ALASKA ENERGY AUTHORITY

BRADLEY LAKE EXPANSION PROJECT

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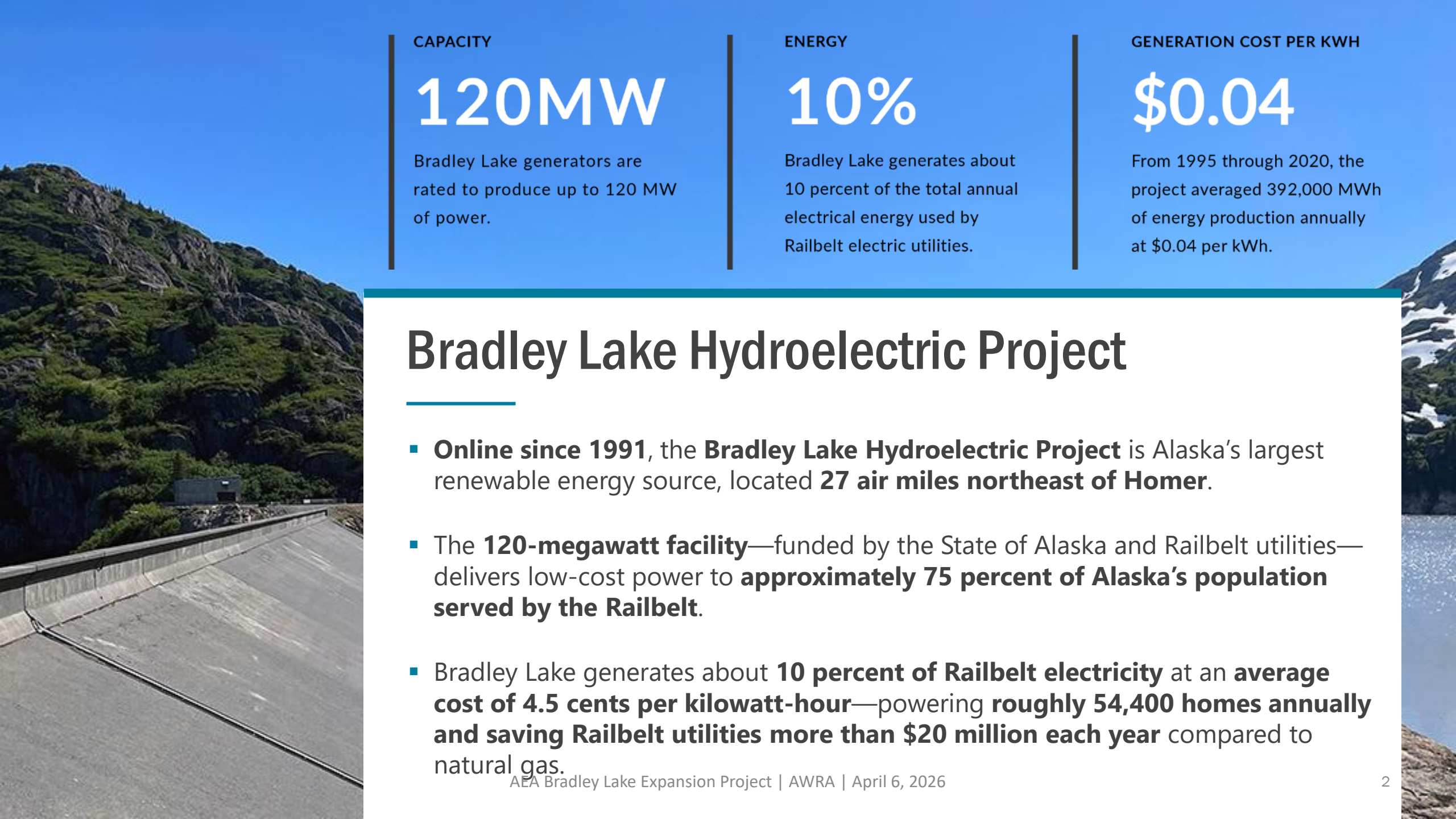
Chief Dam Safety Engineer

American Water Resources Association
April 6, 2026

ALASKA ENERGY AUTHORITY
50 YEARS OF SERVICE



CAPACITY

120MW

Bradley Lake generators are rated to produce up to 120 MW of power.

ENERGY

10%

Bradley Lake generates about 10 percent of the total annual electrical energy used by Railbelt electric utilities.

GENERATION COST PER KWH

$0.04

From 1995 through 2020, the project averaged 392,000 MWh of energy production annually at $0.04 per kWh.

Bradley Lake Hydroelectric Project

- **Online since 1991**, the **Bradley Lake Hydroelectric Project** is Alaska's largest renewable energy source, located **27 air miles northeast of Homer**.
- The **120-megawatt facility**—funded by the State of Alaska and Railbelt utilities—delivers low-cost power to **approximately 75 percent of Alaska's population served by the Railbelt**.
- Bradley Lake generates about **10 percent of Railbelt electricity** at an **average cost of 4.5 cents per kilowatt-hour**—powering **roughly 54,400 homes annually and saving Railbelt utilities more than $20 million each year** compared to natural gas.

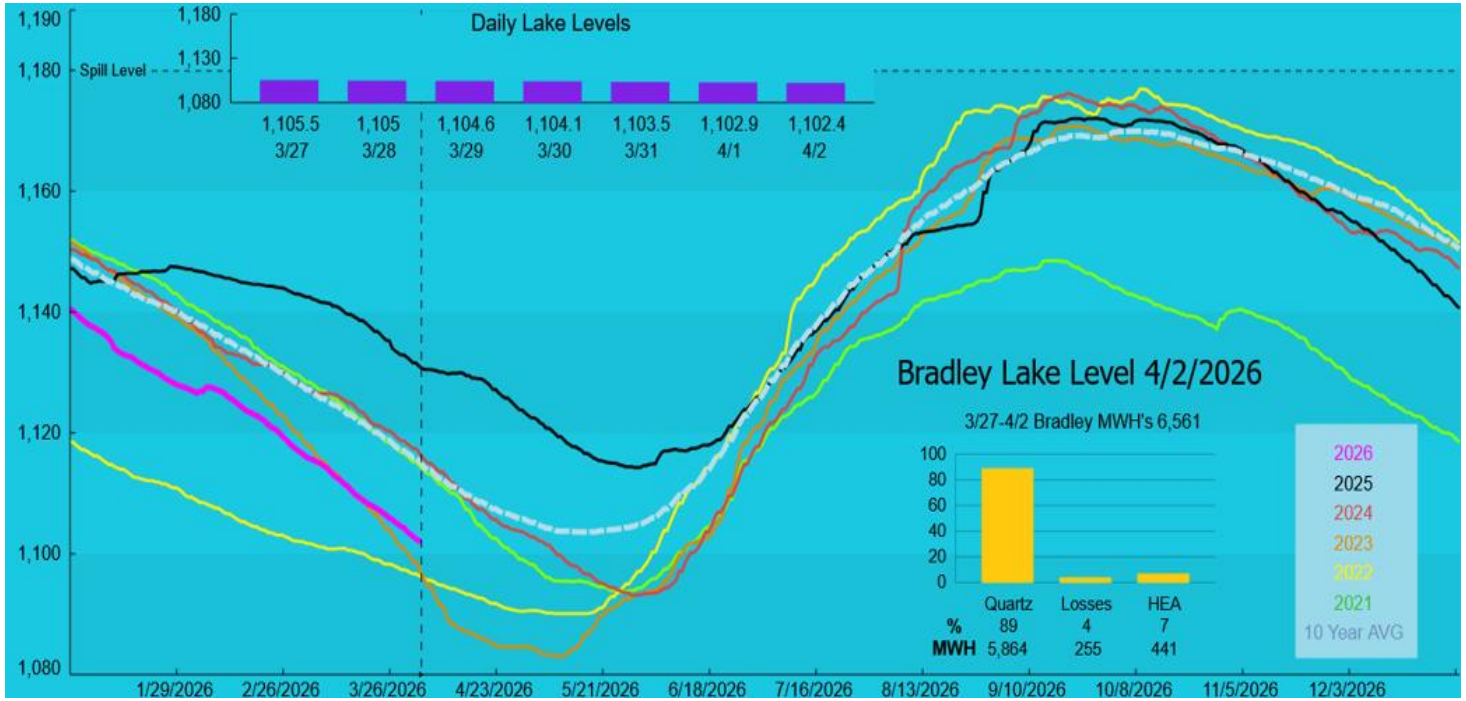
Bradley Lake Hydroelectric Project Components

- **Original dam**, **power tunnel**, **and power plant**
- **Bradley to Bradley Junction** and **Sterling to Kenai Lake** transmission lines
- **West Fork Upper Battle Creek Diversion** (completed)
- **Bradley Lake Expansion Project** (future)
- **Cook Inlet PowerLink** (future)

