SUMMARY OF SKOOKUM BASIN SUMMIT
25 MARCH 2019
Squaxin Island Tribe Natural Resources Department
(revised for use in SPSSEG grant proposal)

Compiled by Sherry Wilhelm based on notes taken by Erica Marbet and Sherry Wilhelm and materials and comments submitted by summit participants and invitees who were unable to attend.

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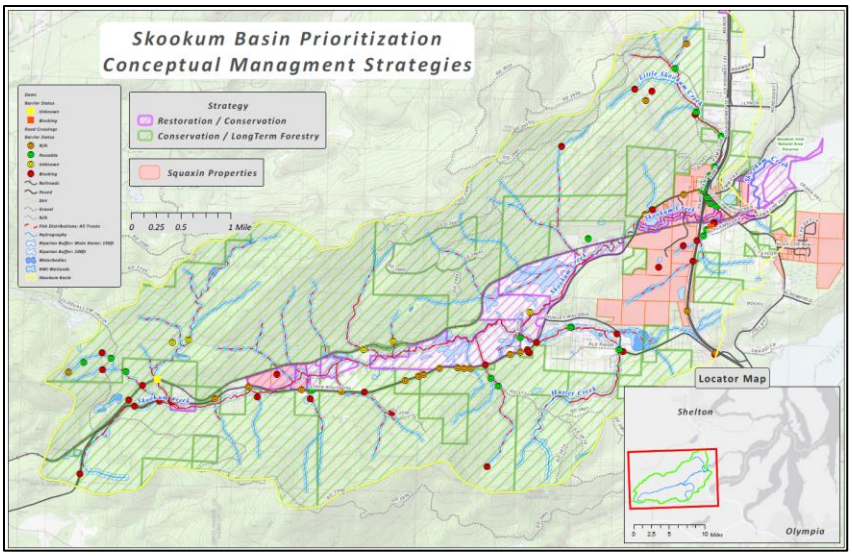
1 SUMMIT OBJECTIVE AND DOCUMENT STRUCTURE

Purpose: To initiate the development of a natural resource management strategy that identifies and prioritizes restoration and conservation actions and opportunities within the Skookum Creek watershed. Major opportunities for conservation and restoration are developing:

- The Tribe and the Capital Land Trust are working to acquire a major portion of valley floor (via Washington State Recreation and Conservation Office grants).
- Much of rest of basin (77% of basin, 68% of permanent water courses) is owned by the Tribe and forestry industry.



Source: Brian McTeague, Squaxin Natural Resources

Method: Bring together knowledgeable people with diverse expertise for a brainstorming, neuron-stimulating discussion.

Contents

1.1 Objectives of this Document

- Summarize discussion at summit and follow-up comments
- Lay out next steps for conservation and restoration planning
- Encourage big-picture thinking about opportunities in Skookum Basin.

1.2 Structure of this Document

This document is a record of material shared and discussed at the summit, re-arranged into sections by topic, with the addition of the introductory materials and figures circulated before summit and the related comments submitted after the summit. The document begins with sections about the physical setting and hydrology of the basin, followed by sections on specific animals and plant communities in the basin.

Contents of each topic includes:

- Summary of current knowledge and available data.
- Important questions, gaps in knowledge, and resources. (The importance of addressing these questions and gaps will be determined by priorities for basin – it's not necessary to address all of them.)
- Actions that would improve conditions (listed for individual or multiple topics).

Following the sections on individual topics, the document closes with a section focused on restoration, especially the possible acquisition of farmland and wetland in the lower basin, and a brief outline of next steps for this effort.

2 SUMMIT PARTICIPANTS

Attendees (acronym; expertise):

- Evan Bauder, Mason Conservation District Habitat Program Manager, WRIA 14 lead entity manager (MCD; habitat restoration)

- Steve Boessow, Washington Department of Fish and Wildlife (WDFW; fish habitat, instream flow, water rights)
- Brian Combs, South Puget Sound Salmon Enhancement Group (SPSSEG; wetland and stream restoration)
- Jeff Dickison, Squaxin Natural Resources Department, Assistant Director (Squaxin NR)
- Wendy Gerstel, Qwg Applied Geology
- Mark Golliet, Green Diamond Resource Company Senior Biologist (GDR)
- Katrinka Hibler, MCD District Engineer
- James Losee, WDFW (fish biology)
- Chris Madsen, Northwest Indian Fisheries Commission (NWIFC; elk management)
- Erica Marbet, Squaxin NR (forest hydrology)
- Aimee McIntyre, WDFW Wildlife Biologist (amphibians)
- Brian McTeague, Squaxin NR (GIS)
- Chris Pitre, Coho Water Resources (CWR; hydrogeology, watershed planning)
- Claudine Reynolds, Port Blakely Tree Farms (PBTF; ecology)
- Scott Steltzner, Squaxin NR, Project Manager
- Andy Whitener, Squaxin NR, Director
- Sherry Wilhelm, CWR (water cycling, GIS)
- Sarah Zaniewski, Squaxin NR, TFW Habitat Biologist

Not able to attend:

- Jean Caldwell, Caldwell & Associates (freshwater ecologist/watershed scientist)
- Elizabeth Campbell (Squaxin community garden member) – sent comments
- Paul Cereghino, NOAA (restoration ecology)
- Brian Murphy, WDFW (elk management) - sent comments
- Aleta Poste (Squaxin community garden member) - sent comments

- Pat Powers, Waterfall Engineering (restoration concepts)
- Lawrence Reeves, Capitol Land Trust
- Karin Strelioff, MCD Environmental Specialist and Designer - sent comments

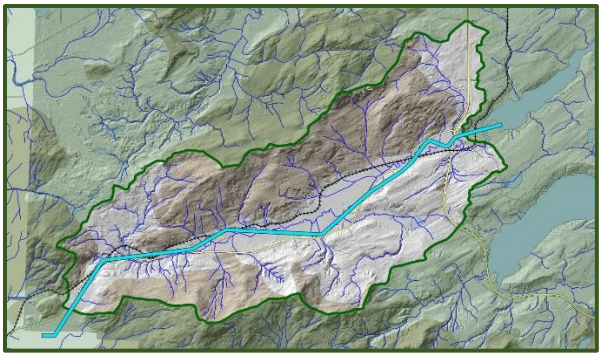
3 PHYSICAL SETTING OF SKOOKUM BASIN

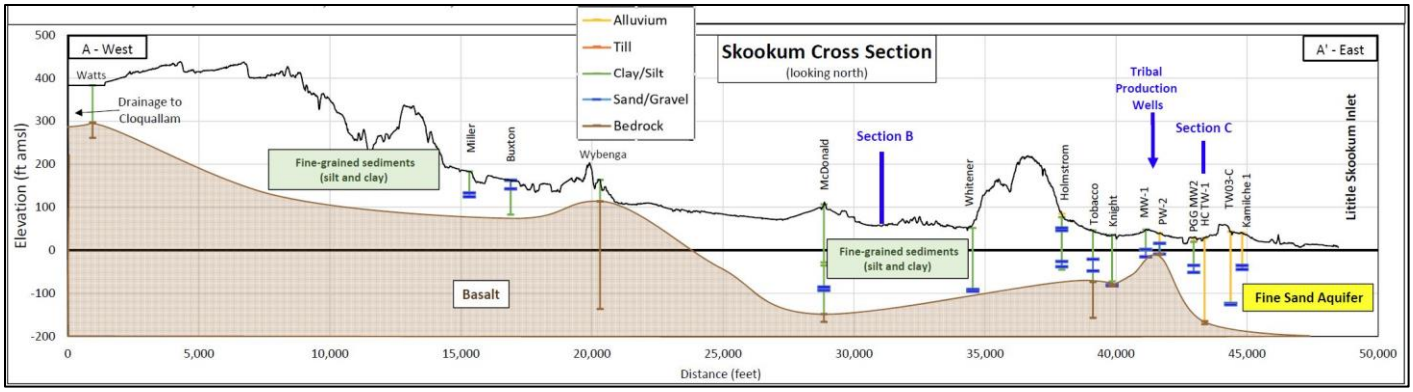
3.1 Size and geology

The Skookum Basin in southern Mason County, Washington, covers about 18 square miles, with the mainstem Skookum Creek extending about 6 miles in length from east to west. The basin's elevation ranges from sea level at the creek's mouth to more than 1500' amsl along its southern border.

Currently mapping of surficial geology of most of basin has only been done at 1:100k resolution. 1:24k resolution map should be issued at some point and will improve geologic understanding. Understanding has been improved by CWR's compilation of well logs and interpretation in cross-sections.

The Skookum watershed is underlain by basalt bedrock and its unconsolidated sediments have been laid down during multiple glacial/interglacial cycles. On the basin's side slopes, bedrock is covered with a thin layer of soil and glacial sediments, but the valley floor is filled with roughly 200' of sediments. In most of the valley the sediments are predominantly clays and silts, lake sediments deposited during by glacial impoundment. The sediments also include thin, discontinuous layers of sands and gravels. Within a mile of the creek's mouth, the valley is filled in part with fine sand deposits.

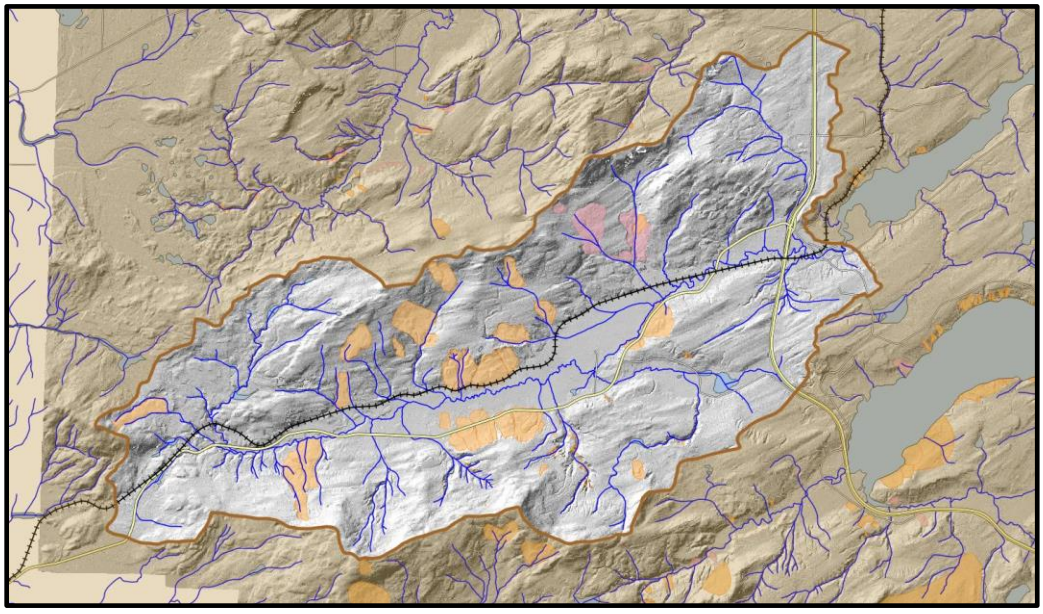




Geologic cross-section along valley axis.
Path of cross section shown in blue in upper figure.
Source: Coho Water Resources.

Landslides have occurred around edges of valley floor, including one near McDonald Creek in late 1990s. Landslides and landslide deposits are probably important in supplying sediment to stream system. Expect update of geologic map to more clearly show till-covered areas of hillsides that may be susceptible to landslides.

Existing 1:100k mapping shows a fault paralleling Skookum Cr. Valley.

