Eklutna Fish & Wildlife Program

Alternatives Analysis - Meeting 3

June 14, 2023

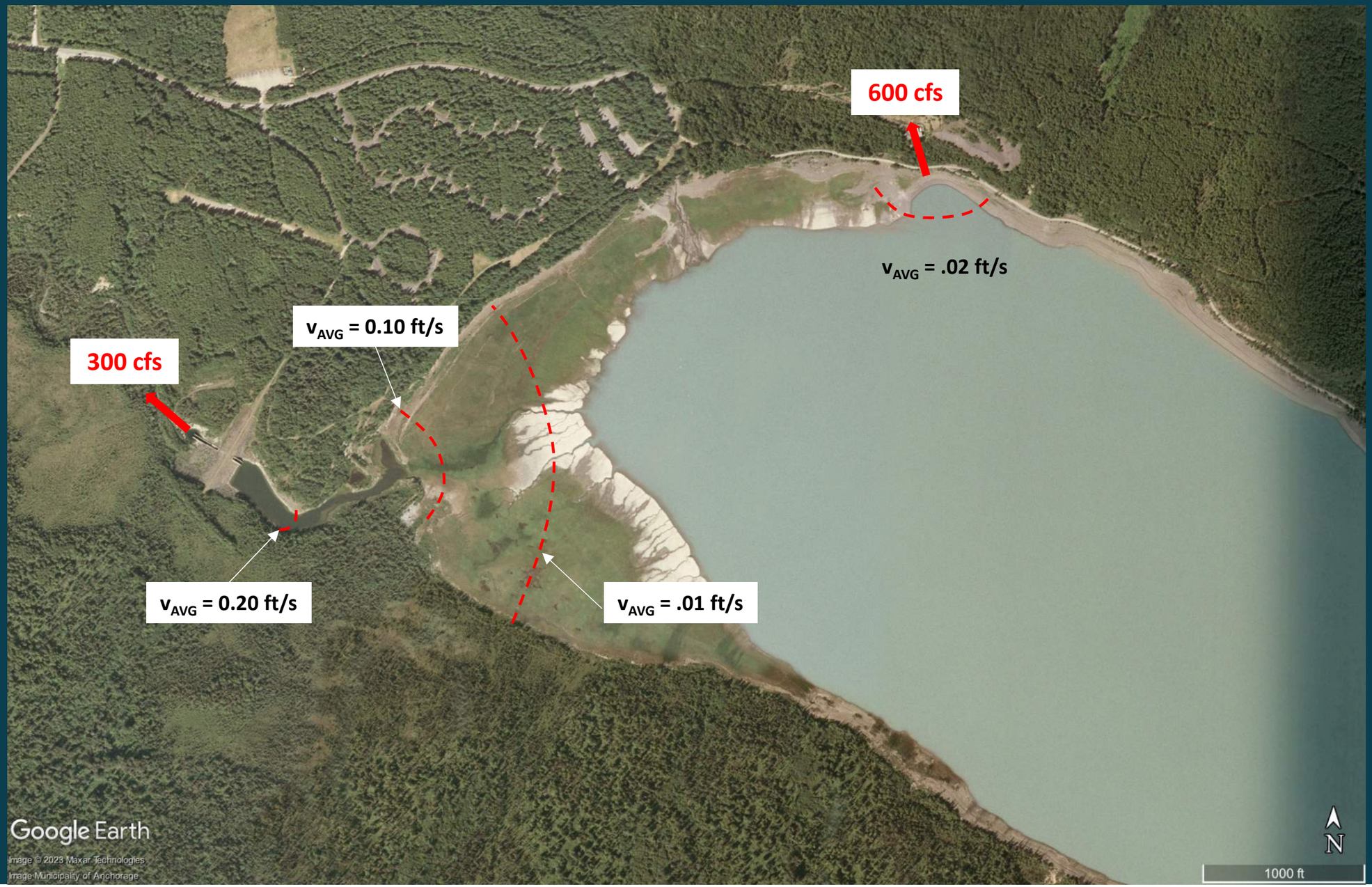
McMillen

Agenda

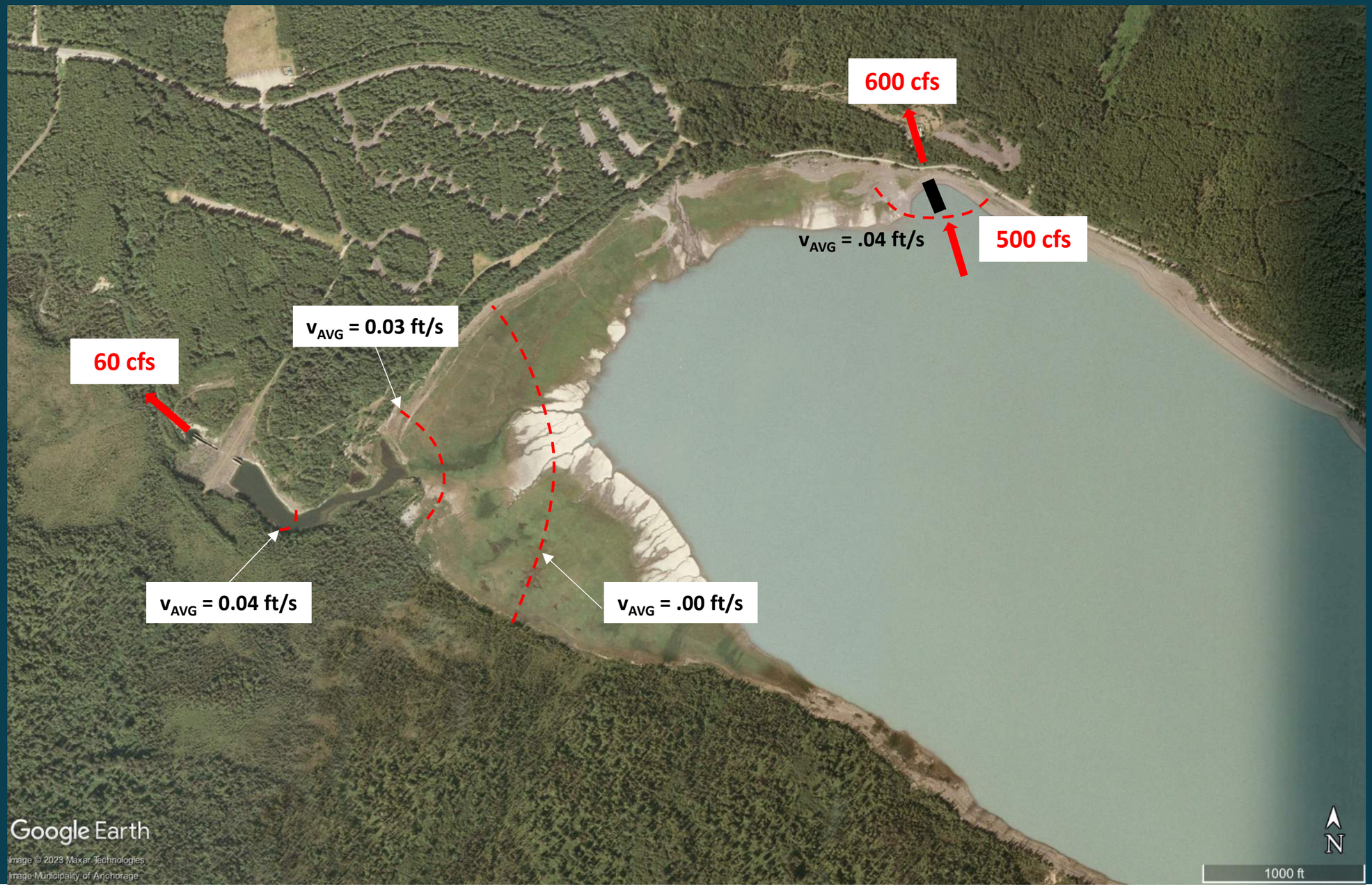
9:00 – 9:15	Introduction
9:15 – 9:30	Downstream Migration Discussion
9:30 – 10:00	Lake/Tributary Habitat Discussion
10:00 – 11:30	Alternatives Analysis Results
11:30 – 11:45	Lunch
11:45 – 12:30	Geomorphology Modeling Results
12:30 – 1:00	Key Takeaways and Next Steps
1:00	Adjourn

Downstream Migration Attraction

Downstream Migration – Dam Release



Downstream Migration – Floating Surface Collector



Downstream Migration – Floating Surface Collector

ID No.	Name	Owner	Location	Reservoir Fluctuation (ft)	Screen Type	Fish Transport	Flow (ft^3/s)
01	North Fork	PGE	Clackamas River, WA	10	FSC	Bypass Conduit	600 / 1,000
02	Lower Baker	PSE	Baker River, WA	30	FSC	Trap and Transport	500 / 1,000
03	Upper Baker	PSE	Baker River, WA	30	FSC	Trap and Transport	500 / 1,000
04	Cougar (in design)	USACE	S. Fork McKenzie River, OR	180	FSC	Trap and Transport	1000
05	Cougar	USACE	S. Fork McKenzie River, OR	180	PFFC	Trap and Transport	100
06	Swift FSC	PacifiCorp	Lewis River, WA	100	FSC	Trap and Transport	600 / 800
07	Cushman	Tacoma Power	Skokomish River, WA	20	FSC	Trap and Transport	250
08	Trail Bridge (design only)	EWEB	McKenzie River, OR	NA	FSS	Bypass Conduit	940
09	Round Butte	PGE	Deschutes River, OR	1 - 9	FSS	Trap and Transport	6,000
10	River Mill	PGE	Clackamas River, WA	2 - 6	FSS	Bypass Conduit	500 / 700
11	Soda Springs Fish Passage	PacifiCorp	North Umpqua River	14	FSS	Bypass Conduit	1,870

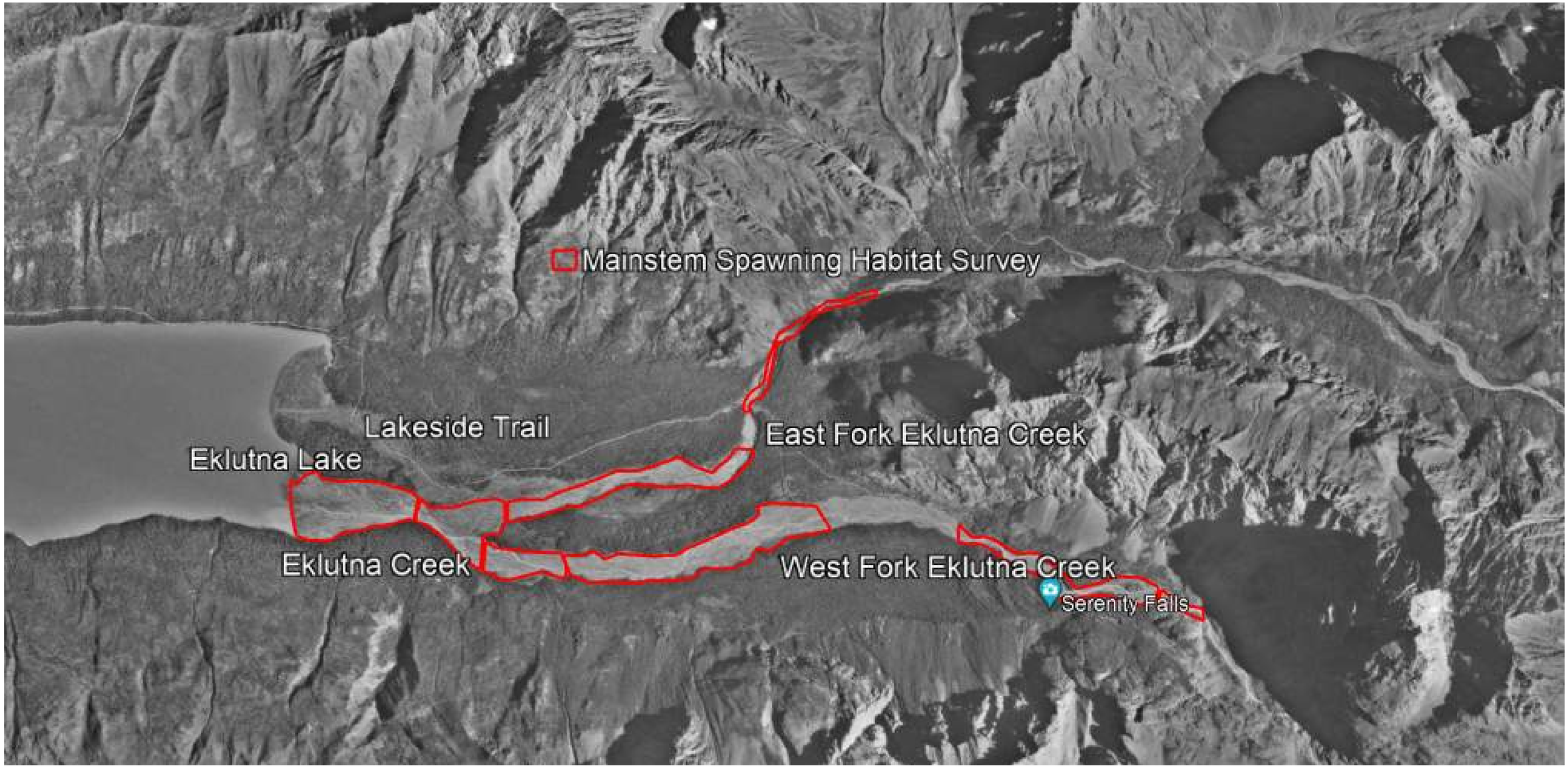
FSC = Floating Surface Collector FSS = Fish Screen Structure PFFC = Portable Floating Fish Collector

Lake/Tributary Spawning/Rearing Habitat

East/West Forks Eklutna Creek

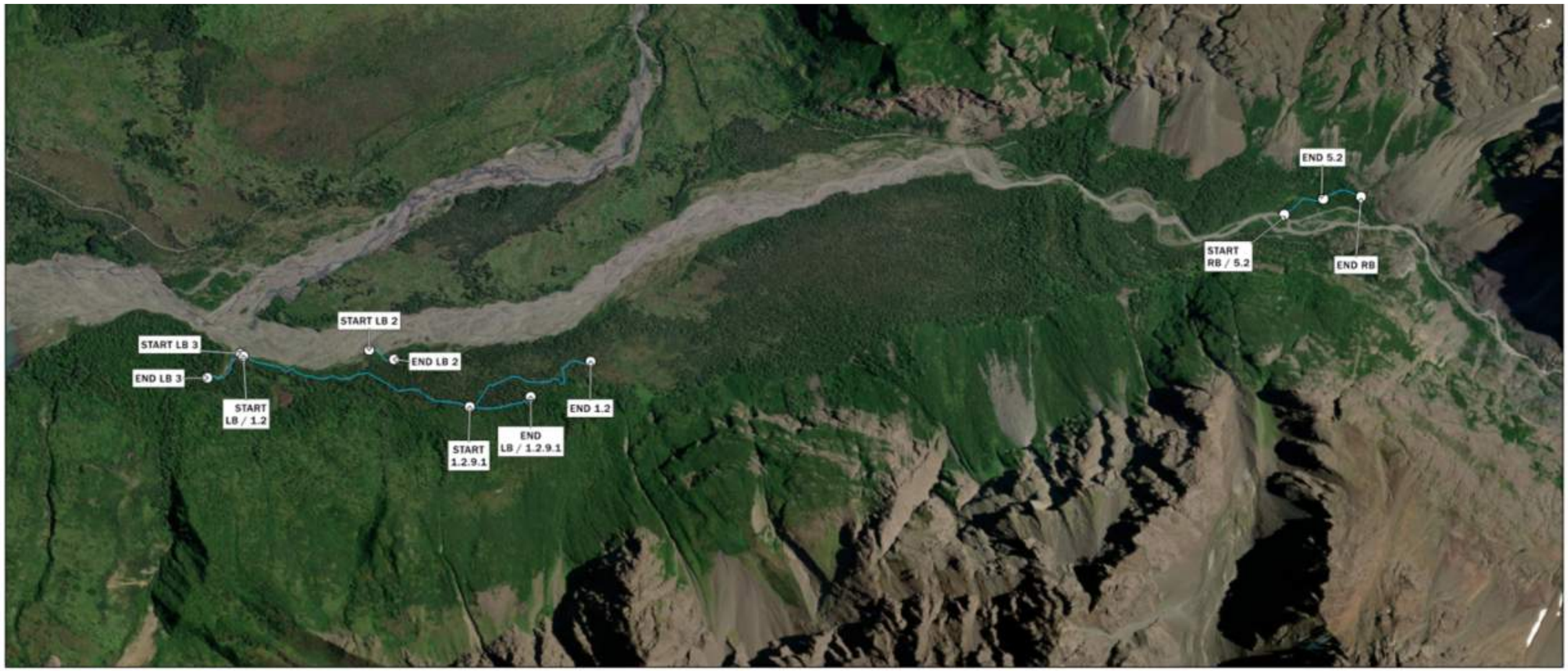
- Habitat in tributaries to Eklutna Lake including 13 tributaries to Eklutna Creek were surveyed for mesohabitat and fish presence in the summer and fall 2021
- Mainstem habitat in the East and West Forks of Eklutna Creek suitable for ocean-run spawning salmon was surveyed in September of 2022.

Mainstem Spawning Habitat Survey Area



- Within the surveyed area, up to 4 acres of suitable spawning habitat for ocean run spawning salmon was documented.
- Additionally, 1.4 acre was identified in tributaries of the West Fork.

West Fork Eklutna Creek Survey



N

0 0.25 0.5 Miles

Scale:1:17,500

Legend

- Consolidated Survey Start/ End Location
- Streams

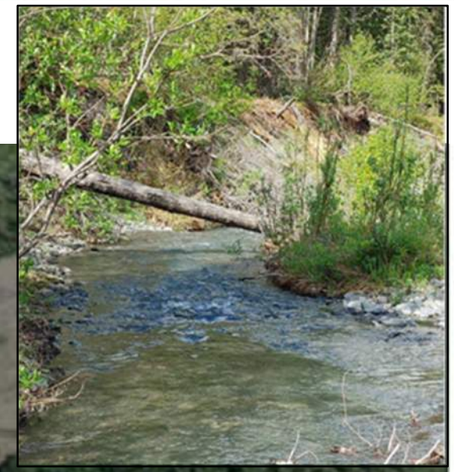
Eklutna

Overview:
West Fork Eklutna Tributaries

April 2023

McMillen

West Fork Eklutna Creek Survey



N

0 150 300 600 900 1,200 Feet

Scale:1:5,000

Legend

Kleinschmidt Obs
- start
- stop

Eklutna Village Obs
- start
- stop
- start (missing stop)
- Streams

Eklutna

West Fork Eklutna Tributaries Zoomin 2

April 2023

McMillen

West Fork Eklutna Creek Survey

N

0 150 300 Feet

Scale:1:1,750

Legend

Kleinschmidt Obs
- start
- stop

Eklutna Village Obs
- start
- stop
- start (missing stop)
- Streams

Eklutna

West Fork Eklutna Tributaries Zoomin 1

April 2023

McMillen

Lake Sockeye Spawning Habitat

- We surveyed the suitability of lakeshore spawning habitat within accessible areas of the varial zone during the lowest lake level (829’) in May of 2021. It was not feasible to perform similar habitat surveys in inundated areas of the lake.
    - Habitat identified as suitable for spawning of Kokanee and Sockeye (~2 acres) included areas with slope, substrate size, and the presence of groundwater.
- Much of the remaining lakeshore is of steep slope (>40%), very large cobble along the lakeside trail, and fine sediment (at tail of Eklutna Lake)

Lake Sockeye Rearing Habitat

- 2021 and 2022 primary productivity study showed very low primary production in Eklutna Lake which is an indicator of poor fish production potential for the water body.
- Turbidity and associated limitation in light penetration is linked to low productivity. Turbidity in Eklutna Lake may have similar on Eklutna Lake as Skilak where ADFG has documented not only trends toward increasing turbidity with climate driven glacial melt, but associated decreases in sockeye salmon numbers.
- The 2017 Eklutna Lake Marine derived nutrients study indicated that historical runs likely did not exceed 10,000 salmon.
    - “We found that a salmon run of up to 1000/year, and potentially as many as 15 000/year, would be possible without noticeably altering the measured isotopic composition of the sediments in Eklutna Lake. Our results provide no evidence that such runs occurred, but do not preclude the possible existence of a relatively small sockeye fishery in Eklutna Lake before 1929”
- Kokanee in Eklutna Lake corroborate the conclusions of the primary productivity and turbidity studies that food availability is low resulting in undersized and low-fecundity fish.
- Eklutna Lake, in the condition under which it was studied in 2021 and 2022, is not supporting a healthy population of resident kokanee and is likely equally insufficient to support ocean-run fish at this time.


EKLUTNA LAKE
10/1/21
61.39104 -149.05747
10/1/2021 EKLUTNA LAKE
61.39048, -149.0642
SPAWNED SOCKEYE/KOKANEE
11
2
13
CM

Alternatives Analysis Results

Stakeholder Consultation

- Received ~36 total alternatives from the following entities:

  - Native Village of Eklutna *No changes
  - Alaska Department of Fish and Game (ADFG)
  - Chugach State Park (ADNR) *No changes
  - National Marine Fisheries Service (NMFS) *No changes
  - U.S. Fish & Wildlife Service (USFWS)
  - Trout Unlimited
  - The Conservation Fund
  - Hydro Project Owners

Note:

ADNR Dam Safety has no comments on flow regime but will have input on any modifications to the dam and appurtenant structures.

Updates from May Meeting

Ratepayer Impacts:

Matanuska Electric:

1.12% Energy Rate Increase /$1M

Chugach Electric:

0.3% Energy Rate Increase /$1M - (Previously 1%/$1M)

Municipality of Anchorage:

.03 mils / $1M

($3 Increased Property Tax per $/100k Property Value)

CAPEX TIER

- Times Interest Earned Ratio – 1.75x
- Multiplied on interest associated with Capex over life of project
- Part of ratepayer basis for utilities (not MOA)

Native Village of Eklutna

Native Village of Eklutna

Proposed PME Measures:

Flow Release Measure

- Replacement Dam w/ Fixed Wheel Gate & Ladder (Measure P)

Upstream Passage

- Naturelike Entrance w/ Variable Exit Ladder

Downstream Passage

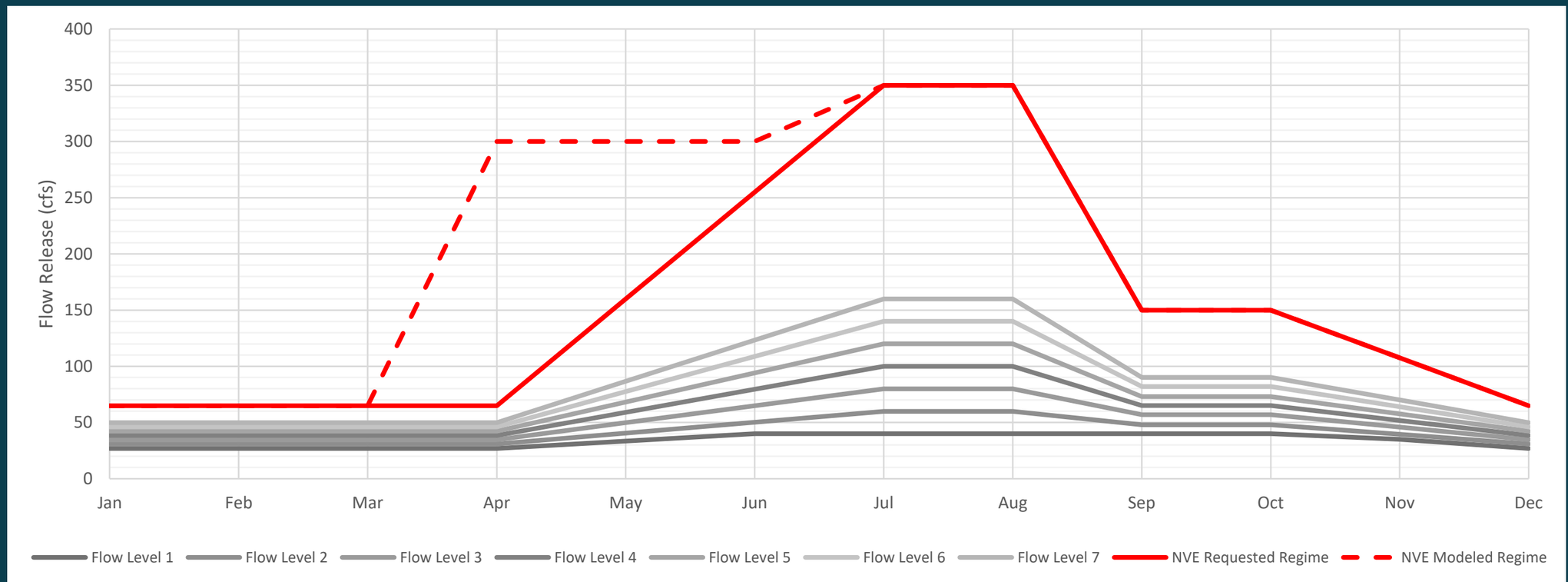
- Spill April / May / June

Other Improvements

- AWWU Bridge Construction
- Physical Habitat Improvements
- Full Lakeside Trail Improvements

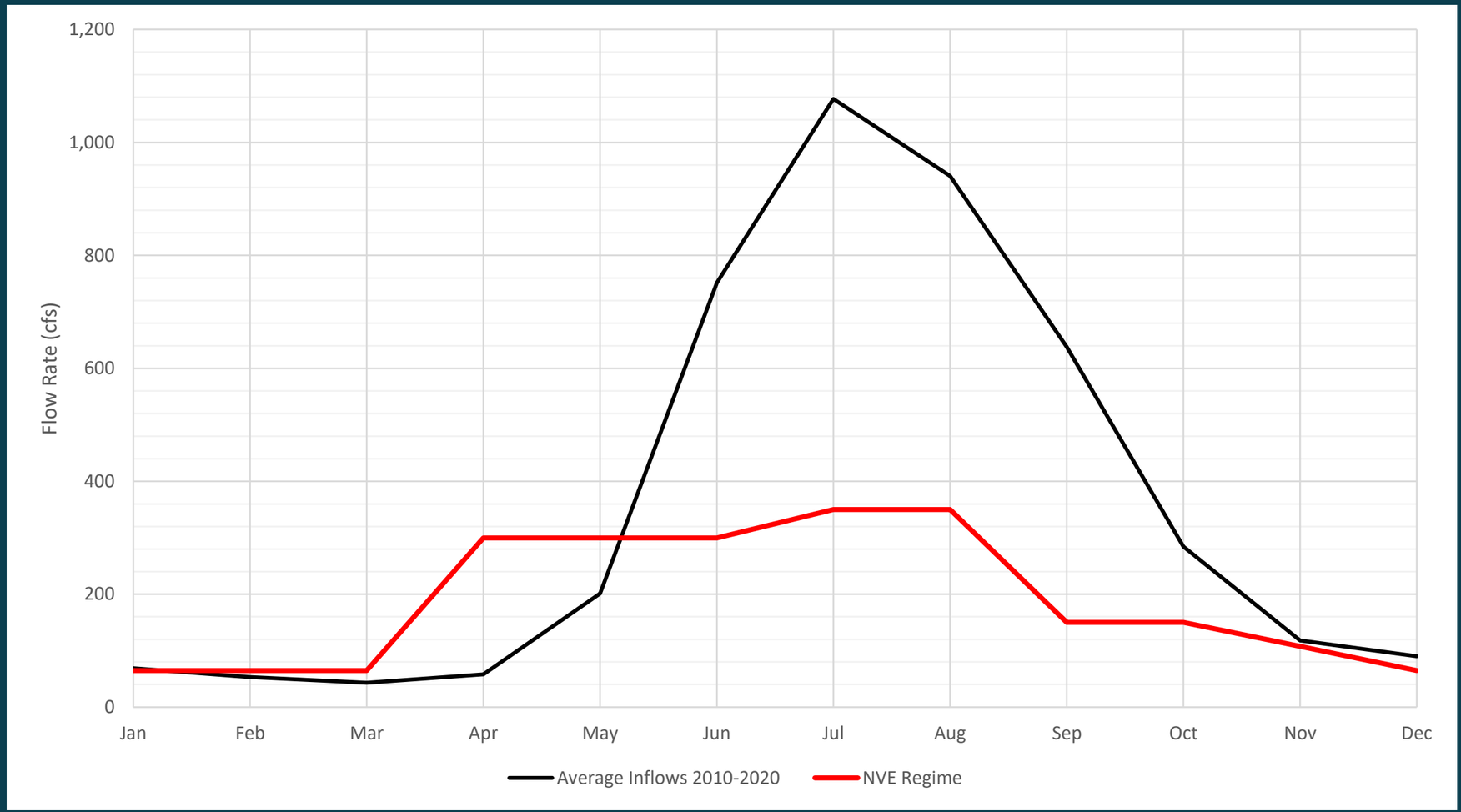
Native Village of Eklutna - Flow Releases

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Hydropower	Public Water Supply	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
NVE Alt	262,456	95,501	24,670	139,616	2,287	**37%**	**9%**	**54%**



Channel Maintenance Flow = 700 cfs - 72 Hr - Annually

Native Village of Eklutna - Flow Releases



Month	Flow Release (cfs)	Average Monthly Inflow	Percent of Inflow
Jan	65	69	**95%**
Feb	65	53	**122%**
Mar	65	43	**150%**
Apr	300	58	**519%**
May	300	201	**149%**
Jun	300	752	**40%**
Jul	350	1,077	**32%**
Aug	350	941	**37%**
Sep	150	638	**24%**
Oct	150	284	**53%**
Nov	108	118	**91%**
Dec	65	90	**72%**

Native Village of Eklutna - Cost Summary

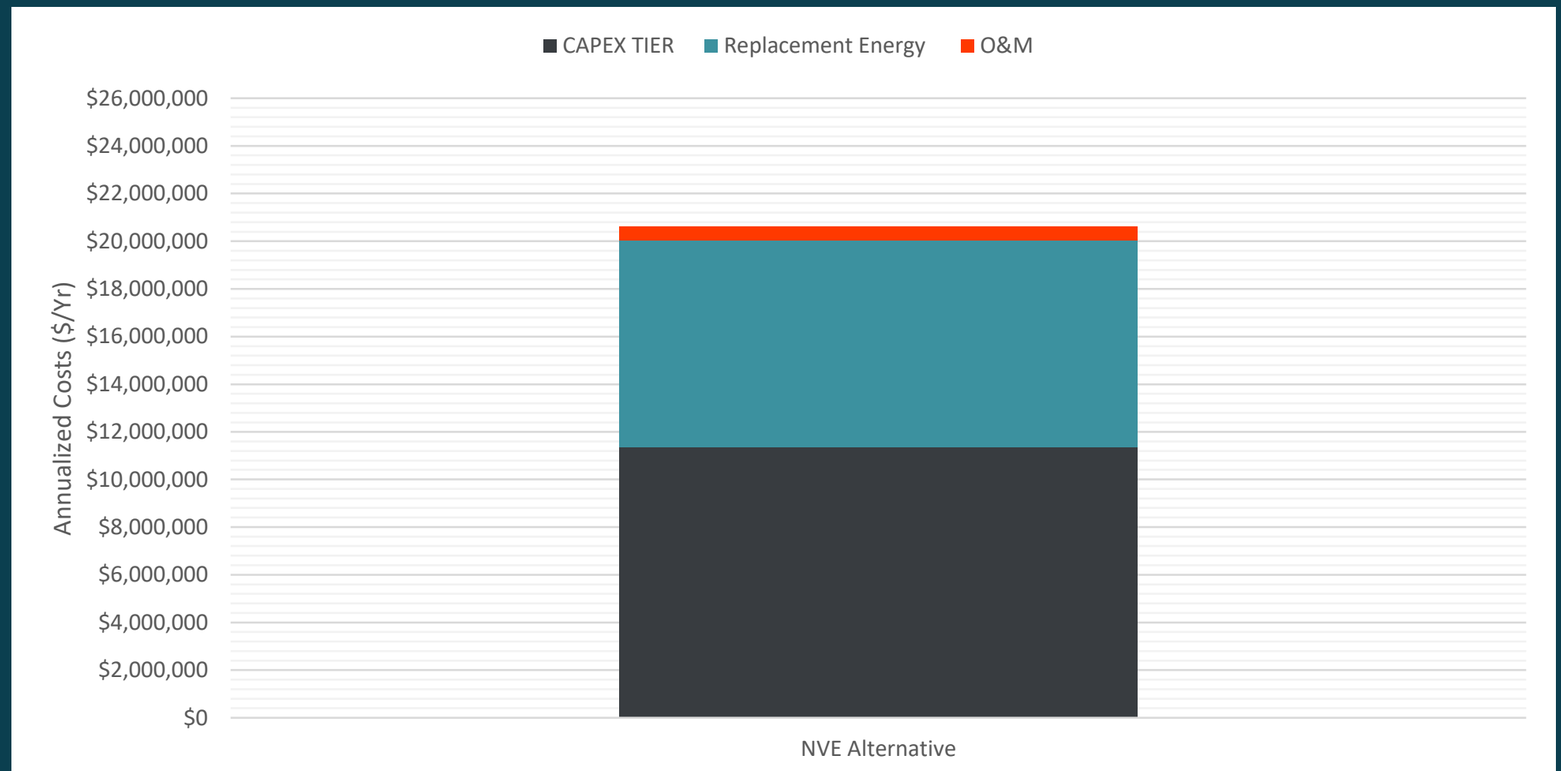
CAPEX ($M)	
Replacement Dam	$113.3
Fish Exclusion Barrier	$2.1
Physical Habitat Improvements	$1.5
Lakeside Trail Improvements	$3.0
AWWU Bridges	$2.9
Total	**$122.9**

O&M ($/Yr)	
Replacement Dam	$299,000
Fish Exclusion Barrier	$37,700
Total ($/Yr)	**$336,700**

Replacement Energy ($/Yr)	
Replacement Energy (MWh)	99,341
Energy Cost ($/kWh)	$73
Total ($/Yr)	**$7,265,000**

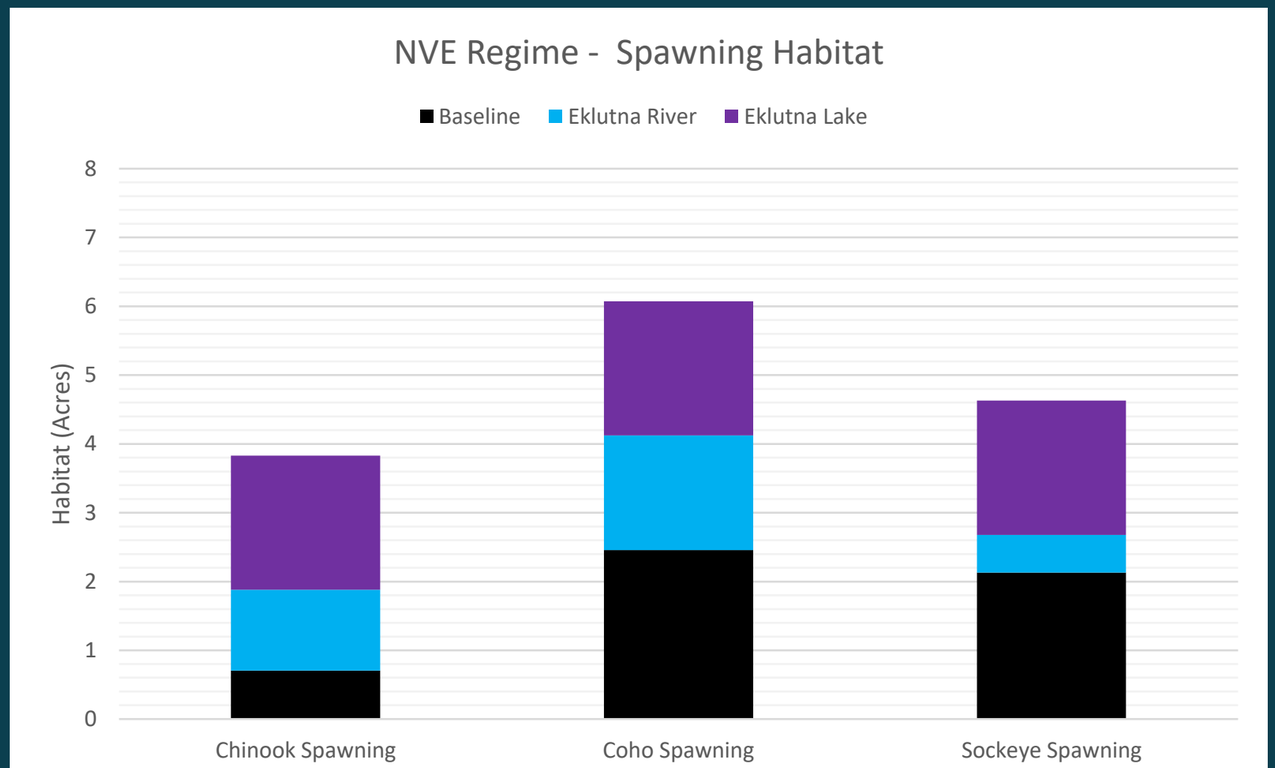
Annualized Costs ($/Yr)	
CAPEX TIER	$11,352,000
CAPEX	$7,503,000
O&M	$592,000
Replacement Energy	$8,693,000
Total	**$20,637,000**
Present Worth ($)	
Present Value	**$338,000,000**