Bradley Lake: Ownership, Operations, and Governance

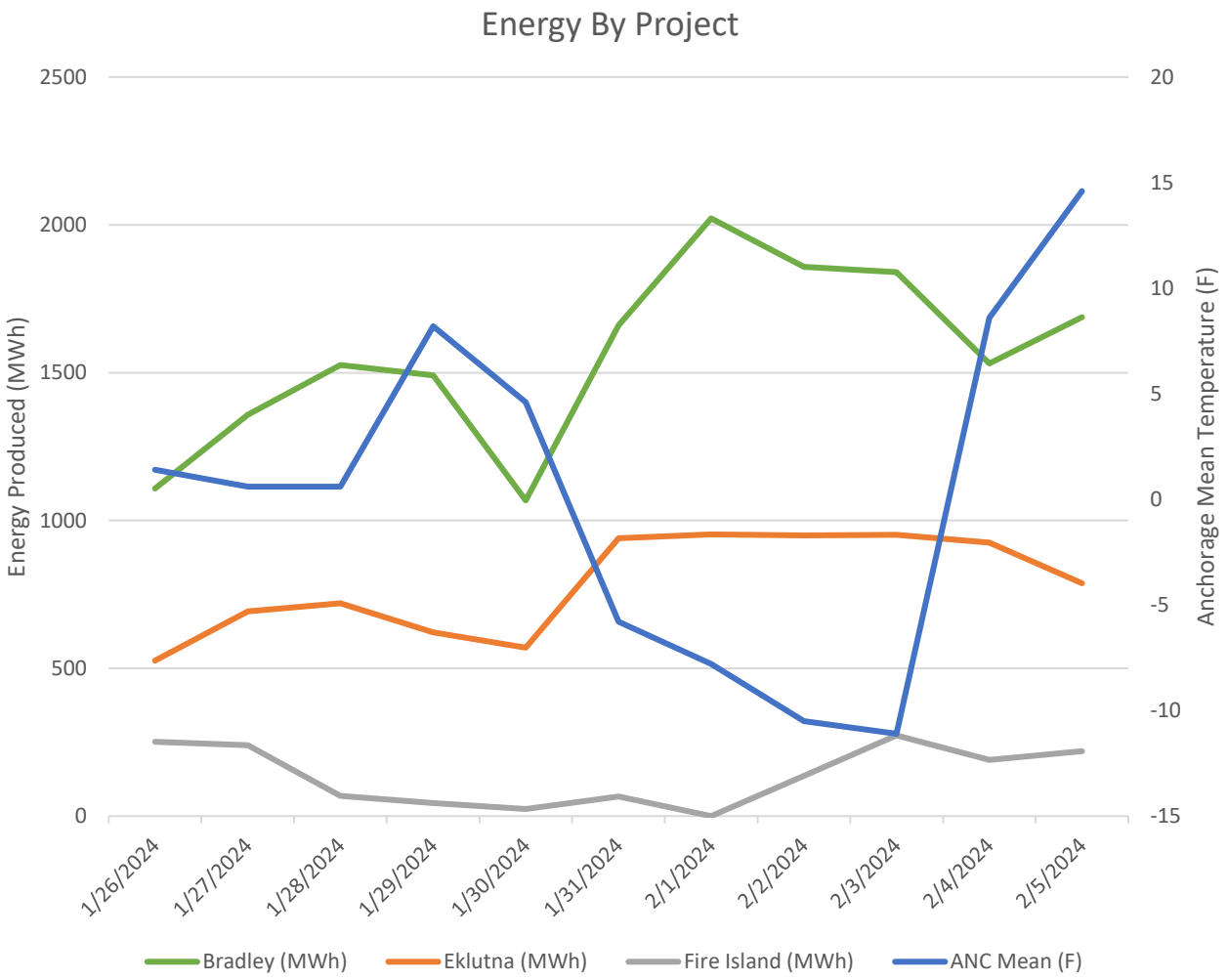
- Owned by **the Alaska Energy Authority**
- Operated by **Homer Electric Association**
- Energy dispatched by **Chugach Electric Association**
- **Utilities** manage the project to the maximum extent practicable
- The **Bradley Lake Project Management Committee** provides overall project governance

The Value of Traditional Hydropower



- Lake level lowest in **early May**.
- The lake refills from **May through October**, driven by snowmelt, ice melt, and storm events.
- Water levels are drawn down **during winter and spring** to meet peak energy demand.

The Value of Traditional Hydropower



- During a cold snap in early 2024, **natural gas supplies for heat and power were constrained**.
- **Peak electricity demand** occurs during calm, cold periods, typically in January.
- **Wind and solar generation is often limited** during these conditions.
- **Traditional and stored hydro can increase output** to meet demand.

West Fork Upper Battle Creek Diversion Project

The project diverts glacial water from the West Fork of Upper Battle Creek into Bradley Lake—expanding Alaska's largest hydroelectric facility.

- Includes three miles of road, a concrete diversion dam, and a **five-foot-diameter pipeline** conveying water to Bradley Lake
- Delivers **about 10% more energy**—enough to power **approximately 5,100 homes annually**—at **lower cost** to ratepayers
- **Completed in 2020** at a cost of **$47 million**

ALASKA ENERGY AUTHORITY

Bradley Lake Expansion Project

AEA is advancing the Bradley Lake Expansion Project, which includes the **Dixon Diversion** and **Bradley Pool Raise** sub-projects. This project will divert water from Dixon Glacier to increase Bradley Lake's annual energy production by **50 percent**.

ESTIMATED ANNUAL OUTPUT
165,000 MWh
≈ 30,000 homes powered

NATURAL GAS OFFSET
1.5 Billion cu ft
7.5% of unmet demand (2030)