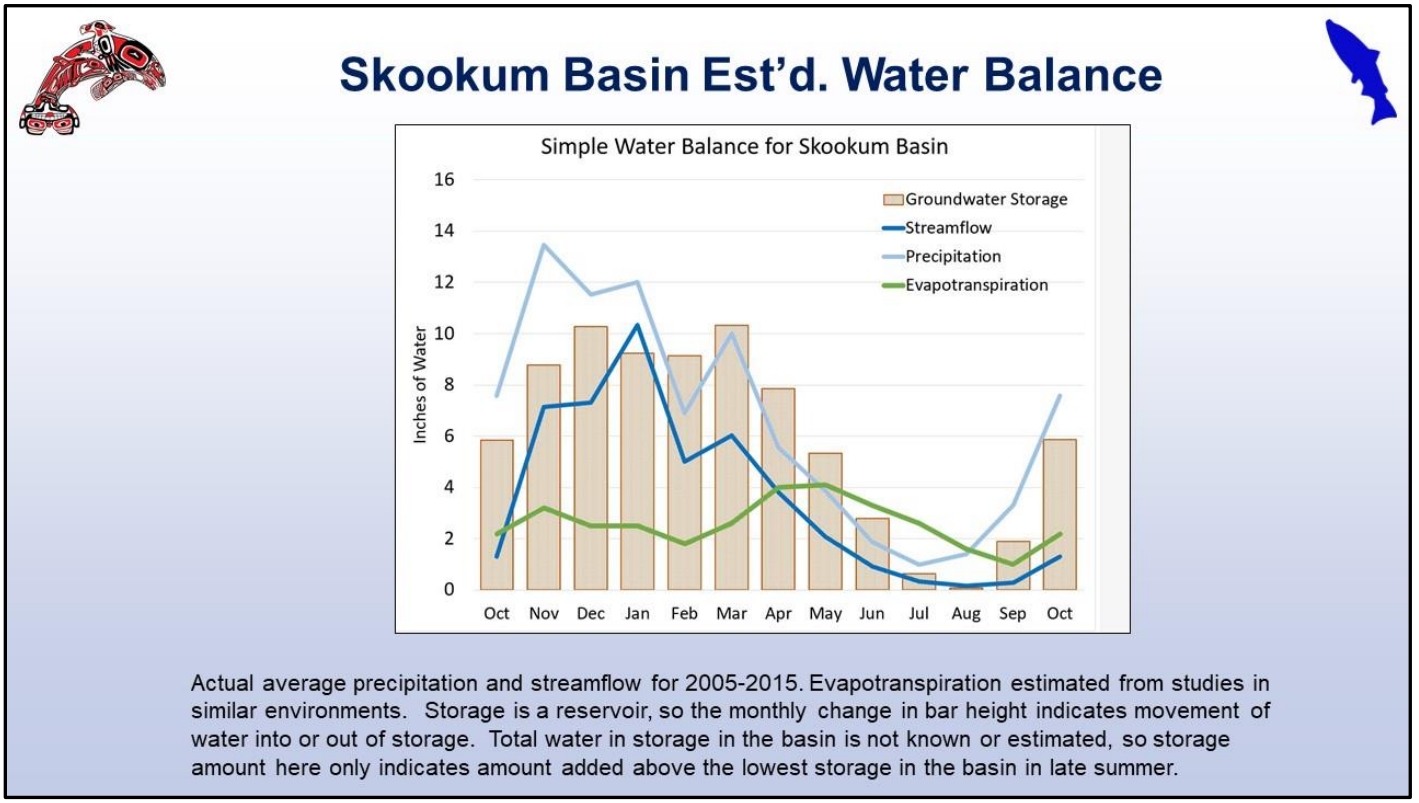


Landslides (pale orange, pink) in Skookum Basin.
(DNR Washington Geologic Survey. Database is incomplete).

Questions/Data/Resources:

- Where is landslide risk? Inventory and characterization: where they are, what their activity level, and sediment gradation of sediment contributions. Higher resolution lidar will be issued in fall. Will enable better landslide mapping.
- Is there any recent/additional work on describing and dating fault activity? Might also have something to do with groundwater upwelling zones.
- Similarly, are there any bedrock highs that might control locations of groundwater upwelling?
- When does DNR WGS plan to issue 24k Kamilche quad?
- Consult with WGS, offer to share compiled well cross-sections, ask to direct some of their data gathering to answer questions that Tribe wants answered.

3.2 Water Balance for Basin



Source: Coho Water Resources

- In an average year the basin receives approximately 80" of precipitation. An equivalent of 45" (almost 60%) leaves the basin as streamflow. Estimate that flow equivalent to 3" is summertime baseflow in Skookum Creek.

- Understanding water fluxes in basin difficult due to uncertainty about evapotranspiration (ET). In coniferous forests and other "rough" vegetation, interception can be 20-30% of precipitation annually.
- The estimated monthly water balance shown in the figure yields about 11" of groundwater recharge/increase in storage during rainy months (and subsequent discharge during drier months) annually.

3.3 Hydrogeology

- Bedrock provides little water storage, and groundwater moves slowly into and out of the valley's clays and silts.
- Limited usable groundwater found in fine grained sediments in main valley and Hurley valley.
- Relatively little underflow to marine waters from basin. Underflow (groundwater flow to Puget Sound) in Skookum's thin, discontinuous aquifer may be only 3% of the total water budget.

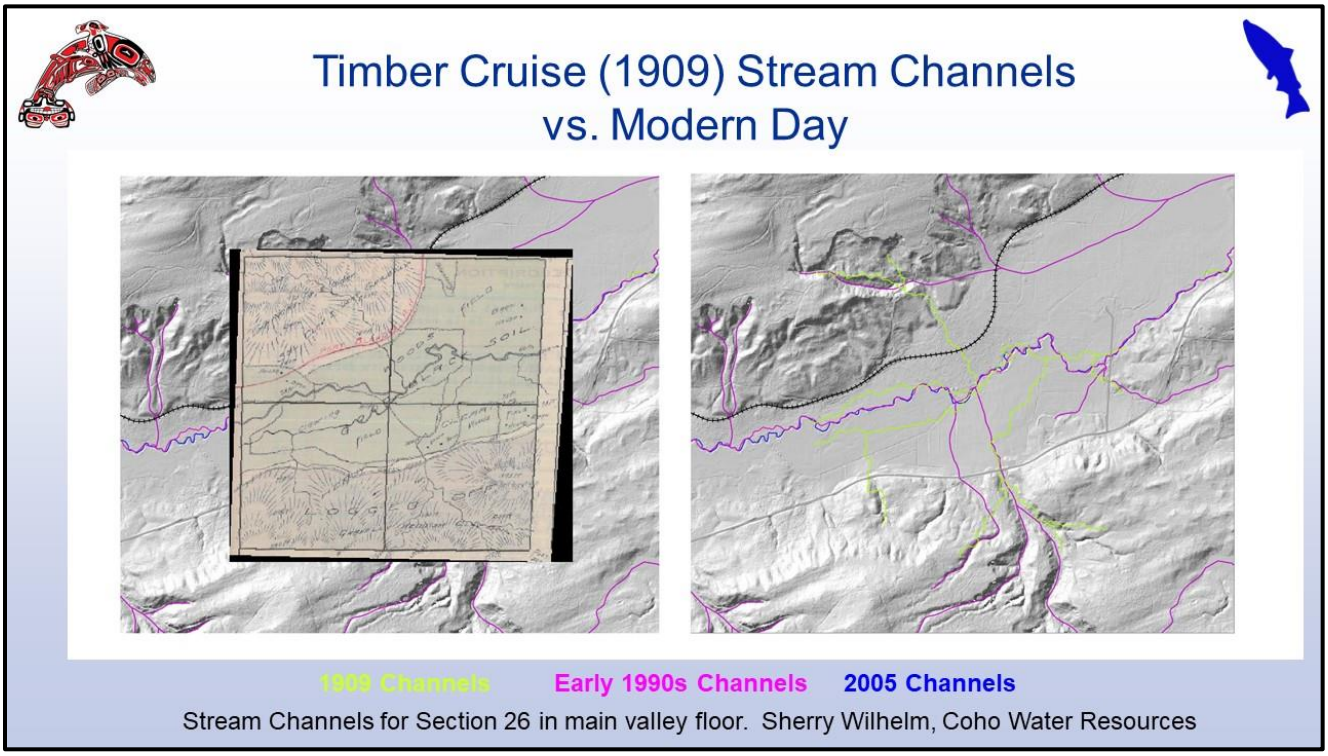
3.4 Stream Network/Geomorphology

Mainstem seems incised into fine grained sediments on valley floor, without an extensive floodplain in most places. Central valley has extensive ditch network in order to drain soil for hay cultivation. Tributaries channelized into ditches when they reach valley floor. Scott mentioned that Andy Whitener remembers pulling large woody debris (LWD) from Skookum Creek in early 1980s under state direction (WDFW?). Now would like stream to have more LWD.

Not clear how current stream channel might differ from pre-development channel. Timber cruise records show conditions in 1909. When compare with state's stream maps and channels shown in 2005 LiDAR, it appears that humans didn't move the mainstem towards Hwy. 108, but the tributaries were really straightened to connect more directly with the mainstem. They used to have meanders and travel down valley before joining mainstem.

Brian C's impressions of general changes in streams during European settlement: Prior to sweeping changes caused by man-made activity, much of the stream system probably flowed through dynamic vegetation and wetland areas that were some combination of forest and scrub-shrub plant communities. Beaver ponds or other wetland types were

likely to be present, as was the case with most WWA lowland systems. As such, it is possible/likely that the stream bed had elevations varying from today's simplified condition. The removal of complexity from the stream and riparian area (i.e. removal of trees, logs, beaver dams, brush) may have induced rapid (as in years or 1-2 decades) scour and simplification of the channel. If so, a feedback loop of sorts will have led to sediment evacuation, increased sheer stress in the channel, and degradation of fish habitat.



Blockages to tributaries

(See Section 4.2: "Salmonids and Other Fish" for details of impacts on fish.)

Particular area of focus is around river mile (RM) 8 – 8.5 near where north and south forks join and where Hwy. 108 and RR cross stream. There is potential 6 to 20 miles of spawning habitat above this area on the north fork. James has walked the stream just above RR crossing, seems to have relatively low gradient so good for spawning. Probably best to unblock Hwy. 108 culvert first, then culvert below RR crossing.

Railroad (RR) bed on north side of valley floor and highway 108 on south side both built with culverts/underpasses that block upstream fish passage and downstream movement of coarse-grained materials.

Sarah - Tribe has recently realized importance of culverts in "above-valley" zone (in more western basin), where there are better quality reaches upstream, compared to culverts on tributaries in the lower parts of the basin that may offer more lineal stream gain if made accessible.

Brian C or James – When culverts are blocked, does water come through on downhill side as springs? Are there opportunities to tap these areas to create locations of cold-water refugia in stream?

Erica – There are some signs of seepage in vicinity "upstream" of Skookum Ranch (man-made) wetland in central valley. Natural drainage here has been disrupted/disconnected.

Working with railroad:

RR exempt from all regulations due to early land ownership/grant. Railroad tracks run from Hoquiam through Skookum Valley out to Bremerton and Bangor and are privately owned (ownership changed recently, now owned by Puget Sound & Pacific Railroad):

https://www.gwrr.com/railroads/north_america/puget_sound__pacific_railroad#m_tab-one-panel

RR may allow activities that help environment but don't cost them money or take line out of service. Evan - Working with this RR on Johnson Farm. Evan was able to get the railroad's attention, and they were open to boring through the railroad bed/under tracks to open fish passage.

Brian C - We may do best to approach RR for a major restoration in a few years, when have funding lined up and can undertake unblocking the whole set of culverts. Better chance of success than separate requests for individual projects. There is an improved culvert inventory underway in this area.

