Bradley Expansion Project

Terrestrial Resources Meeting

March 4, 2026

ALASKA ENERGY AUTHORITY

Kleinschmidt

ABR Environmental Research & Services

DOWL

Meeting Agenda

- **Project Overview**
- **FERC Process Update**
- **Terrestrial Studies**
  - Wetland Delineation
  - Vegetation and Wildlife Habitat Mapping
  - Raptor Nesting and Migration
  - Wildlife Habitat Evaluation
- **Next Steps - Consultation & Proposed PM&Es**

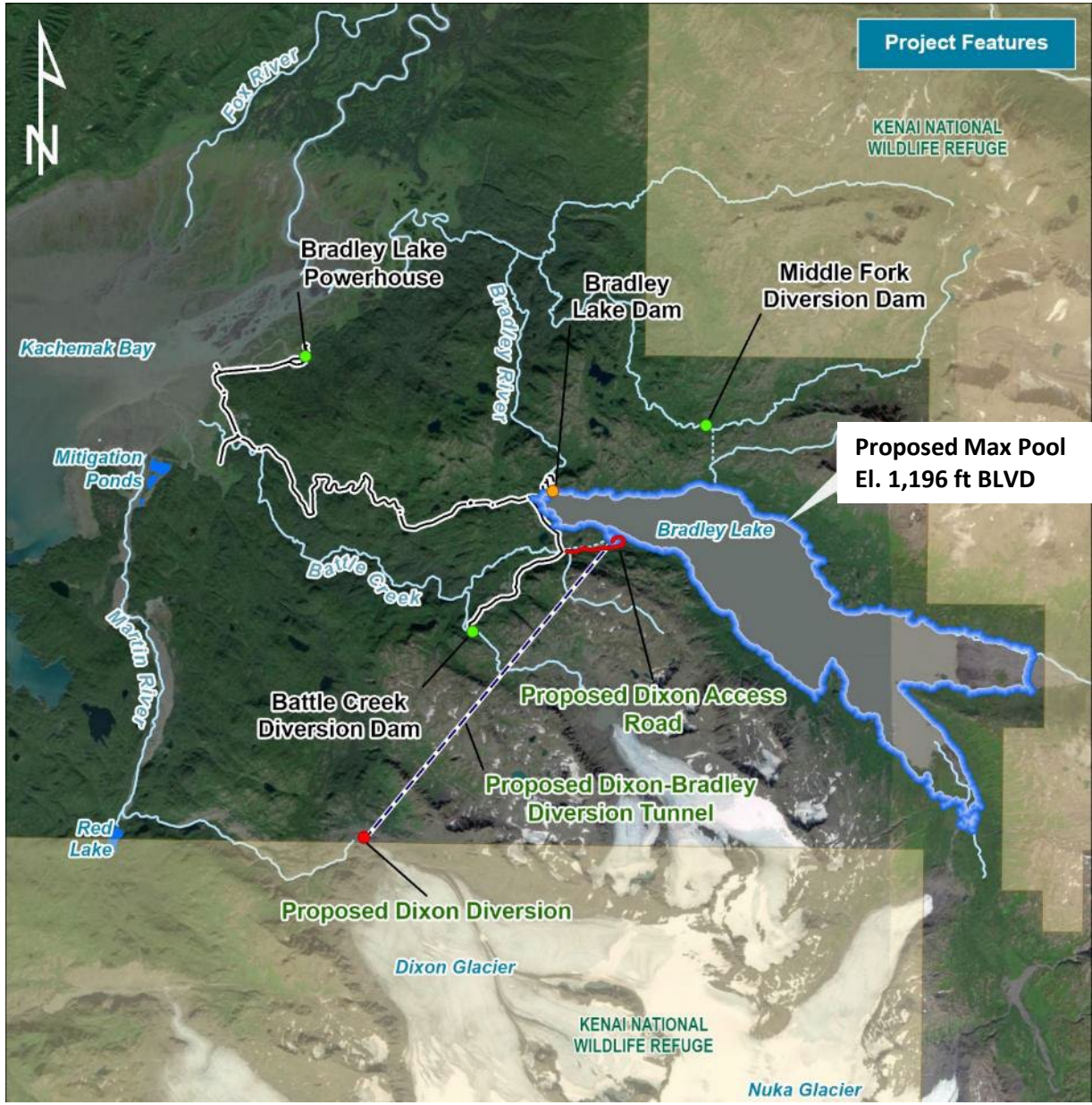
Proposed Project Overview

Divert water from Dixon Glacier to Bradley Lake **May - November** to increase energy output at Bradley Lake Project by about 40%.

All on State-owned Land

Project Elements:

- Modify Bradley dam to **raise pool by 16 ft**
- New diversion dam at Dixon Glacier terminus
- 4.6-mile-long diversion tunnel to Bradley Lake with a **maximum capacity of 1,650 cfs**
- New tunnel outlet discharge channel
- New 1-mile-long access road from existing Battle Creek Diversion road to tunnel outlet



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

FERC License Amendment Process Status

Responsible Party	Activity	Dates
AEA/Stakeholders	Initial Agency Consultation	Jan - Mar 2022
AEA	Conduct 2022 Preliminary Studies	Summer 2022
Stage 1: Initial Consultation Document (ICD)		
AEA	File ICD, Request for Non-federal Representative, & Newspaper Notice	Apr 2022
FERC	FERC Issues Notice of Amendment Accepted	May 2022
AEA	Provide Stakeholders with Notification of Joint Meeting	May 2022
AEA/Stakeholders	Hold Joint Agency/Public Meeting and Site Visit	Jun 14-15, 2022
FERC/Stakeholders	Comments on ICD/ Proposed Studies Due	Aug 14, 2022
Stage 2: Study Planning and Implementation		
AEA	Distribute Draft Study Plans	Nov 2022
Stakeholders	Comments on Draft Study Plans	Dec 2022
AEA	Paused Amendment Process and Refined Project Design	Mar 2023 – Feb 2024
AEA/Stakeholders	Project Update and Study Plan Meetings	Mar - Apr 2024
AEA/Stakeholders	Implement Year 1 Studies	2024
AEA/Stakeholders	Study Reports & NHPA Section 106 Consultation Meetings	Jan - Feb 2025
AEA	Implement Year 2 Studies	2025
AEA/Stakeholders	Consultation with agencies, Tribes, stakeholders	2025

FERC License Amendment Process Status

We are here

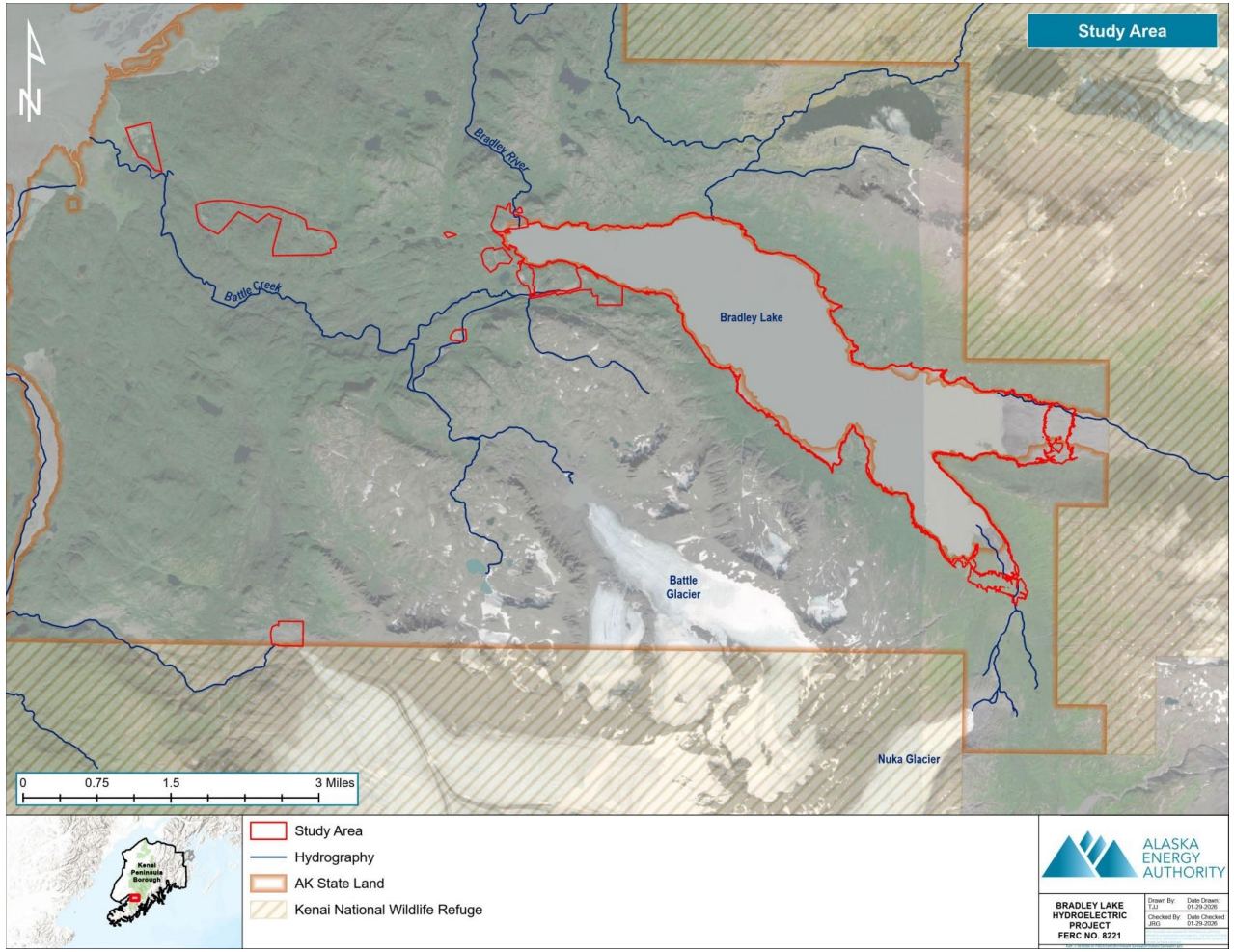
Responsible Party	Activity	Dates
AEA	Posted Draft 2025 Study Reports (45-day review)	Feb 2-6, 2026
AEA	Filed Draft Amendment Application (AEA requests 60-day review)	Feb 13, 2026
Stage 3 Consultation		
AEA/Stakeholders	**Draft 2025 Study Report Meetings**	**Mar 4-5, 2025**
AEA/Stakeholders	Consultation with agencies, Tribes, stakeholders	Mar – Apr 2026
AEA	NHPA Section 106 Consultation Meetings	Apr 2026
Stakeholders	**Comments due on Draft 2025 Study Reports**	**Mar 20, 2026**
Stakeholders	**DAA comments**	**Apr 14, 2026***
AEA/Stakeholders	Consultation with agencies, Tribes, stakeholders – if needed	May 2026
AEA	File Final Amendment Application and Final Study Reports	Early June 2026
FERC	Review FAA; issue AIR; issue REA; license order	2026-2027
AEA	Implement proposed pre-diversion monitoring studies	2026-2028
AEA	Other permitting (e.g., USACE Section 404)	2027-2028
Construction		2028-2030/2031
Operations begin		2031

Wetlands Study

- DOWL:
  Josh Grabel

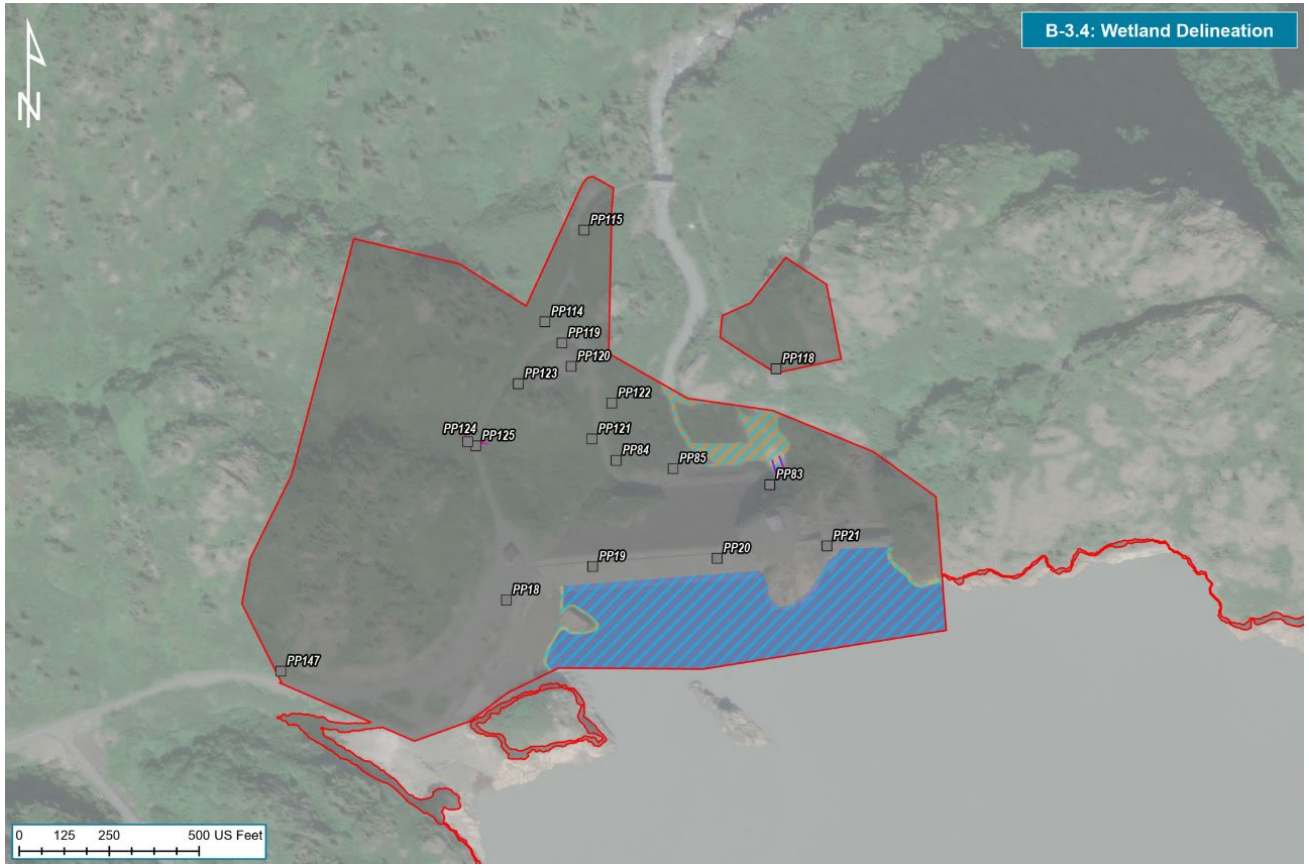
Area Surveyed/Mapped

- **Used standard USACE methodology**
- **Survey Area (734 acres):**
  - Dam with 250-foot buffer
  - Tunnel with 100-foot buffer around inlet and outlet
  - 1-mile-long new access road with 80-foot buffer around centerline
  - Pool Raise area El. 1,180 and 1,196 feet
  - Six material sites, staging areas, and spoil deposition areas
  - Construction camp pad
  - Expanded Project boundary along existing road



