s was 425 sockeye. The few surveys do not indicate an apparent trend.
- Run timing estimated to be the last week of June through Area 4.
- Age structure is unknown, but juvenile migrate out as age-1 smolts.
- The 2005 hydroacoustic survey estimated age-0 sockeye density of 71/ha, which is relatively very low, and estimated >1,500/ha threespine stickleback, which is relatively abundant. It is unknown if the threespine sticklebacks compete directly with juvenile sockeye or if they utilize different limnetic zones for feeding.
- Current stock assessment programs include annual aerial visual spawning escapement surveys and periodic hydroacoustic fry density estimates.

View upstream to Ecstall Lk outlet

View across Lower Lk outlet to Ecstall R

Ecstall Sockeye CU Habitat

- Main sockeye spawning in Ecstall Lake, in Lower Lake, and in Ecstall Lake Creek between the two lakes.
- Stained water, monomictic, oligotrophic, and generally nutrient limited.
- High elevation snowpack, transient snow zone, and precipitation drives hydrological regime.
- No past or present development, no adverse effects to sockeye spawning and rearing habitat.
- Relatively abundant threespine stickleback (TSB) population; unknown if they directly compete for food or utilize different limnetic zones for feeding.
- PR model results indicate optimum escapement of 2,400 sockeye adults subsequent to adjustment for TSB presence.

Johnston Sockeye CU Population

- Sockeye spawning has been recorded for most Johnston Lake shoreline locations.
- Johnston Lake escapement surveys have been mostly continuous from 1950 to 2003. Many years of survey effort did not come up with counts due to the turbid water conditions and depth of spawning. Escapement estimates from 1995 to 2003 were reasonably abundant, are a mixture of low and high reliability, with no apparent trend.

- BC16 records indicate peak spawning appears to vary from September 20 to early November, though shore spawning has been recorded as early as August 10.
- Johnston Lake sockeye run timing through Area 3/4/5 fisheries is unknown. Johnston Lake sockeye enter Ecstall River downstream of the Tyee Test Fishery and therefore are not sampled. There is no known DNA baseline sample collection.
- Current stock assessment programs include annual aerial spawning escapement surveys and periodic hydroacoustic and limnological surveys.

Johnston Sockeye CU Habitat

- Main sockeye spawning scattered around perimeter of Johnston Lake at the inlet and outlet shores and tributary deposition fans. Low flows can leave lower reaches of trib fans dry and impassable.
- Glacially turbid water, monomictic, oligotrophic, and generally nutrient limited in low elevation setting. Single, deep, cold basin with semi-stable thermal structure.
- High elevation snowpack and relatively high precipitation drives hydrological regime; total annual mean precipitation is 3,683 mm at Falls River.
- No past or present development, no adverse effects to sockeye spawning and rearing habitat.
- Few threespine stickleback are present.
- PR model results indicate optimum escapement of 4,100 sockeye adults.

Alastair Sockeye CU Population

- Alastair Lake sockeye CU is a highly diverse system with two discrete run timings and distinct multi-age juvenile residence pattern and behaviour.
- Alastair sockeye spawners have unique spawning colors atypical of other Skeena sockeye. When mature, they possess a silvery body with only a dull red stripe, rather than the typical mature sockeye's bright red body and a green head.
- Sockeye begin moving into the lake in mid to late-June and it is thought this early run holds and spawns in Southend Creek and its tributary. This early run is followed by seals that reside in the lake until December.
- The late sockeye run moves through into the lake in early to late-August. This second run is believed to be mostly shoreline spawners focused on areas of suitable gravels and subsurface upwelling water. If coastal fisheries target the late Babine sockeye run and other salmon species, this late run can be exploited at varying levels. Exploitation rates are uncertain: if the late run is migrating through the Area 3/4/5 fisheries during early to late August, tail end exploitation can be moderate to high.
- Sockeye spawner surveys for Alastair Lake CU include aerial and stream walks on Southend Creek and Alastair Lake shorelines; these counts have been mostly continuous from 1950 to the present. Since the early 1960s, Westside Creek spawner counts have been included in Alastair Lake enumerations.

- Alastair CU decadal escapement averaged 23,742 sockeye during the 1950s and then abundance collapsed. From the 1960s into the present, escapement has been depressed and fluctuates at low levels with decadal averages in the 1960s of 9,057 fish, in the 1970s of 4,175 fish, in the 1980s of 6,434 fish, in the 1990s of 13,989 fish, and 6,235 sockeye in the 2000s. Escapement trend is similar to the non-Babine sockeye lakes aggregate data showing a decline in the early to mid 1950s and then fluctuating at diminished levels indicating overfishing.
- Age structure varies but is generally composed mostly of five and six year old fish with two years in freshwater. There appears to be a variety of freshwater ages from scales and trawl samples and it is likely that the sub-stocks have their own distinct life history behaviour.
- The life history of the late sockeye run is confounded by a lack of DNA data, a lack of run timing information through Area 3/4/5 fisheries, and a lack of age class composition data. This lack of information is pertinent to stock-recruitment and other management relationships.
- There are no parasites or health issues affecting Alastair Lake juvenile sockeye. Juvenile rearing capacity is moderately to heavily eroded by the very dense stickleback population and the nutrient limited freshwater habitat.
- Current stock assessment programs include annual aerial spawning escapement surveys and periodic acoustic and trawl surveys.

View upstream across Gitnadoix Lake

View downstream on Gitnadoix River

Alastair Sockeye CU Habitat

- Main sockeye spawning stream is Southend Creek that supports the late June run and lakeshore spawning occurs on tributary deposition fans and the northeast shore that supports the late fall run.
- Snowmelt driven hydrological regime with peak flows typically from fall, heavy precipitation events.
- Clearwater lake with minor glacial melt input, oligotrophic, dimictic, and north end of lake relatively shallow. Thermal regime leads to highly productive sockeye rearing lake.
- No past development and watershed is encompassed in Provincial Park.
- Threespine stickleback comprises roughly one-half to two-thirds of the limnetic fish and sockeye growth rates are relatively slow due to the intense competition.

Kitsumkalum Sockeye CU Population

- Kalum Lake sockeye spawn principally at the northeast end of Kalum Lake in good gravel and excellent groundwater seepage. Shore spawners have also been observed close to Hall Creek and Goat Creek. The Cedar River spawners are in scattered patches, though concentrated spawning takes place close to the mouth of Little Cedar River. Clear Creek spawning is patchy, with critical beds located from 1 to 3 km above the mouth. The upper Kalum River is reported to have sockeye spawning to above Mayo Creek.
- Escapement estimates for the Kitsumkalum aggregate sockeye stock indicate that in the 1950s, average annual escapement was 3,435 sockeye. The 1960s and 1970s average annual escapements decreased to 2,650, with a further decrease in the 1980s to 1,430 spawners. The 1990s average annual escapement increased to 3,586 sockeye, and further increased in the 2000s with an average annual escapement of 5000 spawners. It is assumed that the increase in sockeye escapement is due to the establishment of the spawning channel at the north end of Kalum Lake in the late 1980s.
- Estimated peak timing through Area 4 during late July and early August.
- Age structure is composed of mostly five and six year old sockeye.
- Cedar River and Clear Creek SK escapement has diminished from the mid-1970s with few recent observations.
- Juvenile sockeye mainly rear in Kalum, Redsand, and Treston Lakes.
- Current stock assessment programs include annual visual escapement surveys and periodic acoustic and trawl surveys.

Kitsumkalum Sockeye CU Habitat

- Main sockeye spawning streams are Cedar River in scattered patches, Clear Creek in scattered patches, and shore spawners in the northeast segment of Kitsumkalum Lake.
- Minor sockeye spawning occurs in upper Kalum River to above Mayo Creek, and Dry Creek, Mayo Creek, Wesach Creek, and Goat Creek all have spawners in some years in their lower reaches. Shoreline spawning is recorded on the Westside, upstream of the Nelson River mouth.
- Hydrology driven by early summer snowmelt peak discharge and subsequent peak flows in most years due to heavy fall rain events.
- Kitsumkalum Lake is glacially turbid and fast flushing limiting primary productivity. Oligotrophic, dimictic, and low productivity. Low fry densities and relatively poor rearing environment.
- Past impacts to migrating, spawning, and rearing habitats from forestry activities.
- Enhancement includes a sockeye spawning channel established in the late 1980s at the north end of Kalum Lake that has increased sockeye production.

Upper Kitsumkalum River (Beaver) flowing into Kalum Lake.

Lakelse Sockeye CU Population

- Three main sockeye spawning streams: Williams Creek, Hatchery Creek, Schulbuckhand Creek;
- Williams Cr produced 80% of Lakelse sockeye spawners. Multiple sockeye counting fences on Lakelse, Williams, Scully, and Sockeye creeks.
- Consistent escapement record since the mid-1930s. Lakelse sockeye escapement levels crashed in the mid-1940s, and since then, have been low relative to historic levels;
- Lakelse sockeye through Skeena mouth in late June, hold in Lakelse Lake, and enter tribs late August- early September depending on stream conditions;
- Age structure composed of four and five year old sockeye;
- Sockeye stock enhancement from 1901 to 1920 at Skeena Hatchery until 1936 and at Scully Creek sockeye hatchery from 1960 to 1966;
- Since 2006, Williams Creek sockeye eggs take have been fertilized and incubated at Snootli Creek hatchery with an approximately 300k fry outplant;
- Formal Lakelse Lake Sockeye Recovery Plan active and functioning with stock rebuilding components.

View across the mouth of Williams Creek.

Lakelse Sockeye CU Habitat

- Three main sockeye spawning streams: Williams Creek, Hatchery Creek, Schulbuckhand Creek;
- All three main sockeye trib fans that supported the majority of spawners have been heavily modified or channelized. Low flow conditions can leave channel dry;
- Increase in sediment production provides favorable habitat for macrophyte *Elodea Canadensis in the lake*;
- Snowmelt driven hydrological regime with relatively warm lake water, oligotrophic to slightly mesotropohic, low Nitrogen:Phosphorous ratio;
- Lakelse sockeye exploitation levels have been low to moderate, however, escapements for the last 20 years have been low relative to historic levels;
- Wide variety of habitat rehabilitation activities over the last 10 years;
- Protection and conservation of ecosystem processes and fish habitat are a high priority;
- Cumulative impacts to fisheries resources from forestry, linear, and residential developments are rated high;
- Formal Lakelse Lake Sockeye Recovery Plan in place and functioning with active habitat rehabilitation components.

Upper Zymoetz Sockeye CU Population

- Upper Zymoetz sockeye CU population includes the Aldrich, Dennis, and McDonell Cus;
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- One main sockeye spawning stream: upper Zymoetz (Copper) upstream of McDonell Lake to Dennis Lake;
- Except for the mid-1990s, fairly consistent escapement record since 1947. Upper Copper sockeye escapements have fluctuated little since 1950 with few counts over 5k. Clearwater system and fairly easy to count with few undercut banks and deep pools;
- Sockeye enter Skeena River mouth early to mid July, hold in McDonell Lake and enter the upper mainstem in late August- early September depending on conditions;
- Age structure is mostly four and five year old sockeye;
- Sockeye enhancement is limited to rockslide removals in the three canyons in lower Zymoetz (1907, 1968, 1973).

Aldrich Sockeye CU Habitat

- Aldrich Lake is co-joined with Dennis and McDonell lakes forming the headwaters of Zymoetz River.
- Occasional sockeye spawning occurs at Aldrich Lake outlet in deep gravels; unclear if fry swim upstream to rear in Aldrich Lake or downstream into Dennis Lake or points beyond.
- Snowmelt driven hydrological regime, relatively shallow and warm lake with well-defined littoral zone, clear water, oligotrophic and polymictic. Aldrich Lake is relatively productive.
- Adjusted PR model results indicate optimum escapement of 2,200 sockeye adults.
- Mine development in the early 1920s to 1954 and failure of the tailings dam lowered pH, deposited heavy metals in the lake sediment, and polluted the upper Zymoetz with elevated

total and dissolved zinc, arsenic, copper lead, and cadmium levels. This situation was not entirely mitigated until the early 2000s. Since then, forestry development has contributed sediment from roaded stream crossings and logging operations.

- Fish passage concerns in the two lower canyons and periodic rockslides have been alleviated but adult immigration can occasionally be difficult due to low flows and bedrock obstructions from Clore River upstream.
- Future near-term threats include construction of gas pipeline corridors. changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, and a lack of fish habitat management.

Dennis Sockeye CU Habitat

- Dennis Lake is co-joined with Aldrich and McDonell lakes forming the headwaters of Zymoetz River.
- Sockeye spawning occurs in the mainstem upstream and downstream of Dennis Lake and in Silvern Creek. Majority of mainstem spawning upstream of Passby Creek. Unclear if fry swim upstream to rear in Dennis Lake or downstream into McDonell Lake.
- Snowmelt driven hydrological regime, shallow and warm lake with dense submergent vegetation, clear water, oligotrophic to slightly mesotrophic, and polymictic. Dennis Lake is relatively productive.
- Adjusted PR model results indicate optimum escapement of 1,000 sockeye adults.
- Mining in the early 1920s through 1954 polluted the upper Zymoetz with elevated total and dissolved zinc, arsenic, copper lead, and cadmium levels. This situation was not entirely mitigated until the early 2000s. Since then, forestry development has contributed sediment from roaded stream crossings and logging operations.
- Fish passage concerns in the two lower canyons and periodic rockslides have been alleviated but adult immigration can occasionally be difficult due to low flows and bedrock obstructions from Clore River upstream.
- Future near-term threats include construction of gas pipeline corridors. changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, and a lack of fish habitat management.