Working with WSDOT:

Tribe has worked with DOT in past to add culverts to list of those needing attention.

Tribe should communicate evolving priority of culverts to DOT. We could put more pressure on DOT, not sure what their current priority culverts are in basin, may be on back burner since Little Creek culvert was such a big project.

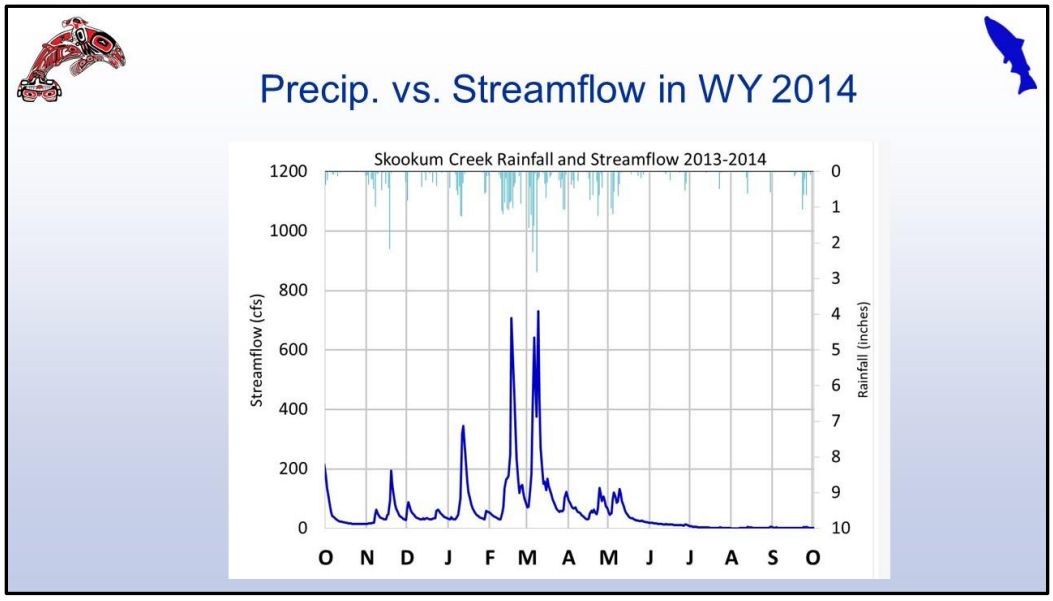
Forestry companies:

Claudine - PBTF has completed unblocking known fish-passage culverts, but occasionally find additional blocking culverts to be addressed. Also, PBTF occasionally finds different fish distribution.

Questions/Data/Resources:

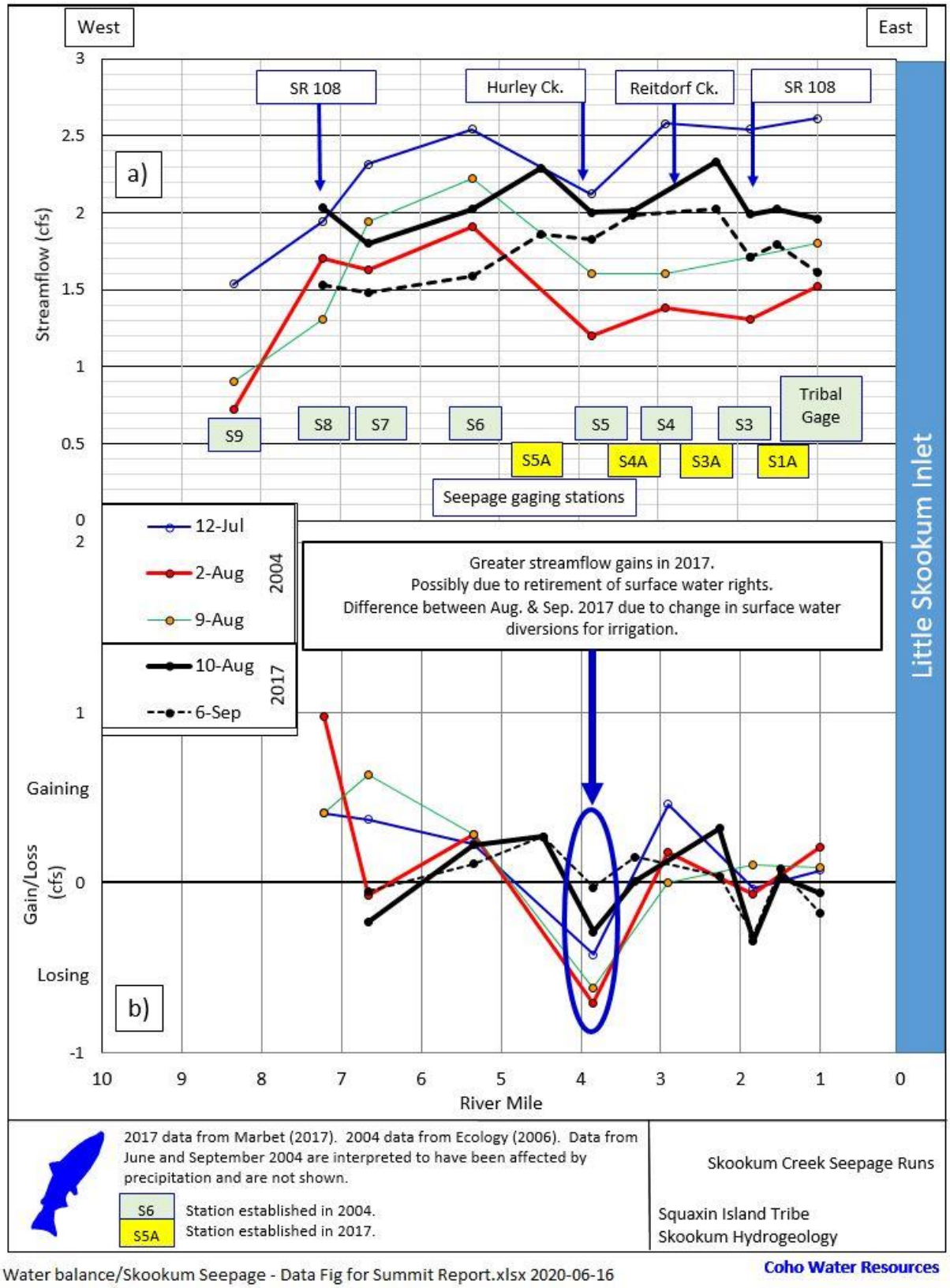
- Higher resolution lidar will be issued in fall. Will show another snapshot of stream channel locations.
- Collect additional stream cross-sections on mainstem, including incised reaches, and tributaries. Steve has several cross-sections from 8 locations around RM 7.3, as well as a surveyed longitudinal profile in this area. Pat Powers has also collected some.
- Were the mainstem stream reaches in old lakebed sediments as entrenched as now before clearing, agricultural use in valley?
- Where does the water in agricultural ditches come from?
- What were original stream and valley conditions? Look for additional sources of historical information (settlers' accounts, photos, maps) – Brian Combs has advice that can help with search.
- Conduct complete barrier inventory along RR tracks.
- How do we engage the railroad for restoration?
- Determine WSDOT schedule for culvert removal/replacement throughout basin.
- Keep track of improved information on culvert inventories and conditions.

3.5 Streamflow



Source: Erica Marbet, Squaxin Natural Resources

- Because of the thin soils on the slopes and the low permeability of the clays and silts, winter rains lead quickly to high peak flows in mainstem Skookum Creek. Most rainfall leaves the watershed as surface runoff in the rainy season.
- Summer stream flow can be less than 1 cubic foot per second (cfs). The instream flow rule for Skookum Creek sets a summer stream flow target of 3 cfs. Some summer stream flow is still diverted for agricultural uses.
- Little Creek drops down to less than 0.25 cfs in late summer, and some of its lower reaches go intermittently dry.
- Hurley Creek - Lower Hurley Creek is a choked, open channel that is a barrier to better reaches upstream. Erica has noticed a cold, seepy ditch that feeds into Hurley Creek right before it hits the mainstem.
- Chris P- Explaining the seepage run data in figure in CWR hydrogeology report (summer 2004 and 2017): stream flow increases at bedrock-valley sediments contact, but then mostly levels off in main valley. Areas of decrease in flow are due to direct diversion of surface water and groundwater pumping.
- The USGS collected stream flow measurements in Skookum Creek in the 1950s. The Tribe has collected stream flow measurements since 2004.
- Sherry - Similar climate and water use since the 1950s, but the seven-day low flows from are lower now than they were in the 1950's. Modern-day three-day peak flows are almost double what those in the 1950s.


West
East
SR 108
Hurley Ck.
Reitdorf Ck.
SR 108
a)
Streamflow (cfs)
3
2.5
2
1.5
1
0.5
0
S9
S8
S7
S6
S5
S4
S3
Tribal Gage
S5A
S4A
S3A
S1A
Seepage gaging stations
Little Skookum Inlet
12-Jul
2-Aug
9-Aug
2004
10-Aug
6-Sep
2017
Greater streamflow gains in 2017.
Possibly due to retirement of surface water rights.
Difference between Aug. & Sep. 2017 due to change in surface water diversions for irrigation.
2
1
Gaining
Gain/Loss (cfs)
0
Losing
-1
b)
10
9
8
7
6
5
4
3
2
1
0
River Mile
2017 data from Marbet (2017). 2004 data from Ecology (2006). Data from June and September 2004 are interpreted to have been affected by precipitation and are not shown.
S6 Station established in 2004.
S5A Station established in 2017.
Skookum Creek Seepage Runs
Squaxin Island Tribe
Skookum Hydrogeology
Water balance/Skookum Seepage - Data Fig for Summit Report.xlsx 2020-06-16
Coho Water Resources

- More tidal influence in lower reach as sea levels rise. At Hwy. 101 gage, we have already see periodic tidal influence. Erica – can use # of days of "tidal overflow" of gage as indicator of local sea level rise over time.

Reducing peak flows:

- Would increased riparian vegetation or land use improvement be effective in reducing peak flows that rip out redds?
- Stormwater management – Tribe did small demonstration project/retrofit in Legal Services parking lot in Little Creek basin, with MCD/Katrinka's help.

Questions/Data/Resources:

- Investigate seeps and springs (location, flow volumes, water quality, temperatures, and sources). Data might be useful in predicting where additional groundwater contributions occur, or in explaining gaining vs. losing reaches of Skookum Cr.
- Consider gaging key tributaries.
- Will changes in land use / restoration lead to observable changes in streamflow? Chris P. and Steve think you wouldn't necessarily see a direct response, but you will get a general temporal trend. It's helpful but almost impossible to pin changes in stream flow to impact of a specific project.
- Re-install gage at USGS location to be closer to restoration activities (upstream of tribal activities) and avoid future interference in discharge measurements from tidal influence in lower creek.

3.6 Water Use

- Summarized by Chris P.
- Approximately 250 residents of the main valley and Hurley valley rely on groundwater from discontinuous sand and gravel layers within the thick valley sediments. They use permit-exempt domestic wells.
- The Tribe's water supply, for both its approximately 450 reservation residents and its enterprises, is provided by wells in the fine sand aquifer in the eastern basin. (CWR, Oct. 2017, Water Demand/Supply Analysis)

Based on water rights records, agriculture is 80% of all human water used during peak summer use. Agriculture relies on surface water mainly.

If Tribe acquires agricultural water rights with valley land, should put in trust or at least maintain use, so as not to relinquish back to state.