Results

- Total area mapped was 734 acres
- Bradley Lake Pool raise area
  - 83.9 acres of riverine and palustrine wetlands
- Remaining study area-
  - 14.8 acres of riverine, palustrine, and lacustrine



Impacts

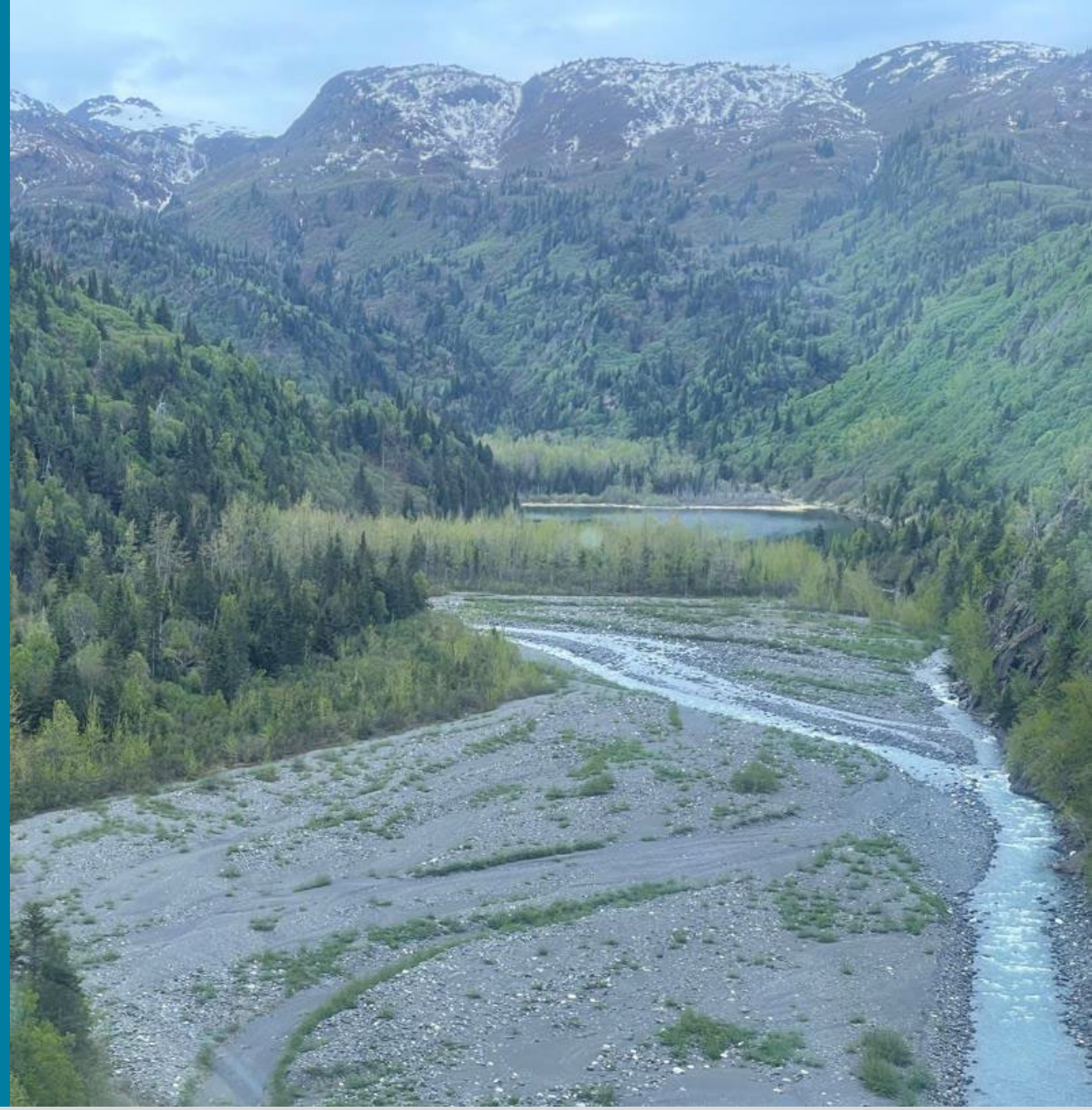
- Fill placement
  - Tunnel intake and facilities
  - Tunnel outlet
  - Dam
- **Total wetlands**
  - **10.07 acres**
- **Total waters**
  - **2.21 acres**

Project Impact	Cowardin Types	Acres
Dixon Diversion dam tunnel intake and appurtenant facilities	0.03-acre isolated pond (PUBH) and 1,673 linear feet (2.21 acres) of the East Fork Martin River (R3UBC, R3UBH, and R4SBC)	2.24
1-mile-long new access road	PEM1C, R4SBC	0.08
Dixon Diversion tunnel outlet and tunnel discharge channel	L2UBH, PUBH, R3UBH, PSS1B, PSS1C	3.50
Bradley Lake Dam (Bradley Lake)	L1UBH, L2UBH	5.47
Bradley Lake Dam (Bradley River downstream of existing dam)	R3UBH	0.67
Material sites (Borrow sites and spoils areas)	L1UBH, PEM1B, PEM1C, PEM1E, PSS1B, PUBH, R2UBH, R3UBH, R3UBJ	0.35
Staging areas (other than the one on WFUBC Rd)	N/A	0
Total Potential Wetland Impact		10.07
Total Potential Waters Impact		2.21

Vegetation and Wildlife Habitat Mapping Study

- ABR, Inc.—Environmental Research & Services

- Wendy Davis
- Terry Schick



Goals & Objectives

Goal:

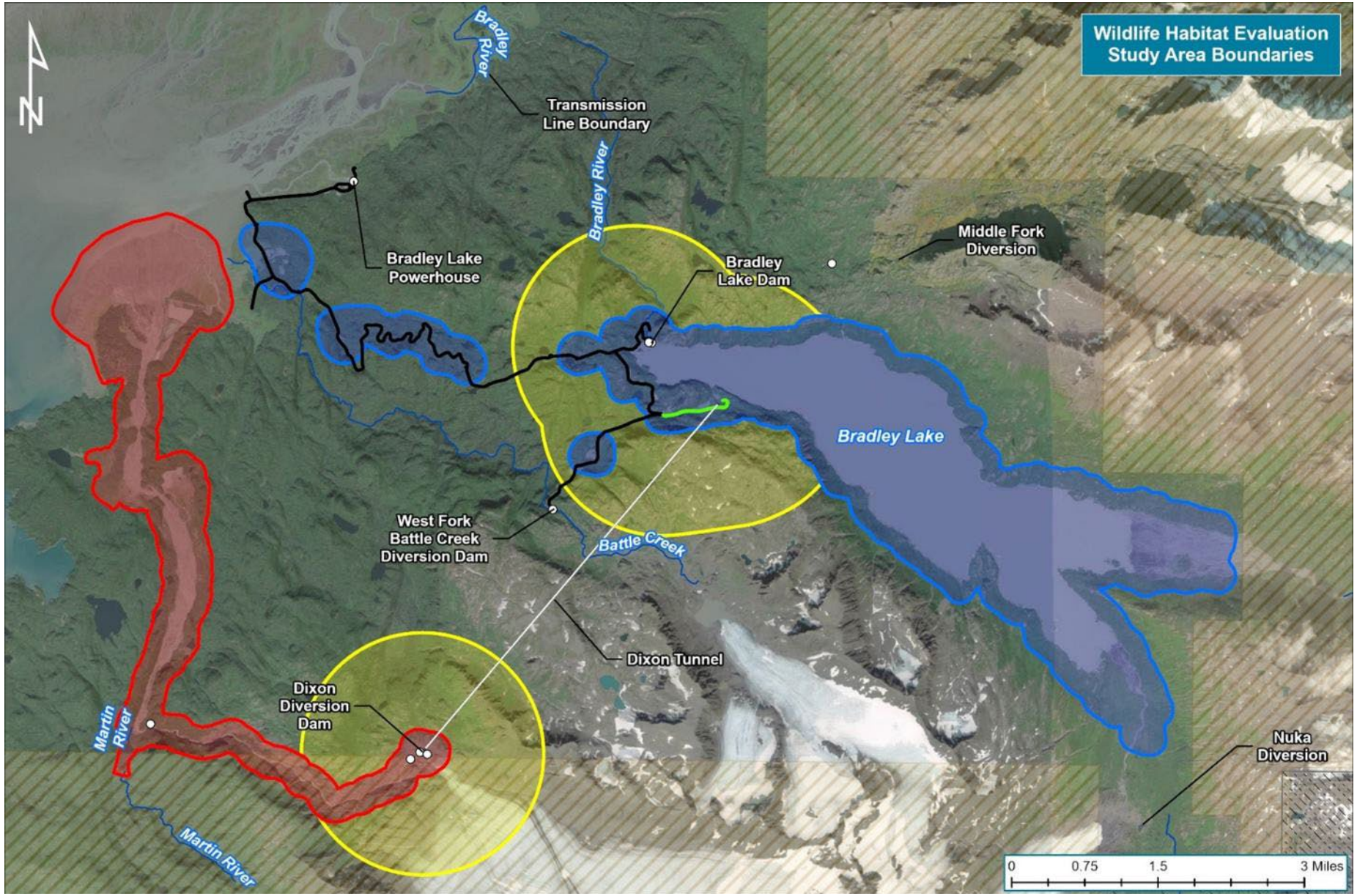
- In conjunction with the Wildlife Habitat Evaluation and Martin River Geomorphology studies, quantify potential Project impacts and future change in extent of important wildlife habitats.

Objectives:

- Identify, delineate, and map existing vegetation and wildlife habitat types in the study area.
- Prepare a vegetation and wildlife habitat map depicting expected, future conditions after 60 years of Project operations.

Study Area

- Mapping areas developed in collaboration with state and federal agencies to include fine-scale wildlife habitat mapping in both the Bradley Lake (blue) and Martin River (red) drainages, and broad-scale mapping (yellow) surrounding planned blasting areas.

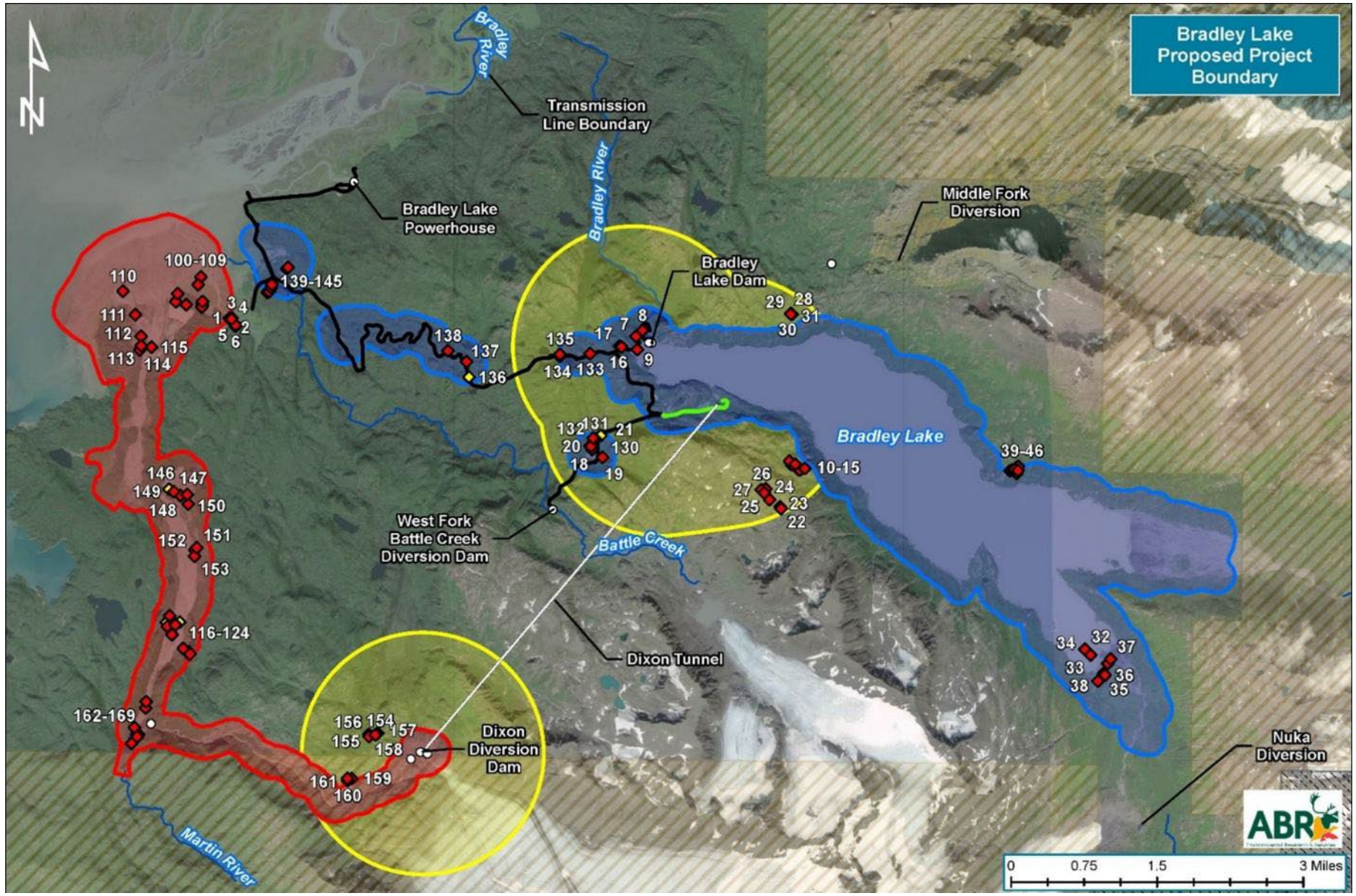


Mapping Methods

- **Fine-scale digital mapping in a 250-m buffer** surrounding all proposed project components, in both the Bradley Lake and Martin River drainages, was done based on July 2022 imagery using a multivariate method. Wildlife habitats were derived from several mapped landscape attributes (vegetation and land cover, physiographic position, surface form, and disturbance type).
- **Per ADF&G request, broad-scale wildlife habitat mapping in 2-km buffers** surrounding planned blasting areas was conducted focusing on suitable wildlife habitat types for a set of five disturbance-sensitive mammals (black bear, brown bear, moose, mountain goat, and wolverine). Golden Eagles were added to this list.