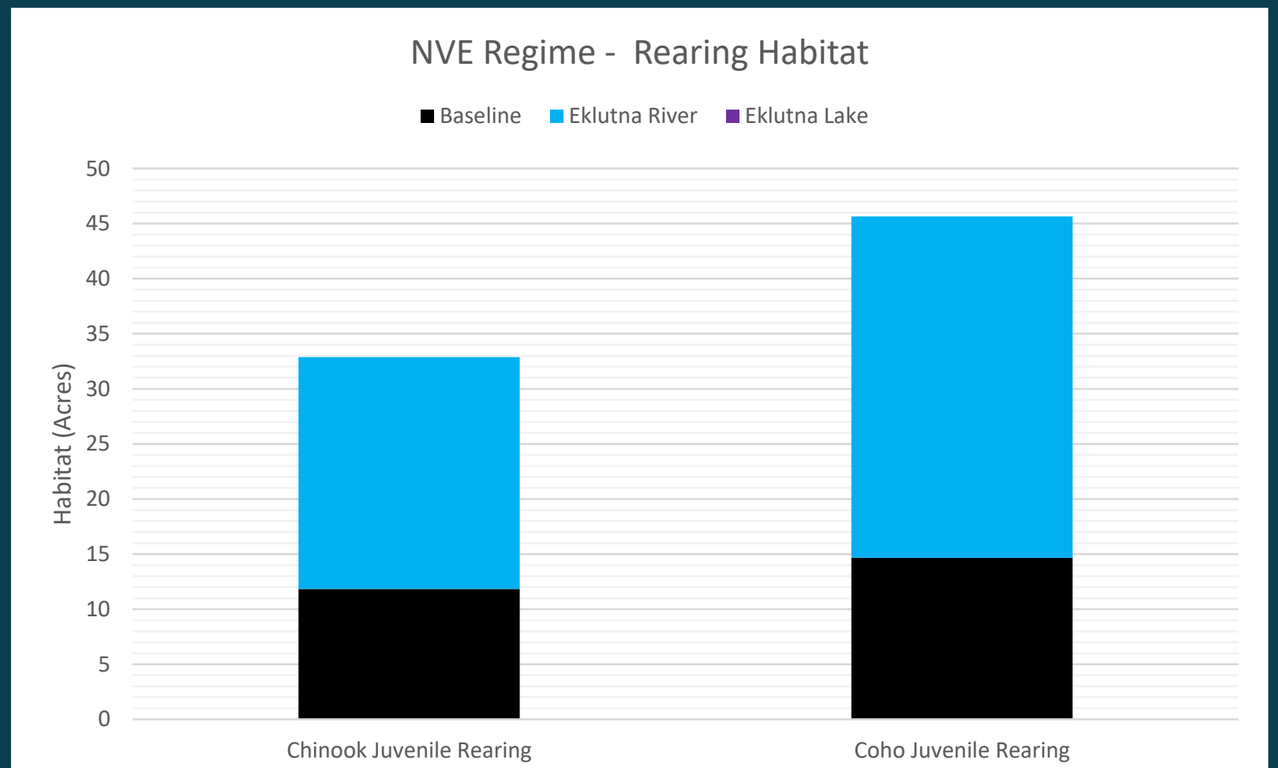
Estimated Ratepayer/Taxpayer Impacts	
Chugach Electric Association	**4.0%**
Matanuska Electric Association	**6.3%**
Municipality of Anchorage ($/100k)	**$4.62 / 0.046 mils**



Carbon Emissions: 43,000 MTCO2eq

Native Village of Eklutna - Habitat Summary





Alaska Department of Fish & Game

ADFG

Proposed PME Measures:

Flow Release Measure

- Replacement Dam w/ Fixed Wheel Gate & Ladder (Measure P);
- AWWU Portal Release (Measure C);

Upstream Passage

- Naturelike Entrance w/ Variable Exit Ladder (Measure P)
- None (Measure C)

Downstream Passage

- Spill in May (Measure P)
- None (Measure C)

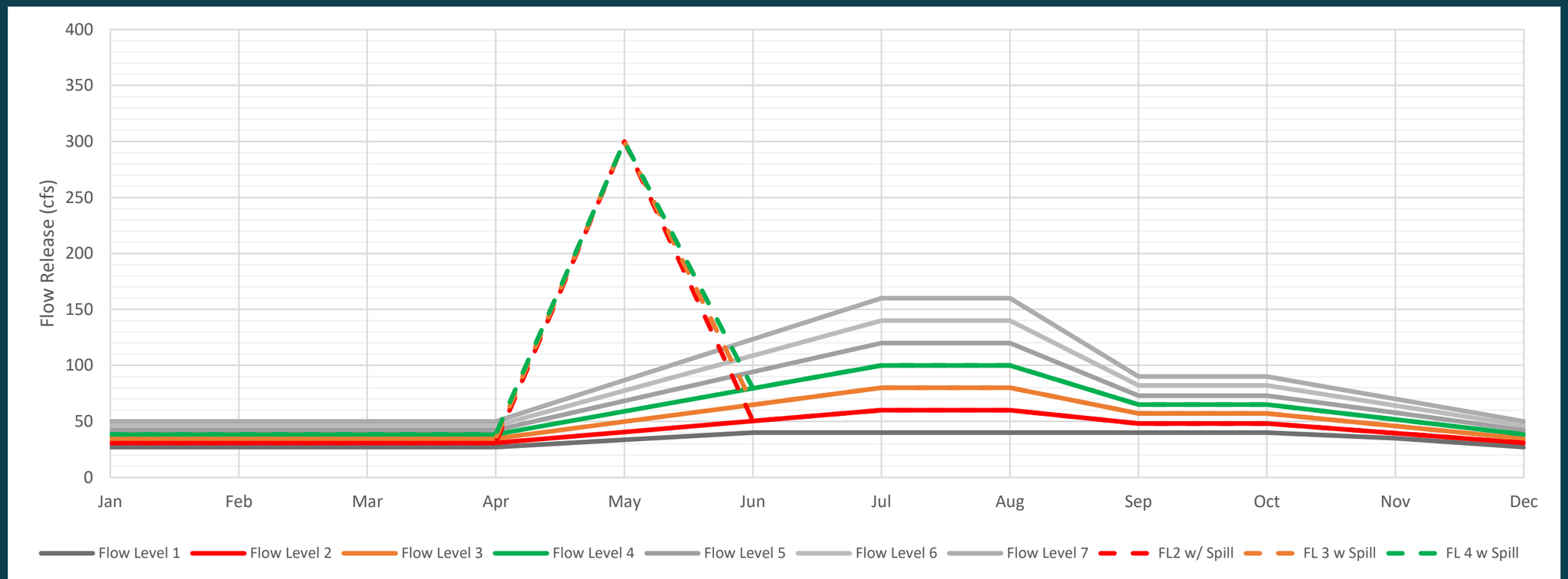
Other Improvements

- AWWU Bridge Construction
- Physical Habitat Improvements
- Partial Lakeside Trail Improvements

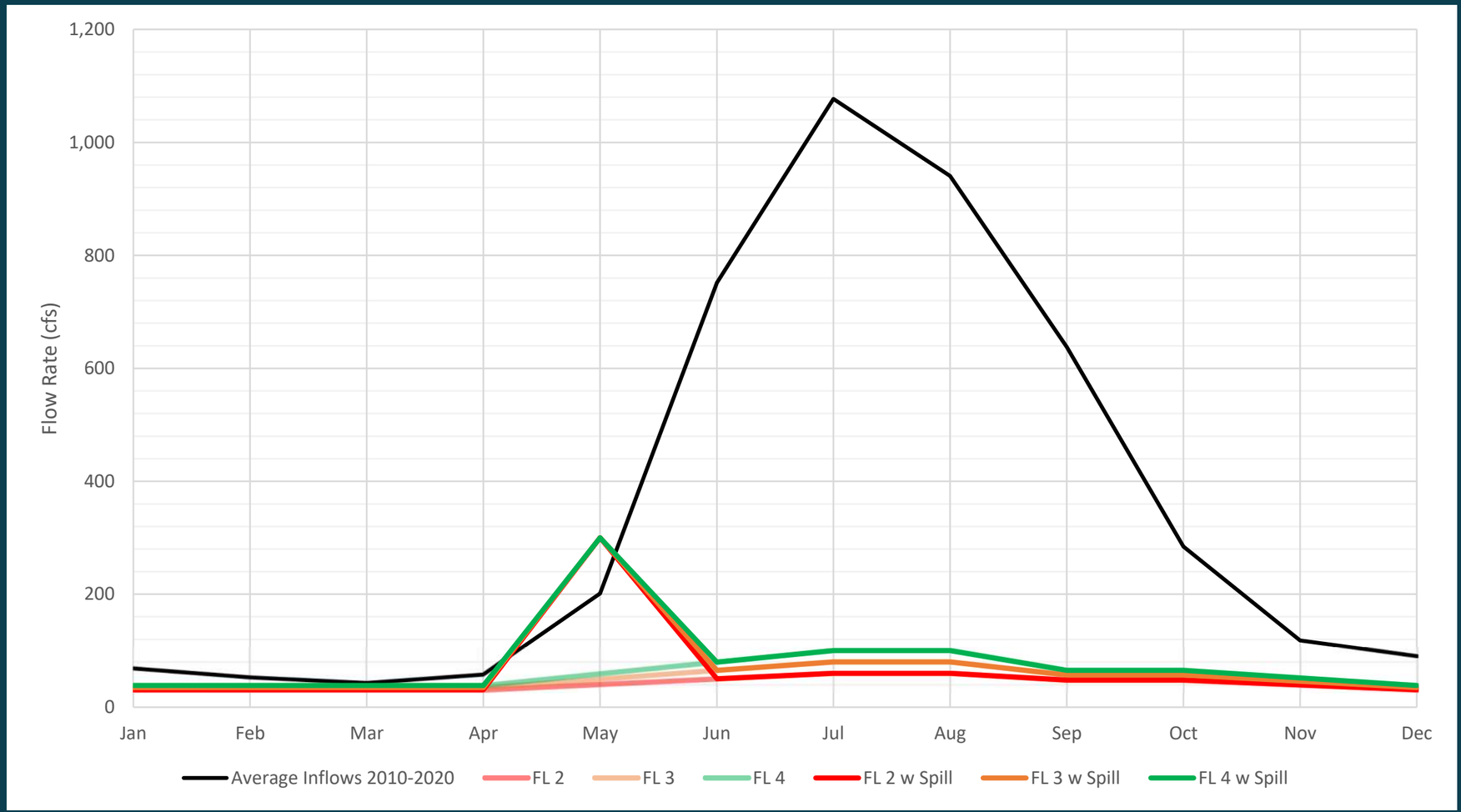
ADFG

Channel Maintenance Flow =
325/400/450 cfs - 72 Hr
3 of 10 years

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Hydropower	Public Water Supply	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
Flow Level 2	262,456	207,663	24,670	30,420	350	**79%**	**9%**	**12%**
Flow Level 3	262,456	201,071	24,670	37,194	427	**76%**	**9%**	**14%**
Flow Level 4	262,456	194,653	24,670	43,612	481	**74%**	**9%**	**17%**
FL 2 w/ Spill	262,456	190,645	24,670	46,473	536	**73%**	**9%**	**18%**
FL3 w/ Spill	262,456	184,551	24,670	52,478	593	**71%**	**9%**	**20%**
FL 4 w/ Spill	262,456	178,630	24,670	58,336	654	**68%**	**9%**	**22%**



ADFG - Flow Releases



Month	Flow Release (cfs)	Average Monthly Inflow	Percent of Inflow
Jan	31 - 39	69	**45% - 57%**
Feb	31 - 39	53	**58% - 74%**
Mar	31 - 39	43	**72% - 91%**
Apr	31 - 39	58	**53% - 67%**
May*	41 - 59	201	**20% - 29%**
Jun	50 - 80	752	**7% - 11%**
Jul	60 - 100	1,077	**6% - 9%**
Aug	60 - 100	941	**6% - 11%**
Sep	48 - 65	638	**8% - 10%**
Oct	48 - 65	284	**17% - 23%**
Nov	39 - 52	118	**33% - 44%**
Dec	31 - 39	90	**34% - 43%**

*May – 300 cfs (**149% Inflow**)

ADFG - Replacement Dam Summary

CAPEX ($M)	
Replacement Dam	$113.3
Fish Exclusion Barrier	$2.1
Physical Habitat Improvements	$1.5
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Total	**$120.3**

O&M ($/Yr)	
Replacement Dam	$299,000
Fish Exclusion Barrier	$37,700
Total ($/Yr)	**$336,700**

Replacement Energy ($/Yr)			
	FL 2 w/ Spill	**FL 3 w/ Spill**	**FL 4 w/ Spill**
Replacement Energy (MWh)	32,435	36,661	40,784
Energy Cost ($/kWh)	$73	$73	$73
Total ($/Yr)	**$2,372,000**	**$2,681,000**	**$2,983,000**

Annualized Costs ($/Yr)			
	FL 2 w/ Spill	**FL 3 w/ Spill**	**FL 4 w/ Spill**
CAPEX TIER	$11,114,000	$11,114,000	$11,114,000
CAPEX	$7,345,000	$7,345,000	$7,345,000
O&M	$592,000	$592,000	$592,000
Replacement Energy	$2,838,000	$3,208,000	$3,569,000
Total	**$14,544,000**	**$14,914,000**	**$15,275,000**
Present Worth ($)			
	FL 2 w/ Spill	**FL 3 w/ Spill**	**FL 4 w/ Spill**
Present Value	**$238,000,000**	**$244,000,000**	**$250,000,000**

Estimated Ratepayer/Taxpayer Impacts			
	FL 2 w/ Spill	**FL 3 w/ Spill**	**FL 4 w/ Spill**
Chugach Electric Association	**2.8%**	**2.9%**	**2.9%**
Matanuska Electric Association	**3.9%**	**4.0%**	**4.2%**
Municipality of Anchorage ($/100k)	**$4.53 / 0.045 mils**	**$4.53 / 0.045 mils**	**$4.53 / 0.045 mils**

Carbon Emissions: 14,000 – 17,500 MTCO2eq

ADFG - AWWU Portal Summary

CAPEX ($M)	
AWWU Portal	$5.5
Fixed Wheel Gate	$6.6
Physical Habitat Improvements	$1.5
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Total	**$16.9**

O&M ($/Yr)	
AWWU Portal	$188,500
Fixed Wheel Gate	$32,500
Total ($/Yr)	**$221,000**

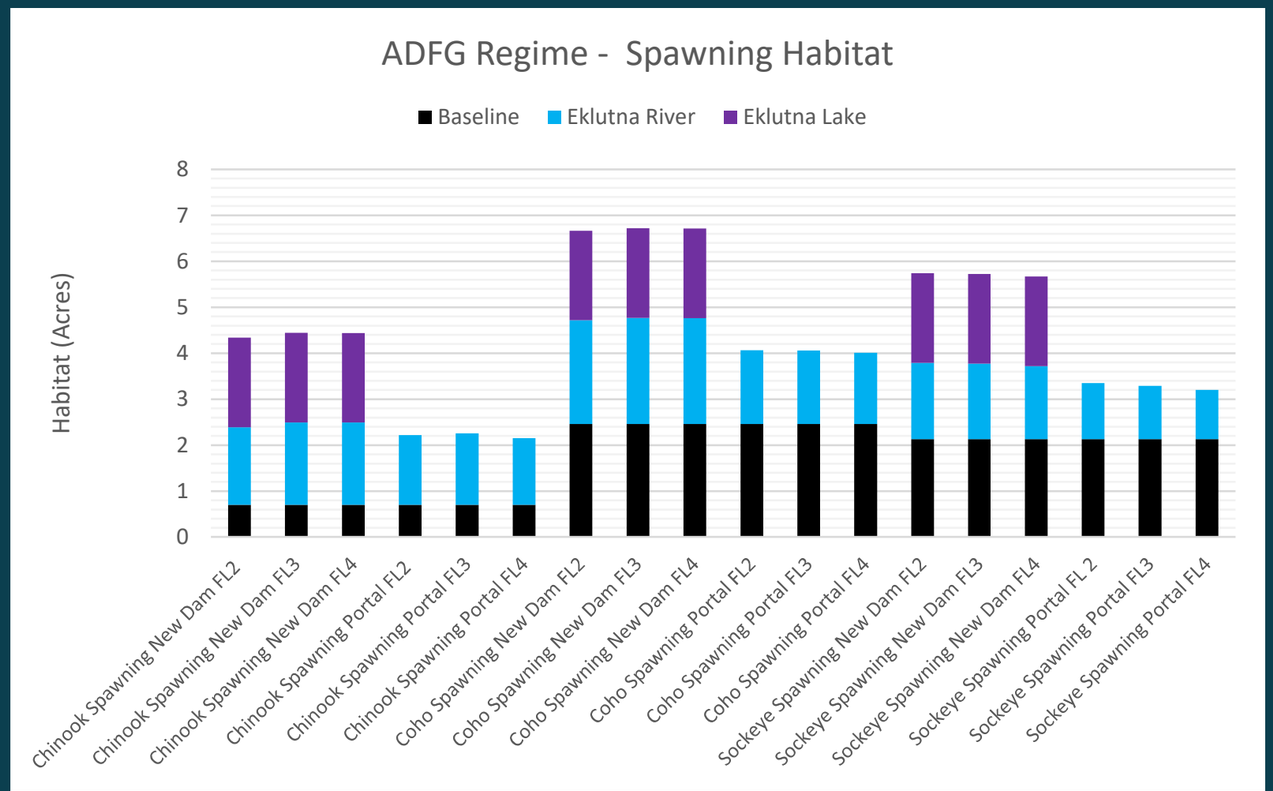
Replacement Energy ($/Yr)		
	FL 2 w/ Spill	**FL 3 w/ Spill**
Replacement Energy (MWh)	19,712	23,974
Energy Cost ($/kWh)	$73	$73
Total ($/Yr)	**$1,442,000**	**$1,753,000**

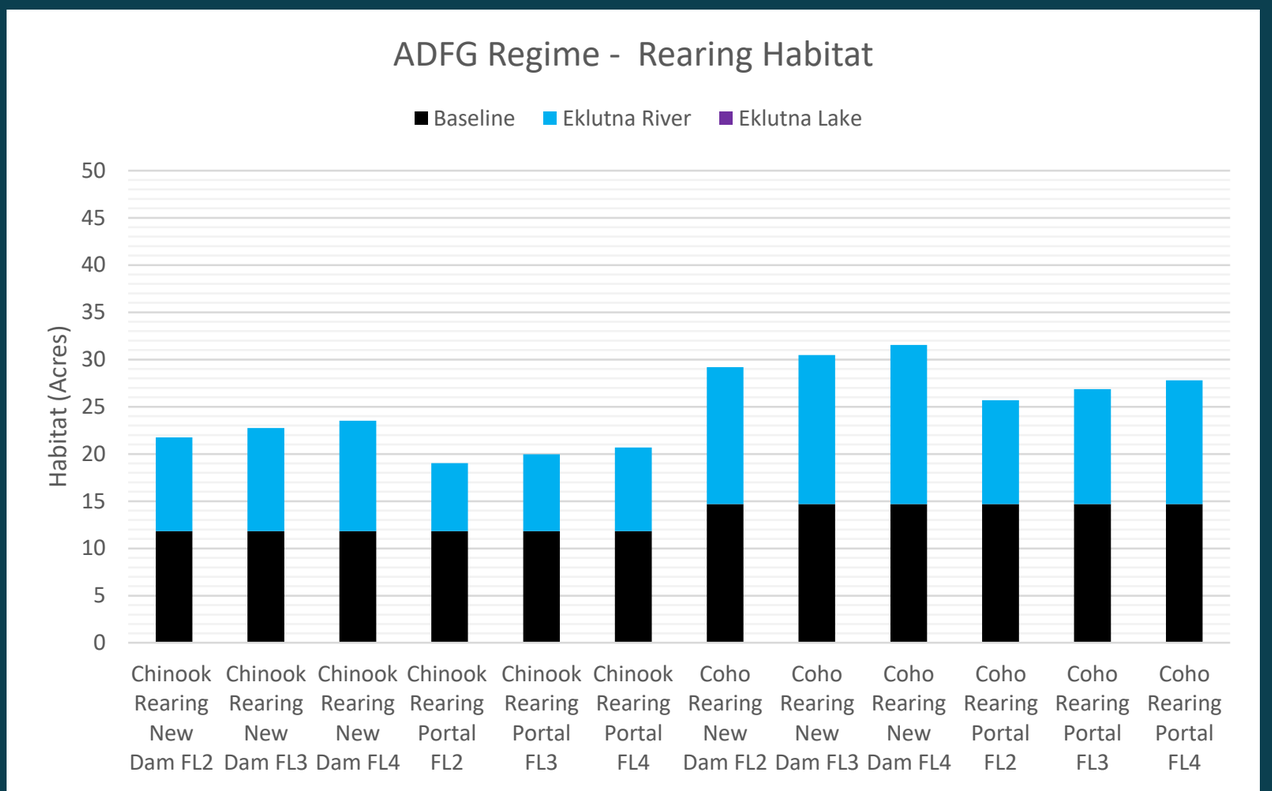
Annualized Costs ($/Yr)		
	FL 2	**FL 3**
CAPEX TIER	$1,562,000	$1,562,000
CAPEX	$1,032,000	$1,032,000
O&M	$388,000	$388,000
Replacement Energy	$1,725,000	$2,098,000
Total	**$3,675,000**	**$4,048,000**
Present Worth ($)		
	FL 2	**FL 3**
Present Value	**$60,000,000**	**$66,000,000**

Estimated Ratepayer/Taxpayer Impacts		
	FL 2	**FL 3**
Chugach Electric Association	**0.7%**	**0.8%**
Matanuska Electric Association	**1.4%**	**1.6%**
Munic. of Anchorage ($/100k)	**$0.81 / 0.008 mils**	**$0.81 / 0.008 mils**

Carbon Emissions: 8,500 – 12,000 MTCO2eq

ADFG- Habitat Summary





ADNR – State Parks

ADNR – State Parks

Proposed PME Measures:

Flow Release Measure

- AWWU Portal (Measure C)

Upstream Passage

- None

Downstream Passage

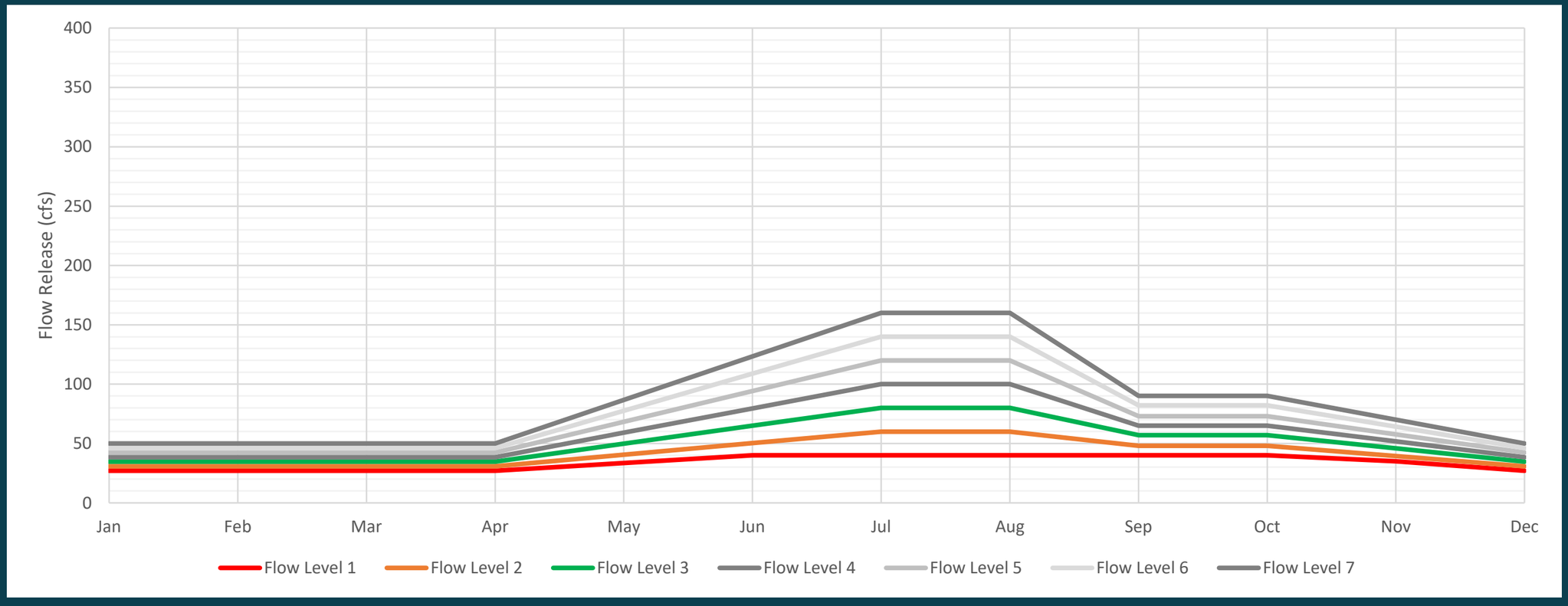
- None

Other Improvements

- AWWU Bridge Construction
- Partial Lakeside Trail Improvements

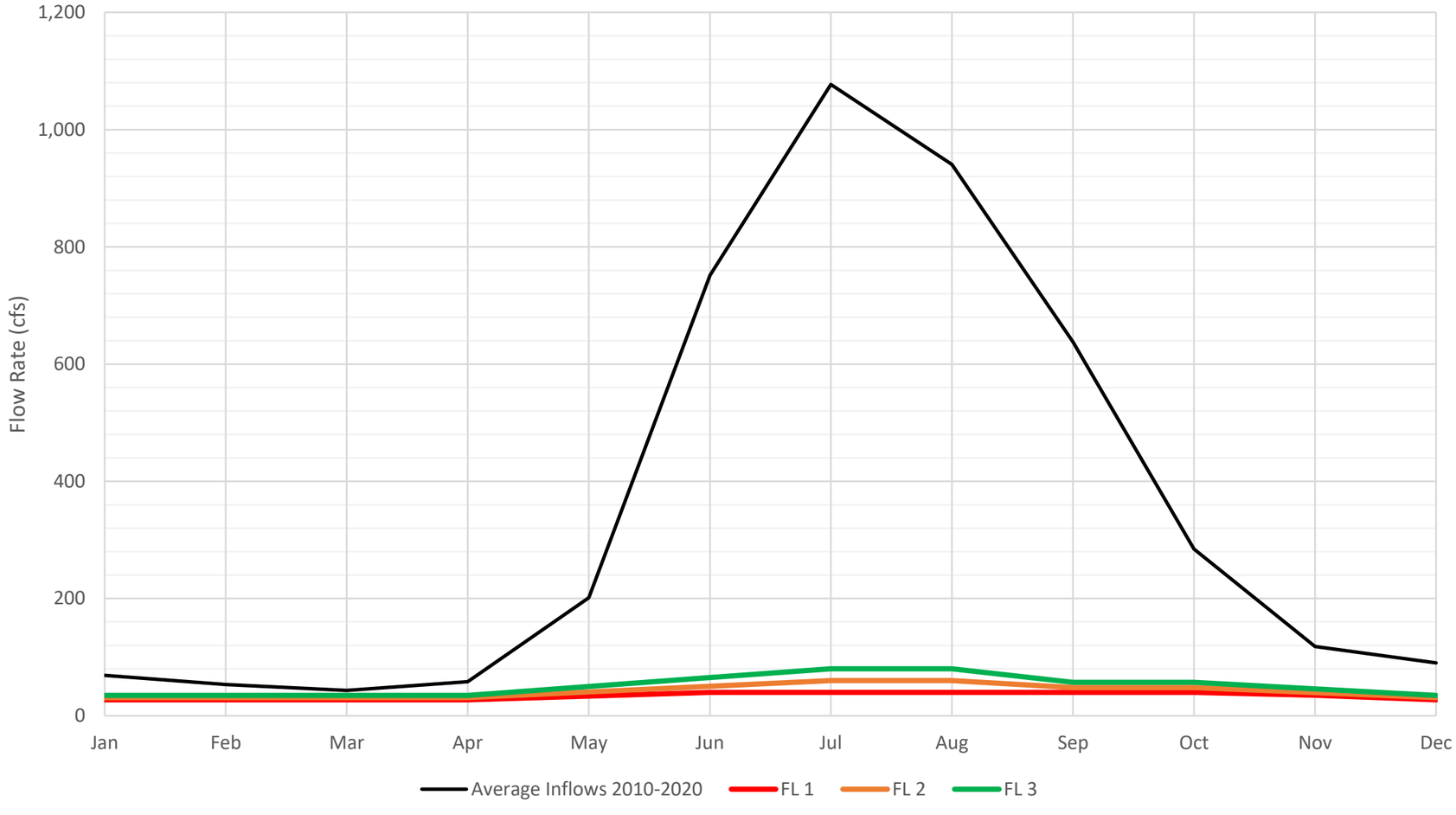
ADNR

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Hydropower	Public Water Supply	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
Flow Level 1	262,456	212,804	24,670	25,023	218	**81%**	**9%**	**10%**
Flow Level 2	262,456	206,380	24,670	31,303	354	**79%**	**9%**	**12%**
Flow Level 3	262,456	199,539	24,670	38,055	436	**76%**	**9%**	**15%**



Channel Maintenance Flow = 200/325/400 cfs - 72 Hr - 3 Years

ADNR - Flow Releases



Month	Flow Release (cfs)	Average Monthly Inflow	Percent of Inflow
Jan	27 - 35	69	**39% - 51%**
Feb	27 - 35	53	**51% - 66%**
Mar	27 - 35	43	**63% - 81%**
Apr	27 - 35	58	**47% - 60%**
May	34 - 50	201	**17% - 25%**
Jun	40 - 65	752	**5% - 9%**
Jul	40 - 80	1,077	**4% - 7%**
Aug	40 - 80	941	**4% - 9%**
Sep	40 - 57	638	**6% - 9%**
Oct	40 - 57	284	**14% - 20%**
Nov	35 - 46	118	**30% - 39%**
Dec	27 - 35	90	**30% - 39%**

ADNR - Summary

CAPEX ($M)	
AWWU Portal	$5.5
Fixed Wheel Gate*	$6.6
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Total	**$15.4**

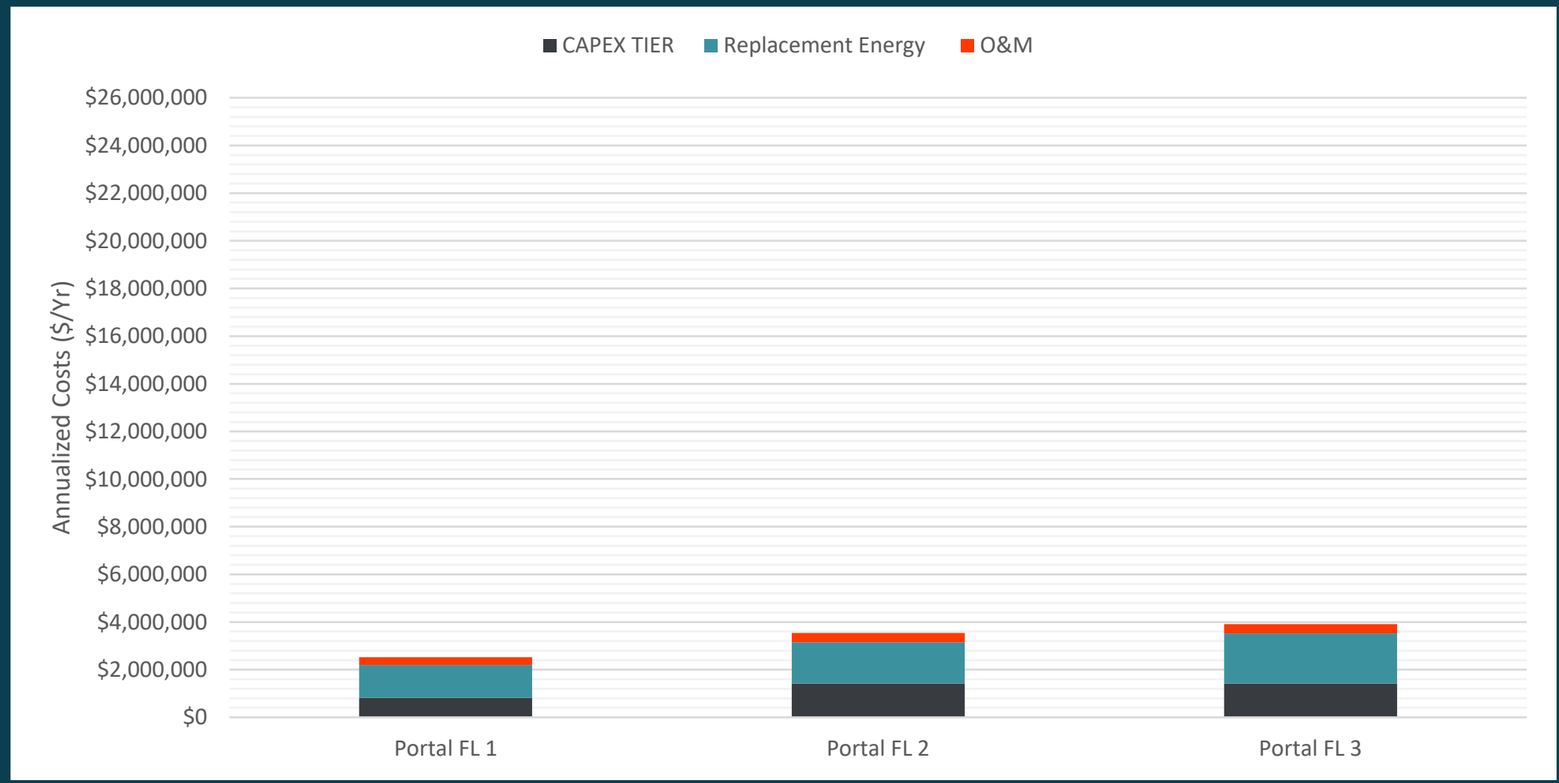
*Fixed Wheel Gate Excluded from FL1 Alternative

O&M ($/Yr)	
AWWU Portal	$188,500
Fixed Wheel Gate*	$32,500
Total ($/Yr)	**$221,000**

Replacement Energy ($/Yr)			
	FL 1	**FL 2**	**FL 3**
Replacement Energy (MWh)	15,723	19,712	23,974
Energy Cost ($/kWh)	$73	$73	$73
Total ($/Yr)	**$1,150,000**	**$1,442,000**	**$1,753,000**

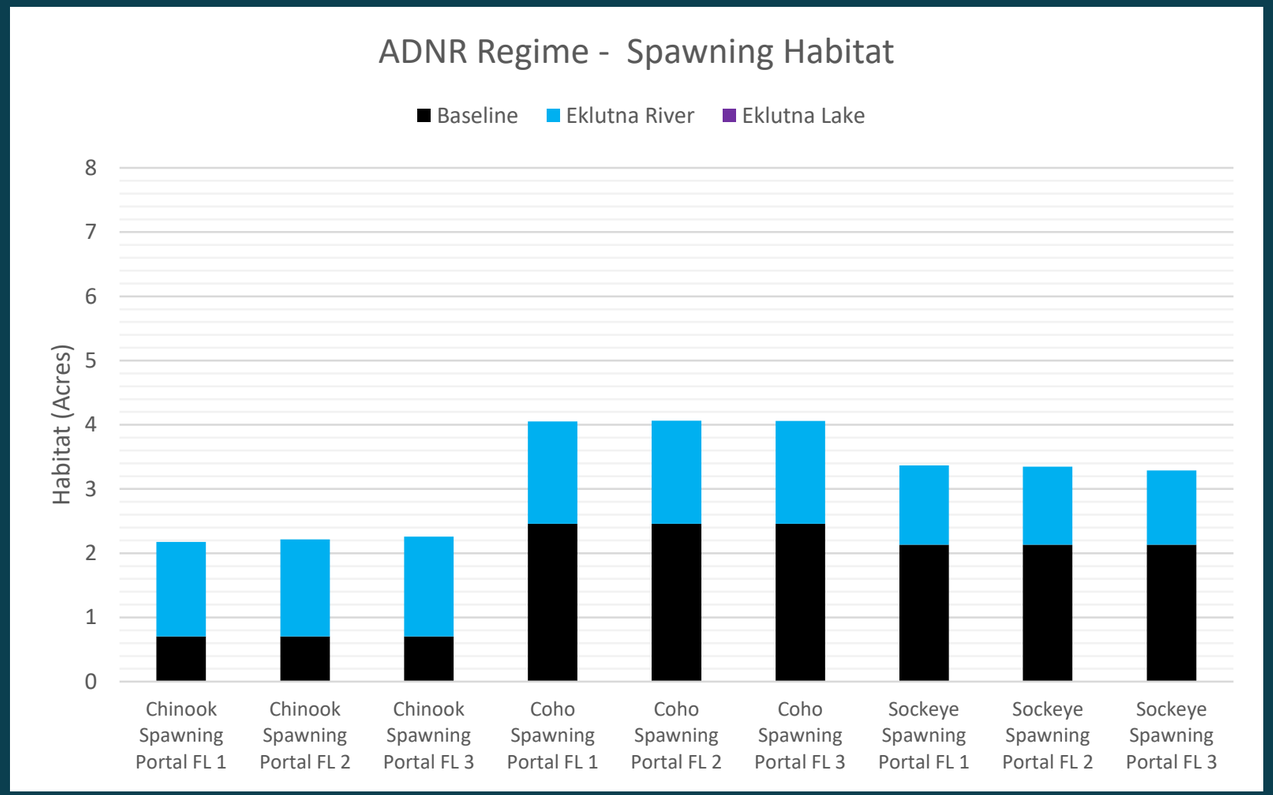
Annualized Costs ($/Yr)			
	FL 1	**FL 2**	**FL 3**
CAPEX TIER	$819,000	$1,426,000	$1,426,000
CAPEX	$541,000	$943,000	$943,000
O&M	$331,000	$388,000	$388,000
Replacement Energy	$1,376,000	$1,725,000	$2,098,000
Total	**$2,526,000**	**$3,539,000**	**$3,912,000**
Present Worth ($)			
	FL 1	**FL 2**	**FL 3**
Present Value	**$41,000,000**	**$58,000,000**	**$64,000,000**

