# Skagit Watershed Council
# Protection Subcommittee Meeting –Notes
# November 19, 2015, 12-2:00 pm, Skagit Publishing, Mount Vernon, WA

(*** indicates action item**; ___ indicates decision)

Attendance: Richard Brocksmith (SWC), Ed Connor (Skagit Climate Science Consortium ($SC^2$), Seattle City Light), Denise Krownbell (SCL), Rick Hartson (Upper Skagit Tribe), Jeff McGowan (Skagit County), Kari Odden (Skagit Land Trust), Devin Smith (Skagit River Systems Cooperative), Alison Studley (Skagit Fisheries Enhancement Group), Tom Slocum (Skagit Conservation District), Erin Lowery (SCL), Bob Warinner (WDFW), , Chris Vondrasek (SWC).

Guests: Emily Derenne (Skagit County), Correigh Greene ($SC^2$, Northwest Fisheries Science Center), Eric Grossman ($SC^2$, WWU, USGS), Leah Kintner (Puget Sound Partnership), Carol Macilroy ($SC^2$, consultant), Jen Lennon (Sauk-Suiattle Indian Tribe), Jon Reidel (National Park Service), Nathan Rice (Kulshan Services).

Meeting commenced at 12:16 pm

*Climate Science Discussion*

Richard Brocksmith introduced the Skagit Climate Science Consortium and the importance of using climate science to inform the property acquisition process, and noted that the Technical Work Group would also benefit from the climate science discussion in relation to restoration projects. Climate science is likewise key to updating the Chinook monitoring plan to reflect current knowledge and trends. Sediment and hydrology transcend function and structure, and processes from top to bottom of the system are hard to incorporate into adaptive management. $SC^2$ might inform how these processes work.

Carol MacIlroy provided an overview of the Skagit Climate Science Consortium, noting that it started in 2009 as a partnership with Seattle City Light, Swinomish Indian Tribe, and the UW Climate Impacts Group, and became a non-profit in 2014. $SC^2$ meets three times a year to share information. They had a workshop with SWC before Richard joined SWC and want to review what's been learned and how they can support SWC.

*Flow and Water Temperature Research Review*

Ed Connor reviewed recent research into flow and water temperature, and the state-of-the-art hydrology research in the watershed. Climate change will bring changes in peak flows and hydrology, shifting from a snowmelt-dominated system to snow-and-rain with snowmelt happening earlier in the year. This will bring higher peak flows and lower base flows. Recent work focuses on downscaling climate models and considering the best grouping of PNW models to make predictions under various climate/emissions scenarios. A coarse-resolution model of

mainstem rivers has been replaced by a higher resolution watershed model with downscaled precipitation, temperature, and wind projections to look at effects of climate change in a select group of 10 tributaries, including Bacon Creek, Illabot Creek, Jackman Creek, Lower Suiattle River, and others – this is a big jump. UW said once they do these, they can look at others as well. They will be finishing this report in the next two months. The bottom line is that peak flows and particularly low flows are worse than expected in some scenarios. In 100 years, base flows in upper Sauk will be 60 percent lower than present. A caveat is that they still need to look at groundwater inputs, which is a big challenge.

Empirical estimates and projected changes of glaciers were incorporated in the watershed model as well – an important contribution especially late in the melt season. This was recently published in *Northwest Science*. The Distributed Hydrology Soil Vegetation model (DHSVM)has done a great job of reproducing the observed mass balance of melting glaciers. The whole Skagit model is at a 150m grain size, want to get that down to 30m grain size at subwatershed levels to see glacier melt input.

Devin Smith asked what other parameters are there for subwatershed models other than discharge? Stream width? Ed Connor responded that $SC^2$ can provide discharge 30, 60, 100 years out, and can predict width and depth using discharge predictions, and stressed the need to work together to marry these parameters together. Eric Grossman noted that the first outputs are pretty coarse. Ed Connor said the real question is once precipitation patterns and discharge patterns change, there will be an adjustment in stream channels themselves and that will be much harder to predict.