Field Surveys

- Over the 2024 and 2025 field seasons, a total of 60 ground-reference plots were sampled across both the Bradley Lake and Martin River drainages.
- 20 of those plots also were located within the 2-km blasting area mapping buffers.



Bradley Lake Drainage Mapping

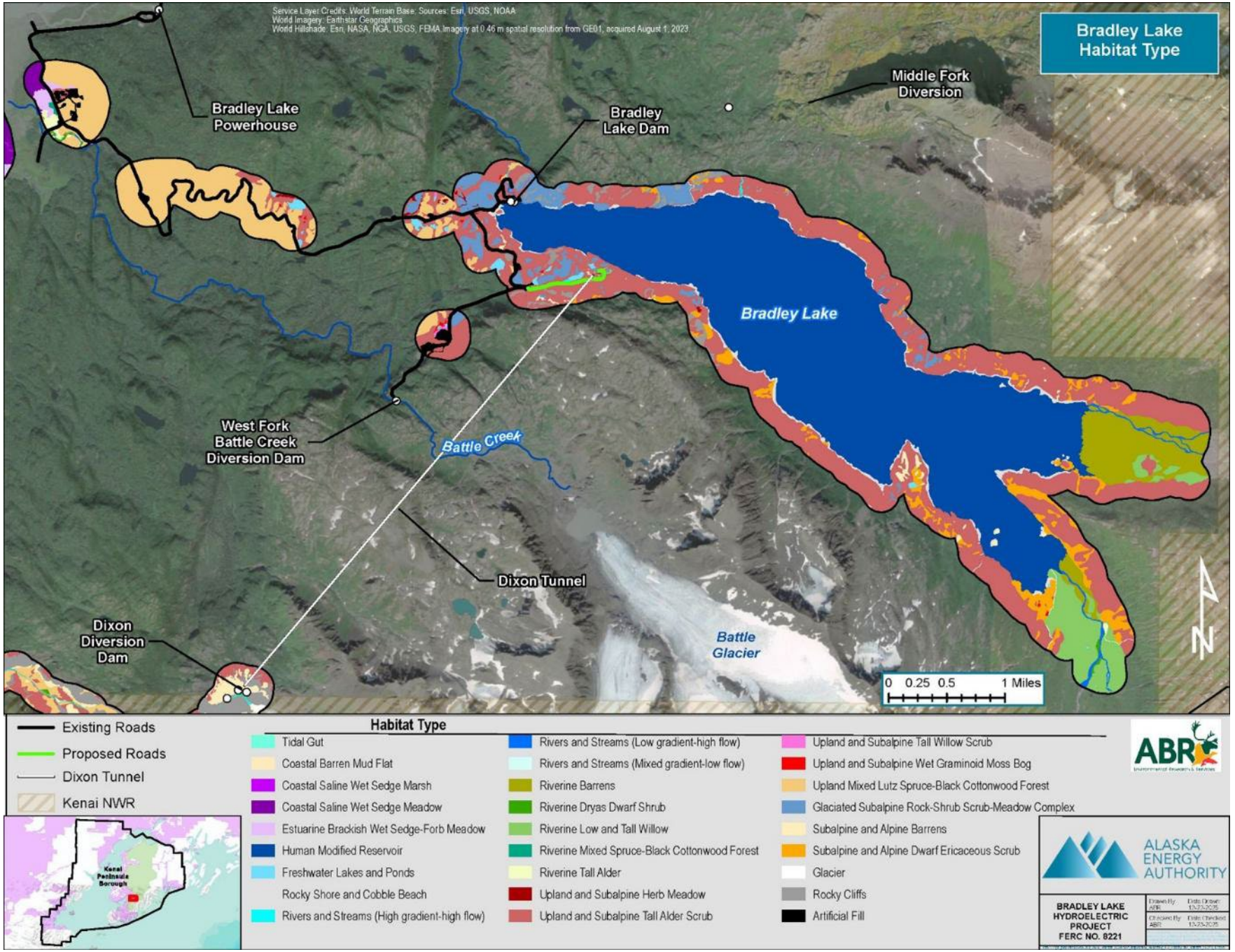
Current Habitats, Bradley Drainage

- 25 wildlife habitat types were identified and mapped in the Bradley Lake drainage study area, based on aerial photography acquired on 28 July 2022.
- Human Modified Reservoir (Bradley Lake) and surrounding tall scrub habitats strongly predominate.

Wildlife Habitat Type	Area (acres)	% of Study Area
Tidal Gut	0.6	<0.1
Coastal Saline Wet Sedge Marsh	0.7	<0.1
Coastal Saline Wet Sedge Meadow	24.3	0.3
Estuarine Brackish Wet Sedge-Forb Meadow	21.4	0.3
Freshwater Lakes and Ponds	43.7	0.6
Human Modified Reservoir	**3343.8**	**44.0**
Rocky Shore and Cobble Beach	102.5	1.3
Rivers and Streams (High Gradient-High Flow)	4.2	0.1
Rivers and Streams (Low Gradient-High Flow)	28.9	0.4
Rivers and Streams (Mixed Gradient-Low Flow)	4.0	0.1
Riverine Barrens	**360.8**	**4.7**
Riverine Dryas Dwarf Shrub	8.1	0.1
Riverine Low and Tall Willow	**265.6**	**3.5**
Riverine Mixed Spruce-Black Cottonwood Forest	3.0	<0.1
Riverine Tall Alder	15.6	0.2
Upland and Subalpine Herb Meadow	13.4	0.2
Upland and Subalpine Tall Alder Scrub	**1993.8**	**26.2**
Upland and Subalpine Tall Willow Scrub	3.0	<0.1
Upland and Subalpine Wet Graminoid Moss Bog	6.4	0.1
Upland Mixed Lutz Spruce-Black Cottonwood Forest	**660.5**	**8.7**
Glaciated Subalpine Rock-Shrub Scrub-Meadow Complex	**240.6**	**3.2**
Subalpine and Alpine Barrens	29.7	0.4
Subalpine and Alpine Dwarf Ericaceous Scrub	**256.2**	**3.4**
Rocky Cliffs	83.1	1.1
Artificial Fill	86.2	1.1
Totals	7600.1	100.0

Current Habitats, Bradley Drainage

- Upland and subalpine scrub and riverine habitats (along tributary streams) predominate at the higher elevations around Bradley Lake.
- Mixed spruce and cottonwood forests are more common at lower elevations towards Kachemak Bay.



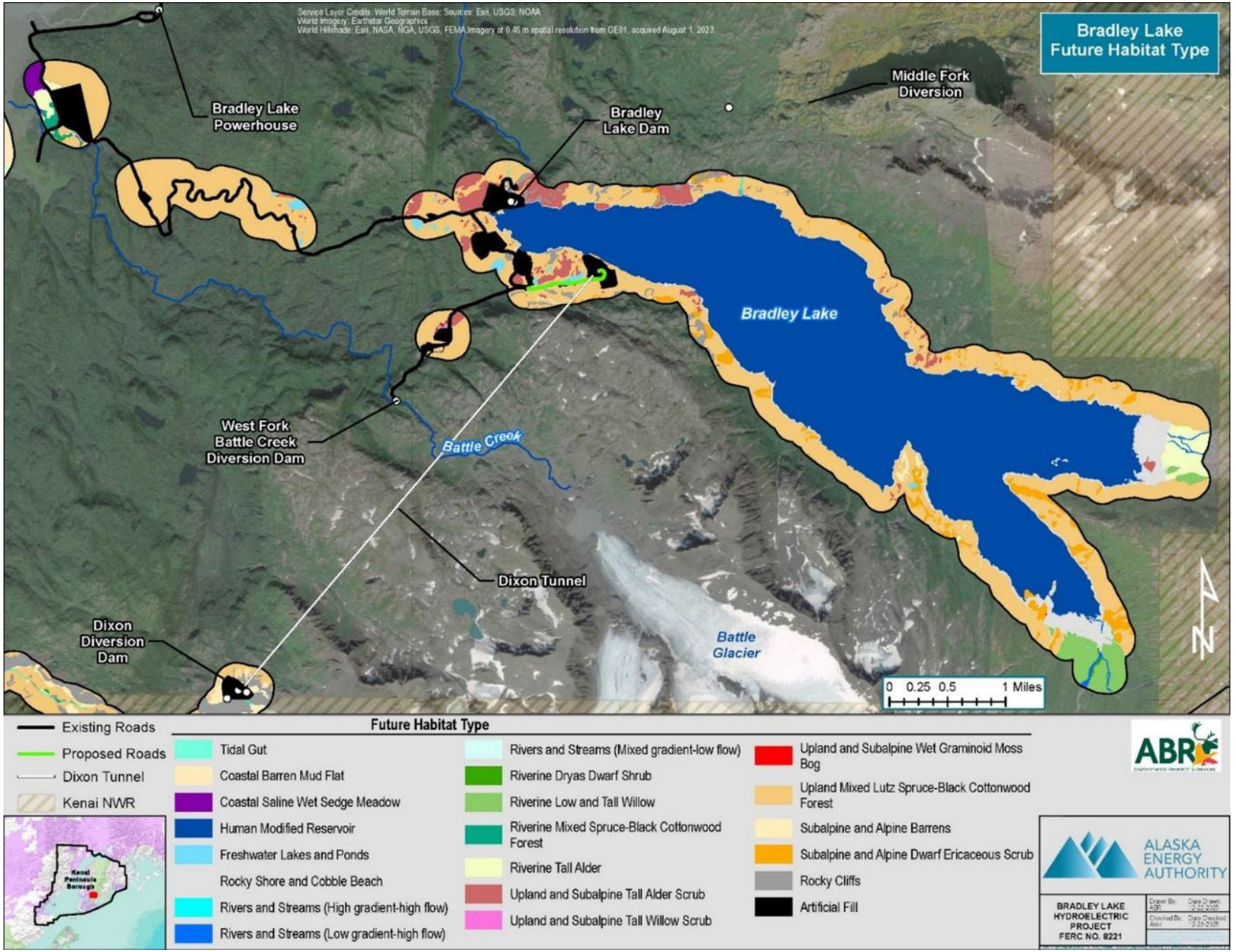
Construction Impacts, Bradley Drainage

- A total of 163 acres of wildlife habitats would be cleared and filled during construction.
- To avoid additional habitat losses, existing disturbed areas, classified as Artificial Fill (37.2 acres), would be used as construction staging areas.