The Tribe produces reclaimed water from its wastewater and uses it as the main source of irrigation water for the Tribe's golf course. Tribe often produces more reclaimed water in the winter than it can store for use during the summer. Tribe desires to minimize its impact on the stream and is open to changing operating schedules, etc.

Questions/Data/Resources:

- What is actual water use by agriculture in basin?

3.7 Stream Water Quality

Skookum Creek is listed as impaired for temperature and fecal coliform bacteria on EPA's 303(d) list.

3.7.1 Temperature

- Cold groundwater sources to Skookum Creek come from the headwaters of the mainstem and some small tributaries. Minimal groundwater baseflow occurs in the lower valley under current conditions. CWR has documented, but not quantified, that baseflow in the lower valley is reduced by groundwater pumping.
- Chris P - Explaining temperature profile from 2004 FLIR survey. At Hwy. 108 crossing around RM 8, temperature is 15 ^{O}C or less. Moving downstream, temperature increases over next ~2 miles, then it plateaus at 17 – 19 ^{O}C below river mile 6 and through central valley. Then below river mile 1, the channel is wide and meandering and influenced by the inlet, and the temperature goes up to 23 ^{O}C, due in party to the lack of vegetation shading and the relatively long residence time of water in the shallow inlet.
- James - Is railroad blockage tied to a temperature drop seen just upstream of RR crossing around RM 8.5/9? Chris P- That has more to do with the bedrock/sediment contact point.

Little Creek reaches that remain flowing during summer have cold groundwater (14°C) that sustains juvenile coho salmon and cutthroat trout.

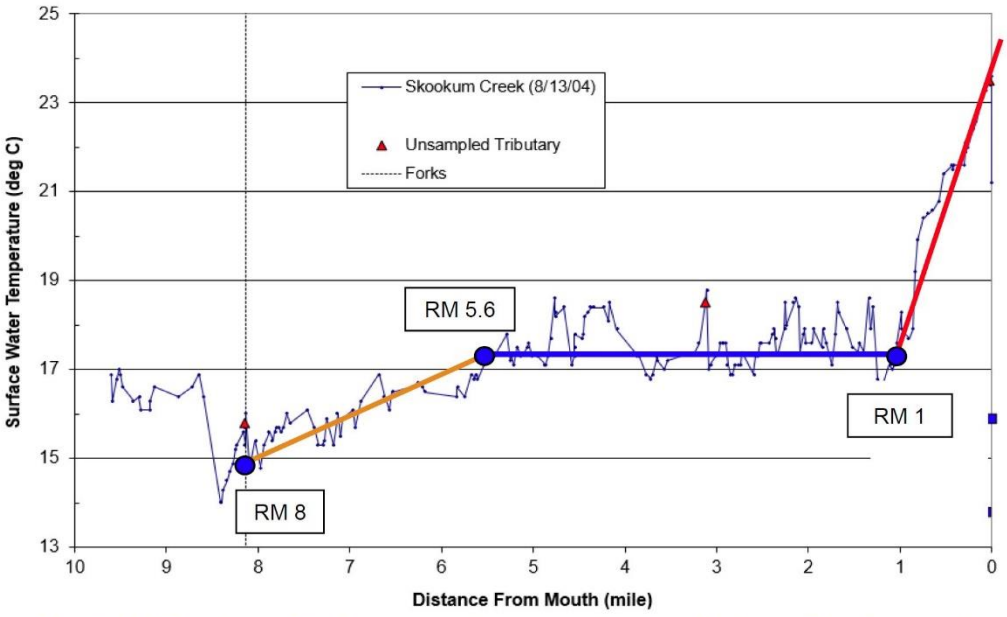


Figure 1. Skookum Creek water temperature longitudinal profile. Forward-Looking Infra-Red (FLIR) flight on August 13, 2004 (Watershed Sciences 2004).

Source: Coho Water Resources.

The Tribe conducts continuous temperature monitoring at the Hwy 101 gage.

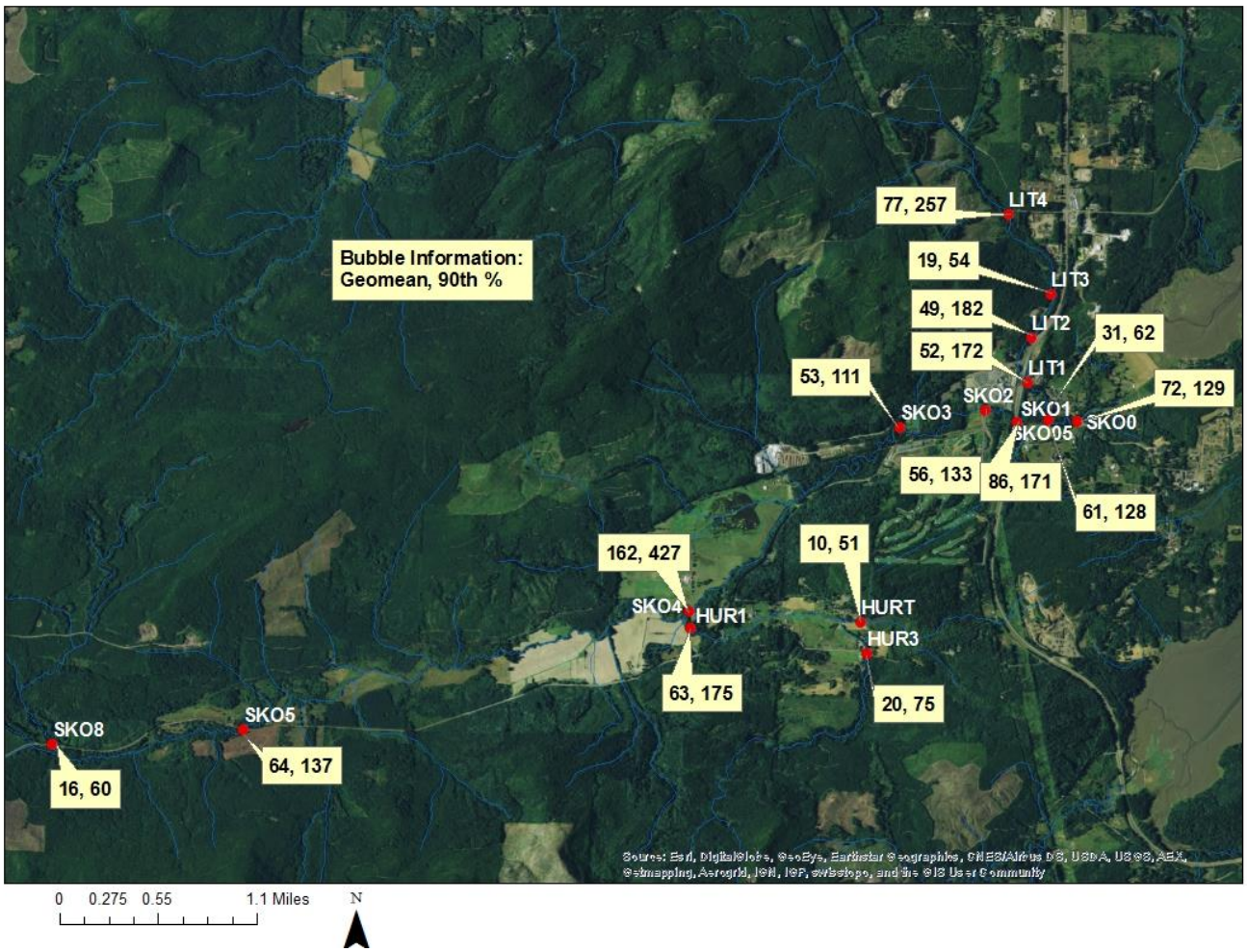
Annual summer high temperatures in Skookum Creek are routinely higher than 16°C, the state standard threshold temperature for rearing salmonids.

There have been and continue to be riparian restoration projects along the Skookum Creek to address stream temperature.

3.7.2 Fecal coliform/bacteria

Erica – Fecal coliform levels elevated in several locations in basin. Collected samples for fecal coliform concentrations in 2015 (see figure).

Mason County and Mason Conservation District have worked with farmers and land owners in the watershed to contain livestock and maintain septic systems. Some transient people associated with the casino and transit station camp out on Skookum and Little Creeks. The Tribe seeks to keep transient populations from leaving waste along streambanks. Bacteria can also be a problem in parking lots and highway stormwater outfalls, as they collect bacteria that are left by humans and animals. The casino managers have placed many dog waste receptacles near walking paths on the casino campus.



Concentrations of fecal coliform in Skookum Creek and tributaries in 2015.
Shown as geometric mean and 90th percentile of three samples,
units are # of colonies per 100 mL. Source: **Squaxin Natural Resources**

Questions/Data/Resources:

- Consider more temperature monitoring at important location to refine details on temperature patterns.
- The Tribe monitors water quality with collection of samples monthly from location near the Knight property.
- Washington Department of Ecology developed a water quality improvement report and implementation plan in 2006 and 2007 respectively: (https://fortress.wa.gov/ecy/publications/documents/0603007.pdf).

Actions to improve stream conditions for fish (includes actions related to hydrogeology, streamflow, and stream water quality):

- Brian C – Given likely incision of stream channel in past, it will be hard to improve stream habitats without large-scale corrections (adding roughness and replicating ponds/wetlands with Beaver Dam Analogs or actual beaver establishment or other methods) as well as strategic vegetation recruitment.
- Focus on improving, expanding usable habitat for coho and other salmonids.
- In main valley, look for opportunities to aggrade stream bed, increase meanders in channels, increase channel diversity.
- Also add LWD - import logs from Cushman.
- Think about various ways to slow passage of water through the basin – rain gardens along roadways?
- Unblock culverts and other stream barriers:
- Consider use of beaver dam analogs (BDAs) in main valley or forested uplands to increase storage and moderate peak flows.
- Consider encouraging beaver activity in basin.
- Focus on upper end of valley and opening up upper reaches to fish. Prioritize removal of blocking WSDOT culvert near RM 8. Then tackle removal of nearby RR blockage.
- Brian C - Question about seeps: can we install shallow wells in degraded wetland or drained areas to see if we could find and tap into cool, shallow groundwater, to essentially create springs? Brian has done some work with Pat Powers and found cooler waters in shallow groundwater/hyporheic areas.
- Learn about constructed gravel pool features that can help regulate stream temperatures (Brian C has talked with Paul Bakke [US FWS] about this).
- Increase summer flow in Little Creek. Explore application of reclaimed water to sand sediments at old septic field. Should include optimizing schedule of filling of reservoir vs. applying reclaimed water to streamflow enhancement.
- Add riparian vegetation to shade stream, keep stream T lower.
- Consider current arrangement of ditches in valley and possible improvements if remove or alter some or all. Develop a "ditch management plan."
- Clean up transient camp along Little Creek.

- Evan - Outreach to farmers in Hurley-Waldrip valley to encourage stewardship of stream, possible participation in CREP (Conservation Reservation Enhancement Program). Could reduce water quality impacts of agricultural activities.

3.8 Wetlands

Wetlands cover less than 3% of the basin and are located along stream channels and on the valley floor. Many wetlands have been ditched and drained, but some stream-adjacent wetlands remain intact on the north side of the creek mid-valley.

Scott believes that much of valley floor was originally forested wetlands. Currently areas with forested wetlands in valley floor stay wet throughout the summer. May be related to gaining and losing stream reaches.

It's hard to devise a restoration of wetlands in the valley until we know the historical location of wetlands.

Specific Wetlands:

Skookum Ranch: This large wetland exists in the lower valley and has perennial flow. The big wetland pond was artificially enhanced with a dike added in the 1990s and is covered by an NRCS conservation easement. The dike is currently falling apart. The wetland hosts waterfowl and some fish enter and cross it. If the Tribe acquires this property, they may choose to maintain this wetland in some form.

