

Eklutna Hydroelectric Project Comparison to Existing Conditions

Evaluation Parameter	Existing Conditions	Proposed Final Fish and Wildlife Program
Instream Flows		
Year-Round Instream Flows	There are currently no year-round flow releases from Eklutna Lake into the Eklutna River. There is some accretion (~4-6 cfs) between the Project Dam and the Thunderbird Creek (TBC) confluence. TBC mean daily flows peaked in June (81 cfs in 2021; 182 cfs in 2022) and ranged from 7 cfs to 27 cfs in the winter.	Provides year-round instream flows to the Eklutna River by utilizing the existing AWWU tunnel. This provides flow to 11 out of 12 miles of the river, varying from 40 cfs in the summer to 27 cfs in the winter. The Committee may request changes to the flow regime within the water budget and operational limitations. Addition inflows to the reservoir will be reallocated every 10 years between hydro generation and instream flows to potentially increase the water budget.
Periodic Channel Maintenance Flows	There have been 10 spill events since the current dam was constructed in 1965 (every 6 years on average). Spill events occurred between August and October, ranged in magnitude from 18 cfs to 1,022 cfs, and ranged in duration from 8 days to 74 days.	Provides channel maintenance flows in 3 out of 10 years utilizing a combination of flows from the AWWU portal valve and the existing drainage outlet gate at the base of the dam. Channel maintenance flows will occur in the fall, ramp up from 40 cfs to 220 cfs over 6 hours, hold at 220 cfs for 36 hours, then ramp back down to 40 cfs over 52 hours. The Committee may request changes to the channel maintenance flows within the water budget and operational limitations. A limited reopener for the fixed wheel gate 10 years after instream flows are established by allow for higher magnitude channel maintenance flows in the future if needed.

Water Quality		
Temperature	Winter water temperatures in the Eklutna River above the TBC confluence ranged from 0.9°C to 3.3°C on average. Peak water temperatures in the Eklutna River above the TBC confluence ranged from 6.2°C to 9.3°C in 2021 and from 7.6°C to 9.7°C in 2022. This meets ADEC water quality criteria ($\leq 15^\circ\text{C}$).	Flow releases to the Eklutna River would come from the existing intake at Eklutna Lake. The water temperature in Eklutna Lake at the intake depth ranges from $\sim 3^\circ\text{C}$ in the winter to $\sim 10\text{-}12^\circ\text{C}$ in the summer, which meets ADEC water quality criteria ($\leq 15^\circ\text{C}$).
Dissolved Oxygen (DO)	DO in the Eklutna River above the TBC confluence is $>10\text{mg/L}$ throughout the year. This meets ADEC water quality criteria ($\geq 7\text{mg/L}$).	Flow releases to the Eklutna River would come from the existing intake at Eklutna Lake. DO in Eklutna Lake at the intake depth is $>10\text{mg/L}$ throughout the year, which meets ADEC water quality criteria ($\geq 7\text{mg/L}$).
pH	pH in the Eklutna River above the TBC confluence ranged from 7.8 to a maximum of 8.6 in the summer, just above the ADEC criteria (8.5).	Flow releases to the Eklutna River would come from the existing intake at Eklutna Lake. pH in Eklutna Lake at the intake depth ranged from 7.9 to 8.1, which meets ADEC water quality criteria (8.5).
Geomorphology		
Substrate	Salmon prefer a substrate size of 16-128 mm for spawning gravel. <ul style="list-style-type: none"> - Coho prefer 16-64 mm - Chinook prefer 64-128 mm The average substrate size where salmon are currently spawning (below the TBC confluence) is $\sim 25\text{-}30$ mm. The average substrate size above the canyon from: <ul style="list-style-type: none"> - RM 5 to 6.5 ranges from $\sim 75\text{-}16$ mm (good for spawning) - RM 6.5 to 10 is <16 mm (bad for spawning) - RM 10 to 11 is $\sim 16\text{-}64$ mm (good for spawning) 	The sediment transport modeling results indicate that the proposed channel maintenance flows will maintain the preferred substrate size of 16-128 mm throughout the majority of the potential spawning reaches in the Eklutna River, with significant improvements from RM 6.5 to 10. Based on monitoring results, the Committee may request changes to the channel maintenance flows within the water budget and operational limitations if needed. A limited reopener for the addition of a fixed wheel gate 10 years after instream flows are established would allow for higher magnitude channel maintenance flows in the future if warranted.