Wildlife Habitat Type	Area (acres)	% of Impact Area
Human Modified Reservoir	5.5	2.7
Freshwater Lakes and Ponds	2.1	1.0
Rocky Shore and Cobble Beach	1.5	0.7
Rivers and Streams (High Gradient-High Flow)	0.4	0.2
Rivers and Streams (Low Gradient-High Flow)	0.6	0.3
Riverine Low and Tall Willow	1.5	0.7
Upland and Subalpine Tall Alder Scrub	**72.7**	**36.3**
Upland and Subalpine Tall Willow Scrub	<0.1	<0.1
Upland and Subalpine Wet Graminoid Moss Bog	0.6	0.3
Upland Mixed Lutz Spruce-Black Cottonwood Forest	**38.8**	**19.4**
Glaciated Subalpine Rock-Shrub Scrub-Meadow Complex	**35.2**	**17.6**
Subalpine and Alpine Barrens	2.2	1.1
Rocky Cliffs	1.9	0.9
Artificial Fill	37.2	18.6
Totals	200.2	100

Future Habitats, Bradley Drainage

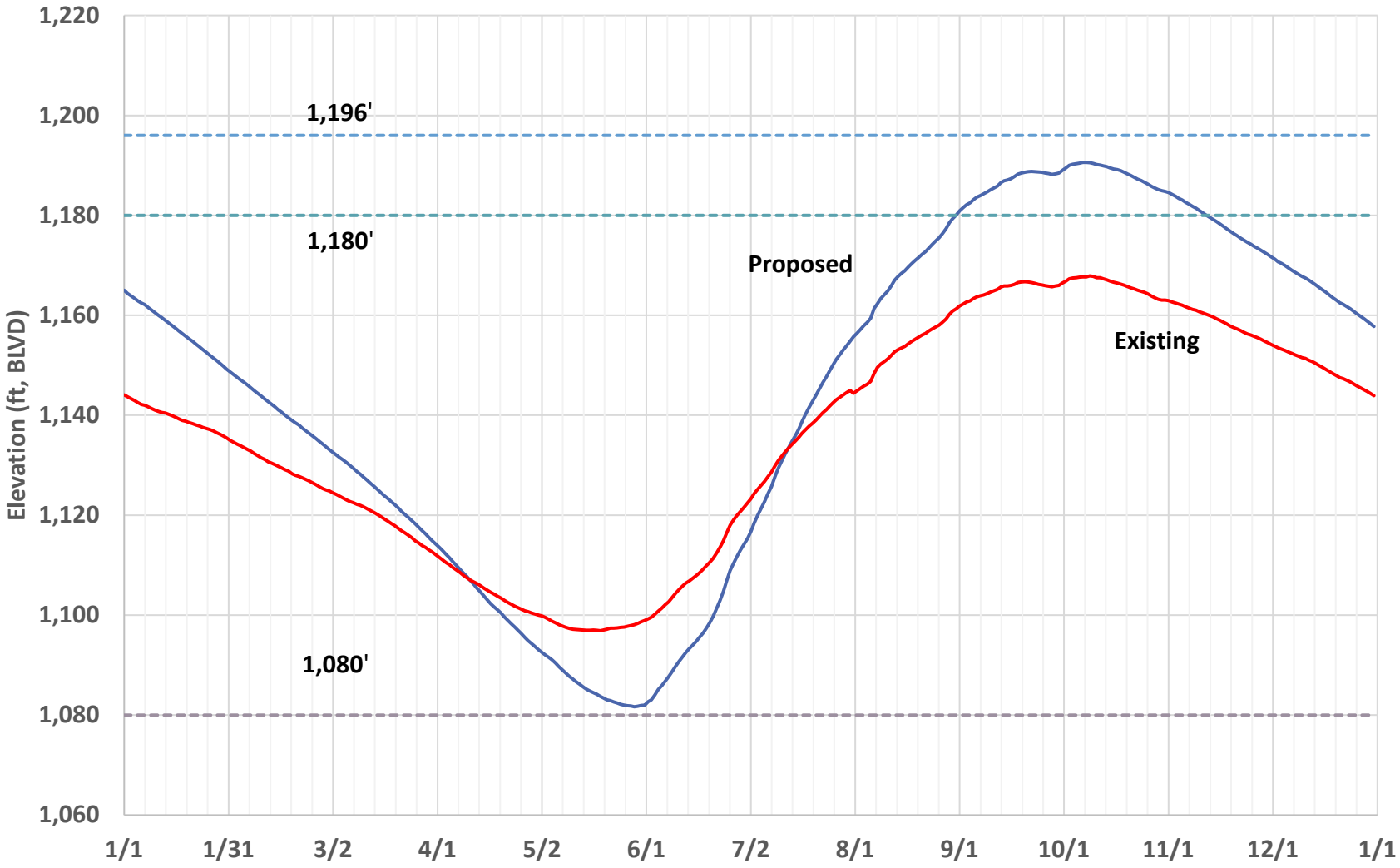
- Areas of Artificial Fill along with changes in vegetation types expected from natural plant succession after 60 years of Project operations.
- Many tall scrub habitats are expected to gradually transition to mixed forests at higher elevations with increased temperatures and precipitation under climate change.



Operations Impacts, Bradley Drainage

- Existing and proposed water level fluctuation zones (WLFZs) at Bradley Lake.
- Some vegetated habitats persist in the upper portion of the existing WLFZ; these areas are exposed each year during the early growing season (June to approx. mid-August or mid-September).

2020–2025 daily water level monitoring data



Operations Impacts, Bradley Drainage

- Habitats mapped along the shoreline of Bradley Lake based on imagery acquired on 28 July 2022 when the lake level had risen from the low point in late May and June to 1,153 ft.

Habitat Type	Acres, Current WLFZ (1,153 to 1,180 ft)	Acres, Expanded WLFZ (1,180 to 1,196 ft)
Freshwater Lakes and Ponds	0.5	0
Rocky Shore and Cobble Beach	**93.8**	**4.8**
Rivers and Streams (High Gradient-High Flow)	0.1	0.1
Rivers and Streams (Low Gradient-High Flow)	7.4	5.1
Rivers and Streams (Mixed Gradient-Low Flow)	1.2	0.4
Riverine Barrens	**211.0**	**59.8**
Riverine Dryas Dwarf Shrub	0	2.0
Riverine Low and Tall Willow	**53.4**	**65.9**
Riverine Tall Alder	0	1.8
Upland and Subalpine Tall Alder Scrub	**43.5**	**69.9**
Upland and Subalpine Wet Graminoid Moss Bog	0.2	1.2
Glaciated Subalpine Rock-Shrub Scrub-Meadow Complex	1.0	0.7
Subalpine and Alpine Barrens	2.7	0.1
Subalpine and Alpine Dwarf Ericaceous Scrub	**36.0**	**16.2**
Rocky Cliffs	0.1	0.3
Artificial Fill	0	1.0
Totals	450.9	229.3

Operations Impacts, Bradley Drainage

- Some vegetated habitats in the upper portions of the proposed future WLFZ may persist during Project operations but will be of lower quality for wildlife due to annual inundation (overall cover and plant species richness expected to be reduced).
- More frequently inundated habitats at lower elevations in the WLFZ are likely to transition to more flood tolerant graminoid-dominated vegetation and/or barren cobble and rock.
- When inundated, all habitats will function as lacustrine waters (Human Modified Reservoir).

Martin River Floodplain Mapping

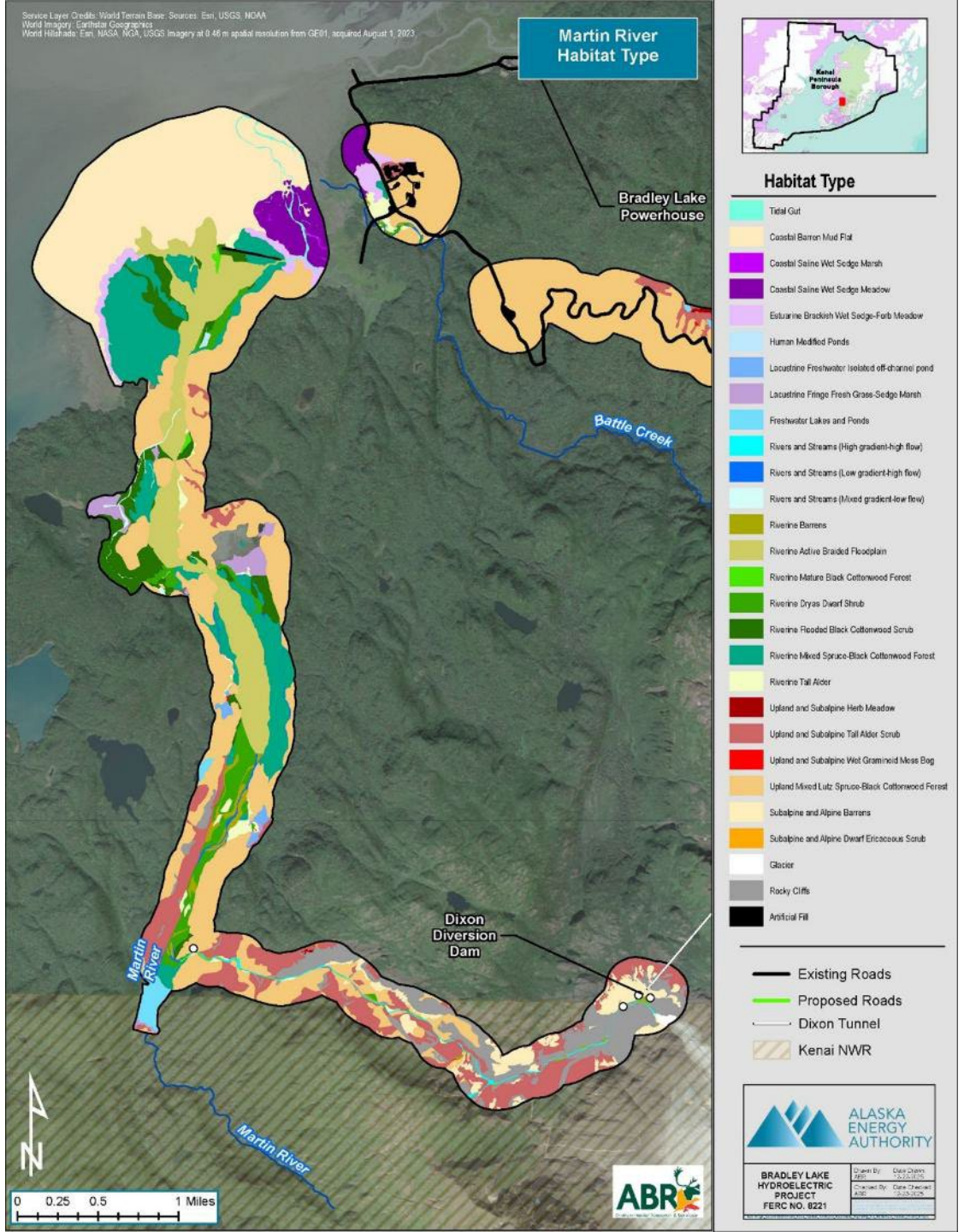
Current Habitats, Martin River

- 29 wildlife habitat types were identified and mapped in the Martin River floodplain study area, spanning a range from rocky subalpine areas at the Dixon Diversion site; upland and subalpine scrub and forest; a diversity of riverine barren, scrub and forest types; lacustrine waterbodies; and coastal habitats at Kachemak Bay.

Wildlife Habitat Type	Area (acres)	% of Study Area
Tidal Gut	19.5	0.5
Coastal Barren Mudflat	**711.8**	**19.9**
Coastal Saline Wet Sedge Marsh	2.5	0.1
Coastal Saline Wet Sedge Meadow	83.1	2.3
Estuarine Brackish Wet Sedge-Forb Meadow	43.9	1.2
Human Modified Ponds	2.8	0.1
Lacustrine Freshwater Isolated off-channel pond	12.8	0.4
Lacustrine Freshwater Tapped off-channel pond	33.2	0.9
Lacustrine Fringe Fresh Grass-Sedge Marsh	47.2	1.3
Freshwater Lakes and Ponds	30.6	0.9
Rivers and Streams (High gradient-high flow)	24.5	0.7
Rivers and Streams (Low gradient-high flow)	17.8	0.5
Rivers and Streams (Mixed gradient-low flow)	12.3	0.3
Riverine Barrens	34.4	1
Riverine Active Braided Floodplain	**373.9**	**10.4**
Riverine Dryas Dwarf Shrub	99.3	2.8
Riverine Tall Alder	26.8	0.7
Riverine Flooded Black Cottonwood Scrub	**150.0**	**4.2**
Riverine Mature Black Cottonwood Forest	4.3	0.1
Riverine Mixed Spruce-Black Cottonwood Forest	**364.7**	**10.2**
Upland and Subalpine Herb Meadow	1	<0.1
Upland and Subalpine Wet Graminoid Moss Bog	0.3	<0.1
Upland and Subalpine Tall Alder Scrub	**386.2**	**10.8**
Upland Mixed Lutz Spruce-Black Cottonwood Forest	**755.3**	**21.1**
Subalpine and Alpine Barrens	99.8	2.8
Subalpine and Alpine Dwarf Ericaceous Scrub	0.3	<0.1
Glacier	4.2	0.1
Rocky Cliffs	**234.3**	**6.5**
Artificial Fill	2.8	0.1
Total	3,579.60	100

Current Habitats, Martin River

- Rocky barrens and cliffs, and upland and subalpine scrub and mixed forests predominate in the upper river and canyon.
- Riverine habitats predominate after the confluence with the East Fork and development of the braided floodplain.
- Saline-influenced marshes and meadows and mudflats at the coast.



Construction Impacts, Martin River

- Compared to the Bradley Lake drainage, only 25.8 acres are expected to be disturbed and/or filled from construction of the Dixon Diversion dam, diversion pond, and tunnel intake.
- The majority of that acreage is Subalpine and Alpine Barrens and Rocky Cliffs exposed by the receding Dixon Glacier.

