June 28, 2021

Jon Yoder, PhD
State of Washington Water Research Center
Washington State University

RE: ESSB 6095: Water in the Skagit Basin Sources and Uses, Present and Future Draft Storyboard

Dear Dr. Yoder,

Thank you very much for the opportunity to review the Water in the Skagit Basin Sources and Uses, Present and Future Draft Storyboard (Draft Storyboard). Overall, we are very pleased with the quality and depth of this investigation and appreciate the level of detail and information developed by you and your team. We have the following general comments.

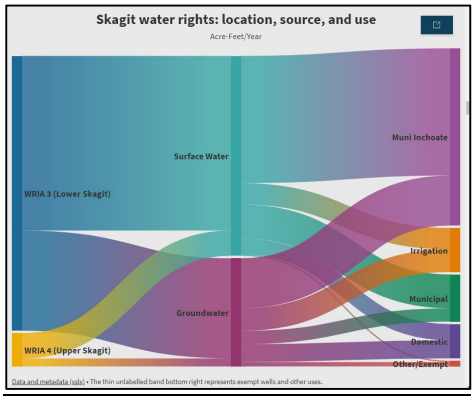
- The term "scarcity" is used throughout the Draft Storyboard without context or a clear definition as to its meaning. We believe a more precise definition of scarcity is warranted. The Skagit River is the largest U.S. tributary to Puget Sound. Based on information provided in the Draft Storyboard, the Skagit River has a mean annual volume of 12 million acre-ft with an additional 2.4 million acre-ft of groundwater recharge annually: it appears that less than 2 percent of the total annual volume of the river has been allocated under existing surface and groundwater rights, and the total existing and future consumptive demand is significantly less. A summary of water rights, current and future demand, and consumptive use as compared to total supply will be helpful and relevant in providing context for the term "scarcity." Another option is to use a word that would be a better fit.

- The spatial relationship between supply and demand is important, but not described sufficiently throughout the Draft Storyboard. The three largest allocations of water rights (Anacortes, PUD, and Agriculture) occur near or below the point of compliance in Mount Vernon. Significant withdrawals occur in the tidally influenced portion of the river, leaving the remainder of the upstream watershed largely unaffected. Accurate and detailed mapping of the spatial distribution of water rights and water demand will make it easier to understand the relationship between instream resources and consumptive uses.

- Natural conditions and conditions arising from potential changes in hydrology due to climate change are portrayed as "impacts" throughout the Draft Storyboard, implying that consumptive uses exacerbate these "impacts." Please clarify the baseline condition used for this characterization of impacts to instream resources. Please include a discussion of how hydropower operations that modify the natural condition have been incorporated into the definition of baseline condition.

In addition to these general comments, we have prepared the following specific comments on the Draft Storyboard.

Big Picture Tab. Figure BP Figure 1. Skagit Basin and Water Rights: Uses and Sources



We find this figure confusing and potentially misleading. We believe it would provide more context if this graphic were revised to include the total annual natural water supply.

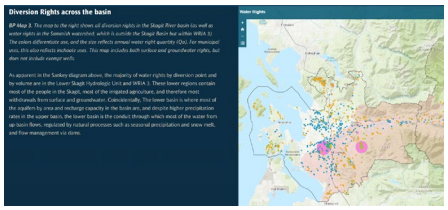
Based on information provided in the Draft Storyboard, it appears that the water rights are less than 2 percent of the total annual volume of water in the system and even less if estimated demand or consumptive uses are reported. Revising this figure would provide some perspective as to the relative volume of water allocated for municipal, irrigation, domestic, and other uses, and provide context for the use of the term “scarcity.”

Please consider revising the text and performing the proposed additional analyses.