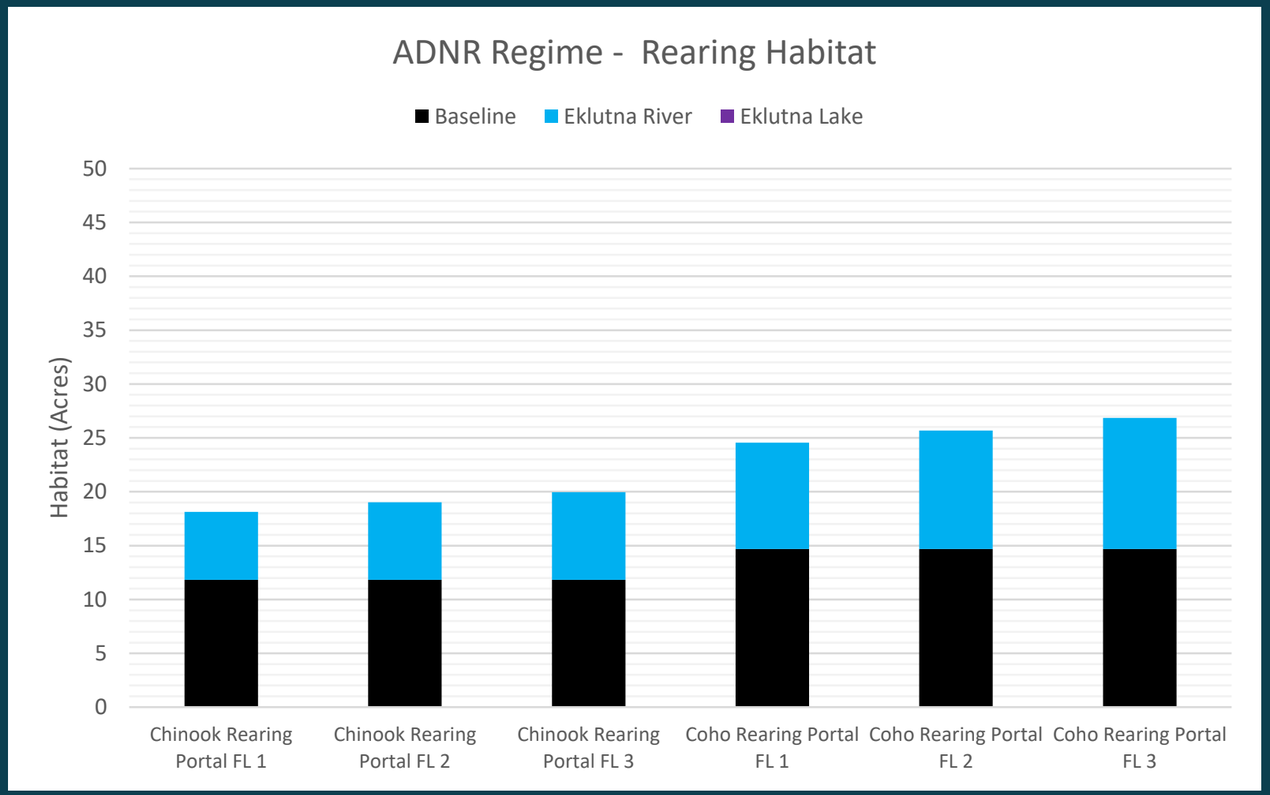
Estimated Ratepayer/Taxpayer Impacts			
	FL 1	**FL 2**	**FL 3**
Chugach Electric Association	**0.5%**	**0.7%**	**0.8%**
Matanuska Electric Association	**1.1%**	**1.4%**	**1.5%**
Munic. of Anchorage ($/100k)	**$0.50 / 0.005 mils**	**$0.76 / 0.007 mils**	**$0.76 / 0.007 mils**



Carbon Emissions: 7,000 – 10,000 MTCO2eq

ADNR - Habitat Summary





National Marine Fisheries Service

NMFS

Proposed PME Measures:

Flow Release Measure

- Replacement Dam w/ Fixed Wheel Gate & Ladder (Measure P)
- Existing Dam Release w/ Fixed Wheel Gate – No Fish Passage (Measure A)*

Upstream Passage

- Naturelike Entrance w/ Variable Exit Ladder (Measure P)
- None (Measure A)

Downstream Passage

- Floating Surface Collector (Measure P)
- None (Measure A)

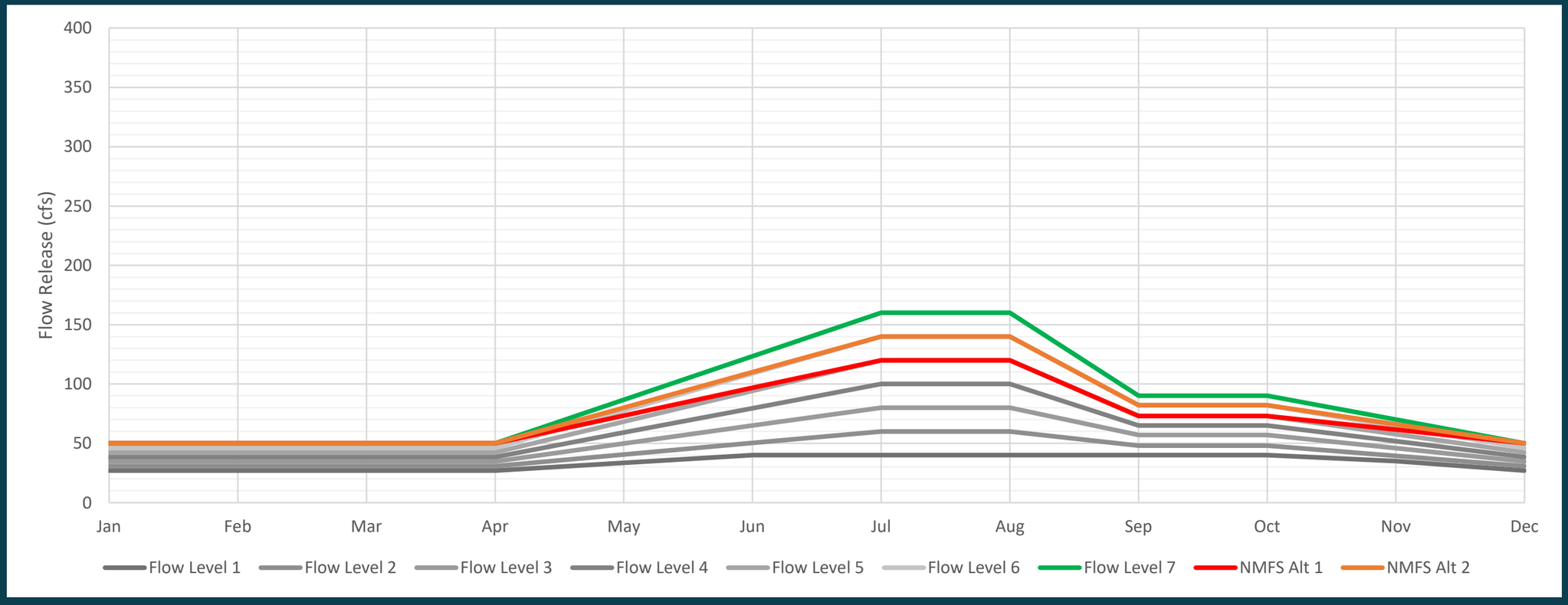
Other Improvements

- AWWU Bridge Construction
- Partial Lakeside Trail Improvements
- Physical Habitat Improvements

* Requires powerhouse offline through winter

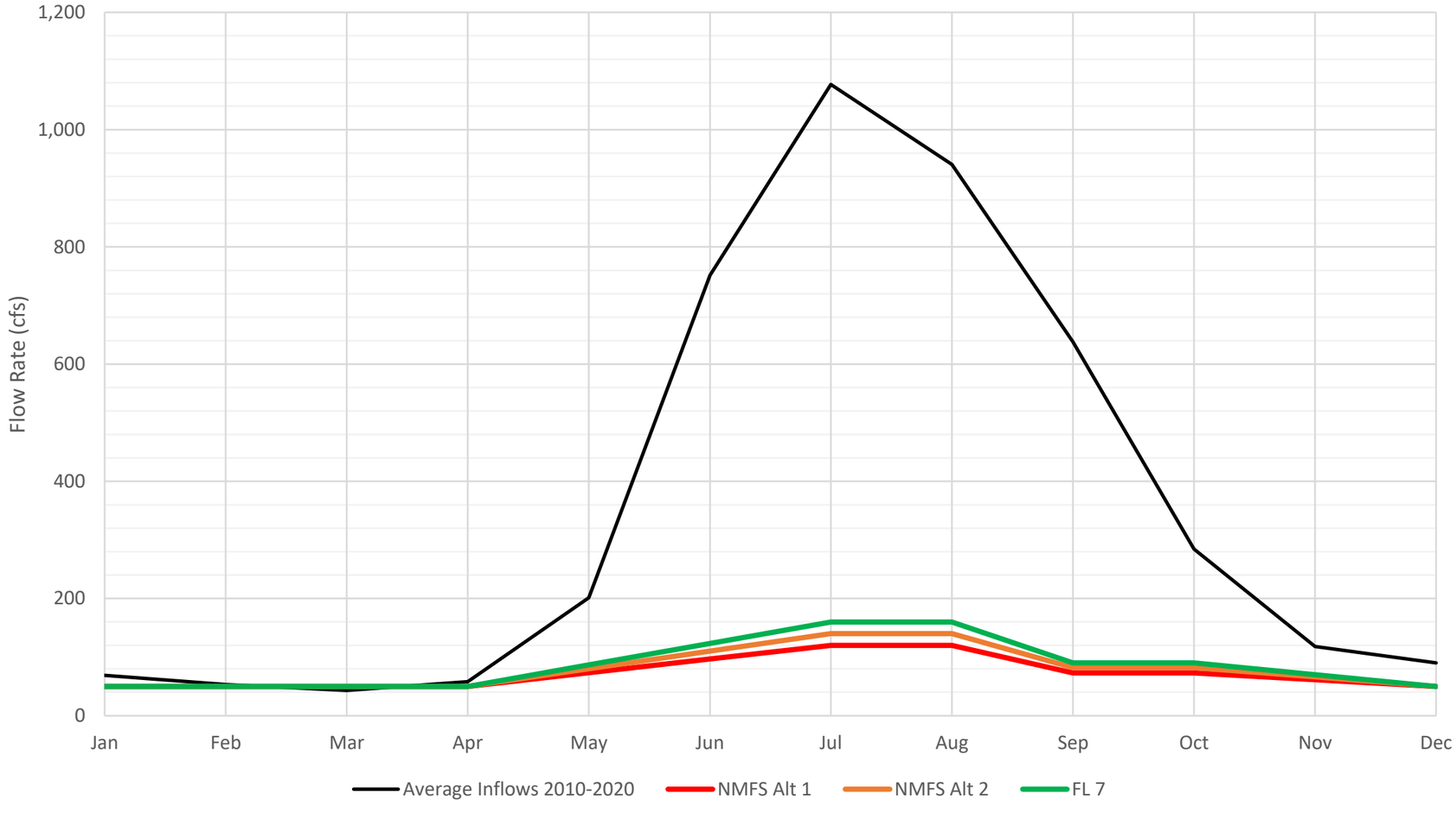
NMFS

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Hydropower	Public Water Supply	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
FL 5 Modified	262,456	183,064	24,670	54,084	545	**70%**	**9%**	**21%**
FL 6 Modified	262,456	177,836	24,670	59,258	599	**68%**	**9%**	**23%**
FL 7	262,456	174,065	24,670	62,974	654	**67%**	**9%**	**24%**



Channel Maintenance Flow = 500/550/600 cfs - 72 Hr - 3 Years

NMFS - Flow Releases



Month	Flow Release (cfs)	Average Monthly Inflow	Percent of Inflow
Jan	50	69	**72%**
Feb	50	53	**94%**
Mar	50	43	**116%**
Apr	50	58	**86%**
May	73 - 87	201	**36% - 43%**
Jun	97 - 123	752	**13% - 16%**
Jul	120 - 160	1,077	**11% - 15%**
Aug	120 - 160	941	**13% - 17%**
Sep	73 - 90	638	**11% - 14%**
Oct	73 - 90	284	**26% - 31%**
Nov	62 - 70	118	**53% - 60%**
Dec	50	90	**56%**

NMFS - Replacement Dam Summary

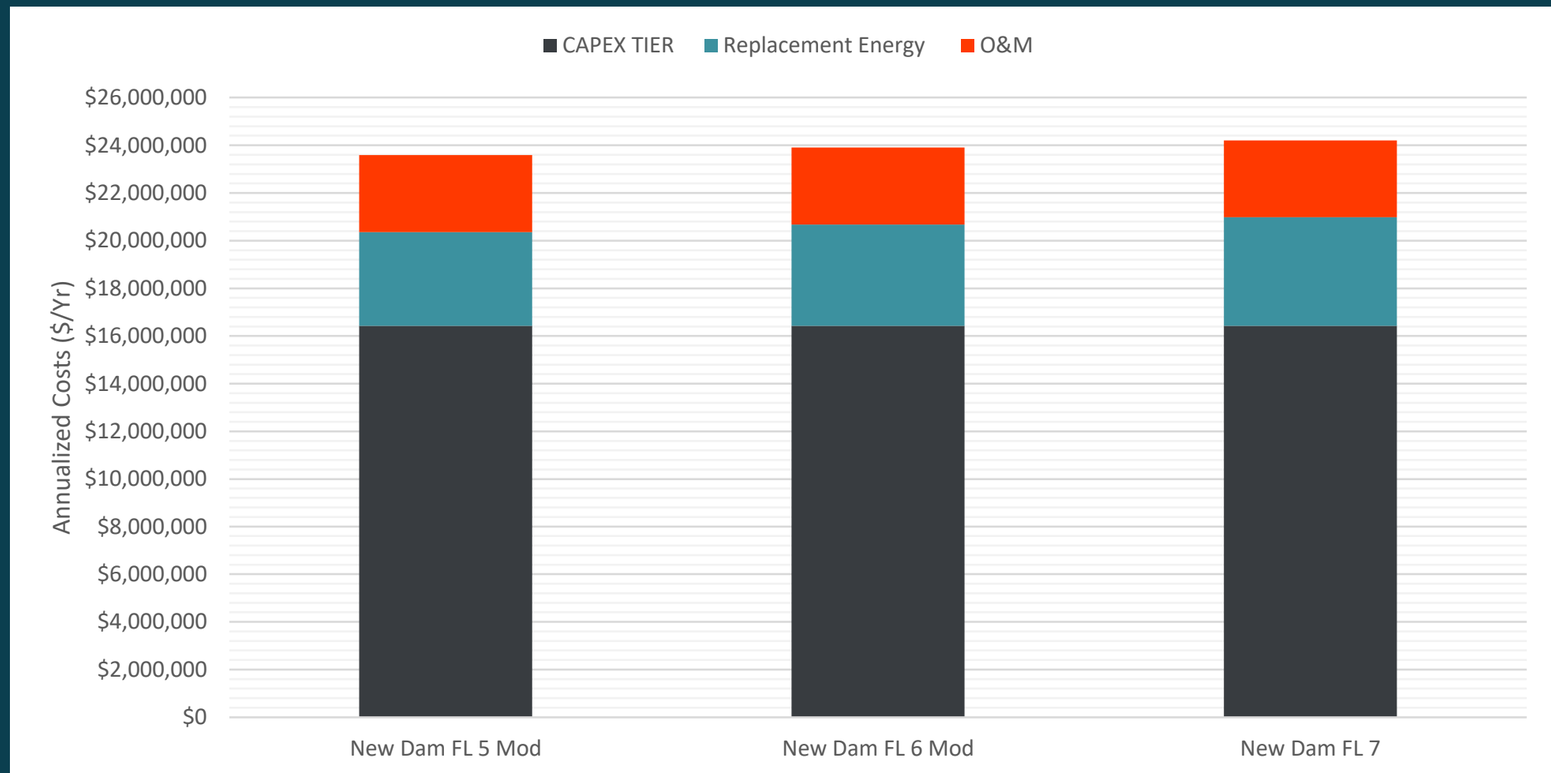
CAPEX ($M)	
Replacement Dam	$113.3
Fish Exclusion Barrier	$2.1
Floating Surface Collector	$57.6
Physical Habitat Improvements	$1.5
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Total	**$177.8**

O&M ($/Yr)	
Replacement Dam	$299,000
Floating Surface Collector	$1,500,200
Fish Exclusion Barrier	$37,700
Total ($/Yr)	**$1,836,900**

Replacement Energy ($/Yr)			
	FL5 Modified	**FL 6 Modified**	**FL 7**
Replacement Energy (MWh)	37,037	40,623	43,751
Energy Cost ($/kWh)	$73	$73	$73
Total ($/Yr)	**$2,709,000**	**$2,971,000**	**$3,200,000**

Annualized Costs ($/Yr)			
	FL5 Modified	**FL 6 Modified**	**FL 7**
CAPEX TIER	$16,433,000	$16,433,000	$16,433,000
CAPEX	$10,861,000	$10,861,000	$10,861,000
O&M	$3,229,000	$3,229,000	$3,229,000
Replacement Energy	$3,928,000	$4,246,000	$4,547,000
Total	**$23,590,000**	**$23,908,000**	**$24,209,000**
Present Worth ($)			
	FL5 Modified	**FL 6 Modified**	**FL 7**
Present Value	**$386,000,000**	**$391,000,000**	**$396,000,000**

Estimated Ratepayer/Taxpayer Impacts			
	FL5 Modified	**FL 6 Modified**	**FL 7**
Chugach Electric Association	**4.5%**	**4.6%**	**4.7%**
Matanuska Electric Association	**8.3%**	**8.4%**	**8.5%**
Munic. of Anchorage ($/100k)	**$8.05 / 0.081 mils**	**$8.05 / 0.081 mils**	**$8.05 / 0.081 mils**



Carbon Emissions: 16,000 – 19,000 MTCO2eq

NMFS - Dam Release Summary

CAPEX ($M)	
Dam Release Modifications	$6.7
Fixed Wheel Gate	$6.6
Physical Habitat Improvements	$1.5
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Total	**$18.0**

O&M ($/Yr)	
Dam Release Modifications	$462,800
Fixed Wheel Gate	$32,500
Total ($/Yr)	**$495,300**

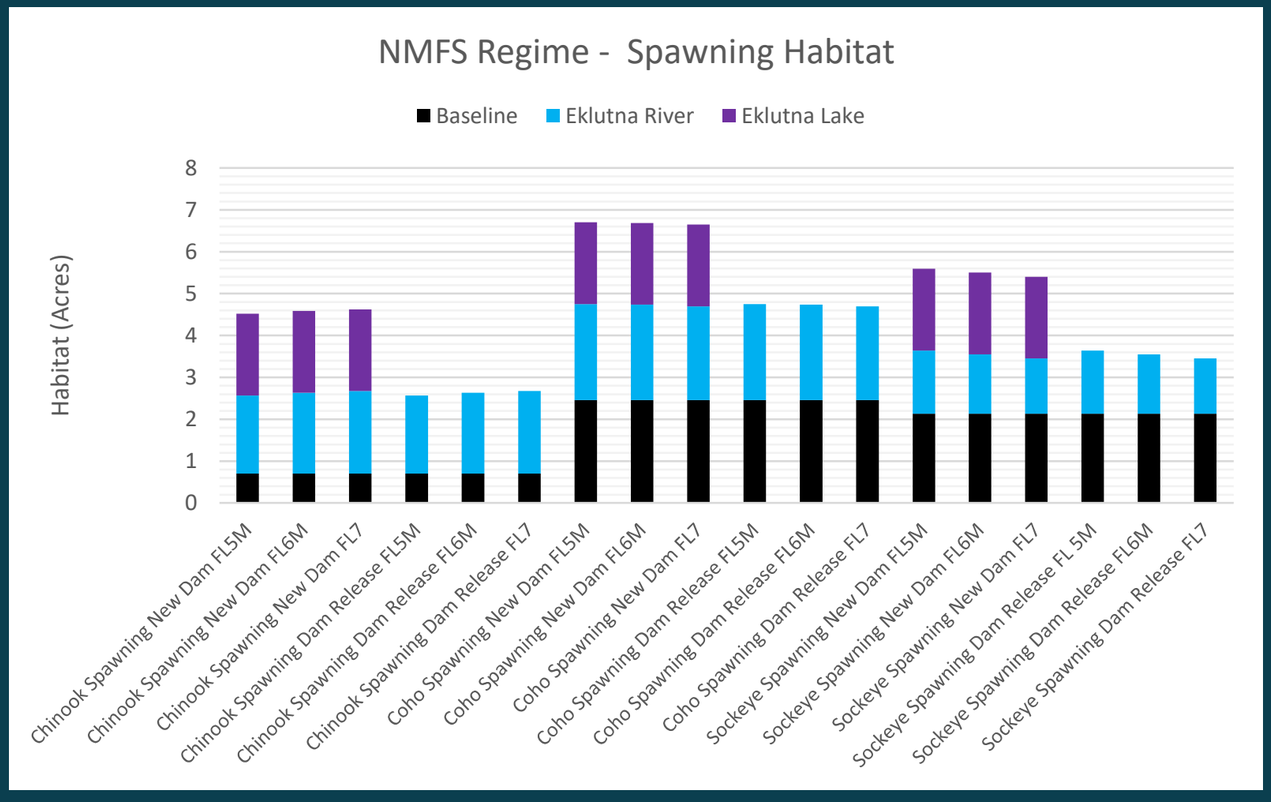
Replacement Energy ($/Yr)			
	FL5 Modified	**FL 6 Modified**	**FL 7**
Replacement Energy (MWh)	44,685	48,304	51,723
Energy Cost ($/kWh)	$73	$73	$73
Total ($/Yr)	**$3,283,000**	**$3,549,000**	**$3,800,000**

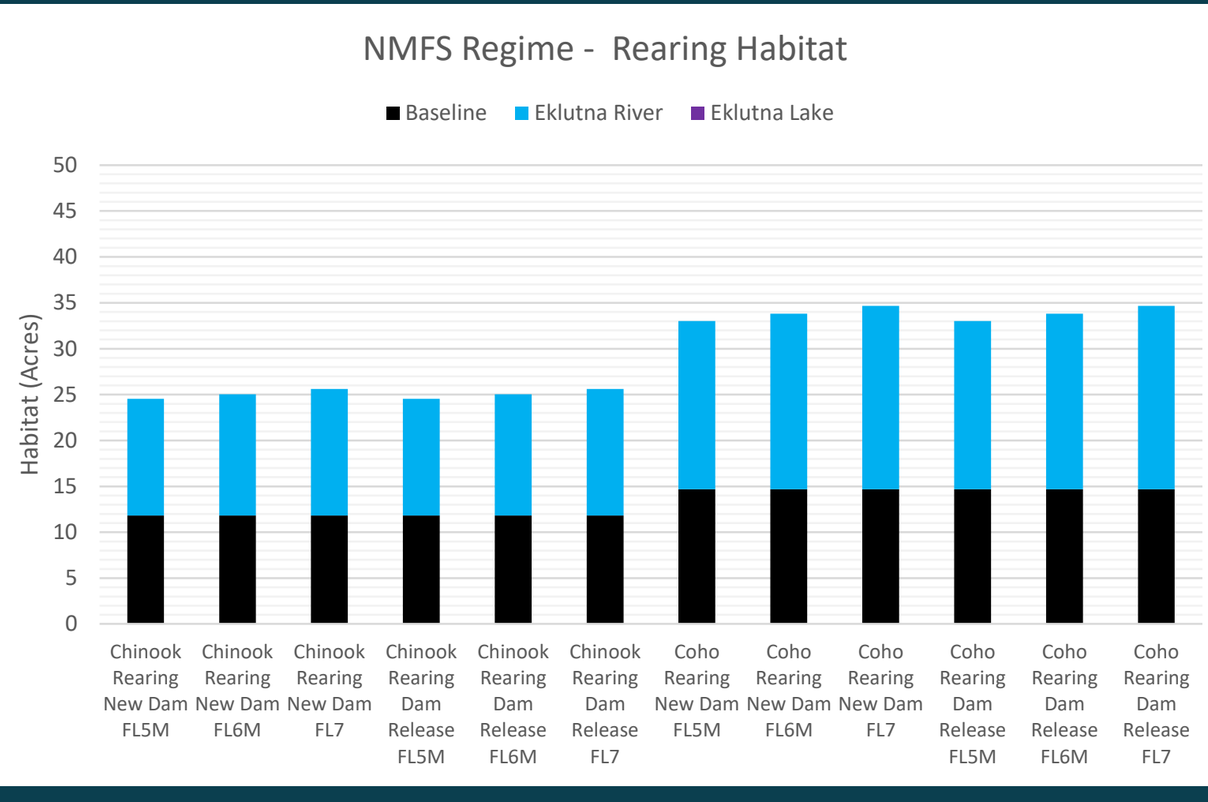
Annualized Costs ($/Yr)			
	FL5 Modified	**FL 6 Modified**	**FL 7**
CAPEX TIER	$1,667,000	$1,667,000	$1,667,000
CAPEX	$1,102,000	$1,102,000	$1,102,000
O&M	$871,000	$871,000	$871,000
Replacement Energy	$3,241,000	$3,555,000	$3,829,000
Total	**$5,779,000**	**$6,093,000**	**$6,367,000**
Present Worth ($)			
	FL5 Modified	**FL 6 Modified**	**FL 7**
Present Value	**$95,000,000**	**$100,000,000**	**$104,000,000**

Estimated Ratepayer/Taxpayer Impacts			
	FL5 Modified	**FL 6 Modified**	**FL 7**
Chugach Electric Association	**1.1%**	**1.2%**	**1.2%**
Matanuska Electric Association	**2.6%**	**2.7%**	**2.8%**
Munic. of Anchorage ($/100k)	**$1.13 / 0.011 mils**	**$1.13 / 0.011 mils**	**$1.13 / 0.011 mils**

Carbon Emissions: 19,000 – 22,000 MTCO2eq

NMFS - Habitat Summary





U.S. Fish & Wildlife Service

USFWS

Proposed PME Measures:

Flow Release Measure

- Replacement Dam w/ Fixed Wheel Gate & Ladder (Measure P)
- Existing Dam with Fixed Wheel Gate and Variable Fish Ladder (Measure K)*

Upstream Passage

- Naturelike Entrance w/ Variable Exit Ladder (Measure P)
- Variable Exit Fishway (Measure K)

Downstream Passage

- Floating Surface Collector
- Spill (April/May/June)
- Spill w/ Attractant Pumps (April/May/June) *

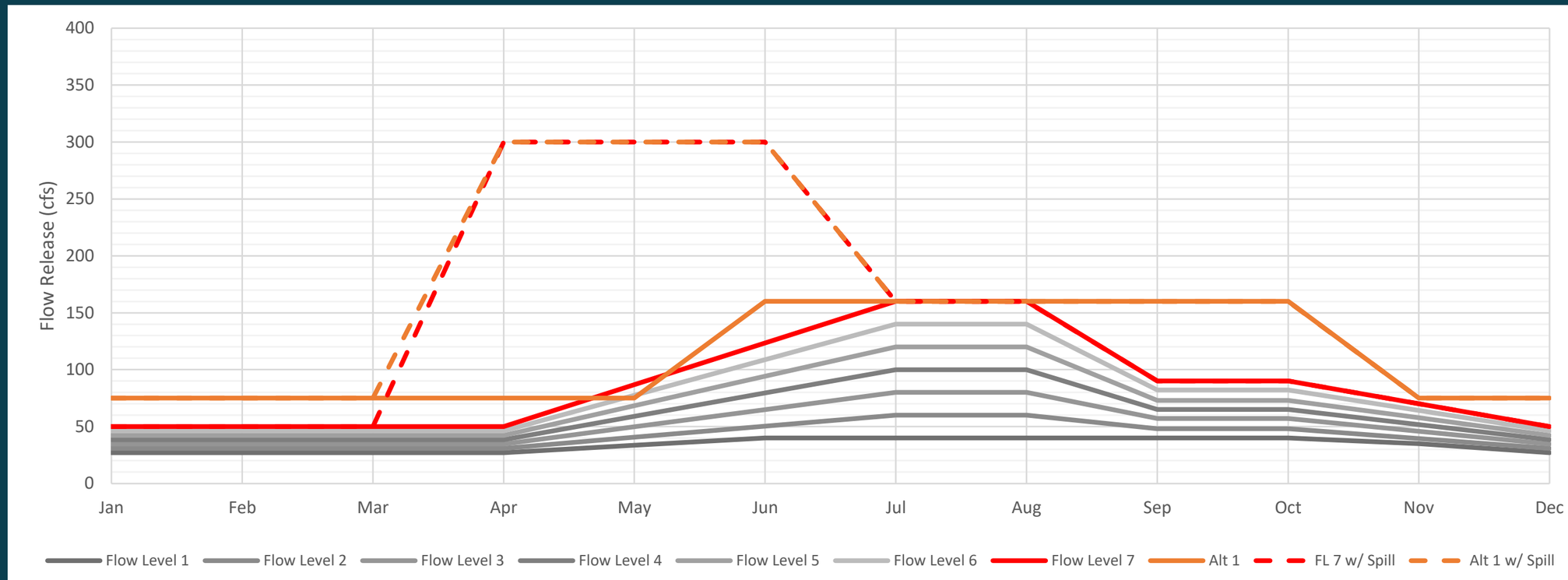
Other Improvements

- AWWU Bridge Construction
- Partial Lakeside Trail Improvements
- Physical Habitat Improvements

* Requires powerhouse offline through winter

USFWS

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Powerhouse	AWWU	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
FL7 - FSC	262,456	171,191	24,670	64,281	1,961	**66%**	**9%**	**25%**
FL7 - Spill	262,456	128,448	24,670	107,025	1,961	**49%**	**9%**	**41%**
Alt 1 - FSC	262,456	153,370	24,670	82,053	1,961	**59%**	**9%**	**32%**
Alt 1 - Spill	262,456	113,651	24,670	121,772	1,961	**44%**	**9%**	**47%**
Alt 2 - Spill	262,456	114,087	24,670	121,554	1,743	**44%**	**9%**	**47%**

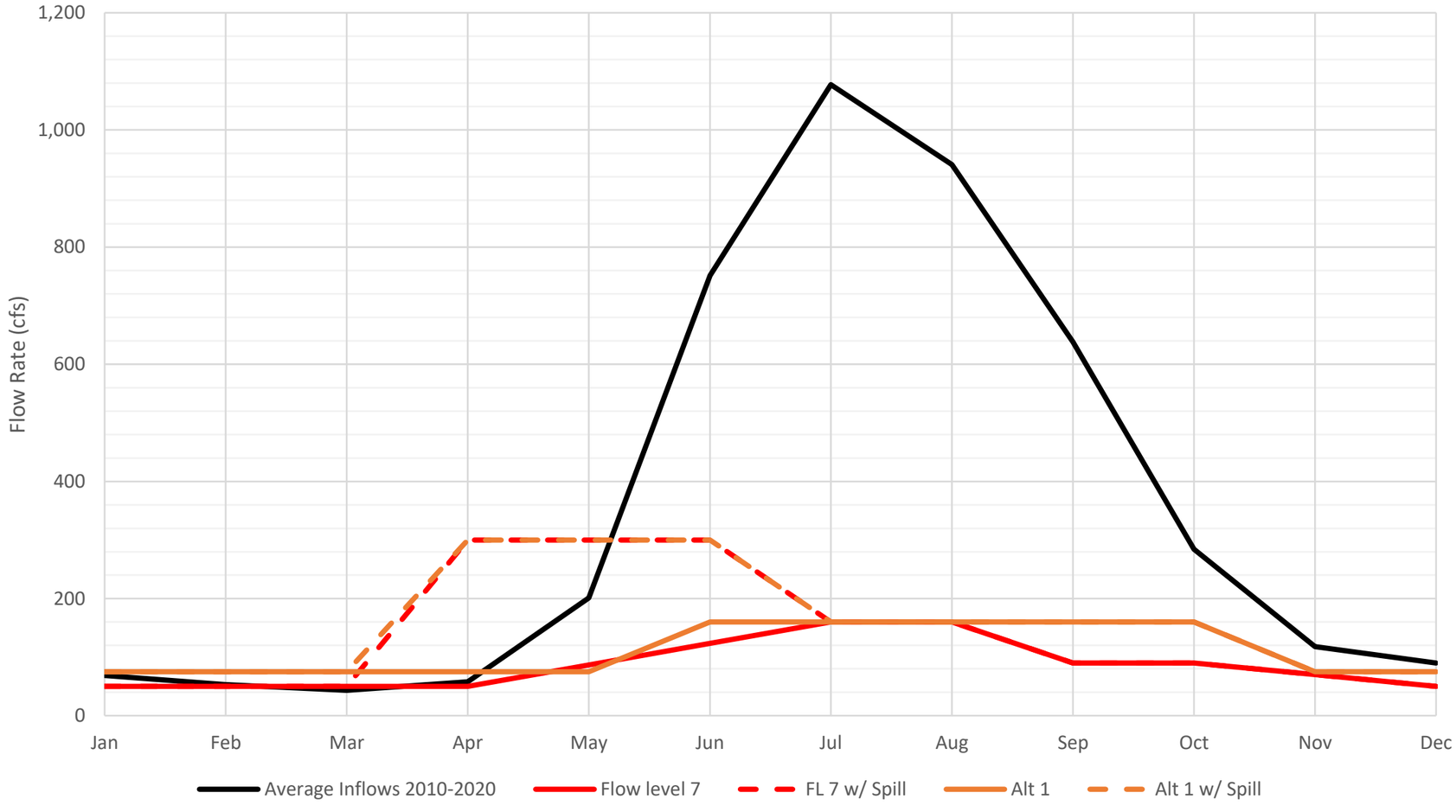


Channel Maintenance Flow:

FL7 / Alt 1: 600 cfs - 72 Hr - Annually

Alt 2: 700 cfs/72 hr Y1/2 + 400 cfs/72 Hr Y3/4/5, 600 cfs/72Hr Y6 - Repeat 3/4/5/6

USFWS - Flow Releases



Floating Surface Collector Alternatives			
Month	**Flow Release (cfs)**	**Average Monthly Inflow**	**Percent of Inflow**
Jan	50 - 75	69	**72% - 108%**
Feb	50 - 75	53	**94% - 142%**
Mar	50 - 75	43	**116% - 174%**
Apr	50 - 75	58	**86% - 129%**
May	75 - 87	201	**37% - 43%**
Jun	123 - 160	752	**16% - 21%**
Jul	160	1,077	**15%**
Aug	160	941	**17%**
Sep	90 - 160	638	**14% - 25%**
Oct	90 - 160	284	**32% - 56%**
Nov	70 - 75	118	**59% - 64%**
Dec	50 - 75	90	**56% - 83%**

Spill Alternatives			
Month	**Flow Release (cfs)**	**Average Monthly Inflow**	**Percent of Inflow**
Jan	50 - 75	69	**72% - 108%**
Feb	50 - 75	53	**94% - 142%**
Mar	50 - 75	43	**116% - 174%**
Apr	300	58	**517%**
May	300	201	**149%**
Jun	300	752	**40%**
Jul	160	1,077	**15%**
Aug	160	941	**17%**
Sep	90 - 160	638	**14% - 25%**
Oct	90 - 160	284	**32% - 56%**
Nov	70 - 75	118	**59% - 64%**
Dec	50 - 75	90	**56% - 83%**

USFWS - Replacement Dam Summary

CAPEX ($M)	
Replacement Dam	$113.3
Fish Exclusion Barrier	$2.1
Physical Habitat Improvements	$1.5
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
w/ Attraction Pumps at Dam	$38.4
Floating Surface Collector	$57.6
Total w/ Spill for Passage	**$120.3**
Total w/ Attraction Pumps	**$158.7**
Total w/ FSC	**$177.8**

O&M ($/Yr)	
Replacement Dam	$299,000
Fish Exclusion Barrier	$37,700
Attraction Pumps at Dam	$1,326,000
Floating Surface Collector	$1,500,200
Total w/ Spill for Passage	**$336,700**
Total w/ Attraction Pumps	**$1,662,700**
Total w/ FSC	**$1,836,900**