Habitat Type	Area (acres)	% of Impact Area
Rivers and Streams (High Gradient-High Flow)	1.4	5.4
Riverine Barrens	1.8	7.0
Upland and Subalpine Tall Alder Scrub	0.8	2.9
Subalpine and Alpine Barrens	**17.5**	**67.9**
Rocky Cliffs	4.3	16.8
Total direct impact area	25.8	100.0

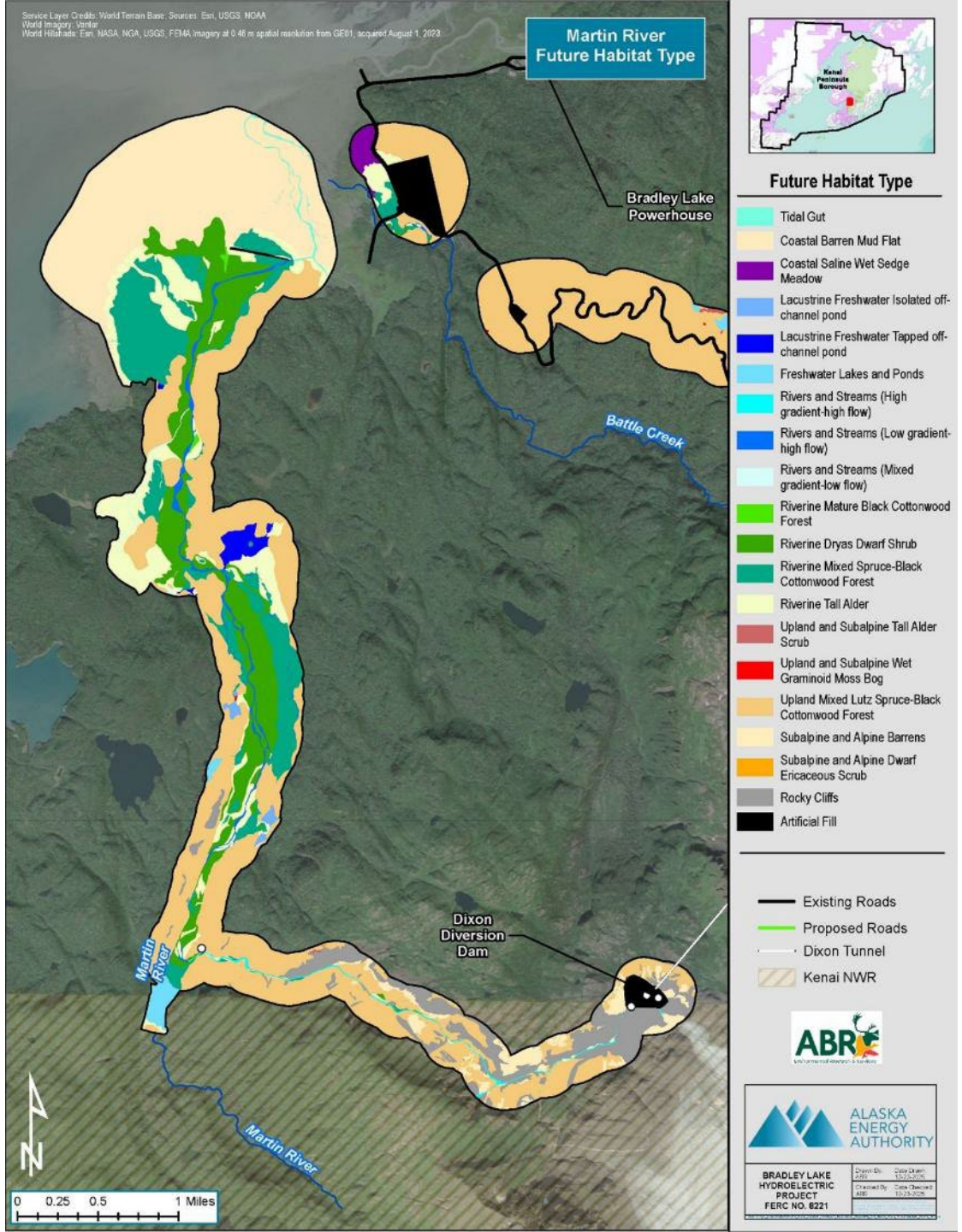
Operations Impacts, Martin River

- Seasonal flow and substantial overbank flooding reductions expected to result in gradual transition to a single-channel system.
- Colonization of barren floodplains by riverine dwarf and tall scrub.
- Sediment deposition at the coast from recent channel change expected to cover coastal habitats, transition to mudflat.
- Adjacent upland and subalpine tall scrub expected to transition to mixed forest under natural plant succession.

Habitat Type	Current Acres	Future Acres	Acreage change
Tidal Gut	19.5	19.5	0.0
Coastal Barren Mudflat	**711.8**	**797.4**	**85.6**
Coastal Saline Wet Sedge Marsh	**2.5**	**0.0**	**-2.5**
Coastal Saline Wet Sedge Meadow	**83.1**	**0.0**	**-83.1**
Estuarine Brackish Wet Sedge-Forb Meadow	**43.9**	**0.0**	**-43.9**
Human Modified Ponds	2.8	0.0	-2.8
Lacustrine Freshwater Isolated Off-channel Pond	12.8	12.8	0.0
Lacustrine Freshwater Tapped Off-channel Pond	33.2	33.2	0.0
Lacustrine Fringe Fresh Grass-Sedge Marsh	47.2	0.0	-47.2
Freshwater Lakes and Ponds	30.6	30.6	0.0
Rivers and Streams (High Gradient-High Flow)	23.1	23.1	0.0
Rivers and Streams (Low Gradient-High Flow)	17.8	61.4	43.6
Rivers and Streams (Mixed Gradient-Low Flow)	12.3	12.3	0.0
Riverine Barrens	32.6	0.0	-32.6
Riverine Active Braided Floodplain	**373.9**	**0.0**	**-373.9**
Riverine Dryas Dwarf Shrub	**99.3**	**419.1**	**319.8**
Riverine Tall Alder	**26.8**	**286.9**	**260.1**
Riverine Flooded Black Cottonwood Scrub	**150.0**	**0.0**	**-150.0**
Riverine Mature Black Cottonwood Forest	4.3	4.3	0.0
Riverine Mixed Spruce-Black Cottonwood Forest	364.7	391.5	26.8
Upland and Subalpine Herb Meadow	1.0	0.0	-1.0
Upland and Subalpine Wet Graminoid Moss Bog	0.3	0.3	0.0
Upland and Subalpine Tall Alder Scrub	**385.4**	**1.0**	**-384.4**
Upland Mixed Lutz Spruce-Black Cottonwood Forest	**755.3**	**1140.7**	**385.4**
Subalpine and Alpine Barrens	82.2	86.5	4.2
Subalpine and Alpine Dwarf Ericaceous Scrub	0.3	0.3	0.0
Glacier	4.2	0.0	-4.2
Rocky Cliffs	230.0	230.0	0.0
Artificial Fill	2.8	2.8	0.0

Future Habitats, Martin River

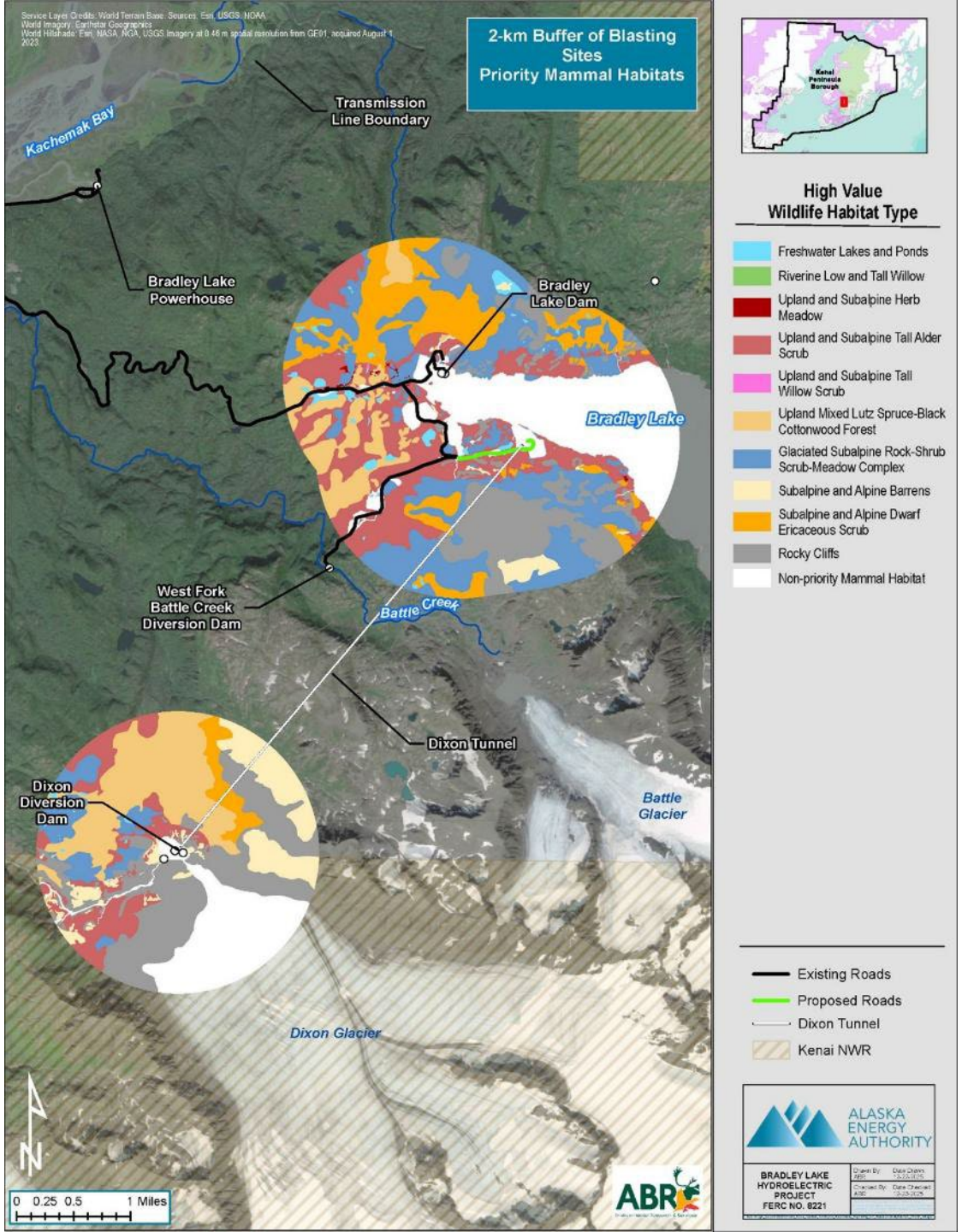
- Predicted single-channel system with expansion of riverine dwarf and tall scrub in previously braided floodplain.
- Expansion of intertidal mudflats at the coast.
- Expansion of upland mixed forest throughout the system replacing upland and subalpine tall scrub.



Blasting Area Buffer Zones Mapping

Suitable Habitat for Six Focal Wildlife Species

- 10 suitable habitats, ranked as high- or moderate-value, for each of the six disturbance-sensitive species (black bear, brown bear, Golden Eagle, moose, mountain goat, and wolverine) occur in both buffers where blasting is anticipated during construction.
- To be discussed in more detail in the wildlife habitat evaluation study presentation.



Raptor Nesting Study

- ABR Inc.—Environmental Research & Services

- Joe Welch
- Alex Prichard

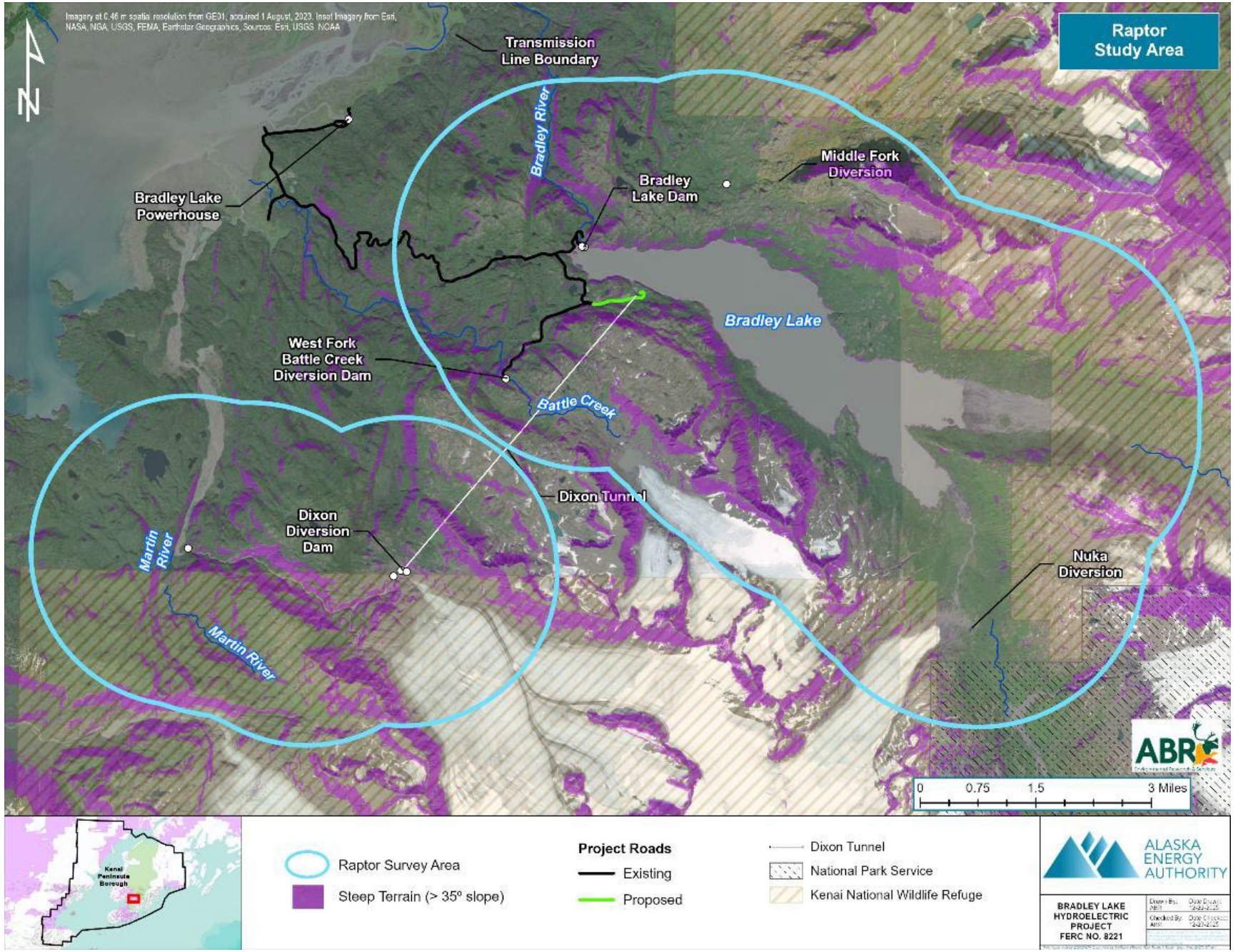
Photo by Erin Katzner, public domain

Goals & Objectives: 2025

- Per USFWS protocols, survey suitable cliff habitat for nesting Golden Eagles in a 2-mile buffer zone surrounding areas where habitats will be altered and/or where disturbance from blasting is expected during construction.
  - Assess Abundance and Distribution
  - PM&E Measures to Avoid Impacts
- Qualitatively evaluate and delineate Golden Eagle cliff-nesting habitat in the survey area using a categorical ranking system.
- Bald Eagle nesting at lower elevations will be addressed closer to the construction phase.