Fish Passage		
Canyon Reach	The minimum flow required for adult salmon to migrate up through the canyon is ~40 cfs. Flows in the canyon currently range from ~4-6 cfs. Therefore, adult salmon are currently unable to migrate through the canyon.	Modeling indicates that the proposed 40 cfs flow release from the AWWU portal valve in the summer, plus the ~4-6 cfs of accretion above TBC, should allow adult salmon to migrate through the canyon. Based on monitoring results, the Committee may request changes to the instream flow regime within the water budget and operational limitations if needed.
Beaver Dams	There are several beaver dams in the Eklutna River below the railroad bridge. However, adult salmon have been observed above those dams, which indicates that they are not a barrier to upstream fish passage. There are 6 additional beaver dams above the canyon, the largest of which is 6 feet tall. It is unknown if these are a barrier to fish passage since adult salmon currently cannot reach this section of the river.	It is likely that increased flows in the Eklutna River will encourage beavers to build their dams on side channels instead of in the main channel, which should not impede upstream fish passage. Physical habitat enhancement funding may be used by the Committee to remove any beaver dams that are a barrier to fish passage if needed.
Project Dam	The dam does not currently have any volitional fish passage facilities; however, adult salmon are not currently able to reach the dam due to insufficient flows. Trap and haul of fish from the river into the lake is not currently being done.	The Proposed Final Program does not include any volitional or trap and haul fish passage into or out of Eklutna Lake at this time. However, the limited reopener for fish passage may allow fish passage measures to be implemented in the future (any time more than 10 years after instream flows are established) as long as they meet specific criteria.
Spawning Habitat		
Chinook	0.7 acres	2.2 acres (this is a 209% increase and represents 96.5% of the max available habitat below the AWWU portal valve and 81.7% of the max available habitat in the Eklutna River)
Coho	2.5 acres	4.1 acres (this is a 65% increase and represents 99.6% of the max available habitat below the AWWU

		portal valve and 83.7% of the max available habitat in the Eklutna River)
Pinks	Pink salmon are known to utilize the lower Eklutna River for spawning; however, spawning habitat for pink salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit pink salmon.
Chum	Chum salmon are known to utilize the lower Eklutna River for spawning; however, spawning habitat for chum salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit chum salmon.
Sockeye	No adult sockeye salmon were observed spawning in the Eklutna River by the Project Owners or NVE.	While the year-round flow releases may technically create spawning habitat for sockeye in the Eklutna River, sockeye generally rear in lakes and the Proposed Final Program does not propose fish passage into Eklutna Lake at this time. Therefore, any sockeye habitat that may technically be created in the Eklutna River is not included in the habitat benefits related to the Proposed Final Program. However, the limited reopener for fish passage may allow fish passage measures to be implemented in the future (any time more than 10 years after instream flows are established) as long as they meet specific criteria.
Rearing Habitat		
Chinook	11.8 acres	18.1 acres (this is a 53% increase) It should also be noted that beaver dams in the river above the canyon may create additional rearing habitat; however, this was not quantified. Physical habitat enhancement funding provided in the Proposed Final Program may be used by the Committee to improve rearing habitat in the river as deemed appropriate.