Out of the 6,055 total water right documents pertaining to WRIAs 3 and 4 in the Washington State Department of Ecology's water rights database, 4,489 of them (74 percent) represent claims rather than permits or certificates. The fact that claims make up a super-majority of the water right authorizations in WRIA 3 and 4 is a significant source of uncertainty in understanding the water budget. While a Superior Court Adjudication is the only way to resolve this issue with finality, a simple GIS screening technique can be used to separate potentially valid claims from those that may not be valid. For example, please screen the priority date of all surface claims after 1917 (or after 1932 if adjacent to the river) and all groundwater claims after 1945 as potentially invalid because they post-date the adoption of the surface and groundwater codes. For claims that were mapped by Ecology, please perform a GIS comparison of their places of use to identify likely overlaps, thus avoiding double-counting the same water use. This methodology would reduce the number of claims from 4,489 to X. This doesn’t mean that the Y claims excluded are invalid, or that the X claims included are valid, but it

is likely a closer representation of the magnitude of actual vested water use than simply taking all claims at face value. The limited information on the status of claims remains a substantial source uncertainty around the Skagit Basin's water rights portfolio and associated water use.

Big Picture Tab. BP Map 3. Diversion rights across the basin



The information provided in the Draft Storyboard is summarized by WRIA. Please revise this map to match SW Map 1, which ends at Mount Vernon (HUC 9).

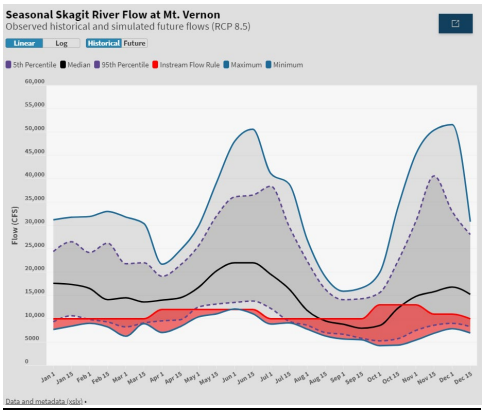
Instead of symbol size, please consider using a percentage to represent the relative size of the water right. Also please include existing demand and consumptive use.

Please include the location of the USGS Mount Vernon Gage as the point of compliance.

The associated text states that "the lower basin is where most of the aquifers by area and recharge capacity in the basin are." Our understanding is that much of the area below Mount Vernon is strongly influenced by tides and high groundwater and does not influence the river or shallow aquifer. Please use a more spatially explicit description of where recharge is occurring in relationship to points of withdrawal.

Please clarify how the 2001 Instream Flow Rule accounts for diversions below the point of compliance in Mount Vernon. This comment is related to the recent work performed by the Academy of Sciences review of the Estuary Study in the Duke 1999 Report.

BP Figure 2. Seasonal Skagit River Flow at Mt. Vernon



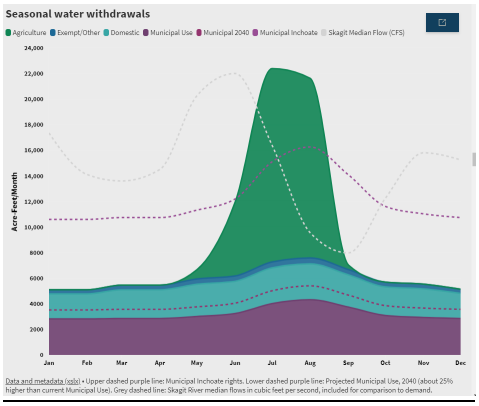
As discussed in the text, both Puget Sound Energy and Seattle City Light operate hydroelectric projects in the basin. As part of their operations, they re-time hydrographs as compared to natural conditions.

Please revise this figure and change observed historical with ***regulated*** historical Skagit river flows. Also, please add information to this figure that displays the modeled historic ***unregulated*** flow at Mount Vernon.

Puget Sound Energy gave a presentation to the Water Task Force in 2018, explaining that their new operating license that went into effect in 2008 requires them to discharge 1,000 cfs during summer as compared to their previous requirement of 80 cfs.

We believe it is important to include information about how hydropower projects influence observed historic flows, as well as current flows in the river as compared to unregulated flows. Please describe how the changes in hydropower operation are accounted for in the 2001 Instream Flow Rule, which was based on an analysis of flow records prior to 2001.