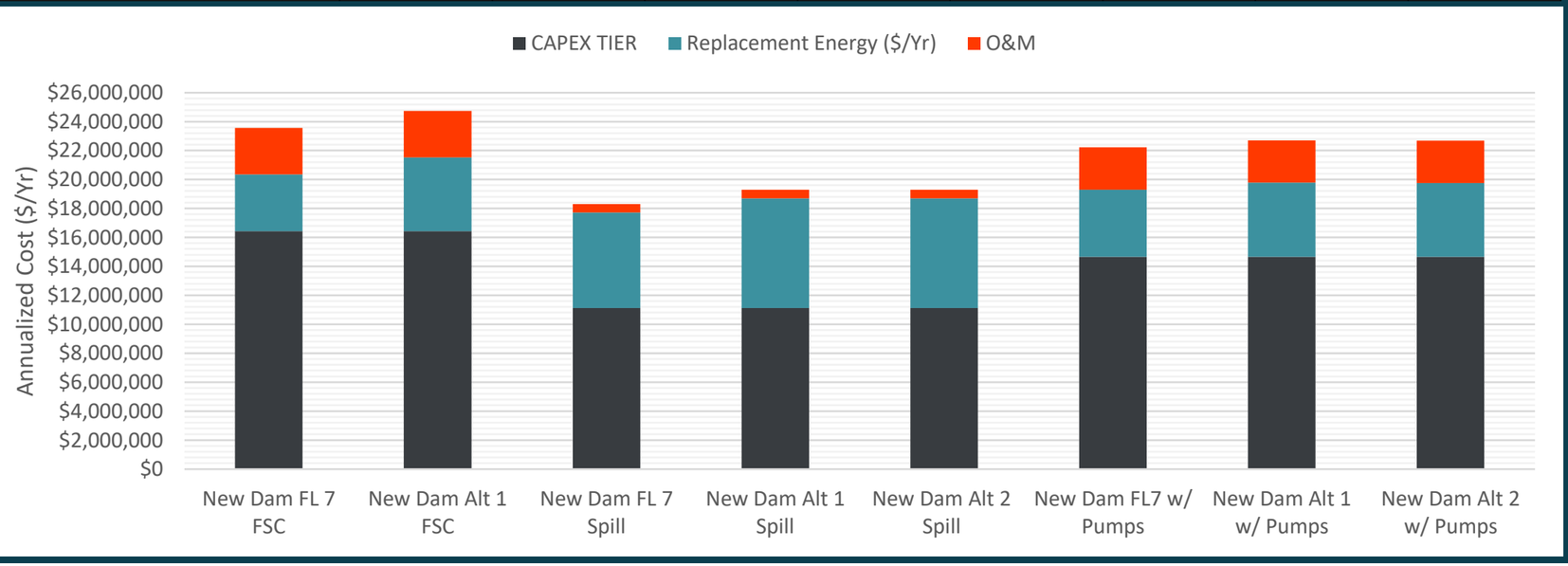
Carbon Emissions:
19,000 – 37,000 MTCO2eq

Replacement Energy ($/Yr)								
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**	**FL7 w/ Pumps**	**Alt 1 w/ Pumps**	**Alt 2 w/ Pumps**
Replacement Energy (MWh)	44,660	58,193	75,059	86,313	57,933	52,594	58,193	57,933
Energy Cost ($/kWh)	$73	$73	$73	$73	$73	$73	$73	$73
Total ($/Yr)	**$3,266,000**	**$4,256,000**	**$5,514,000**	**$6,341,000**	**$4,256,000**	**$3,864,000**	**$4,275,000**	**$4,256,000**

Annualized Costs ($/Yr)								
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**	**FL7 w/ Pumps**	**Alt 1 w/ Pumps**	**Alt 2 w/ Pumps**
CAPEX TIER	$16,433,000	$16,433,000	$11,114,000	$11,114,000	$11,114,000	$14,666,000	$14,666,000	$14,666,000
CAPEX	$10,861,000	$10,861,000	$7,345,000	$7,345,000	$7,345,000	$9,693,000	$9,693,000	$9,693,000
O&M	$3,229,000	$3,229,000	$592,000	$592,000	$592,000	$2,922,000	$2,922,000	$2,922,000
Replacement Energy	$3,908,000	$5,093,000	$6,598,000	$7,588,000	$7,577,000	$4,624,000	$5,116,000	$5,093,000
Total	**$23,570,000**	**$24,755,000**	**$18,304,000**	**$19,294,000**	**$19,283,000**	**$22,212,000**	**$22,704,000**	**$22,681,000**

Present Worth ($)								
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**	**FL7 w/ Pumps**	**Alt 1 w/ Pumps**	**Alt 2 w/ Pumps**
Present Value	**$386,000,000**	**$405,000,000**	**$300,000,000**	**$316,000,000**	**$316,000,000**	**$364,000,000**	**$372,000,000**	**$371,000,000**

Estimated Ratepayer/Taxpayer Impacts								
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**	**FL7 w/ Pumps**	**Alt 1 w/ Pumps**	**Alt 2 w/ Pumps**
Chugach Electric Association	**4.5%**	**4.8%**	**3.5%**	**3.7%**	**3.7%**	**4.3%**	**4.4%**	**4.4%**
Matanuska Electric Association	**8.2%**	**8.7%**	**5.4%**	**5.8%**	**5.8%**	**7.9%**	**8.1%**	**8.0%**
Munic. of Anchorage ($/100k)	**$8.05**	**$8.05**	**$4.53**	**$4.53**	**$4.53**	**$7.21**	**$7.21**	**$7.21**



USFWS - Variable Exit Fish Ladder Summary

CAPEX ($M)	
Variable Exit Fishway	$17.6
Fixed Wheel Gate	$6.6
Physical Habitat Improvements	$1.5
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Fish Exclusion Barrier	$2.1
Floating Surface Collector	$57.6
Total w/ Spill for Passage	**$31.1**
Total w/ FSC	**$88.6**

O&M ($/Yr)	
Variable Exit Fishway	$555,100
Fixed Wheel Gate	$32,500
Fish Exclusion Barrier	$37,700
Floating Surface Collector	$1,500,200
Total w/ Spill for Passage	**$625,300**
Total w/ FSC	**$2,125,500**

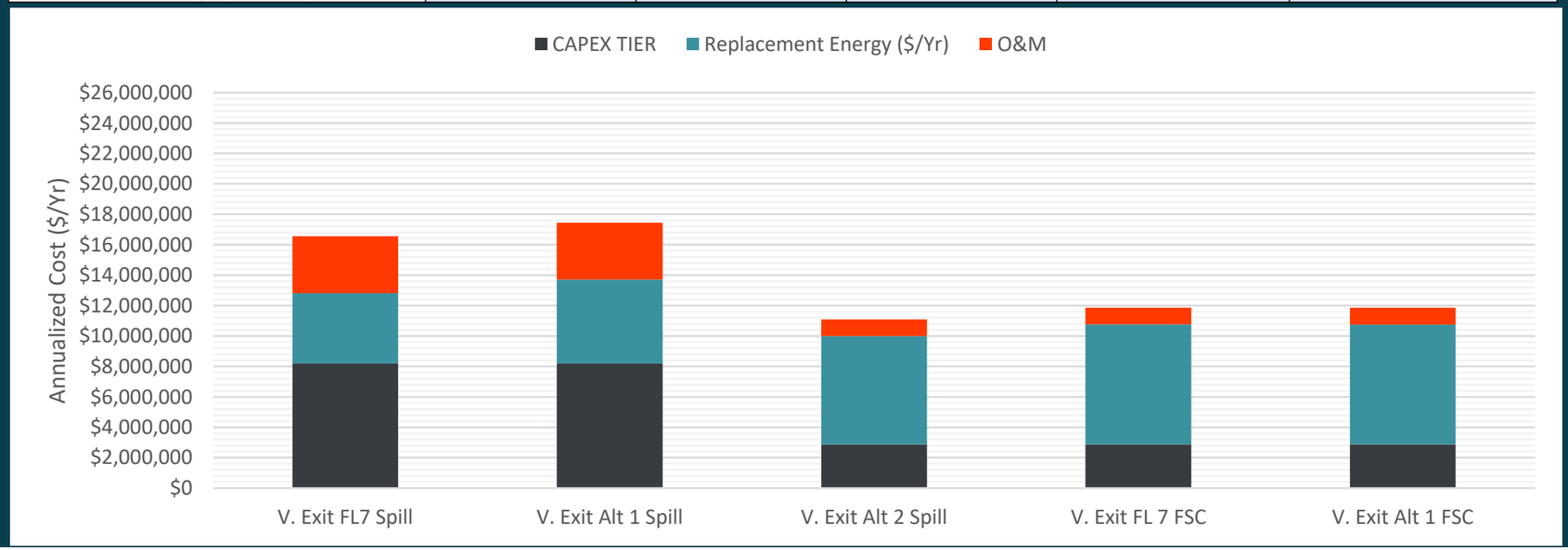
Carbon Emissions:
23,000 – 39,000 MTCO2eq

Replacement Energy ($/Yr)					
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**
Replacement Energy (MWh)	52,594	62,802	81,044	89,786	89,660
Energy Cost ($/kWh)	$73	$73	$73	$73	$73
Total ($/Yr)	**$3,266,000**	**$4,614,000**	**$5,954,000**	**$6,596,000**	**$6,587,000**

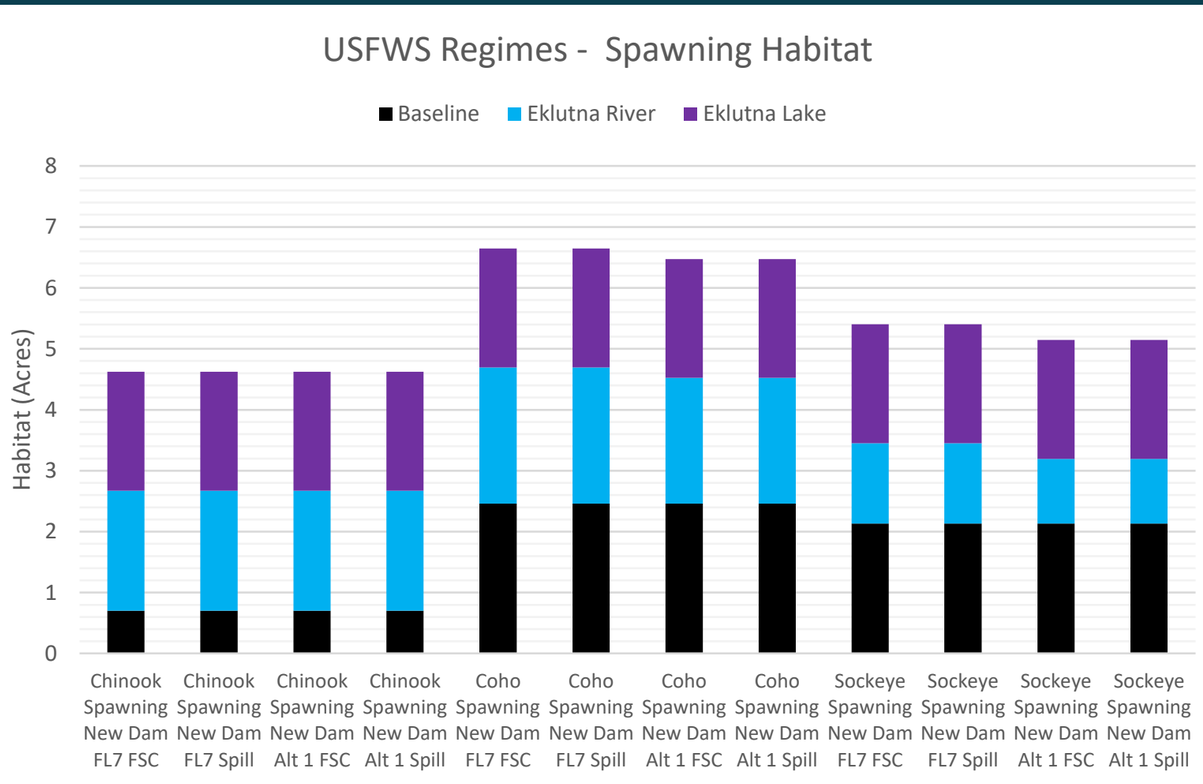
Annualized Costs ($/Yr)					
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**
CAPEX TIER	$8,190,000	$8,190,000	$2,871,000	$2,871,000	$2,871,000
CAPEX	$5,413,000	$5,413,000	$1,898,000	$1,898,000	$1,898,000
O&M	$3,736,000	$3,736,000	$1,099,000	$1,099,000	$1,099,000
Replacement Energy	$4,624,000	$5,521,000	$7,125,000	$7,893,000	$7,882,000
Total	**$16,550,000**	**$17,447,000**	**$11,095,000**	**$11,863,000**	**$11,852,000**

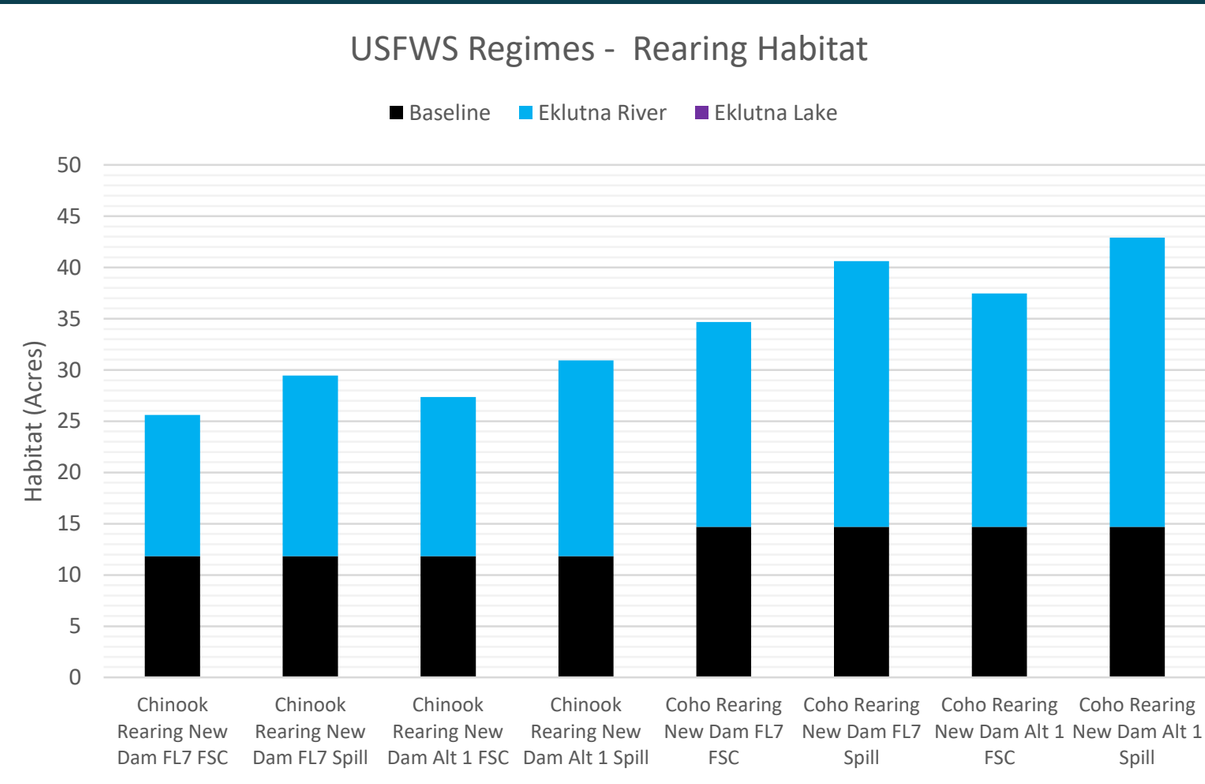
Present Worth ($)					
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**
Present Value	**$271,000,000**	**$286,000,000**	**$182,000,000**	**$194,000,000**	**$194,000,000**

Estimated Ratepayer/Taxpayer Impacts					
	FL 7 FSC	**Alt 1 FSC**	**FL 7 Spill**	**Alt 1 Spill**	**Alt 2 Spill**
Chugach Electric Assoc.	**3.2%**	**3.4%**	**2.1%**	**2.3%**	**2.3%**
Matanuska Electric Assoc.	**7.6%**	**7.9%**	**4.6%**	**4.9%**	**4.9%**
Munic. of Anchorage ($/100k)	**$5.23**	**$5.23**	**$1.71**	**$1.71**	**$1.71**

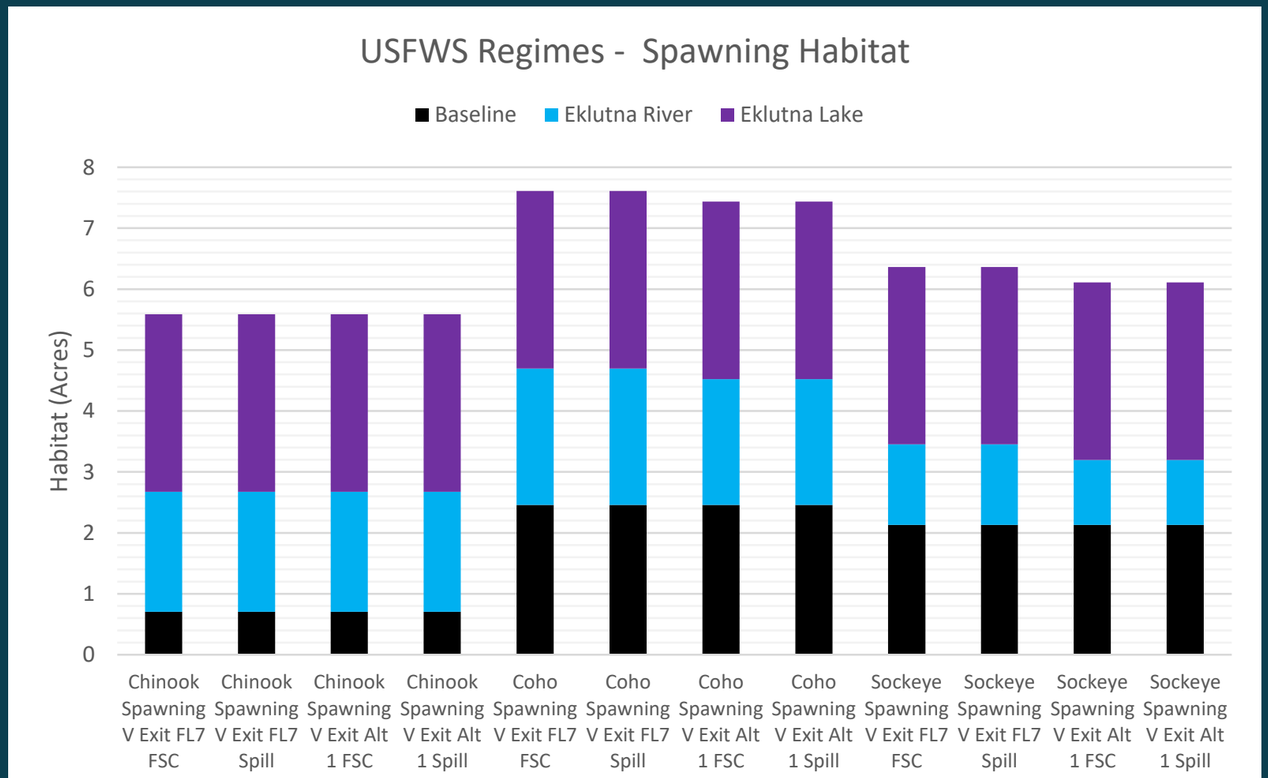


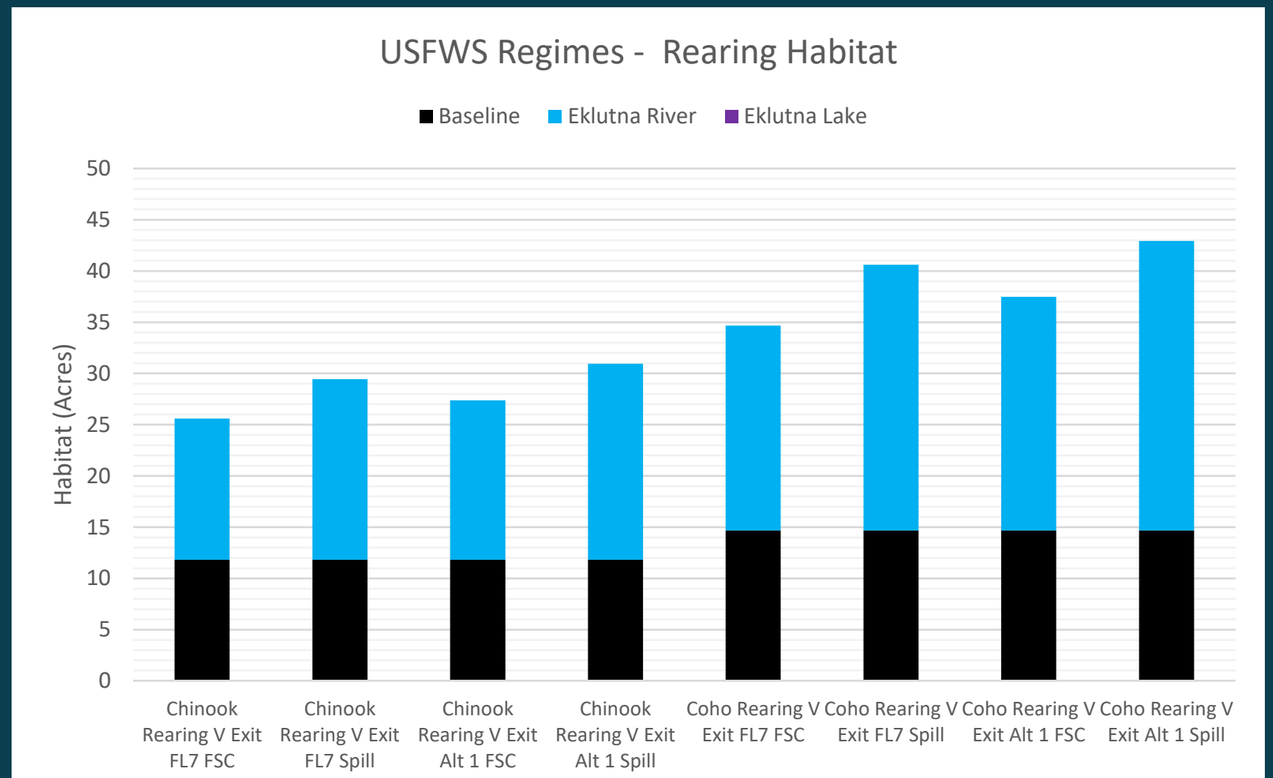
USFWS - Habitat Summary
Replacement Dam





USFWS - Habitat Summary
Variable Exit Fish Ladder





Trout Unlimited

Trout Unlimited

Proposed PME Measures:

Flow Release Measure

- Existing Dam with Fixed Wheel Gate and Variable Fish Ladder (Measure K)*

Upstream Passage

- Variable Exit Fishway (Measure K)

Downstream Passage

- Spill (April/May/June)

Channel Maintenance Flows

- 800 cfs Y1 Flushing Flow w/ No Maintenance Flow
- 800 cfs Y1 Flushing Flow w/ 300 cfs Maintenance Flow 3 out of every 10 years
- 800 cfs Y1 Flushing Flow w/ 400 cfs Maintenance Flow 3 out of every 10 years
- 800 cfs Y1 Flushing Flow w/ 525 cfs Maintenance Flow 3 out of every 10 years
- 800 cfs Y1 Flushing Flow w/ 700 cfs Maintenance Flow 3 out of every 10 years

- 700 cfs Y1 Flushing Flow w/ No Maintenance Flow
- 700 cfs Y1 Flushing Flow w/ 240 cfs Maintenance Flow 3 out of every 10 years
- 700 cfs Y1 Flushing Flow w/ 320 cfs Maintenance Flow 3 out of every 10 years

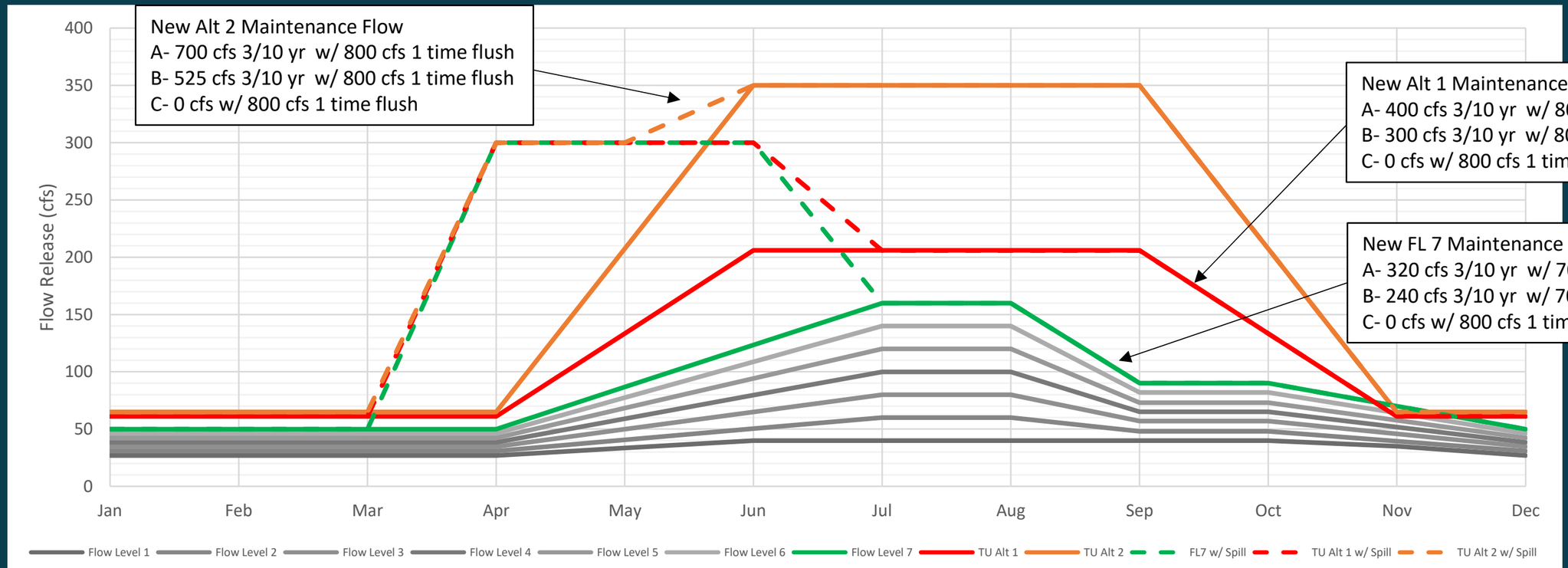
Other Improvements

- AWWU Bridge Construction
- Partial Lakeside Trail Improvements
- Physical Habitat Improvements

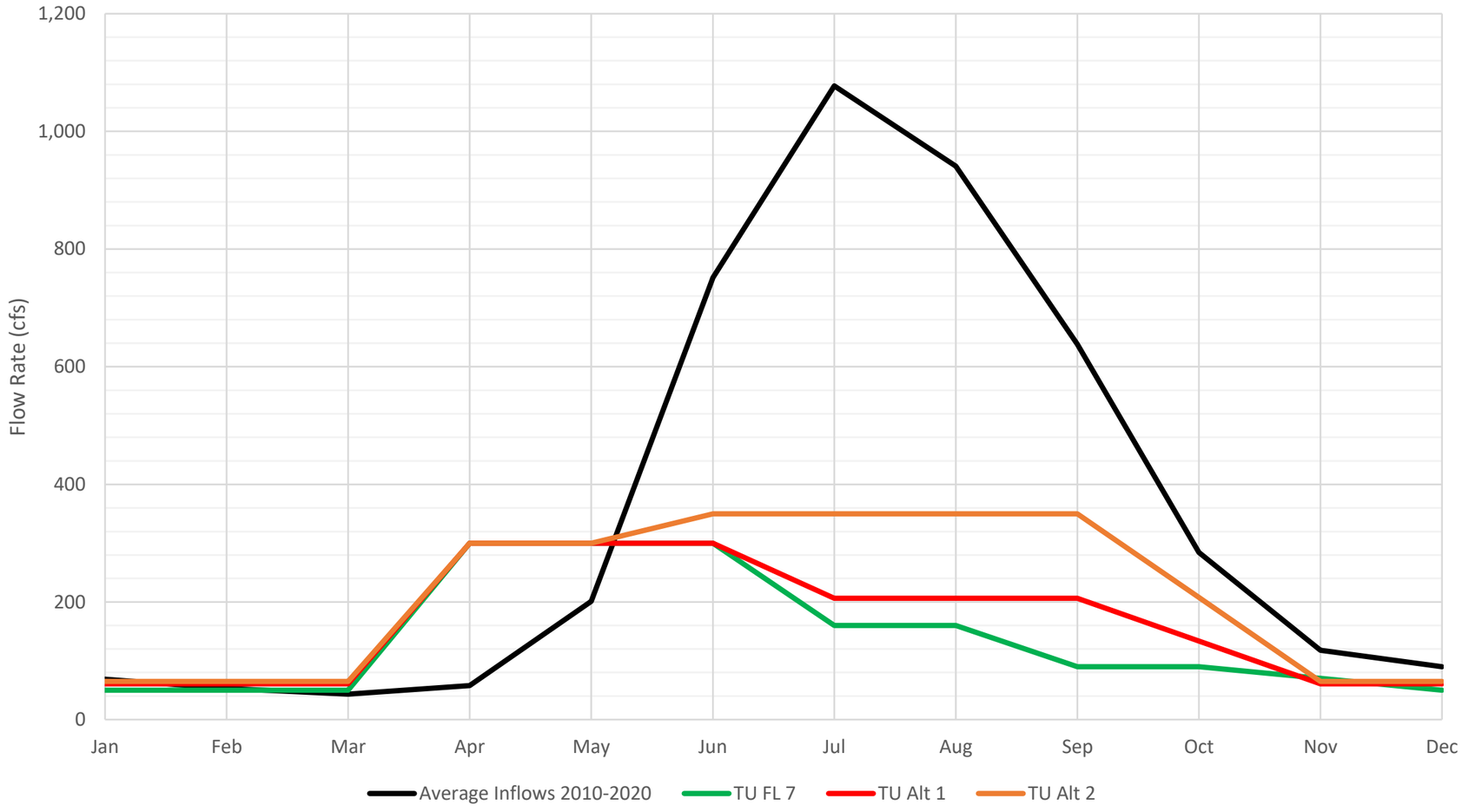
* Requires powerhouse offline through winter

Trout Unlimited

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Hydropower	Public Water Supply	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
TU FL7	262,456	135,522	24,670	101,387	0 - 349	**52%**	**9%**	**39%**
TU Alt 1	262,456	113,869	24,670	121,522	0 - 436	**44%**	**9%**	**47%**
TU Alt 2	262,456	82,803	24,670	153,450	0 - 762	**32%**	**9%**	**59%**



TU - Flow Releases



Spill Alternatives			
Month	**Flow Release (cfs)**	**Average Monthly Inflow**	**Percent of Inflow**
Jan	50 - 65	69	**72% - 94%**
Feb	50 - 65	53	**94% - 123%**
Mar	50 - 65	43	**116% - 151%**
Apr	300	58	**517%**
May	300	201	**149%**
Jun	300 - 350	752	**40% - 47%**
Jul	160 - 350	1,077	**15% - 32%**
Aug	160 - 350	941	**17% - 37%**
Sep	90 - 350	638	**14% - 55%**
Oct	90 - 208	284	**32% - 73%**
Nov	61 - 70	118	**52% - 59%**
Dec	50 - 65	90	**56% - 72%**

TU - Variable Exit Ladder Summary

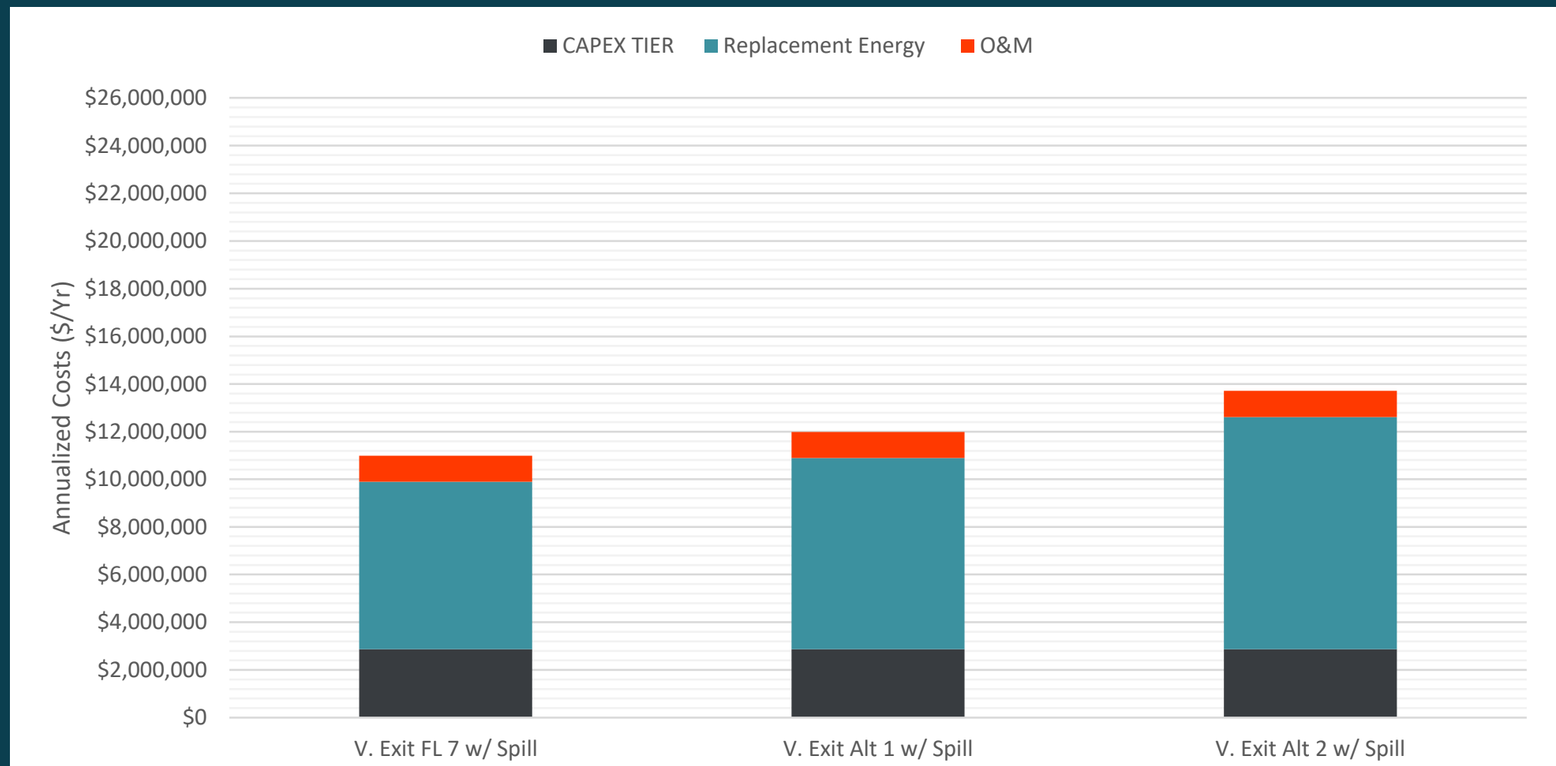
CAPEX ($M)	
Variable Exit Fishway	$17.6
Fixed Wheel Gate	$6.6
Physical Habitat Improvements	$1.5
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Fish Exclusion Barrier	$2.1
Total	**$31.1**

O&M ($/Yr)	
Variable Exit Fishway	$555,100
Fixed Wheel Gate	$32,500
Fish Exclusion Barrier	$37,700
Total ($/Yr)	**$625,300**

Replacement Energy ($/Yr)			
	FL 7 w/ Spill	**Alt 1 w/ Spill**	**Alt 2 w/ Spill**
Replacement Energy (MWh)	79,887	89,723	109,231
Energy Cost ($/kWh)	$73	$73	$73
Total ($/Yr)	**$5,869,154**	**$6,591,796**	**$8,025,011**