TARGET COMPLETION
2031
Shovel-ready status

ESTIMATED COST
$400 Million
Class IV Estimate

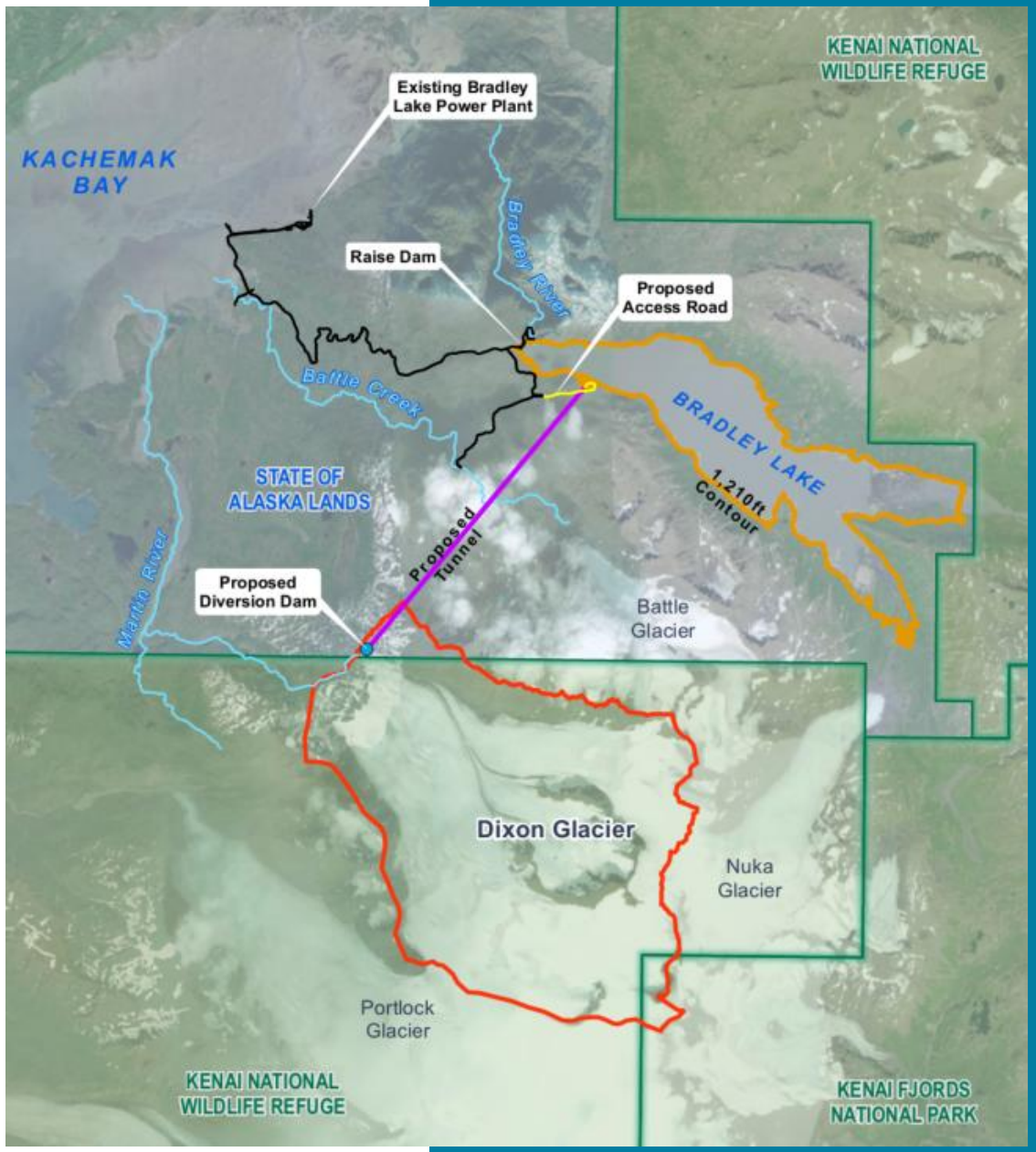

BRADLEY LAKE
EXPANSION PROJECT

Bradley Lake Expansion Project

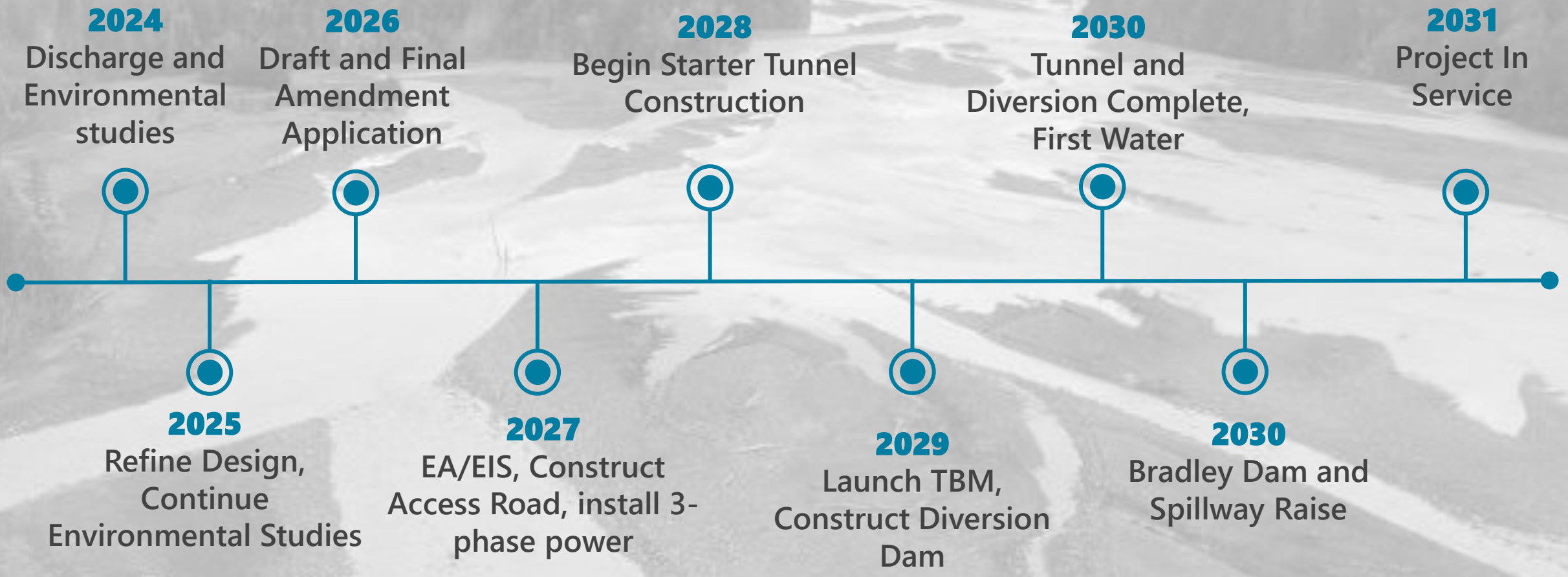
The **Bradley Lake Expansion** represents Alaska's largest new renewable energy development since the Bradley Lake Hydroelectric Project was completed in 1991.

Major Infrastructure Elements:

- Diversion dam at the toe of Dixon Glacier
- 4.6 mile tunnel (~14-foot diameter) conveying water to Bradley Lake
- Bradley Pool Raise up to 16'
- Approximately one mile of new access road



Licensing and Construction Schedule



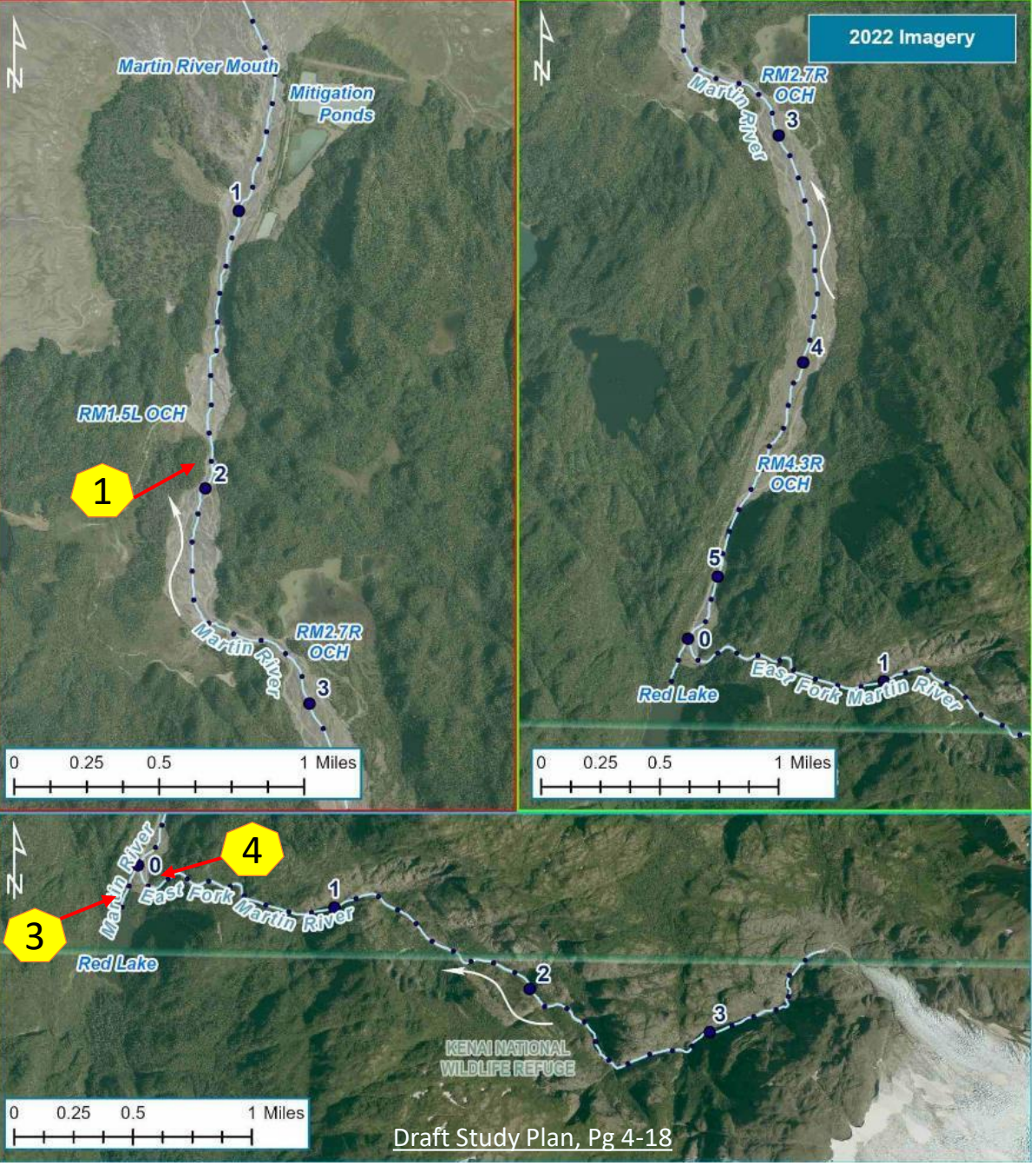
Dixon Glacier

Environmental Impacts

- **Selected Alternative: Least Environmental Impact**
  - No road to diversion dam
  - Dixon powerhouse alternative removed
- **Project Benefits and Anticipated Impacts**
  - Minimal environmental footprint for a high-value project
  - ~1 mile of new access road
  - Pool raise causes inundation at Bradley Lake headwaters
  - Diversion dam site was ice-covered as recently as 10 years ago
- **Martin River Conditions**
  - Highly dynamic mainstem
  - Migration corridor for small coho/sockeye runs and juvenile
  - Fast, cold flow (2^{0}C) with high turbidity and bedload
  - Coordination with resource agencies underway to define Minimum Instream Flow and channel maintenance flows
- **Hydraulic Model of Modeling**
  - 2D model of Martin River
  - Snapshot: May 2024