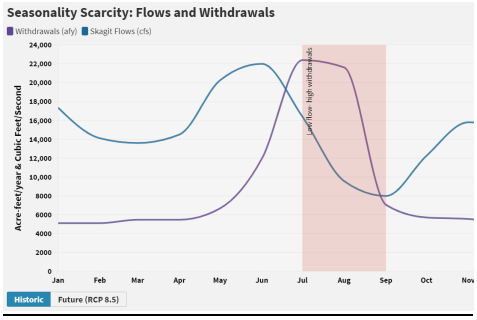
BP Figure 3. Seasonal Water withdrawals



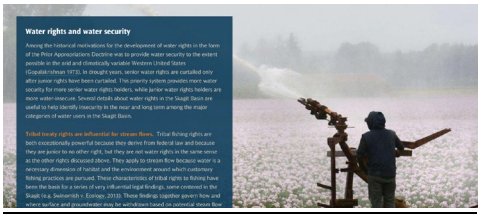
It is difficult to understand the relative importance of seasonal water withdrawals when they are reported in acre-ft/month and supply is estimated using cfs. Please revise these figures to use a consistent unit of measurement.

In addition, it would be helpful if this information were provided at several locations in WRIA 3 and 4, as much of the water withdrawal is below the point of compliance in Mount Vernon.

Using consistent units of measurement and spatially explicit reporting will provide context for the use of the term "scarcity" and will better illustrate the relationship between seasonal water withdrawals and instream habitat and salmon life histories.

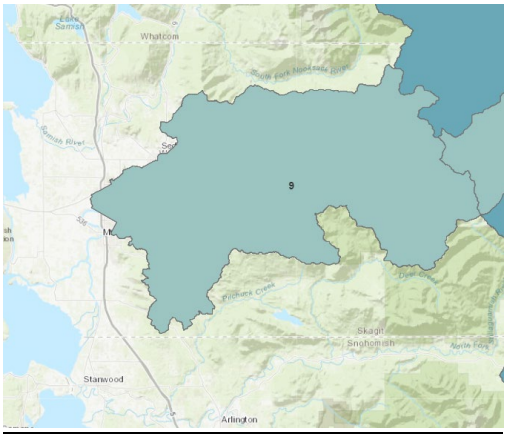


Background image: Big Picture Water rights and water security



Please change the background image to be neutral. Associating a picture of big gun irrigation with the text regarding treaty rights may inadvertently perpetuate the perceived conflict between agricultural and tribal interests.

SW Map 1. The interactive map to the right displays percent contributions by sub-basin to surface water for the Skagit River at Mount Vernon

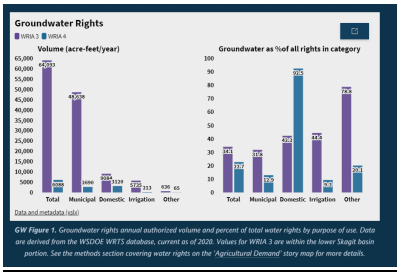


Given that most of the water demand and major diversions are in the extreme lower reaches or downstream of HUC 9, please provide context around the importance of tributaries and habitat upstream in the upper portion of HUC 9, the HUCs upstream of Sedro-Woolley in the 100+ miles of wild and scenic river, and tributaries that seem relatively unaffected by water demand.

In terms of watershed area and quantity of water as a percentage of flow, this figure and the supporting text appear to show that approximately 95 percent of the contribution of flow is upstream of virtually all the known water rights/demand.

Please revise the text to clarify the differences between tributary and mainstem flows. Many of the major diversions are on the mainstem and reflect cumulative water supply, unlike tributaries that are more closely related to HUC or sub-watershed supply.

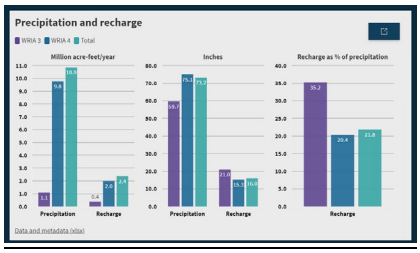
GW Figure 1. Groundwater rights annual authorized volume and percent of total water rights by purpose of use.



If groundwater resources are replenished annually from precipitation (see comment GW Figure 3), can you please estimate the annual groundwater supply as compared to the annual demand to provide context? The Draft Storyboard reports an annual groundwater recharge of 2.4 million acre-ft, with an annual consumptive use of 286 acre-ft per year, which is about 0.012%. This information relates to our general comment about the use of "scarcity" to describe water supply in the Skagit.