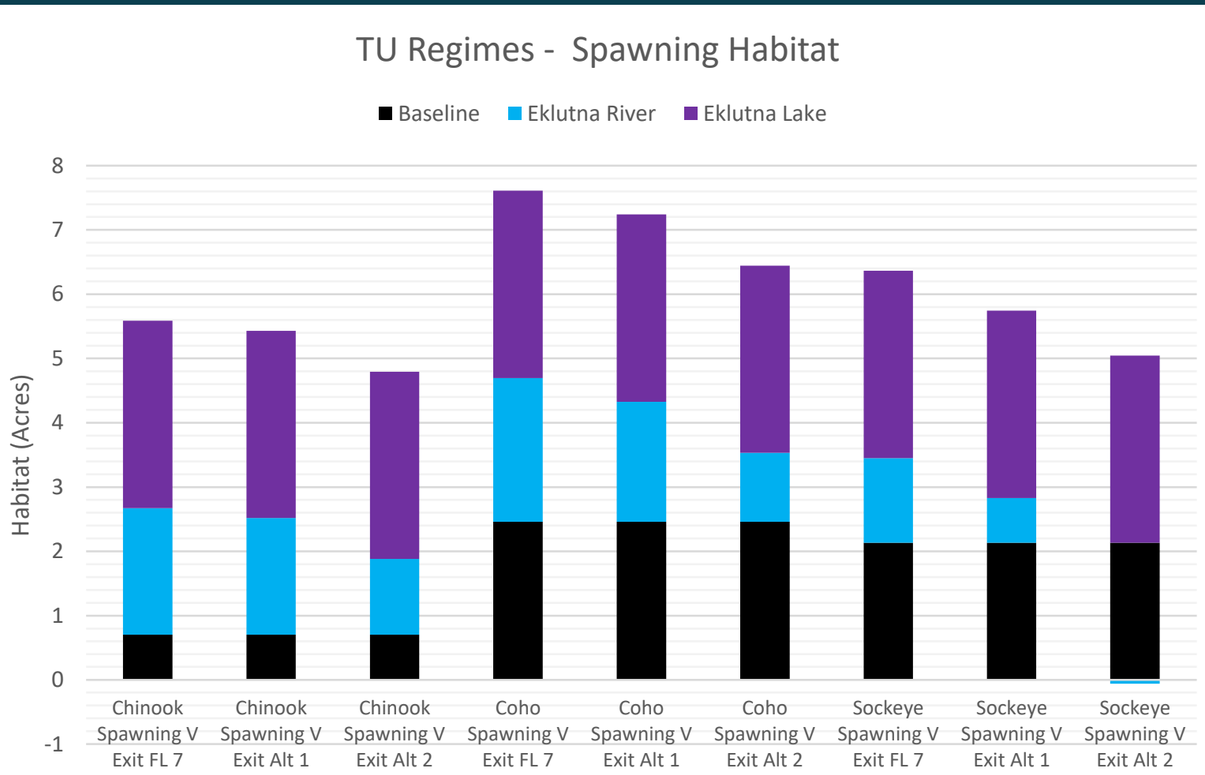
Annualized Costs ($/Yr)			
	FL 7 w/ Spill	**Alt 1 w/ Spill**	**Alt 2 w/ Spill**
CAPEX TIER	$2,871,000	$2,871,000	$2,871,000
CAPEX	$1,898,000	$1,898,000	$1,898,000
O&M	$1,099,000	$1,099,000	$1,099,000
Replacement Energy	$7,022,912	$7,887,611	$9,602,567
Total	**$10,992,912**	**$11,857,611**	**$13,572,567**
Present Worth ($)			
	FL 7 w/ Spill	**Alt 1 w/ Spill**	**Alt 2 w/ Spill**
Present Value	**$180,000,000**	**$194,000,000**	**$222,000,000**

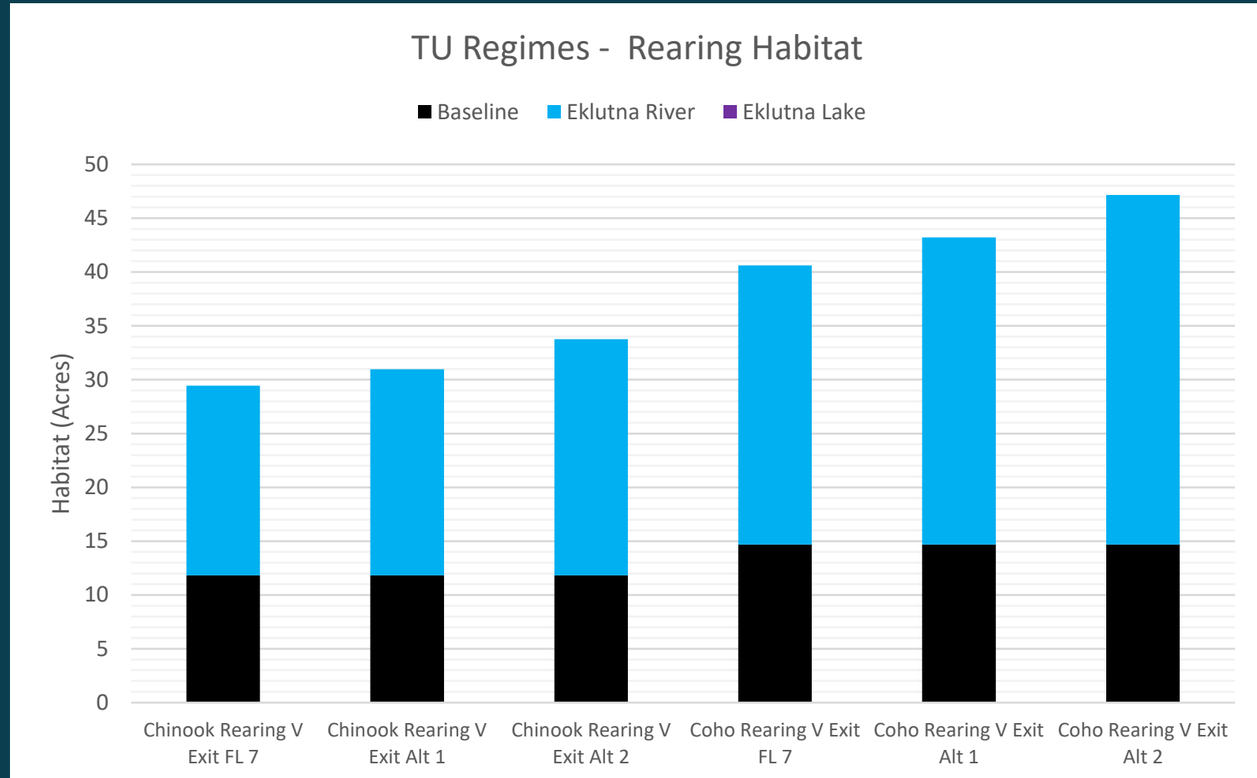
Estimated Ratepayer/Taxpayer Impacts			
	FL 7 w/ Spill	**Alt 1 w/ Spill**	**Alt 2 w/ Spill**
Chugach Electric Association	**2.1%**	**2.3%**	**2.6%**
Matanuska Electric Association	**4.6%**	**5.0%**	**5.7%**
Munic. of Anchorage ($/100k)	**$1.71 / 0.017 mils**	**$1.71 / 0.017 mils**	**$1.71 / 0.017 mils**



Carbon Emissions: 34,000 – 48,000 MTCO2eq

Trout Unlimited - Habitat Summary





Hydro Project Owners
CEA/MEA/MOA

Hydro Project Owners

Proposed PME Measures:

Flow Release Measure

- AWWU Portal (Measure C)

Upstream Passage

- None

Downstream Passage

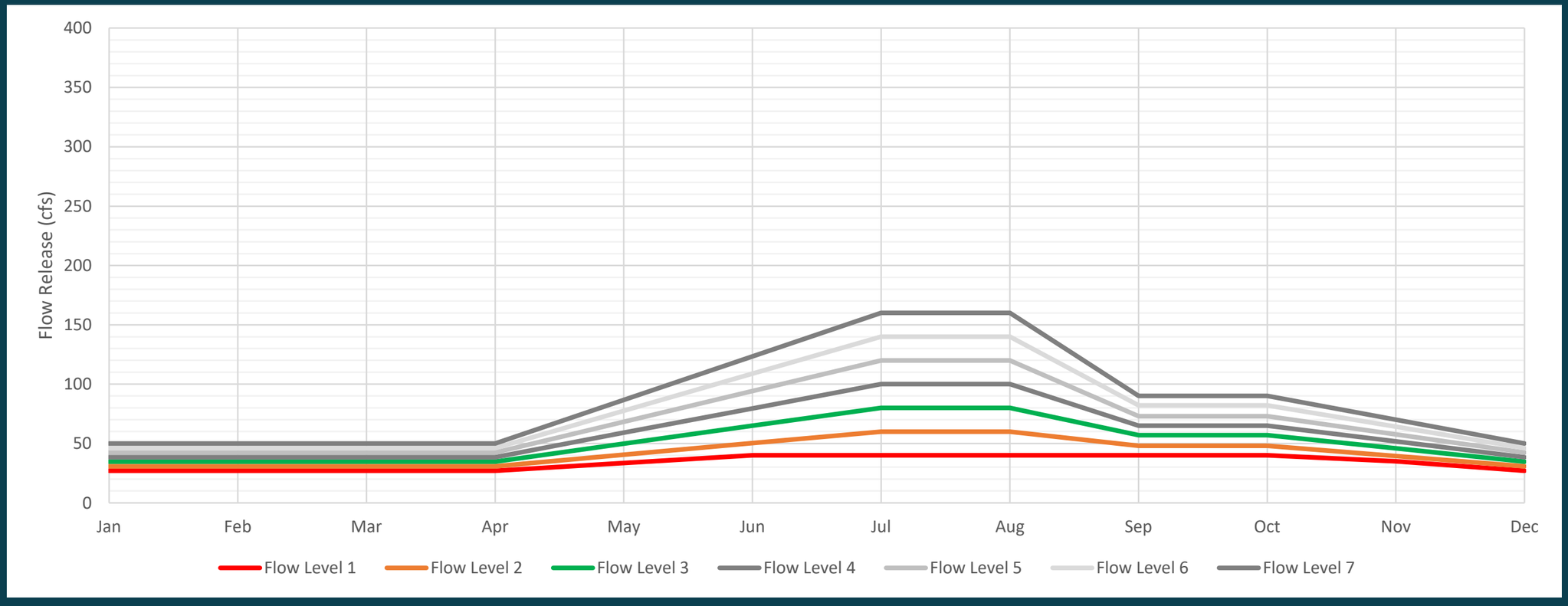
- None

Other Improvements

- AWWU Bridge Construction
- Partial Lakeside Trail Improvements

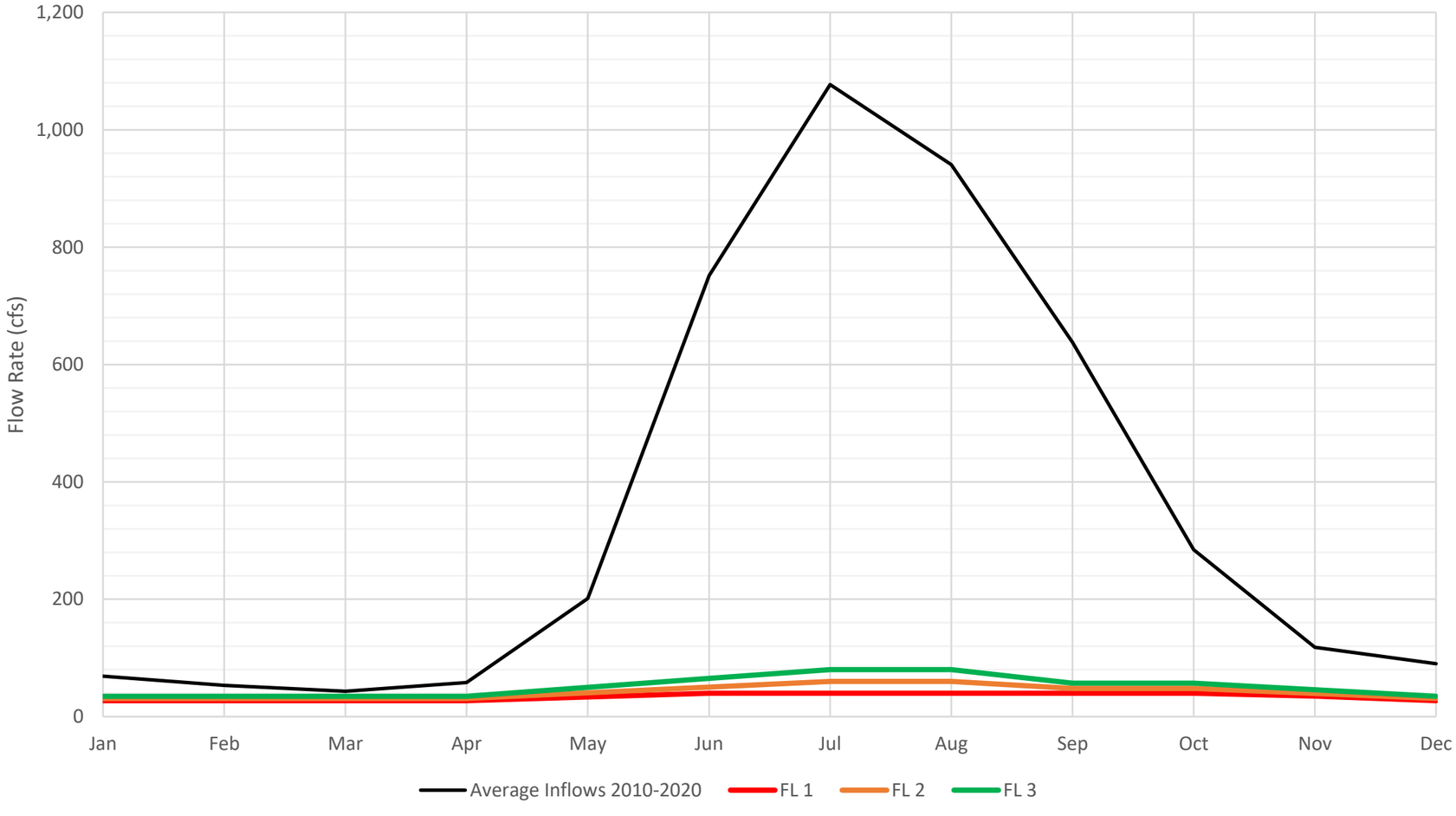
CEA
MEA
MOA

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Hydropower	Public Water Supply	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
Flow Level 1	262,456	212,804	24,670	25,023	291	**81%**	**9%**	**10%**
Flow Level 2	262,456	206,380	24,670	31,303	350	**79%**	**9%**	**12%**
Flow Level 3	262,456	199,539	24,670	38,055	427	**76%**	**9%**	**15%**



Channel Maintenance Flow = 200/325/400 cfs - 72 Hr - 3 of 10 Years

CEA/MEA/MOA - Flow Releases



Month	Flow Release (cfs)	Average Monthly Inflow	Percent of Inflow
Jan	27 - 35	69	**39% - 51%**
Feb	27 - 35	53	**51% - 66%**
Mar	27 - 35	43	**63% - 81%**
Apr	27 - 35	58	**47% - 60%**
May	34 - 50	201	**17% - 25%**
Jun	40 - 65	752	**5% - 9%**
Jul	40 - 80	1,077	**4% - 7%**
Aug	40 - 80	941	**4% - 9%**
Sep	40 - 57	638	**6% - 9%**
Oct	40 - 57	284	**14% - 20%**
Nov	35 - 46	118	**30% - 39%**
Dec	27 - 35	90	**30% - 39%**

CEA/MEA/MOA - Summary

CAPEX ($M)	
AWWU Portal	$5.5
Fixed Wheel Gate*	$6.6
Partial Lakeside Trail Improve.	$0.4
AWWU Bridges	$2.9
Total	**$15.4**

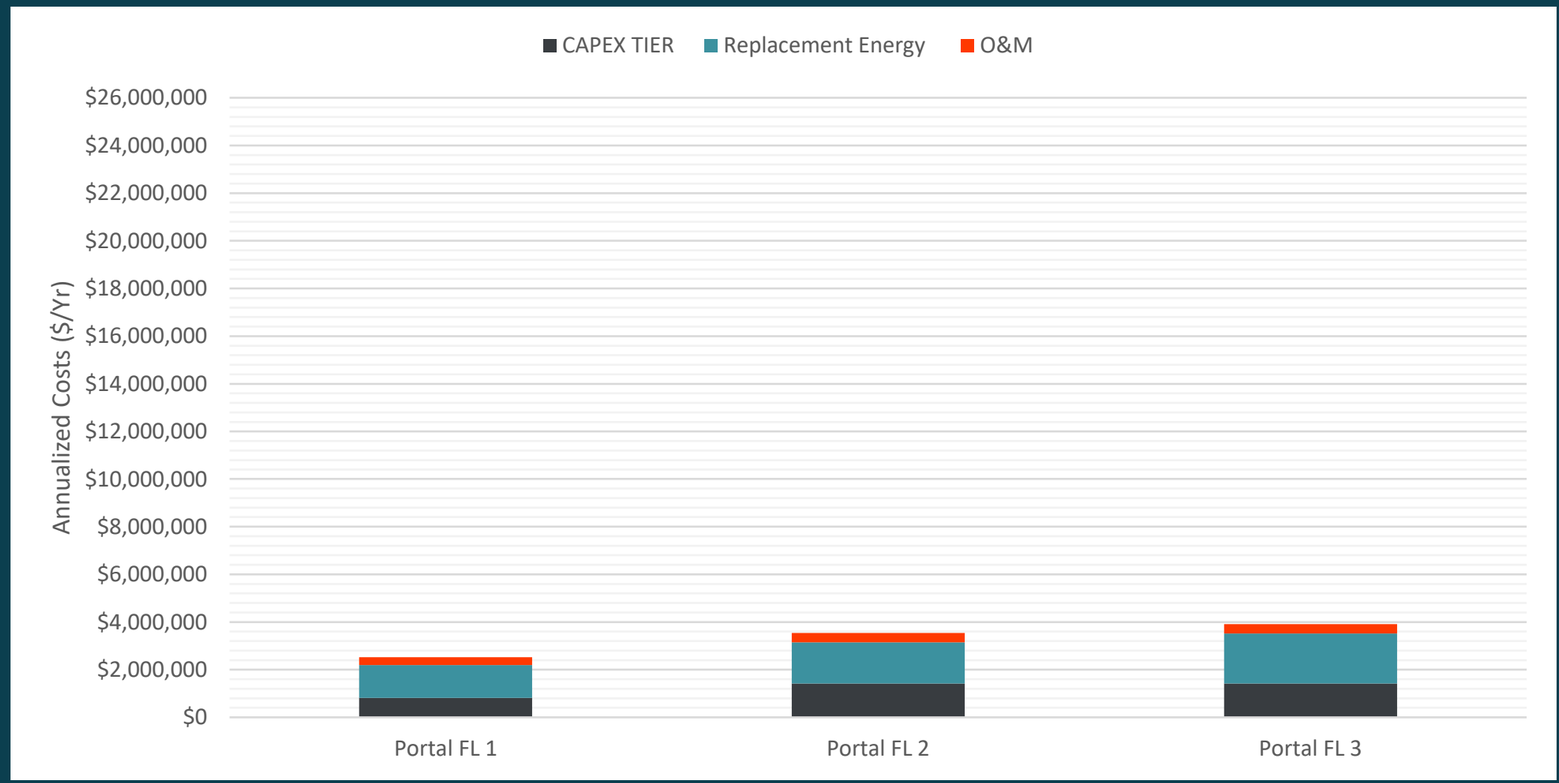
*Fixed Wheel Gate Excluded from FL1 Alternative

O&M ($/Yr)	
AWWU Portal	$188,500
Fixed Wheel Gate*	$32,500
Total ($/Yr)	**$221,000**

Replacement Energy ($/Yr)			
	FL 1	**FL 2**	**FL 3**
Replacement Energy (MWh)	15,723	19,712	23,974
Energy Cost ($/kWh)	$73	$73	$73
Total ($/Yr)	**$1,150,000**	**$1,442,000**	**$1,753,000**

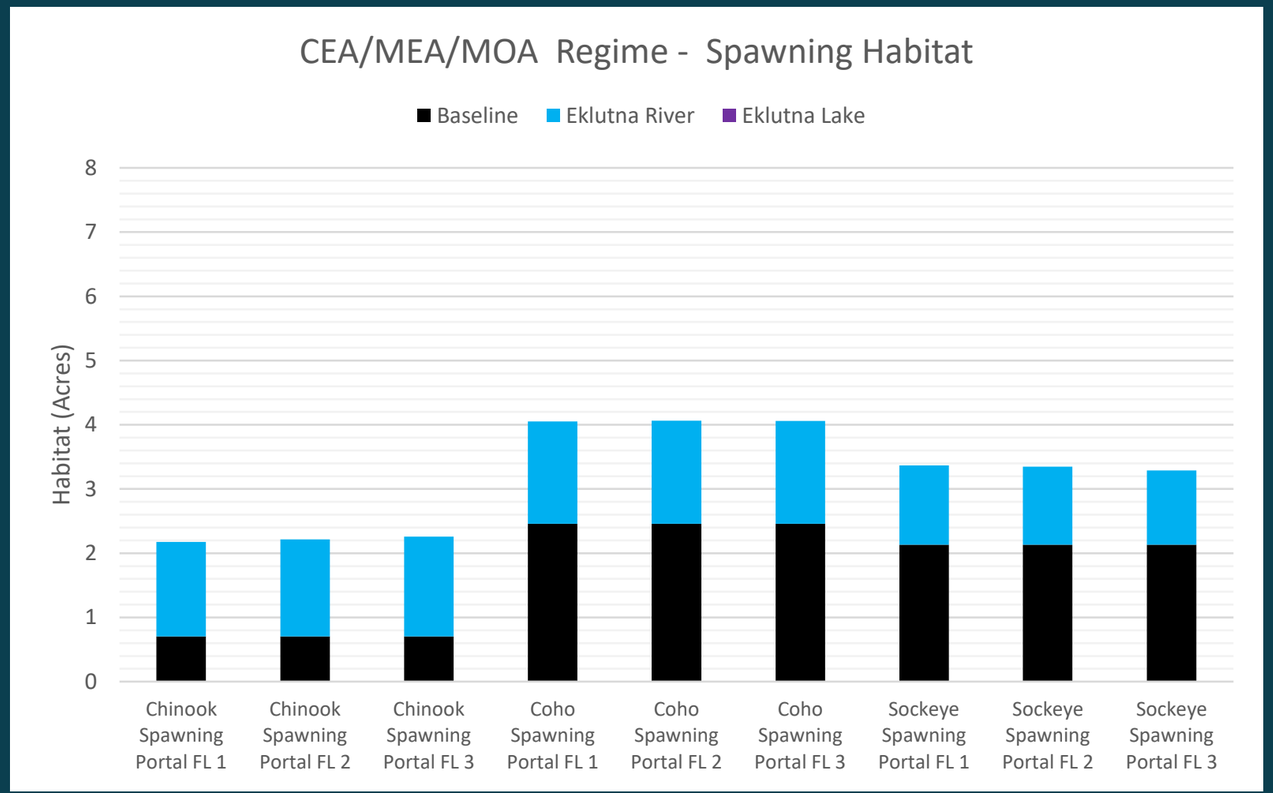
Annualized Costs ($/Yr)			
	FL 1	**FL 2**	**FL 3**
CAPEX TIER	$819,000	$1,426,000	$1,426,000
CAPEX	$541,000	$943,000	$943,000
O&M	$331,000	$388,000	$388,000
Replacement Energy	$1,376,000	$1,725,000	$2,098,000
Total	**$2,526,000**	**$3,539,000**	**$3,912,000**
Present Worth ($)			
	FL 1	**FL 2**	**FL 3**
Present Value	**$41,000,000**	**$58,000,000**	**$64,000,000**

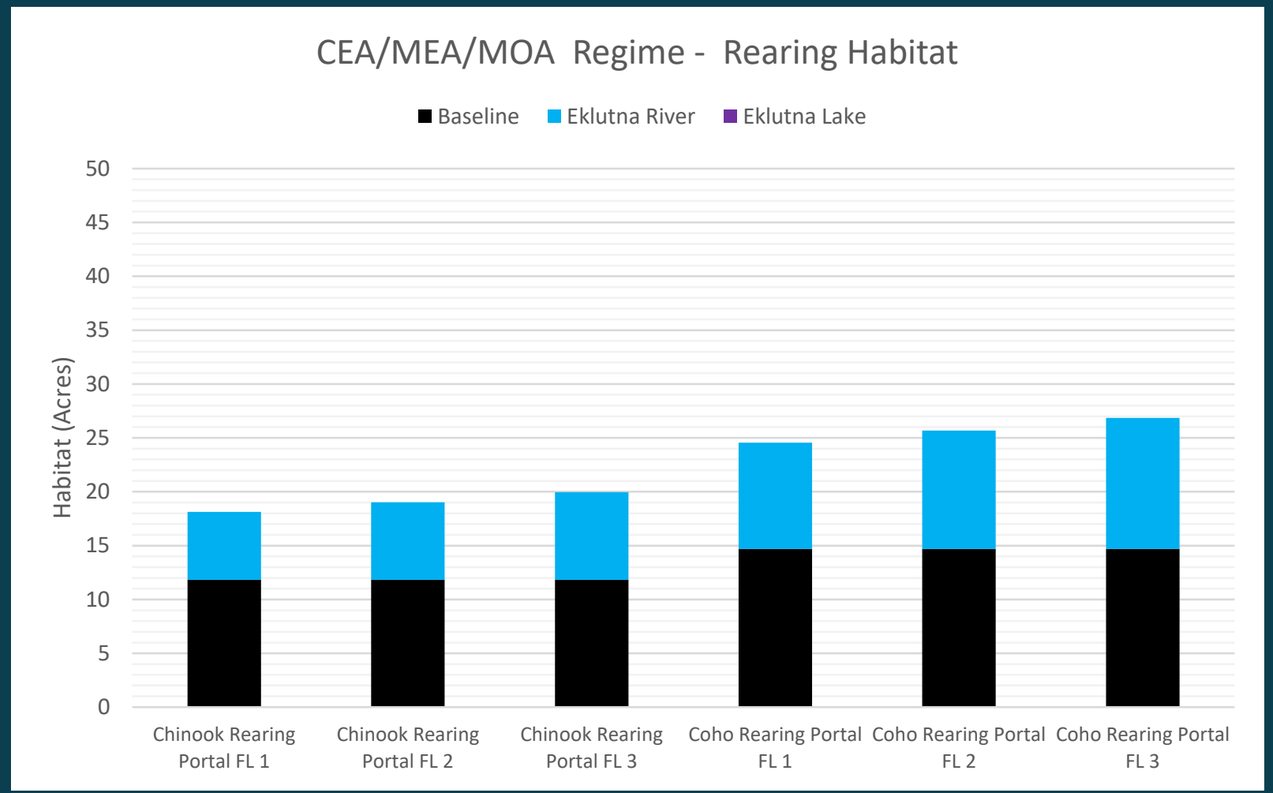
Estimated Ratepayer/Taxpayer Impacts			
	FL 1	**FL 2**	**FL 3**
Chugach Electric Association	**0.5%**	**0.7%**	**0.8%**
Matanuska Electric Association	**1.1%**	**1.4%**	**1.5%**
Munic. of Anchorage ($/100k)	**$0.50 / 0.005 mils**	**$0.76 / 0.007 mils**	**$0.76 / 0.007 mils**



Carbon Emissions: 7,000 – 10,000 MTCO2eq

CEA/MEA/MOA - Habitat Summary





The Conservation Fund

The Conservation Fund

Proposed PME Measures:

Flow Release Measure

- Replacement Dam w/ Fixed Wheel Gate & Ladder (Measure P)

Upstream Passage

- Naturelike Entrance w/ Variable Exit Ladder (Measure P)

Downstream Passage

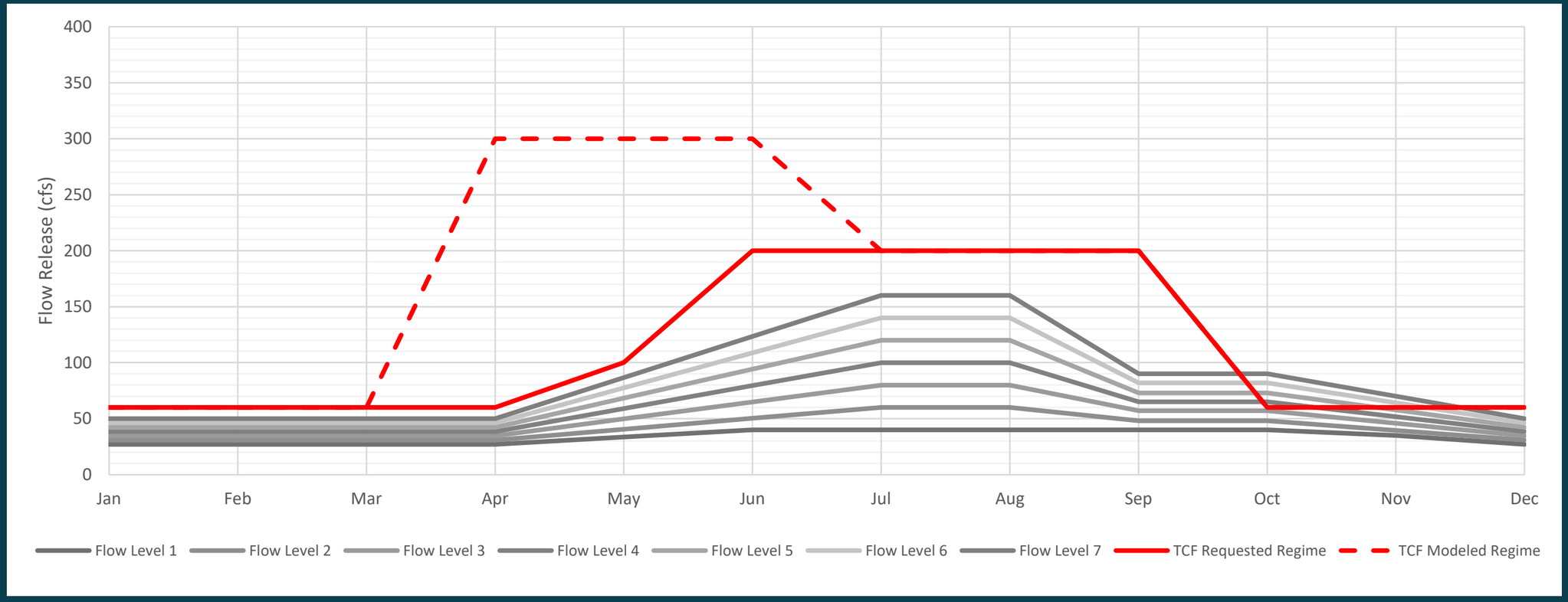
- Spill (April/May/June)

Other Improvements

- None*

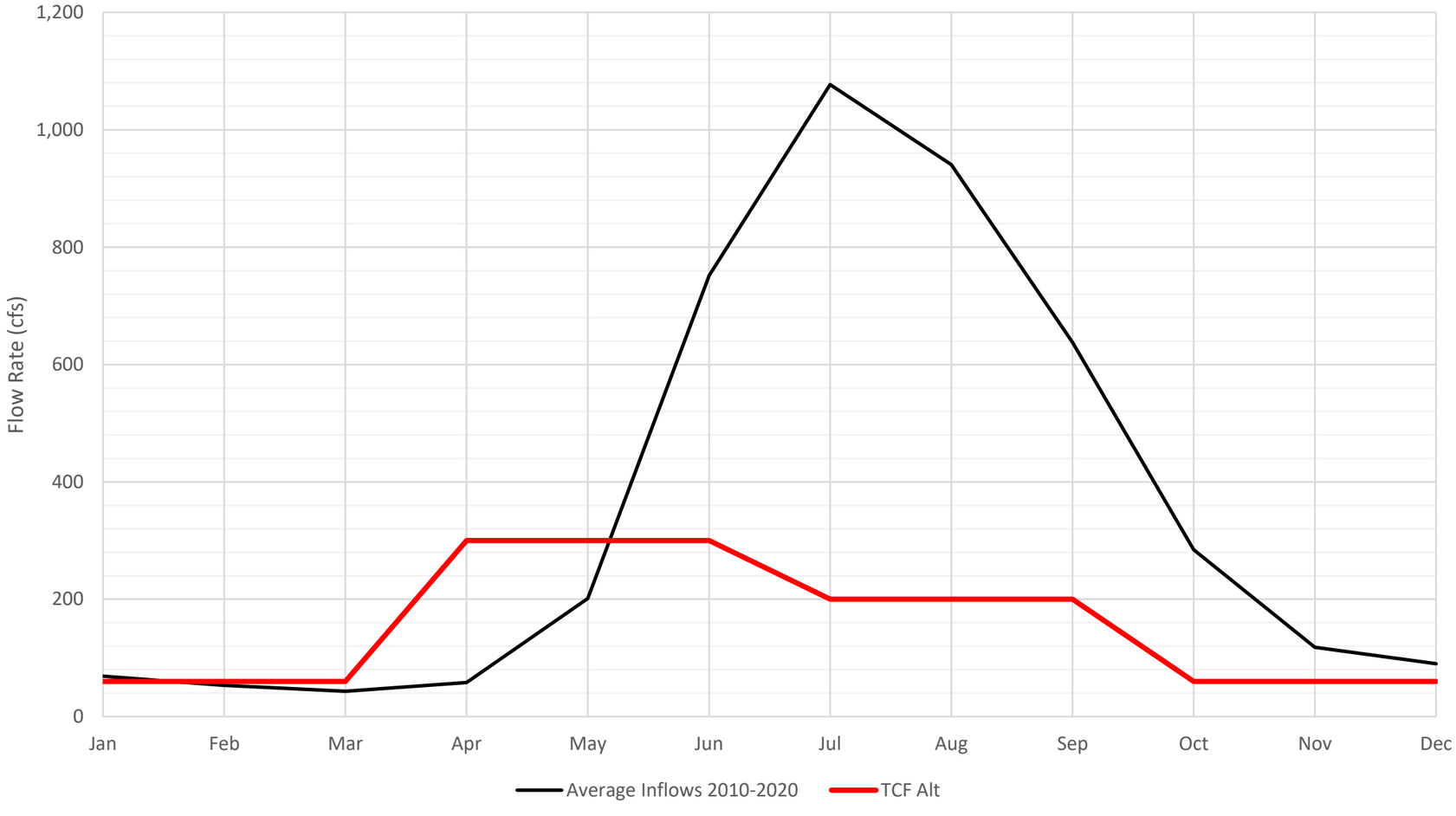
*Other infrastructural improvement cost should fall outside the scope of this project

Eklutna Water Volume (Acre-Ft)								
	Inflows	Powerhouse Water Usage	AWWU Water Usage	Instream Flow Habitat Usage	Peak Water Releases (Gated)	Powerhouse	AWWU	Instream Flow
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
TCF Alt	262,456	120,797	24,670	116,072	654	**46%**	**9%**	**44%**



Channel Maintenance Flow = 1500 cfs Flush Y1 w/ 600 cfs - 72 Hr - 3 of 10 years

TCF - Flow Releases



Month	Flow Release (cfs)	Average Monthly Inflow	Percent of Inflow
Jan	60	69	**87%**
Feb	60	53	**113%**
Mar	60	43	**140%**
Apr	300	58	**517%**
May	300	201	**149%**
Jun	300	752	**40%**
Jul	200	1,077	**19%**
Aug	200	941	**21%**
Sep	200	638	**31%**
Oct	60	284	**21%**
Nov	60	118	**51%**
Dec	60	90	**67%**

TCF - Summary

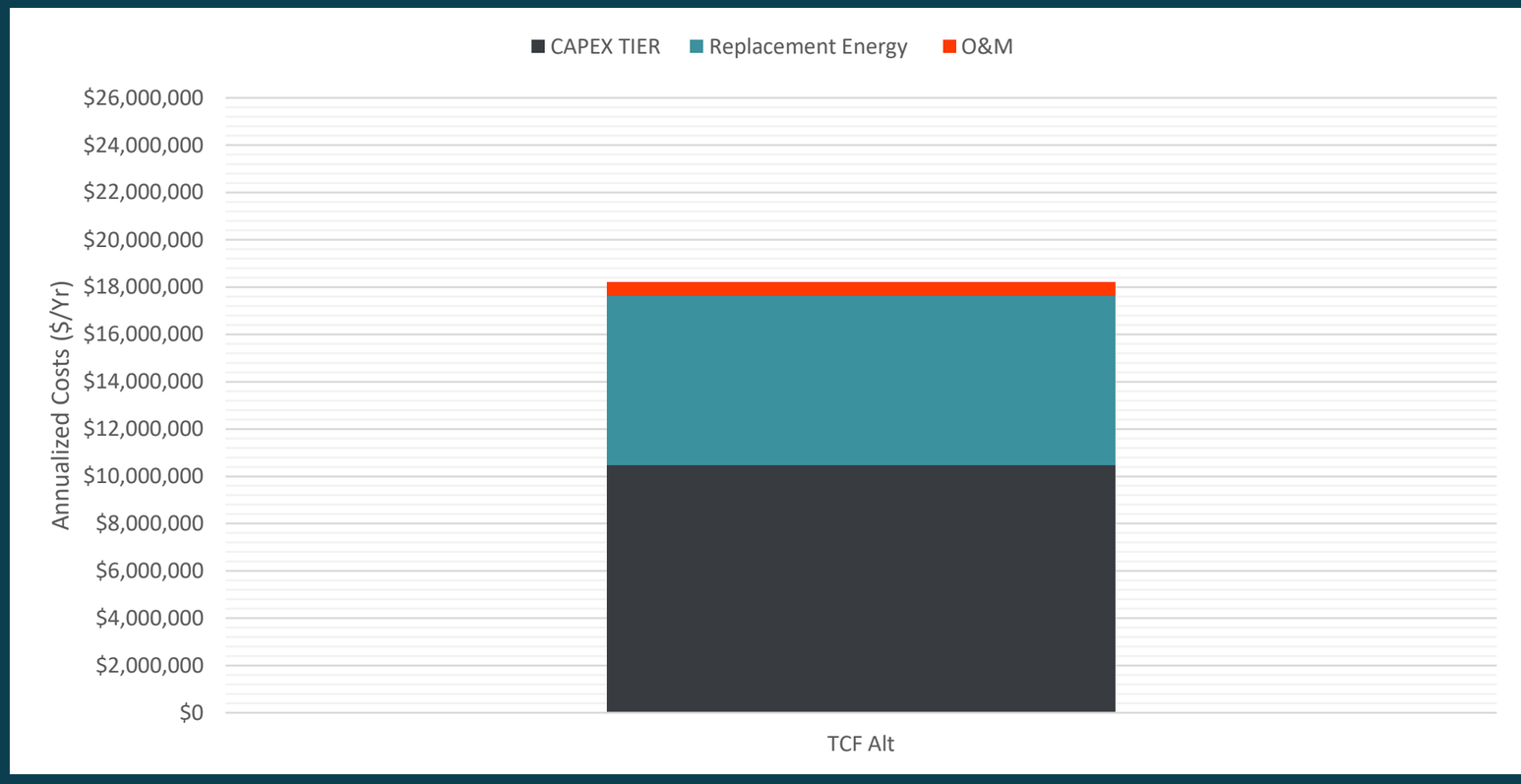
CAPEX ($M)	
Replacement Dam	$113.3
Total	**$113.3**