Mainstem Turbidity

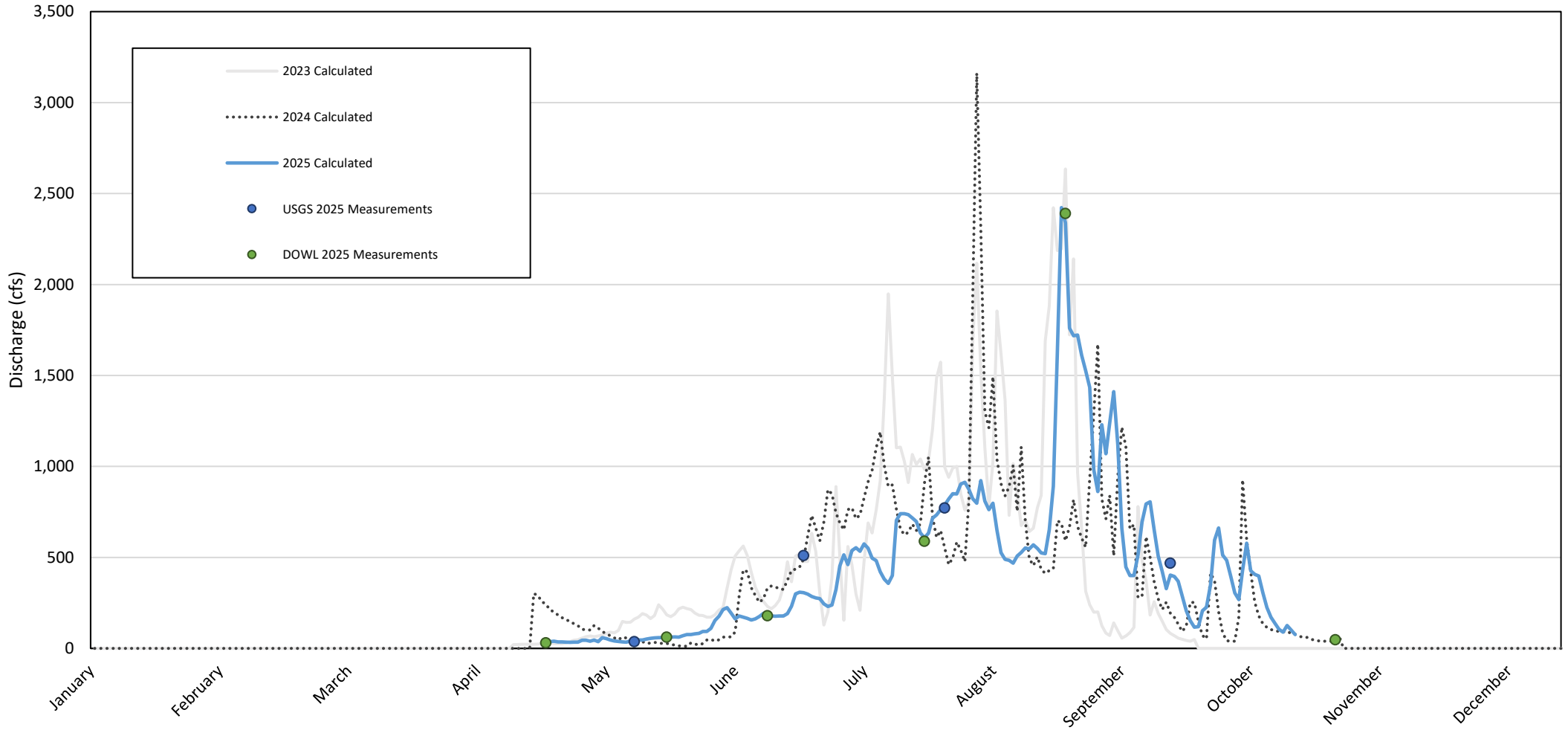
Stream Gaging



- **Goal**
  - Characterize flow regime of the Martin River and select tributaries
- **Objectives**
  - Use the past three years of stream gaging on the Martin River to establish a record
  - Use data from nearby Upper Bradley Basin to extend the record
  - Perform flood-frequency and flow-exceedance analyses on hydrographs at:
    - EFMR at the Mouth
    - MR at the Constriction (RM 1.9)

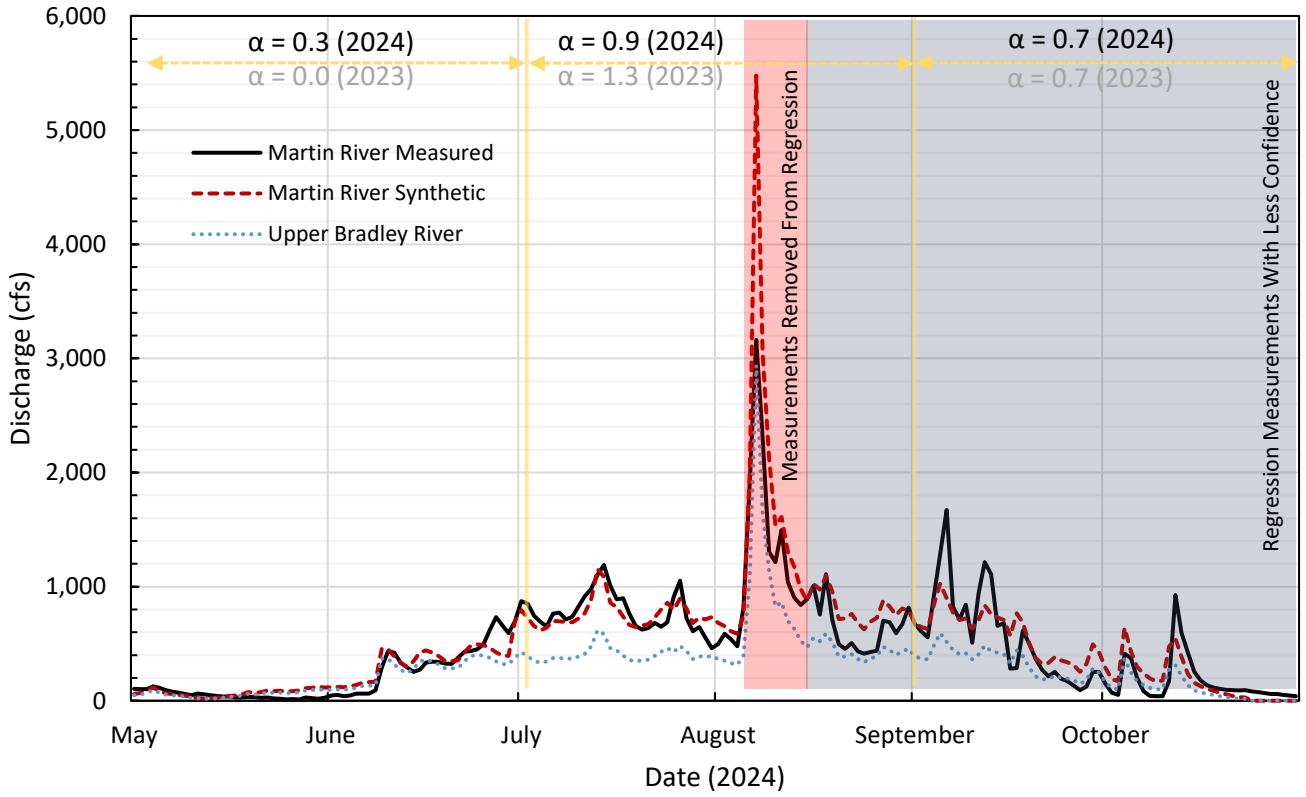
Draft Study Plan, Pg 4-18

Calculated Hydrograph at the EFMR Mouth



Synthetic Hydrograph at EFMR

Period	Area Exponent (Factor) 2023	2024	Best Estimate (Average)
May 1 through June 30	0.0 (1.0)	0.3 (1.2)	0.1 (1.1)
July 1 through August 31	1.3 (2.5)	0.9 (1.9)[1]	1.1 (2.1)
September 1 through October 31	0.7 (1.6)	0.8 (1.7)[2]	0.7 (1.6)



- USGS Stream Gage 15238990
  - Measurements since 1979
  - Tributary area = 11.2 mi^2
- EFMR at the Mouth
  - Measurements since 2023
  - Tributary area = 22.3 mi^2

$$Q_{EFMR} = Q_{Bradley}\left(\frac{A_{EFMR}}{A_{Bradley}}\right)^{\alpha} = Q_{Bradley} \times Factor$$

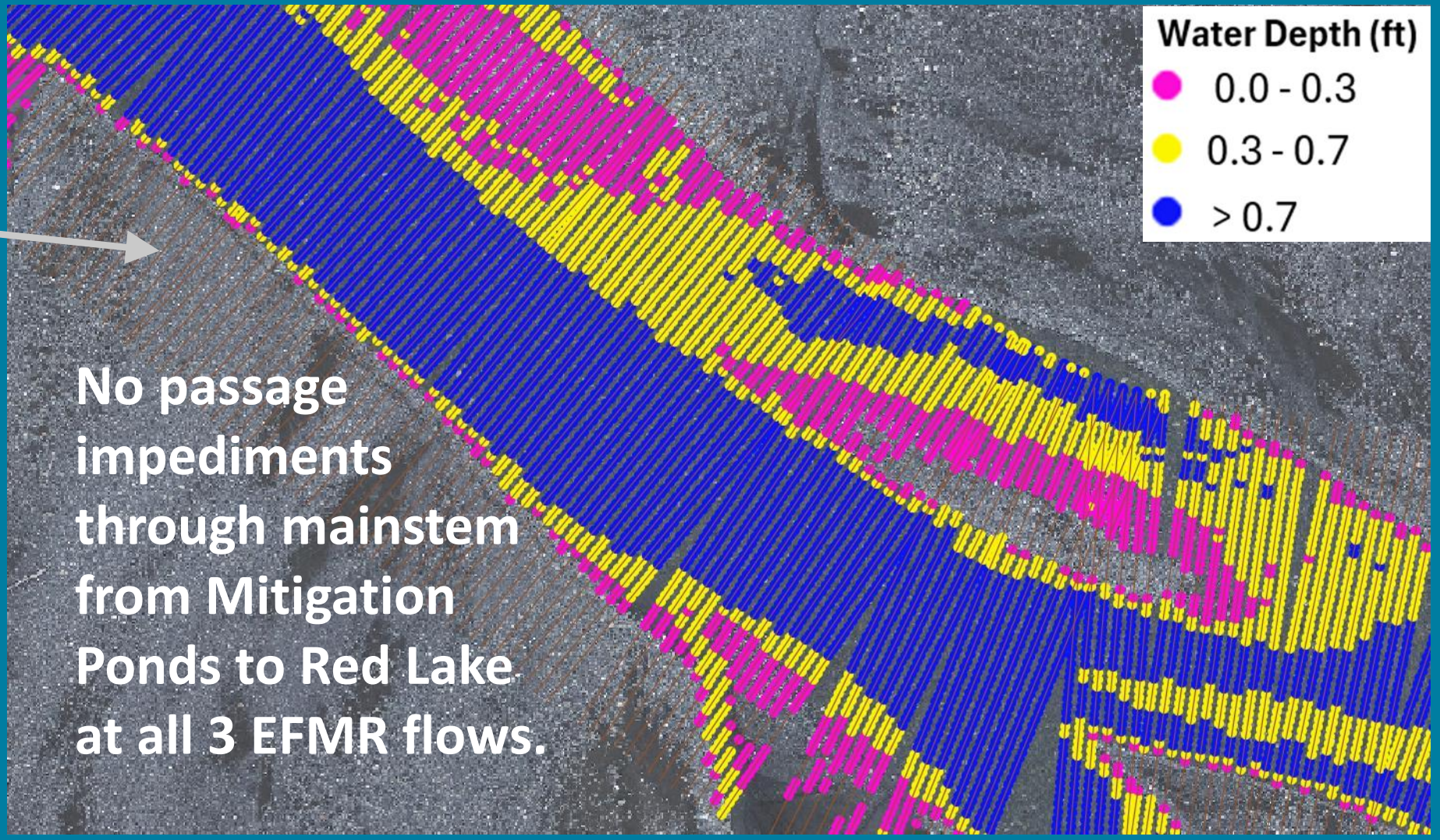
Continued Stream Gaging

- 2026-2028
  - Data collection during open-water season
  - Three sites
    - MR at the Constriction (RM 1.9)
    - WFMR at Red Lake Outlet
    - EFMR at the Mouth