Upper Copper – Passby Creek confluence pool.

McDonell Sockeye CU Habitat

- McDonell Lake is co-joined with Aldrich and Dennis lakes forming the headwaters of Zymoetz River.
- Sockeye spawning occurs in the mainstem upstream of McDonell Lake with the majority upstream of Passby Creek. Downstream of McDonell Lake, spawning is patchy to the confluence of Serb Creek. Unclear if fry swim upstream to rear in McDonell Lake or downstream to rear in mainstem sidechannels.
- Snowmelt driven hydrological regime, multi-basin warm lake with dense submergent vegetation, clear water, oligotrophic and polymictic. McDonell Lake is relatively productive.
- Adjusted PR model results indicate optimum escapement of 3,500 sockeye adults but this figure may be too low.
- Nearly 100% of the pelagic fish are juvenile sockeye.
- Mining in the early 1920s through 1954 polluted the upper Zymoetz with elevated total and dissolved zinc, arsenic, copper lead, and cadmium levels that diminished in McDonell Lake samples. Since then, forestry development has contributed sediment from roaded stream crossings and logging operations.
- Fish passage concerns in the two lower canyons and periodic rockslides have been alleviated but adult immigration can occasionally be difficult due to low flows and bedrock obstructions from Clore River upstream.
- Future near-term threats include construction of gas pipeline corridors. changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, and a lack of fish habitat management.

Kitwancool (Gitanyow) Sockeye CU Population

- Sockeye spawning on Gitanyow Lake shoreline includes six key sites;
- Historic sockeye escapement is uncertain. First Nation annual estimates prior to the 1950s are in the 30,000 plus range. DFO estimate records show escapement stable at 5 to 10 k until early 1950s when it diminished and has fluctuated at low levels into the present. The 2000 decadal average escapement was approximately 1,700 sockeye, 2010 = 20,800 sockeye, 2011 was under 2,500 sockeye, 2012 was 5,500 sockeye.
- Gitanyow sockeye exploitation levels moderate to high;Sockeye timing is variable with sockeye entering river starting in mid to late-July with the bulk of the run entering during the second and third week of August. Sockeye hold in Gitanyow Lake till spawning;
- Age structure is composed of four and five year olds;
- Wide variety of sockeye pop and habitat assessment, status, and restoration – rebuilding since 2000;
- Several years of small egg take and fry release with outcomes unknown;
- Sockeye smolt and adult counting fences in place;
- Formal Gitanyow Sockeye Recovery Plan in place and functioning since 2006 with stock rebuilding components.

Seining sockeye adults in Gitanyow Lake for egg take

Gitanyow Sockeye CU Habitat

- Sockeye spawning occurs on Gitanyow Lake shoreline at six key sites.s.
- Snowmelt driven hydrological regime, multi-basin warm and moderately shallow lake, clear water, mesotrophic and dimictic. Gitanyow Lake is very productive due to it s very high macrozooplankton biomass composed mostly of *Daphnia*.
- Adjusted PR model results indicate optimum escapement of 56,500 sockeye adults.
- Highway and forestry development has contributed sediment loads from inadequate stream crossings, unstable terrain, and logging operations, which adversely impacted the lake.
- Spawning ground and rearing habitat altered by massive amounts of sediment input.
- Wide variety of habitat improvement initiatives and projects over the last decade.
- Formal Kitwanga Sockeye Recovery Plan in place with implementation and monitoring.

Swan, Club, and Stephens Sockeye CU Population

- Swan, Club, and Stephens Sockeye are co-joined sockeye spawning and rearing lakes;
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- Consistent escapement records since 1950 show moderate fluctuations with decadal means from 3,200 to 7,700 sockeye.
- Run timing is early to mid-July and relative to early Babine sockeye;
- Age structure appears to be four and five year olds;
- Sockeye timing is variable with sockeye entering Stephens Lake between mid-August and early September with fish holding in all lakes till spawning;
- Juvenile sockeye rear for one year before migrating to sea;

Stephens Sockeye CU Habitat

- Stephens Lake is co-joined with Club and Swan lakes forming the western headwaters of Kispiox River.
- Sockeye spawning occurs in Stephens Creek downstream of Stephens Lake and on the shoreline point opposite Club Creek. Unclear if fry swim upstream to rear in Stephens Lake or downstream to rear in Kispiox mainstem sidechannel habitat.
- Low water conditions provide for difficult or no fish passage at Gitangwalk Falls located approximately 24 km downstream of Stephens Lake;

- Hydrology is snowmelt driven. Stephens Lake is single-basin, relatively warm, with moderately deep, clear water, dimictic, and oligotrophic conditions. Lake has a strong thermal structure. Stephens Lake is relatively productive.
- Apparently, very few other pelagic fish other than juvenile sockeye.
- Spawning and rearing habitat in pristine condition as the CU is encompassed by Swan Lake Kispiox River Provincial Park.

Club Sockeye CU Habitat

- Club Lake (upper and lower) is co-joined with Stephen and Swan lakes forming the western headwaters of Kispiox River. Lower Club Lake is connected to Stephens Lake by the 0.5 km Club Creek.
- Sockeye spawning occurs in lower Club Lake and accounts for the majority of sockeye spawning in the lake chain system. Spawning grounds are predominantly composed of 15 – 20 cm boulders (an exceptionally large substrate size) and secondarily in patches of scattered gravel. Unclear if fry swim downstream to rear in Stephens Lake given the shallow, weedy habitat.
- Hydrology is controlled by downstream flow from Swan Lake. Club Lake is a multi-basin with relatively warm, clear water, polymictic and oligotrophic conditions.
- Low water conditions provide for difficult or no fish passage at Gitangwalk Falls located approximately 24 km downstream of Stephens Lake;
- No habitat issues as the CU is pristine and encompassed by Swan Lake Kispiox River Provincial Park.

Swan Sockeye CU Habitat

- Swan Lake is co-joined with Stephen and Club lakes forming the western headwaters of Kispiox River.
- Sockeye beach spawning occurs in Swan Lake in scattered pockets on the northeastern shores. Stream spawning occurs in Falls Creek, Barnes Creek, Jackson Creek, and Swan Lake Unnamed Creek #2.
- Hydrology is snowmelt driven. Swan Lake has multiple-basins, is relatively warm, is clear water, is dimictic, and is oligotrophic – likely nutrient limited. Swan Lake has a strong thermal structure. Stephens Lake is moderately productive with relatively abundant macrozooplankton.
- Low water conditions provide for difficult or no fish passage at Gitangwalk Falls located approximately 24 km downstream of Stephens Lake;
- Very few other pelagic fish other than juvenile sockeye.
- No habitat issues as the CU is encompassed by Swan Lake Kispiox River Provincial Park.

View northwest across Swan Lake

Babine Wild Sockeye CU Population

- Babine Wild sockeye CU needs to be broken out into Babine early, middle, and late CUs due to timing and rearing habitats that vary in trophic structure and productivity;
- Babine Lake is the largest sockeye nursery lake in BC and produces 90% of sockeye returns to Skeena River. 65 years of escapement records from Babine counting fence;
- Babine wild sockeye abundance collapsed in 1951 due to the relatively massive landslide into lower Babine River, but recovered by the late-1950s;
- Wild sockeye abundance diminished since enhancement began in late 1960s. Since the 1990s, wild and enhanced escapement shows an overall declining trend hypothesized as relating to fish health;
- Age structure is 4s and 5s similar to all Babine sockeye;
- Eighteen Babine Wild early sockeye spawning streams: Major streams include: Four Mile, Nine Mile, Pierre, Shass, Sutherland, Sockeye, Tachek, and Twain; Minor Babine Wild early sockeye spawning streams include: Boucher, Donald's, Five Mile, Nichyeskwa, Nilkitkwa, and Pendleton;
- Babine Middle Wild includes Fulton River and Pinkut Creek (spawning channels are separate) whose flow is regulated since the late 1960's. Fulton River and Pinkut Creek wild are thought to be genetically compromised by enhanced fish. Periodic problems with wild sockeye health due to disease outbreaks in spawning channel sockeye;
- Babine Late Wild includes sockeye from the Nilkitkwa CU that migrate upstream into Babine Lake North Arm;

Babine Wild Sockeye CU Habitat – General

- Babine Wild sockeye habitat needs to be broken out into Babine early, middle, and late as habitat varies in trophic structure;
- Nechako Plateau snowmelt drives the hydrological regime. Babine Lake has multiple basins, is a stained oligotrophic lake with an overall moderate productive trophic status;
- High enhanced fry recruitment may cause adverse plankton grazing pressure. Permitted and unpermitted discharge from toxic mining waste products may be affecting fry health. Current freshwater habitat conditions not clearly understood.

- Low flows can restrict access to spawning grounds, increase stream temperatures, and increase predation;
- Unclear how freshwater habitat and/or marine survival variation may be influencing recent diminished Babine sockeye brood year recruitment;
- Available habitat baseline studies from the 1960s and 1970s;

- Forestry activities are the main development in the Babine watershed, which has been extensively logged and roaded over the last 70 years. Adverse effects to fish habitat due to forest development include: impacts to riparian areas on temperature sensitive streams; sediment generated from stream bank instability and erosion; scouring of stream channels; and lack of fish passage at various road crossings.
- Future near-term threats include construction of gas pipeline corridors, changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, and a lack of fish habitat management.
- Unclear on how adverse effects from accumulated development will change habitat given current climate change projections.

Babine Sockeye Early Wild

- Eighteen Babine Wild early sockeye spawning streams. Major streams include: Four Mile, Nine Mile, Pierre, Shass, Sutherland, Sockeye, Tachek, and Twain. Minor Babine Wild early sockeye spawning streams include: Boucher, Donald's, Five Mile, Nichyeskwa, Nilkitkwa, and Pendleton;
- Majority of spawning stream drainages have supported roaded forestry activities and have been adversely affected. Increased deciduous growth following deforestation leads to extensive beaver activity.
- Future near-term threats include construction of gas pipeline corridors, changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, and a lack of fish habitat management.

Babine Sockeye Mid Wild

- Pinkut and Fulton drainages have sustained large amounts of forestry activity.
- Mountain pine beetle infestations have changed the hydrological regime with increased peak flows and diminished base flows.
- Fulton River and Pinkut Creek have increased spring snowmelt freshets and consequently have trees and large debris flowing downstream that in some years threaten the counting fence structures.
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Babine Sockeye Late Wild

- Major Babine Wild Late sockeye spawning streams include: Babine River upstream of Nilkitkwa Lake (Rainbow Alley) and Babine River downstream of Nilkitkwa Lake to the Counting Fence.
- Babine Wild Late rear in the North Arm;

- Habitat concerns with Tsezakwa Creek, especially high flows generated by overcutting of forests; the fan is disturbed and consequently introduces massive sediment loads into Nilkitkwa Lake.
- Unclear if habitat factors in the North Arm and Nilkitkwa Lake are contributing to diminished production.

Babine Enhanced Sockeye CU Population

- Babine CU sockeye needs to be broken out into Babine enhanced due to middle timing, egg-to-fry survival, overall incubation capacity and production, and to rearing habitat varying in trophic structure and productivity;
- In the late 1960s, spawning channels were constructed at Fulton River and Pinkut Creek to augment Babine sockeye production;
- Pinkut and Fulton spawning channels receive regulated flow from upstream lakes, wherein water temperatures can be relatively high during prolonged sunny weather conditions. To enable optimum spawning conditions, adequate amounts of cold or cool water need to be delivered to the spawning channels; this is not possible in all years.
- The Babine spawning channels concept aimed to accommodate 200,000 sockeye spawners, who would produce 100 million fry to rear in Babine Lake; since the early 1970s, annual average fry production has been 206 million.
- Maximum spawning capacities at the Fulton channel and river total 381,000 sockeye, with maximum spawning capacities at Pinkut channel and river totalling 128,000 adults.
- High spawning sockeye densities in the enhancement channels have led to health problems over the last four decades. Three fish diseases causing concern include the viral disease infectious hematopoietic necrosis (IHN), endemic to adult and juvenile sockeye, the protozoan parasite Ichthyophthirius multifilis (Ich); and Loma salmonae, a microsporidial parasite. The latter two diseases cause pre-spawning mortality of female sockeye, and in 2013, have been noted as the cause of at least 50% pre-spawn mortality at Pinkut channel.
- An overall health concern is the cestode Eubothrium salvelini, a common intestinal parasite of salmonids in northern latitudes and present in approximately 30% of Babine Lake sockeye fry. It is highly doubtful if Eubothrium infected smolts survive the emigration downstream to Skeena estuary and/or survive the stress of adapting to marine conditions.

Fulton #2 spawning channel, dry for cleaning, early August 2012.

Babine Middle Enhanced Habitat

- Babine Middle enhanced includes Fulton River and Pinkut Creek with spawning channels and regulated flow established since the late 1960's. Periodic problems with spawning channel habitat are mostly centered on water temperature issues.
- There is little actual data to debate and conclude whether or not the fry rearing capacity of Babine Lake is over or under estimated. Estimates of sockeye fry rearing capacity in Babine and Nilkitkwa lakes can be controversial mostly due to:
  1. changes to average abundance of zooplankton between seasons and years;
  2. concentrated and prolonged predation on zooplankton in certain lake areas;
  3. size of zooplankton prey in relation to age and size of sockeye fry; density-dependent variations.