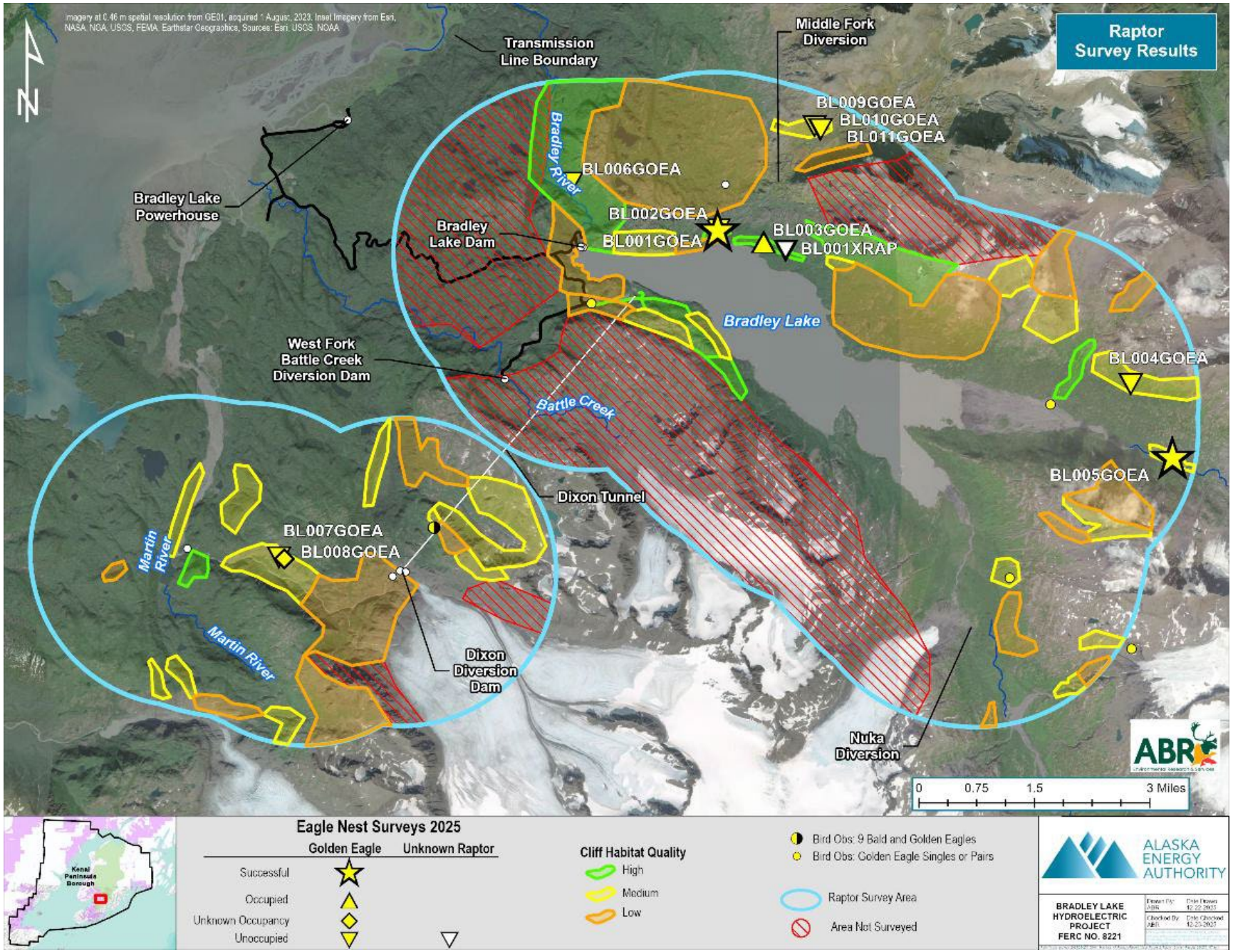
Survey Area

- 2-mile buffer around:
  - Bradley Lake Dam
  - Dixon Outflow Tunnel and Access Road
  - Dixon Diversion Site
  - Bradley Lake
- Expanded to include the Martin River Canyon downstream of the Dixon Diversion site



Results

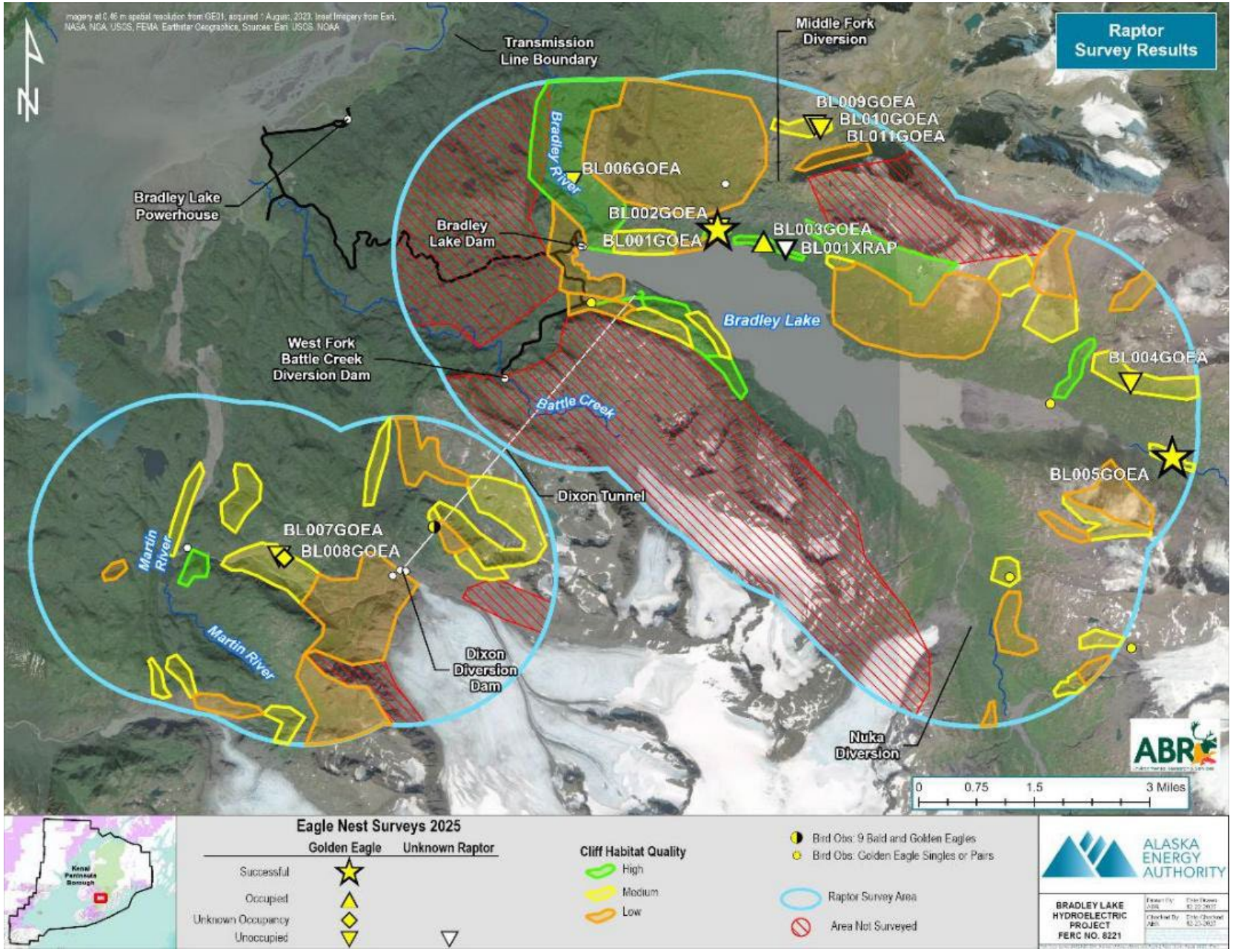
- Suitable cliff nesting habitat was common and both active and inactive Golden Eagle nests were found.
- The full survey area was not surveyed due to high winds.
- 2026 surveys planned
  - USFWS guidance is requested to determine survey extent



Results

Bradley Lake Area:

- **Within the 2-km blasting area buffer***
  - 1 unoccupied nest (BL006GOEA)
- **Outside the 2-km blasting area buffer**
  - 2 active and successful nests
  - 1 occupied nest
  - 7 unoccupied nests
  - 1 unknown occupancy nest

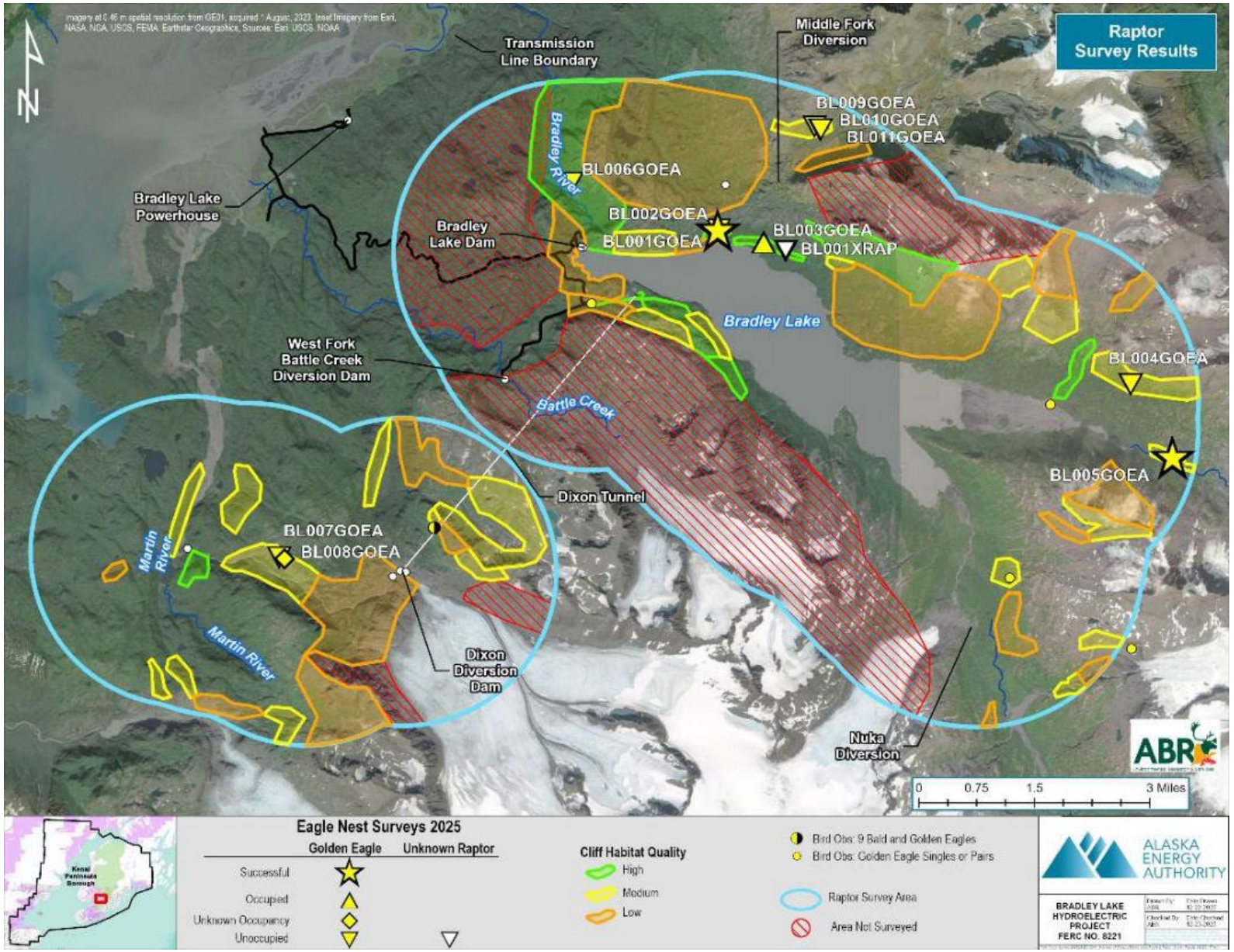


* ADFG recommended distance for Bears, Goats, Moose, and Wolverine

Results

Dixon Diversion Area:

- **Within the 2-km blasting area buffer**
  - no nests
- **Outside the 2-km blasting area buffer**
  - 1 unoccupied nest
  - 1 unknown occupancy
  - Both nests were located downstream in the Martin River canyon