The model doesn't do temperature right now but it can be included. Erkan, professor at UW civil engineering has been developing a model. They are expanding stream temperature records to base models on. Jon Reidel and Sauk-Suiattle tribe are getting more information from the Forest Service. Data is being gathered and network of monitoring sites for water temperature is expanding in the watershed, including mainstem and tributaries – an impressive network of sites. Need to get QAQC on data. Temperature patterns across the basin are interesting to see. Forest Service temperature database in GIS format is being use to make data accessible. The ultimate goal is to develop a model perhaps DHSVM. Need a specific reservoir temperature model and mainstem model.

Jon Riedel: There are limitations of the DHSVM model for temperature in terms of groundwater/hyporheic flow.

Carol Macilroy said that $SC^2$ partnered with the Yale project on climate communications and did a poll on perceptions of climate change in Skagit Valley. Possibility for another model? They are also talking to the Skagit Valley Herald to do a series on climate change and impacts, and working with the Museum of Northwest Art to host an exhibit combining artistic and scientific perspectives on climate change. $SC^2$ has spent the last four years getting the hydrology story together and now we need the sediment story, which will become 90% of the focus looking forward.

Correigh Greene said that climate change introduces uncertainty as to where to prioritize restoration sites, considering estuarine and marine life stages for salmon and sea level rise. This area should be developed in the near future.

*Sediment Research Review*

Eric Grossman reviewed sediment research. Higher peak flows will affect sediment transport with more sediment and coarser materials coming down, armoring the bed for the next floods. This will require more flow to move that material out. Flood protection and salmon needs will have to be balanced. Started mapping of nearshore and deeper areas. Over last 100 years, the amount of sediment getting to the bays has increased about 10 times over natural historical loadings. We are more efficient at routing it to the bays with levees, etc., causing lots of impacts for future flood risk, and changing the coastal slope to be more gentle with more sediment. This makes it harder to drain all that water in the tidal prism. As that slope is changing it will back up sediment further up the river. Is sediment starting to aggrade further up the river? It could start to retard the river's ability to move sediment offshore. In many places, there is up to ten feet of sediment since year 2000. This is the case in the Nooksack, too. They are looking at sediment sources up in the mountains, and are monitoring suspended sediment movement in the lower reaches. Research on bedload shows that more bedload is coming through these systems than thought previously. Coarser and coarser bedload is coming down, making it harder to clear it out. It will require higher flows to move it.

Richard Brocksmith asked where the ten-fold sediment increase was being observed. Eric said just beyond the shoreline at river mouths, sediment has grown so much in the last ten years. Eric clarified that's not a ten-times increase in runoff upland, but we are not letting sediment spill over levees, causing a pipeline effect. This has caused reductions in vegetated flats. It's like a big firehose moving a lot of sediment away from delta where we want it, exporting a lot more sediment than it should and moving it further out into the bay.

Eric noted that the agricultural community cares about flooding but they care more about drainage. Ponding groundwater is increasing and modeling shows that in a few decades significant areas will pond long enough that agricultural value will be lost. We will have to pump it out eventually. At what point does it become so costly and so saline that we can't fix it?

*Protection Strategy Overview*

Richard Brocksmith provided an overview of the SWC Protection Strategy. In 1998, SWC wrote the strategy for protection and restoration, and to prioritize actions. Priorities were 1) Acquisition – to protect the last of the best habitats that are still functioning, and 2) Cost effectiveness – benefit divided by cost, real estate info, monetary property value. Benefits were weighted and four parameters were used to quantify habitat – reach level habitat, floodplain habitat, connectivity, and threat. This is reflected in the cost effectiveness equation. Acquisitions are considered cost effective if in the 33 percent that score the best.

Most of the land that meets these criteria has already been acquired, so the protection strategy needs to be revisited if we are going to keep purchasing land to protect habitat. Allison Studley noted that there is also the challenge of reflecting tributary habitat in the updated strategy.