Morrison / Tahlo Sockeye CU Population

- Morrison and Tahlo need to be two separate sockeye CUs due to genetics, timing, and rearing habitat, and trophic structure and productivity;
- Major Morrison sockeye spawning locations include: Morrison River with smaller amounts of spawning on the lake shoreline beaches;
- Major Tahlo sockeye spawning locations upper and lower Tahlo Creek with early and late run timing respectively;
- Age structure is 4s and 5s similar to all Babine sockeye;
- Rearing in Tahlo and Morrison lakes is rated relatively high productivity, but habitat often underutilized due to low escapements;
- Tahlo and Morrison sockeye enhanced during 1907 to 1936 period;
- Tahlo late and Morrison River timing is very similar to Babine enhanced and consequently suffers relatively heavy exploitation;

View north to head of Morrison Lake

Morrison / Tahlo Sockeye CU Habitat

- Major sockeye stream spawning locations include: Morrison River, lower Tahlo Creek, and upper Tahlo Creek. Major sockeye lakeshore spawning include multiple locations on Morrison Lake.
- Snowmelt is the peak discharges and dominates hydrological regime with significant surface freshwater storage in the many small lakes and wetland complexes. Water is organically stained, oligotrophic.
- Spawning observed to be coincident with complex groundwater inflows. Low flows restrict access to spawning grounds, increase temperatures, and increase predation. Upper Tahlo spawning access often limited by beaver damming.
- Morrison Lake is rated relatively high productivity, but rearing habitat often underutilized due to low escapements.
- Watershed has and continues to be impacted by forest road and logging activity, which continues into the headwaters.
- Concerns center on increased temperature from forestry and climate change, the threat of inappropriate mine development, and the lack of fish habitat management.

Nilkitkwa Sockeye CU Population

- Major sockeye stream spawning locations include: Babine River upstream of Nilkitkwa Lake (aka Rainbow Alley; aka DFO–Sections 1-3) and Babine River downstream of Nilkitkwa Lake to the Counting Fence; these are the largest wild sockeye spawning populations in the Babine system. Minor sockeye spawning streams include Boucher, Nichyeskwa, and Tsezakwa creeks. The latter historically had significant sockeye spawning.
- Since 1997, escapement has diminished. Unknown if this is freshwater or marine productivity issue. Fish health could be hypothesized and include increased Eubothrium or imported fish farm viruses;
- Age structure is 4’s and 5’s similar to all Babine sockeye;
- Nilkitkwa CU run timing follows the Babine enhanced and typically these sockeye do not start passing through the counting fence until mid-August;

- Unclear of the extent Nilkitkwa Lake utilized year-round or provides littoral and pelagic feeding prior to fry moving upstream into North Arm of Babine Lake. Sockeye fry known to move upstream out of Nilkitkwa Lake and into Babine Lake–North Arm;
- Competitor interactions mostly involve kokanee, mountain whitefish, and rainbow trout.

View downstream on Nilkitkwa Lake

Nilkitkwa Sockeye CU Habitat

- Major sockeye stream spawning locations include: Babine River upstream of Nilkitkwa Lake (Rainbow Alley) and Babine River downstream of Nilkitkwa Lake to the Counting Fence.
- Flow and peak discharges totally dominated by Babine Lake hydrological regime. Water is organically stained, oligotrophic, and water temperature can fluctuate daily.
- Nilkitkwa Lake is a widening of Babine River, shallow, and traps significant amount of sediment transported by Tsezakwa Creek. The extent and trend, if any, of macrophyte growth is unknown.

Onerka Sockeye CU Population

- Principal sockeye spawning grounds are in the unnamed tributary flowing from the west;
- Spawner access can be obstructed by beaver dams from Onerka Lake downstream for four km;
- Run timing is early to mid-July and relative to early Babine sockeye;
- Age structure is unknown;
- Competitor interactions include kokanee, mountain whitefish, and Dolly Varden;
- Fry recruitment is limited by low adult escapement.

View southward across Onerka Lakes

Onerka Sockeye CU Habitat

- Nilkitkwa River is headwatered by the sockeye rearing Onerka Lake;
- Principal sockeye spawning grounds are in the unnamed tributary flowing from the west;
- Spawner access can be obstructed by beaver dams from Onerka Lake downstream for four km;
- Snowmelt dominates hydrological regime with significant surface freshwater storage in the many small lakes and wetland complexes. Clearwater, oligotrophic lake with moderate productivity;
- Competitor interactions include kokanee, mountain whitefish, and Dolly Varden;
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Sicintine Sockeye CU Population

- Principal sockeye spawning grounds are in groundwater controlled ponds and channels upstream and downstream of upper and lower Sicintine Lakes;
- Spawner access can be limited by low flow conditions at mainstem falls; in some years, sockeye do not reach their upper Sicintine spawning grounds, but spawn upstream of Endless Creek in the multi-channeled mainstem;
- Major life history characteristics such as age structure, run timing, and relative genetics are unknown;
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized.

View east across lower and upper Sicintine Lakes

Sicintine Sockeye CU Habitat

- Sicintine River is headwatered by the upper and lower Sicintine Lakes;
- Principal sockeye spawning grounds are in groundwater controlled ponds and channels;
- Spawner access can be limited by low flow conditions at the mainstem falls; in some years, sockeye do not reach their spawning grounds;
- Snow melt dominates hydrological regime with significant surface freshwater storage in the many small lakes and wetland complexes. Sicintine Lake is characterized by glacially turbid water, shallow and moderately warm, dimictic, oligotrophic lake with low productivity;
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Slamgeesh & Damshilgwit Sockeye CU Population

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- Major sockeye spawning occurs in Damshilgwit Creek between Slamgeesh and Damshilgwit lakes.
- Escapement diminished in early 1950s and since then, has fluctuated at low levels. Weir counts from 2000 to 2010 indicate annual average of less than 500 sockeye;
- Juvenile rearing occurs in both lakes that provide excellent sockeye rearing habitat..
- Formal Slamgeesh Sockeye Monitoring Program with adult and smolt fence counts;
- Slamgeesh Lake is encompassed in Damdochax Protected Area. Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Slamgeesh & Damshilgwit Sockeye CU Habitat

- Slamgeesh and Damshilgwit lakes are co-joined and lie in the Slamgeesh–Damdochax trough.
- Major sockeye spawning occurs in Damshilgwit Creek between Slamgeesh and Damshilgwit lakes.
- Snowmelt driven hydrological regime, single-basin, warm and shallow lake with clear water. Lake is oligotrophic to mesotrophic, and dimictic.

- Excellent sockeye rearing habitat. Slamgeesh Lake is very productive due to its warmth and high macrozooplankton biomass composed mostly of *Daphnia*.
- Adjusted PR model results indicate optimum escapement of 800 sockeye adults, which appears to be a very low estimate.
- Formal Slamgeesh Sockeye Monitoring Program in place.
- Slamgeesh Lake is encompassed in Damdochax Protected Area.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

View upstream across Slamgeesh Lake

Motase Sockeye CU Population

- Principal sockeye spawning grounds are the unnamed tributaries flowing into the south shore of Motase Lake which headwaters Squingula River;
- Motase sockeye escapement crashed in the early 1950s and has fluctuated at low levels since then;
- All escapement counts are visual, aerial surveys; 26 years of surveys show annual average of 250 sockeye;
- Timing arrival in Skeena River mouth is typically early to mid-July and coincident with early Babine and Pinkut stocks;
- Age structure is mostly five and six year old fish;
- Fry recruitment is limited by low adult escapement.

View southward across upper Squingula River and Motase Lake

Motase Sockeye CU Habitat

- Motase Lake headwaters Squingula River;
- Principal sockeye spawning grounds are the unnamed tributaries flowing into the south shore of Motase Lake;
- Snowmelt dominates hydrological regime with significant surface freshwater storage in the many small lakes and wetland complexes. Motase Lake is glacially turbid, cold water, of moderate depth with multiple basins, dimictic, oligotrophic with low productivity, and nutrient limited;
- Rearing habitat generally underutilized.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Bear Sockeye CU Population

- Bear Lake headwaters Bear River with clear water, warm, moderately deep multi-basin, oligotrophic with high productivity due to preferred sockeye macrozooplankton community;
- Principal sockeye spawning grounds are the shallow and deepwater locales fed by groundwater on western shorelines of Bear Lake. Minor spawning in Salix Creek and Bear River downstream of the lake outlet.
- Escapements are visual aerial counts with lakeshore spawners at depth making difficult to impossible to count conditions. The only fence count conducted in 1947 recorded 42k. In the 1950s, escapement decreased greatly and has not recovered. Current recorded escapement is generally less than 1,000 sockeye;
- Age structure is composed of four and five year old fish;
- Run timing is reported as similar to the relatively late-timed upper and lower Babine River sockeye – late July to early August at Skeena River mouth;
- Fry recruitment is limited by low adult escapement.

Slide into Bear River chinook spawning habitat from BC Rail construction

Bear Sockeye CU Habitat

- Bear Lake headwaters Bear River.
- Principal sockeye spawning grounds are the shallow and deepwater locales on western shoreline of Bear Lake with minor spawning in Salix Creek and Bear river downstream of the lake outlet.
- Snowmelt dominates hydrological regime. Clear water, warm, moderately deep and multi-basin, dimictic, oligotrophic with high productivity. Preferred sockeye macrozooplankton community.
- Rearing habitat generally underutilized. Adjusted PR model results indicate optimum escapement of 82,800 sockeye adults.
- Habitat issues center on the BC Rail corridor that has impacted access into tributaries, caused sedimentation via landslides and bank failures, and functions as a contaminated linear corridor.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Azuklotz Sockeye CU Population

- Principal sockeye spawning grounds are upper and lower Azuklotz Creek. Unclear as to how much juvenile sockeye rearing occurs in Azuklotz Lake, but there is thought to be at least some.
- Since 1950, Azuklotz Creek had variable escapement with no clear trends till the mid-1980s, when escapement increased to above pre-1950 levels.
- Annual average escapement from 2000 to 2009 was 1,360 sockeye the same as in the 1980s.
- Nearly consistent escapement record since the 1950s.
- Fry recruitment is limited by very low adult escapement.
- Clear water, warm, shallow and multi-basin, oligotrophic with low to moderate productivity. Receives moderate amount of sediment from the upstream fan which is very unstable;
- Age structure is composed of four and five year old fish;
- Run timing is late July to early August at Skeena River mouth;

- Fish passage to Azuklotz is often obstructed by beaver dams in the short, lower Azuklotz Creek reach between Bear and Azuklotz lakes;

Azuklotz Sockeye CU Habitat

- Azuklotz Lake drains into Bear Lake.
- Principal sockeye spawning grounds are upper and lower Azuklotz Creek. Snowmelt dominates hydrological regime. Clear warm and shallow water and multi-basin, polymictic, oligotrophic with moderate productivity.
- Rearing habitat generally underutilized. Adjusted PR model results indicate optimum escapement of 9,000 sockeye adults.
- Habitat issues center on the BC Rail corridor that crosses the upper Azuklotz creek fan downstream of the apex. This crossing impacted stream integrity and is the priority rehabilitation site in the upper Skeena watershed. The BC Rail corridor functions as a contaminated linear corridor.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Asitka Sockeye CU Population

- Principal sockeye spawning grounds are Asitka Lake groundwater receiving shorelines particularly those in the south, southwest, and west.
- Sockeye are frequently obstructed by beaver dams from reaching Asitka Lake and those sockeye are thought to spawn in patchy groundwater influenced locations 16 km downstream of Asitka Lake.
- 23 escapement records since 1950 with visual counts and an average escapement under 300 sockeye.
- Run timing is early to mid-July similar to early Babine and Pinkut stocks;
- Age structure is composed of mostly five and six year old sockeye;
- Asitka sockeye life history information is scant. Fry recruitment is limited by very low adult escapement.

Asitka River downstream of the lake

Asitka Sockeye CU Habitat

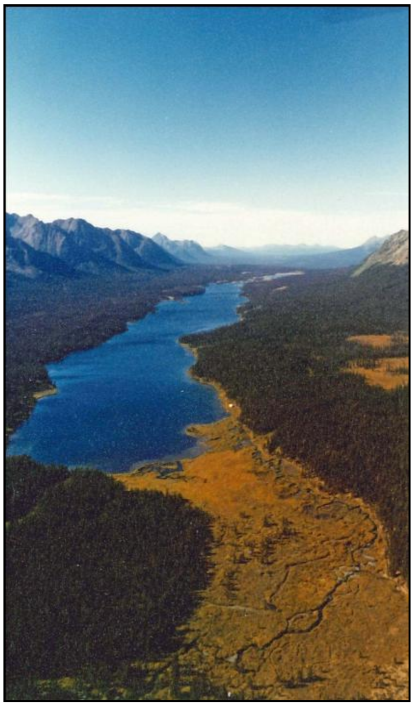
- Asitka Lake headwaters Asitka River that flows into Sustut River.
- Principal sockeye spawning grounds are Asitka Lake groundwater receiving shorelines particularly those in the south, southwest, and west. Sockeye are frequently obstructed by beaver dams from reaching Asitka Lake and those sockeye are thought to spawn in patchy groundwater influenced locations 16 km downstream of Asitka Lake.
- Snowmelt dominates hydrological regime. Clear water, moderately warm, shallow, polymictic, oligotrophic with moderate productivity in a high elevation short rearing season.
- Fry recruitment is limited by very low adult escapement and rearing habitat generally underutilized.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Sustut Sockeye CU Population

- Principal sockeye spawning grounds are Sustut Lake groundwater receiving shorelines on both sides of the long, narrow lake;
- Sustut sockeye escapement records date back to the late 1940s and are intermittent till the early 1960s. From the early 1960s to early 1990s, the annual average escapement was 606 sockeye as determined by visual counts. Escapement data from fence counts during the 1990s show the annual average to be at least double that number of spawners;
- Age composition is mostly five and six year old sockeye;
- Run timing is early to mid-July similar to early Babine and Pinkut stocks;
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized; however, rearing conditions are thought to be complex.
- There are currently no habitat issues.