Fish Passage and Habitat Connectivity Study

- Developed hydraulic model based on May 2024 channel
- Estimated water depth at different EFMR flows:
  - ✓ 100, 150, 200 cfs
- Evaluated fish passage and habitat connectivity based on water depth and velocity criteria

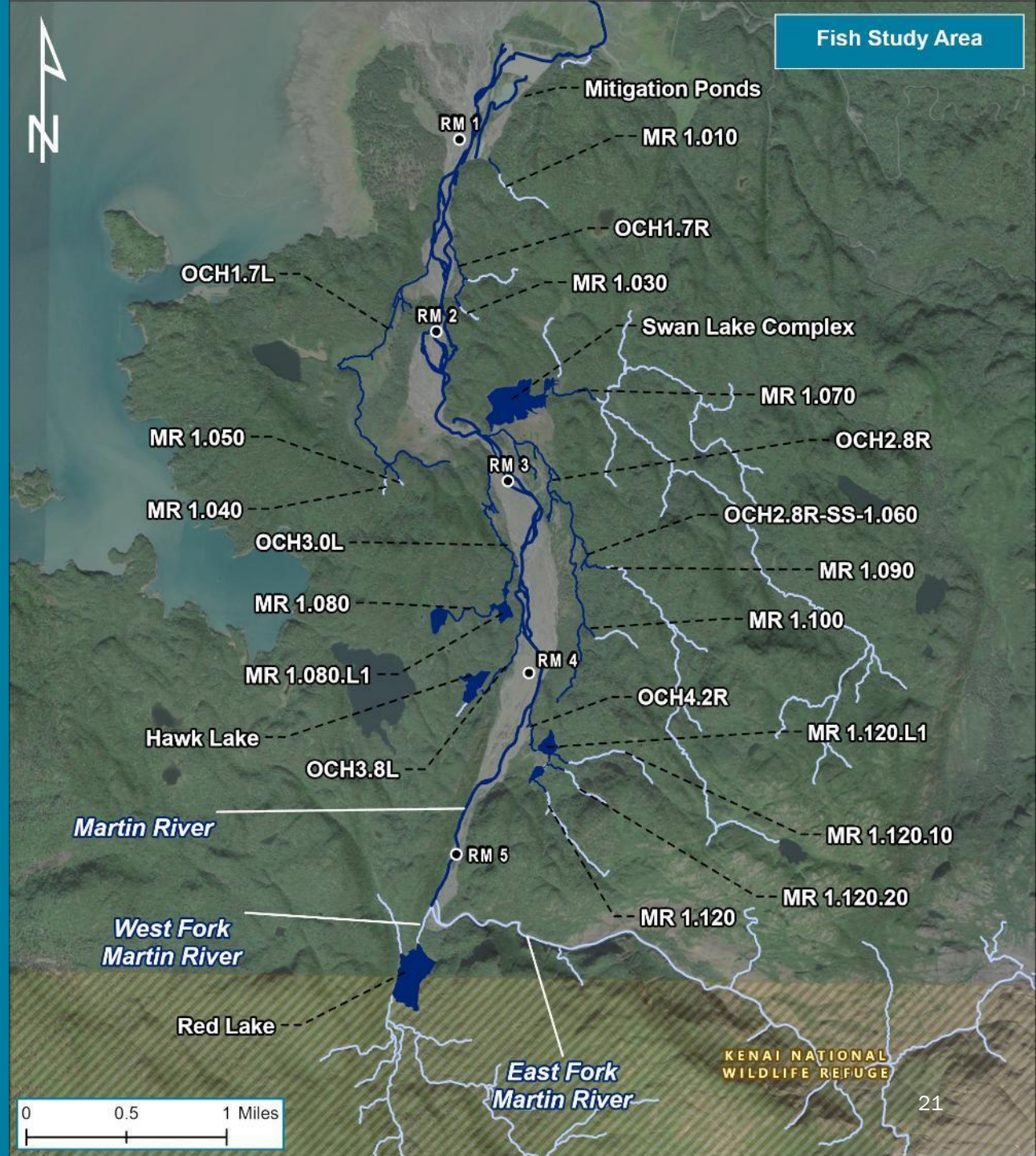
Connectivity Results: Mainstem Habitat (100 cfs)



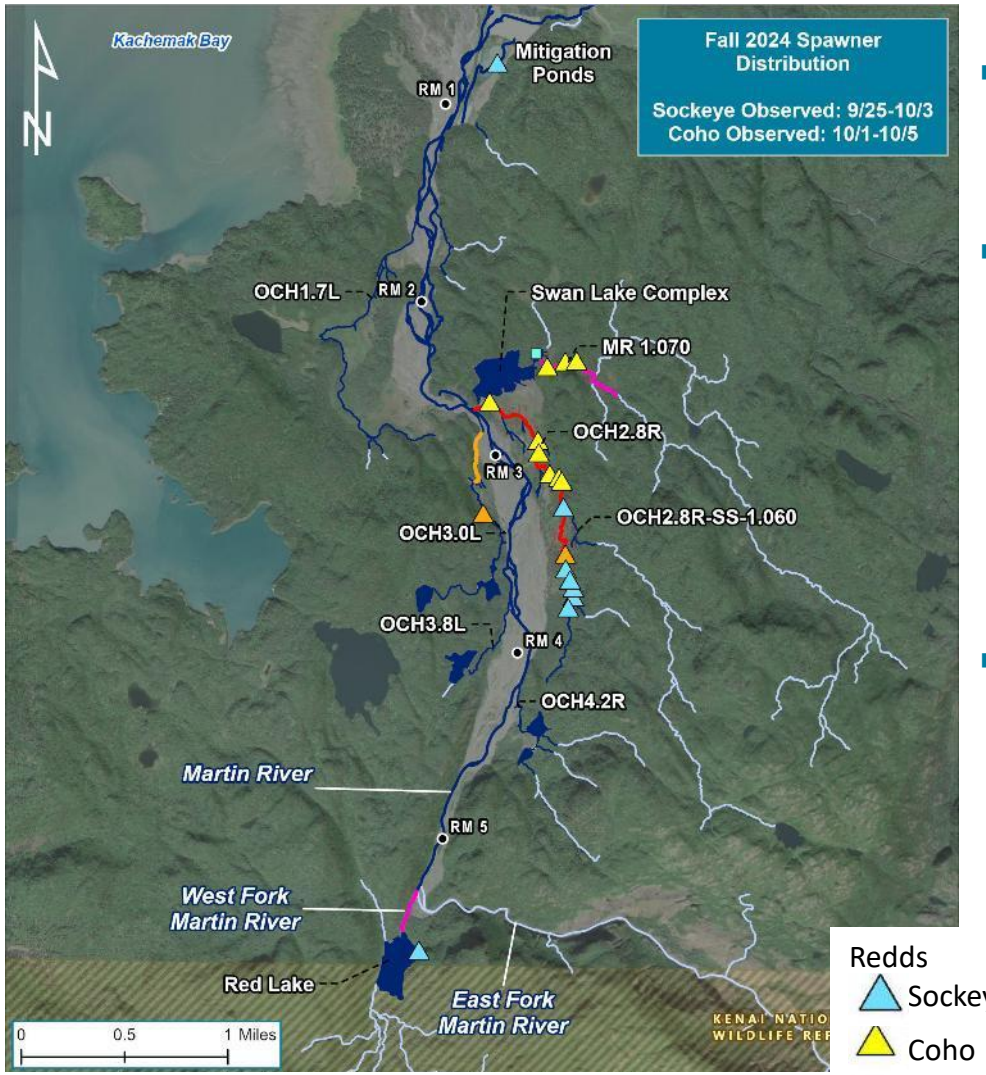
No passage impediments through mainstem from Mitigation Ponds to Red Lake at all 3 EFMR flows.