Coho	14.7 acres	24.6 acres (67% increase) It should also be noted that beaver dams in the river above the canyon may create additional rearing habitat; however, this was not quantified. Physical habitat enhancement funding provided in the Proposed Final Program may be used by the Committee to improve rearing habitat in the river as deemed appropriate.
Pinks	Pink salmon are known to utilize the lower Eklutna River for rearing; however, rearing habitat for pink salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit pink salmon.
Chum	Chum salmon are known to utilize the lower Eklutna River for rearing; however, rearing habitat for chum salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit chum salmon.
Sockeye	Sockeye generally rear in lakes. Ocean-run sockeye cannot currently access Eklutna Lake; however, the current water quality conditions in Eklutna Lake (high turbidity, low nutrients, low productivity) indicate that it would not support a large sockeye run. This is supported by the current condition of the kokanee (land-locked sockeye) population in Eklutna Lake, which is poor (undersized and low fecundity with no sexual dimorphism or coloration).	The Proposed Final Program does not propose any volitional or trap and haul fish passage into Eklutna Lake at this time; therefore, no change in sockeye rearing habitat is anticipated. However, the limited reopener for fish passage may allow fish passage measures to be implemented in the future (any time more than 10 years after instream flows are established) as long as they meet specific criteria.
Winter Habitat	The current overwintering strategy for salmon in the Eklutna River is unknown. However, modeling indicates that low winter flows may be causing unfavorable ice conditions (frazil ice and anchor ice) in the river.	Modeling indicates that the proposed 27 cfs flow release from the AWWU portal valve in the winter, plus the ~4 cfs of accretion above the TBC and ~7-27 cfs from TBC itself, should promote good ice conditions (surface ice) in the river. Based on monitoring results, the Committee may request changes to the flow regime within the water budget and operational limitations if needed.

Wetlands		
Estuary	There are 487.0 acres of habitat in the Eklutna River estuary below the railroad bridge. The brackish habitat types in this area have a high ranking for wetland function.	Since the Eklutna River estuary already receives flows from TBC (mean daily flows peaked in June at 81 cfs in 2021 and 182 cfs in 2022) the proposed base flow releases from the AWWU portal valve (40 cfs in the summer months) are not likely to significantly impact the quantity or quality of estuary habitat.
Riparian Zone	There are 42.5 acres of habitat in the flooded forest (area between the railroad bridges and the highway bridges) with a low to moderate ranking for wetland function. There are 46.9 acres of seasonally flooded Alder-Willow shrub scrub located above the canyon in portions of the dewatered Eklutna River channel with a high ranking for wetland function.	Channel maintenance flows are expected to remove the small, linear strip of riparian shrub along the narrowed stream channel in the upper and middle river. Overbank flooding and sediment deposits could, over time, promote greater cover of streamside cottonwoods in mixed forests. Physical habitat enhancement funding may be used by the Committee for vegetation management as deemed appropriate.
Littoral Zone	There are 114 acres of freshwater littoral habitat near the outlet of Eklutna Lake with a low to moderate ranking for wetland function.	Since there are no proposed changes to reservoir operations, the quantity and quality of littoral habitat near the outlet of Eklutna Lake is not likely to change significantly.
Wildlife		
Bears	Camera traps were deployed throughout the Eklutna River in 2022. A total of 32 black bear groups and 14 brown bear groups were recorded, some with 1-3 cubs. Both black and brown bears were seen throughout most of the river corridor. However, there were more brown bears seen below the canyon and more black bears seen above the canyon.	Increased salmon abundance will likely benefit and may attract more bears to the area. This could potentially increase competition between black and brown bears for prime fishing habitats.
Moose	Moose were the most abundant wildlife species observed along the Eklutna River. A total of 352 moose	Increased salmon abundance should indirectly benefit moose (increased plant nutrients for forage); however,