Sustut Sockeye CU Habitat

- Sustut Lake is the western headwaters of Sustut River.
- Principal sockeye spawning grounds are Sustut Lake groundwater receiving shorelines on both sides of the long, narrow lake.
- Snowmelt dominates the hydrological regime. Clear water and multi-basin with extensive shallows produces both cool and warm water temperatures. Polymictic, ultra-oligotrophic with very low productivity (low zooplankton biomass) in a high elevation short rearing season.
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized; however, rearing conditions are thought to be complex. Adjusted PR model results indicate optimum escapement of 5,000 sockeye adults.

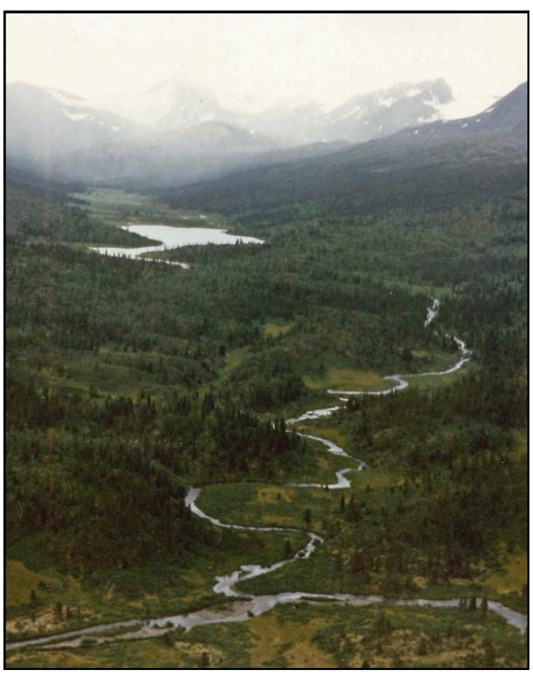


❖ Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

View north across Sustut Lake

Spawning Sockeye CU Population

- ❖ Principal sockeye spawning grounds are Spawning Lake groundwater receiving shorelines.
- ❖ Age composition is mostly five and six year old sockeye;
- ❖ Run timing is early to mid-July similar to early Babine and Pinkut stocks;
- ❖ Small and barely known sockeye population; abundance has only been recorded once in 1968.



Spawning Sockeye CU Habitat

❖ Spawning Lake is a mid-valley lake of Solo Creek, which drains into Johanson Creek.

❖ Principal sockeye spawning grounds are Spawning Lake groundwater receiving shorelines.

❖ Snowmelt dominates the hydrological regime. Clear water and unknown productivity in a high elevation, short rearing season.

❖ Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

View south across Johanson Creek, Solo Creek to Spawning Lake

Johanson Sockeye CU Population

- Principal sockeye spawning grounds are groundwater receiving shorelines at depth below normal visibility in Johanson Lake.
- Johanson sockeye escapement estimate from visual counts are fairly consistent since the late the late 1950s to the mid-1990s. Since 1996, Johanson sockeye escapement has been estimated from the Sustut weir counts;
- Run timing is early to mid-July similar to early Babine and Pinkut stocks. The peak of the sockeye run passes through the Sustut fence in late August;
- Age composition is mostly five and six year old sockeye;
- Fry recruitment is limited by low adult escapement.

Johanson Sockeye CU Habitat

- Johanson Lake headwaters Johanson Creek.
- Principal sockeye spawning grounds are groundwater receiving shorelines at depth below normal visibility.
- Snowmelt dominates the hydrological regime. Clear and moderately cold water, relatively deep with steep shorelines, and multi-basin. Polymictic, ultra-oligotrophic with low zooplankton biomass and overall low productivity in a high elevation, short rearing season.
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized.
- Habitat issues concerned with linear development and increased sediment inputs. In the past, mineral exploration development activity polluted the lake.

Johanson Lake view south

Kluatantan Sockeye CU Population

- Principal sockeye spawning grounds at Kluatantan upper and lower lakes are groundwater receiving shorelines, especially the southern shore and at the lower lake outlet.
- There is a lack of data concerning Kluatantan sockeye spawning abundance (one escapement record) and rearing conditions.
- The two drops/falls on the Skeena mainstem downstream of Kluatantan limit fish passage in low flows in some years.

- Run timing at Tyee is unknown but suspected to be early to mid-July similar to early Babine and Pinkut stocks. Sockeye typically appear in mid to late August at Kluatantan Lakes;
- Age structure is unknown, but most likely five and six year old sockeye;
- Fry recruitment is limited by low adult escapement.

Lower Kluatantan Lake – view east

Kluatantan Sockeye CU Habitat

- Kluatantan Lakes (upper and lower) drain 1.5 km via Tantan Creek to Kluatantan River.
- Principal sockeye spawning grounds are groundwater receiving shorelines, especially the southern shore and the lower lake outlet. There is a lack of data concerning Kluatantan spawning and rearing. The two drops/falls on the Skeena mainstem limit fish passage in low flows in some years.
- Snowmelt dominates the hydrological regime. The upper and lower lakes are relatively small. The lower lake is an overall shallow, warm, multi-basin with two small deep holes (max. depth of 6.7 m). The upper lake has a single deep hole (max depth of 27.9 m) with a strong thermal regime structure. Both lakes are clear water, dimictic, oligotrophic with low productivity in a high elevation, short rearing season.
- Rearing habitat generally underutilized.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Kluayaz Sockeye CU Population

- Principal sockeye spawning grounds are groundwater receiving shorelines, especially the eastern shore Kluayaz Lake.
- There is a lack of data concerning Kluayaz spawning abundance and rearing conditions. There are two escapement records tghat average to 500 sockeye.
- The two drops/falls on the Skeena mainstem downstream of Kluatantan River may limit fish passage in low flows in some years.

- Run timing at Tyee is unknown but suspected to be early to mid-July similar to early Babine and Pinkut stocks. Sockeye typically appear in mid to late August at Kluatantan Lakes;
- Age structure is unknown, but likely mostly five and six year old sockeye;
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized. Adjusted PR model results indicate optimum escapement of 300 sockeye adults.

Kluayaz Lake view north

Kluayaz Sockeye CU Habitat

- Kluayaz Lake drains into Kluatantan River.
- Principal sockeye spawning grounds are groundwater receiving shorelines, especially the eastern shore. There is a lack of data concerning Kluayaz spawning and rearing. The two drops/falls on the Skeena mainstem downstream of Kluatantan River may limit fish passage in low flows in some years.
- Snowmelt dominates the hydrological regime. The lake is glacially turbid, moderately warm, overall shallow, dimictic, and oligotrophic with low productivity in a high elevation short rearing season.
- Rearing habitat generally underutilized. Adjusted PR model results indicate optimum escapement of 300 sockeye adults; however, this estimate is based on only one set of field data.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Maxan Sockeye CU Population

- Principal sockeye spawning grounds are on Maxan Creek between Foxy Creek and Maxan Lakes and the west shoreline upstream of Maxan Lake outlet. Sockeye escapement and spawning records are few with three escapement records since 1950 with an average of 200 fish.
- Bulkley system sockeye are known to have crashed in 1954. First Nation catch records support the premise that there was abundant escapement back to at least 1900;

- Run timing is early to mid-July similar to early Babine and Pinkut stocks;
- Age structure is unknown;
- Migration into the Maxan system is dependent on adequate flow, lack of beaver dams, and moderate temperature water;
- Fry recruitment is limited by very low adult escapement.

Maxan Lake – view southeast

Bulkley Sockeye CU Population

- The principal sockeye spawning ground is the outlet of Bulkley Lake. Sockeye escapement records are few; 15 since 1950 with a range from 9 to 600 fish.
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- Principal sockeye spawning ground is the outlet of Bulkley Lake. Sockeye spawning records are few, but Bulkley system sockeye are known to have crashed in 1954.
- First Nations knowledge of sockeye presence and only three escapement estimates up to 1978. Stock appears to have crashed then;
- Run timing is early to mid-July similar to early Babine and Pinkut stocks;
- Age structure is unknown;
- Fry recruitment is limited by very low or nil adult escapement.
- During low flows, Bulkley Falls are an obstruction to fish passage.

Bulkley Lake view east

Maxan & Bulkley Sockeye CUs Habitat

- Maxan and Bulkley Lakes headwater the Bulkley River.
- Principal sockeye spawning grounds are the outlet of Bulkley Lake, on Maxan Creek between Foxy Creek and Maxan Lakes and possibly in Maxan Lake.
- The upper Bulkley drainage is for the most part subdued, rolling country with some of the lowest precipitation and streamflows in Skeena watershed.
- Snowmelt dominates the hydrological regime. The relatively low amount of precipitation causes the discharges of low and medium elevation tributaries to drop off sharply following spring freshet. Summer and early autumn are characterized by low flows.
- Maxan Lake is clear water, warm, moderately deep with a single basin, dimictic, oligotrophic with unknown productivity. Bulkley Lake is relatively shallow, warm, single basin, dimictic, oligotrophic to mesotrophic with unknown productivity.
- Bulkley Lake is relatively shallow, warm, single basin, oligotrophic to mesotrophic with unknown productivity.
- Fry recruitment is limited by very low adult escapement and rearing habitat generally underutilized.
- During low flows, Bulkley Falls are an obstruction to fish passage and concurrently, Maxan Creek may not have sufficient flow to allow sockeye passage. From Bulkley Lake downstream to Bulkley Falls, persistent beaver dam activity obstructs fish passage.
- A century of habitat degradation has lead to cumulative effects adverse to sockeye and their habitat. Hillslopes, roads, riparian areas, stream channels, and fish habitats have been impacted by land use practices. Development has included rail and highway corridors significantly impinging fish habitat, logging and road construction and agriculture have eroded and deposited sediment. Restoration activities have been minimal.
- The CN Rail line functions as a contaminated linear corridor.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Morice Sockeye CU Population

- Principal sockeye spawning grounds are Nanika River downstream of Nanika Falls and Morice Lake shorelines south of Atna Arm.
- Morice sockeye spawning estimate records are consistent from 1940 into the present. Morice system sockeye are known to have crashed in 1954 and fluctuated at relatively low levels of abundance except for the peculiar moderate escapement levels in the mid-1990s.
- Age structure is mostly five and six year olds with most of these spending two years in freshwater;
- Run timing is early to mid-July at Skeena River mouth similar to early Babine and Pinkut stocks. Sockeye typically appear in mid to late August at Morice Lake;
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized;

- Enhancement activities include blasting key rocks in both Hagwilget and Moricetown canyons, establishing fish ladders in Moricetown Canyon, and operating a pilot hatchery on lower Nanika River from 1960 to 1965;

Morice Lake view south

Morice Sockeye CU Habitat

- Morice Lake is the headwaters of Morice River.
- Principal sockeye spawning grounds are Nanika River downstream of Nanika falls and Morice Lake shorelines south of Atna Arm.
- The hydrological regime is dominated by the early summer snowmelt.
- Morice Lake is large, deep, cold, has multiple basins, and shows slightly glacially turbid water especially at the south end and near Atna Arm. The lake is dimictic, ultra-oligotrophic, and of generally low biological productivity. The north end of the lake near the outlet is warmer, clearer, and has increased productivity.
- Fry recruitment is limited by low adult escapement. Adjusted PR model results indicate optimum escapement of 206,800 sockeye adults.
- Minor logging and mineral exploration activities provide few impacts to sockeye habitats.
- Future threats include proposed oil and gas pipeline corridors, changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Atna Sockeye CU Population

- Principal sockeye spawning grounds are the north, south, and eastern Atna Lake shorelines.
- Escapement estimates in Atna Lake are difficult to impossible due to glacial turbidity and depth of spawners;
- Age structure is five and six year olds with most of these spending two years in freshwater;
- Run timing is early to mid-July at Skeena River mouth similar to early Babine and Pinkut stocks. Sockeye typically appear in mid to late August at Morice Lake;
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized;
- Atna Lake is glacially turbid, moderately deep, cold, single basin, ultra-oligotrophic, and of generally low productivity.

- There are currently few impacts to Atna CU sockeye habitats.
- Future threats include proposed oil and gas pipeline corridors.