Martin River Fish Study

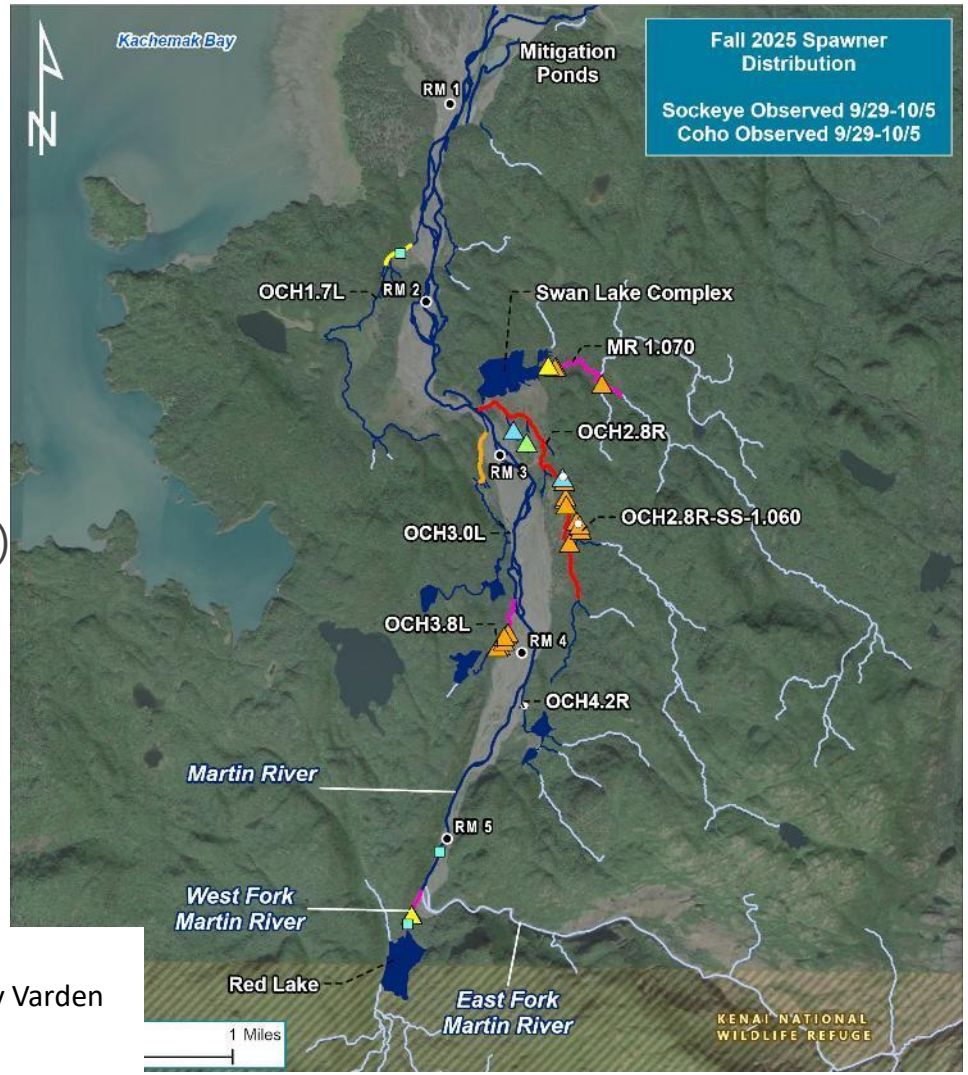
- Presence/Absence
- Document salmon spawning in suitable habitats
- 2024
  - April 28th – May 10th
  - September 23rd – October 3rd
- 2025
  - May 21st – May 27th
  - July 28th – August 3rd
  - September 29th – October 5th



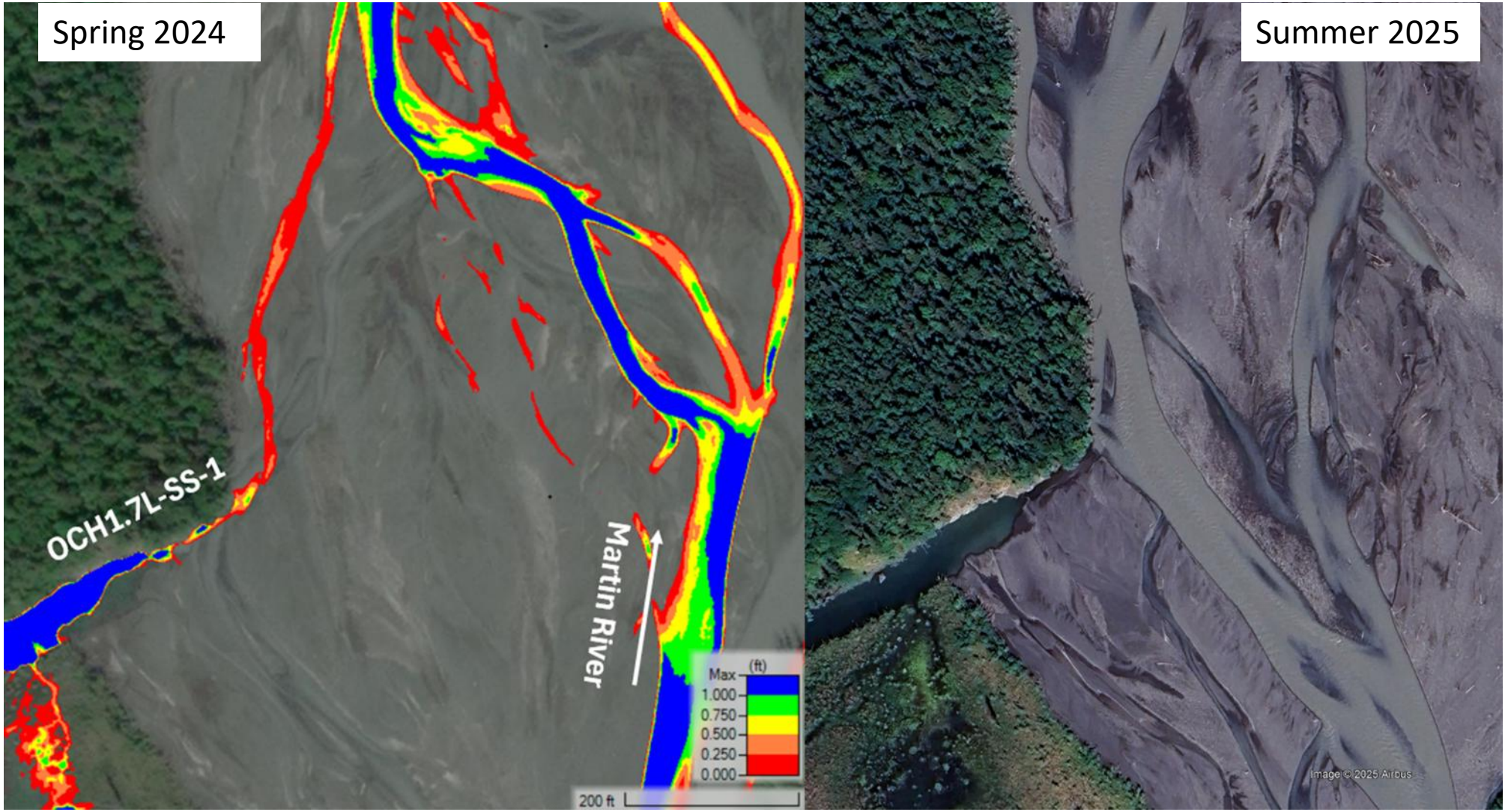
Martin River – Sockeye and Coho Salmon Spawning Distribution



- No spawning in mainstem Martin River
- Significant salmon spawning (2024 and 2025)
  - Red Lake
  - OCH2.8R
  - MR1.070 (Coho only)
- Adult Coho observed in 2025 only
  - OCH1.7L
  - OCH3.8L