O&M ($/Yr)	
Replacement Dam	$299,000
Total ($/Yr)	**$299,000**

Replacement Energy ($/Yr)	
	TCF Alt
Replacement Energy (MWh)	81,632
Energy Cost ($/kWh)	$73
Total ($/Yr)	**$5,970,000**

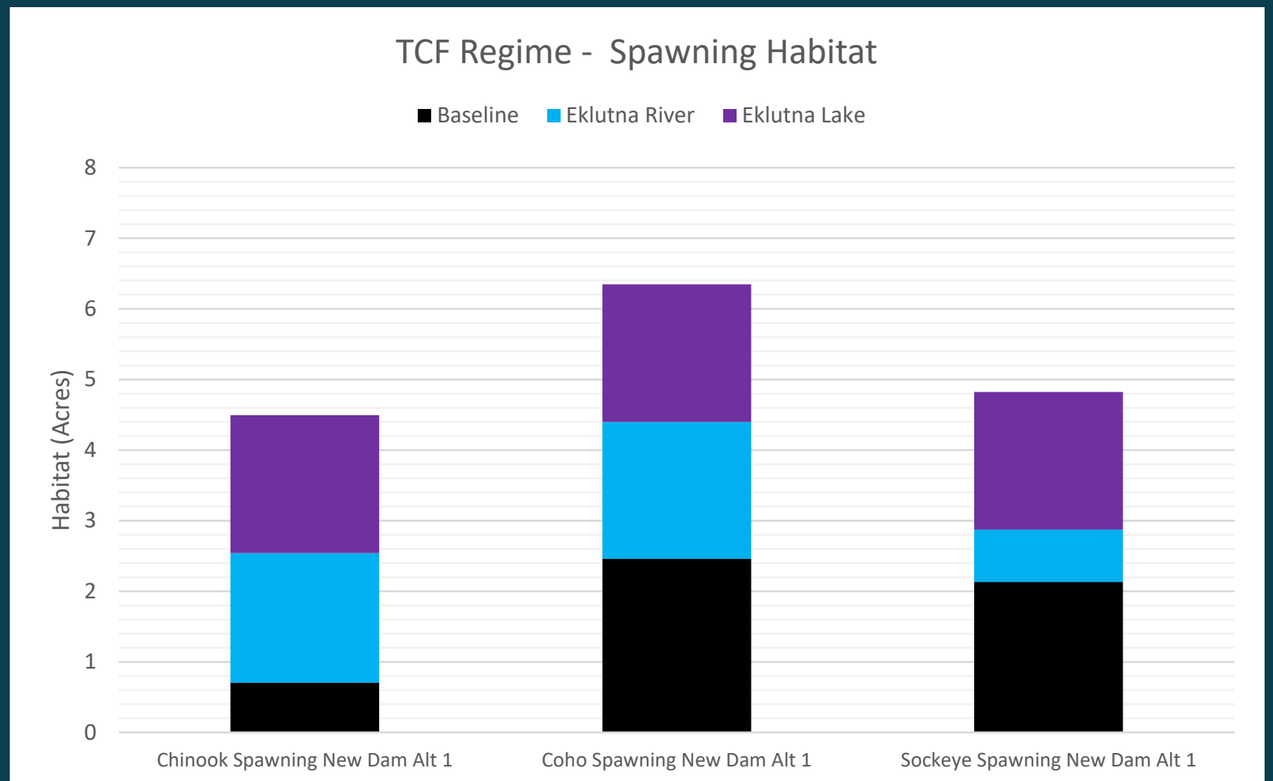
Annualized Costs ($Yr)	
	TCF Alt
CAPEX TIER	$10,474,000
CAPEX	$6,922,000
O&M	$592,000
Replacement Energy	$7,144,000
Total	**$18,210,000**
Present Worth ($)	
Present Value	**$298,000,000**

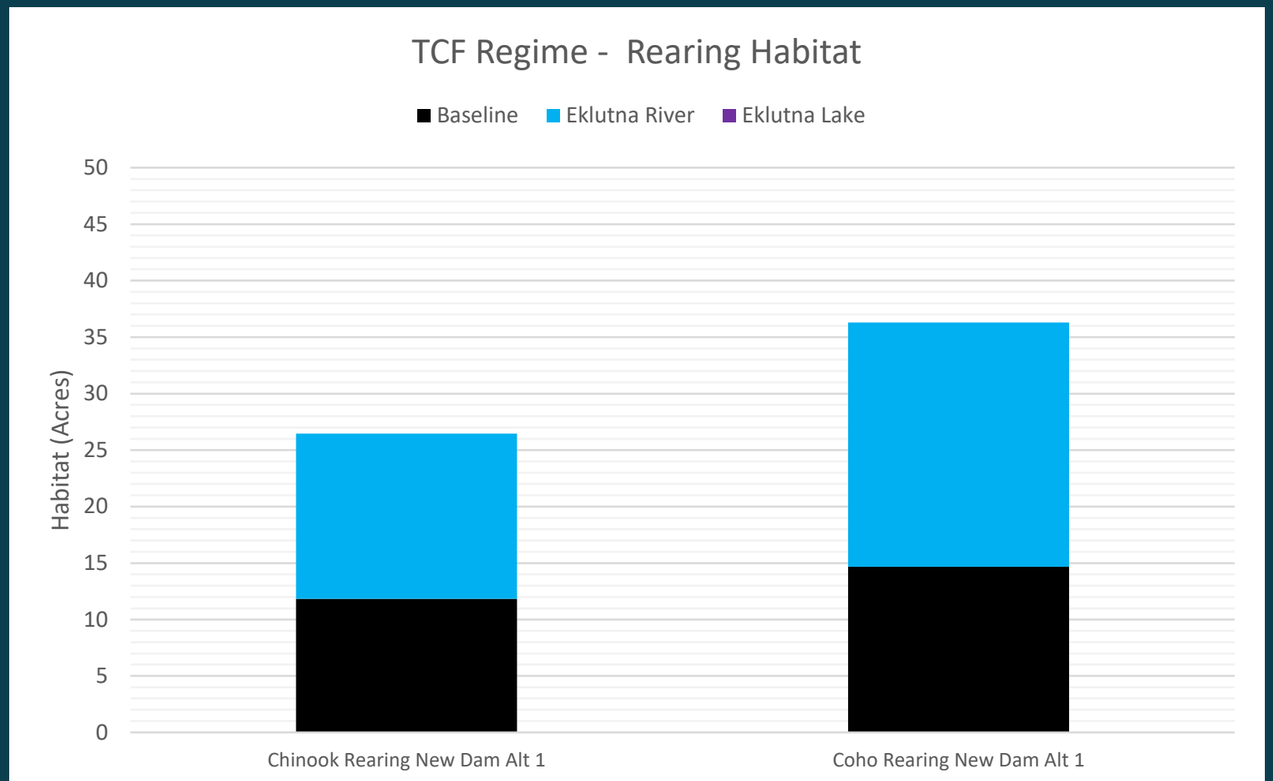
Estimated Ratepayer/Taxpayer Impacts	
Chugach Electric Association	**3.5%**
Matanuska Electric Association	**5.5%**
Munic. of Anchorage ($/100k)	**$4.29 / 0.043 mils**



Carbon Emissions: 35,000 MTCO2eq

TCF - Habitat Summary

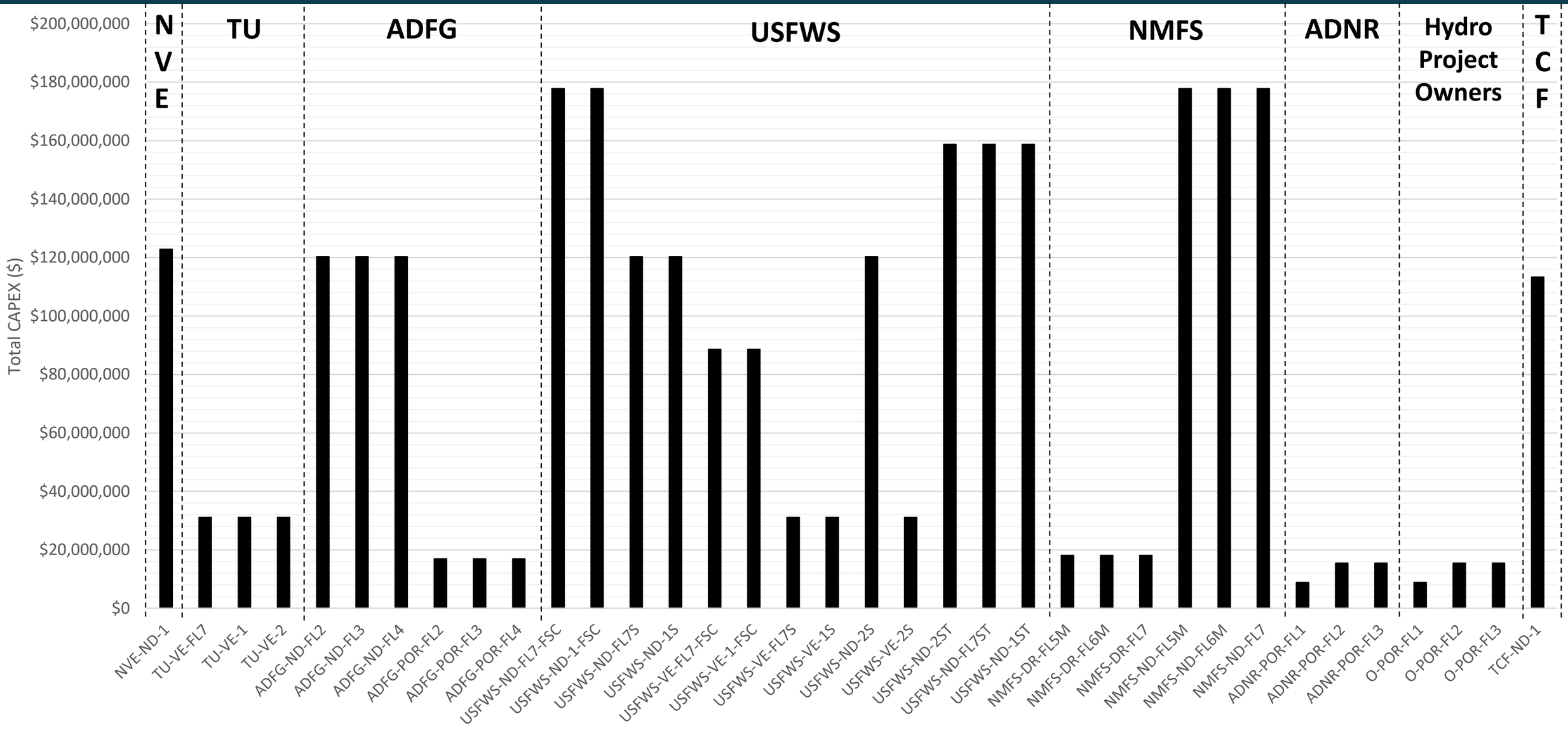




Total CAPEX*

*Excludes costs associated with upgrades at MEA EGS plant for winter shutdown of powerhouse

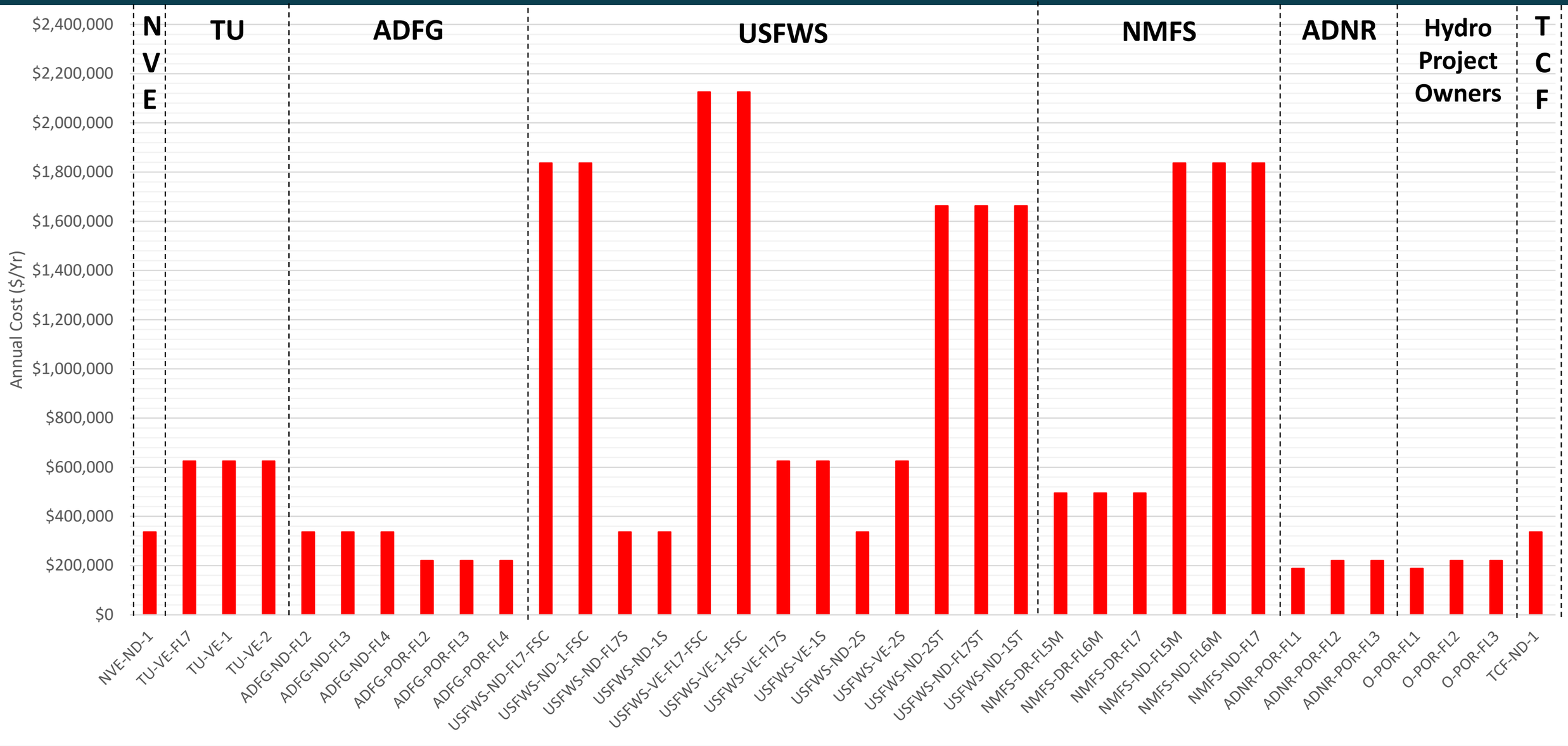
Total CAPEX


NVE
TU
ADFG
USFWS
NMFS
ADNR
Hydro Project Owners
TCF
Total CAPEX ($)
$200,000,000
$180,000,000
$160,000,000
$140,000,000
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
NVE-ND-1
TU-VE-FL7
TU-VE-1
TU-VE-2
ADFG-ND-FL2
ADFG-ND-FL3
ADFG-ND-FL4
ADFG-POR-FL2
ADFG-POR-FL3
ADFG-POR-FL4
USFWS-ND-FL7-FSC
USFWS-ND-1-FSC
USFWS-ND-FL7S
USFWS-ND-1S
USFWS-VE-FL7-FSC
USFWS-VE-1-FSC
USFWS-VE-FL7S
USFWS-VE-1S
USFWS-ND-2S
USFWS-VE-2S
USFWS-ND-2ST
USFWS-ND-FL7ST
USFWS-ND-1ST
NMFS-DR-FL5M
NMFS-DR-FL6M
NMFS-DR-FL7
NMFS-ND-FL5M
NMFS-ND-FL6M
NMFS-ND-FL7
ADNR-POR-FL1
ADNR-POR-FL2
ADNR-POR-FL3
O-POR-FL1
O-POR-FL2
O-POR-FL3
TCF-ND-1

Annual O&M Costs*

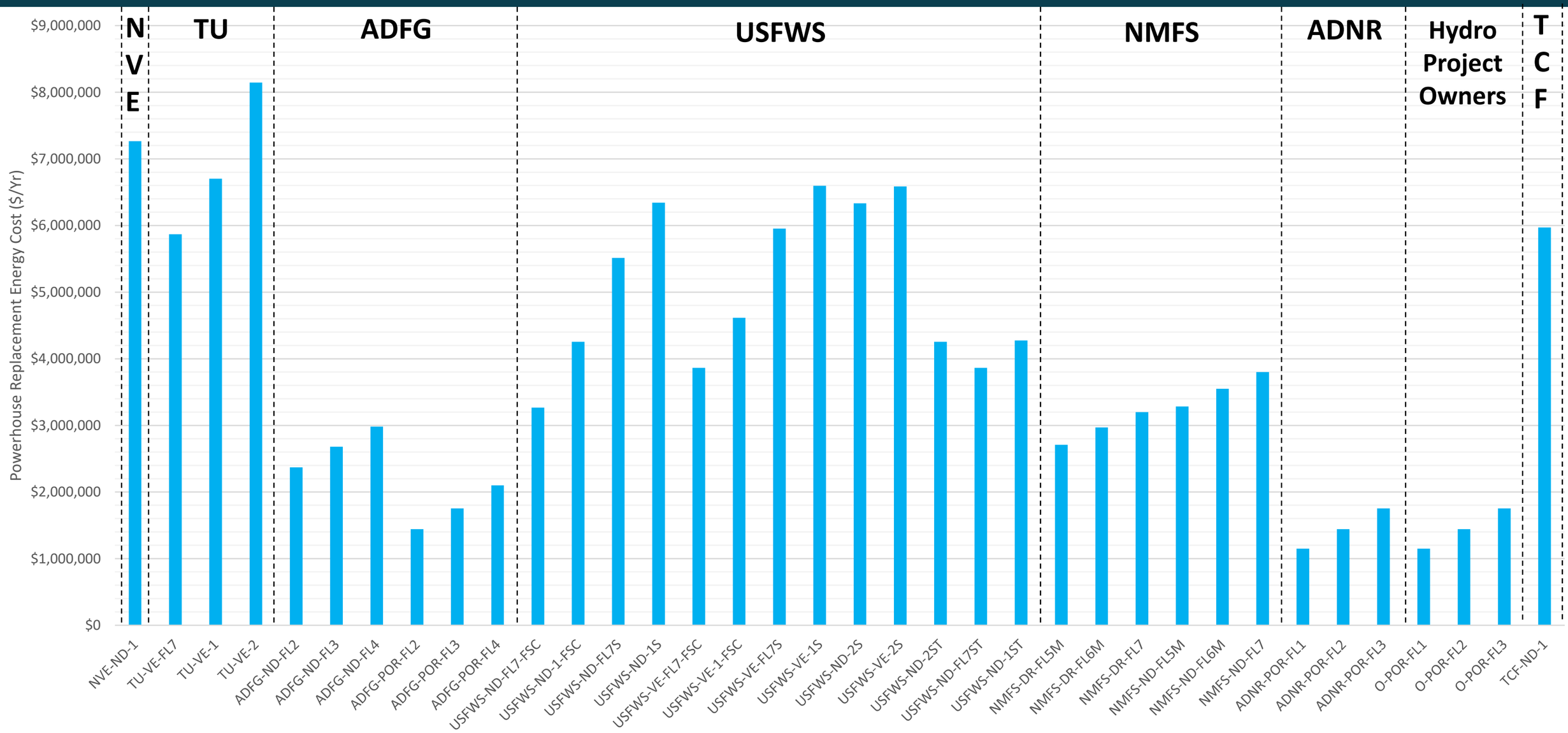
*Excludes costs associated with Adaptive Management

Annual O&M Costs



Energy Losses

Replacement Energy Cost



Total Annualized Costs

35-Years

35-Yr Annualized Costs

Input Parameters

- Discount Rate – 5%
- Annual Increase in O&M Costs – 3%
- Annual Increase in Energy Costs – 1%
- Carbon Emissions – 0.43 $MTCO_2eq/MWh$

Utility Pricing

- CEA: $64.61/MWh
- MEA: $88.48/MWh

Input Pricing

- $73.13/MWh

Ownership

Matanuska Electric:	35.71% of Energy
	16.67% of Capex and O&M
Chugach Electric:	64.29% of Energy, CAPEX, O&M
Municipality of Anchorage:	19.04% of CAPEX and O&M

Ratepayer Impacts:

Matanuska Electric:

1.12% Energy Rate Increase /$1M

Chugach Electric:

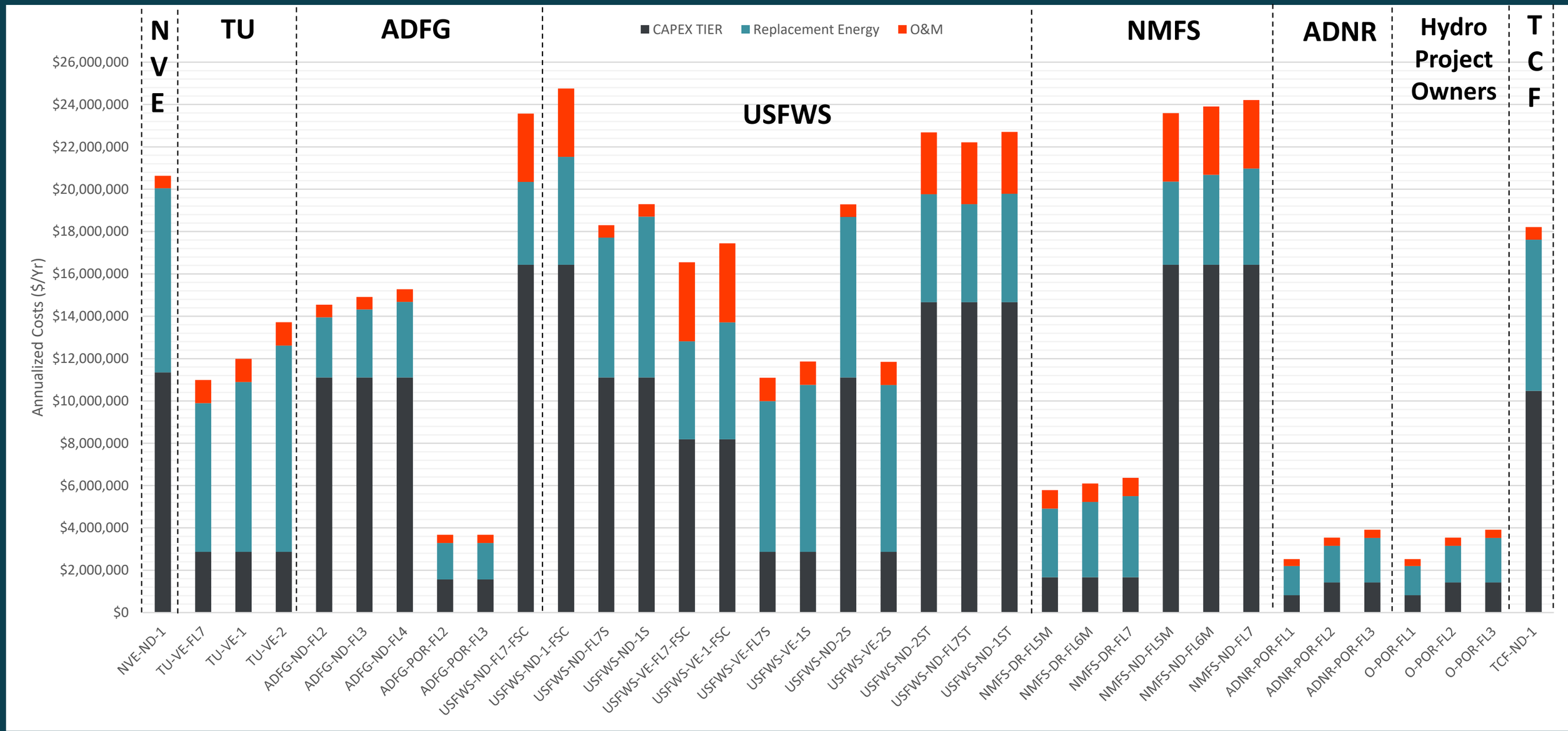
0.3% Energy Rate Increase /$1M

Municipality of Anchorage:

.03 mils / $1M

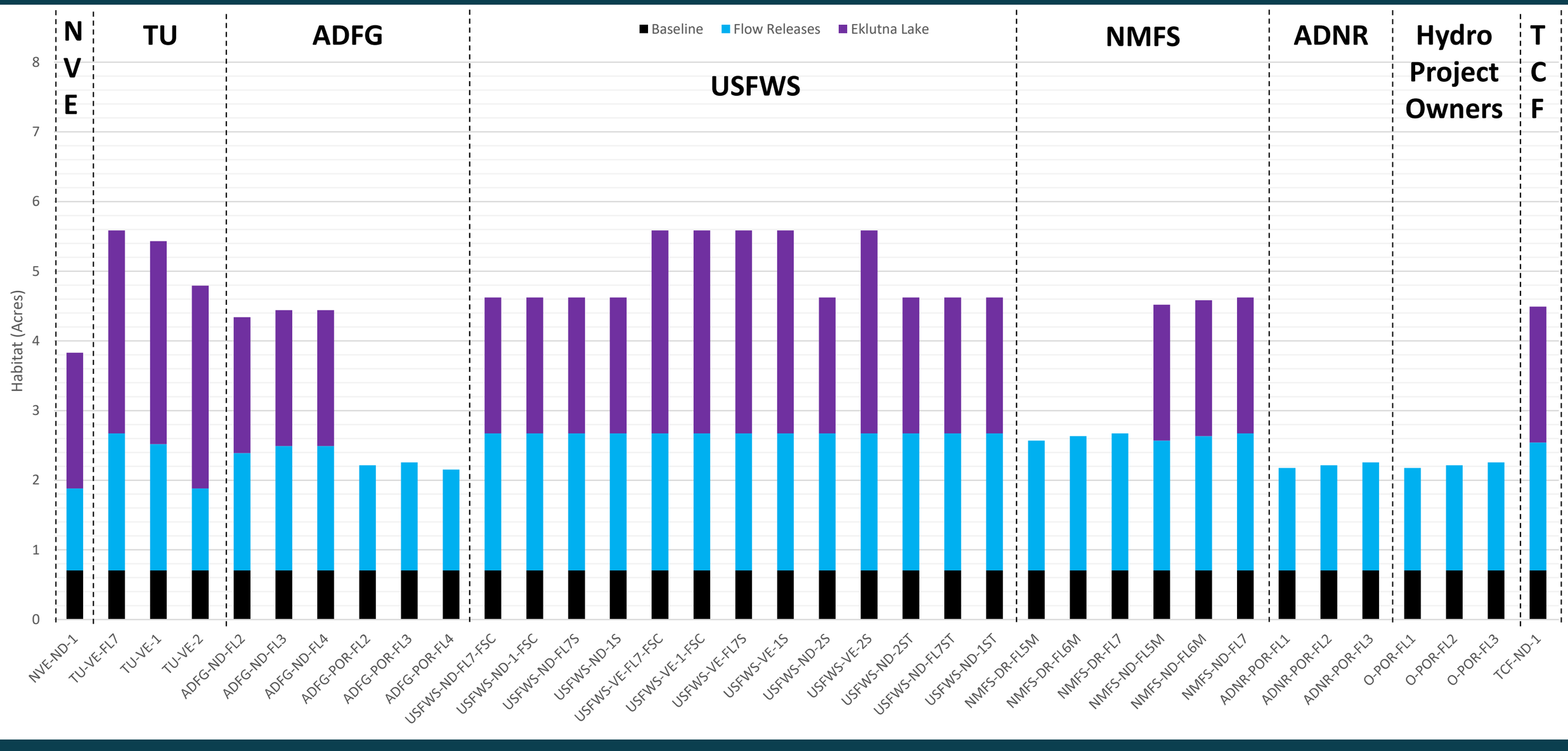
($3 Increased Property Tax per $/100k Property Value)