Atna Sockeye CU Habitat

- Atna Lake provides major flow into Morice Lake.
- Principal sockeye spawning grounds are the north, south, and eastern lake shorelines.
- The hydrological regime is dominated by the early summer snowmelt.
- Atna Lake is glacially turbid, moderately deep, cold, and a main basin grading to the outlet. The lake is dimictic, ultra-oligotrophic, and of generally low productivity.
- Fry recruitment is limited by low adult escapement and rearing habitat generally underutilized.
- There are currently few impacts to Atna CU sockeye habitats.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Atna Lake, view southwest

SKEENA PINK CUs –Key Points

Lower Skeena Pink – Odd CU POPULATION

- Lower Skeena (LSK) pink odd-year CU encompasses all spawning in Skeena watershed from the coast to just west of Kitwanga;
- LSK pink odd-year CU has 54 spawning tributaries, and hundreds of spawning sites;
- Annual variability of specific stocks is substantial. LSK pink odd CU abundance can and has been extremely variable;
- The majority of pink spawning records are from the late 1950s into the early 1990s. Currently, major pink spawning abundance occurs at Skeena West (Skeena River mainstem from Terrace downstream to Kasiks River) and in Lakelse River. Moderate pink abundance is recorded at Ecstall River, Khyex River, lower Kitsumkalum River, Kasiks River, and recently, Kleanza Creek. Since the 1990s, Kasiks and Lakelse rivers are the only pink stocks with continuous escapement records. In most years, Skeena West and Ecstall pinks are uncountable due to turbid water conditions;
- Major pink spawning occurs at Skeena West (escapement to 750,000 in 1989) and in Lakelse River (1,800,000 in 1991, 1,206,000 in 2009). The Lakelse pink salmon run typically averages 50% of Area 4 pink abundance.
- Run timing is late July to early September with the average peak aggregate Skeena pink run entry date of August 7th as determined by the Tyee Test Fishery. Lower Skeena pinks typically arrive a week earlier later than Middle and Upper Skeena CU pinks.
- Age structure is exclusively 2 year olds with fry emerging and migrating to sea;
- Odd-year pinks are usually larger in size than even-year fish.

Lower Lakelse River – typical pink spawning locale

Lower Skeena Pink – Odd CU HABITAT

- The pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
- LSK pink odd CU is characterized by the Skeena River valley cutting through the Coast Mountains with approximately 50% of tributary valley draining remnant glaciers;
- Pink abundance somewhat reflects climate and ocean regime shifts in 1977, 1989, and 1998 and their subsequent production.
- Major shift in spawning habitat occurred in 1954 when mainstem Cedarvale vicinity spawners moved to Skeena West.
- Winter low flows can dewater and freeze eggs, especially those laid in side and back channels that dry.
- Tributaries supporting LSK pink have many large scale precipitation events that can cause erosion, scouring, and siltation.
- The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
- Mature pink salmon bring massive amounts of marine nutrients into LSK pink odd-year freshwater and riparian ecosystems;
- The majority of LSK pink spawning habitat is in good condition.

View upstream Skeena on mainstem (upstream of Gitnadoix) of typical Skeena West pink spawning grounds

Middle & Upper Skeena Pink – Odd CU POPULATION

- MUSK pink odd-year CU encompasses all spawning in Skeena watershed from just west of Kitwanga to the headwaters;

- MUSK pink odd-year CU is composed of 49 spawning locales with hundreds of sites;
- Annual variability of specific stocks is substantial and abundance can and has been extremely variable;
- Pink escapement records are complete for Kispiox River (1920 to 2001) and Kitwanga River (1920 to present). Babine River pink escapement records are complete from 1950 into the present.
- Currently, major pink spawning occurs at Kitwanga River, Kispiox River, and Babine River upstream of the counting fence.
- Moderate pink spawning occurs at Morice River, Babine River – downstream stream of the counting fence, Thautil River, and Bear River.
- Since 2000, Kitwanga, Morice, and Babine upstream of the fence are the only pink stocks with continuous escapement records. In most years, all these systems are countable due to clearwater conditions;
- Pink salmon generally enter the Kitwanga River during early to mid-August in two timing groups, though this is variable. Early spawners use the lower Kitwanga River below Kitwancool Creek. The later (7 to 10 days) spawning group uses the mainstem between Moonlit Creek and Kitwancool Lake. Major concentrations of pink spawners occur from Tea Creek downstream to the Skeena confluence.
- Typically, pink salmon enter the Kispiox system in mid to late August and spawn throughout the mainstem and its lower tributaries. The area of heaviest spawning occurs from Seventeen Mile Bridge upstream to Cullon Creek with Gitangwalk Canyon being a barrier to upstream movement.
- Adult pink salmon usually pass through the counting fence on Babine River between August 10 and September 10, with odd-year pinks typically entering and spawning ten days earlier than even-year pinks. The principal spawning ground is from the forestry bridge (below the fence) upstream to Nilkitkwa Lake, but particularly in the 300 m upstream of the fence.
- Run timing is July to early September with the average peak aggregate Skeena pink run entry date of August 7th as determined by the Tyee Test Fishery. Lower Skeena pinks typically arrive a week later than Middle and Upper Skeena CU pinks.
- Age structure is exclusively 2 year olds with fry emerging and migrating to sea;
- Odd-year pinks are usually larger in size than even-year fish.

Middle & Upper Skeena Pink – Odd CU HABITAT

- Pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
- Major shift in spawning habitat distribution occurred in Morice and Babine systems. Between 1950 and 1990, odd-year pink escapements have increased by a factor of thirteen in Babine River and minor upstream colonization in the Morrison, Pinkut, Fulton, Nine-mile, Twain, and Pierre systems. The odd-year Morice pink run has been expanding since construction of the Moricetown Canyon fishway in 1951 and was augmented with the removal of key rocks by

blasting at Hagwilget Canyon in 1959. Pink salmon have not colonized many tributaries including the Nanika River.

- ❖ Winter low flows can freeze pink eggs, especially those laid in heavily utilized side and back channels that dry up. Large scale precipitation events can cause flooding, erosion, and siltation.
- ❖ The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
- ❖ Mature pink salmon bring massive amounts of marine nutrients into the mid and upper Skeena freshwater and riparian ecosystems;
- ❖ The majority of MUSK pink spawning habitat is in good condition.

View east across Morice River to Owen confluence over prime pink spawning grounds.

Nass & Skeena Estuary Pink – Even CU POPULATION

- ❖ NSKEst pink even-year CU encompasses all spawning in: Skeena watershed from the coast to just west of Kitwanga, the Nass watershed downstream of New Aiyansh, and coastal drainages to the Alaskan border.
- ❖ NSKEst pink even -year CU annual variability of specific stocks is substantial and can be extreme.
- ❖ Currently, major pink spawning abundance occurs in Lakelse River and Kwinamass River with moderate spawning abundance at Ksi X'anmas, Moore Cove Creek, Khutzeymateen River and Skeena River West.

- Since the 2000, Lakelse River, LaHou Creek, Oona River, and Silver Creek are the only pink even stocks with continuous escapement records.
- Lakelse pink even run spawning occurs throughout the mainstem. Kwinamass pink spawning occurs mainly in the lower reaches, but extends up to 26 km.
- There are no known major shifts in spawning distribution in the NSKEst CU.
- Pink run timing is annually variable and for the CU in general,, spawning occurs from early August through September. Run timing is from late July to late September with the average peak in mid August for the Portland Canal, and Portland and Observatory Inlets pink aggregate. For the and lower Nass aggregate, run timing is from late July to late September with the average peak in early to mid August For the lower Skeena, the pinks entry date is August 7th as determined by the Tyee Test Fishery Spawning peaks in mid-September and ends mid-September to mid-October. Skeena estuary pink run timing spawning is very similar.
- Age structure is exclusively 2 year olds with fry emerging and migrating to sea;

Nass & Skeena Estuary Pink – Odd CU HABITAT

- The pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
- NSKEst pink even CU is characterized by coastal fjords and the Nass and Skeena rivers cutting through the Coast Mountains with approximately 50% of tributary valleys draining glaciers and icefields.
- Winter low flows can dewater channels and freeze pink eggs. On some coastal streams, heavy precipitation causes erosion and siltation adversely effecting incubation.
- The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
- At the northeast Pacific scale, pink abundance reflects climate and ocean regime shifts in 1977, 1989, and 1998 and their subsequent production.
- Mature pink salmon bring massive amounts of marine nutrients into the freshwater and riparian ecosystems in the NSKEst pink even CU.
- The majority of NSKEst pink even CU spawning habitat is in good or better condition.

Middle & Upper Skeena Pink – Even CU POPULATION

- MUSK pink even-year CU encompasses all spawning in Skeena Watershed from just west of Kitwanga to the headwaters;
- Annual variability of specific stocks is substantial and can be extremely variable. MUSK pink even years have relatively less abundance than MUSK pink odd years.
- Major MUSK pink even spawning occurs in Kitwanga, Babine (upstream of the counting fence), and Kispiox rivers. Kitwanga and Babine pink even escapement records are complete into the present. Between 1950 and 1990, the mean pink even-year escapement into the Babine system has increased by a factor of seventeen.

- ❖ Moderate MUSK pink even spawning occurs at Morice River and Babine River downstream stream of the counting fence. Morice River pink even escapement records are complete into the present.
- ❖ In most years, Kitwanga, Babine, and Morice systems are countable due to clearwater conditions;
- ❖ Pink even-year salmon generally enter the Kitwanga River in early to mid-August in two timing groups, though this is variable. Early spawners use the lower Kitwanga River below Kitwancool Creek. The later (7 to 10 days) spawning group uses the mainstem between Moonlit Creek and Kitwancool Lake. Major concentrations of pink spawners occur from Tea Creek downstream to the Skeena confluence. Even-year pinks are typically a week later than odd-year pink in their timing.
- ❖ Pink even-year salmon enter the Kispiox system in mid to late August and spawn throughout the mainstem and its lower tributaries. The area of heaviest spawning occurs from Seventeen Mile Bridge upstream to Cullon Creek with Gitangwalk Canyon being a barrier to upstream movement.
- ❖ Adult pink salmon usually pass through the counting fence on Babine River between August 10 and September 10, with even-year pinks typically entering and spawning ten days later than odd-year pinks. The principal spawning ground is from the forestry bridge (below the fence) upstream to Nilkitkwa Lake, but particularly in the 300 m section upstream of the fence.
- ❖ Age structure is exclusively 2 year olds with fry emerging and migrating to sea;
- ❖ Even-year pinks are usually smaller in size than odd-year fish.

Middle & Upper Skeena Pink – Even CU HABITAT

- ❖ Pink salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry.
- ❖ Moderate shift in spawning habitat occurred in the Babine systems. Between 1950 and 1990, even-year pink escapements have increased by a factor of seventeen in Babine River with small amounts of upstream colonization in the Morrison, Pinkut, Fulton, Nine-mile, Twain, and Pierre systems. It wasn't until the 1980s that the even-year Morice pink run began rapidly expanding habitat and abundance, particularly into Morice River, Reach 2.
- ❖ The principal limiting factor with egg-to-fry survival is dewatered and frozen pink eggs caused by winter low flows drying up heavily utilized side-channels areas. Siltation and scouring are infrequent problems usually related to major rain-on-snow events.
- ❖ The early marine stage of the life cycle is the most critical period influencing adult returns. The variability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
- ❖ Even-year pink salmon bring massive amounts of marine nutrients into the upper Skeena freshwater and riparian ecosystems;
- ❖ The majority of MUSK pink even-year spawning habitat is in good or better condition.

SKEENA COHO CUs – Key Points

Lower Skeena Coho CU POPULATION

- Lower Skeena (LSK) coho CU encompasses all spawning in Skeena watershed from the coast to just west of Kitwanga.
- LSK coho CU has 98 recorded spawning tributaries with hundreds of spawning sites. Many of the spawning tributaries are known to support coho spawning, but there are few escapement observations. Typically, visual coho spawner counts underestimate escapement. Annual variability of specific stocks is moderate.
- LSK coho CU has had a long-term decline in spawner abundance and productivity since 1950, which is attributed to mixed-stock overfishing.
- The majority of LSK coho spawning records are from the late 1950s into the early 1990s. Ecstall, Lakelse, Kasiks, Exchamsiks, Exstew, and Gitnadoix have fairly consistent escapement records.
- Currently, major coho spawning abundance occurs in the Lakelse, Ecstall, Gitnadoix, and Exstew systems. Moderate coho abundance is recorded in the Kitsumkalum, Kasiks, Zymoetz, Exchamsiks, and Khyex systems.
- LSK coho CU run timing into the lower Skeena River is between late July and the end of September. Timing varies within and by sub-basin; Zymoetz and Kalum have early and late runs with differing fish size and weights. Ecstall, Green, and Kyhex appear to have the relatively latest timing with runs entering in mid-September.
- Age structure is mostly 3 year and 4 year olds.
- Potential for moderate to heavy angler exploitation.
- The LSK coho CU has a history of small stock enhancement operations including the Deep Creek, Kitsumkalum, and Eby Street hatcheries with outplants to the Kalum, Zymoetz, Zymacord, and Lakelse.

Lower Skeena Coho CU HABITAT

- Coho salmon life history emphasizes freshwater habitat with significance placed on rearing habitat quality and quantity.
- LSK coho CU is characterized by the Skeena River valley cutting through the Coast Mountains with approximately 50% of tributary valley draining remnant glaciers;
- Tributaries supporting LSK coho have frequent large scale precipitation events that can cause erosion, scouring, and siltation.
- Logging and related road development is the most widespread land use activity that has adversely affected coho habitat, particularly in the Zymoetz, Lakelse, Kalum, and Zymacord.
- Linear developments such as railroad, highway, and road corridors have resulted in considerable damage to coho habitat especially cutting off side channel and back channel habitat along the lower Skeena River.