	<p>groups were recorded in 2022. A moose browse survey was also conducted in 2022. The results showed a 22% browse removal rate, which is indicative of a population that should be in good nutritional status with healthy twinning rates. However, few moose twins were observed, which may be due to moose calf predation.</p>	<p>increased salmon abundance may also attract more bears, which could lead to a heightened predation risk for moose.</p>
<p>Beavers</p>	<p>There is one long-standing active beaver colony (with 4 active dams) in the Eklutna River below the railroad bridge. Since the lower dam was removed in 2018, evidence of beavers started to be seen above the lower dam site. In 2022, there were 2 active beaver colonies above the canyon, each with a colony size of ≥ 3 beavers. The middle river colony has 6 active dams. The largest dam is over 6 ft tall and some of the dams have caused flooding along the AWWU access road. The upper river colony was removed by ADFG in late 2022 because the impoundment behind the beaver dam was flooding the AWWU access road.</p>	<p>The study flow releases in 2021 breached 2 beaver dams and completely removed a third. It is likely that increased flows in the Eklutna River will encourage beavers to build their dams on side channels instead of in the main channel.</p>
<p>Raptors</p>	<p>A raptor nest survey was conducted in 2022. Suitable nesting sites for bald eagles are limited to coastal areas. A total of 4 bald eagle nests were recorded near the coast, but only 1 nest was determined to be occupied. The eroding cliff substrate in the river above the canyon is very low quality for other nesting raptors. However, 2 raven (or possible goshawk) nests were recorded in the Eklutna River valley.</p>	<p>Increased salmon abundance will likely benefit and may attract more raptors to the area.</p>

Marine Mammals	Beluga, harbor seals, and sea otters have been observed around the mouth of the Eklutna River.	Increased salmon abundance will likely benefit and may attract more marine mammals to the area.
Cultural Resources		
Natural Resources	Eklutna Village (Idlughet) is located near the mouth of the Eklutna River (Idluytnu). The Eklutna River drainage is an important subsistence area for the Eklutna Dena'ina. <ul style="list-style-type: none"> - Fishing – salmon - Hunting – moose, bear, sheep and ground squirrel - Gathering – berries, plants, trees, and stones 	Increased salmon abundance will indirectly benefit other wildlife species, all of which are important subsistence resources for the Eklutna Dena'ina.
Archaeological Resources	There were no archaeological resources identified within the Area of Potential Effect (APE).	No impacts to archaeological resources are anticipated.
Historic Resources	The Eklutna Dam and Spillway and the Eklutna River Railroad Bridge are within the APE and are eligible for the National Register of Historic Places.	No substantial modifications to the dam or spillway are proposed at this time. If the fixed wheel gate is implemented, the Project Owners will consult with the SHPO regarding a determination of effects. ARRC had previously raised concerns about the potential for increased flows to impact the railroad bridge. However, the study flow releases in 2021 had no impact on the railroad bridge, and the proposed flows are well within the hydraulic capacity of the bridge. Therefore, no impacts to the railroad bridge are anticipated.
Municipal Water Supply		
Water Availability	AWWU's water right allows them to divert up to 41 million gallons per day (MGD); however, on average AWWU only diverts ~31 MGD.	The Proposed Final Program proposes to utilize the excess capacity in the AWWU tunnel for providing flows to the Eklutna River. This will not impact AWWU's ability to divert up to 41 MGD. In addition, several engineering measures are