35-Yr Annualized Costs

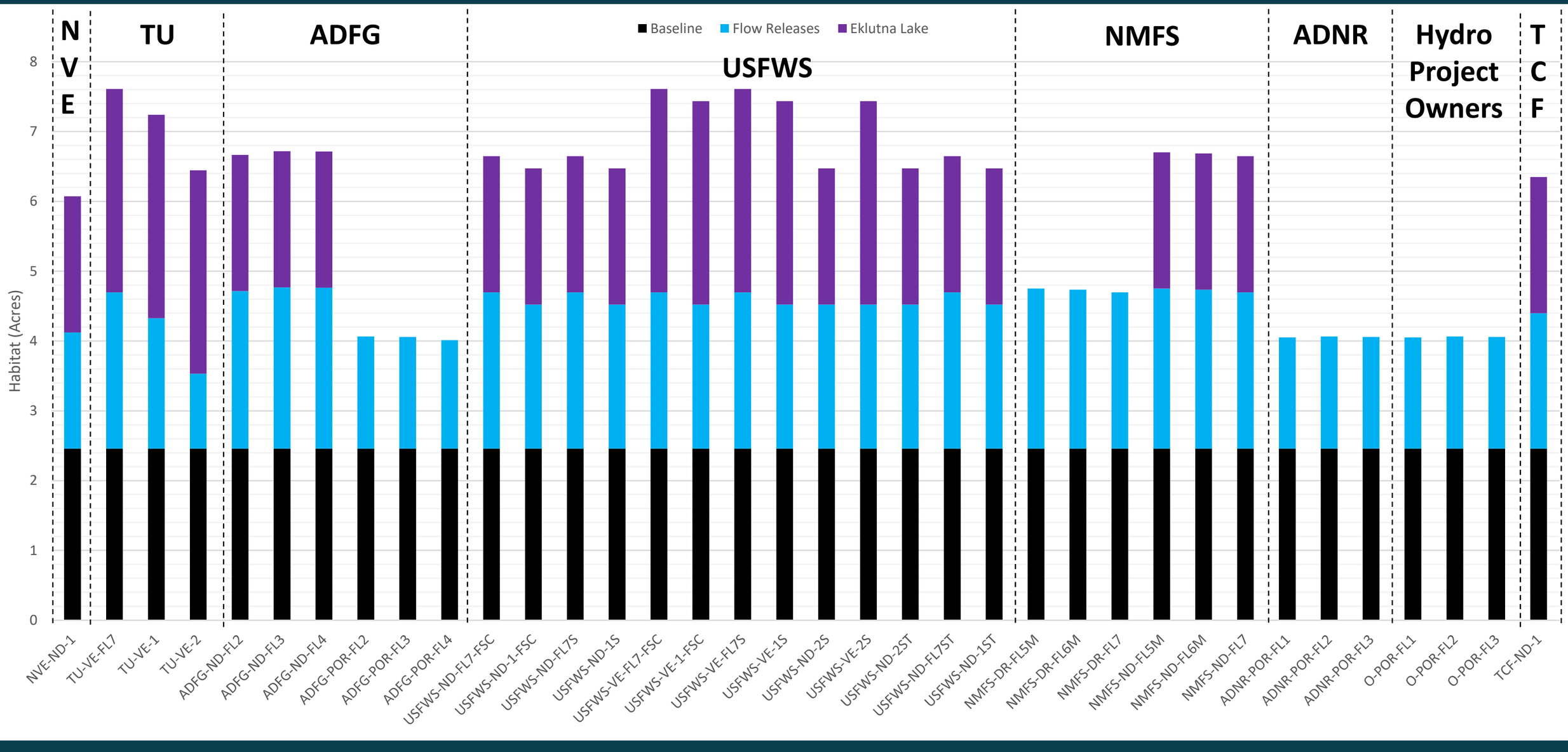


Habitat Improvements

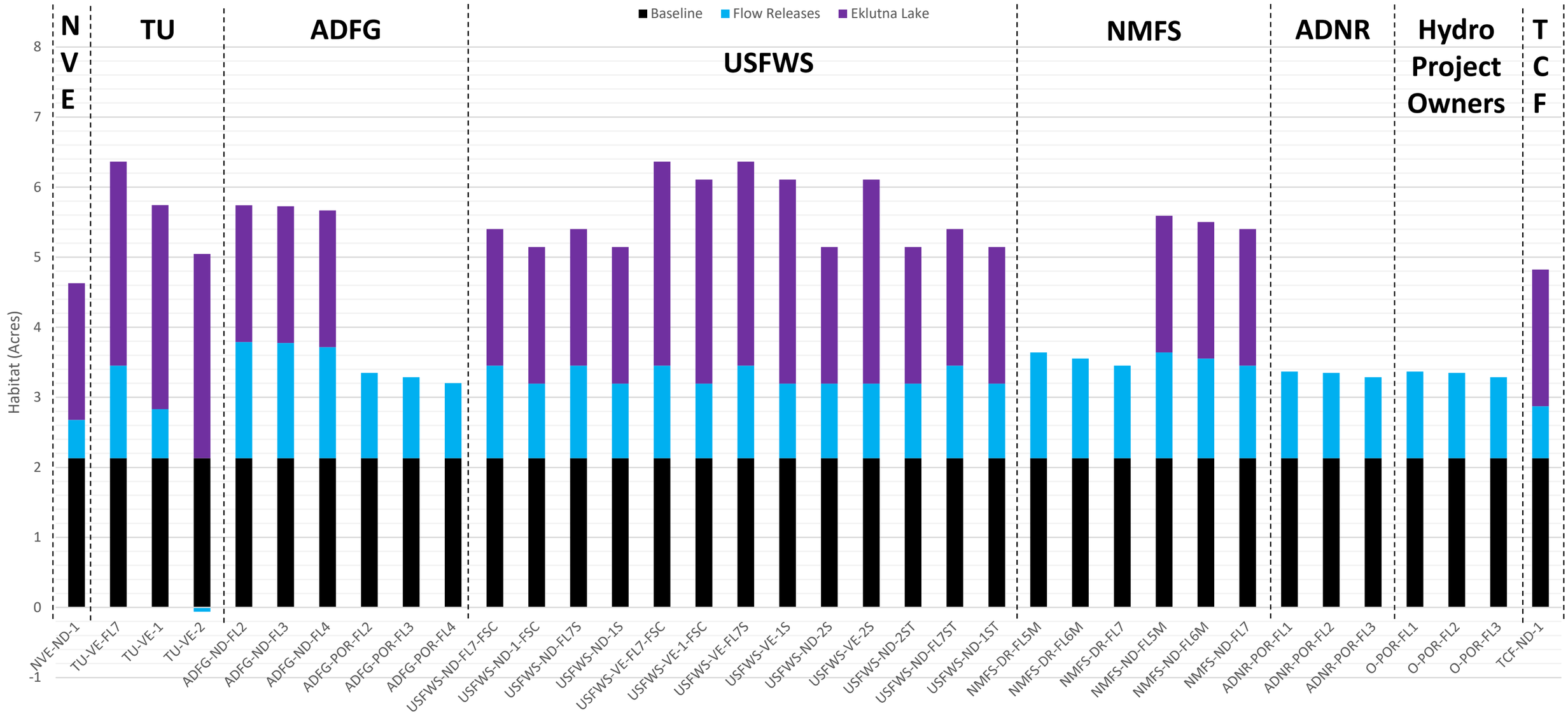
Chinook Spawning Habitat Gains



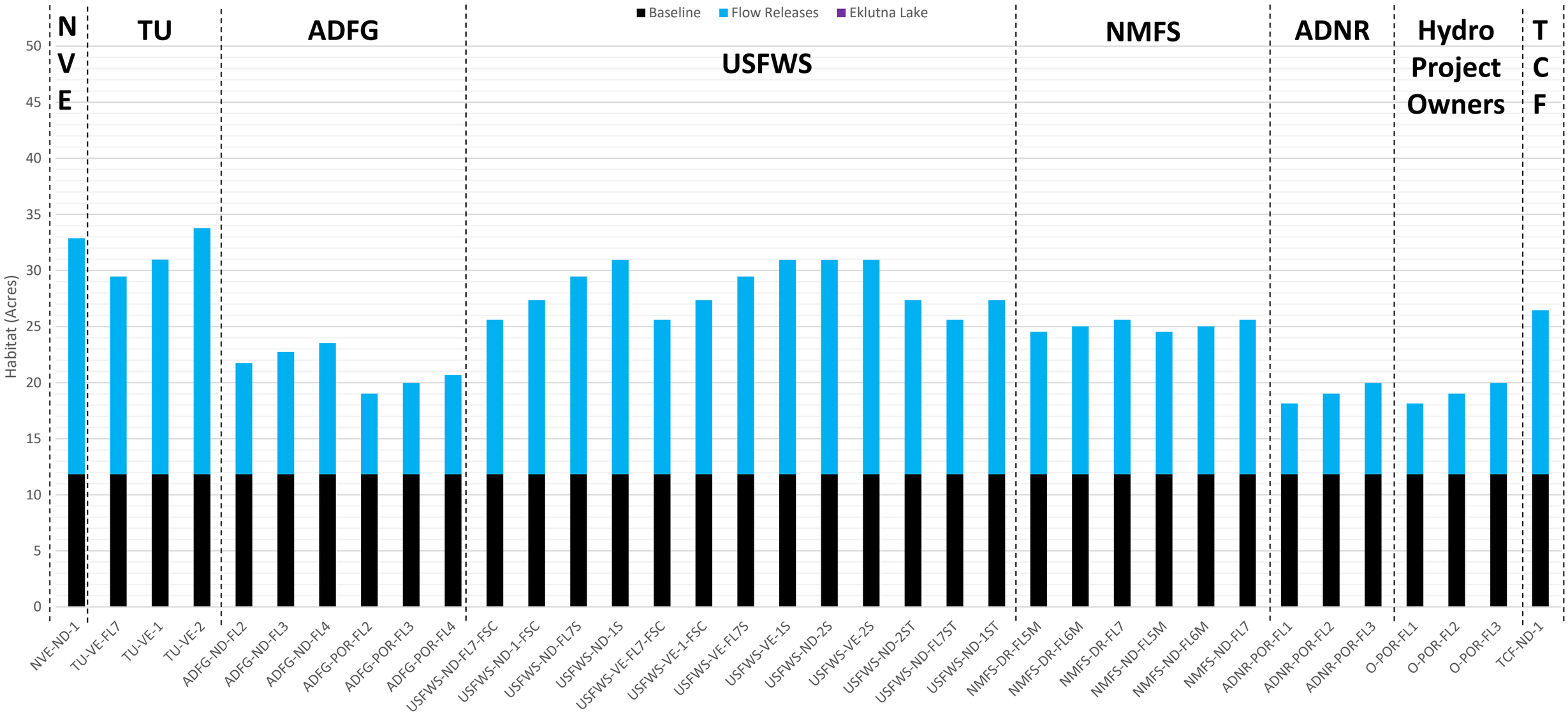
Coho Spawning Habitat Gains



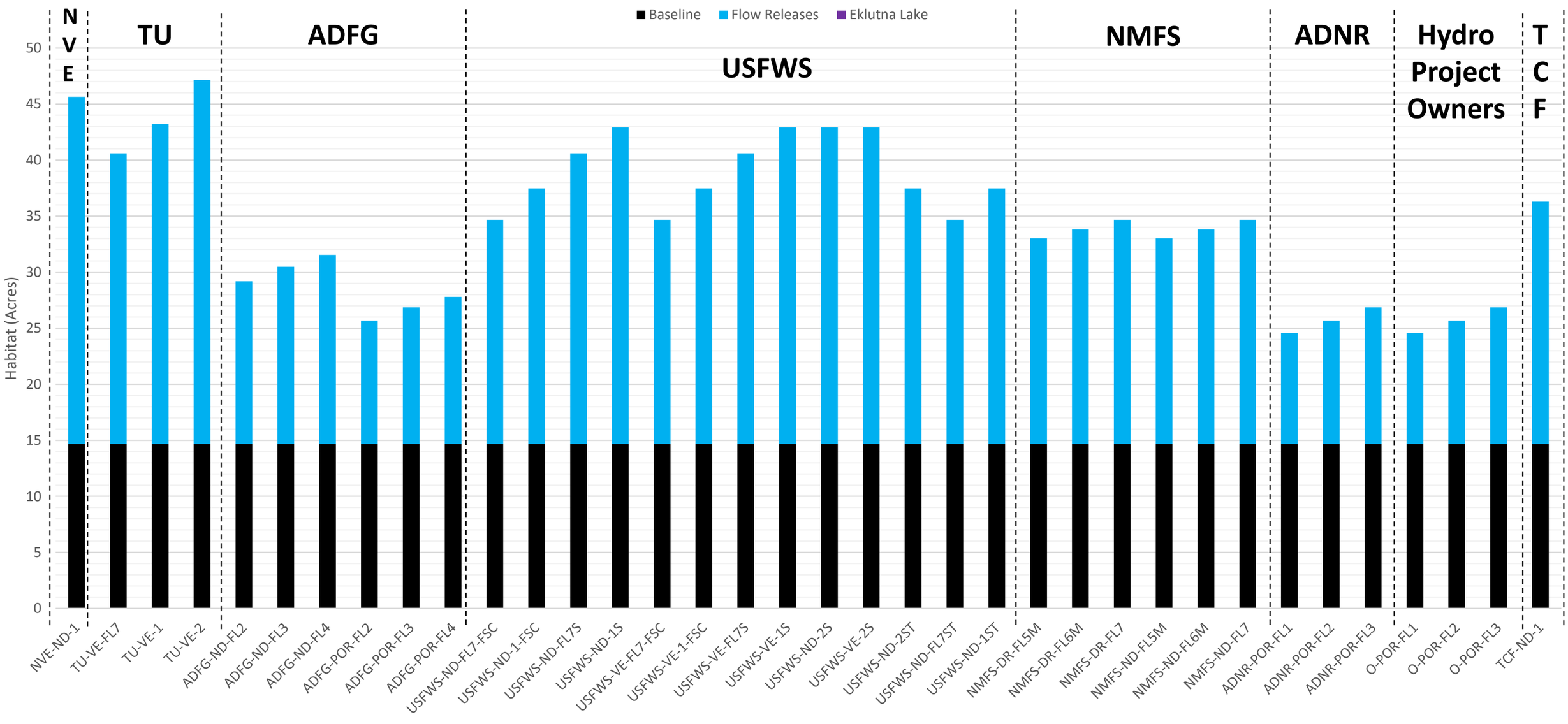
Sockeye Spawning Habitat Gains



Chinook Rearing Habitat Gains

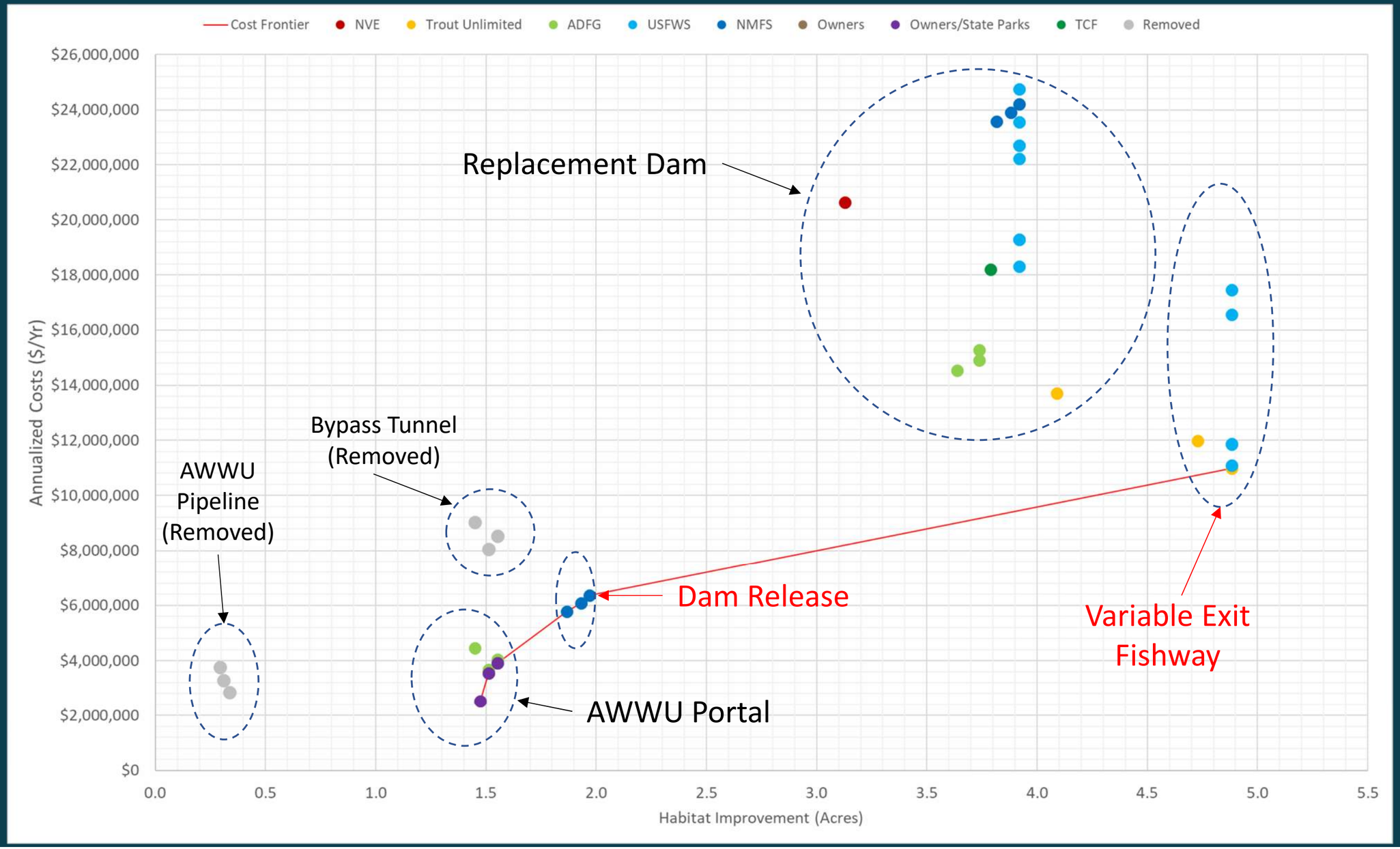


Coho Rearing Habitat Gains



Cost Effectiveness Model Results

Cost Effectiveness – Chinook Spawning Habitat

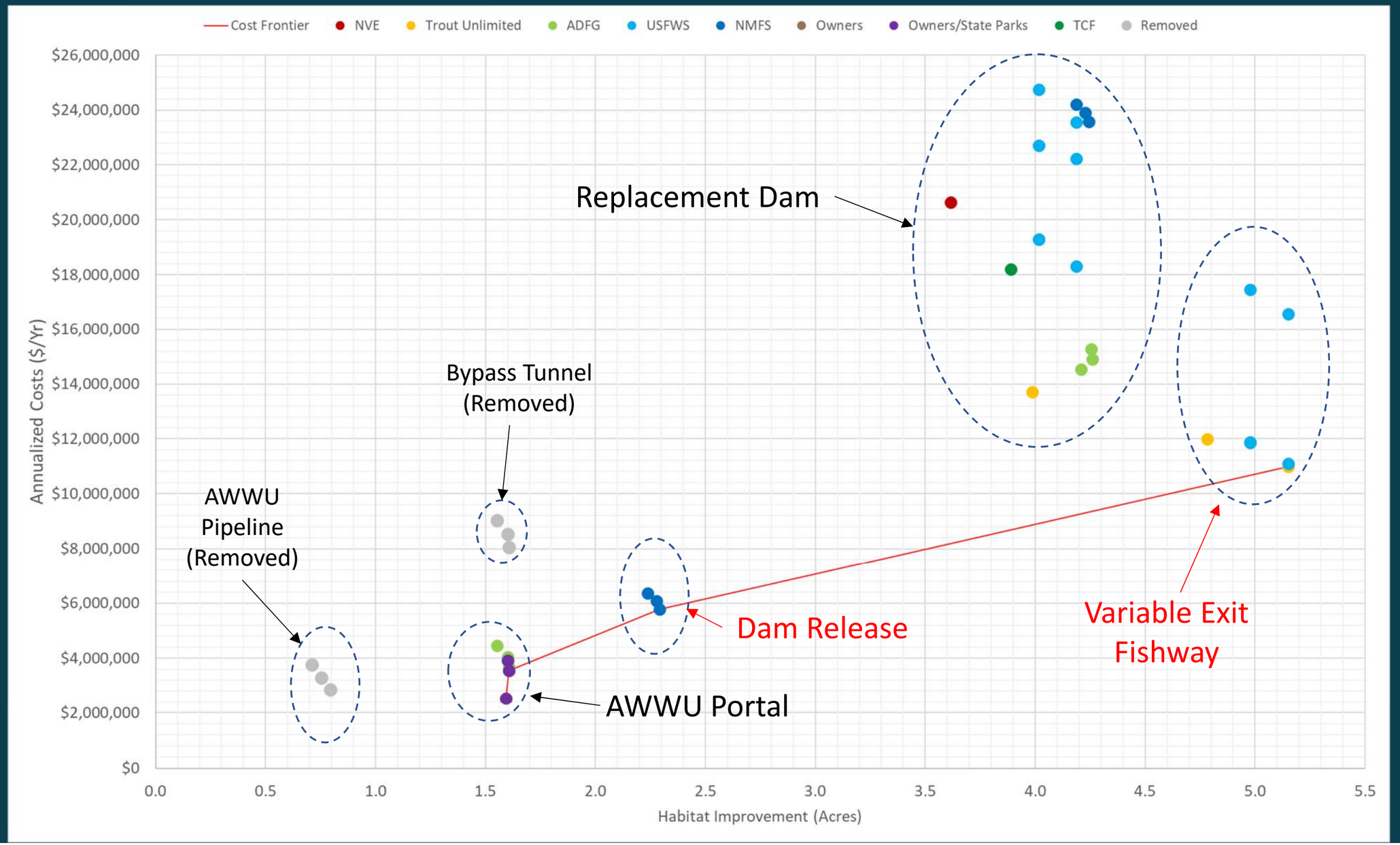


Cost Effectiveness – Chinook Spawning Habitat

Cost Effective Alternatives for Habitat Gains

- AWWU Portal – Flow Level 1
  - Owner/ADNR Alternative
  - Annual Costs - $2.5M
  - Habitat Gains – 1.5 Acres
  - **$1.7M/Acre**
- AWWU Portal – Flow Level 2
  - Owner/ADNR Alternative
  - Annual Costs - $3.5M
  - Habitat Gains – 1.5 Acres
  - **$2.3M/Acre**
- AWWU Portal – Flow Level 3
  - Owner/ADNR Alternative
  - Annual Costs - $3.9M
  - Habitat Gains – 1.6 Acres
  - **$2.5M/Acre**
- Dam Release – Flow Level 5 Modified
  - NMFS Alternative
  - Annual Costs - $5.8M
  - Habitat Gains – 1.9 Acres
  - **$3.1M/Acre**
- Dam Release – Flow Level 6 Modified
  - NMFS Alternative
  - Annual Costs - $6.1M
  - Habitat Gains – 1.9 Acres
  - **$3.2M/Acre**
- Dam Release – Flow Level 7
  - NMFS Alternative
  - Annual Costs - $6.4M
  - Habitat Gains – 2.0 Acres
  - **$3.2M/Acre**
- Variable Exit Fishway – Flow Level 7
  - Trout Unlimited Alternative
  - Annual Costs - $10.0M
  - Habitat Gains – 4.9 Acres
  - **$2.1M/Acre**

Cost Effectiveness – Coho Spawning Habitat

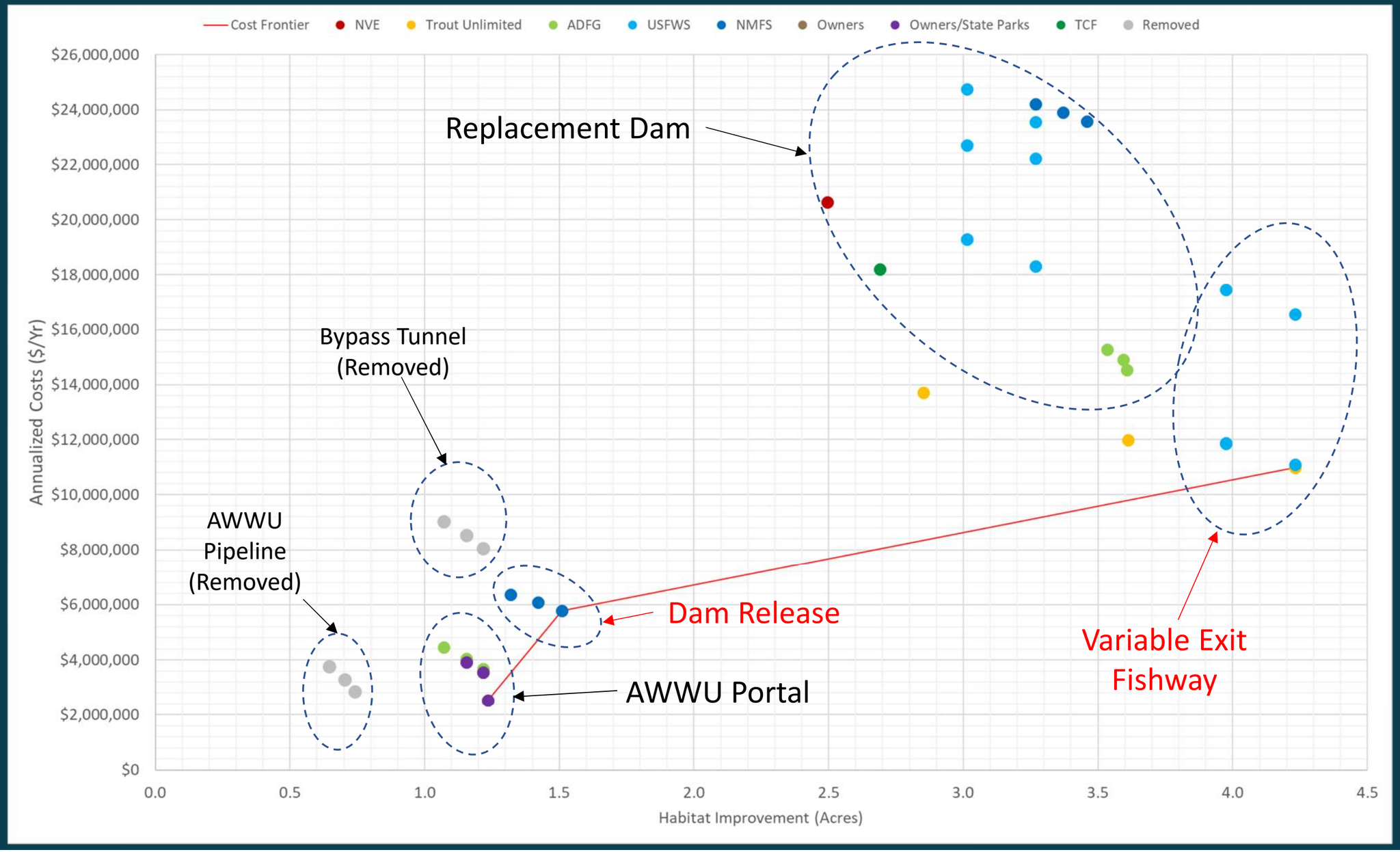


Cost Effectiveness – Coho Spawning Habitat

Cost Effective Alternatives for Habitat Gains

- AWWU Portal – Flow Level 1
  - Owner/ADNR Alternative
  - Annual Costs - $2.5M
  - Habitat Gains – 1.6 Acres
  - **$1.6M/Yr/Acre**
- AWWU Portal – Flow Level 2
  - Owner/ADNR Alternative
  - Annual Costs - $3.5M
  - Habitat Gains – 1.6 Acres
  - **$2.2M/Yr/Acre**
- Dam Release – Flow Level 5 Modified
  - NMFS Alternative
  - Annual Costs - $5.8M
  - Habitat Gains – 2.3 Acres
  - **$2.5M/Yr/Acre**
- Variable Exit Fishway – Flow Level 7
  - Trout Unlimited Alternative
  - Annual Costs - $10.0M
  - Habitat Gains – 5.2 Acres
  - **$1.9M/Yr/Acre**

Cost Effectiveness – Sockeye Spawning Habitat

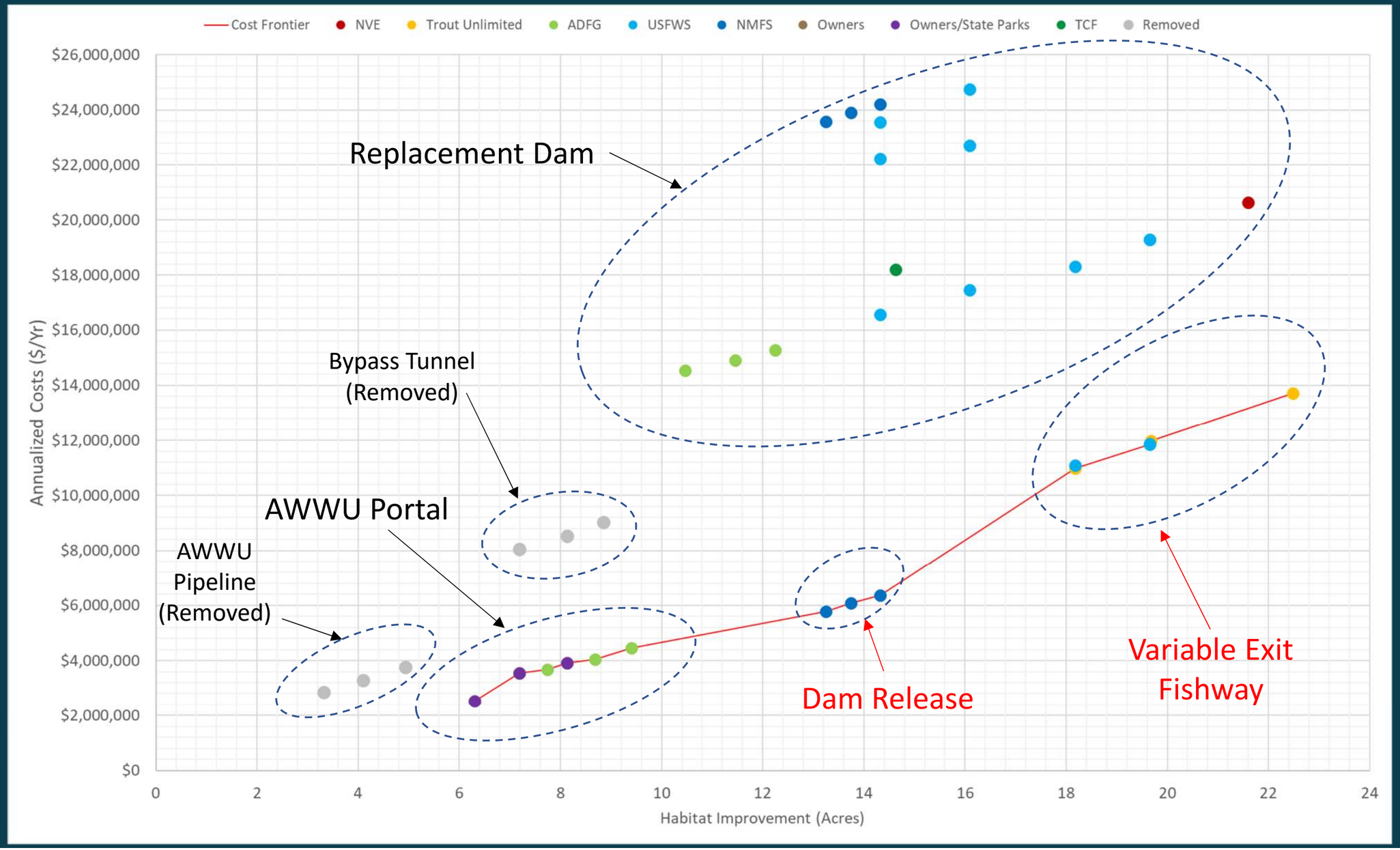


Cost Effectiveness – Sockeye Spawning Habitat

Cost Effective Alternatives for Habitat Gains

- AWWU Portal – Flow Level 1
  - Owner Alternative
  - Annual Costs - $2.5M
  - Habitat Gains – 1.2 Acres
  - **$2.0M/Acre**
- Dam Release – Flow Level 5 Modified
  - NMFS Alternative
  - Annual Costs - $5.8M
  - Habitat Gains – 1.5 Acres
  - **$3.8M/Acre**
- Variable Exit Fishway – Flow Level 7
  - Trout Unlimited Alternative
  - Annual Costs - $10.0M
  - Habitat Gains – 4.2 Acres
  - **$2.4M/Acre**

Cost Effectiveness – Chinook Rearing Habitat

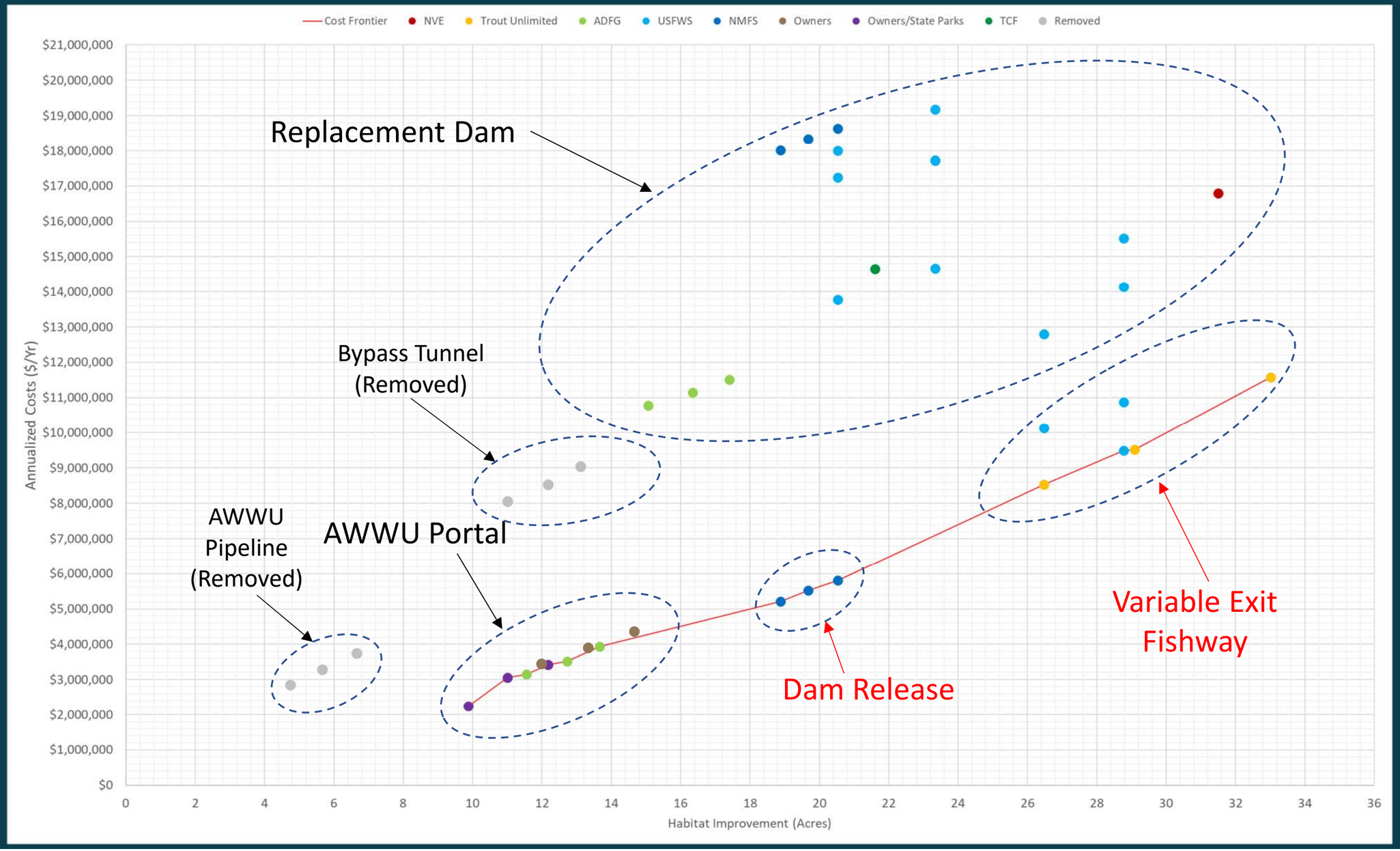


Cost Effectiveness – Chinook Rearing Habitat

Cost Effective Alternatives for Habitat Gains

- AWWU Portal – Flow Level 1 / 2 / 3
  - Owner/ADNR/ADFG Alternative
  - Annual Costs - $2.5/$3.7M/$4.1M
  - Habitat Gains – 6.3 / 7.2 / 8.1 Acres
  - **$400k – $480k/Acre**
- Dam Release – Flow Level 5 / 6 / 7
  - NMFS Alternative
  - Annual Costs - $5.8M / $6.1M / $6.4M
  - Habitat Gains – 13.3 / 13.7 / 14.3 Acres
  - **$440k – $444k/Acre**
- Variable Exit Fishway – FL 7 / Alt 1
  - Trout Unlimited Alternative
  - Annual Costs - $10.0M / $10.9M
  - Habitat Gains – 18.2 / 19.7 Acres
  - **$550k/Acre**
- Variable Exit Fishway – Alt 2
  - Trout Unlimited Alternative
  - Annual Costs - $12.6M
  - Habitat Gains – 22.5 Acres
  - **$560k/Acre**

Cost Effectiveness – Coho Rearing Habitat



Cost Effectiveness – Coho Rearing Habitat

Cost Effective Alternatives for Habitat Gains

- AWWU Portal – Flow Level 1 / 2 / 3
  - Owner/ADNR/ADFG Alternative
  - Annual Costs - $2.5/$3.7M/$4.0M
  - Habitat Gains – 9.9 / 11.6 / 12.7 Acres
  - **$256k – $318k/Acre**
- Dam Release – Flow Level 5 / 6 / 7 Modified
  - NMFS Alternative
  - Annual Costs - $5.8M / $6.1M / $6.4M
  - Habitat Gains – 18.9 / 19.7 / 20.5 Acres
  - **$306k - $310k/Acre**
- Variable Exit Fishway – FL 7 / Alt 1
  - Trout Unlimited Alternative
  - Annual Costs - $10.0M / $10.9M
  - Habitat Gains – 26.5 / 28.8 Acres
  - **$380k/Acre**
- Variable Exit Fishway – Alt 2
  - Trout Unlimited Alternative
  - Annual Costs - $12.6M
  - Habitat Gains – 33.0 Acres
  - **$380k/Acre**

Lunch

Geomorphic Considerations

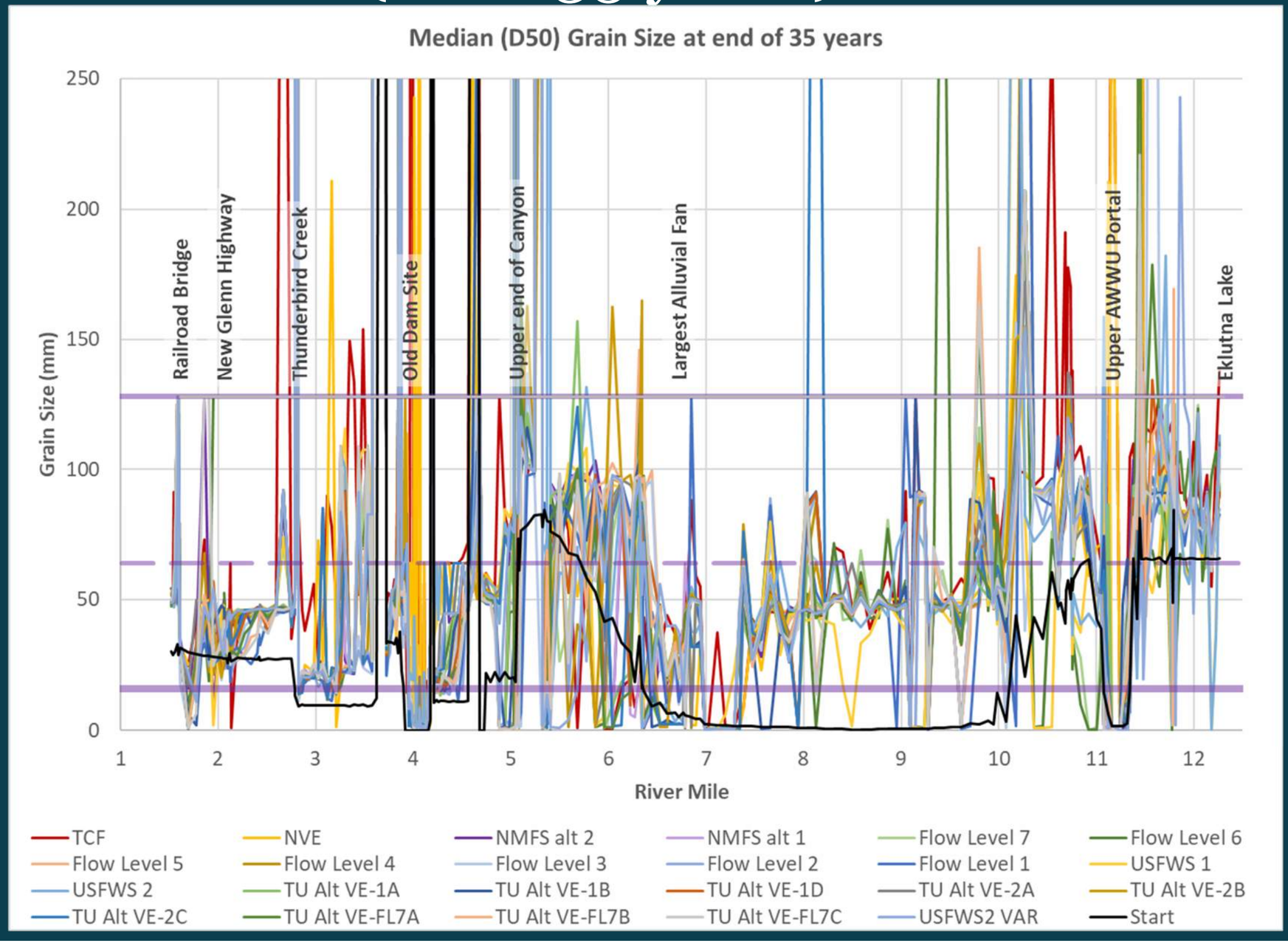
Geomorphic Considerations

- Effects of flow regime on substrate, channel maintenance, riparian
- HEC-RAS 1-D model results (substrate, cross section/profile changes)
  - 23 different flow regimes
  - End of 35 years (and 10 years)
- Primary variations among alternatives modeled
  - Magnitude of peak (and daily) flows
  - Frequency of peak (annual or every 3 years)
  - Shape of peak flow hydrograph (72 hours full peak vs. shaped peak)
- Spawning-sized substrate
  - Coho/sockeye 16-64mm
  - Chinook 64-128 mm

