FS comments, 2023

Over the last decades the North Fork Stillaguamish basin as whole and the fish that use that basin have undergone significant changes that could jeopardize the future of the ESA listed species (Chinook, steelhead and bull trout) that call the waters of the North Fork home. It has always been the case that in our river basins water will always flow downstream and the rivers themselves are the sum of the all the parts entering the system. Of particular concern for the long-time survival of the North Fork fishery resources is the changing hydrograph, particularly the increase magnitude of the annual floods.

The USGS NF Stillaguamish gauge located near Arlington, station #12167000

 provides use with a record of the largest annual flood since 1929 allowing the change flood magnitude over time. From the “Stillaguamish River Comprehensive Flood Hazard Management Plan, 2004” Snohomish provides a flood frequency table using the data series from 1929 to 1998. That table is-

Frequency level in cfs.

2 year 23,800

5 year 29,600

10 year 33,000

25 year 36,400

50 year 39,100

100 year 41,200

500 year 45,300

A second Snohomish County report “Sustainable Lands Strategy North Fork Stillaguamish Reach Scale Plan, December 2020” provides an updated flood frequency table though it is unclear what data series was used. The table is –

Frequency Level in cfs.

2 year 23,900

5 year 31,600

10 year 36,200

25 year 41,600

50 year 45,300

100 year 48,800

500 year 56,400

What is clear is what was considered a 100-year flood prior is now occurring 4 times more frequently and what was considered a 500-year event is now likely to occur 10 times more frequently. In the 71 years if annual flood records prior to 2000 the largest flood event 36,700 cfs in 1991. Since 2000 the has been exceeded 8 times, 2004 (44,000cfs), 2005 (39,000cfs), 2011 (49,400 cfs), 2011 (55,100cfs), 2016 (50,600 and 46,500cfs), 2018 (39,800cfs), and 2020 (40,600cfs). Clearly the hydrographic conditions in the North Fork Stillaguamish basin have changed dramatically since 200o.

I have often heard that climate change is a major driver in those hydrograph changes in the North Fork basin. A search of the annual flood records of western Washington USGS gauge found in addition to the North Fork Stillaguamish gauge sixteen other stations with records from today back at least 70 years. Two of those were the Sauk at Sauk and the Skykomish at Goldbar both of which had an period of record exactly the same as the North Fork Stillaguamish near Arlington. It would reasonable that these two neighboring basins would be experiencing much the same weather patterns. If climate change was a major driver in the flood in the NF Stillaguamish, then I would expect the flood pattern in the Sauk and Skykomish to be similar. To test that I looked at and compared what portion of the 10 largest floods in each basin. Through 2021 the years between 2000 and 2021 represent 24% of the time series. If those 10 floods were randomly disturbed across the period of record, we would expect on average 2.4 of them to have occurred post 2000. For both the Sauk and Skykomish 3 of those 10 largest floods occurred posted 2000. As noted above on the North Fork Stillaguamish the 8 largest floods in the period of record occurred post 2000: a rate 2.67 times higher than that seen on the either the Sauk or Skykomish.

All the above clearly shows there has been major changes in the NF Stillaguamish basin’s hydrograph since 2000 that were not considered or captured in either the North Fork (2000) or Deer Creek (1996) watershed analysis. Updated watershed analysis capture current conditions are essential to make informed decisions about potential downstream impacts from the proposed projects.

In number of Puget Sound river systems including the North Fork Stillaguamish a strong correlation between the magnitude of flooding during Chinook egg incubation and per cent of the eggs deposited that survive the downstream migrant stages has been noted; the higher the flow the lower the survival. It is hardly surprising that post the year 2000 the Chinook salmon in the Stillaguamish have become less productive. In the co-manager’s draft “Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component (2020) in Table 7 of the Stillaguamish River Management Unit Status profile the Recruit/Spawner (R/S) information is presented for the brood years 1990 to 2013. The information presented by the Stillaguamish tribe is based on agree to run reconstructions. A brood year is the year of a Chinook escapement with spawners (S) being the number of fish that spawned that year. The recruits (R) is the number of adults that would have returned to the river without any fishing. A given brood would be expected to produce that would return 2 to 6 years later.

For the brood years prior to 2000 (1990 to 1999) the average number of recruits produced per spawner (R/S) was 1.16 with a range of 0.60 to 1,80 with 8 of the 10 years have a R/S greater than 1.0. What this simply means is that on average during that period for every 20 spawners placed on spawning grounds 23 potential returning adults were produced. For the 14 brood years from 2000 to 2013 the annual R/S ranged from 0.35 to 1.05 and averaged 0.64. Only one fo the 14 years had a R/S greater than 1 (1.03) for brood year 2009. For the post 2000 period putting those same 20 spawners on the gravel only produced an average of 13 potential returning adults. Without the tribal conservation hatchery rescue program one could argue that the Stillaguamish Chinook are on the fast track to extinction.

Clearly the current ESA Chinook in the Stillaguamish basin ae in an extremely fragile position with little resiliency (productivity) to withstand any incremental threat increases, such as increases in sedimentation, temperature, flooding, etc. The listed steelhead and bull trout would also be at risk from the same threats