Can you please clarify which portion of the groundwater rights/water demand is in the tidally influenced portion of the watershed in the area that has been identified as exempt from the 2001 Instream Flow Rule?

GW Figure 3. Average annual precipitation and recharge for the historic period (1981–2010)

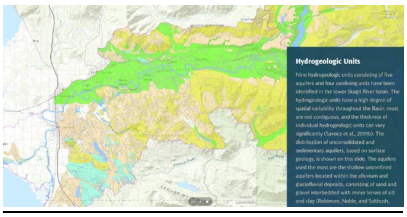


It appears there is a surplus of rainfall; more detail on the relationship between precipitation, groundwater recharge, and surface runoff would be helpful.

Can you please add a total groundwater budget based on inputs from precipitation and outputs?

Can you clarify if annual precipitation is enough to recharge the aquifer or if the aquifers are being impacted by withdrawals that are not replenished annually?

GW Map 2 Geography - The Skagit River (1981–2010)

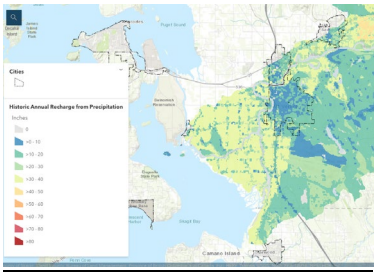


The Draft Storyboard text associated with this map states that "*Groundwater withdrawals are heaviest in the shallow unconfined aquifers of the lower Skagit River basin, with municipal and irrigation being the two largest uses of groundwater. Groundwater-surface water interactions occur along the Skagit River and its tributaries, which can lead to streamflow depletion up to the full amount of water pumped by a well. The strong stream-aquifer connectivity and high recharge rates play a moderating role on groundwater levels.*"

Can you please:

- Provide context about the relative importance of demand/consumptive use as compared to supply; the text seems to indicate large uses of groundwater in the unconfined aquifers relative to the supply.
- Clarify if some of the geologic units that are highly connected to the river are recharged by surface water sources or primarily through precipitation?
- Include cross sections that illustrate how groundwater resources are recharged?
- Better explain the effect of the hydropower projects and modified summer low-flow hydrographs on shallow aquifers/floodplain water table?
- Clarify if it is possible that hydropower operations result in higher-than-natural stream flows in the summer and also result in higher-than-natural shallow/floodplain aquifer elevations in the summer?
- Clarify how the work performed by Ecology for the SCL Water Mitigation Agreement relates to shallow aquifer recharge and water availability?

GW Map 4. Distribution of historic period (1981–2010) annual average groundwater recharge from precipitation in inches per year

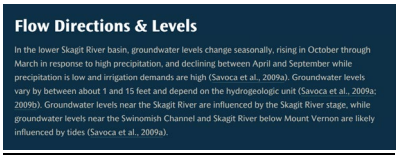


This seems like a very high level of recharge in the delta – this area is below mean high tide and the groundwater table is at or very near the surface most of the year.

Can you please clarify which portion of the groundwater rights/water demand is in the tidally influenced portion of the watershed in the area that has been identified as exempt from the 2001 Instream Flow Rule?

Can you provide a cross section?

GW Flow Direction & Levels



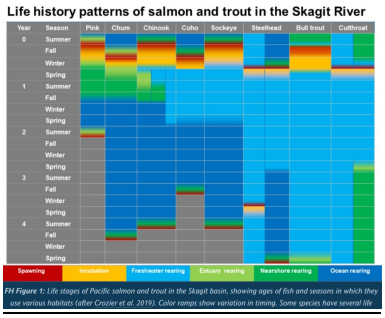
This text states that *"In the lower Skagit River basin, groundwater levels change seasonally, rising in October through March in response to high precipitation, and declining between April and September while precipitation is low and irrigation demands are high (Savoca et al., 2009a).*

Please revise this statement to clarify that Savoca et al. is the source for the conclusion that the connection between decline groundwater levels is related to irrigation demands, and provide more specific information about the relative importance of precipitation as it pertains to seasonal groundwater level as compared to irrigation demand.