Middle Skeena Coho CU POPULATION

- MSK coho CU encompasses all spawning in Skeena watershed from just west of Kitwanga upstream to include the Kispiox, Babine, Bulkley, and Skeena tributaries to the Babine confluence.
- MSK coho CU is composed of 78 recorded tributary streams and hundreds of spawning sites. Many tributaries are known to support coho spawning, but there are few escapement observations. Typically, visual coho spawner counts underestimate escapement. Annual variability of specific stocks is low to moderate.
- The majority of MSK coho spawning records are from the late 1950s into the early 1990s. It is difficult to determine escapement trends over time due to the low number of streams enumerated over the last two decades. Indicator coho stocks include the Toboggan wild and enhanced, (tagged and fence counts), and Babine and Kitwanga fence counts.
- Generally, there is long-term diminished spawner abundance and freshwater productivity since 1970s with a coastal-interior productivity gradient. At the sub-basin level, Bulkley shows a 15% long-term decline in spawner abundance. MSK coho are likely in long-term slow recovery to carrying capacity from chronic mis-match of productivity and exploitation.
- Currently, major coho spawning occurs in the Kitwanga, Kispiox, Gosnell, Telkwa, Toboggan, and Babine systems. Moderate coho spawning occurs in the upper Bulkley, Fulton, and Nangeese systems.
- Babine system typically has the largest aggregate escapement followed by the Morice system, both in the Middle Skeena coho CU and Skeena basin-wide.
- Coho enter middle Skeena systems in mid-August through to mid-September, generally holding in the mainstems and lakes, and then, depending on water flow conditions, move with fall freshets into the tributaries to spawn. Spawning can occur shortly after entering tributaries, or commonly into mid-January, and infrequently into March. Many systems have early and late runs.
- MSK coho age structure is predominantly three-year olds and less four-year olds.
- Small-scale enhancement occurred from the 1980 for 25 years in Hazelton, Kispiox, Smithers, Richfield, Houston, and Fort Babine; however, Toboggan Creek is the only hatchery still in operation and typically releases 30-40k CWT coho annually.
- Morice and upper Bulkley coho may require recovery planning.

Middle Skeena Coho CU HABITAT

- Coho salmon life history emphasizes freshwater habitat with significance placed on rearing habitat quality and quantity.
- MSK coho CU spawning and rearing habitat is characterized by low-gradient at a mix of elevations often adjacent to wetland complexes frequently impounded by beavers. Large elevation difference from Kitwanga into higher elevation interior spawning and rearing locales.
- Logging and related road development is the most widespread, valley-bottom land use activity that has adversely affected high-value coho habitat; however, generally coho habitat not used due to long-term excessive exploitation rates.

- Linear developments such as rail and road corridors have resulted in considerable impacts to high-value coho spawning and rearing habitat especially cutting off side and back channel and riparian habitats or generally obstructing fish passage.
- Excessive impacts from agriculture in the upper Bulkley and lower Kispiox.
- Access to habitat is a big issue especially at low water level conditions. Upstream development or natural disturbance may cause erosion resulting in sediment deposition on tributary fans exasperating low water issues.
- Increased stream temperatures linked to global warming may be forcing juveniles to rear in Babine and Morice lakes and mainstems.
- Future threats include: changing freshwater and ocean conditions linked to global climate change, could be expressed in poor freshwater and marine survival rates; ongoing forestry development in Morice and Babine sub-basins creating additional cumulative impacts; continuing lack of habitat management in the upper Bulkley and Morice drainages.

Upper Skeena Coho CU POPULATION

- USK coho CU encompasses all spawning in Skeena watershed upstream of Babine confluence.
- USK coho CU is composed of 21 recorded tributary streams and hundreds of spawning sites. Many of the spawning tributaries are known to support coho spawning, but there are few escapement observations. Typically, visual coho spawner counts underestimate escapement. Annual variability of specific stocks is low to moderate.
- USK coho spawning records are few and abundance and productivity trends are unknown.
- Slamgeesh is the coho indicator stock; however, it does not characterize the CU as a whole due to its unique biophysical factors. Sustut Fence records the early and mid portions of the upper Sustut runs.
- USK coho age structure is predominantly three-year olds and few four-year olds.
- Coho enter upper Skeena systems in mid-August through to mid-September, generally holding in the mainstems and lakes, and then, depending on water flow conditions, move with fall freshets into the tributaries to spawn. Most spawning goes unrecorded.
- There are no known stock enhancement programs in the USK coho CU.

Upper Skeena Coho CU HABITAT

- Coho salmon life history emphasizes freshwater habitat with significance placed on rearing habitat quality and quantity.
- USK coho CU spawning and rearing habitat is characterized as low-gradient at a mix of relative elevations often adjacent to wetland complexes frequently impounded by beavers. Much USK coho habitat is at relatively high elevations. Most spawning and rearing habitats have never been surveyed.
- Linear developments such as the road corridor in the upper Sustut and rail corridor in the upper Skeena have resulted in considerable impacts to high-value coho spawning and rearing habitat.
- Access to habitat can a big issue especially due to low water level conditions.

- Future threat includes changing freshwater and ocean conditions linked to global climate change, could be expressed in poor freshwater and marine survival rates.

SKEENA CHUM CUs –NARRATIVES

Lower Skeena Chum CU POPULATION

- Lower Skeena (LSK) chum CU encompasses all spawning in Skeena Watershed from the coast to just west of Kitwanga;
- The majority of historical LSK chum spawning survey records do not provide a reliable index of escapement, but rather valuable spawner abundance information. There is outstanding variability in year to year chum salmon spawner abundance.
- Taking the somewhat ambiguous historic catch into effect, LSK chum abundance up to the 1930s was 10 to 50 times larger than the recent decade. However, the lack of recent escapement data for many streams does not allow clear trends to be shown.
- Chum spawning populations are located in 33 different stream-type spawning locales, as well as a myriad of mainstem spawning sites located in side and backchannel sites collectively known as Skeena West.
- The main chum spawning populations are located in the Ecstall and Skeena West areas, both of which are typically uncountable due to turbidity conditions. The majority of escapement observations are aerial counts.
- Ecstall River receives the largest escapements of all Skeena chum stocks, averaging 65% of the 1950 and 2000escapement.
- Sparkling Creek to Lower Lake Creek is the only Ecstall River chum spawning area with a consistent enumeration record (to 2002).
- Skeena–West area is defined as the Skeena multi-channelled reach that extends from Kwinitsa River upstream to Terrace and includes 22 recorded spawning locations in the mainstem, sloughs, and side channels. Consistent chum escapement records extend from 1972 to 1993 and show the average annual escapement was 2,750 chum.
- Ecstall and Skeena West chum escapement records likely underestimate abundance due to turbidity making fish visibility difficult or impossible.
- The main run of chum salmon into the Ecstall system occurs throughout August with peak arrivals in mid-August. LSK chum run timing as recorded by the Tyee Test Fishery (TTF) indicates the bulk of the chum moving upstream from July 10 to September 10 with the peak August 10 to the 28.
- Age composition of LSK chum is generally three to five years with the majority returning as four year old fish; however, year class abundance varies annually and also spatially. Chum in Andesite and S-Bend sidechannels show 75% age 3, 25% age 4, with no age 5 fish present.
- Chum run reconstructions show a smooth downward trend. The exploitation rate pattern likely reflects the accommodation of harvesting decisions directed to sockeye and pink salmon, and in particular, the enhanced Babine sockeye stocks.
- There has been an overall decline in LSK CU chum enumeration effort with uncertainty as to the magnitude and significance of spawning stock loss and their genetic diversity.

- ❖ Minimal management activities and research ensure an inadequate understanding of Skeena chum biology, population structure, presence, and abundance. Why Skeena chum salmon declines are occurring is currently not understood.

Lower Skeena Chum CU HABITAT

- ❖ The LSK chum CU contains a large number of spawning locations in streams of various sizes and types possessing different hydrological regimes with a diverse suite of water quality conditions and flow levels.
- ❖ Chum salmon life history emphasizes marine habitat; they only enter freshwater for spawning, egg incubation, and alevin development into fry. Fry emerge early in the spring and migrate to the Skeena estuary immediately upon hatching. There is little specific information available on Skeena juvenile chum residency in the estuary and near-shore marine waters. Chum salmon offshore distribution is mostly affected by sea surface temperature (SST).
- ❖ LSK chum CU habitat is characterized by large river channels and the presence of upwelling groundwater. The lower part of Skeena River is dominated by tidal influences for 55 km upstream to the Kasiks River. From there, upstream to Terrace, the Skeena is characterized by the floodplain bounded by the valley walls, and a low-gradient flow. There is massive scale erosion and deposition with multiple-channels changing significantly over relatively short periods of time. From Terrace upstream to Sedan Creek, the Skeena is a single channel incised into the relatively narrow valley bottom that cuts through mountains of high relief.
- ❖ The main Ecstall chum spawning grounds are located in the mainstem above the tidal range, from Sparkling Creek to Lower Lake Creek.
- ❖ Winter low flows can dewater and freeze eggs, especially those laid in side and back channels that dry up.
- ❖ Tributaries supporting LSK chum may have large scale precipitation events causing high flows, erosion, scouring, and siltation.
- ❖ Enhancement of LSK chum includes Kitsumkalum Hatchery capturing broodstock and releasing fed fry at Andesite Sidechannel and in the lower Kitsumkalum River during the mid and late 1980s.
- ❖ The early marine stage of the life cycle is the most critical period influencing adult returns. The unpredictability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
- ❖ The majority of LSK chum spawning habitat is in good condition.
- ❖ Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Middle Skeena Chum CU POPULATION

- Middle Skeena (MSK) chum CU encompasses all spawning in Skeena Watershed from just west of Kitwanga upstream to include the Kitwanga, Kispiox, Babine, Bulkley drainages, as well as the Skeena tributaries to the Babine confluence.
- Despite the relatively small chum populations in the Middle Skeena CU, water conditions and visibility combine to allow generally easier enumeration than is typical in the LSK chum CU. MSK chum spawning populations are located in 33 different spawning locales. Most chum counts are conducted by stream walks.
- MSK chum life history characteristics such as ocean distribution, spawning timing, age structure, and early marine life are similar to the LSK chum CU.
- Kitwanga River is considered a chum escapement index site and the only chum run that has enumeration through a counting fence. Chum salmon timing into the Kitwanga River as recorded for 10 years at the KSEF indicate a few chum arrive in early August with the majority arriving August 25 to September 25.
- The Kitwanga chum escapement record is semi-continuous from 1924 to 1950 with fluctuations similar to the last 60 years. In the early 1950s, Kitwanga River chums comprised approximately 40% of the total reported Skeena system chum escapement. The 1950s annual average was 2,485 with the escapement severely declining in 1957. The decadal average was: 1960s – 44 chums, 1970s – 264 chums, 1980s – 1,940, 1990s –728 chums, and 2,000s – 1,084 chums. It is unknown how many chum spawn in the 4.5 km lower reach downstream of the fence and if their timing is similar to chum counted through the fence.
- Generally chum are thought to arrive in the Kispiox system in early to mid-August and spawn shortly thereafter and into September in specific mainstem sections. Time of spawning residence is considered 15 days. Chum spawning tributaries includes the lower reaches of Date, McQueen (Hevenor), Murder, the unnamed right bank creek 1.5 km upstream of McCully Creek, and the lower reaches of Sweetin and Nangeese rivers.
- Kispiox River chum escapement records extend back to 1921 and are fairly consistent up into the early 2000s. Prior to 1950, the escapement fluctuated between 1,500 and 5,000 chums. The decadal average escapement for the 1950s was 4,083 chums, 553 chums for the 1960s, 978 chums for the 1970s, 372 chum for the 1980s, and 500 chums for the 1990s. Since 2000, no chum escapement survey results have been recorded.
- For many streams, the lack of recent escapement data hinders understanding trends.
- MSK chum run timing as recorded by the Tyee Test Fishery (TTF) indicates the bulk of the chum moving upstream from July 10 to September 10 with the peak timing from August 10 to the 28.
- Age composition of MSK chum is unknown but likely similar to LSK ages, which are generally three to five years with the majority returning as four year old fish; however, these year classes vary annually and also spatially.
- North Coast chum run reconstructions show a smooth downward trend. The exploitation rate pattern reflects the accommodation of harvesting decisions directed to sockeye and pink salmon, and in particular, the enhanced Babine sockeye stocks.
- There has been an overall decline in enumerating effort for MSK CU chum with uncertainty as to the magnitude and significance of spawning stock loss and their genetic diversity.

- Minimal management activities and research have resulted in an inadequate understanding of Skeena chum biology, population structure, presence, and abundance. Why, where, and how Skeena chum declines are occurring is currently not understood.

Middle Skeena Chum CU HABITAT

- Chum salmon life history emphasizes marine habitat, only entering freshwater for spawning, egg incubation, and alevin development into fry. Fry emerge early in the spring and migrate to the Skeena estuary immediately upon hatching. There is little specific information available on Skeena juvenile chum occupancy and movement in the estuary and near-shore marine waters. Chum salmon offshore distribution is mostly affected by sea surface temperature (SST).
- MSK chum CU habitat is difficult to characterize due to spawning locations in streams of various sizes and types possessing different hydrological regimes including the presence of upwelling groundwater and a diverse suite of water quality and flow level conditions.
- The Skeena River heads northward through the CU as a generally entrenched single thread stream, that more than doubles its elevation by the Babine confluence. The main chum spawning populations are located in the low relief, Kitwanga and Kispiox valley-bottoms as well as a few Skeena mainstem and side and backchannels.
- Winter low flows can dewater and freeze eggs, especially those laid in side and back channels that dry up.
- MSK chum spawning sites may have large scale precipitation events causing high flows, erosion, scouring, and siltation.
- Due to depressed chum abundance levels, the Kitwancool Channel was excavated in 1985 with the expectation that chum salmon would benefit. The channel is 300m in length and 5 m wide with adequate groundwater flows and reasonable oxygen levels. There were problems acquiring broodstock and no adults chum returned to spawn. The channel was abandoned in 1989.
- The early marine stage of the life cycle is the most critical period influencing adult returns. The unpredictability in early marine growth and survival is correlated to climatic generated variations in the abundance and distribution of predator and prey communities.
- The majority of MSK chum spawning habitat is in good condition.
- Future near-term threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of fish habitat management.