		proposed to prevent any potential disruption to the public water supply.
Water Treatment	Four step process: coagulation / flocculation, sedimentation, filtration, and disinfection.	Because the Proposed Final Program does not propose fish passage into Eklutna Lake at this time, no impact to the water quality in Eklutna Lake is anticipated. Therefore, no change in water treatment is required. The Committee is required to obtain AWWU's consent or approval of any fish passage measures they may propose in the future as part of the limited reopener.
Water Supply Infrastructure	AWWU's buried pipeline follows the Eklutna River for 6 miles, crossing it 8 times before exiting the valley to the water treatment facility. The pipeline is buried ~5 feet deep, and the crossings are armored; therefore, no impacts to the buried pipeline are anticipated. AWWU's access road follows the buried pipeline and crosses the river 10 times. Of the 10 crossings, 2 of them are bridges and 8 of them are fords. The AWWU bridges have a hydraulic capacity of ~1,000-1,200 cfs.	Year-round base flows will prevent AWWU from crossing the river at the 8 fords. Therefore, the Proposed Final Program proposes to construct 8 new bridges at these crossing to allow continued access by AWWU once the instream flow regime is implemented.
Other Downstream Infrastructure		
Old Glenn Highway Bridge	The current bridge was constructed in 2015 and has a hydraulic capacity of >1,800 cfs. Since 2015, the largest flow release from the dam was the study flow releases in 2021 which had a max flow release of 150 cfs and resulted in a peak mean daily flow of 215 cfs in the lower river. In 2022, the peak mean daily flow was 270 cfs. Neither of these flows in 2021 or 2022 impacted the bridge.	Increasing flows in the Eklutna River by 27 cfs in the winter, 40 cfs in the summer, and 220 cfs during peak flows is well within the hydraulic capacity of the Old Glenn Highway bridge.
New Glenn Highway Bridges	These bridges were constructed in 1975 and have a hydraulic capacity of >4,700 cfs. Since 1975, the largest	Increasing flows in the Eklutna River by 27 cfs in the winter, 40 cfs in the summer, and 220 cfs during peak

	<p>flow release from the dam was the spill event in 1995 which had a max flow of 1,022 cfs. This did not impact the highway bridges, but it did occur before the lower dam was removed in 2018. ADOT&PF previously raised concerns about how all the accumulated sediment that was left in the river after the lower dam removal would be transported downstream and may impact the highway bridges. In 2021, the Project Owners conducted a series of study flow releases with a max flow release of 150 cfs. These flows did not impact the highway bridges.</p>	<p>flows is well within the hydraulic capacity of the New Glenn Highway bridges.</p>
<p>Railroad Bridge</p>	<p>The current bridge pre-dates the existing hydro project and has a hydraulic capacity of >8,000 cfs. Since 1965 when the existing dam was constructed, the largest flow release from the dam was a spill event in 1995 with a max flow of 1,022 cfs. This did not impact the railroad bridge, but it did occur before the lower dam was removed in 2018. ARRC previously raised concerns about how all the accumulated sediment that was left in the river after the lower dam removal would be transported downstream and may impact the railroad bridge. In 2021, the Project Owners conducted a series of study flow releases with a max flow release of 150 cfs. These flows did not impact the railroad bridge.</p>	<p>Increasing flows in the Eklutna River by 27 cfs in the winter, 40 cfs in the summer, and 220 cfs during peak flows is well within the hydraulic capacity of the railroad bridge.</p>
<p>Recreational Use and Facilities</p>		
<p>Lakeside Trail</p>	<p>A recreation survey was conducted in 2022. The Eklutna Lakeside Trail was the most frequently reported destination in the area, with >400</p>	<p>Chugach State Park has received funding to repair the sections of the trail that are currently impacted by erosion at high lake levels, and the</p>