Based on the summary of groundwater rights provided in the Draft Storyboard, irrigation is a small fraction of the overall demand (see GW Figure 1). Is there conclusive data that irrigation demand is causal to groundwater decline?

Please provide more information about how groundwater recharge in the delta below the point of compliance in areas where groundwater levels are influenced by tides and unconfined salt water is relevant to an evaluation of water supply and demand.

FH Figure 1: Life stages of Pacific salmon and trout in the Skagit basin



FH Figure 1: Life stages of Pacific salmon and trout in the Skagit basin, showing ages of fish and seasons in which they use various habitats (after Crozier et al. 2019). Color ramps show variation in timing. Some species have several life

This figure is confusing because it includes too much information. Please use several figures to clarify the difference(s) (if any) between estuary, nearshore habitat, tributaries, and mainstem habitats.

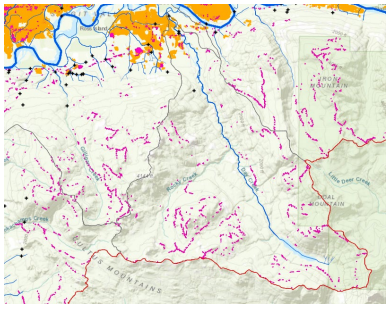
Please remove the information related to ocean rearing. We believe it is not relevant to water supply and demand.

Please clarify if nearshore and estuary life stages are in Skagit Bay or in the lower tidally influenced freshwater river reaches. If habitat associated with nearshore or estuary life stages are not influenced by the volume/flow rate of water from the Skagit River, please consider removing this information from the figure. This comment is related to the recent work performed by the Academy of Sciences review of the Estuary Study in the Duke 1999 Report.

Please include a figure/map that describes the life history patterns and spatial and seasonal distribution of Pacific salmon and trout in the watershed and distinguishes between mainstem and tributary life history patterns, including the lower mainstem Skagit.

Please clarify which, if any, river reaches are primarily used for migration.

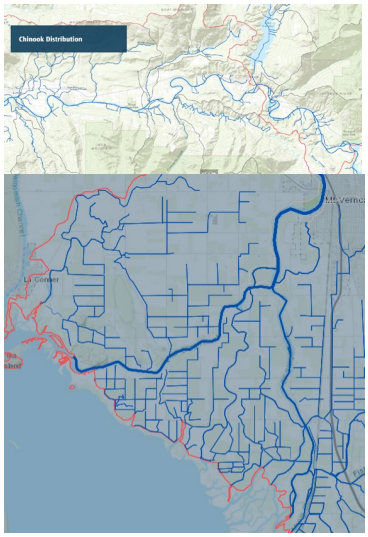
FH Map 4. Water rights across the basin by land-use class and in relationship to fish habitat



The municipal land-use data layer seems to indicate that logging roads are a municipal land-use that would require water. Please revise the data layer as needed to better reflect land uses that are likely to use water.

It is unclear why the distribution of floodplain-sensitive species was used as a proxy for impacts. The WDFW SalmonScape database shows a significantly larger network of streams/habitat and fish distribution. Is there a reason this dataset wasn't used?

FH Map 1. Distribution of floodplain sensitive species in the Skagit Basin



The distribution of Chinook salmon includes Lake Shannon and some of the steeper tributaries in some locations and seems to exclude lower gradient larger streams in other areas.

Please clarify how this data layer of Chinook/other floodplain-sensitive species distribution was developed and how it supports the statement that:

"all anadromous species use the lower reaches of the Skagit River and many of the lower tributaries. Steelhead and bull trout physically utilize a greater spatial extent of the basin, and more so than the Salmon species, physically utilize the upper reaches of many of the sub-basins."

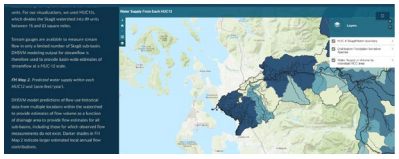
Please provide more spatially and seasonally explicit information about the life history stages of salmonids that utilize the lower reaches of the mainstem Skagit River as opposed to tributaries or other types of habitat that is available.