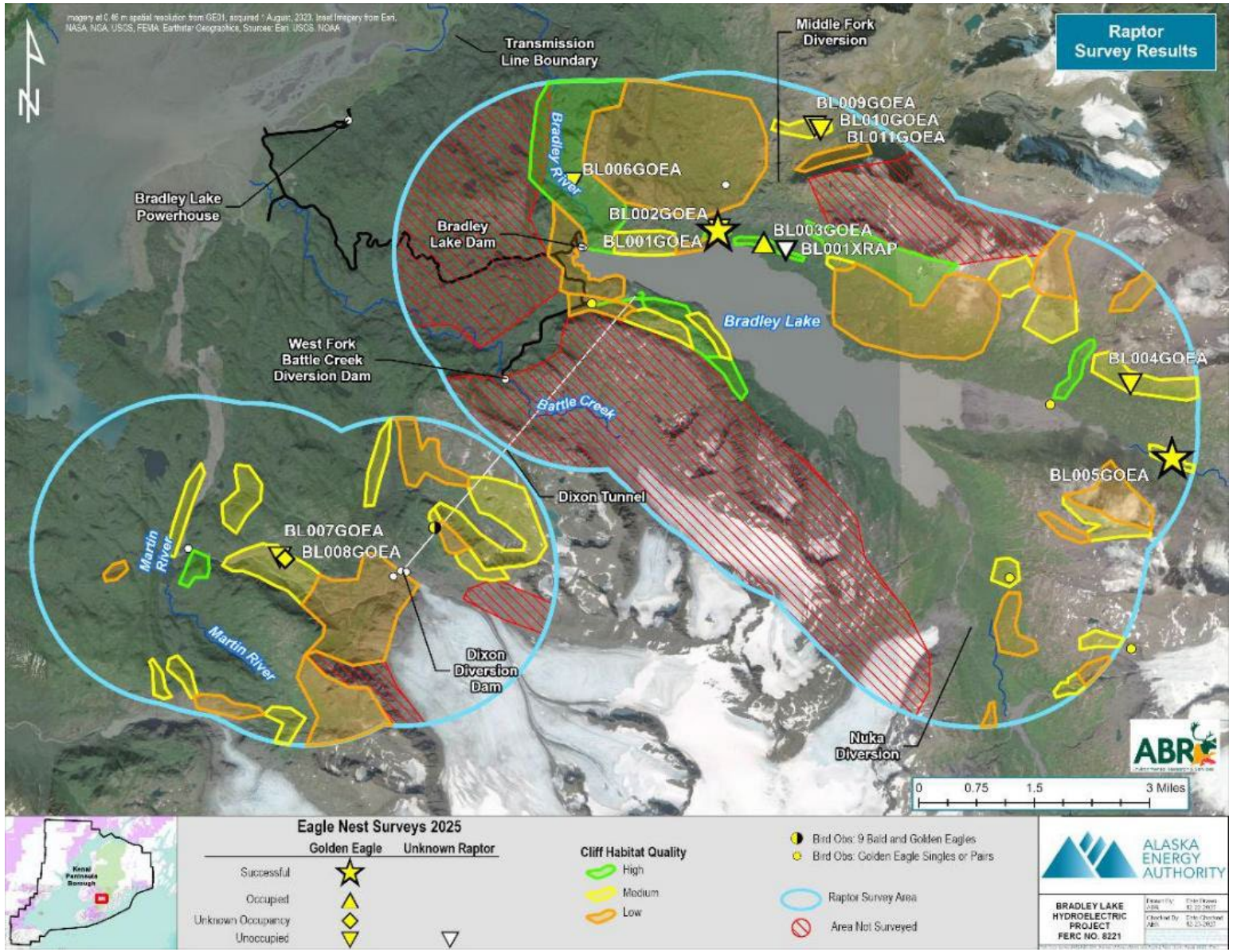
Results

Bradley Lake Area:

- High-quality cliff habitat for Golden Eagles downstream of the dam. More nests could be found there.

Dixon Diversion Area:

- Higher quality cliffs further downstream in the Martin River Canyon.
- Glacially rounded rock surrounding the Dixon Diversion does not provide good nesting ledges for Golden Eagle.



Next Steps

- Complete the nesting survey for Golden Eagles in 2026 focusing on areas in which blasting, if conducted during nesting, could result in adverse impacts.
- Determine an effective blasting area buffer distance for Golden Eagles with USFWS to avoid impacts.
- Finalize the PM&E measures for the Project license amendment application.
- Surveys for nesting Bald Eagles at lower elevations in Project area will be conducted closer to the construction phase.

Wildlife Habitat Evaluation

- ABR, Inc.—Environmental Research & Services

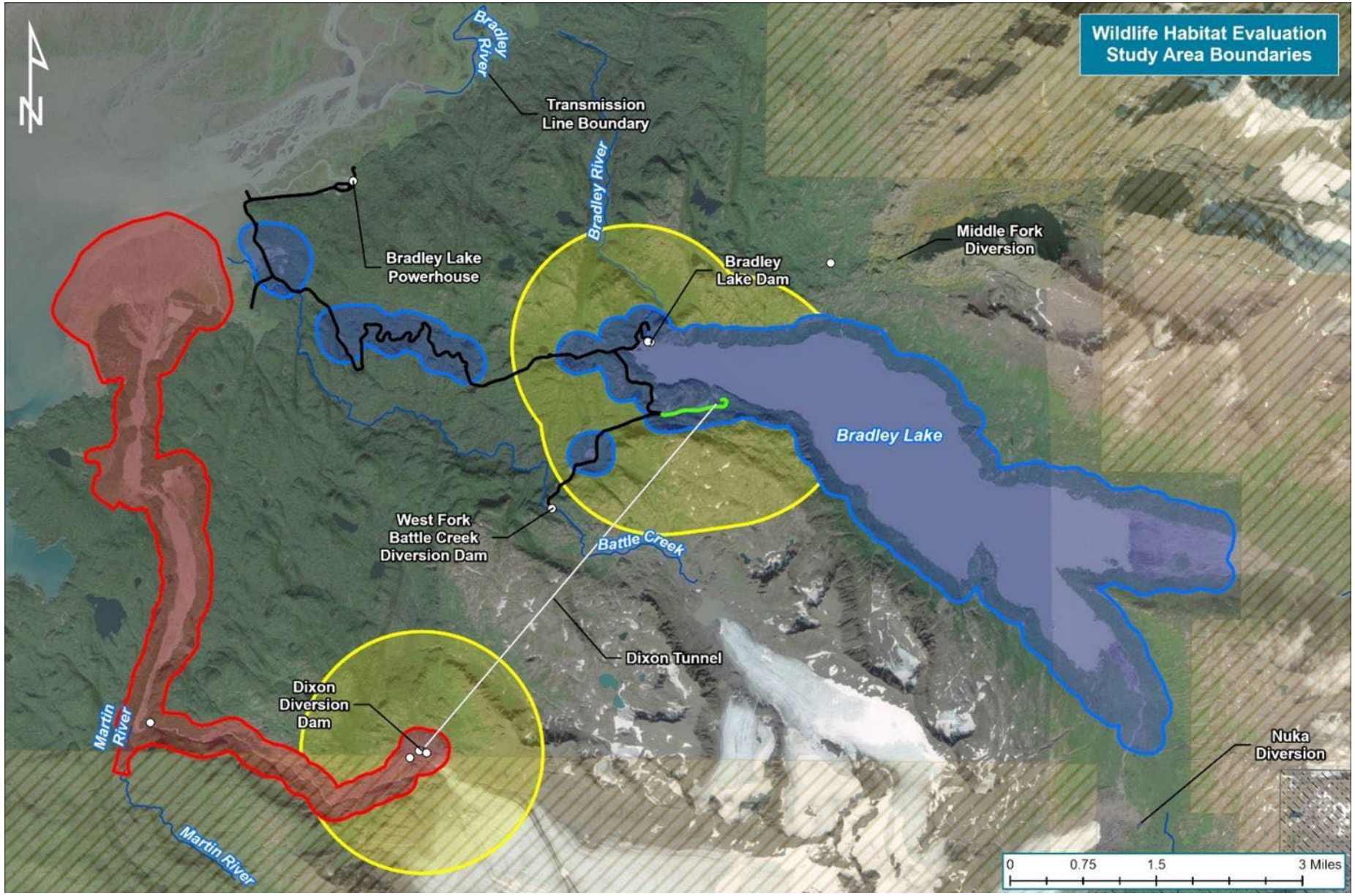
- Rebecca McGuire
- Terry Schick

Goals & Objectives

- In conjunction with the Vegetation and Wildlife Habitat Mapping Study, determine wildlife habitat values for birds and mammals of concern in the Project area to quantitatively assess potential loss and alteration of suitable habitats for each species.
- Determine availability of suitable habitats for six disturbance-sensitive species in broad buffer zones surrounding areas where construction blasting in anticipated.

Study Area

- Wildlife habitat evaluation conducted using the same mapped areas from the Vegetation and Wildlife Habitat Mapping Study.
- 250-m buffer around Project elements in the Bradley Lake drainage (blue) and around the entire Martin River floodplain (red).
- 2-km buffers (yellow) surrounding planned blasting areas.



Species List for Analysis - Mammals

- Species of concern to assess for habitat values determined in consultation with state and federal agencies.
- 14 mammal species selected.

Black bear [2]
Brown bear [2]
Moose
Mountain goat
Hoary marmot [2]
American beaver
River otter
Wolverine [1, 2]
Singing vole
Tundra (root) vole [1]
Snowshoe hare
Dusky shrew
Western water shrew
Little brown myotis

[1] USFWS request
[2] ADF&G request

Species List for Analysis - Birds

- 49 bird species selected.

[1] USFWS request

Northern Pintail [1]	Lesser Yellowlegs [1]	Rufous Hummingbird [1]
Steller's Eider [1]	Greater Yellowlegs [1]	Belted Kingfisher
Harlequin Duck	Marbled Murrelet [1]	Olive-sided Flycatcher [1]
Black Scoter	Kittlitz's Murrelet	Alder Flycatcher
Long-tailed Duck [1]	Black-legged Kittiwake [1]	Horned Lark [1]
Common Goldeneye [1]	Bonaparte's Gull [1]	Bank Swallow [1]
Barrow's Goldeneye [1]	Herring Gull [1]	American Pipit [1]
Common Merganser	Arctic Tern [1]	Lapland Longspur [1]
Red-breasted Merganser	Pelagic Cormorant [1]	Fox Sparrow
Red-throated Loon [1]	Golden Eagle	Savannah Sparrow
Semipalmated Plover	Northern Harrier	Song Sparrow
Rock Sandpiper [1]	Bald Eagle	Orange-crowned Warbler
Semipalmated Sandpiper [1]	Red-tailed Hawk	Northern Yellow Warbler
Western Sandpiper [1]	Short-eared Owl [1]	Blackpoll Warbler [1]
Short-billed Dowitcher [1]	Peregrine Falcon [1]	Wilson's Warbler
Spotted Sandpiper	Willow Ptarmigan	
Wandering Tattler [1]	Rock Ptarmigan	

Habitat Evaluation Methods

- A matrix wildlife habitat relationship procedure was conducted with cells for each species of concern and each mapped habitat type.
- Habitat values were ranked categorically (3 = high, 2 = moderate, 1 = low, and 0 = negligible) for each combination of species and habitat type.
- Current and future habitat values (predicted after 60 years of Project operations) for wildlife in the study area based on the mapping of current and expected future habitats described in the *Vegetation and Wildlife Habitat Mapping Study Report*.

Species	Rocky Cliffs	Rocky Shore and Cobble Beach	Subalpine and Alpine Barrens	Subalpine and Alpine Dwarf Ericaceous Scrub	Upland and Subalpine Herb Meadow	Upland and Subalpine Tall Alder Scrub	Upland and Subalpine Tall Willow Scrub	Upland and Subalpine Wet Graminoid Moss Bog	Upland Mixed Lutz Spruce-Black Cottonwood Forest
Golden Eagle	3	0	2	2	1	0	0	1	0
Northern Harrier	0	0	3	3	1	0	0	1	0
Bald Eagle	0	0	1	1	1	0	0	1	2
Red-tailed Hawk	1	0	1	1	2	0	0	1	3
Short-eared Owl	0	0	0	0	0	0	0	0	0
Belted Kingfisher	0	0	0	0	0	0	0	0	0
Peregrine Falcon	3	0	1	1	1	0	0	1	1
Olive-sided Flycatcher	0	0	0	0	2	0	0	2	3
Alder Flycatcher	0	0	0	0	0	3	3	0	3
Horned Lark	0	0	3	2	0	0	0	0	0
Bank Swallow	0	0	0	0	1	0	0	1	0
American Pipit	1	1	3	3	1	0	0	1	0
Lapland Longspur	0	1	2	2	1	0	0	1	0
Fox Sparrow	0	0	0	0	0	2	3	0	1
Savannah Sparrow	0	0	3	3	3	2	2	3	0
Song Sparrow	0	0	0	0	0	0	0	0	1
Orange-crowned Warbler	0	0	0	0	0	3	3	0	2
Northern Yellow Warbler	0	0	0	0	0	2	3	0	2
Blackpoll Warbler	0	0	0	0	0	1	1	0	1
Wilson's Warbler	0	0	0	0	0	2	3	0	1

Habitat Ranking Scores

Wildlife Group	Ranking Score	Value Class	Description
Birds	3	High	Known to be frequently used for nesting and/or foraging/hunting during the breeding season, these habitats also are often used during migration and in winter for resident species
	2	Moderate	Moderate-value habitats may be regularly used during the breeding, migration, or wintering seasons for foraging/hunting, but less so than high-value habitats
	1	Low	Low-value habitats would see little use by the species under consideration and in very low numbers
	0	Negligible	The species is not expected to occur, or will occur very rarely, in negligible-value habitats
Mammals	3	High	Known to be frequently used for breeding, shelter, denning, overwintering, and/or foraging/hunting during some portion of the year
	2	Moderate	Moderate-value habitats may be regularly used for foraging/hunting and as travel corridors, but less so than high-value habitats
	1	Low	Low-value habitats would see little use by the species under consideration and in very low numbers
	0	Negligible	The species is not expected to occur, or will occur very rarely, in negligible-value habitats

- Habitat value rankings based on project-specific habitat relationship data, the scientific literature for habitat relationships for the species in Alaska, ADF&G species management reports and species profiles, and extensive field observations in southcentral Alaska of the species evaluated.
- The combination of high- and moderate-value habitats represents those consistently used, referred to as “suitable habitats.”

Bradley Lake Drainage Habitat Impact Results

Construction Impacts

Loss of Mammal Habitats

- Amount of suitable mammal habitat expected to be lost within the Project footprint in the Bradley Lake drainage, excluding lake-level rise effects:
  - Large mammals: 156.1 acres – black bears would see the greatest amount of loss and mountain goats the least.
  - Furbearers: 161.8 acres – wolverines would see the greatest amount of loss and beavers the least.
  - Small mammals: 158.7 acres – voles, shrews, and hares would see the greatest amount of loss and water shrews the least.
  - Little brown myotis: 45.9 acres.