Richard explained that floodplains will be much more of a focus given the larger area, as well as 14 tributaries that are critical for spawning and rearing that aren't reflected in the formula. In 2005, they looked strictly at Chinook, but steelhead is a different animal, so now we have to move to a Chinook and steelhead-dominated process. The formula covers all these parameters and spits out one score, and each parameter carries lots of info. We could look at parameters in a stepwise function, or look at acres as a proxy for cost to reduce the overriding effect of cost. Other potential improvements include looking at reach-level habitat instead of just mainstem habitat, looking at edge habitat to include more tributaries, which would equalize the mainstem and tributary quantification of habitat. One challenge is how to include riparian habitats more discretely. Climate change is coming and floodplains provide resiliency, but the formula doesn't really value groundwater and tributaries. SWC is just starting to debate how to include other parameters specific to climate change. These could include critical inputs of cold water and linkages to quality habitats, like where sub tributaries meet tributaries. How can we bring more climate change parameters in?

Another issue is that the formula doesn't look at estuarine or nearshore components very well. Isolation gives a zero score, which prevents recognition of areas below Sedro-Woolley.

Three questions were submitted to $SC^2$ regarding the protection strategy.

Richard noted that Question 1 was very broad. Ed Connor laid out a logic model in his written response. He said it's a really good question and it will be tough to answer it well.

Someone asked what is the goal for chinook, steelhead, and bull trout? Will the focus be on restoration activities with shared benefits for multiple species, or will we prioritize particular species? Should we weight actions in freshwater for multiple benefits? Or a portfolio of benefits?

Richard responded that the structure we have is multi-species, and the sweet spot is projects with multiple benefits. Co-managers are working on a recovery plan for steelhead. In a year we will have two documents that diagnose chinook and steelhead. How we as a community manage them is unknown now. In the interim, we can look at where species/projects overlap.

Chris Vondrasek said we should look at all species including bull trout and cutthroat. Protection strategy was to protect all species, not just listed species. Richard said bull trout are doing well compared to chinook and steelhead, hence the focus on them. Chris said bull trout will be more affected by climate change.

Ed Connor said the long term prognosis for bull trout is not good. They are the least tolerant in terms of physiology and they don't have a recovery plan yet. USFWS hasn't been engaging with the watershed like NOAA has. Ed identified climate change as number one threat to bull trout in this watershed; they have good protection otherwise. Eggs denature at 10 degrees C. Spawning is limited to headwaters, and will become pressed with climate change over time. Bull trout models suggest that this is the last great place for them in the long term with glaciers and high elevations.

Correigh Greene discussed how different species will be affected by climate change. Chinook yearlings are tied to cold water. Climate change will impact nearshore and estuary habitats. The combined processes of climate change are pinching chinook at both ends of their early life stage. Parr migrants may be most resilient over time, especially if sea-level rise has big impacts as fry move to estuary.

Steelhead studies show habitat is limiting in Skagit. Tributaries are most important. The key question is the relative contribution of residents to the population. Population is dominated by anadromous type not resident type. Most of productivity is based on anadromy. Key elements are tributaries, connectivity of tributaries, access, habitat quality, and their combination. There are climate risks across all salmonid species, and adaptation strategies across species.. For adaptation strategy, restoration in fresh water reaches rose to the top for mitigating risks and providing benefits to all species.

Richard asked how we should define restoration. Someone noted that WRIA 1 is doing big work on the South Fork Nooksack – will the Skagit go that direction? Correigh said there's a different combination of impacts than on the Nooksack, particularly considering the steelhead contribution.

Devin Smith asked what does a restoration project that mitigates for these impacts (higher peak flows, etc) look like? What do we do differently? Correigh suggested looking at different habitat types. Refugia may be more important during high flow events.

Richard said it's all about floodplains, mainstems, and side channels, protecting what's already functioning, and restoring access. Tributary connectivity may need more emphasis.

Correigh compared riparian restoration down lower to restoring and reconnecting floodplain habitat.

Carol Macilroy asked if there is a volume of flow that needs to be thought of differently with climate change. Correigh said yes, but these are semi-quantitative results. Item 1.G. on the hand out shows list of these findings.

Ed Connor was asked what would he protect? Where is most important considering climate change? What are the most resilient and least resilient streams? Some of the key elements of

our Tier 1 targets are exactly what you do for climate change but the tributaries are not addressed well. Climate issues will push us further in that direction.