Upper Skeena Chum CU POPULATION

- USK Chum Cu supports one spawning population in Bear River, downstream of Sapolio Lake and Triple Creek.
- There are no known chum spawning records or DNA samples collected for this population.
- Abundance ranges from 1 to 20. Williams et al. (1985) reported low densities of chum salmon fry caught in their upper and lower IPTs and beach seines. Shirvell and Anderson (1990) reported one chum spawner in the upper Bear River, September 9, 1990 with good visibility conditions.
- Spawning timing is reported to be early to mid-August.
- Age composition of USK chum is unknown but likely similar to LSK and MSK CU ages, which are generally three to five years with the majority returning as four year old fish; however, these year classes vary annually and also spatially.
- There are no known habitat issues.

SKEENA CHINOOK CUs –NARRATIVES

Ecstall Chinook CU POPULATION

- ❖ Ecstall chinook CU encompasses all known chinook spawning and rearing areas in Ecstall watershed. ECST chinook CU has four recorded spawning locales with at least 10 spawning sites.
- ❖ The escapement record is fairly consistent into the early 1990s, but since then, there are few escapement observations.
- ❖ Long-term decline in spawner abundance and productivity since 1970 even following the closure of directed net chinook fisheries in 1983.
- ❖ The critical chinook spawning grounds are the lower reach of Johnston Creek and the Ecstall River.
- ❖ Ecstall River chinook start arriving in early July, spawning notably earlier than the Johnston Creek run, who return in early and mid-August and start spawning shortly thereafter. It is likely the Johnston Creek run is intercepted by Area 4 pink seine fisheries and fluctuates at low abundance levels.
- ❖ Ecstall chinook age compositions are typically 4_1`s and $5_1$`s.
- ❖ Ecstall chinook are genetically separable from all other Skeena stocks and appear more related to north coast chinook populations.
- ❖ No known enhancement history.
- ❖ A well-established sport fishery operates on the Ecstall centered on the Johnston Creek area that intercepts chinook.

Ecstall Chinook CU HABITAT

- ❖ Ecstall chinook CU spawning and rearing is in its natural condition.
- ❖ Tidal influence extends approximately 42 km upstream of the Ecstall River mouth to Sparkling Creek and chinook spawning is located upstream of that point unless in tributaries or on their fans. Ecstall River chinook spawn in scattered pockets from the upper tidal limit with high densities from Johnston Creek upstream for 6 km, and with lower densities upstream to the Lower Lake outlet.
- ❖ Johnston Creek spawning grounds are the excellent gravels in the lower 1.4 km reach between Ecstall River and Johnston Lake.
- ❖ Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of habitat management.

Lower Skeena Chinook CU POPULATION

- Lower Skeena chinook CU encompasses all known chinook spawning and rearing areas from the Skeena mouth upstream and including Fiddler Creek, except for the Lakelse, Kalum, and Zymoetz systems, which are represented in their own CUs.
- Lower Skeena chinook CU has 18 recorded spawning locales with at least a hundred spawning sites. Chinook spawning locales with escapement records include Skeena River West, Khyex, Kasiks, Exchamsiks, Gitnadoix, Magar, Kadeen, Dog-Tag, Exstew, Zymagotitz (Zymacord), Kleanza, and Fiddler. Kasiks is the spawning locale with a consistent record while Exchamsiks and Exstew are semi-continuous.
- Individual and aggregate escapement records indicate a slight increase of abundance from the 1960s into the present.
- Skeena mainstem chinook spawning enumerations are difficult due to turbid water conditions.
- All chinook populations are relatively small, have essentially the same run-timing, and show few genetic divergences.
- Chinook spawn primarily from mid-August through September in the lower Skeena River; however, run timing is annually variable, relatable to water conditions and age class returns that may indicate success or failure of one age or another. In most years, chinook age 4`s and 5`s-dominate the escapement. Juvenile chinook are believed to be the predominant juvenile salmon in the lower Skeena mainstem. Unknown how many of the juveniles in the lower Skeena area can be attributed to the CU and what is the proportion of chinook with ocean and steam life histories.
- There are a large and growing number of tidal and in-river sportfishers who intercept lower Skeena chinook stocks.
- Chinook enhancement includes fry released to sites in the lower Zymagotitz and Erlandson from Deep Creek Hatchery. Oldfield Creek Hatchery outplanted chinook in the Kyhex during the mid-1980s.

Lower Skeena Chinook CU HABITAT

- Tidal influence extends approximately 55 km upstream to the Kasiks River and most Skeena mainstem chinook spawning is located upstream to the Terrace area.
- Lower Skeena chinook CU spawning and rearing habitats are composed of impacted and natural condition sites. Spawning sites are closely related to groundwater inflows. Generally the habitat is in good condition except for the Zymagotitz drainage.
- Logging and related road development is the most widespread land use activity that has adversely affected high-value tributary chinook habitat particularly in the Zymagotitz system.
- Linear developments such as rail and road corridors have resulted in considerable impacts to high-value chinook spawning and rearing habitat, especially side and back channel floodplain habitats cut-off from the Skeena mainstem.
- Future challenges and threats include: changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and the lack of fish management habitat.

Lakelse Chinook CU Population

- ❖ Lakelse chinook CU encompasses all known chinook spawning and rearing areas within the Lakelse drainage.
- ❖ Lakelse chinook CU has 5 recorded spawning locales including Lakelse River, White, Coldwater, Williams, and Sockeye creeks. Lakelse River is the only spawning locale with a consistent chinook escapement record to 2000.
- ❖ Lakelse chinook stock is relatively small (<400). Individual and aggregate escapement records indicate a diminished abundance from the 1960s into the present. Decadal mean since 1950 is 180 chinook. Lakelse tributary chinook spawning is typically less than 20 fish.
- ❖ Chinook salmon spawn primarily from mid-August through September with chinook age 4's and 5's dominating the escapement.
- ❖ The only known stock enhancement is chinook fry released into Coldwater Creek during the late 1980s from Deep Creek Hatchery.

Lakelse Chinook CU HABITAT

- ❖ Lakelse chinook CU spawning and rearing habitats are composed of impacted sites in the tributaries and nearly natural condition sites in the Lakelse River.
- ❖ Chinook spawn principally downstream of the lake outlet with limited spawning in the Lakelse River mainstem in a patchwork of small groundwater receiving areas.
- ❖ Logging, related road, and urban development are the most widespread land use activity that has adversely affected high-value tributary chinook habitat.
- ❖ Future challenges and threats include: changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and the lack of fish management.

Early Kalum Chinook CU Population

- ❖ Early Kalum chinook CU encompasses all known chinook spawning sites in Cedar River including Anweiler and Hadenschild creeks, as well as Clear, Goat, Spring, and Star creeks. An unknown number of chinook also spawn in the upper Kitsumkalum River upstream of the lake. Early Kalum chinook CU is one of two distinct Kalum chinook runs.
- ❖ Early Kalum chinook CU principal spawning areas include Cedar River with 82% and Clear Creek with 18% of the escapement. Both streams have consistent escapements records from the 1950s into the present.
- ❖ Annual average escapement plunged from 1,475 chinook in the late 1950s to 222 chinook in the 1960s, increased to 1,100 chinook in the 1970s and the 1980s, fell to 673 in the 1990s, and increased to 1,200 in the 2000s. Chinook salmon spawn primarily from late July into mid-September with chinook age 5's and 6's dominating the escapement. Early Kalum chinook are stream type life history.
- ❖ Stock enhancement includes releasing CWT chinook fry from Deep Creek Hatchery into Cedar Creek.

- Early Kalum chinook CU pass through the coastal zone before the intense commercial fishing activity begins and the run is lightly exploited; however, this early run has been and can be heavily impacted by proliferate sport fishing activity.

Early Kalum Chinook CU HABITAT

- Cedar River has significant and productive spawning beds upstream to Sterling Creek and possibly further. Clear Creek supports extensive chinook spawning upstream for 9 km to the second reach break.
- Most of the streams flow clearwater except for the glacially-turbid Little Cedar River.
- Early Kalum chinook CU spawning and rearing habitats have been impacted by logging and related road development that has adversely affected high-value tributary chinook habitat. Adverse effects have declined but many still remain.
- Future challenges and threats include: changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and the lack of fish management.

Late Kalum Chinook CU POPULATION

- Late Kalum chinook CU encompasses all spawning in the upper (Beaver) and lower Kitsumkalum as well as Deep and Lean-to creeks at hundreds of spawning sites.
- Many of the spawning locales are known to support chinook spawning, but there are few escapement observations. Kitsumkalum River escapement is estimated by mark-recapture (CWT) since the mid 1980s with an escapement record from 1960 to the present.
- The late Kalum chinook CU represents approximately 30% of Skeena chinook in the escapement index and the stock is utilized as the North Coast exploitation rate indicator stock and as a Pacific Salmon Treaty sentinel stock.
- The late Kalum chinook are the largest size on the west coast of North America.
- Early Kalum chinook have stream type life histories.
- The predominant portion of returns occur at age 5_2 and 6_2 for males and at age 6_2 for females who generally mature a year older than other Skeena chinook stocks.
- Spawning migration occurs in early July through the estuary with spawning in late August and September.
- Between 30,000 and 250,000 CWT fed-fry have been released annually since 1979. Deep Creek Hatchery production for the exploitation rate indicator contributes an annual average of 2.6% of the total return.
- Stock-recruit analyses of the 1980 to 2000 period indicate the late Kalum chinook CU has been exploited at an unsustainable level most years and is likely representative of harvest pressures on other Skeena chinook stocks except the early Kalum and early upper Bulkley.
- Egg-to-fry survival can vary significantly. Downstream fry migration peaks in late April to mid-May.

Late Kalum Chinook CU HABITAT

- ❖ Critical late Kalum chinook spawning beds in Kitsumkalum River are distributed in the lower 3 to 9 km mainstem section and in the 0.5 km reach downstream of t Kalum Lake outlet and are especially concentrated between Spring and Deep creek confluences.
- ❖ The limited life history information indicates that juvenile overwintering is minimal.
- ❖ Logging activity including channelizing the river to enable log drives and related road development heavily impacted chinook habitat particularly downstream of Kalum Lake.
- ❖ The late Kalum chinook CU can suffer low egg-to-fry mortality from high and low-water events.
- ❖ Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates; ongoing forestry development creating additional cumulative impacts, and a lack of future fish habitat management.

Zymoetz Chinook CU POPULATION

- ❖ Zymoetz chinook CU encompasses all known chinook spawning and rearing areas from the Skeena mouth upstream to the headwaters. The Zymoetz system is locally known as the Copper.
- ❖ Zymoetz chinook CU has 7 recorded spawning locales with at least a hundred spawning sites. Major locales supporting chinook with or without escapement records include upper and lower Zymoetz, Salmon Run Creek, Simpson Creek, Clore River, Trapline Creek, Thomas Creek, Kitnayakwa River, Limonite Creek, and Corner Creek.
- ❖ Zymoetz chinook CU escapement information is limited with few estimates available other than from 1968 until 1994. Individual and aggregate escapement records indicate a slight increase of abundance from the 1960s into the present.
- ❖ All Zymoetz chinook populations are relatively small, have essentially the same run-timing and show few genetic divergences.
- ❖ Chinook salmon enter the Zymoetz in late June with spawning primarily from late-August through late September; however, run timing is annually variable, relatable to water conditions and age class returns that may indicate success or failure of one age or another. In most years, chinook age 4's and 5's dominate the escapement.
- ❖ Zymoetz chinook show a stream type life history.
- ❖ There are a substantial number of in-river sportfishers who intercept Zymoetz chinook.
- ❖ Chinook enhancement includes a chinook incubation box at Fossil Creel from 1981 to 1983. Chinook fry were released downstream of McDonnell Lake in 1984 and 1985; however, no returning adults were observed. Chinook fry were released in the sidechannel upstream of the lower canyon in 1984 and 1985.

Zymoetz Chinook CU HABITAT

- ❖ Zymoetz River forms a wandering gravel bed channel for about 6 km then is confined within the lower canyon for 3 km and in the upper canyon for 2 km. There is a 10 km stretch of unconfined river between the canyons. The river then widens out again to a multi-channel, wandering reach for about 20 km up to the Clore River confluence. Upstream of there, the river is confined by numerous bedrock obstructions. Zymoetz is a flashy system subject to extreme discharges and channel changes.

- Zymoetz cuts through the Hazelton Mountains and tributaries supporting chinook are for the most part coldwater, moderately steep gradient (2-5%), and relatively short.
- The mainstem floodplain has come undone a few times due to large flood events affecting logging, road construction, a gas pipeline corridor, and a hydro transmission line. These events and the ill=placed development caused channel instability, massive bank erosion, avulsions, rapid meander bend migration, large amounts of bedload mobilization, and loss of riparian function. Adverse effects have declined but many still remain.
- Future challenges and threats include: changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and a lack of future fish habitat management.