Construction Impacts

Loss of Avian Habitats

- Amount of suitable bird habitat expected to be lost within the Project footprint in the Bradley Lake drainage, excluding lake-level rise effects:
  - Waterbirds: 10.2 acres – Common and Barrow's goldeneye[1] would see the greatest amount of loss; Northern Pintail and Red-breasted Merganser the least.
  - Shorebirds: 6.1 acres – Spotted Sandpiper and Wandering Tattler would see the greatest amount of loss. The remaining seven species assessed have no suitable habitat in the footprint.
  - Seabirds: 2.1 acres – Bonaparte's Gull and Arctic Tern are the only species that would lose suitable habitat. The remaining five species assessed have no suitable habitat in the footprint.

[1] Expansion of the lake area could provide additional lacustrine habitat for the goldeneye species.

Construction Impacts

Loss of Avian Habitats continued

- Amount of suitable bird habitat expected to be lost within the Project footprint in the Bradley Lake drainage, excluding lake-level rise effects:
  - Raptors: 78.1 acres – Habitat loss amounts are roughly the same for Golden Eagle, Northern Harrier, Bald Eagle, Red-tailed Hawk, and Peregrine Falcon. No suitable habitat for Short-eared Owl would be lost.
  - Landbirds: 157.3 acres – Willow Ptarmigan, Alder Flycatcher, Savannah Sparrow, Orange-crowned Warbler, and Northern Yellow Warbler would see the greatest amount of loss; Horned Lark, American Pipit, and Lapland Longspur would see the least. No suitable habitat for Song Sparrow would be lost.

Operations Effects

Lakeshore Mammal Habitat Alteration

- Suitable habitat altered by lake-level rise and water level fluctuations along the shore of Bradley Lake:
  - Large mammals: 294.0 acres – black bears, brown bears, and moose would see the greatest amounts of suitable habitat altered; mountain goats would see the least.
  - Furbearers: 577.2 acres – river otters and wolverines would see the greatest amounts of suitable habitat altered; beavers and hoary marmots would see the least.
  - Small mammals: 292.3 acres – voles, shrews, and hares would see the greatest amount of loss and water shrews the least
  - Little brown myotis: 139.7 acres.

Operations Effects

Lakeshore Avian Habitat Alteration

- Suitable habitat altered by lake-level rise and water level fluctuations along the shore of Bradley Lake:
  - Waterbirds: 404.9 acres – By far, Harlequin Duck would see the greatest amount of suitable habitat altered. Only small amounts of suitable habitat would be altered for the other species.
  - Shorebirds: 501.9 acres – Spotted Sandpiper and Wandering Tattler would see the greatest amount of suitable habitat altered. Of the other species, only Semipalmated Plover has suitable habitat along the lakeshore.
  - Seabirds: 0.5 acres – Bonaparte's Gull and Arctic Tern would see very small amounts of suitable habitat altered. The remaining five species assessed have no suitable habitat along the lakeshore.

National Park Service, public domain

Operations Effects

Lakeshore Avian Habitat Alteration continued

- Suitable habitat altered by lake-level rise and water level fluctuations along the shore of Bradley Lake:
  - Raptors: 57.1 acres – Golden Eagle and Northern Harrier would see the greatest amount of suitable habitat altered; Peregrine Falcon the least. The other two species assessed have no suitable habitat along the lakeshore.
  - Landbirds: 308.0 acres – Willow Ptarmigan, Alder Flycatcher, Fox Sparrow, Orange-crowned Warbler, Northern Yellow Warbler, and Wilson's Warbler would see the greatest amount of suitable habitat altered; Belted Kingfisher and Bank Swallow would see the least. Song Sparrow has no suitable habitat along the lakeshore.

Martin River Floodplain Habitat Impact Results

Construction Impacts

Loss of Mammal Habitats

- Amount of suitable mammal habitat expected to be lost within the footprint of the Dixon Diversion facility in the upper Martin River:
  - Large mammals: 22.6 acres – mountain goats would see the greatest amount of loss. The other three species would see very little loss.
  - Furbearers: 25.8 acres – hoary marmots would see the greatest amount of loss. The other three species would see very little loss.
  - Small mammals: 0.8 acres – small amount of suitable habitat lost for all species except water shrews.
  - Little brown myotis: 5.7 acres.

Construction Impacts

Loss of Avian Habitats

- Amount of suitable bird habitat expected to be lost within the footprint of the Dixon Diversion facility in the upper Martin River:
  - Waterbirds: 3.2 acres – Harlequin Duck would see the greatest amount of loss. The only other species to lose suitable habitat is Common Merganser.
  - Shorebirds: 3.2 acres – Wandering Tattler would see the greatest amount of loss, followed by Semipalmated Plover and Spotted Sandpiper. No suitable habitat occurs in the footprint for the other six species.
  - Seabirds: 0 acres – No suitable habitat occurs in the footprint for any seabird species.

Construction Impacts

Loss of Avian Habitats

- Amount of suitable bird habitat expected to be lost within the footprint of the Dixon Diversion facility in the upper Martin River:
  - Raptors: 21.8 acres – Golden Eagle would see the greatest amount of loss, followed by Northern Harrier and Peregrine Falcon. No suitable habitat for the other three species occurs in the footprint.
  - Landbirds: 22.6 acres – Rock Ptarmigan would see the greatest amount of loss, followed by Savannah Sparrow, Horned Lark, American Pipit, and Lapland Longspur. Another five species would see very little loss. No suitable habitat for the remaining six species occurs in the footprint.

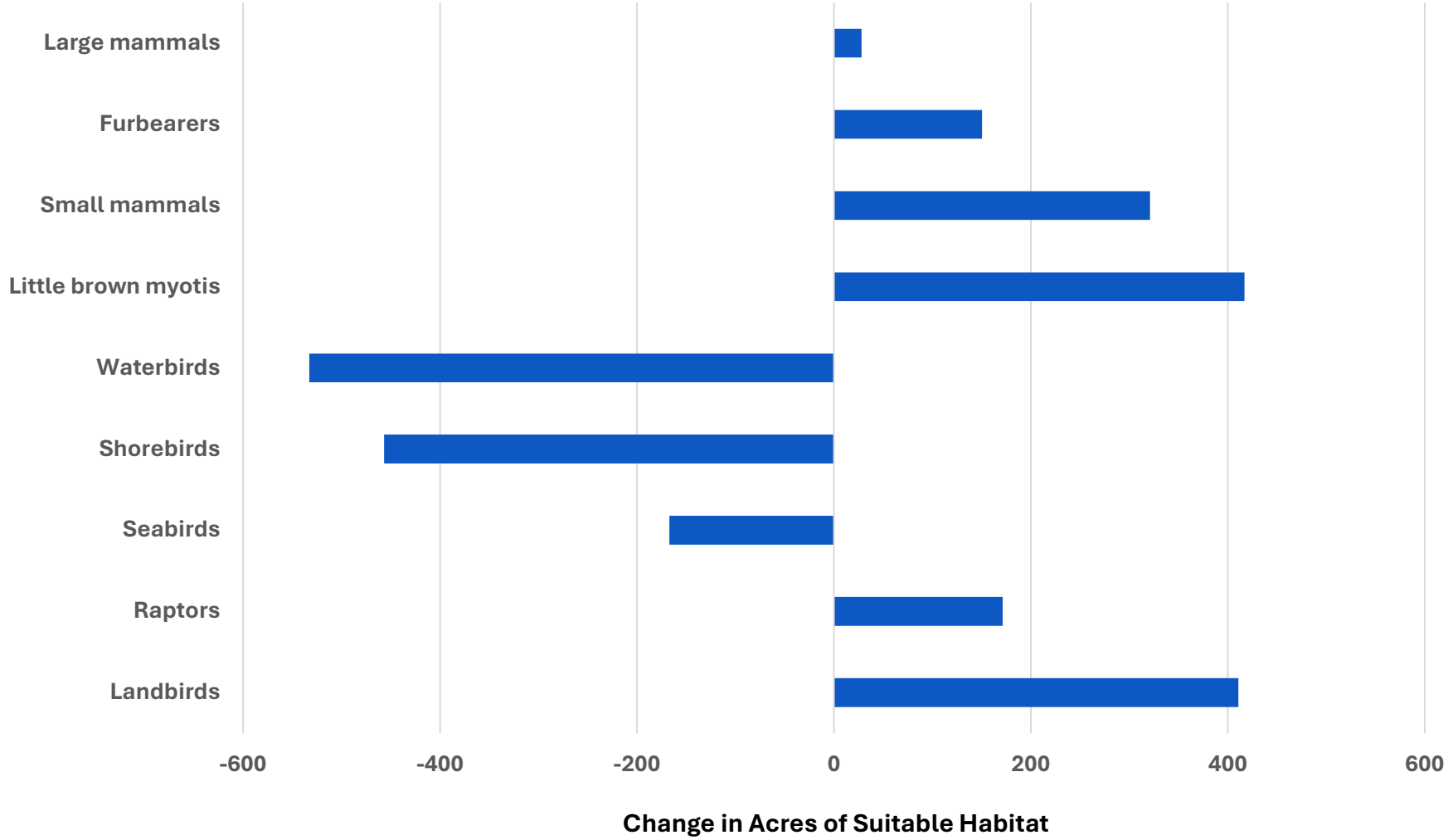
Operations Effects

Project-induced Habitat Changes in Martin River Floodplain

- Changes in extent of suitable habitats due to Project-induced river flow reductions and climate change-driven plant succession:
  - Large mammals: +28.1 acres
  - Furbearers: +150.4 acres
  - Small mammals: +320.9 acres
  - Little brown myotis: +416.9 acres
  - Waterbirds: -532.8 acres
  - Shorebirds: -456.8 acres
  - Seabirds: -167.1 acres
  - Raptors: +171.5 acres
  - Landbirds: +410.7 acres

Operations Effects

- Future habitat availability in Martin River floodplain is likely to result in an assemblage of more terrestrial-oriented wildlife species.



Blasting Area Buffer Zones Habitat Values

Construction Disturbance Concerns

Habitat Values in Blasting Buffer Zones

Mapping of suitable habitats was conducted within the two 2-kilometer blasting area buffer zones for six disturbance-sensitive species.

Total suitable habitat available in the two buffer zones combined is:

- Mountain goat: 5,336.7 acres
- Wolverine: 4,959.2 acres
- Golden Eagle: 4,306.2 acres
- Black bear: 4,276.8 acres
- Brown bear: 4,043.3 acres
- Moose: 2,671.3 acres

Next Steps

- Kleinschmidt Associates: Betsy McGregor

Next Steps – Pre-Diversion Monitoring

- 2026 Pre-diversion Activities
  - Nesting raptor survey - late May/early June
  - Martin River stream gaging and temperature monitoring
  - Red Lake AVCT adult salmon counts (ADF&G)

Next Steps – Bald and Golden Eagle Consultation

- Consult with USFWS
  - 2026 raptor nest survey area
  - Buffer distance from active Golden Eagle nests for blasting and other construction activities
  - Develop raptor nest disturbance avoidance plan (e.g., timing and distance buffers)

Next Steps – Initiate ESA Section 7 Consultation

- USFWS IPAC list:
  - Short-tailed Albatross – pelagic, not likely to occur; no designated critical habitat
  - Steller's Eider – winter in Kachemak Bay; action area not included in critical habitat
- NMFS
  - Need to define the action area – Kachemak Bay? Cook Inlet?
    - Up to 10 barges annually during construction mob and demob
    - Access to Project site limited to high high tides that occur about 4 days per month
  - What listed marine mammals may be present?
    - Northern sea otters, Cook Inlet beluga whale, humpback whale
    - Steller sea lion Western DPS?
    - Fin whale?
    - Leatherback sea turtle?

Next Steps – Consultation and Development of PM&Es

- **Erosion and Sediment Control Plan**
- **Fuel and Hazardous Substance Spill Plan**
- **Wetlands and Botanical Resources**
  - Maintain natural drainage patterns; stake and/or flag boundaries with buffers to prevent encroachment; comply with **AK Pollution Discharge Elimination System Permit** and FEMA requirements for fills within 100-year floodplains
  - Segregate and stockpile surface organic material from borrow sites for use in reclamation efforts after construction.
  - Use reserved organic material to help revegetate tunnel muck spoils at Bradley Lake and control erosion and fugitive dust. Sitka alder should establish readily and fix nitrogen.
  - Require all construction equipment be cleaned of debris prior to onsite use to ensure invasive and/or non-native species are not introduced.

Next Steps – Consultation and Development of PM&Es

- **Site/Brush Clearing Window**
  - outside May 1 – July 15 to avoid take of migratory bird nesting
  - outside May 1 – Aug 31 within 660 feet of bald eagle nests
- **Bear Safety Plan**
  - Best practices to minimize possible bear-human conflicts, including installation of bear-proof garbage receptacles during construction to prevent bears from obtaining putrescible waste;
  - Implementing strict no-feeding rules for all wildlife including bears;
  - Establishing procedures for handling problematic bears; and
  - Establishing reporting requirements for any bear-human conflicts.
- No hunting or fishing by contractors

Next Steps – Consultation and Development of PM&Es

- **Fund ADF&G goat monitoring study**
  - ADF&G proposed capturing and collaring animals to monitor movement patterns pre- and post-construction
  - Monitoring would begin when license is amended (2027)
- **Goat avoidance measures** (e.g., maintain 1,500 ft distance in all directions)
- **Survey for nesting raptors** just prior to construction for current information on nest locations (delayed study component)
- **Raptor nest disturbance avoidance plan** (e.g., timing and distance buffers)

Next Steps – Consultation and Development of PM&Es

- What other potential PM&E measures?

Thank you for your participation!