The WDFW SalmonScape database shows a significantly larger network of streams/habitat and fish distribution. Is there a reason this dataset wasn't used?

Many of the lower tributaries are not mapped correctly. WDFW has classified almost all these as artificial drainage and irrigation ditches that are not tributaries to the Skagit River; please correct the maps that rely on this data layer.

Are there documented locations where salmon habitat is impacted by low-flows beyond what naturally occurs in the system?

FH Map 2. Predicted water supply within each HUC12 unit (acre-ft/year)



The purpose of this figure is to illustrate "*estimated local annual flow contributions"* and states that "*from the perspective of fishes in the Skagit River, larger tributaries offer inherently more water to support fish habitat forming processes."*

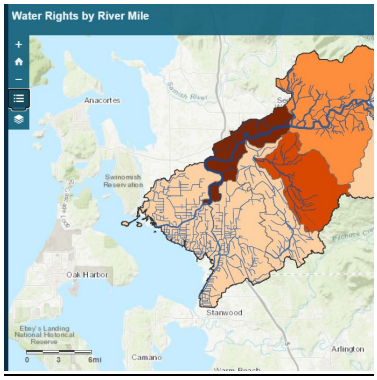
FH Map 2 is confusing because the color coding doesn't account for accumulation of flow in larger tributaries with multiple HUC basins' contributing flow.

It is unclear how this FH Map 2 supports the statement in the text without showing cumulative flow in the mainstem and larger tributaries.

The text states HUC12 was used but the map states HUC8. This extent of FH Map 2 should be consistent with SW Map 1 that ends at HUC 9.

Please clarify that habitat in the lower river is also influenced by tides and input of saltwater, and that at lower flow rates the importance of tides increases. This comment is related to the recent work performed by the Academy of Sciences review of the Estuary Study in the Duke 1999 Report.

FH Map 5. Potential water demand (water rights summed by volume) by river mile, summarized for each HUC12 unit



It is our understanding that the purpose of FH Map 5 is to illustrate that water withdrawals by volume are generally largest in the lower basin, thereby impacting fish.

It is clear from the Draft Storyboard that most of the withdrawals are in the lower river and are mainstem diversions (Anacortes/PUD, Ag). Please provide consistency in the map coloring to either include cumulative river flow or water rights/demand specific to the HUC identified. It is important to revise the Draft Storyboard to provide clarity in terms of mainstem supply and demand as compared to tributary supply and demand, particularly in the context of potential impacts to fisheries.

Would it be possible to present the relationship between supply and demand/consumptive use as a ratio or percentage indicating the relative importance as it pertains to instream habitat?

A spatially explicit description of points of withdrawal and points of return is important to better characterize the relative importance of supply vs. consumptive use. Particularly in the upper watershed, the Draft Storyboard suggests that most of the estimated water demand is almost immediately returned to the river, thereby reducing the potential effect to a spatially explicit reach.

The seasonality of water demand/consumptive use needs to be better explained in the context of impacts to fisheries: Do the withdrawals have the same impact throughout the year or are they concentrated on a specific species and/or life-history stage?

Please revise the tributary network in the lowest HUC: most of the blue lines are artificial ditches that drain directly to salt water.

Please be consistent with SW Map 1 that ends at HUC 9.

Flow Regulation

This section header in the Draft Storyboard is confusing because the use of "*regulation*" has two very different meanings.

As it pertains to the role of hydropower to re-time the hydrograph, please provide more information about how the regulated hydrograph was accounted for during the 2001 rule making/IFIM process and how it relates to the baseline condition by which impacts are compared.