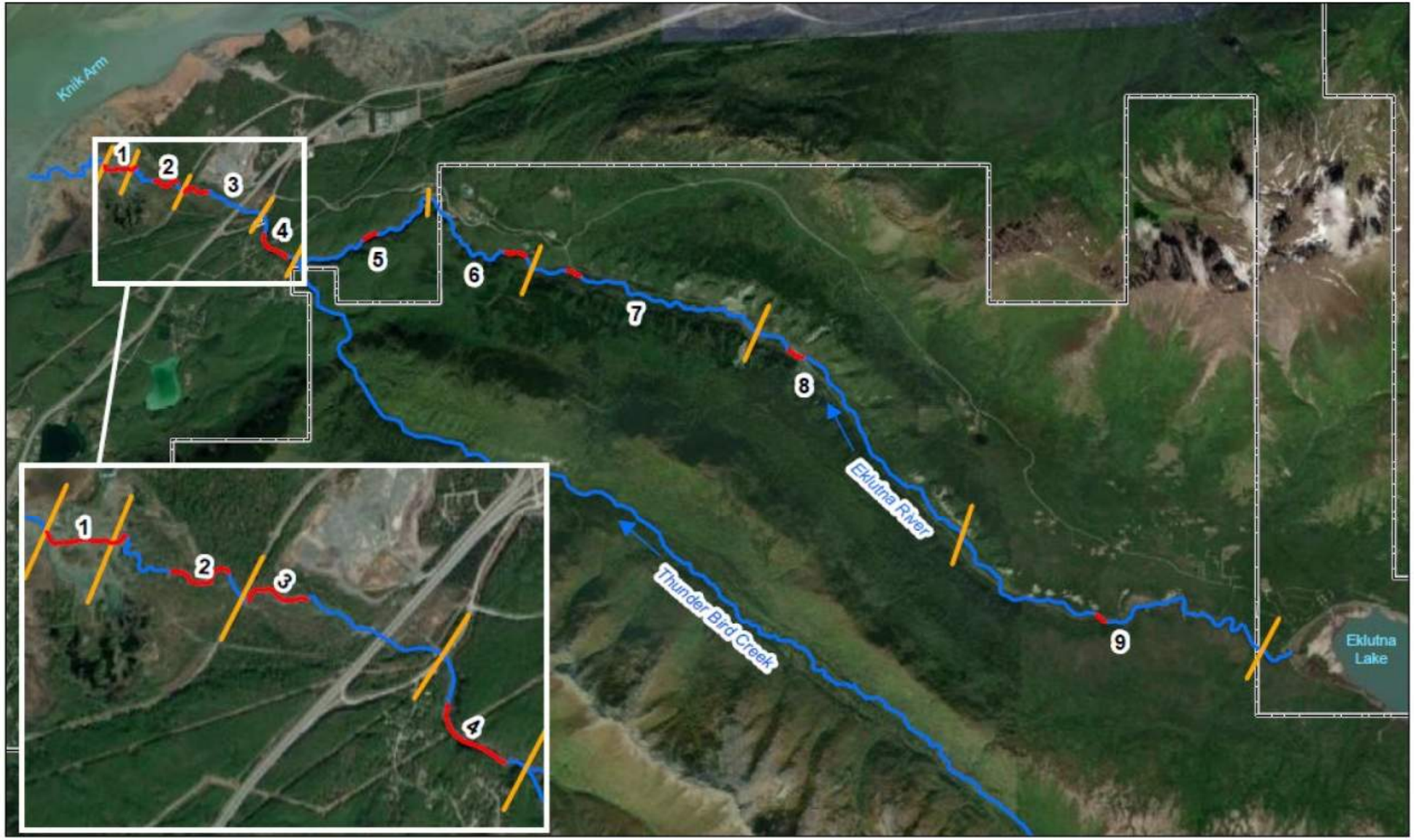
Unique Channel Maintenance Flows

Run number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Name	Flow Level 1	Flow Level 2	Flow Level 3	Flow Level 4	Flow Level 5	Flow Level 6	Flow Level 7	TCF	NVE	NMFS alt 1	NMFS alt 2	USFWS 1	USFWS 2	TU Alt VE-1A	TU Alt VE-1B	TU Alt VE-1D	TU Alt VE-2A	TU Alt VE-2B	TU Alt VE-2C	TU Alt VE-FL7A	TU Alt VE-FL7B	TU Alt VE-FL7C	USFWS2 VAR
Peak	220	325	400	450	500	550	600	1500	700	500	550	600	600	800 once then 400	800 once then 300	800 once	800 once then 700	800 once then 525	800 once	700 once then 320	700 once then 240	700 once	Variable 400-600
Freq/ Shaped or 72 hrs?	3 years shaped	3 years shaped	3 years shaped	3 years shaped	3 years shaped	3 years shaped	3 years shaped	every year shaped	every year for 72 hours	3 years for 72 hours	3 years for 72 hours	every year for 72 hours	every year for 72 hours	3 years shaped	3 years shaped	shaped	3 years shaped	3 years shaped	shaped	3 years shaped	3 years shaped	shaped	every year for 72 hours
Peak: Mean Annual Flow Ratio	6.5	7.8	7.9	7.6	7.3	7.1	7	14.8	4.6	6.9	7	7	5.3	3.3	2.5	n/a	3.8	2.9	n/a	3.2	2.4	n/a	Variable

All Alternatives (after 35 years)



Fish Survey Reaches



N

Sources: USGS, ADNR, ESRI

0 0.75 1.5 3 Miles

Legend

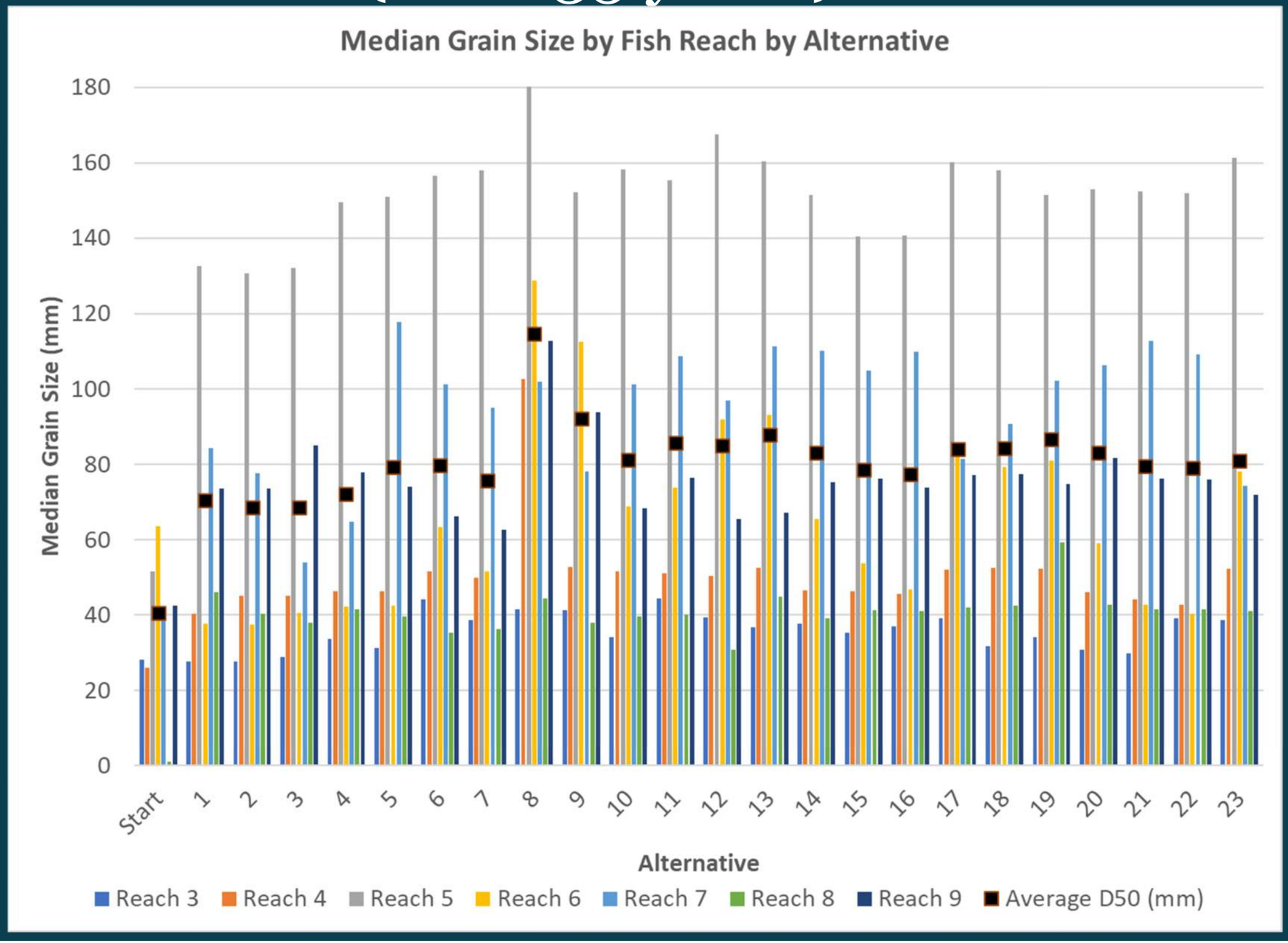
- 2021 Sampled Reaches
- Fish Study Reach Breaks
- Rivers
- Chugach State Park

MLP

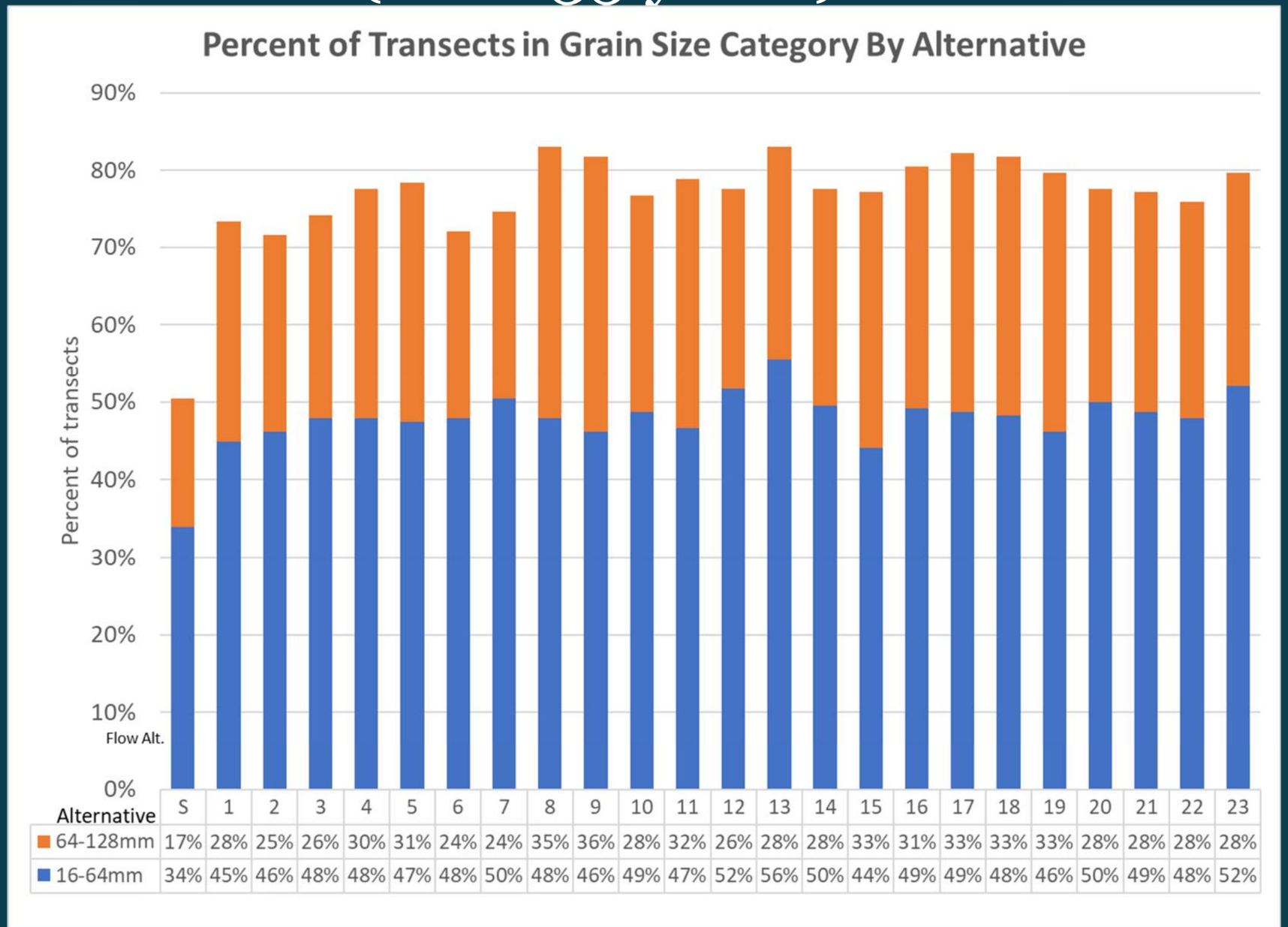
MEA

CHUGACH

All Alternatives (after 35 years)



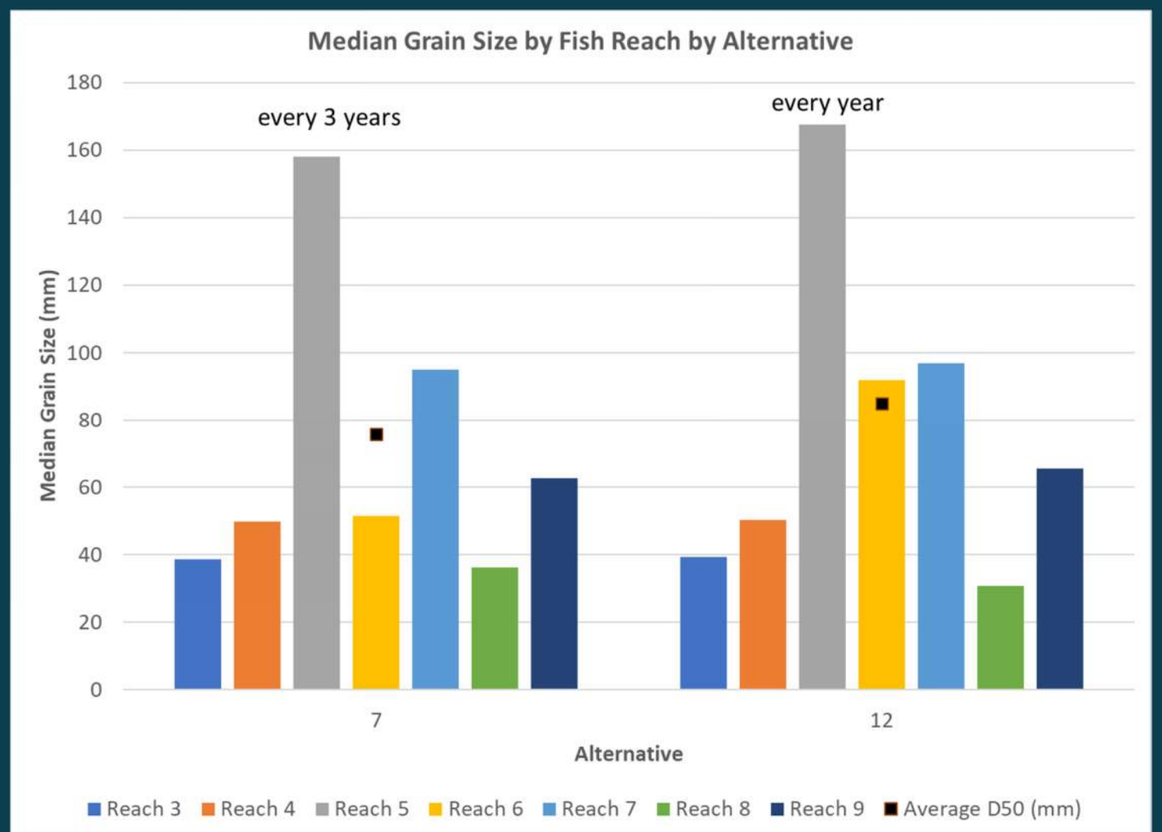
All Alternatives (after 35 years)

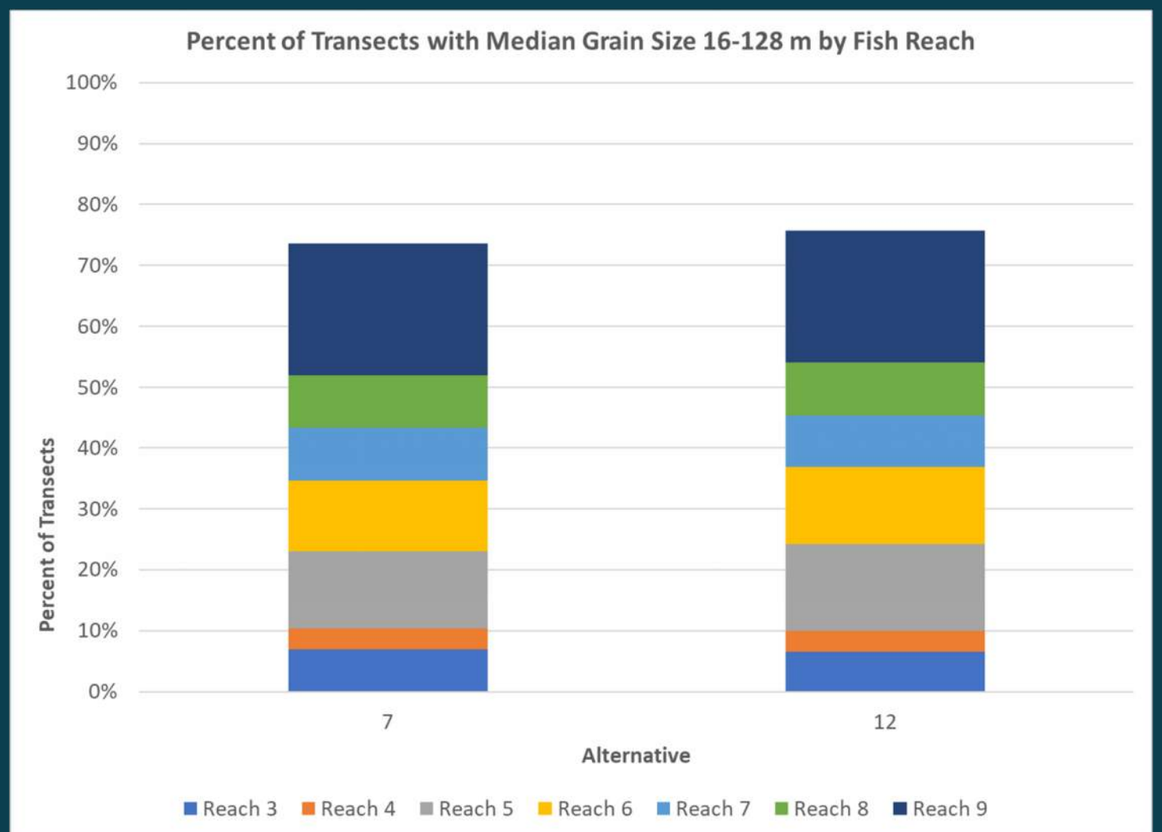


Alternative	S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
64-128mm	17%	28%	25%	26%	30%	31%	24%	24%	35%	36%	28%	32%	26%	28%	28%	33%	31%	33%	33%	33%	28%	28%	28%	28%
16-64mm	34%	45%	46%	48%	48%	47%	48%	50%	48%	46%	49%	47%	52%	56%	50%	44%	49%	49%	48%	46%	50%	49%	48%	52%

Frequency of Peak of Flows (annual vs. every 3 years after 35 years of flows)

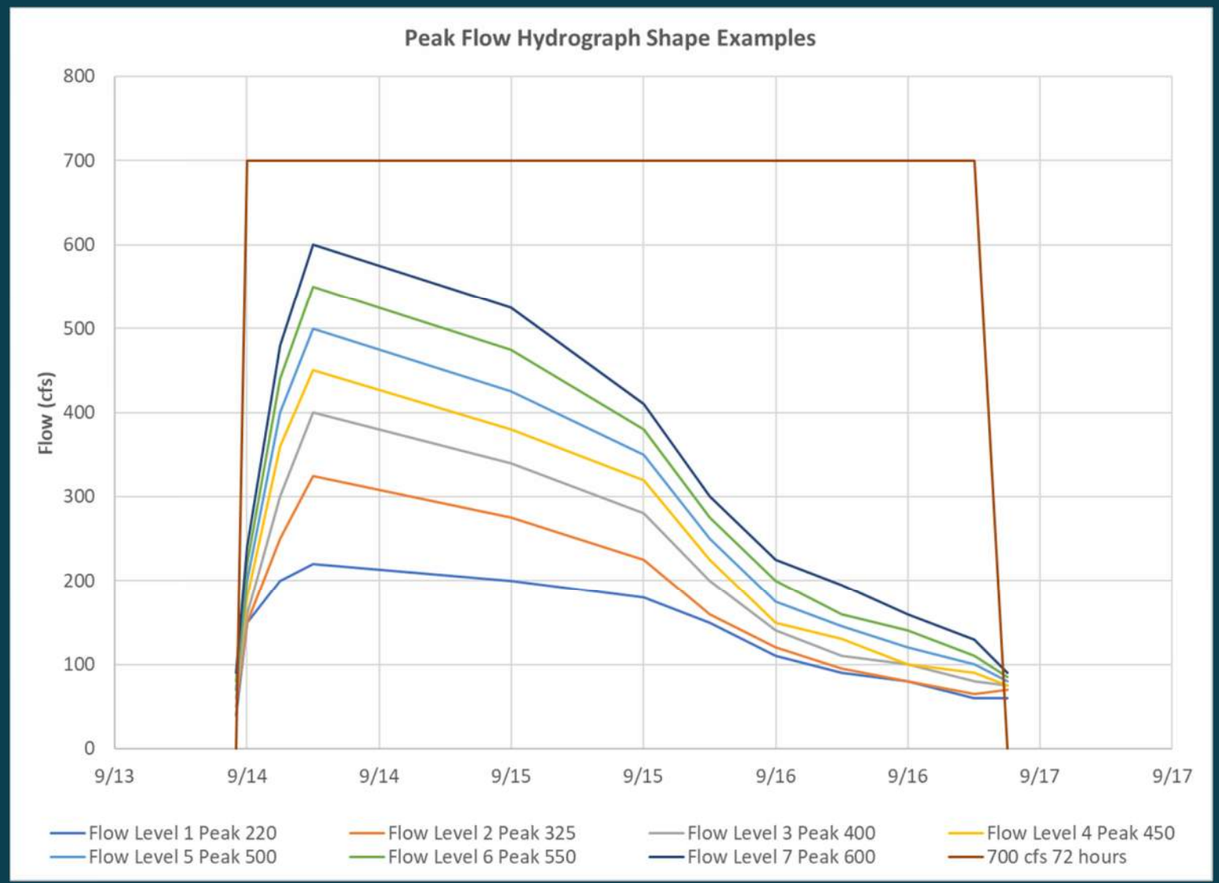
- Compare runs 7 (FL7, peak 600 cfs every 3 years) and 12 (FL7, peak 600 cfs every year)



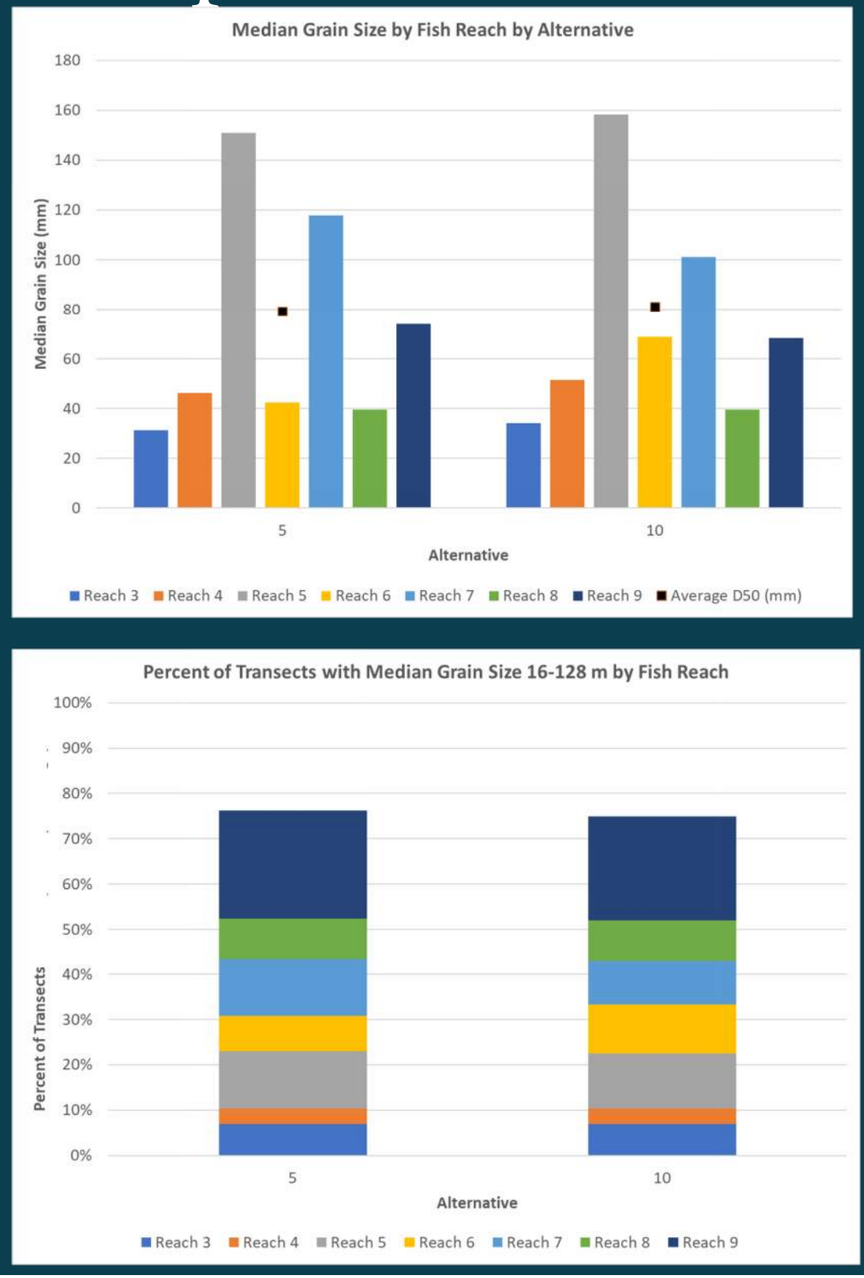


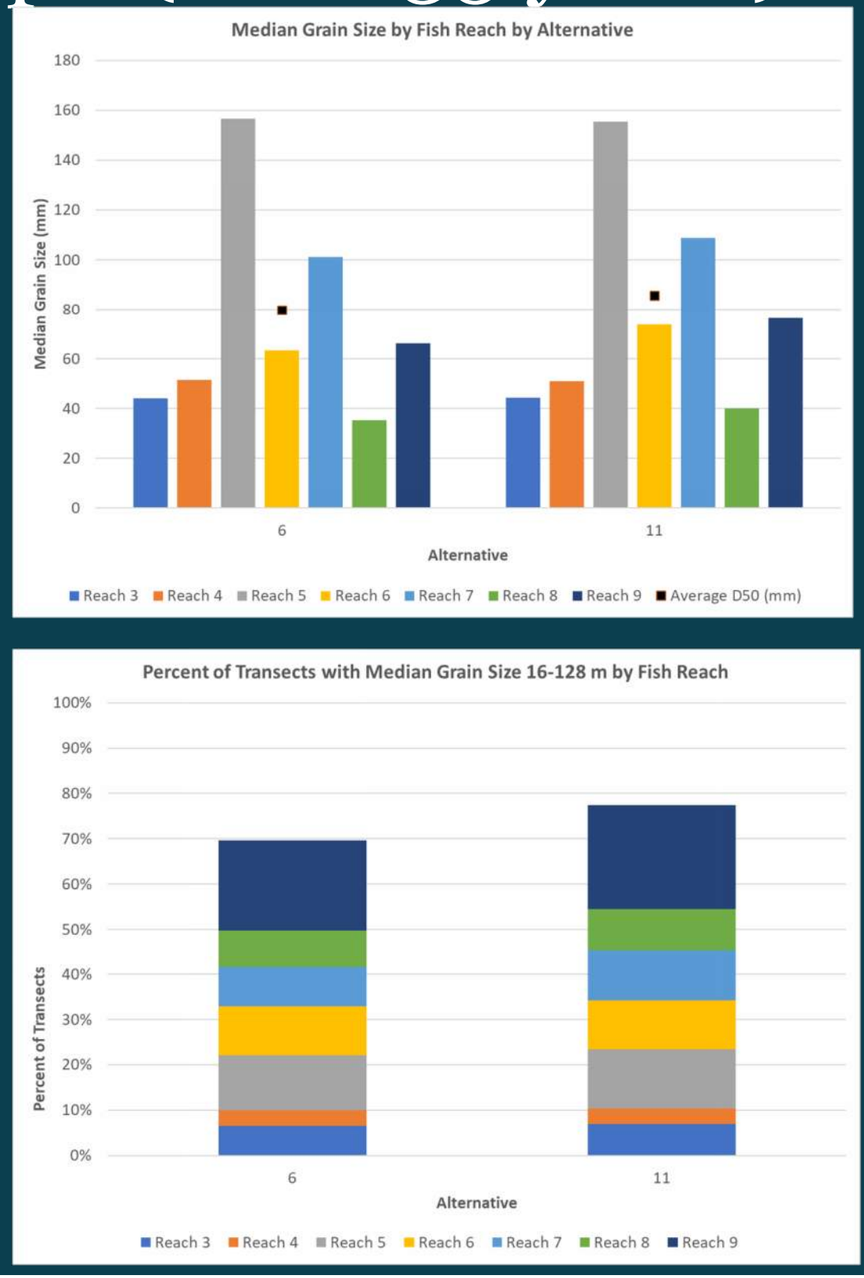
Shape of Peak Flow Hydrograph

- Compare:
  - Runs 5 to 10 (FL5, 500 cfs)
  - Runs 6 to 11 (FL 6, 550 cfs)

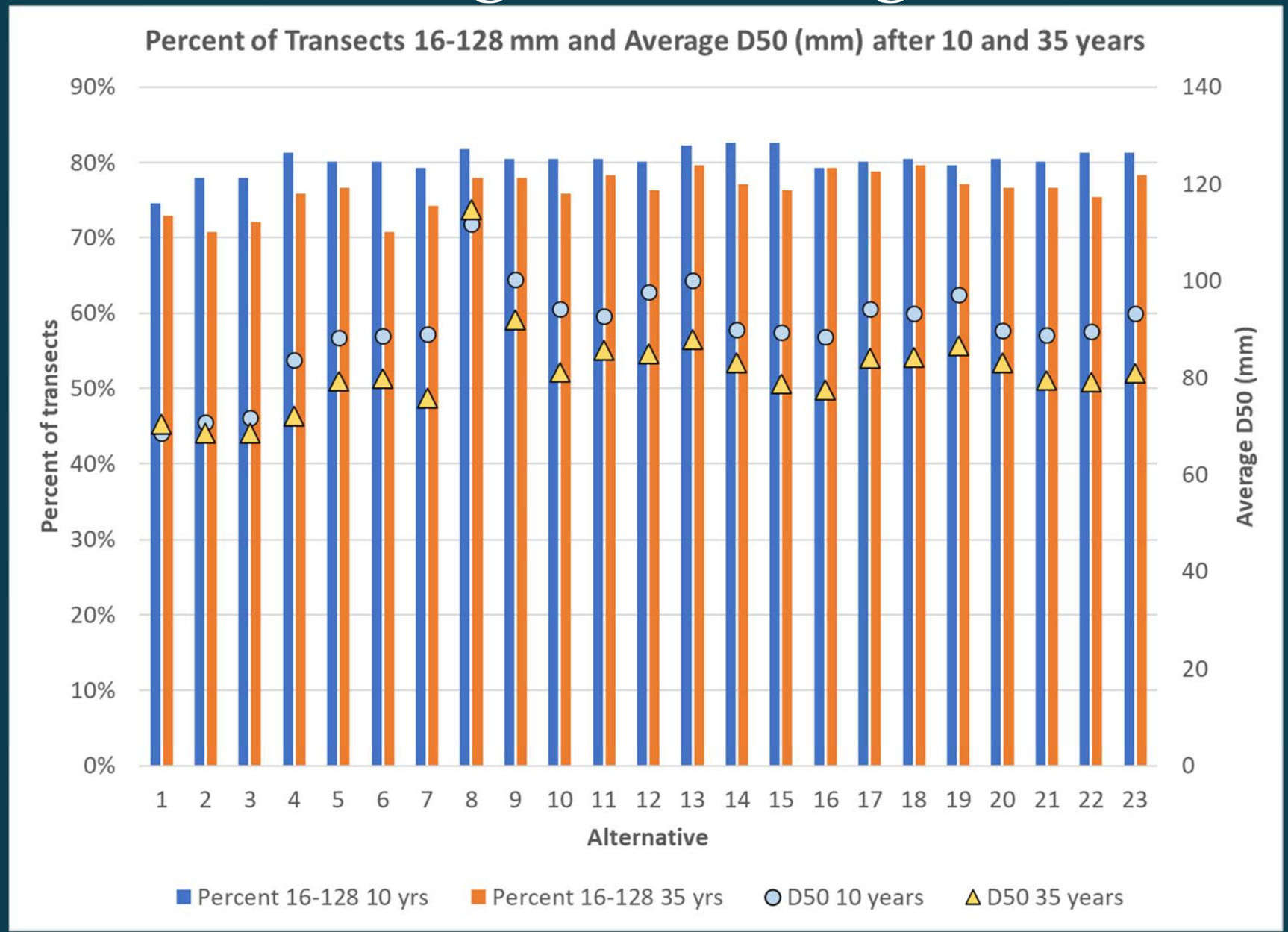


Shape of Peak Flow Hydrograph (after 35 years)





Short-term vs. Long-term Changes



Geomorphic Considerations Summary

- All (22) flow regimes analyzed provide spawning-sized gravel areas (16-128 mm)
  - Subtle differences among alternatives (70 to 80 percent of transects suitable)
  - Confined (canyon) reaches = generally larger sized sediment
- Higher percentage of transects best for coho/sockeye (16-64mm) than Chinook (64-128mm)
- Flow magnitude: generally higher flows/peaks =coarser sediment
- Shaped vs. 72-hour peak: higher percentage of suitable spawning transects for 72-hour peaks suggest peak flow part of shaped hydrographs could be longer (need to explore more)
- Frequency of peaks (every year vs every 3 years):
  - Every year slightly coarser, but overall similar percent suitable for spawning
  - Some differences among reaches (confined reaches)
- Short term (10 years) vs long term (35 years): few differences among alternatives after 10 years, suggests trends take time to develop

Channel Maintenance Flow Cost Summary

Run number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Name	Flow Level 1	Flow Level 2	Flow Level 3	Flow Level 4	Flow Level 5	Flow Level 6	Flow Level 7	TCF	NVE	NMFS alt 1	NMFS alt 2	USFWS 1	USFWS 2	TU Alt VE-1A	TU Alt VE-1B	TU Alt VE-1D	TU Alt VE-2A	TU Alt VE-2B	TU Alt VE-2C	TU Alt VE-FL7A	TU Alt VE-FL7B	TU Alt VE-FL7C	USFWS2 VAR
Peak	220	325	400	450	500	550	600	1500	700	500	550	600	600	800 once then 400	800 once then 300	800 once	800 once then 700	800 once then 525	800 once	700 once then 320	700 once then 240	700 once	Variable 400-600
Freq/ Shaped or 72 hrs?	3 years shaped	3 years shaped	3 years shaped	3 years shaped	3 years shaped	3 years shaped	3 years shaped	every year shaped	every year for 72 hours	3 years for 72 hours	3 years for 72 hours	every year for 72 hours	every year for 72 hours	3 years shaped	3 years shaped	shaped	3 years shaped	3 years shaped	shaped	3 years shaped	3 years shaped	shaped	every year for 72 hours
Peak: Mean Annual Flow Ratio	6.5	7.8	7.9	7.6	7.3	7.1	7	14.8	4.6	6.9	7	7	5.3	3.3	2.5	n/a	3.8	2.9	n/a	3.2	2.4	n/a	Variable
Average Annual Release (Acre-Ft)	291	350	427	481	537	593	654	4902	2287	537	593	1961	1961	502	401	75	837	647	75	414	327	65	1743
Annual Average Cost	$13,716	$16,497	$20,126	$22,671	$25,311	$27,950	$30,825	$231,047	$107,794	$25,311	$27,950	$92,428	$92,428	$23,662	$18,917	$3,520	$39,451	$30,480	$3,520	$19,514	$15,397	$3,080	$82,153
Present Worth ($)	$224,582	$270,116	$329,541	$371,216	$414,435	$457,653	$504,730	$3,783,162	$1,765,013	$414,435	$457,653	$1,513,419	$1,513,419	$387,438	$309,747	$57,639	$645,977	$499,085	$57,639	$319,516	$252,115	$50,429	$1,345,176

Geomorphic Recommendations for Peak Flows

- Also consider other non-substrate size geomorphic work/values in natural systems (spring-fed vs. disturbance-regime systems)
  - Sediment source erosion, sediment sorting
  - Disturbance in low flow vs. high flow channel areas
  - Riparian conditions
    - Remove intruding vegetation
    - Unvegetated fine sediment needed for cottonwood regeneration

- Recommendations for peak flow regime
  - Peak flow approx. 7 times mean annual flow – mimic rainfall peak in similar AK rivers
  - Provide peak 3 out of 9 years to allow for natural variability of incoming flows
  - Shaped hydrograph with long tail – rising vs. descending limb transport patterns
  - Consider an initial longer peak (maybe 7 days?) to help re-set channel (based on test flow release dynamics)

Key Takeaways and Next Steps

Key Takeaways

- Under current conditions, increasing flows beyond Flow Level 7 have reduce spawning habitat for Chinook and Coho in Eklutna River and may promote detrimental anchor ice in winter
- Replacement dam and floating surface collector have significant annualized costs and associated ratepayer impacts
- Existing Dam Release with or without Fish Ladder requires winter shutdown of powerhouse
- Fixed Wheel Gate is the best means of achieving channel maintenance flows for anything above Flow Level 1
- AWWU Portal Valve flow release options provides 2x – 3x the spawning and rearing habitat compared to baseline conditions (in 11 of 12 miles…) – achieve 87-93% of available habitat…
- Floating Surface Collector would not be effective (icing) for passing out-migrating juveniles and has significant costs
- Spill for downstream passage may have reduced effectiveness due to low attraction velocities in Eklutna Lake
- Eklutna Lake studies have shown low primary productivity, high levels of turbidity, and a kokanee population of significantly smaller size and lower fecundity than has been documented in other systems– all indications that Eklutna Lake in its current state is not likely to support a healthy population of ocean-run sockeye. Like Skilak Lake, where ADFG has documented an increase in lake turbidity with glacial melt and associated declines in sockeye population/ primary productivity, Eklutna Lake may be on a similar trajectory toward decreasing habitat quality resulting from similar effects of climate change.

Next Steps

- After Meeting 3 (June)
  - Provide preferred alternative(s) by June 30th

- Meeting 4 (July)
  - Discuss Positive/Negative Impacts to Water Supply, Wetlands, Wildlife, Recreation, Cultural Resources
  - Initiate discussion regarding appropriate monitoring program and potential adaptive management

- Meeting 5 (August)
  - Continue discussing appropriate monitoring program and potential adaptive management
  - Outline Draft Fish and Wildlife Program

McMillen