Middle Skeena-Large Lakes Chinook CU POPULATION

- Middle Skeena-large lakes Chinook CU includes a diverse selection of streams including Babine River-section 4 (Nilkitkwa Lake to fence); Babine River-section 5 (downstream of fence); Babine River-sections 1 To 3 (Rainbow Alley); Bear Lake; Bear River; Boucher Creek; Boucher; Fulton River; Morice River; Morrison Creek; Nanika River; Nichyeskwa Creek; Nilkitkwa River; and Tachek Creek. It is important to add Shelagyote River to the list of CU streams.
- Middle Skeena-large lakes Chinook CU is a ``lumper`` CU. The three multi-population lakes in this CU (Bear, Babine, & Morice) are geographically disjoint, are genetically distinct, differ temporally in return timing, and biologically different in age structure. They may be separated into three CUs at a later date.
- Morice, Bear, and Babine rivers have a fairly consistent escapement record from 1950 into the present and are among the top five chinook producers in the Skeena. Tributary stream escapements range from small to moderate size. The Babine River, Section 1, 2, 3, and 4 chinook counts are enumerated through the fence; all other CU counts are visual estimates. The Babine fence is located in the middle of the principal Babine chinook spawning grounds and chinook salmon frequently are not receptive to moving through weirs.
- Middle Skeena-large lakes chinook have stream type life histories.
- Chinook salmon spawn primarily from mid-August through September in the Middle Skeena-large lakes CU. However, the Morice chinook tend to be a bit later with spawning into October. Chinook 4 (4_1`s, $4_2$`s) and 5-year olds (5_1`s, and $5_2$`s) dominate the escapement except for the Morice chinook, which have a slightly higher percentage of six-year olds (12% versus 3%).
- Stock enhancement consists of minor chinook fry releases into Morice River from the Toboggan Creek Hatchery, fry releases from Fulton facility from 1975 to 1979, and releases annually averaging 45,000 fry and smolt from the Fort Babine Hatchery during the 1984 to 2005 period.
- Bear and Morice rivers exhibit exceptionally high chinook spawning densities.

Middle Skeena-Large Lakes Chinook CU HABITAT

- ❖ The habitat downstream of the three large lakes is considered very high quality due to the attenuated flows, moderated temperatures, and groundwater flows though predators are often prevalent.
- ❖ Spawning and rearing habitat in the tributary streams ranges from moderate to good depending on upstream development disturbance.
- ❖ Egg-to-fry mortality from high and low-water events can vary significantly in tributaries and subsequent annual escapement variability can be moderate.
- ❖ Logging and related road development is the most widespread land use activity that has adversely affected high-value tributary chinook habitat. On the Bear River, rail construction caused a series of landslides into the most valuable chinook spawning habitat.
- ❖ Future threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, resource development creating additional cumulative impacts, and a lack of future fish habitat management.

Middle Skeena-Mainstem tributaries Chinook CU POPULATION

- ❖ Middle Skeena-Mainstem Tributaries Chinook CU includes a mix of sites including: Date Creek; Hevenor Creek; Kispiox River; Nangeese River; McCully Creek; Cullen Creek; Sweetin River; Club Creek; Stephens Creek; lower Williams Lake Creek; Kitseguecla River; Kitsuns Creek; Comeau Creek; Shegunia River; Deep Canoe Creek; lower Bulkley River; Toboggan Creek; Canyon Creek; Suskwa River; Harold Price Creek; Simpson Creek; Kitwanga; Kitwancool Creek, Moonlit Creek; Kuldo River; Slamgeesh River; Shilahou Creek; and Damshilgwit Creek.
- ❖ Historically, chinook have been observed spawning in Canyon Creek;[1] Boulder (West), Insect, Burdick, Hazelton, and Chicago creeks and these streams should likely be listed in the CU.
- ❖ Kitwanga and Kispiox rivers have the highest escapements and fairly consistent escapement records from 1950s into the present. Kispiox River is among the top five chinook producers in the Skeena. The other streams range from small to moderate size escapement. Kitwanga chinook have for the most part been enumerated through the fence since the early 2000s; all other CU counts are visual estimates.
- ❖ Generally, CU-wide escapement has increased since the 1950s except for Kispiox mainstem.
- ❖ Middle Skeena mainstem tributary chinook have stream type life histories.
- ❖ Chinook salmon spawn primarily from mid-August through September in the Middle Skeena mainstem tributary CU; however, run timing is annually variable, relatable to water conditions and age class returns, which may indicate success or failure of one age class or another.
- ❖ In most years, chinook age 4's and 5's dominate the escapement.

[1] Located downstream of Slamgeesh River.

- ❖ Stock enhancement efforts in the CU have been moderate and consist of chinook fry releases into a variety of Kispiox River tributaries and the Shegunia River from the Kispiox Hatchery between 1977 and 2001.
- ❖ Many of the chinook spawning populations within the CU exhibit unique spawning characteristics.
- ❖ In all the Middle Skeena-Mainstem tributaries chinook spawning streams, egg-to-fry survival can vary significantly and thus, affect the abundance of age-class returns.

Middle Skeena-Mainstem tributaries Chinook CU HABITAT

- ❖ The diversity of habitats in the Middle Skeena-Mainstem tributaries chinook CU is large and complex.
- ❖ At least half of the chinook spawning and rearing habitat within the Middle Skeena-Mainstem tributaries CU has been impacted by logging, highway, railroad, agricultural, and urban development.
- ❖ Egg-to-fry mortality from high and low-water events can vary significantly.
- ❖ Future challenges and threats include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, ongoing forestry development in tributary sub-basins, and lack of future fish habitat management.

Sicintine Chinook CU POPULATION

- ❖ Sicintine chinook CU encompasses all known chinook spawning and rearing areas from the Skeena mouth upstream to the headwater lakes.
- ❖ Sicintine chinook CU has one recorded spawning locale with at least sixty spawning sites. Major tributaries supporting chinook with or without escapement records include Maxhla Didaat, Tommy Jack, and Endless creeks. Specific and total aggregate escapement is currently unknown. Chinook have been observed at 63 km and at least 30 pairs of spawners utilize the low-gradient, multi-channeled reach upstream of Endless Creek.
- ❖ All Sicintine chinook populations are relatively small, have essentially the same run-timing, and likely show no genetic divergences.
- ❖ Chinook salmon enter the Sicintine in late July with spawning primarily from late-August through late September; however, run timing knowledge is still evolving.
- ❖ Knowledge of Sicintine chinook life histories is limited. Chinook age information is unavailable.
- ❖ Sicintine chinook show a stream type life history.
- ❖ There is no known enhancement.

Sicintine Chinook CU HABITAT

- ❖ Sicintine River provides the principal drainage flows for the Atna and Sicintine Ranges. The lower 49 km are mostly confined in a narrow steep-sided valley. The upper 24 km meanders in a mostly unconfined valley bottom with extensive wetlands and is headwatered by the upper and lower lakes. This latter section supports high quality chinook spawning and rearing habitat.

- ❖ The tributaries supporting chinook for the most part possess steep gradient; however, Maxhla Didaat Creek is low gradient for 2.5 km to its lake.
- ❖ Sicintine chinook CU spawning and rearing habitat is in its natural condition.
- ❖ Future challenges and threats include: changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and the lack of future fish habitat management.

Upper Skeena Chinook CU POPULATION

- ❖ Upper Skeena Chinook CU encompasses all chinook spawning upstream of Slamgeesh River except for the Bear system. This includes the Squingula, the upper and lower Sustut and its tributaries, and the upper Skeena and its tributaries.
- ❖ Upper Skeena Chinook CU has 10 recorded spawning locales with at least eighty spawning sites. Major tributaries supporting chinook with or without escapement records include Squingula River, lower and upper Sustut River, Asitka River, Moosevale Creek, Johanson Creek, Mosque River, lower Chipmunk Creek, lower Barker Creek, lower Duti River, Kluatantan River, Tantan Creek, Kluayaz Creek, Skeena River North (upper), Currier Creek, Beirnes Creek, Otsi Creek, and Kluakaz Creek.
- ❖ Escapement records for the most part do not exist or are limited. There are fence counts for the upper Sustut and Johanson chinook for most years from 1992 into the present.
- ❖ Upper Skeena chinook have stream type life histories.
- ❖ Beyond a basic understanding of the migration timing and spawning, little is known about the biology of these high elevation populations.

Upper Skeena Chinook CU HABITAT

- ❖ The Upper Skeena chinook CU covers a large portion of the high interior headwater zone and the diversity of habitats is complex. The majority of the spawning habitat lies at relatively high elevations; for instance, spawning at Kluakaz Creek occurs at 1,372 m, while the Moosevale–Sustut confluence lies at 1,160 m elevation.
- ❖ The upper Skeena bisects the northwestern Skeena Mtns, while the Sustut cuts through the northeastern Skeena Mtns; both are steep and rugged.
- ❖ Most of the spawning occurs just downstream from lake outlets or is controlled by groundwater flows. Few spawning habitat have been surveyed.
- ❖ Linear developments such as rail and road corridors in the upper Sustut and upper Skeena have resulted in direct or indirect impacts to high-value chinook spawning and rearing habitat.
- ❖ Future threat includes: changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, and a lack of future fish habitat management. Proposed mineral and coal mine developments utilizing the abandoned BC Rail grade have multiple-scale habitat issues and concerns.

Upper Bulkley Chinook CU POPULATION

- ❖ Upper Bulkley Chinook CU encompasses all chinook spawning upstream of Morice River confluence including the Bulkley mainstem, Buck, Richfield, and Maxan creeks.
- ❖ Upper Bulkley Chinook CU has four recorded spawning locales with at least 40 spawning sites.
- ❖ Upper Bulkley Chinook CU may support two chinook stocks: the early run and possibly a later run that spawn in Buck Creek and downstream of there in the mainstem. These chinook are slightly bigger and run slightly later, but are all counted as upper Bulkley chinook.
- ❖ Upper Bulkley chinook escapement records are fairly consistent from 1950 to 2006. Escapement in the upper Bulkley mainstem has apparently increased since the 1950s; however, the tributary escapement records are incomplete and limiting to determining any trends.
- ❖ Migration timing past Tyee Test Fishery is only partially recorded due to the early timing.
- ❖ Spawning migration timing is noted as starting in early June through Moricetown Canyon. Average peak of spawning is mid August. Migration to the upper reaches of upper Bulkley River (upstream or Bulkley Falls) is dependent on accessible water levels and timing.
- ❖ Upper Bulkley chinook are genetically distinct and have stream type life histories.
- ❖ Beyond a basic understanding of the migration timing and spawning locations, little is known about the biology of these chinook populations.
- ❖ Since 1985, there has been considerable history of chinook fry and smolt enhancement from Toboggan Hatchery to Maxan, Bulkley mainstem, and the Buck that served as a CWT indicator stock. The wild status of upper Bulkley chinook is uncertain.

Upper Bulkley Chinook CU Habitat

- ❖ The upper Bulkley drainage is for the most part subdued, rolling country with some of the lowest precipitation and streamflows in Skeena watershed. The relatively low amount of precipitation causes the discharge of low and medium elevation tributaries to drop off sharply following spring freshet. Summer and early autumn are characterized by low flows.
- ❖ Bulkley Falls is considered impassable to fish at low water levels.
- ❖ Upstream and downstream of Bulkley Falls, persistent beaver dam activity typically obstructs fish passage.
- ❖ A century of habitat degradation has led to adverse cumulative effects to chinook and their habitat. Hillslopes, roads, riparian areas, stream channels, and fish habitats have been impacted by land use practices. Development includes rail and highway corridors that continue to significantly impinge on fish habitat, logging and road construction. Agriculture practices have caused erosion and deposition of sediment on a moderate to large scale. Restoration activities have been minimal.
- ❖ Migration habitat issues center on the CN Rail line that was built through the middle of the floodplain, impacted access into the mainstem floodplain and tributaries, and caused sedimentation. The rail line functions as a contaminated linear corridor.
- ❖ Future threat includes: changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates, a lack of fish habitat rehabilitation, and a lack of fish habitat management.

Skeena River-Type Sockeye CU Population

- Twenty known river-type sockeye spawning sites are spread throughout the CU. The degree of persistency with these sites is varied with many unknown. There are likely many more undocumented small spawning populations.
- No consistent escapement records.
- There is a lack of documentation regarding migration and spawning timing.
- Few if any DNA collections.
- Beyond a basic understanding of their presence, little is known about the biology of these stream-type sockeye populations.

Skeena River-Type Sockeye CU Habitat

- Spawning sites are thought to be influenced by groundwater inputs.
- Some spawning sites may be characterized as fall-back sites due to upstream fish passage obstructions such as impassable falls at low or high water levels.
- Many sites are persistent spawning locations distinct to stream-type sockeye spawners.
- Future threat include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of future fish habitat management.

Skeena High Interior River-Type Sockeye CU Population

- Three known river-type sockeye spawning beds spread throughout the CU. All sites are known to be persistent. There are likely many more undocumented small spawning populations.
- No consistent escapement records.
- There is a lack of documentation regarding migration and spawning timing.
- No DNA baseline collection and interpretation.
- Beyond a basic understanding of their presence, little is known about the biology of these stream-type sockeye populations.

Skeena High Interior River-Type Sockeye CU Habitat

- Spawning sites are thought to be influenced by groundwater inputs.
- Future threat include changing freshwater and ocean conditions linked to global climate change that could be expressed in poor freshwater and marine survival rates and a lack of future fish habitat management.