OCH1.7L



2024

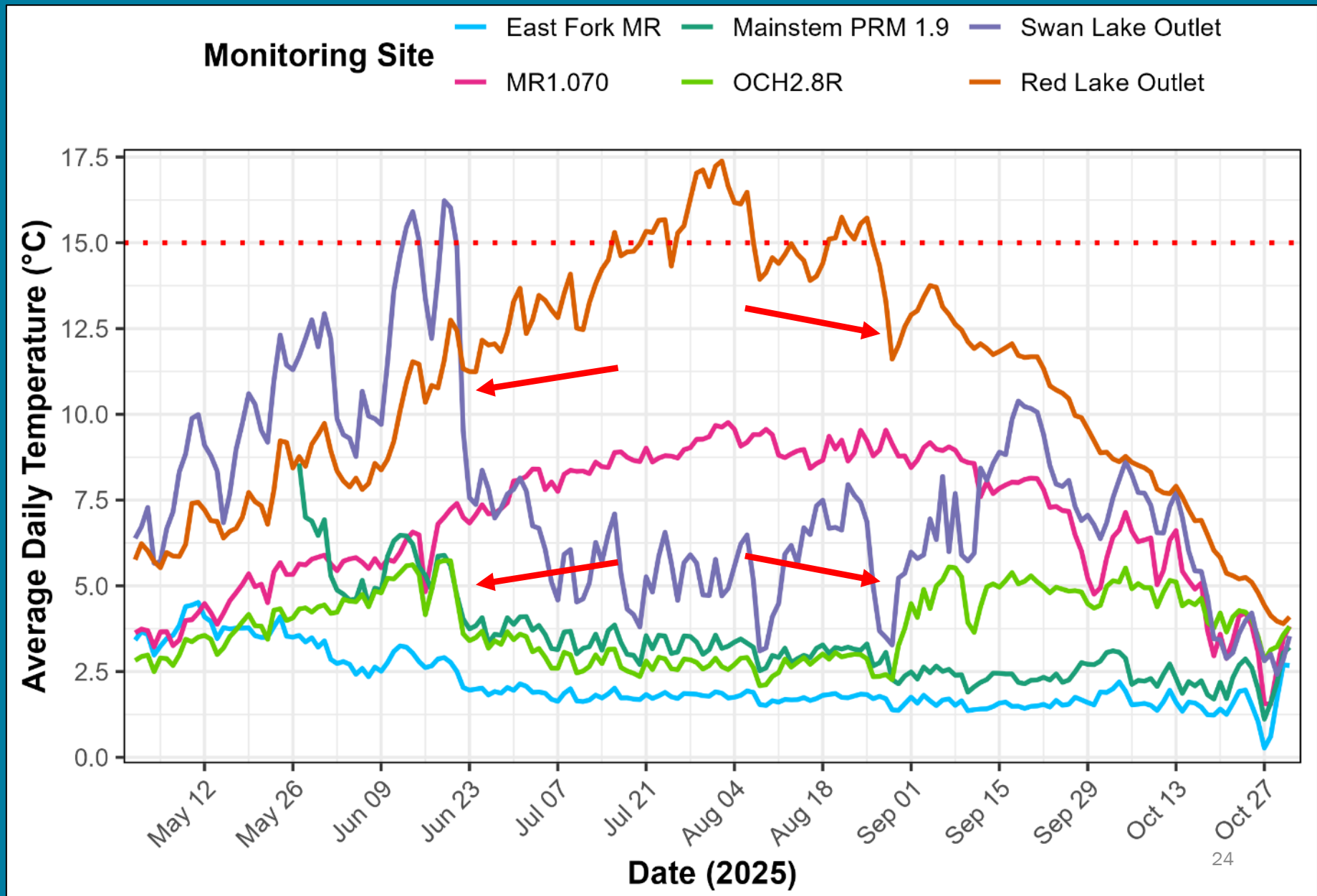
- Coho
  - 1+, 2+

2025

- Coho
  - Adults
  - 1+, 2+

2025 Results: Temperature

- SLO & OCH2.8R inundation (~300 cfs)
- August 28 high flow event (2,635 cfs)



Martin River Fish Use: Red Lake AVCT

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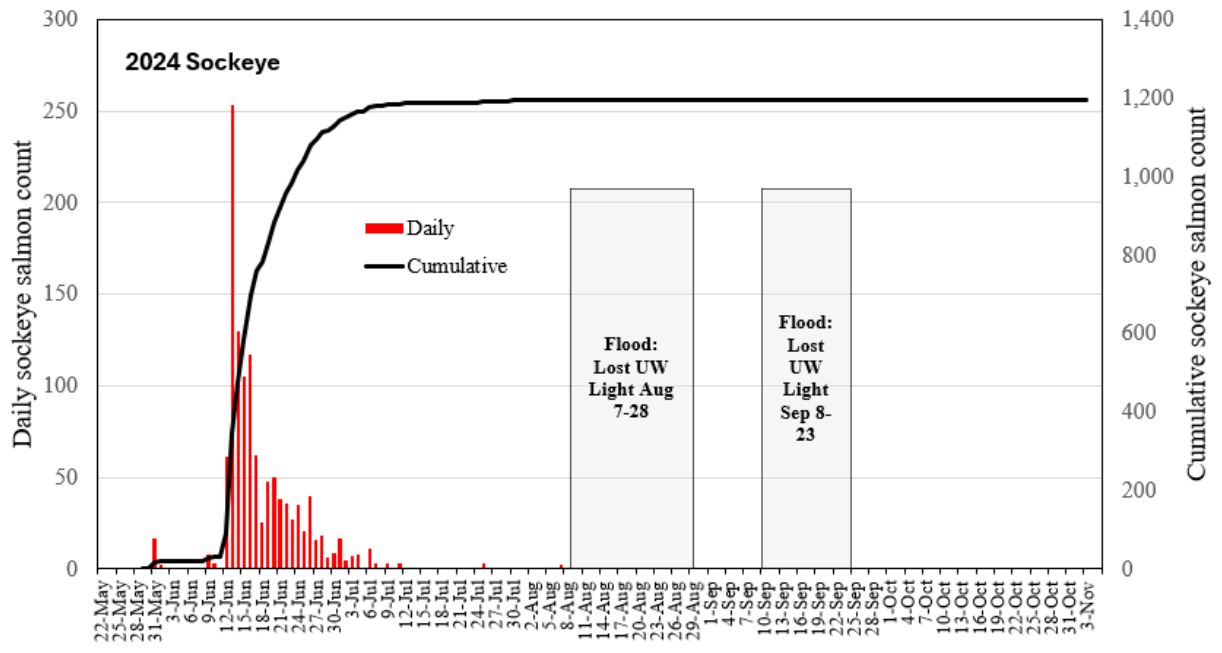
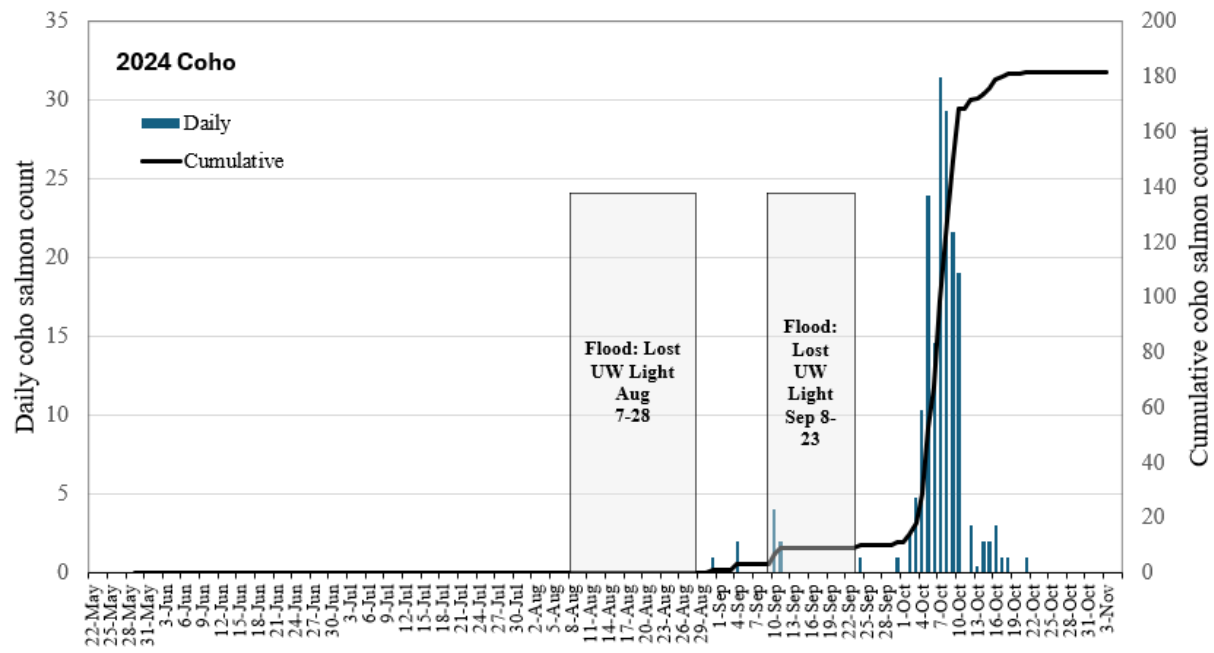
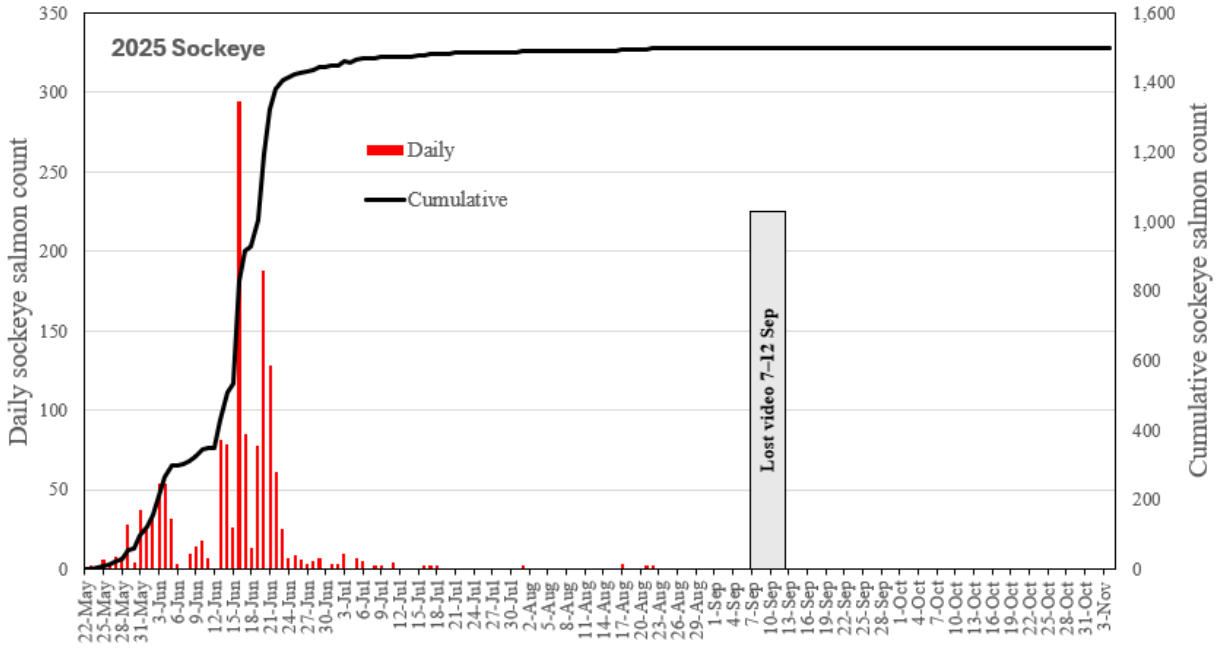
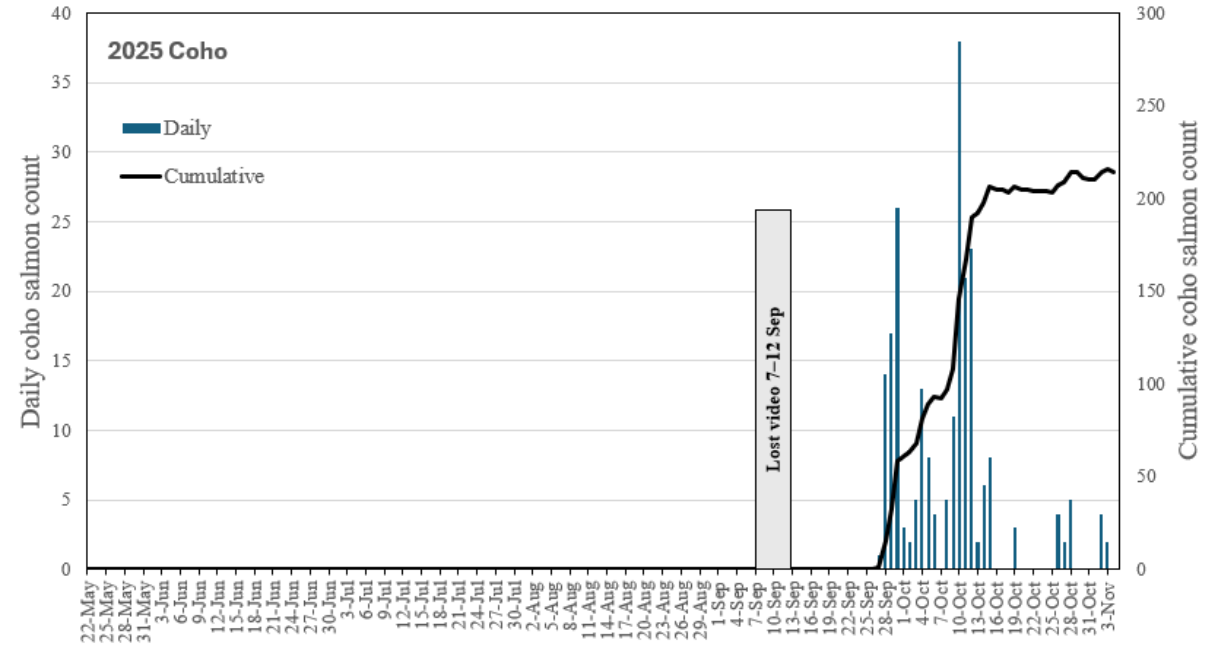