Upper Hurley Valley: Additional wetlands are located in NE of H-W valley. Not much known about them.

Port Blakeley property in valley: Sarah - The Port Blakely piece on the north side of the valley is in good shape and has had relatively little modification. It is an old Christmas tree farm planted with Norway spruce. The trees are dying now as soil becomes too wet. Sarah has found salmon carcass, indicating some use by fish. Could serve as a control area as Tribe restores larger NRCS/Skookum Ranch wetland in lower valley.

Questions/Data/Resources:

- How does agricultural activity affect water level in Skookum Ranch wetland?
- What is impact of Skookum Ranch wetland on water storage and water temperature in summer?
- Is Port Blakely property intact habitat? Sarah would like a forestry person or ecologist to consider health, functioning of this property.
- What is relative ecological value of different wetlands?
- Helpful to conduct vegetation survey in the Skookum Ranch wetland and smaller surrounding wetlands.
- SPSSEG has done wetland stream restoration and revegetation in other location, so can offer lessons learned from past restorations.

Actions: Consider opportunities to enhance/restore wetlands. Wetlands were extensive before development, so re-establishing them in appropriate places may improve valley hydrology/stream health and provide important habitat for many species. May also be helpful for water storage capacity to prepare for drier summers with climate change.

4 FAUNA AND FLORA OF SKOOKUM BASIN

4.1 Land Cover/Vegetation

Valley floor originally forested wetlands, now agriculture. Much of forest clearing conversion to agriculture in valley floor apparently even before 1909 timber cruises.

Roughly 80% of the basin, including its sloped sides, are covered by managed coniferous forest of various ages. The harvest period is roughly 35-40 years. The remaining land cover includes approximately 5% developed/impervious area and about 10% agricultural land.

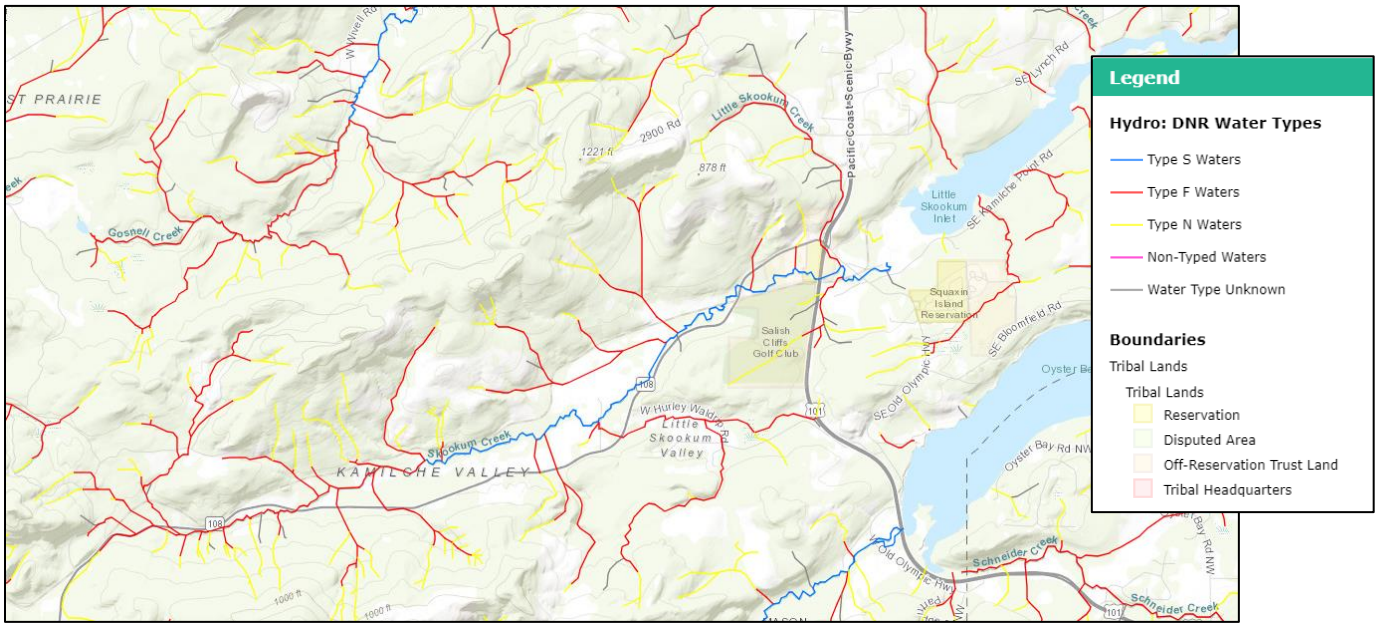
Questions/Data/Resources:

- Brian C - basic vegetation and habitats survey would be worthwhile, especially if overlain on geologic and soils maps.
- What age of regrowth represents functional habitat? If it is 20-year growth, then half of the managed forest is not functional habitat..
- Are there rare plant species or important plant communities in the basin?

Actions:

- Include plantings that will thrive in anticipated longer, drier summers.
- Develop short-term and long-term invasive species plan.
- Consider placement of large logs in the upland areas, not just in the stream. Think about kick-starting deep forest again and how large fallen logs act as nurse logs, provide critical invertebrate and amphibian habitat, help absorb water, and create micro-niches and sheltered spots in the woods.

4.2 Salmonids and Other Fish



DNR Fish-Bearing Classification of Skookum Basin Streams.
Source: https://geo.nwifc.org/swifd/

Skookum Creek is host to several stocks of salmonids—Deep South Sound Tributary Coho, Upper Skookum Creek Fall Chum, and Skookum Inlet Fall Chum, in addition to Sea-run Cutthroat Trout. The chum stocks were rated as healthy in 2002, but the coho stock is in severe decline. ESA-listed juvenile Chinook salmon from other areas of Puget Sound have been found to frequent South Sound estuaries for summer rearing. Spawning is concentrated in three areas—in Skookum Creek upstream of the ancient lakebed and in two downstream tributaries, Reitdorf Creek and Little Creek.

James - Fish monitoring work: State has walked Skookum Creek since the late 1960's. Has done long term monitoring of coho here. Skookum Creek is a cutthroat investigatory

laboratory. Skookum Creek is the only place on the west coast of North America with a continuously monitored cutthroat population.

James - Pit tag antenna is plugged into power at Legal Services, and that will be there in almost perpetuity, so other fish could be tagged and tracked there. There is also a powered-up antenna in lower McClane Creek that can be used.

4.2.1 Locations of Fish Life History Stages in Basin

Most coho (and cut-throat too?) spawn at the short headwater reaches that are available, at mouth of tribs along main creek but not in between. We can support our general observations about fish presence with robust survey data.

Rearing juvenile coho are not present in the middle and lower reaches of Skookum Creek in summer. They take refuge in the cool headwaters and a precious few small, cool tributaries.

Salmon and trout do not have access to most tributaries due to blocking culverts, degraded habitat (ditched, incised, and full of reed canary grass), and disconnection from wetlands (isolated and drained).

James (and Sarah) - Best spawning is RM 6 to 8.5. RR crossing at river mile 8.5 is a blockage. Fish hit that and then turn around. WSDOT culverts just downstream of RR also are a barrier – juveniles often found just below these. Unblocking would also improve sediment transport.

James - Cutthroat trout occupy all of mainstem Skookum Creek in the summer. Work in Skookum Creek has doubled or tripled the amount of information we have on cutthroat trout. Cut-throat trout found above RR blockage at RM 8.5. Due to this barrier, cutthroat can go downstream, but they can't go back upstream (separates resident and sea-run cutthroat). In other areas found 20% of sea-run cutthroat came from resident mothers. (Gave example from nearby river with waterfall that blocks upstream travel [Deschutes?].) But much life history comes from small males.

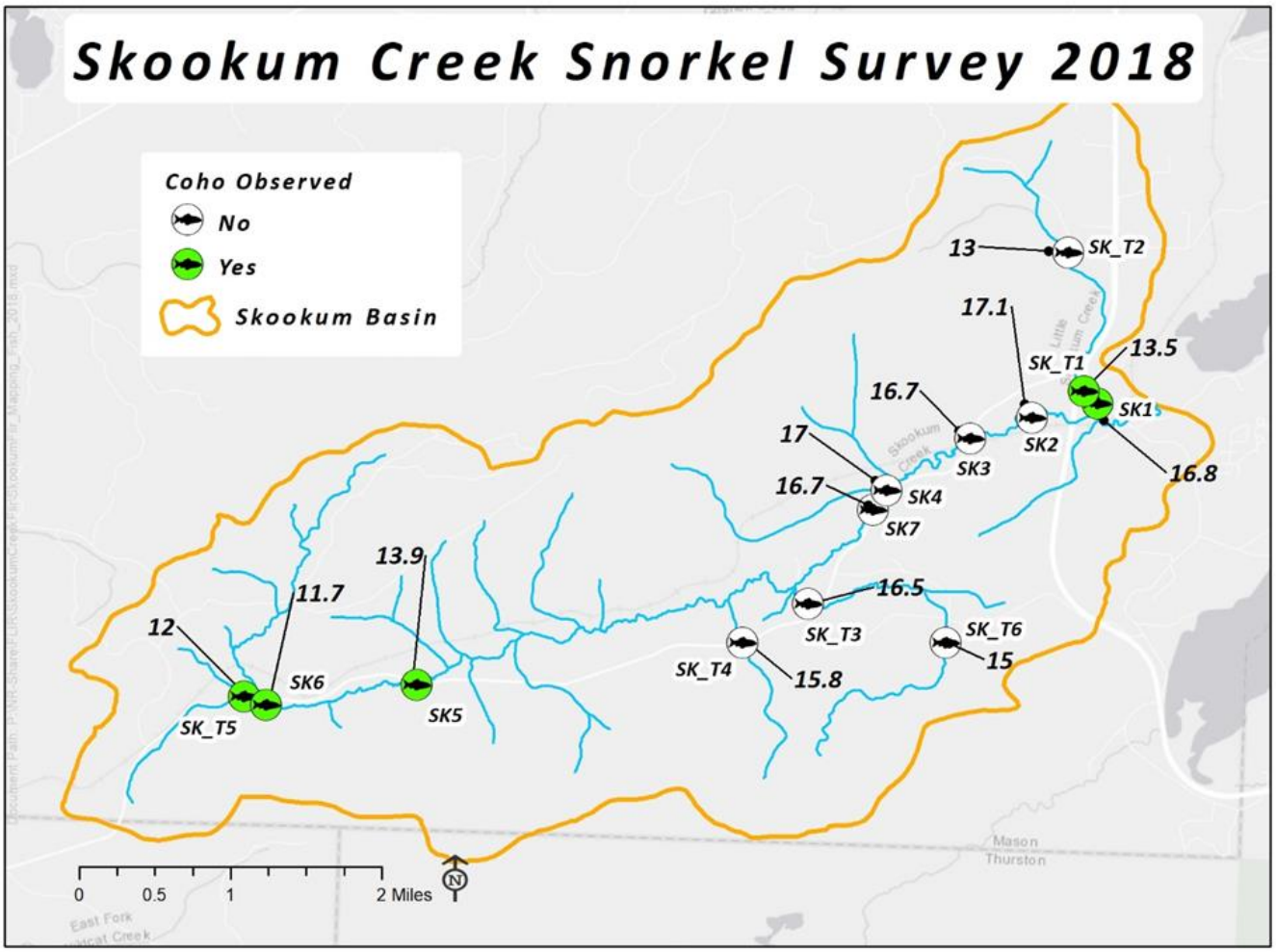
The south fork of Hurley Creek has sculpin and cutthroat trout on forest lands, according to Green Diamond records (Mark).