Ed said he looked at worst areas in watershed and was impressed at their resiliency. Some streams held up flows and cool temperatures through the entire drought episode, providing excellent steelhead, bull trout, and spring chinook habitat when other streams were dried up. We will have metrics for these streams working with Eric Grossman, looking at 2015 event, looking at standouts to rank tributaries based on recent observations in a bad year for temperature and flow.

Richard suggested looking at recent observations to validate model predictions.

Ed Connor suggested buying land and securing conservation easements in high quality habitat. These may be areas that provide additional benefits and a good long term investment to hedge against climate change.

Devin Smith asked if the loss of glaciers will change these streams. How?

Ed Connor said the model will show. The South Fork Sauk gets nailed by low flows. Ground water is a big factor. We need to get a better grip on groundwater.

Someone referenced a restoration project implemented on a small stream on the Eastside that convinced farmers to change how they till and cover crop. Beavers were part of the project. They didn't see extreme low flows. Resiliency may not require a lot, but just a more creative approach. Here we don't do a lot of work on upper tributaries but this may be more important with climate change.

Ed Connor said that temperature data will be available early next year. This year was a real eye opener, and a great year to have temperature probes out. But it was also a terrible year. We learned more about what low flows look like in the watershed. Half of the probes were buried under Glacier Peak ash.

***Carol Macilroy suggested scheduling something early in the year to present data.**
Jon Reidel noted that we do have information on how glaciers in the entire watershed have changed that may help identify how sub-basins have changed in the last 50 years.

Devin Smith noted that many resiliency ideas are already recognized. Groundwater could provide more resiliency, and groundwater locations may be able to be identified with existing data.

Jon Reidel also noted that some streams flow from a huge accumulation of sand and gravel. There are different patterns of low flows on opposite sides of the river. Red Cabin Creek is like a glacial stream just due to ground water. He agreed we need to learn more about groundwater.

Correigh suggested that surficial geology maps may be used to make predictions about where groundwater is. Jon Reidel agreed that there's a lot more we could learn from surficial map than we know now. We have an idea of how tributaries behave differently on other sides of river.

**Carol said she would send the Power Point presentation out.**

Richard asked if sediment accumulations in the mainstem are going to change. Could that refocus what we are doing? We are trying to create more resilient floodplains. Are we missing anything?

Eric Grossman suggested structuring the approach and strategies based on life histories. Think about upper watershed areas and potentially do the South Fork Nooksack approach to buffer them. What should we do about spawning habitat up high? Slow flows to prevent scour? If high velocities are scouring redds, one idea would be to maintain the right sediment composition.

Correigh suggested sediment source control of fine sediments.

Richard said a lot of chinook spawning grounds are in the mainstem. Some steelhead.

Jon Reidel said that if a lot of sediment comes down, it could change how the entire river flows. It could be a moving target.

Devin Smith said that Puget Sound Energy dams include the possibility of releasing sediment. Are there clear benchmarks for this?

Richard said that engineered logjams manage sediment in the Nooksack. Here it's different. Crossing to the Nooksack strategy is a broader discussion. Whether that is going to work is unclear.

Ed Connor said that Finney Creek is the poster child for riparian restoration. Great salmon and steelhead watershed went sour because of sediment and logging impacts. Salmon may start returning and we may need to do more and more in terms of upland protection of landslides to protect against the vicious cycle of peak flow and erosion. **We should reevaluate effects of landslides in the watershed.**

Richard noted that management impacts have been reduced but climate change impacts will cause more landslides. Are there processes upstream that we need to look at with climate change?

Ed said that the Protection Committee has looked at where fish live, but what about protecting the upland areas? They will impact habitat downstream. Climate change may provide a reason to revisit that approach.

Carol said that Dave Peterson couldn't make it but wants to talk more about this.

Richard said the devil is in the details. If hydrology is a problem controlled by forest cover, is there a reason to think about timber rotation changes? Riparian areas of tributaries, slope stability – two different domains in the uplands we are wrestling with. Instability and riparian function.