2024 Sockeye
Daily sockeye salmon count
Cumulative sockeye salmon count
Daily
Cumulative
Flood: Lost UW Light Aug 7-28
Flood: Lost UW Light Sep 8-23


2024 Coho
Daily coho salmon count
Cumulative coho salmon count
Daily
Cumulative
Flood: Lost UW Light Aug 7-28
Flood: Lost UW Light Sep 8-23


2025 Sockeye
Daily sockeye salmon count
Cumulative sockeye salmon count
Daily
Cumulative
Lost video 7–12 Sep


2025 Coho
Daily coho salmon count
Cumulative coho salmon count
Daily
Cumulative
Lost video 7–12 Sep

Proposed Dixon Diversion Operations

Start 2030 or 2031

May 1 – November 30

Minimum Instream Flow (MIF)
- 100 cfs EFMR @ diversion

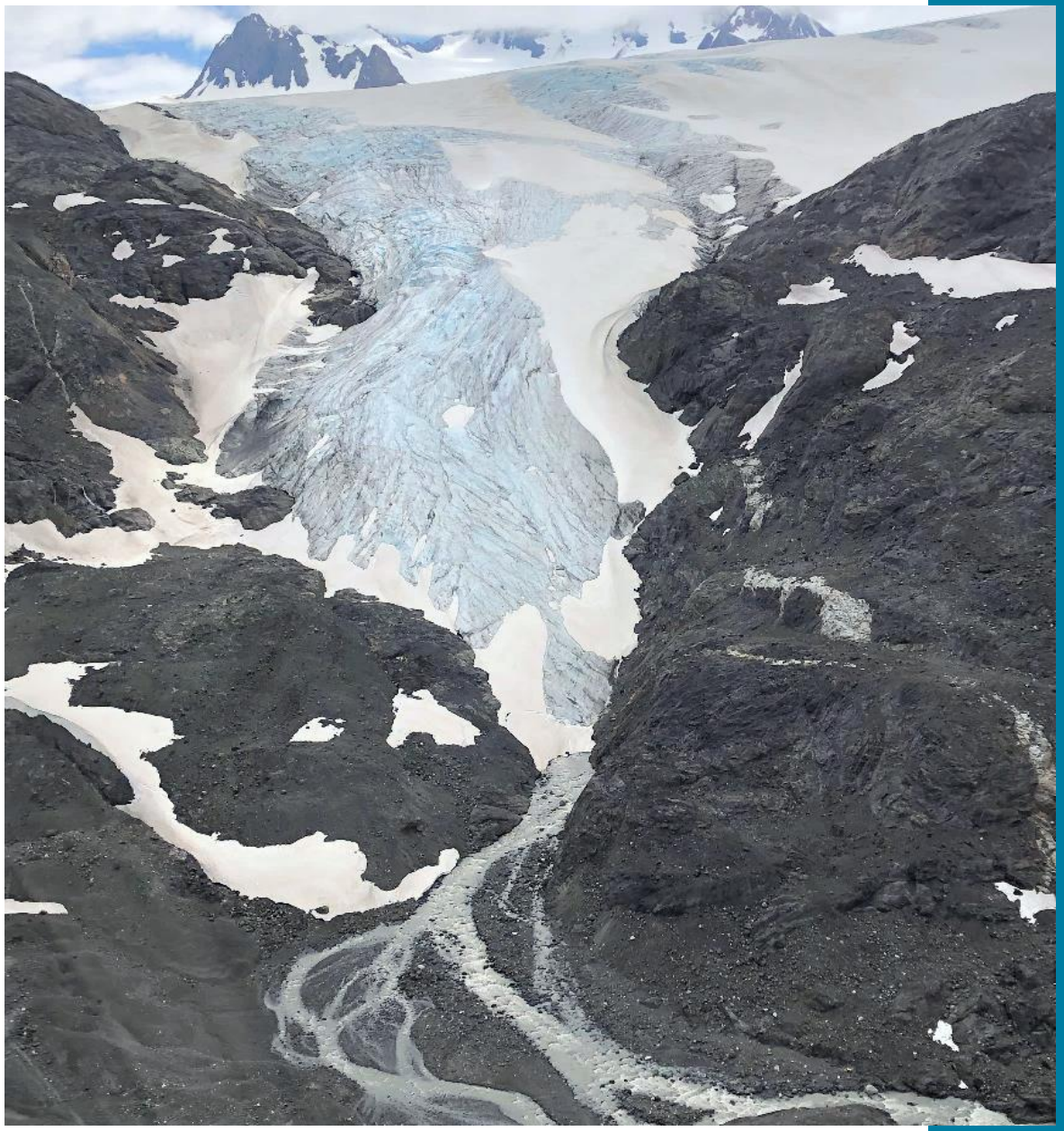
Diversion Tunnel Capacity
- 1,650 cfs

Sediment Management Flows
- Flush sediment from Diversion Dam forebay on an as needed basis

Channel Maintenance Flows
- 1,000 cfs for 12 hours
  3 times every 10 years

Month	Volume (acre-ft)				Percentage		
	Total Runoff	MIF	Diverted	Bypass in Excess of MIF	MIF	Diverted	Bypass in Excess of MIF
May	4,100	2,800	1,300	0	68%	32%	0%
June	17,300	5,700	11,600	0	33%	67%	0%
July	60,700	6,100	53,200	1,400	10%	88%	2%
Aug	62,100	6,100	52,500	3,400	10%	85%	5%
Sept	34,200	5,800	27,300	1,100	17%	80%	3%
Oct	13,200	4,300	8,700	200	33%	66%	1%
Total*	191,600	30,800	154,600	6,100	16%	81%	3%

*May 15-October 31



Permitting Requirements

- **FERC license amendment**
- **Additional Permits and Consultations**
  - USACE Section 404 Permit
  - ADF&G Fish Habitat Permit
  - DNR lease modification for change in project boundary
  - DEC Section 401 Water Quality certification or waiver
  - Consultation with NMFS for Essential Fish Habitat and endangered species
  - Consultation with USFWS for endangered species
  - Consultation with SHPO and affected tribal entities for NHPA Section 106 compliance

Bradley Lake Expansion Project Timeline

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2027

Anticipate Bidding

Initiation of the formal bidding process for construction contracts.

2028

Construction Starts

Breaking ground and commencement of Major civil works.

2031

Project Completion

Finalization of all construction phases and systems testing.

Target

New Annual Output

>600K

MWh Annual Output

AEA provides **energy solutions** to meet the unique needs of Alaska's rural and urban communities.

ALASKA ENERGY AUTHORITY

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