Steve: Presented observations and modeling results from article that is in preparation based on study in Skookum Creek. This study took measurements and modeled conditions at RM 7.2 on Green Diamond property. This location is near Mile Marker 6 on Hwy. 108.

Presented chart on flowrates for optimal spawning for chum, coho, steelhead, and cutthroat. Peak spawning flow is 15-18 cfs, and these flows are about what you see in the spring runoff time period. Cutthroat spawn from February forward and spawn during the optimal times. Cutthroat spawning decreased as discharge exceeded 15-18 cfs. In field noticed that spawning happened at about ½ of pool depth, so fish shifted depth as pool depth changed. They spawn at the pool tailout.

For rearing, Weighted Usable Area is important. Rearing is compromised at streamflows less than 4-5 cfs. Low flow is critical. Once streamflow reaches 11-13 cfs, more water doesn't necessarily make more habitat.

This modeling is augmented with empirical redd measurements in Skookum Creek – researchers mapped location of about 50-60 redds each year. For rearing, they snorkeled to observe fish distribution.



Snorkel Survey Results, July and August 2018.
Source: Sarah Zaniewski, Squaxin Natural Resources

This does not represent the full distribution of coho salmon in the watershed, but rather spot checks. Numbers in black indicate stream temperature (degrees Celsius) at time of survey.

4.2.2 Fish and Stream Temperature

Erica – Snorkel survey: Chose locations originally based on cold-water indications identified by 2004 FLIR as good locations to check for spawning, but only found spawning above RM 5.5 plus in Little Creek.

Sarah - Coho salmon are right on the cold water spots. You could find adult cutthroat in warmer reaches, but not juvenile cutthroat. Juvenile cutthroat were with the juvenile coho in the cold water. At Little Creek confluence with main creek, only found coho in cooler

Little Creek waters, not in mainstem, which was like a warm bath-tub. Juvenile cutthroat also preferentially in cooler waters.

Some intermittent tribs used for spawning even though go dry in summer. Also reaches that are too warm in summer may still be used by fish in cooler, wetter seasons.

Sarah - In areas that we have actively restored and with intact riparian habitat, we still don't find coho present.

James - Look at adult surveys too to see if they use sub-optimal conditions/areas, especially when there are big returns like in 2017. In 2017, didn't see broader extent of locations used. We are always going to find a few juveniles in the optimal habitat. But if in a good year, juveniles might also utilize sub-optimal habitat.

Sarah – In restoration, we need to consider life history.

Questions/Data/Resources:

- Pit tag antenna installed near tribal center so can tag fish to study movements.
- PBTF has data on fish distribution in the headwaters of their properties.
- Can Tribe rank the value of access to currently blocked tributaries?
- Sarah - What's going to be most effective and practical for improving fish runs – restoring a 150'+ wide riparian corridor along the central valley of the stream to lower stream temperature vs. focusing restoration efforts on specific valuable areas?
- Sarah – What life-history stage should restoration efforts focus on? Is there some way to combine geomorphology and streamflow/temperature information with a spawning survey and winter and summer habitat limits to identify which life-history stage to prioritize? Improvements in which life history stage will result in best overall improvement?

Actions:

- Adding more LWD and more riparian shade and structure to accessible stream channels will likely give more habitat, even if you don't have more flow.

4.3 Other aquatic species

We know that freshwater mussels occur in Skookum Creek.

Steve observed lamprey eels in stream. (Brook or River lamprey? Need to survey and decide which are present.)

4.4 Amphibians

Red-legged frog and Pacific Chorus Frog, plus three species of salamanders (long-toed salamander, rough skinned newt, and western red salamander), have been detected in main Skookum Creek or adjacent uplands. The Skookum Ranch wetland looks like it has a lot of shallow area that would be great egg-laying habitat for stillwater breeds. This wetland/basin? also looks like good Oregon Spotted Frog (OSF) habitat, but they have not been identified here, and this area is outside of their historic range. Forested wetlands are not ideal for OSF (ESA listed as endangered), but other amphibian species, like red-legged frog, are known to breed in them. If the canopy is opening up at the Port Blakely property as trees die, that wetland might become better suited to OSF.

Would riparian restoration negatively affect OSF? Aimee - OSF would like more open wetland habitat.

Amphibians require connectivity of different habitats that they use. Stillwater species require still water for breeding but also upland areas, such as upland forest, to overwinter. Downed wood provides important cover for amphibians, including stillwater and stream-associated species.

Claudine - headland amphibians not well-surveyed in basin.

Mark Golliet - 1 Copes Giant salamander in the Skookum Creek watershed noted by GDR. There are coastal tailed frog, torrent salamanders, and Copes Giant salamander in the Mill Creek watershed (like in Capitol Forest). Amphibian habitat protection would be similar to salmonid habitat protection in the headwaters.

Aimee - Stream-associated amphibians, especially Coastal Tailed Frogs, need cool, faster flowing streams, generally with not a lot of sediment input or transport.

Aimee – Coastal tailed frogs are sensitive to land use change, including timber management. Even upland timber harvest outside of the riparian forest can affect tailed

frog habitat. In a 10-year study, tailed frogs were nearly absent from clearcut basins 8 years after harvest, regardless of whether the streams maintained leave-tree buffers in the riparian areas. Only continued study of these sites will reveal whether the species abundance recovers in these harvested streams.

In streams with riparian buffers, temperature returned to pre-harvest temps within 5 years after harvest. Took 9 years if riparian zone clear cut. Torrents and giant salamanders are also in those basins.

Vandyke's salamander also need cool shaded forest, but they are a terrestrial species with no free-living larval stage. They are stream-associated, so found in hyporheic zones but not in the stream itself. Northwestern and Long-toed salamanders are in lower still-water habitats, probably like the Skookum Ranch wetland.

Downed wood is important for terrestrial stream-associated amphibians.

Questions/Data/Resources:

- Conduct amphibian survey around the large wetland and smaller surrounding wetlands.
- Are OSF present in basin? Are coastal tailed frog present?

Actions: Remove reed canary grass from large wetland to create better habitat for OSF.

4.5 Ungulates (Elk and Deer)

Deer are ubiquitous in the watershed. Elk prefer the mid-valley farms, though they have been known to move to higher elevation in other watersheds. 20% of Willapa Bay elk herd known to use valley.

What is the Tribe's desire for elk in valley? Andy - This elk herd is near and dear to our Tribe. Many want to hunt it, but Andy would like to do what's right for the herd. Tribe does have other areas in which to hunt elk.

Chris M - Elk are very adaptable. They love pastureland and fields where there is good quality food. They like a mosaic pattern with more cover and riparian areas near to fields/forage land so they can get out of those fields when they want to. Hiding cover

along freeways and roads (if there is poaching) would also be good. Bryan Murphie sent an example of a mosaic of settings designed for elk in Wynoochee Valley.

Brian C - Does converting land back to forest and shade reduce forage? Chris M. – Elk need about what cows eat per animal. Elk should be able to move around, not be concentrated in one area. If they are congregated in one spot, that can foster disease and will also decimate vegetation there. Salmon enhancements/riparian plantings are usually beneficial to elk because they like to eat those plants. You want them to move to some of the higher areas too. We need to find out what collar studies have shown. A patchwork of clear-cuts is something that elk like and utilize. They like smaller clear-cuts rather than larger clear-cuts, because they only move so far away from timber. Or they may need some landscape feature to hide behind.

Bryan Murphie: Retaining pastures in the lower valley will be critical to keeping elk here. Management of pastures could emphasize elk needs; fields could be seeded and fertilized to provide forage in summer and fall/winter with rotation specifically for elk. Also, creating some cover islands could be important (see Wynoochee example).

Do wet soils cause elk hoof rot? Chris M. – Hoof rot does better in wet soils, but it's so widespread that not just limited to wet soils.

Chris M. – Trout Lake area had a small herd with hoof rot. They tried to remove the animals with hoof rot before they left the winter range but it was too difficult to accomplish. In Western Washington, WSU and WDFW, led by Dr Margaret Wild, are looking at the metagenomics of the diseases. Is this just a SW Washington problem that is spreading outward? Or has it popped up in multiple regions? Perhaps Skagit and Blue Mountains. The disease is in the soil.

Questions/Data/Resources:

- Chris M - We need to know more about this population of 60 to 80 animals. Is the population stable? What's limiting the population size? That would allow us to decide how to help it increase. It appears Skokomish has had the elk herd collared in the past with GPS collars. The data would help understand the home range of the herd and could help identify habitat use.

- Skokomish Tribe has collaring program (contact: Bethany?) and may have information on Skookum elk if some have wandered from there to here.
- We need to know how the Tribe wants to manage the elk and have an understanding of how WDFW is currently managing the herd.
- Are there properties where elk are currently causing damage? Are there depredation permits issued for those properties? (Elizabeth Campbell noted that electric fences are used in Packwood area to keep elk out of gardens, etc.)
- What is the current harvest strategy and how many elk are taken annually from the herd?

Actions: Plant forage mixtures in areas where encouraging elk. Give preference for native species, and don't plant invasive species. (Choice of forage mix often based on maintenance requirements.)

Projects and funding: Rocky Mountain Elk Foundation has PAC grants that could be tapped for elk habitat enhancement. They are matching funds.

4.6 Other Mammals

Our knowledge of birds and amphibians in the valley is very limited. Mammals present include: mink, beavers, otters, bear, cougar, coyote, and bobcat. Fisher are a potential returning species – they have been introduced in Olympics and have been traced to areas near Skookum.

Could/should beavers be encouraged in the basin?

In future, possible re-introduction of wolves. Consider how to manage.

4.7 Birds

Non-waterfowl: Not discussed at summit.

Waterfowl:

Waterfowl use portions of the Skookum Creek watershed in winter. Species include mallard, green-winged teal, American widgeon, Northern Shoveler, scaup, ring-necked duck, bufflehead, common goldeneye, and western Canada geese. Waterfowl

concentrations occur most notably on the Skookum Ranch diked wetland. Canada geese also use this pond and probably neighboring pastures as well. Both common and hooded mergansers may use Skookum Creek.

4.8 Humans

Human uses of the basin were not directly covered during summit, but recognize these current uses of basin by people:

- Residential
- Industrial/Alta Lumber
- Agriculture
- Logging
- Recreation – tribal casino, golf course, other?
- Transportation through basin
- Utility passage (electricity, natural gas)

5 BIG-PICTURE THINKING ON RESTORATION IN BASIN

Overall protection and restoration:

Finite resources available, restoration is expensive. $100,000 was recently spent on restoration of just 600' of mainstem channel by the Knight property and community garden (pulled bridge, planted riparian vegetation).

WRIA 14 has 2nd lowest level of funding among all WRIAs.

Existing resource – tribal community group who contribute to community garden, interested in extending work beyond the garden itself. Community garden could expand to propagate native plants. Consider how to keep involved in long term.

Aleta Poste on the value of restoring native plants and ecosystems:

> "For centuries the Squaxin Island People have harvested foods from the land. Disruption in the lifestyles of these ways created a lack of access to important nutritious ancestral

foods such as stinging nettle, elderberry, salmonberry, wild Nootka rose, Indian tea (Labrador tea or swamp tea), hazelnut and wild ginger, to name a few. In recent years, tribes have taken a proactive approach to bridging the gap between access through the implementation of selective farming techniques to recreate ecosystems for these plants to thrive. By doing so, it has created a pathway to important cultural knowledge of plants and medicines, increased the amount of native foods being harvested and eaten, and has provided a platform for cultural leaders to share techniques of preservation, restoration, and propagation in the terms of traditional ecological knowledge."