	<p>pedestrians per day in the summer months. The trail is open to motorized use Sunday-Wednesday and non-motorized use Thursday-Saturday. There are areas where the trail splits, with the non-motorized trail closer to the lake shoreline. Current reservoir operations cause some erosion of the non-motorized trail at high lake levels.</p>	<p>Project Owners will provide match funding upon Governor’s approval. Since the Proposed Final Program does not propose any changes to reservoir operation, no additional impacts are anticipated.</p>
<p>Campground and Cabins</p>	<p>The nearby Eklutna Lake Campground has 50 campsites and is a popular camping area. There are also 2 popular cabins near the dam.</p>	<p>No impacts to the campground or the cabins are anticipated.</p>
<p>Kayaking</p>	<p>Kayaking is a popular activity on Eklutna Lake.</p>	<p>No impacts to kayaking are anticipated.</p>
<p>Tailrace Fishery</p>	<p>ADFG stocks Chinook and coho smolts at the Project tailrace to support a recreational fishery. In 2022, a minimum of 31,447 recreators partook in activities (mostly fishing) at the tailrace between June 8 and August 23.</p>	<p>With the Proposed Final Program, water from Eklutna Lake will now be released into both the Project tailrace and the Eklutna River. Salmon returning to the tailrace will first pass by the mouth of the Eklutna River and may stray into the river. This could decrease the number of adult salmon returning to the tailrace each year, which could impact the tailrace fishery. Therefore, a straying study must be conducted as part of the monitoring plan. If significant straying is observed, the appropriate mitigation measures will be determined in coordination with ADFG.</p>
<p>Eklutna River Fishery</p>	<p>Most of the land around the river is owned by Eklutna, Inc. There is currently no free, non-permitted public access to the Eklutna River.</p>	<p>The Project Owners have requested that Eklutna, Inc. provide free, non-permitted public access to the Eklutna River once fishing for Chinook, coho, or sockeye is allowed.</p>
<p>Hunting</p>	<p>ADFG regulates hunting and trapping activities in the Eklutna Lake Management Area, which is closed to all hunting except by bow and arrow.</p>	<p>Bears and potentially moose are likely to benefit from increased salmon abundance, which could</p>

	The taking of moose, brown bear, and sheep requires a permit, and the taking of black and brown bears requires completion of a hunter safety course.	improve hunting opportunities for these species in the area.
Wildlife Viewing	Some people reported wildlife viewing as one of their intended recreational activities in the Eklutna area.	Increased salmon abundance and the indirect benefits to other wildlife species will likely improve wildlife viewing opportunities in the area.
Safety		
Wildlife-Human Interactions	Negative wildlife-human interactions, while not common within Chugach State Park, are a public safety concern as visitors seek to view wildlife and use park resources for recreational pursuits. At least half of the 12 people injured or killed by bears in Chugach State Park since its establishment were within 100 yards of salmon spawning streams.	Increased salmon abundance may attract more bears to the area, which could increase negative bear-human interactions near the campground. However, the year-round base flows will be released at the AWWU portal valve approximately 1 mile downstream of the dam and campground. Therefore, any increase in negative bear-human interactions should be low.
Flood Protection	The entire volume of the Probable Maximum Flood can be contained in the flood storage capacity of the reservoir with 3 feet of freeboard remaining even if the spillway was blocked.	Because there are no proposed changes to reservoir operations, there will be no change in the flood storage capacity.
Power Production		
Generation	Average annual generation at the Eklutna Power Plant is approximately 169,000 MWh per year.	The water released into the river will not go through the powerhouse and will result in a net reduction of 16,100 MWh per year. This is a 10% reduction on average.
Grid Reliability	The Project provides grid reliability through diversification of fuel for generation.	While the Project would continue to provide grid reliability through diversification of fuel for generation, its benefit would be slightly reduced.
Renewable Integration	The Project can be used to firm other intermittent renewables (wind and solar).	While the Project could still be used to firm other intermittent renewables, its benefit would be slightly reduced.

Other Aspects of Environmental Quality		
Carbon Offsets	The Project offsets approximately 72,500 metric tons of CO ₂ equivalent per year.	Carbon offsets would decrease by 6,900 metric tons of CO ₂ equivalent per year. This is a 10% reduction on average.
Costs		
Capital Improvements	-	\$20,482,860 with the fixed wheel gate
Operations and Maintenance	-	\$315,900 (per year)
Replacement Energy	-	\$1,333,188 (per year)
Total Annualized Cost	-	\$4,043,000 (per year)
Potential Ratepayer and Taxpayer Impacts		
Chugach Electric	-	+0.78%
Matanuska Electric	-	+1.07%
Municipality of Anchorage	-	+\$1.03 (per \$100k of property value)