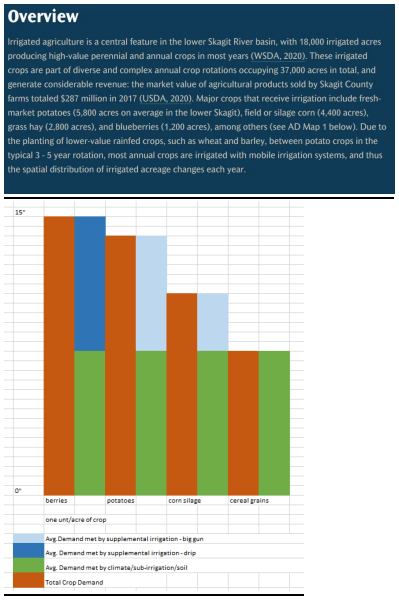
The Draft Storyboard text states that:

"for the Baker hydroelectric project, minimum required flows are 1,000 cfs for August 1 to October 20 and 1,200 cfs from October 21 to July 31. These required minimum flows make up about 10% of the flows associated with the Skagit Instream Flow Rule (IFR) at Mt. Vernon for August to October."

It is important to note that this requirement did not go into effect until after the 2001 Instream Flow Rule was established. See our comments on BP Figure 2.

Please explain the relationship between increases in hydropower low-flow discharge rate requirements, the instream flow rule, and water availability.

Ag Overview

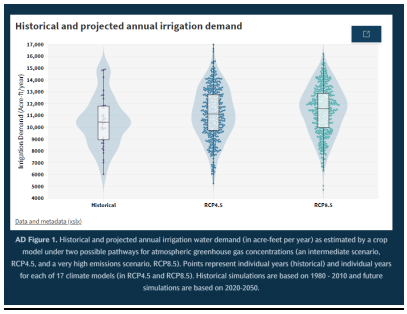


It is important to point out that only about half of the crops grown in any given year require supplemental irrigation. Unlike eastern Washington/California, this is supplemental irrigation, with some portion of the crop irrigation needs met by soil and climate conditions.

A more comprehensive ag water demand picture is needed. Please include a bar chart (see adjacent example) of CropSyst output to illustrate the water budget for each crop shown on AD Map 1 and the range of the crops' water needs that are met through soil moisture/climate and then supplemental irrigation.

Please include impacts to yield from deficit irrigation. A more comprehensive water demand picture is needed.

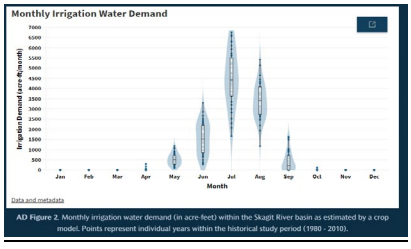
AD Figure 1. Historical and projected annual irrigation water demand



Given the recent trend in increasing agricultural irrigation demand, as noted in the Draft Storyboard, please include a future annual irrigation demand based on climate change scenarios and a shift in the annual mix of the types of crops grown from lower-value crops to higher-value crops.

Please clarify whether monthly irrigation water demand was calculated based on plant growth and did not include other factors related to soil preparation, harvest, and soil health.

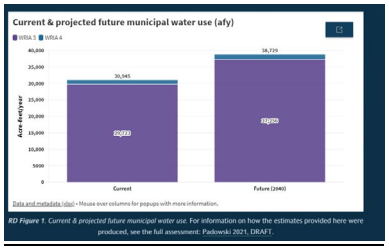
AD Figure 2. Monthly irrigation water demand



Please include a summary figure showing both demand and Jr. and Sr. Supply.

In addition to the hyperlink to the other segment of the storyboard, please provide more detail to the chart to illustrate when and where junior irrigation water rights are impacted by the 2001 Instream Flow Rule.

RD Figure 1. Current and Projected future municipal water use



Please provide more context for municipal growth. The Draft Storyboard text states that only about 15 percent of the total municipal water rights are currently being used. How much growth is expected in Skagit County given the current Comprehensive Plan? How does the estimate of future municipal water use relate to the existing municipal water rights?

Under the 1996 MOU and 1999 Coordinated Water System Management plan, were senior municipal water rights intended to support growth outside Skagit County? Please clarify if future growth includes expansion of service areas outside Skagit County and/or new water intensive industries.

Thank you for your consideration of our comments. We very much appreciate the opportunity to review and comment on the Draft Storyboard and are available for additional discussion/follow-up questions.

Sincerely,

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Co-Chair Representative Debra Lekanoff; Washington State 40th Legislative District
Dave Christensen; Washington State Department of Ecology Water Resources
Austin Melcher; Washington State Department of Ecology Water Resources