Lower valley land acquisition and restoration:

- Acquisition may be imminent and will require significant planning. Be prepared for an incremental approach to restoration, as planning proceeds and funding becomes available.
- Think about sequencing of actions so don't miss opportunities.
- Develop an interim farm management plan.
- Retain agriculture on some portion of property:
  - Would preserve some of the limited farmland left in the community.
  - There may be a nexus between preserving agricultural production and restoration and native foods.
  - If possible, include agricultural practices that honor tribal traditions in restoration plans. Ideas from community garden group:
    - Increasing production and access to traditional plants for food, medicine and other cultural uses like basketry and traditional technologies (could use these species: willow, tule, cattail, hazelnut, salmonberry, elderberry, thimbleberry, salal, camas, huckleberry, devil's club, soapberry, dogwood, currants, ironwood, cottonwood)
    - Organic orchards, blueberry patch - creates jobs in maintenance, harvesting, processing, canning, value-added products for restaurants, gift shops, etc.
    - Organic, free-range poultry; heritage breed turkeys, chickens

  - Organic, free-range laying hens for eggs that the hotel/casino restaurants could add to their menus, as well as feeding the Squaxin Community
  - Pork, lamb, beef, etc.
  - Cultivate nettle and other traditional "wild" greens for community members to have access to larger harvests in good, clean areas
  - Beekeeping
  - If a pond is available, Duck hunting area? Aquaculture - cattail and wapato production.

- Consider how to put profitable crop on public land/land purchased with public money. Talk to granting agency about this. Scott says you can operate a profitable agricultural enterprise as long as the profits go back into stewardship.

  Fee Simple Purchase - If you are acquiring land in farm tax status, and you convert it, then you will own back taxes. (Farm tax status is similar to timber land – deferred tax status.) The Tribe may be looking to put land into trust, but they will keep it in fee simple in the short-term to ward off a large tax payment.

- If acquire water rights with property, keep using the water until you have a plan for entering into trust. Avoid relinquishing water rights.

- Has there been outreach to valley residents about land purchase and restoration plans? Steve has encountered an angry resident in the upper valley near his monitoring site. Erica – outreach not started yet. Reller knows Tribe is looking for money to make purchase. McDonald has been talking to Capitol Land Trust.

- Consider public access to parts of restored area and the goals that public access could support – environmental education, stewardship opportunities, recreation, etc.

- Include management plan for leveed wetland.

Resources for advice and examples of similar projects:

- Washington Association of Land Trusts – Who has created long term management around farm preservation?
- Ask Capitol Land Trust to reach out to the land trust community about farmland management. They have a stewardship program.
- South Thurston County farmland preservation trust.
- SPSSEG work on Deschutes.

6 NEXT STEPS

From original summit agenda, although we were not able to address these topics due to time:

Identify goals (Sarah's big question) - will guide prioritization of efforts in basin.

Possible goals:

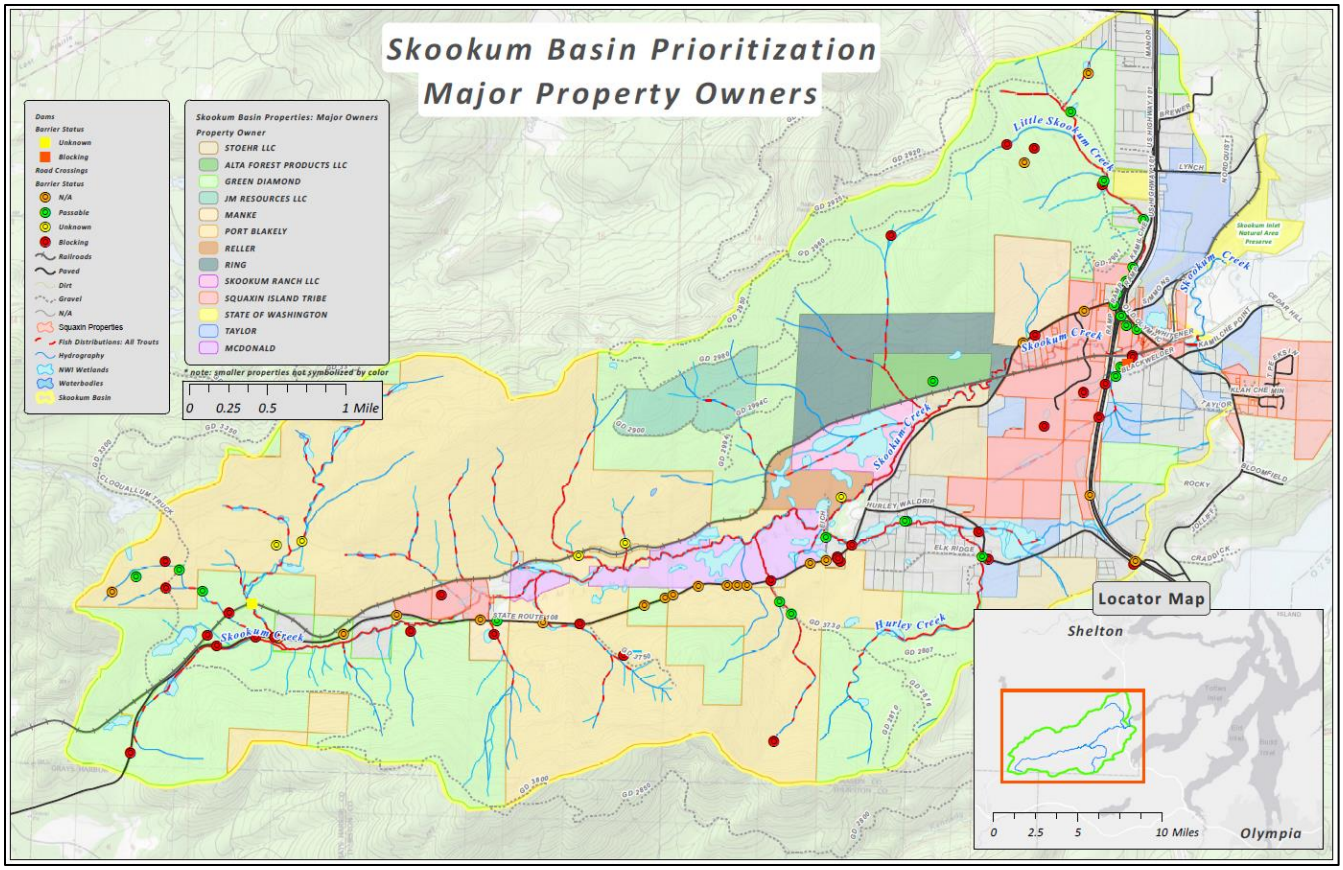
- Restoration to original conditions.
- Create new valuable habitat and features.
- Enhance current beneficial features.
- Maintain existing modifications because of their current value.
- Build in resilience to stresses of climate change.
- Create places to continue tribal culture and connection to land and stream.

Outreach to Squaxin Tribe or broader basin community, learn of their needs and desires for basin in future.

Form a strategy:

- Restoration Goals
- Project List – with Cost, Benefits, and Feasibility
- Measurable Environmental Parameters to Define and Monitor Success
- Rough Timeline
- Potential Funding Sources

We very much appreciate the contributions of the summit's attendees (and input from those who couldn't attend).



Source: Brian McTeague, Squaxin Natural Resources

7 APPENDIX- SPECIFIC EMAILS

From: Madsen, Chris [mailto:cmadsen@nwifc.org]

Sent: Tuesday, March 26, 2019 11:37 AM

To: Erica Marbet <emarbet@squaxin.us>

Subject: Elk

Good Morning,

It was great meeting you yesterday. I found the discussion very interesting and refreshingly not elk heavy. I had a few parting thoughts from yesterdays discussion that I thought I would share with you. My take away message is that out of all of the species discussed yesterday, elk are probably the most adaptable to any manipulations to the land you mike make. Right now, I would focus on gathering data/information that is already available that will help guide elk management on the valley.

Here is a list of information that could be useful:

1. It appears Skokomish has had the elk herd collared in the past with GPS collars. The data would help understand the home range of the herd and could help identify habitat use.

2. We need to know how the tribe wants to manage the elk and have an understanding of how WDFW is currently managing the herd.

3. Are there properties where elk are currently causing damage? Are there depredation permits issued for those properties?

4. What is the current harvest strategy and how many elk are taken annually from the herd?

5. If the tribe prioritizes farming, be cautious of the farmed location and crop from areas where elk habituate. Elk can wreak havoc on crops. I heard blueberries mentioned yesterday and my mind raced to the Skagit elk that caused an estimated 100K worth of damage when they got into a blueberry farm.

Rocky Mountain Elk Foundation has PAC grants that could be tapped for elk habitat enhancement. They are matching funds, but every little bit helps I suspect.

Cheers,

Chris

--

Chris Madsen
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Northwest Indian Fisheries Commission
6730 Martin Way E.
Olympia Washington 98516
(360) 438-1181 ext. 366
cmadsen@nwifc.org

From: Karin Strelioff [mailto:karinls@masoncd.org]
Sent: Tuesday, March 19, 2019 2:05 PM
To: Erica Marbet <emarbet@squaxin.us>
Cc: Katrinka Hibler <katrinka@masoncd.org>
Subject: Skookum Summit

Hey there,
just a quick note that I can no longer attend the Skookum Summit as hoped; there is too much on my plate. Evan and hopefully Katrinka are still planning to go, so you will have plenty of MCD presence.

I know Katrinka already shared her cool ideas about agricultural practices that might honor tribal traditions. I think that's an amazing idea and hope it gains traction. (On that note, this was probably discussed, but just in case . . . if any areas of the site are gravelly and open in the upland and hint at prairie conditions, might there be interest in establishing large Camas (Camassia quamash) plantings? That would be amazing for edible production, but conditions would need to be appropriate. I suspect that those conditions won't be found in the valley, but I had to throw the comment out there).

Okay, so I was hoping to make some of the following points if I attended. Since I can't come I will send them to you and you can ignore or integrate them as you see fit. I apologize in advance for this long-winded rambling brainstorm:

1) Push the group attending to think beyond stream/fish habitat enhancement (riparian buffers, side channels, LWD etc.- the typical restoration work that focuses on fish as the primary design driver). What other species and habitats can benefit given the scale of space you have to work with? Can you have a component of the restoration team thinking about birds species and threatened avian habitat that might be integrated into the plan? What about amphibians? Invertebrates?

2) Especially discuss opportunities in relation to wetlands. Could the restoratino include transitional earthwork between the upland and stream that facilitates extensive wetland establishment over time? Wetlands- either permanent or ephemeral - would be a huge benefit to the system. We all know that wetlands are degraded everywhere and minimally mapped and regulated. They will only continue to be filled and altered in the majority of places where they remain. Mitigation wetlands are often failures, but they are often sited inappropriately. In the floodplain and areas adjacent to the stream, there were doubtless myriad wetlands before people got in and altered the landscape. Can any of that be recovered? Expanded? This seems like a great opportunity to think about how subtle topographic variation in the right soils can create opportunities for wetland establishment that will feed into and benefit stream health in the long run. Such work will also of course benefit diverse species in addition to fish (we are all fish-centric in our restoration thinking because of their value and because of funding, but need to be more holistic, in my personal opinion).

3) Wetlands and climate change? Could wetland expansion and water storage capacity in the uplands help counter drier summers?

4) Also, are there other ways to explore slowing surface runoff of water specifically to slow high peak flows during the winter and to store some water?

- Can we design to help recharge longer into the summer?
- Feral rain gardens along all the roadways!
- haha I don't have perfect answers, but someone might have great ideas?
- Also, plant selection and climate change. Should plantings be varied in some areas to try to anticipate longer drier summers?