Correigh noted that climate impacts include increased pest outbreaks in the forest. Decrease in cover and an increase in wildfire frequency. Ed referenced Goodell Creek and Newhalem as an example of this.

We need information as soon as possible on ground water and cold water refugia to inform Tier 3 acquisitions.

Eric Grossman said we should formulate proposals to do that work based on the metrics you need. Groundwater is a really complex problem.

**Richard said we will be scoping those metrics for the protection strategy in three months.**

Can we look at sub-tributary inputs to tributaries as a proxy for quantifying groundwater and surface water inputs that are so important for chinook and steelhead. Is that a good proxy?

John Reidel Said that's easier to do with glaciers than with groundwater. Surficial mapping would help us understand which of the tributaries have a lot of groundwater contribution.

Richard asked if the nexus of habitat connectivity and influence of sub-tributaries is a useable proxy?

Chris Vondrasek asked if climate change is making it such that we should be creating extra columns in the protection formula for how we value upland parcels? Should we add metrics for restoration potential? Is climate change driving us to think outside the box of the formula?

Ed Connor said that the uplands haven't been prioritized. We should link sediment and hydrology with downstream population centers where people fish, and rethink the priority of upper areas. Long term viability of fish may be more dependent on risks in the upper watershed. There may be a change in our perceptions. These are good questions.

Correigh noted that upland habitats are indirect effects. We could strategize better development codes, pervious surfaces, etc.

Richard asked how do we quantify those upland risks? Area of pervious surfaces, changes in harvest. Perennial sub-tributaries that are larger and more consistent are what we are looking for.

Devin Smith noted that we should distinguish the north side from the south side. There's nothing about groundwater in any of our habitat metrics. That seems like a big deal.

Correigh suggested revamping the protection formula into a decision framework so there would be multiple levels of evidence that lead you on a pathway.

John Reidel said larger scale (1:100,000) surficial maps may have groundwater information. The low flow study (Hidaka, 1973) could provide some information now. North side of the Skagit versus south side – aspect is huge because of glacial history and microclimate. Some of that you could put together now without large scale surficial maps or intensive groundwater study or mapping.

Devin Smith asked where do these other priorities that aren't in the protection formula (groundwater, floodplain processes, off-channel habitat) fit amongst upslope watershed processes versus floodplain habitat?

Correigh said the expert opinion (semiquantitative) adaptation study prioritized floodplain reconnection, water releases, culvert improvements, levee setbacks, and sediment source control.

**Richard asked to get that framework for the adaptation strategies from Correigh's manuscript that's in process.**

Kari Odden asked if we have spatially identified streams, can we work that into our strategy so we can use the information now and identify these properties? Where available, can we fit this into the process?

Eric Grossman asked if we can make maps showing all these datasets (fish productivity, acquisition opportunities, riparian condition)? Richard said SRSC, County, SWC may have this data but there isn't one place to get data. **That is a growing opportunity, how to work most efficiently in that system.**

Devin Smith said we should identify clear geological surficial features associated with groundwater and we could identify the percentages of geologic codes in a given watershed.

John Reidel said every tributary needn't be studied in order to identify the pattern.

Ed Connor noted that ground water mapping is a recurrent theme. Has there been any attempt to get funding for this?

**Carol Macilroy said she and Eric are going to submit an NTA for sediment funding and surficial geology work. They are also going to try to frame up current status of groundwater work. Finney Creek case study to scope groundwater proxies and formulate a plan. We can see if**

**Christina and Erkan from UW can come talk about their tributary and flow thesis. She will also send John's PowerPoint presentation and Correigh's framework for adaptation strategies.**

Correigh asked if moving toward a decision framework rather than formula would be a good next step. Richard said yes, we want to move in that direction. Correigh said that Tim Beechie has developed some frameworks and Richard could talk to him about applying those frameworks to this situation.

**Carol will follow up with Alison and Richard about next steps.**

Alison expressed gratitude at the amount of brain power working on this issue. It looks like our strategy is addressing many of the things we are looking at with climate change, in general.

Meeting adjourned at 2:25 pm.