4) Large wood in the upland: discuss placement of large logs in the upland areas, not just LWD In the stream - think about kick-starting deep forest again and how large fallen logs act as nurse logs and provide critical invertebrate and amphibian habitat, help absorb water and create micro-niches and sheltered spots in the woods - we have access to large wood that isn't the right size for LWD projects but is the perfect size for restoration placement as "downed trees" in the upland for forest habitat enhancement. Consider this idea (I have been pushing it a lot at other sites, with minimal success because of trucking costs) But, I believe it should be taken seriously. Ask folks to discuss whether the use of large wood in the landscape can be part of a wetland/upland transition strategy. Think messy topography and not just neat riparian plantings of the standard conifer/hardwood/shrub mix.

3) Last but never least: consider public assess as part of this discussion, and define what is acceptable. Ask questions such as:

- How important it is that the community have access to any part of this area?
- If some access is important, why? Defining why will help to create an access framework. Is the goal to generate goodwill and a sense of shared stewardship? To support outdoor education? To create an incubator for experimental restoration techniques; a place to try techniques that don't fit in conventional restoration boxes?
- If access is important, ask which parts of the future site will be more tolerant of access and which parts should be protected? Humans are amazingly high-impact and if left to their own devices, they will inevitably cause problems. So how do you control impact?
- Pedestrian-only access on well-defined trails? Seasonal fishing access?
- Limit access to upland fields nearest the road? For what? Make a fenced dog park? Clearly I am throwing arbitrary things out, I know a dog park isn't something folks will want, but try to think outside of the box.
- Maybe an educational preserve trail that can be accessed based on reservations, for local school groups, with a defined trail?
- Maybe more of a series of partnerships with local Audubon groups or amphibian geeks who will want to help create habitat.

etc. etc. I hope that there is discussion of a public access component, particularly for children and families, because they are the future of stewardship and if they can't access outdoor spaces to discover their magic, they won't care when it comes time to preserve them in the future. Can't help but preach to the choir...

Okay Erica, I hope it's an amazing forum and I am sorry I can't participate.
If there are future opportunities or if I can help in any way please don't hesitate to ask.
Best,
Karin

Karin Strelioff, MLA
360.427.9436 x 122
Environmental Specialist | GSI Designer
Mason Conservation District

From: Murphie, Bryan L (DFW) [mailto:Bryan.Murphie@dfw.wa.gov]
Sent: Friday, March 22, 2019 10:21 AM
To: Erica Marbet <emarbet@squaxin.us>
Subject: RE: Reminder- Skookum Creek Summit is this coming Monday, March 25th

Hi Erica,

Unfortunately, another meeting was scheduled on top of this one in Port Angeles that I cannot miss. It is related to a mountain goat relocation effort we (multiple agencies and people) are conducting this summer and I have a supervisory role at two of three staging areas. I may be able to call in for the first segment if that is an option.

I did look at your material and offer a few comments about elk and waterfowl in the valley, as well as, a couple suggestions to consider.

I would still like to help in this endeavor, so please keep me in the loop.

Thanks,
Bryan

Bryan L. Murphie
Wildlife Biologist
WA Department of Fish and Wildlife
District 15: Mason, Kitsap, east Jefferson Counties
360-790-8687

Word document attached to Brian Burphie's email

Waterfowl:

Waterfowl use portions of the Skookum Creek watershed in winter; including mallard, green-winged teal, American widgeon, Northern shoveler, scaup, ring-necked duck, bufflehead, common goldeneye, and western Canada geese. Waterfowl concentrations occur most notably on the wetland shown below. Canada geese also use this pond and probably neighboring pastures, as well. It is possible both common and hooded mergansers use Skookum Creek.

Retaining this pond and some pastures in the lower valley would be important for wintering waterfowl.

Ungulates:

Deer are ubiquitous in the watershed. Elk prefer the mid-valley pastures, though they have been known to move to higher elevation and other watersheds. This elk herd is comprised of about 60-65 elk and is considered a non-migratory herd; winter and summer range overlap. Based on recent estimates, this group represents about 20% of the elk population in GMU 651.

Retaining pastures in the lower valley will be critical to keeping elk here. Management of pastures could emphasize elk needs; seeded and fertilized to provide forage in summer and fall/winter with rotation specifically for elk. Also, creating some cover islands could be important (see map below for example).

As an example, WDFW manages forage fields in the Wynoochee Valley for elk. In 1972, approximately 417 ha were acquired for wildlife mitigation about 16 km downstream from the dam and 32 km north of Montesano, WA. The land was acquired as mitigation for the loss of winter range following dam construction. These mitigation lands consist of five fields, approximately 20.2 ha each, totaling 101 ha of wildlife rangeland that is mowed and fertilized annually. Fields are tilled and seeded with perennial tetra rye (Lolium perenne), orchard grass (Dactylis glomerata), annual tetra rye (Lolium multiflorum), inoculated red clover (Trifolium pretense), inoculated New Zealand (white) clover (Trifolium repens), and birdsfoot trefoil (Lotus corniculatus) (Plants of the Wild) on a 5-year rotation schedule (Gerchak and Gallegos 1999). Fields are separated by at least one-half mile to provide escape cover and promote animal dispersal (USACE 1975).

Another pasture seed mix used on the Olympic Peninsula for elk forage seeding applications includes 45% Athos late maturing orchard grass, 25% Calibra perennial ryegrass, 15% Striker tetra ryegrass, 8% Kenland medium red clover, and 7% New Zealand white clover.

Not native species, but elk like them.

The Google map below captures an aerial view of one field complex at the Wynoochee Mitigation Field site. Note the small islands of cover within the pastures. Having the river flow through the middle also provides added escape cover.

Elk use of these pastures is a source of human-elk conflict in the Skookum Creek valley; elk cause damage to or compete with grazing livestock. Loss of some pastureland would encourage elk to move to other pastures in the valley increasing human-elk conflict on those properties. Conversely, adding/keeping specific pastures for elk in the valley could alleviate human-elk conflict elsewhere.

Other Species:

Our knowledge of birds and amphibians in the valley is very limited. We know that freshwater mussels occur in Skookum Creek. There are also beavers and otters. Bear, cougar, coyote, and bobcat are also present.

Recreation:

Was not covered, but I'd like to see that be a part of any strategy here. Public access potential for elk hunting/viewing, waterfowl hunting, and other activities, biking, walking.

From: Wendy Gerstel [mailto:mudpeople@earthlink.net]
Sent: Thursday, March 28, 2019 4:38 PM
To: Erica Marbet <emarbet@squaxin.us>
Subject: Post - Skookum Creek Summit geo thoughts
Hi Erica,
Sorry not to have gotten this off to you sooner. Distractions…..

Here are some follow-up thoughts to our conversations on Monday, and possible talking points for your letter to/conversation with Mike Polenz or other Wash. Geological Survey geologist at DNR.

- First, I'd find out the status of 1:24k mapping of the Kamilche Quadrangle. Could be it's already in the works. If so, find out who's leading the mapping effort and talk with them directly. Might be Mike, or maybe Trevor. Both good guys interested in public outreach and servitude.

- Don't forget to mention you have data for them! (nothing better than your, "data and a smile" entry ☺) Geologists love getting subsurface info since drilling projects are so expensive.

- Ask whether there will be any additional landslide mapping with the new, higher res lidar. Might mention that additional landslides to those shown on the landslide layer of the Washington Geology Portal have been identified.

- When will the higher res lidar be available for download on the portal? Or for that matter, available to your GIS folks (Brian may already know this)

- Existing 1:100k mapping shows a fault paralleling Skookum Cr. valley. Is there any recent/additional work on describing and dating fault activity? Might also have something to do with upwelling zones.

- Ask about working collaboratively to share data and direct some of the data gathering so that your planning questions get answered so that specific geologic information could be incorporated into your planning process:

- Nature/orientation of bedrock structure (strike/dip of bedding; lithologic characterization (grainsize, cementation, permeability, etc.) – in other words, controls on surface infiltration rates and groundwater flow.
- Characterization of landslides – activity levels, certainty rating, triggering mechanisms, geologic materials being mobilized, areal delineation….
- Investigation of seeps and springs – location, flow volumes, H2O quality, temps, source – contributing to why/where upwelling occurs, data might be useful in predicting where additional upwelling might occur, or help explain gaining vs. losing reaches of Skookum Cr.

Let me know if you want more detail on the above or have additional thoughts. And if WGS has no mapping currently underway and not likely within your planning time-frame, I'd love to work on your team and would be very willing to negotiate a good rate.

Kind regards and good luck with your projects,
Wendy

Qwg Applied Geology
Wendy Gerstel, LEG
Olympia, WA
360.754.2409
Qwg Applied Geology

From: Mcintyre, Aimee P (DFW) [mailto:Aimee.Mcintyre@dfw.wa.gov]
Sent: Monday, April 8, 2019 10:03 AM
To: Erica Marbet <emarbet@squaxin.us>
Subject: RE: Summary from Skookum Creek Summit

Hi Erica,

Thank you for the opportunity to participate in this important event. I made some edits in track changes. Please let me know if you have any questions or require any further clarification.

I suspect that OSF (Oregon Spotted Frog) is not in the large wetland, but given its status as an ESA listed species I feel it is only prudent to at least take a look.

As for the other species, I believe they will benefit from restoration work planned to enhance habitat for the other species, especially fish.

Best, Aimee

From: Elizabeth Campbell
Sent: Monday, April 8, 2019 11:06 AM
To: Erica Marbet <emarbet@squaxin.us>
Cc: Aleta Poste <acposte@squaxin.us>
Subject: RE: Landscape Conservation

Good Morning,
I was recently in Packwood and noticed electric fencing placed around yards and anywhere landowners didn't want the elk grazing. I couldn't believe how much fencing there was actually. We would only need it in areas that would really need to be protected. This could be an option for a blueberry patch or other agricultural prospects. I'm not quite clear on the size or place/type of land, but we can always modify as needed.
Here are a few ideas that came to mind after our meeting:
Increasing production and access to traditional plants for food, medicine and other cultural uses like basketry and traditional technologies
Willow, tule, cattail, hazelnut, salmonberry, elderberry, thimbleberry, salal, camas, huckleberry, devil's club, soapberry, dogwood, currants, ironwood, cottonwood, etc.
Organic orchards-creates jobs in maintenance, harvesting, processing, canning, value-added products for restaurants, gift shops, etc.
Organic, free-range poultry; heritage breed turkeys, chickens
Organic, free-range laying hens for eggs that the hotel/casino restaurants could add to their menus, as well as feeding the Squaxin Community
Pork, lamb, beef, etc.
Cultivate Nettle and other traditional "wild" greens for community members to have access to larger harvests in good, clean areas
Beekeeping
Pond? I think you had mentioned a pond. Is it clean? Duck hunting area? Aquaculture-cattail and wapato production.
Aleta has been on vacation, but will be returning this week. I'll see if I can find her beautiful contribution as well.
Elizabeth

Elizabeth subsequently sent some text from Aleta on April 8, 2019
"For centuries the Squaxin Island People have harvested foods from the land. Disruption in the lifestyles of these ways created a lack of access to important nutritious ancestral foods such as stinging nettle, elderberry, salmonberry, wild Nootka rose, Indian tea (Labrador tea or swamp tea), hazelnut and wild ginger, to name a few. In recent years, tribes have taken a proactive approach to bridging the gap between access through the implementation of selective farming techniques to recreate ecosystems for these plants to thrive. By doing so, it has created a pathway to important cultural knowledge of plants and medicines, increased the amount of native foods being harvested and eaten, and has provided a platform for cultural leaders to share techniques of preservation, restoration, and propagation in the terms of traditional ecological knowledge." ~Aleta Poste